February 29, 2016

U.S. EPA Region 5
Remediation and Reuse Branch
Land and Chemicals Division, LU-9J
77 West Jackson Blvd.
Chicago, IL 60604-3590
Attn: Ms. Mirtha Cápiro

RE: Site-Wide Groundwater Monitoring Report for 2015
RACER Trust Moraine Facilities
Moraine, Ohio

Dear Ms. Cápiro:

The Revitalizing Auto Communities Environmental Response Trust (RACER Trust) is providing this Site-Wide Groundwater Monitoring Report for 2015 (Annual Report) for the RACER Trust Moraine Facilities in Moraine, Ohio (Site). This report presents the groundwater monitoring activities conducted to assess the performance of the corrective measures completed in 2015 at the following facilities located in Moraine, Ohio: former Delphi Harrison Thermal Systems, Moraine Plant, former General Motors Powertrain Group, Moraine Engine Plant and former General Motors Truck Group, and Moraine Assembly Plant.

The Ohio Environmental Protection Agency (Ohio EPA) provided comments to the Site-Wide Groundwater Monitoring Report for 2014 on June 26, 2015. Subsequently, RACER Trust provided responses to the comments in a letter dated August 28, 2015. Comments and responses that pertain to changes made to the Annual Report this year are noted below, with references to where the information can be found. Please refer to the August 28, 2015 letter for comprehensive responses to all of the Ohio EPA's comments.

> *Comment 3a. Ohio EPA recommends ground water analyses for the next annual report achieve 1,1-dichloroethene and vinyl chloride laboratory detection limits below MCLs. Detection limits below MCLs are recommended to ensure complete delineation of plume extent, to demonstrate remedy performance, and to demonstrate compliance with groundwater standards. Ohio EPA found that this past October 2014, seven wells had 1,1-DCE laboratory detection limits in excess of the MCL of 7, and twelve wells had vinyl chloride laboratory detection limits in excess of the MCL of 2 ug/L.*
>
> Response. A second 10 times less dilute run was used for samples from the following monitoring wells: GM-23, GM-29, GM-35, GM-43, GM-44, GM-59, GM-60, GM-67S,

GM-75S, GM-75D, HR-1, HR-3, HR-17, RMW-86, and W-4-S. With the exception of the reporting limit for vinyl chloride (4.0 micrograms per liter [ug/L]) in the sample from monitoring well GM-60, the reporting limits for the wells sampled in association with the annual groundwater sampling event were below the Maximum Contaminant Levels (MCLs). As indicated in the August 28, 2015 letter, a more than 10 times dilute run would be necessary to obtain a reporting limit for vinyl chloride that is less than the MCL (2.0 ug/L). While this is possible it would cause instrument contamination that would require clean-up. Considering that the sample from monitoring well GM-60 is not intended for closure evaluation, the reporting limit that was obtained for vinyl chloride is sufficient to assess vinyl chloride at the Site. The laboratory analytical data for the annual groundwater sampling that was completed in 2015 is summarized on Table 3, Figures 9 and 10, and Appendix G.

*Comment 3b. Ohio EPA also found that former oil house area performance monitoring wells GM-23 and GM-29 have had detection limits in excess of MCLs for approximately ten years. With detection limits for these constituents greater than MCLs at a number of wells, the Appendix E upper aquifer plume delineation maps appear to under-represent 1,1-DCE and vinyl chloride plume area. The plume delineation maps should be revised to contour estimated detections in excess of the MCLs.*

*Comment 3b.i. The extent of upper aquifer vinyl chloride should be contoured in the annual report to incorporate the estimated detections in excess of the MCL. Ohio EPA finds that had the October 2014 plume delineation (map Figure E-4) included estimated detections in excess of the MCL, the longitudinal plume axis would expand from approximately 1,200 feet to approximately 4,000 feet, toward the vicinity of downgradient well GM-21 (5.8 ug/L), located near the former company vehicle operations building.*

*Comment 3b.ii. The extent of upper aquifer 1,1-DCE should also be contoured in the annual report to incorporate the estimated detections in excess of the MCL. A 1,1-DCE plume is not interpreted in the report. However, Ohio EPA finds that had the October 2014 estimated detections in excess of the MCL been contoured, a plume could be interpreted between the former Delphi thermal building in the west and the former engine plant building in the east. The compound 1,1-DCE was estimated at <10 ug/L at well GM-66 located at the former thermal building, and <67 ug/L at well GM-60 located at the former engineer plant.*

Response. The isoconcentration contours that are included in Appendix H of the Annual Report were developed considering both detectable concentrations and half of the reporting limits for constituents that were not detected to address the Ohio EPA's comment and capture expansion or contraction of the plume.

*Comment 5. GM-28 is the only downgradient performance monitoring well for RZ-1 (former oil house area). Data has not been collected from well GM-28 in reporting years 2012, 2013, and 2014 due to an obstruction in the well. GM-28 should be cleared, repaired, or representative data should be gathered from an alternate location in order to monitor performance of RZ-1.*

Response. Monitoring well GM-28 was unable to be repaired. Therefore, monitoring well GM-28R was installed on December 21, 2015. Monitoring well GM-28R was constructed similar to monitoring well GM-28 and screened from 20 to 30 feet below ground surface. The well construction log for GM-28R is provided in Appendix E. Monitoring well GM-28R is located approximately 87 feet southeast of monitoring well GM-28, and the current location of monitoring well GM-28R is shown on Figures 2, 3, and 5. Monitoring well GM-28R was sampled on December 28, 2015, and the results are summarized in Sections 2.1.3 and 2.2.3 of the report text, Figure 9, Table 3, Appendix A, and Appendix G. As per communications with the United States Environmental Protection Agency (U.S. EPA), abandonment of monitoring well GM-28 will be completed in the future.

*Comment 6. In order to improve demonstration of in-situ reactive zone effectiveness annual reports should discuss progress toward transitioning the plume from PCE and TCE dominated, to terminal breakdown product and innocuous byproduct dominated. While the reporting of total VOCs is useful, the reporting of each constituent within the PCE breakdown series is essential for demonstrating the effectiveness of intended reductive dechlorination.*

*Reporting of molar fractions for the PCE degradation series should be included as a means for demonstrating remedy effectiveness. Once aqueous concentrations are converted to molar concentrations, well percentages can be calculated for each compound in the series, and displayed in a table or pie chart. A map displaying the percentages with color-coded pie charts can provide a ready means for distinguishing between parent compound dominated area, and daughter product dominated areas where efficient breakdown is occurring.*

Response. To address the requests for a different visual presentation of the individual volatile organic compound (VOC) data and capture the relative changes in both mass-based and molar-based VOC data, the Annual Report includes the following three performance assessment components.

1. Two plan view, site-wide maps (Figures 11 and 12) have been generated to support a more visual assessment of relative VOC concentrations across the Site. One map was generated for each of the upper (Figure 11) and lower (Figure 12) aquifers and includes pie charts to depict the total mass-based VOC concentration at each well in addition to the relative percentage of individual VOCs as a percentage of the total VOC value. The overall size of the individual pie chart corresponds to the relative total VOC order of magnitude (e.g., 1 to 10 ug/L, 11 to 100 ug/L, etc.) such that the relative VOC distribution can be viewed easily from a site-wide standpoint. Individual chlorinated ethene species reflect the color-coded fraction of each pie chart to present the constitution (e.g., parents versus daughter products) at a given well.
2. The discussion section within Appendix A of the Annual Report has been revised to not only reflect comparative changes in total VOC concentrations at individual wells but also a broader discussion of changes in parent species, daughter products, and end products over time.

3. In support of the mass-based pie charts and Appendix A discussions, the current at-a-glance figures (i.e., Figures A-1 through A-3 in Appendix A of the Annual Report) provide a detailed summary of the primary historical VOC performance data (parent species, daughter products, and end products) in addition to total organic carbon, pH, and methane data. VOC data will continue to be provided on a molar-basis to show relative changes in molar mass balance.

*Comment 8. In order to meet the objective of demonstrating in-situ reactive zone effectiveness, annual reports should begin comparing results to performance metrics. Because induction of efficient reductive dechlorination is intended, reports should demonstrate that necessary highly anaerobic REDOX conditions are present within the in-situ reactive zone treatment areas: RZ-1, RZ-3 east, RZ-3 west, and RZ-4 east. Efficient reductive dechlorination requires highly anaerobic conditions within the sulfate reducing to methanogenic range, in order for parent PCE and TCE to breakdown to terminal daughter products and innocuous by-products. Therefore, REDOX zonation maps should be provided for each reactive zone, to demonstrate where necessary conditions prevail in relation to the intended treatment area.*

Response. As discussed in the August 28, 2015 letter, the most representative and straightforward method of assessing whether chemical reduction-oxidation reaction (REDOX) conditions are appropriate for reductive dechlorination is to continue reviewing whether detectable methane is present at a given well location and using this performance metric to document that highly anaerobic groundwater conditions exist at a given well location. Appendix A of the Annual Report has been updated to include a discussion of the methane results as compared to 0.2 milligrams per liter (mg/L) cited by the United States Geological Survey.

*Comment 9. In order to demonstrate that sulfate reducing to methanogenic conditions necessary for efficient reductive dechlorination are present throughout each reaction zone's treatment area, sulfate and methane concentrations should be compared to threshold performance concentrations. In selecting threshold concentrations, Ohio EPA recommends reference to U.S. EPA's Technical Protocol for Evaluation Natural Attenuation of Chlorinated Solvents in Ground Water, EPA/600/R-98/128, September 1998. According to U.S. EPA protocol, sulfate concentrations indicative of sulfate reducing conditions are typically less than 20 mg/L. According to the U.S. Geological Survey, Water Resources Investigation Report 03-4057, methane concentrations indicative of methanogenesis are typically in excess of 0.2 mg/L.*

Response. As part of the Annual Report (see Appendix A), geochemical data associated with sulfate and methane concentrations will be compared to the benchmark values of 20 mg/L and 0.2 mg/L, respectively. As noted in the August 28, 2015 letter, the "benchmark" concentrations for these values are highly variable throughout the literature and have different frameworks for assessment as part of bioremediation applications.

*Comment 10. On March 13, 2015, ARCADIS provided a memo which included Figure 1 Upper Aquifer Methane Results. Please provide this figure in the annual report. There appears to be a discrepancy in the units reported (ug/L) on Figure 1 versus*

*units (mg/L) reporting in the 2014 Annual Report Tables A-7 through A-10 for the same values of methane. The figure should also be revised to show the in-situ reactive zones.*

Response. Figure A-4 Upper Aquifer Methane Results at Reactive Zone Performance Wells is included in Appendix A of the Annual Report and includes the in-situ reactive zones.

*Comment 11. While page 5 states that performance monitoring is conducted for reactive zone RZ-3 West at two monitoring wells, wells GM-6 and GM-8, a chlorinated ethene concentration versus time plot is provided for one well, well GM-6. Please update the report to provide the data, or to clarify the number of performance monitoring wells.*

Response. As discussed in Appendix A of the Annual Report, monitoring well GM-8 is used for performance monitoring of reactive zone RZ-3 West. A graph showing the enhanced reductive dechlorination analysis of monitoring well GM-8 is shown on Figure A-2 in Appendix A. Table A-8 in Appendix A has been revised to exclude results for monitoring well GM-6.

*Comment 12. To facilitate review of performance well concentration trend-plots such as Figures A1 through A3, must also be reported in terms of aqueous concentration versus time in addition to molar concentration versus time. Molar concentrations cannot be readily compared to MCLs as a performance measure. This is a concern in cases where aqueous concentrations are in excess of respective MCLs. For example, the Figure A-1 October 2014 trend-plots for well GM-23 display cis,1-2-DCE and vinyl chloride molar concentrations approaching zero micro-moles per liter. Yet Report Table 3 reveals aqueous concentrations one to two orders of magnitude in excess of respective MCLs. For example, the cis-1,2-DCE aqueous concentration of 210 ug/L is in excess of the MCL of 70 ug/L. And the vinyl chloride aqueous concentration of 200 ug/L is in excess of the MCL of 2 ug/L.*

Response. Figures 9, 10, and 13 through 16 in the Annual Report and Figures H-1 through H-12 in Appendix H compare concentrations observed in the performance monitoring wells and other monitoring wells at the Site to MCLs. It should be noted that the most appropriate review of the performance monitoring wells is to evaluate the data within molar concentrations to directly correlate the degradation of the chlorinated compounds.

*Comment 13. The following primary operation monitoring data is not discussed in Appendix A. The report should include a separate section in Appendix A, Page 3/6, Analysis of Primary Operation Monitoring Data, which provides a discussion and analysis of the ethene, ethane, and total parent-daughter compound molarity data.*

Response. Appendix A has been updated to include a mass-based comparison of ethene, ethane, and total parent-daughter compound data. Figures 11 and 12 in the Annual Report depict this comparison with the use of pie charts.

If you have any questions, please contact me at (937) 751-8635.

Sincerely,

Pamela L. Barnett

Pamela L. Barnett, PG
Cleanup Manager (DE, LA, MA, OH, PA, VA)
RACER Trust

cc: Bhooma Sundar, U.S. EPA
Conor Neal, U.S. EPA
Brian Gitzinger, Ohio EPA
Matt Justice, Ohio EPA

ARCADIS Design & Consultancy for natural and built assets

Revitalizing Auto Communities Environmental Response Trust (RACER Trust)

# SITE-WIDE GROUNDWATER MONITORING REPORT FOR 2015

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

February 29, 2016

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# 1 INTRODUCTION

This Site-Wide Groundwater Monitoring Report presents the groundwater monitoring activities completed in 2015 at the following Revitalizing Auto Communities Environmental Response Trust (RACER Trust) (formerly General Motors Corporation [GM Corporation]) facilities located in Moraine, Ohio (Site; Figure 1): 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, Moraine Assembly Plant (former Moraine Assembly).

This report addresses the site-wide groundwater monitoring program (Table 1) and the performance of the ongoing interim measures. These interim measures were proposed in the Interim Measures/Corrective Measures (IM/CM) Report (ARCADIS Geraghty & Miller, Inc. 2001) and incorporated the Former Oil House Area interim measures (in-situ remediation of groundwater, Figure 2); the capture zone interim measures (pump and treat system for the upper aquifer and pumping for the lower aquifer, Figure 2); institutional actions (the Site will remain industrial and groundwater use will be restricted); and a site-wide groundwater monitoring program. The groundwater monitoring for the facilities was conducted in accordance with the approved Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) and as modified in the Site-Wide Groundwater Monitoring Report for 2009 (ARCADIS, Inc. 2010a).

## 1.1 Site Description

The Site has been used for industrial purposes since the property was acquired in the mid-1920s by former 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 presents the location of each facility, property boundaries, and site features.

Frigidaire (a former division of GM Corporation) produced appliances from the late 1920s until 1979. 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 undergone decommissioning and demolition, 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. Operations at the regional haulaway ceased in December 2008.

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. 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 Industrial Realty Group (IRG) Moraine, LLC. As part of the property transfer, RACER Trust retained environmental liability for these properties. Current Site operations include multi-tenant use for industrial purposes. 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 Moraine 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.

IRG currently leases several portions of the Site for industrial purposes. IRG sold several portions of the property in 2014. Figure 1 provides details of the established parcels and subsequent Site owners. Specifically, the following transactions were completed in 2014:

- Copart of Connecticut, Inc. (Copart) acquired Lot #5433 (Parcel IDs J44 26413 0015 and J44 26413 0016) on May 2, 2014. Copart currently utilizes this lot to store cars for online auctions.
- Fuyao Asset Management A, Inc. acquired Lots #1, #2, #5438 (Parcel IDs N64 03305 0127, N64 03305 0129, and J44 26413 0023) on May 15, 2014. Fuyao currently produces and stores OEM automotive glass at this facility
- Inland Property Management, Inc. acquired Lot #5436 (Parcel IDs J44 26413 0020 and J44 26413 0021) on May 13, 2014. This lot is currently vacant.

Since 2014, property ownership has remained the same.

## 1.2 Groundwater Monitoring Program Objectives

The objectives of groundwater monitoring at the former Moraine Facilities are as follows:

1. Monitor groundwater quality upgradient and downgradient of the closed North and South Settling Lagoons;
2. Monitor groundwater quality upgradient and downgradient of Landfills L1, L2, and L3;
3. Monitor the effectiveness of the lower aquifer capture (DN-13) downgradient of property boundary;

4. Monitor the effectiveness of corrective measures activities in In-Situ Reactive Zones RZ-1, RZ-3, and RZ-4 east, to address Volatile Organic Compounds (VOCs) related to the Former Oil House Area; and
5. Monitor an appropriate list of wells once corrective measures objectives have been met, as discussed in the 2012 Corrective Measures Proposal (CMP) (ARCADIS, Inc. 2012a), to verify that these objectives continue to be met without the active measures.

## 1.3 Baseline Groundwater Monitoring Program Sampling Event

To provide a basis for evaluating the performance of the interim measures, a comprehensive site-wide groundwater sampling event for VOCs was completed in September 1999 to establish a baseline data set. The next site-wide groundwater sampling event was completed between September and October 2000. During the 2000 sampling event, at the request of the United States Environmental Protection Agency (U.S. EPA), groundwater samples were analyzed for Appendix IX VOCs and cis-1,2-dichloroethene (cis-1,2-DCE) by Method 8260, semi-volatile organic compounds (SVOCs), and metals by Method 6010B to verify that current groundwater conditions were consistent with previous site conditions. The results of this one-time sampling event confirmed that VOCs were the only constituents of potential concern in groundwater at the Site. SVOCs were not detected and metals were not detected above levels of concern during the 2000 sampling event. The analytical results from the 1999 baseline event and the 2000 site-wide event are presented in the IM/CM Report (ARCADIS Geraghty & Miller, Inc. 2001).

## 1.4 Interim Measures Description

### 1.4.1 In-Situ Reactive Zones

The reductive dechlorination of chlorinated VOCs can be enhanced by the introduction of a carbon source that stimulates activity of indigenous microorganisms. The high carbon loading triggers a succession of microbial species. Initially, aerobic electron acceptors such as oxygen and nitrate are consumed. Then, the microbial succession leads to a consortium of species that survive by sulfate reduction, methanogenesis, and other similar metabolic pathways, supporting the highly reducing conditions necessary for the dechlorination of tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-DCE, and vinyl chloride. This enhanced reductive dechlorination (ERD) process has been developed at the Site through the use of reactive zones for introduction of a degradable carbon source necessary to develop the desired reducing conditions.

Enhanced reductive dechlorination was implemented in 1999 as a component of the Former Oil House Area interim measures at three zones: 1) at the southern boundary of the Former Oil House Area (RZ-1); 2) at an intermediate downgradient location south of the Former Oil House Area in the ME well series area (RZ-2 which was operated from 1999 to 2002); and 3) at a downgradient location south of former Delphi Thermal Moraine (RZ-3 West) and the former Moraine Engine plant (RZ-3 East). Using the data obtained from the Supplemental Groundwater Investigation conducted in 2006, RZ-4 was designed and installed to address VOC impacts identified west of RZ-3 West (GM-16). The RZ locations are shown on Figure 2. The actual layouts of each reactive zone are shown on Figures 3 and 4 and discussed below:

- At RZ-1, molasses solution was introduced into the upper aquifer, above the upper clay till. The carbon injection wells are screened across the lower 10 feet (ft) of this portion of the upper aquifer, which is 4 ft to 12 ft thick. RZ-1 consists of 21 injection wells, of which 12 wells (RZ-1J through RZ-1U) were added in 2002 to expand RZ-1.
- Former RZ-2 consisted of four monitoring wells (ME-1 [abandoned], ME-2, ME-4, ME-5 [abandoned]), located along the western edge of the former Moraine Engine Plant 3 building. The RZ-2 wells were screened within the upper 3 ft of the upper aquifer. RZ-2 was operated from 1999 to 2002.
- RZ-3 consists of 46 injection wells, 30 wells in RZ-3 West (RZ-3A through RZ-3DD) and 16 wells in RZ-3 East (RZ-3FF through RZ-3KK and RZ-3MM through RZ-3VV). At RZ-3, the injection wells were screened from the approximate upper aquifer water table to a depth of 46 ft to 68 ft below land surface (bls), allowing carbon introduction through the lower 20 ft to 30 ft of the upper aquifer. Injection wells RZ-3RR through RZ-3VV were installed in April 2005 in order to establish a reactive zone further down-gradient and closer to the property boundary. The additional injection wells were screened from 34 ft to 54 ft bls. Injection wells RZ-3MM through RZ-3QQ have not been operated since the installation of RZ-3RR through RZ-3VV in 2005; therefore, of the 16 existing injection wells in RZ-3 East, only 11 are active.
- RZ-4 consists of 15 injection wells, 7 wells in RZ-4 West (RZ-4I through RZ-4O) and 8 wells in RZ-4 East (RZ-4A through RZ-4H). These injection wells were installed in July 2006. The RZ-4 West injection wells are located in the southeast corner of the closed South Settling Lagoon and the RZ-4 East injection wells are located north of Landfill L1 and west of the Waste Pile/Staging Area. At RZ-4, the injection wells were screened from the approximate upper aquifer water table to a depth of 57 ft to 62 ft bls, allowing carbon introduction through the lower 30 feet of the upper aquifer. Only RZ-4 East remains active.

To establish conditions conducive to ERD within reactive zones RZ-1, RZ-2, and RZ-3, a readily degradable carbon source (a dilute solution of molasses and potable water) was periodically delivered into the reactive zone injection wells during a 6-month period from December 1999 to May 2000. The molasses solution consisted of either a 10-to-1 or 20-to-1 ratio of potable water to feed-grade molasses that was pumped into each RZ well (Table 2). The initial event, conducted in December 1999, consisted of two consecutive rounds of carbon source introductions in each RZ well. After the initial introduction event, the carbon source solution introductions were scheduled twice per month through May 2000. Due to the success during the first six months of implementing this technology, carbon source introduction activities continued in October, November, and December 2000, and subsequently from June 2001 through December 2015.

Introductions in RZ-1 were modified in the fall of 2003 after review of the previous site-wide groundwater analytical results. Due to the success of RZ-1, reduced carbon loading was implemented at a frequency of one introduction event every other month, and monitoring well GM-28 was periodically sampled to ensure that the necessary reducing conditions were being sustained to promote the dechlorination process. In May 2005, the introduction routine was changed to two injections every quarter to maintain reducing conditions and provide sufficient carbon to allow for complete degradation of the VOCs.

Monthly injections were completed in 2013 in Reactive Zones RZ-1, RZ-2, and RZ-4 East through August, with the exception of January, due to weather conditions. The frequency of substrate injections at

reactive zones RZ-1, RZ-3, and RZ-4 East was modified starting in September 2013. This amended schedule includes quarterly injections based on the updated Conceptual Site Model (CSM), specifically transport velocities in the upper aquifer. The groundwater mass transport velocity was evaluated and refined as part of the 2012 CMP (ARCADIS, Inc. 2012a) using data generated through operation of the injection program and the Pre-Design Investigation. The results of the evaluation indicated that the estimated mass transport velocity is approximately 0.25 feet per day (ft/day), which is slower than estimates generated prior to initiation of the injections in 1999 (e.g., greater than 1 ft/day). Calculations were subsequently completed to evaluate the current injection frequency relative to the revised (lower) mass transport velocity. Specifically, the estimated time for the molasses solution to "wash out" of the injection area through groundwater transport was estimated assuming a mass transport velocity of 0.25 ft/day. The results of these calculations indicated that molasses will wash out of the injection area every three to four months.

During the initial period of the amended injection schedule (quarterly), an evaluation was completed to confirm the estimated carbon source wash out rate and to confirm that the interim measure remained effective. This evaluation consisted of baseline sampling and a three month discontinuation from December 2013 through February 2014 of reagent injections to provide data for the establishment of organic carbon degradation trends. The organic carbon degradation trends were subsequently used to confirm the theoretical quarterly wash out rate.

To support the injection evaluation, groundwater samples were collected from injection wells RZ-1E, RZ-3D, RZ-3S, RZ-3TT, and RZ-4E for the analysis of total organic carbon (TOC). Baseline groundwater grab samples for TOC were collected on December 11, 2013, immediately following completion of the November 2013 injection in these wells. Grab groundwater samples for TOC then were collected on a monthly basis from the same five RZ injection wells in January and February 2014. In addition, groundwater samples were collected for the analysis of TOC, methane, ethene, ethane, and VOCs from monitoring wells GM-19S, GM-21, and GM-32 during the site-wide annual groundwater monitoring event in October 2014.

TOC generally decreases on a first-order relationship. As such, first order decay rate constants were calculated and used to estimate/extrapolate when it is expected that concentrations will reach 20 milligrams per liter (mg/L) at each injection location and on a site-wide/average basis. Twenty mg/L is the optimal concentration that typically results in sufficient excess organic carbon to drive enhanced reductive dechlorination within the injection area. Ultimately, these calculations were used to document the proposed revised injection frequency.

A summary of the TOC analytical results collected during the evaluation period is provided in Appendix A. Using these data, a unique degradation half-life (k-value [$day^{-1}$]) was calculated for each of the sampled injection wells (RZ-3D, RZ-3S, RZ-3TT, RZ-1E, and RZ-4E). The hydraulic conductivity estimates provided in the 2012 CMP (ARCADIS, Inc. 2012a) were then used to calculate the time it would take the TOC levels to drop to 20 mg/L starting from the day of the injection event. A summary of the half-life analysis is provided in Appendix A. As shown on Table A-2, the calculated required injection frequency ranges from approximately 6 to 12 months with an average of 9 months.

The organic carbon degradation trend evaluation confirmed the revised site model and that a reduced injection frequency was warranted at the Site. As a conservative initial step, the injection frequency was reduced to quarterly (e.g., as opposed to every 6 to 12 months). In addition, monitoring data collected

from GM-19S, GM-21, and GM-32 during the site-wide annual sampling event in October 2014 confirmed that the ERD process has not been adversely affected as a result of the revised injection frequency. Specifically, methane, ethane, ethene, and VOC analytical data were consistent with historic data as discussed in Appendix A. Additional injection frequency reductions may be evaluated and recommended at a future time based on the results presented herein and future performance monitoring data.

An ERD microbial investigation was completed in 2015. An evaluation of the results of this investigation is included in Appendix B.

### 1.4.2 Capture Zones

The capture zone interim measure for the upper aquifer consisted of groundwater extraction at the property boundary using well TW-2, treatment through an air stripper tower, and discharge through a National Pollution Discharge Elimination System (NPDES) permitted outfall to the South Storm Water Retention Basin ultimately discharging to the Great Miami River. Groundwater recovery from TW-2 began on January 31, 1996. On July 20, 2012, RACER Trust sent the U.S. EPA a letter indicating that operation of TW-2 would be discontinued. RACER Trust indicated operation of TW-2 was no longer necessary and was shut down on July 31, 2012 based on the performance of the upgradient IRZ barrier and groundwater sampling data results collected monthly over six months. These results were presented in a letter from RACER Trust to the U.S. EPA on April 24, 2013 (ARCADIS, Inc. 2013b).

Well DN-13 is a lower aquifer extraction well that is owned and operated by Montgomery County and has been used in a Pump-to-Waste Program since March 1990 in cooperation with former GM Corporation/Motors Liquidation Company (MLC) until March 31, 2011 and continued with RACER Trust. The capture zone interim measure for the lower aquifer consists of continued pumping of DN-13 in 2015. A sample at the DN-13 outfall and the flow rate is collected on a monthly basis as a requirement of the NPDES permit and is submitted to the Ohio Environmental Protection Agency (Ohio EPA). Well DN-13 was operational throughout 2015 except for the periodic shutdowns related to power failures and for operation and maintenance activities. Details on well DN-13 operation and lower aquifer capture analysis are discussed in Section 3.2. The location of well DN-13 is shown on Figure 2.

# 2 GROUNDWATER MONITORING SUMMARY

In accordance with the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), annual groundwater sampling was completed from 2001 through 2015. The latest annual groundwater monitoring was completed in October, November, and December 2015. The 1999 baseline through 2014 groundwater quality data for the site-specific VOC parameter list are reproduced in tables in Appendix C. For 2015, the site-specific VOC groundwater data is summarized in Table 3 of this report. This information is provide to support the evaluation of the groundwater quality of source areas, the effectiveness of the on-going interim measures (RZ and capture zones), monitoring the closed settling lagoons, and monitoring plume migration.

A summary of the activities and methodologies completed in 2015 is presented in Section 2.1, and the groundwater monitoring results are presented in Section 2.2.

In addition to the annual groundwater sampling, sampling to evaluate the effectiveness of the ERD process and to provide an understanding of 1,4-dioxane concentrations were completed in 2015. Summaries of these evaluations can be found in Appendices B and D, respectively.

## 2.1 Groundwater Monitoring Activities/Methodologies

To meet the objectives of the groundwater monitoring program, the scope of work presented in Section 3.0 of the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) and Section 5.0 of the Site-Wide Groundwater Monitoring Report for 2014 (ARCADIS, Inc. 2015a) was implemented during 2015. The following sections summarize collection of the annual groundwater elevation measurements, monthly groundwater monitoring, and annual site-wide groundwater monitoring.

### 2.1.1 Groundwater Elevation Monitoring

Groundwater levels were measured on December 9 and 10, 2015. The measured wells included all on-site and off-site monitoring wells at the three facilities as shown on Figure 5 (upper aquifer wells) and Figure 6 (lower aquifer wells). Groundwater levels were also measured in former Moraine Assembly production wells (where accessible), former Moraine Assembly fire wells, one lower aquifer well (MT596M) located east of the former Moraine Assembly and Engine plants, and four City of Moraine upper aquifer wells located west of the Great Miami River. Groundwater levels were measured in accordance with procedures defined in the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), Standard Operating Procedure (SOP) #4.

### 2.1.2 Monthly Groundwater Recovery System Monitoring

The NPDES permit was revised in 2012 to include lower aquifer well DN-13 as a separate final outfall to the Great Miami River and remove the north and south retention basins (TW-2 is an intermediate monitoring station prior to discharge to south storm water retention basin), as they were included with the property sold to IRG Moraine LLC in 2011. The Ohio EPA approved renewal of NPDES Permit 1IC00008*KD for the internal outfall related to TW-2 and for the DN-13 outfall on September 11, 2012. The permit requires monthly monitoring and reporting. As proposed in a letter from RACER Trust to the U.S. EPA, submitted July 20, 2012 (ARCADIS, Inc. 2012b), the TW-2 groundwater recovery and

treatment system was shut down on July 31, 2012, following the shutdown procedures in the 1996 Operations, Maintenance, and Monitoring Manual Groundwater Recovery and Treatment. The impact of the system shutdown was measured by the results of monthly sampling of monitoring wells GM-6 and GM-17 for a total of six months (August 2012 through January 2013). As discussed in the April 24, 2013 letter to the U.S. EPA (ARCADIS, Inc. 2013b), shutdown of the groundwater recovery and treatment system continued through 2014 due to the results of this monthly sampling. Continued shutdown of the system is recommended based on the results of the 2015 site-wide sampling event. A discussion of the 2015 monitoring well data from GM-6 is provided in Section 2.2.3.1.3.

Table 4 summarizes the VOC results for the monthly DN-13 effluent sampling during 2015. The analyses were conducted in accordance with methods specified in the NPDES Permit 1IC00008*KD.

### 2.1.3 Site-Wide Groundwater Monitoring

In 2015, the following changes from the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) were made, as recommended in the Site-Wide Groundwater Monitoring Report for 2014 (ARCADIS, U.S., Inc. 2015a):

- Upper aquifer monitoring wells HR-1, HR-16, and GM-63 were sampled to support the evaluation of VOC concentrations in proximity to the closed South Settling Lagoon.
- Upper aquifer monitoring wells HR-8 and HR-9 were not sampled due to accessibility. These wells were replaced by sampling upper aquifer well W-1-N.
- Lower aquifer monitoring well HR-10 was not sampled due to accessibility. This well was replaced by sampling lower aquifer well RMW-88.
- Due to the depths, lower aquifer monitoring wells GM-40 and GM-42 were not sampled and were replaced by sampling lower aquifer monitoring wells RMW-86 and RMW-87. Lower aquifer monitoring wells RMW-86 and RMW-87 are shallower and better positioned to monitor lower aquifer plume migration.
- Lower aquifer monitoring well RMW-85 was sampled due to its proximity to the former Process Sump Area.
- Upper aquifer monitoring wells HR-1, GM-63, and HR-16 were sampled due to increased concentrations at wells HR-17 and W-4-S that were not attributed to the closed South Settling Lagoon. Although, monitoring well GM-83S was not sampled in 2015, this well was sampled previously to assist in evaluation of groundwater data trends present in closed South Settling Lagoon monitoring well W-4-S.
- Upper aquifer monitoring wells GM-30, GM-31, GM-51, and HR-3 were sampled in 2015 to monitor for increasing VOC concentrations.
- Upper aquifer monitoring wells RMW-89 (installed in 2014), RMW-90 (installed in 2014), and GM-28R (installed in 2015) were included in the 2015 site-wide groundwater event. The well construction log for monitoring well GM-28R is provided in Appendix E.

For a summary of the site-wide monitoring well sampling program, see Table 21 of the Site-Wide Groundwater Monitoring Report for 2009 (ARCADIS, Inc. 2010a). A summary of the 2015 annual

sampling event, including the number of monitoring wells and analytical parameters, is presented on Table 1. Well construction data for the wells used in the site-wide program are presented in Table 5.

Upper aquifer monitoring well GM-28 could not be sampled due to an obstruction in the well and was replaced with upper aquifer monitoring well GM-28R on December 21, 2015. Monitoring well GM-28R is located approximately 87 feet southeast of the original monitoring well GM-28. The well construction log is included as Appendix E.

Groundwater samples were collected from the specified wells using the low-flow methodology and following procedures outlined in SOP #21 (ARCADIS G&M, Inc., 2002). Field parameters including pH, specific conductance, temperature, oxidation/reduction potential, and dissolved oxygen were measured during purging of each well using a multi-parameter groundwater quality flow-through cell (Appendix F). One groundwater sample from well DN-13 was collected through the sampling valve according to SOP #28 (ARCADIS G&M, Inc. 2002).

The groundwater samples were collected and managed under standard chain-of-custody procedures and validated in accordance with the approved Supplemental Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan and the RFI Quality Assurance Project Plan (Geraghty & Miller, Inc. 1997a) and as presented in the Amended Quality Assurance Project Plan (ARCADIS, Inc. 2011). Field parameter data for the site-wide groundwater monitoring event are presented in Appendix F. Analytical results are presented and discussed in Section 2.2.3.

### 2.1.4 Laboratory Analytical Methods

Groundwater samples were analyzed for the site-specific VOC parameter list using SW 846 Method 8260. This parameter list was developed after evaluating data from the September 1999 baseline groundwater sampling event and the one-time sampling event conducted in September/October 2000 (which included analysis of Appendix IX VOCs, cis-1,2-DCE, SVOCs, and metals) as part of the Former Oil House Area interim measures. The site-specific VOC parameter list is: benzene, 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), cis-1,2-DCE, trans-1,2-dichloroethene (trans-1,2-DCE), ethylbenzene, PCE, toluene, 1,1,1-trichloroethane (1,1,1-TCA), TCE, vinyl chloride, and xylenes. As indicated previously, additional analyses were completed to support the effectiveness of ERD and to evaluate 1,4-dioxane at the Site. These results are summarized in Appendices B and D.

Select groundwater samples from upper aquifer monitoring wells collected during the site-wide groundwater monitoring event were also analyzed for the following biogeochemical indicator parameters: manganese (total and dissolved), iron (total and dissolved), sulfate, sulfide, TOC, chloride, dissolved gases (ethane and ethene), and methane. Table 1 lists specific field, laboratory, biogeochemical indicator parameters, and field and laboratory analytical methods. The groundwater samples were submitted to TestAmerica Laboratories, Inc. in North Canton, Ohio or Microseeps/Pace Analytical Energy Services, LLC in Pittsburgh, Pennsylvania. Only ethene, ethane, and methane samples were submitted to and analyzed by Microseeps/Pace Analytical. Groundwater VOC results from 2015, including quality assurance/quality control samples, are presented in Appendix G.

## 2.2 Groundwater Monitoring Program Results

### 2.2.1 Groundwater Elevation Monitoring

As part of the site-wide assessment of current groundwater conditions, groundwater levels were measured to determine groundwater flow directions, horizontal hydraulic gradients, and vertical hydraulic gradients in and between the upper and lower aquifers. One groundwater elevation monitoring event was completed on December 9 and 10, 2015 as part of the site-wide groundwater monitoring. The groundwater level measurement data are presented on Table 6.

#### 2.2.1.1 Upper Aquifer

Depth-to-water data from upper aquifer wells were collected on December 9 and 10, 2015. Groundwater elevations ranged from 701.77 feet above mean sea level (ft AMSL) (MW-4 - southwest of the Site and west of the Great Miami River) to 710.82 ft AMSL (GM-24 - northern end of Site). A contour map of the potentiometric surface was manually drawn for the upper aquifer (Figure 7). Groundwater flow for the upper aquifer is generally from northeast to southwest. A comparison of the December 2015 general groundwater flow conditions to the historical groundwater flow conditions documented in the annual groundwater monitoring reports for the upper aquifer post-2001 indicates a similar flow direction across the Site.

Table 7 presents the 2015 monthly precipitation totals, recorded by the National Weather Service, and the deviation from calculated average amounts. The 2015 annual total precipitation recorded at the Dayton, Ohio monitoring station was 41.12 inches, which was 2.71 inches above average. Precipitation for the months of February, May, August, September, and November was below normal, while precipitation for the other months was above normal.

Horizontal hydraulic gradient values within the upper aquifer ranged from 2.5 $x10^{-4}$ ft/ft to 6.2 $x10^{-4}$ ft/ft (Table 8). Considering these values, the average horizontal hydraulic gradient was $4.6x10^{-4}$ ft/ft for the upper aquifer.

#### 2.2.1.2 Lower Aquifer

Depth-to-water data from lower aquifer wells were collected on December 9 and 10, 2015. Groundwater elevations ranged from 705.67 ft AMSL (GM-15 - southwest of the Site) to 711.65 ft AMSL (MT596M - northeast of Site). A contour map of the potentiometric surface was manually drawn for the lower aquifer (Figure 8). Groundwater flow for the lower aquifer is generally from northeast to southwest towards IM pumping well DN-13. An estimated cone of depression surrounds pumping well DN-13 as indicated by influence of the surrounding monitoring wells (Figure 8). Capture at DN-13 is discussed further in Section 3.2. A comparison of the December 2015 general groundwater flow conditions to the historical groundwater flow conditions documented in the annual groundwater monitoring reports for the lower aquifer post-2001 indicates a similar flow direction across the Site.

Horizontal hydraulic gradients in the lower aquifer in 2015 ranged in magnitude from 5.1 x $10^{-4}$ ft/ft to 6.7 x $10^{-4}$ ft/ft (Table 8). Overall, an average hydraulic gradient of 5.5 x $10^{-4}$ ft/ft was calculated for the lower

aquifer; however, further downgradient the hydraulic gradient increased with proximity to pumping well DN-13 (Section 3.2).

### 2.2.2 Vertical Hydraulic Gradients

Vertical hydraulic gradients between the upper aquifer above the upper clay till, upper aquifer, and the lower aquifer were calculated for the groundwater elevation data collected on December 9 and 10, 2015. Thirteen pairs of upper and lower aquifer wells were used to calculate the vertical hydraulic gradients upgradient, on-site, off-site, and downgradient (Table 9). Vertical gradients were calculated using the following equation:

$$I_V = \frac{h_{upper} - h_{lower}}{D_v}$$

Where

$I_v$ = vertical hydraulic gradient (ft/ft)

$h_{upper}$ = groundwater elevation in upper aquifer monitoring well (ft AMSL)

$h_{lower}$ = groundwater elevation in lower aquifer monitoring well (ft AMSL)

$D_v$ = distance between midpoint of lower screen and midpoint of saturated section of upper screen (ft)

Vertical hydraulic gradients ranged between 1.2 x $10^{-2}$ ft/ft downward to 2.8 x $10^{-3}$ ft/ft upward. Based on the spatial distribution of the monitoring well pairs, it appears the overall vertical gradient for the upper aquifer upgradient, on-site, and downgradient is downward. However, there were three on-site well pairs (HR-3/HR-13, GM-6/GM-3, and GM-75S/GM-75D) with an upward gradient.

### 2.2.3 Groundwater Monitoring Analytical Results

As described in Section 2.1.4, groundwater was evaluated on a site-wide basis for the presence of the site-specific list of VOCs. Table 3 presents the results for the site-wide groundwater sampling event completed in 2015 for the upper and lower aquifers. Analytical data for 1999 through 2015 groundwater sampling events are presented on Figures 9 and 10 for the upper and lower aquifer wells, respectively. The 2015 groundwater analytical results are summarized for PCE, TCE, cis-1,2-DCE, and vinyl chloride and shown as pie graphs on Figures 11 and 12, for the upper and lower aquifers, respectively. The pie graphs represent molar concentrations (micromoles/liter) for these four VOCs with the size of each pie representing the order of magnitude based on the total concentration (micrograms per liter [ug/L]). The upper aquifer groundwater results are presented in Sections 2.2.3.1 and 2.2.3.2 and evaluated based on groundwater quality at the upgradient plume contributions, source areas (Former Oil House Area and former Process Sump Area), in relation to current interim measures (reactive zones), upgradient/downgradient of closed settling lagoons, and plume migration. The lower aquifer groundwater results are presented in Sections 2.2.3.3 and 2.2.3.4.

#### 2.2.3.1 Upper Aquifer Groundwater Quality

Upper aquifer groundwater quality is discussed in the following sections by Site area. The groundwater data were also posted on the upper aquifer Site map to produce isoconcentration maps to graphically

show the concentration distribution in relation to Maximum Contaminant Levels (MCLs) and interim measures. These isoconcentration maps are provided in Appendix H for PCE, TCE, cis-1,2-DCE, vinyl chloride, 1,1-DCE, and total chlorinated volatile organic compounds (CVOCs) and are also discussed in the following sections. The production of the chemical-specific plume maps is not typically part of the Site-Wide Groundwater Monitoring Program but was completed at the request of the U.S. EPA via teleconference on February 3, 2015.

#### *2.2.3.1.1 Upgradient Contributions*

Upgradient monitoring well W-1-N was sampled in 2015. Concentrations in W-1-N were below detection levels for all constituents in 2015, except for low detections of 1,1-DCA, cis-1,2-DCE, and TCE at 4.2 ug/L, 0.32 J[1] ug/L, and 0.25 J ug/L, respectively. The detected chlorinated VOCs are consistent with historical values for upgradient groundwater quality as indicated in the Description of Current Conditions (DOCC) (Geraghty & Miller, Inc. 1991 and 1997b) and RFI Reports (ARCADIS Geraghty & Miller, Inc. 2000a and 2000b) for the former Moraine Facilities (including the 1999 baseline sampling results) and are similar to detected compounds downgradient at the Site. This confirms that upgradient sources of chlorinated VOCs not related to former GM Corporation operations continue to exist in the local area and are contributing to groundwater quality on-site.

#### *2.2.3.1.2 Source Areas*

As discussed in the CMP, the groundwater source areas include the Former Oil House Area and the former Process Sump Area (ARCADIS, Inc. 2012a). To evaluate the source areas of VOCs at the Site, 11 upper aquifer monitoring wells (GM-23, GM-46, GM-59, GM-60, GM-67S, GM-71, GM-72, GM-75S, GM-76S, RMW-89, and RMW-90) were sampled in 2015. Monitoring wells GM-23 and GM-46 are located in the Former Oil House Area and are screened above the upper clay till. Monitoring wells GM-59, GM-60, and GM-67S are located in the former Vehicle Distribution Center/former Moraine Engine building footprint. Monitoring well GM-59 is screened above the upper clay till and monitoring wells GM-60 and GM-67S are screened above the regional clay till. Monitoring wells GM-71 and GM-72 are located north of the former Moraine Assembly Paint building and screened at the upper clay till and regional clay till, respectively. Monitoring well GM-75S is located in the southwest corner of the former Moraine Assembly building in the former Process Sump Area and is screened at the regional clay till. Monitoring well GM-76S is located in the former Moraine Assembly building and is screened at the regional clay till. Monitoring wells RMW-89 and RMW-90 are located in the vicinity of the former Process Sump Area and are screened above regional clay till. The following is a summary of the groundwater VOC analytical results for the source area wells:

- Monitoring well GM-23 is within the zone of influence of current interim measure (RZ-1) and the groundwater concentration trends are presented in Figure 13. A comparison between historical VOC concentrations detected at monitoring well GM-23 to 2015 VOC concentrations is discussed in Section 2.2.3.1.3.

[1] A “J” qualifier indicates the concentration is an estimated concentration.

- Concentrations of VOCs in monitoring well GM-46 were below detection levels, except for low concentrations of cis-1-2-DCE, PCE, and TCE at 0.41 J ug/L, 0.47 J ug/L, and 0.30 J ug/L, respectively. These results are similar to the 2014 results. Prior to 2014, monitoring well GM-46 was only sampled in 2006. Since then, site-specific VOC concentrations have decreased or remained low or below detection limits.
- Monitoring wells GM-59, GM-60, GM-67S, GM-71, GM-72, GM-75S, GM-76S, RMW-89, and RMW-90 are located in the vicinity of the former Process Sump Area and are currently not addressed by ongoing interim measures; however, this area was evaluated in the CMP (ARCADIS, Inc. 2012a). The following is a summary of the groundwater analytical results for the wells located in the former Process Sump Area:
    - PCE concentrations in monitoring well GM-59 reached a peak of 1,000 ug/L in 2013 and have decreased to 270 ug/L in 2015. The TCE concentration decreased from 1,100 ug/L in 2013, to 110 ug/L in 2014, and to 97 ug/L in 2015. Concentrations of cis-1,2-DCE have remained relatively low since a detection of 41 ug/L in 2008. The cis-1,2-DCE concentration in monitoring well GM-59 was 2.4 ug/L in 2015. With the exception of a low-level detection of 1,1,1-TCA (0.48 J ug/L) in 2015, other site-specific VOCs were not detected in monitoring well GM-59 in 2015.
    - Concentrations of PCE in monitoring well GM-60 reached a peak of 1,100 J ug/L in 2009. Since 2009, PCE concentrations in monitoring well GM-60 have remained relatively consistent, with a concentration of 770 ug/L in 2015. Concentrations of TCE in monitoring well GM-60 decreased from 1,400 ug/L in 2014 to 910 ug/L in 2015. Concentrations of cis-1,2-DCE decreased from 96 ug/L in 2014 to 16 ug/L in 2015. Other site-specific VOCs were not detected in monitoring well GM-60 in 2015.
    - In 2015, the TCE concentration in monitoring well GM-67S was 130 ug/L and was relatively consistent with the previous two sampling events in 2007 and 2014. Concentrations of the other site-specific VOCs were relatively low-level or non-detect and consistent with the previous two sampling events.
    - In 2015, the PCE and TCE concentrations in monitoring well GM-71 were 19 ug/L and 20 ug/L, respectively. The PCE concentration is consistent with the 2014 result and lower than the 2007 result of 62 ug/L. The TCE concentration detected in 2015 is relatively consistent with the previous sample results. Concentrations of the other site-specific VOCs were relatively low-level or non-detect and consistent with the previous two sampling events.
    - Concentrations of site-specific VOCs were below detection limits in monitoring well GM-72 in 2015, with the exception of PCE (2.2 ug/L). These results are relatively consistent with the results from 2014, and the PCE concentration has decreased from the concentration observed in 2007 (53 ug/L).
    - Concentrations of PCE in monitoring well GM-75S remained consistent from 2014 to 2015 (460 ug/L and 420 ug/L, respectively) and consistent since sampling was initiated in 2007. The concentration of TCE decreased from 170 ug/L in 2014 to 68 ug/L in 2015. Concentrations of the other site-specific VOCs in monitoring well GM-75S were relatively low-level or non-detect and consistent with the previous sampling events.

- Concentrations of site-specific VOCs were below detection limits in monitoring well GM-76S in 2015, with the exception of PCE and TCE (1.1 ug/L and 0.64 J ug/L, respectively). These results are relatively consistent with the results from the two previous sampling events in 2007 and 2014.
- Monitoring wells RMW-89 and RMW-90 were sampled for the first time in 2015. PCE and TCE were detected in monitoring well RMW-89 at concentrations of 46 ug/L and 22 ug/L, respectively. TCE and cis,1-2, DCE were detected in monitoring well RMW-90 at concentrations of 29 ug/L and 38 ug/L, respectively. Concentrations of the other site-specific VOCs in monitoring wells RMW-89 and RMW-90 were relatively low-level or non-detect.

#### *2.2.3.1.3 Interim Measures Performance Results*

As described in Section 1.4, the reactive zone network consists of RZ-1, RZ-3 (East and West), and RZ-4 East. In 2015, carbon solution was introduced into the groundwater through injection wells shown on Figures 3 and 4. Operation of the reactive zones was monitored through the collection of field parameter measurements and laboratory analyses of biogeochemical indicator parameters and site-specific VOCs, according to the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) and revisions in the draft Site-Wide Groundwater Monitoring Report for 2009 (ARCADIS, Inc. 2010b). Concentrations of site-specific VOCs as related to the performance of the reactive zones are presented in this section. Groundwater concentration trends for the reactive zone performance monitoring wells are presented in Figure 13 (RZ-1), Figure 14 (RZ-3 East), Figure 15 (RZ-3 West), and Figure 16 (RZ-4 East).

**RZ-1**

Reactive zone RZ-1 (Figure 3) was installed as an interim measure to remediate the area downgradient of the primary source area at the Site (Former Oil House Area). Five upper aquifer wells (GM-23, GM-29, GM-30, HR-3, and GM-28) are used to monitor the groundwater quality to evaluate the effectiveness of the reactive zone (Figure 13).

- PCE concentrations at monitoring well GM-23 have decreased from 15,000 ug/L in 2001 to 0.58 J ug/L in 2015. TCE concentrations have generally decreased from 2,200 ug/L in 2001 to 5.0 ug/L in 2015. Concentrations of cis-1,2-DCE have decreased from 19,000 ug/L in 2005 to 100 ug/L in 2015. Vinyl chloride concentrations increased historically to a concentration of 4,100 ug/L in 2006 and subsequently have decreased to a current concentration of 120 ug/L in 2015. Concentrations of trans-1,2-DCE were relatively low prior to initiating introductions in 2000. Concentrations peaked in 2006 at 270 J ug/L and have generally decreased to 13 ug/L in 2015.
- Monitoring well GM-29 is within the zone of influence of carbon introductions conducted in the Former Oil House Area after reactive zone RZ-1 was expanded in 2002. Concentrations of PCE and TCE have remained relatively consistent since 2000 with current concentrations of 11 ug/L and 270 ug/L in 2015, respectively. A peak concentration of cis-1,2-DCE (2,871 ug/L) was noted in 2000, and concentrations have generally decreased to 440 ug/L in 2015. Concentrations of vinyl chloride have fluctuated since introductions began in 2000 but have generally decreased since 2005, with a concentration of 48 ug/L in 2015.
- Concentrations of VOCs in monitoring well GM-30 have been generally decreasing since the well was installed in 1999. Concentrations of 1,1-DCA (3.0 ug/L), benzene (2.9 ug/L), ethylbenzene (260 ug/L), toluene (0.87 J ug/L), and xylenes (14 ug/L) were detected in 2015.

- Concentrations of 1,1,1-TCA (7.3 ug/L), 1,1-DCA (9.6 ug/L), 1,1-DCE (0.68 J ug/L), cis-1,2-DCE (82 ug/L), trans-1,2-DCE (2.6 J ug/L), TCE (200 ug/L), and vinyl chloride (13 ug/L) were detected in monitoring well HR-3 in 2015. Concentrations of 1,1,1-TCA, cis-1,2-DCE, and TCE peaked in 2014 and were relatively consistent in 2015. The maximum vinyl chloride concentration was detected in 2015. The other constituents were detected at relatively low levels.
- Monitoring well GM-28 was used for evaluating groundwater conditions downgradient of RZ-1. Due to an obstruction in the well, monitoring well GM-28 had not been sampled since 2011. As a result, replacement monitoring well GM-28R was installed on December 21, 2015. Due to constraints associated with property access and underground utilities, monitoring well GM-28R was installed approximately 87 feet southeast of monitoring well GM-28.

  Based on the 2011 data for monitoring well GM-28, concentrations of PCE, TCE, and cis-1,2-DCE remained consistently low since peak concentrations in 1999. Vinyl chloride concentrations in GM-28 fluctuated, with a maximum concentration of 12.4 ug/L in 2000. In 2011 the vinyl chloride concentration in monitoring well GM-28 was 0.57 J ug/L.

  Concentrations of 1,1-DCA (0.55 J ug/L), cis-1,2-DCE (5.6 ug/L), PCE (49 ug/L), trans-1,2-DCE (0.38 J ug/L), TCE (24 ug/L), and vinyl chloride (0.99 J ug/L) were detected in monitoring well GM-28R in 2015. As compared to the data collected from monitoring well GM-28 in 2011, concentrations of cis-1,2-DCE, PCE, and TCE increased, concentrations of 1,1-DCA decreased, and concentrations of trans-1,2-DCE and vinyl chloride were relatively consistent. The data variability may be attributed to the different location of monitoring well GM-28R. Therefore, concentration trends in monitoring well GM-28R should be evaluated separately from trends associated with monitoring well GM-28 in the future.

**RZ-3 East**

Reactive zone RZ-3 East (Figure 4) is located south of the former Moraine Engine Plant, which is downgradient and cross-gradient to the east (Figure 2) of the Former Oil House Area. One upper aquifer well (GM-21) is used to monitor the groundwater quality to evaluate the effectiveness of the reactive zone (Figure 14).

- Monitoring well GM-21 is used to monitor groundwater conditions downgradient of RZ-3 East. PCE concentrations in this well have consistently been below detection limits, except for 2008 when PCE was detected at a concentration of 0.56 J ug/L. Concentrations of TCE in well GM-21 peaked in 2002 at 230 ug/L and have decreased to 16 ug/L in 2015. Concentrations of cis-1,2-DCE have fluctuated since a peak concentration of 100 ug/L in 2003, with a concentration of 22 ug/L in 2015. The maximum vinyl chloride concentration in monitoring well GM-21 (19 ug/L) was observed in 2008. The vinyl chloride concentration detected in 2015 (8.9 ug/L) was relatively consistent with the concentrations detected since 2008.

**RZ-3 West**

Reactive zone RZ-3 West (Figure 4) is located south of former Delphi Thermal Moraine. Two upper aquifer wells (GM-6 and GM-8) are used to monitor the groundwater quality to evaluate the effectiveness of the reactive zone (Figure 15). Note that data from monitoring wells GM-6 and GM-8, along with downgradient monitoring well GM-17, were also utilized to support the shutdown of TW-2 as discussed in

Section 2.1.2. Monitoring well "East" was previously monitored as part of RZ-3 West, but is no longer part of the site-wide program. Historical data for monitoring well East can be found in Appendix C.

- Monitoring well GM-6 is used for evaluating groundwater conditions downgradient of RZ-3 West. Concentrations of PCE have decreased in monitoring well GM-6 from 81.4 ug/L in 1999 to below detection limits in 2015. Concentrations of TCE have decreased from 78.2 ug/L in 1999 to below detection limits in 2015. Concentrations of cis-1,2-DCE have decreased from 52.9 ug/L in 1999 to 0.26 J ug/L in 2015. Vinyl chloride concentrations have fluctuated and are generally decreasing, with a peak value of 12 ug/L in 2002. Vinyl chloride was not detected in 2015.
- Monitoring well GM-8 also serves as a downgradient well for reactive zone RZ-3 West. Concentrations of PCE, TCE, and cis-1,2-DCE have remained consistently low or below their respective detection limits since 2000. Concentrations of vinyl chloride have fluctuated and have remained at low or below the detection limit since 2007, with a current concentration of 0.53 J ug/L in 2015.

**RZ-4 East**

Reactive zone RZ-4 East was designed to address VOC impacts identified west of RZ-3 West (Figure 16).

Monitoring well GM-19S is used to evaluate groundwater conditions downgradient of RZ-4 East. Concentrations of PCE and TCE have been low or below detection limits since 2007. Concentrations of cis-1,2-DCE have been low or below detection limits since 2007, with an increase to 37 ug/L in 2014 and 2015. Concentrations of vinyl chloride reached a peak concentration of 17 ug/L in 2013 and decreased to 6.4 ug/L in 2015.

#### *2.2.3.1.4 Closed Settling Lagoon Monitoring Results*

Groundwater quality is monitored upgradient and downgradient of the closed North and South Settling Lagoons as described in Section 2.1. Upgradient monitoring wells used are HR-4 for the North Settling Lagoon and HR-17 for South Settling Lagoon (Figure 2). Wells downgradient of the closed North (W-2-N, W-3-N, W-4-N) and South (W-2-S, W-3-S, W-4-S) Settling Lagoons (closed through in-situ solidification and installation of a cover system in 2001 after the 1999 baseline sampling event) were sampled for both the site-wide groundwater monitoring and post-closure monitoring programs.

**Closed North Settling Lagoon**

- Concentrations of PCE, TCE, and daughter products in monitoring wells HR-4 and W-2-N have been low or below detection limits since 1999.
- Concentrations of PCE and TCE in monitoring well W-3-N have been generally decreasing since peak values in 2001 at 9.0 ug/L and 2.1 ug/L, respectively. Current concentrations of PCE and TCE are below detection limits. Cis-1,2-DCE had a peak concentration of 291 ug/L in 1999 and has been generally decreasing to a current concentration of 29 ug/L in 2015. Vinyl chloride had a peak concentration of 24.0 ug/L in 2000 and has a current concentration of 1.3 ug/L in 2015.
- Concentrations of PCE and vinyl chloride in monitoring well W-4-N have been low or below detection limits since 1999. TCE had a peak concentration of 15 ug/L in 2009 and has remained relatively

consistent, with a concentration of 12 ug/L in 2015. Concentrations of cis-1,2-DCE have decreased slightly since the peak concentration (14 ug/L) was detected in in 2012 to 7 ug/L in 2015.

**Closed South Settling Lagoon**

- Concentrations of PCE and TCE in monitoring well HR-17 have shown a generally increasing trend and were relatively consistent from 2014 to 2015, at 150 ug/L and 160 ug/L, respectively. Concentrations of cis-1,2-DCE peaked at 7.1 ug/L in 2004 and have generally decreased to a current concentration of 1.7 ug/L in 2015. Vinyl chloride has been below the reporting limit since 1999.
- Concentrations of PCE, cis-1,2-DCE, and vinyl chloride in monitoring well W-2-S have been low or below detection limits since 1999. The concentration of TCE peaked at 23 ug/L in 2015.
- Concentrations of PCE in monitoring well W-3-S have increased, with the peak concentration of 65 ug/L in 2015. Concentrations of TCE have increased, with the peak concentration of 97 ug/L in 2015. Concentrations of cis-1,2-DCE and vinyl chloride have been low or below detection limits since 1999.
- Concentrations of PCE in monitoring well W-4-S have fluctuated since 1999, with a peak concentration of 74 ug/L in 2015. Concentrations of TCE have fluctuated since 1999, with a peak concentration of 72 ug/L in 2015. Concentrations of cis-1,2-DCE have remained relatively consistent since 1999 with concentrations of 9.7 ug/L in 2015. Concentrations of vinyl chloride have been below the detection limit since 1999.

#### *2.2.3.1.5 Plume Migration*

The upper aquifer plume migration from the source areas (Former Oil House Area and former Process Sump Area) is monitored downgradient on-site, at the property boundary, and downgradient off-site.

**Downgradient On-Site**

Monitoring wells GM-31, GM-35, GM-43, GM-44, GM-45, and GM-66 were sampled to monitor the plume between the source area and property boundary (Figure 2).

- PCE and vinyl chloride concentrations in monitoring well GM-31 have been low or below detection levels since 2006. TCE concentrations were generally increasing since 2000, to a peak concentration of 120 ug/L in 2013, and then decreased to 75 ug/L in 2015. Concentrations of cis-1,2-DCE have been generally decreasing since the peak concentration of 200 ug/L in 2002. Cis-1,2-DCE was detected at a concentration of 48 ug/L in 2015.
- PCE concentrations in monitoring well GM-35 have varied, with a peak concentration of 47 ug/L in 2015. TCE concentrations have been generally decreasing since a peak concentration of 270 ug/L in 2003 to 28 ug/L in 2014; however, concentrations increased to 200 ug/L in 2015. Cis-1,2-DCE concentrations have been generally decreasing since a peak concentration of 300 ug/L in 2003 to 57 ug/L in 2014; however, concentrations increased back to 300 ug/L in 2015. Vinyl chloride concentrations have generally decreased since the peak concentration of 59 ug/L in 2003. The vinyl chloride concentration in 2015 was 14 ug/L.
- PCE concentrations in monitoring well GM-43 have been generally consistent since 2004, with a peak concentration of 42 ug/L in 2015. TCE concentrations have been generally increasing since 2004, with a peak concentration of 270 ug/L in 2015. Concentrations of cis-1,2-DCE have decreased from

a peak concentration of 220 ug/L in 2010 to 14 ug/L in 2015. Vinyl chloride concentrations have been low or below the reporting limit since 2006.

- Concentrations of PCE in monitoring well GM-44 have been increasing since 2004 to a peak of 110 ug/L in 2015. Concentrations of TCE have been generally consistent, with a concentration of 180 ug/L in 2015. Concentrations of cis-1,2-DCE have been generally decreasing since 2004, with a current concentration of 18 ug/L. Vinyl chloride concentrations have been below the reporting limit since 2004.
- Concentrations of PCE, TCE, and cis-1,2-DCE in monitoring well GM-45 have been generally consistent since 2006, with concentrations of 190 ug/L, 180 ug/L, and 36 ug/L, respectively, in 2015. Vinyl chloride concentrations have been below the reporting limit since 2006.
- Concentrations of PCE in monitoring well GM-66 have been below the detection limit since 2007. In 2015, concentrations of TCE, cis-1,2-DCE, and vinyl chloride were the same as concentrations in 2014, at 110 ug/L, 280 ug/L, and 3.0 ug/L, respectively.

Monitoring wells HR-1, HR-2, and HR-7 are west (side-gradient) of the Former Oil House Area and south of Landfills L2 and L3 (Figure 2). These wells are also used to monitor the plume migration on-site. Monitoring well HR-2 is part of the annual program to monitor groundwater concentrations south of Landfills L2 and L3. Monitoring well HR-7 is located downgradient of the closed North Settling Lagoon. Monitoring well HR-7 is also located on the western most portion of the former Building 14 property and was added to the site-wide annual program at request of the U.S. EPA (BOW Environmental Solutions, Inc. 2010).

- Concentrations of PCE in monitoring well HR-1 have been variable, with a peak concentration of 76 ug/L in 2015. Concentrations of TCE have been generally increasing since 2004, with a peak concentration of 210 ug/L in 2015. Concentrations of cis-1,2-DCE have been generally decreasing since a peak concentration of 24 ug/L in 2004 to a concentration of 6.6 ug/L in 2015. Vinyl chloride concentrations have been low or below the detection limit since 1999.
- Concentrations of PCE, TCE, and vinyl chloride in monitoring well HR-2 have been low or below the detection limit since 1999. Concentrations of cis-1,2-DCE have generally decreased since the peak concentration was detected 1999 (9.6 ug/L). Vinyl chloride was detected at a concentration of 2.1 ug/L in 2015.
- Concentrations of PCE, cis-1,2-DCE, and vinyl chloride in monitoring well HR-7 have been low or below the detection limits since 1999. Concentrations of TCE have slightly decreased from 9.8 ug/L in 1999 to 6.9 ug/L in 2015.

**Property Boundary**

Monitoring wells GM-2, GM-6, and GM-8, along with inactive extraction well TW-2, are located at the southwestern most property boundary (Landfill L1), downgradient of the Former Oil House Area and RZ-3 West (Figure 2). These wells are used to monitor the groundwater quality at the property boundary.

Monitoring wells GM-6 and GM-8 are used to monitor the performance of RZ-3 West and are discussed in Section 2.2.3.1.3.

- Concentrations of PCE in monitoring well GM-2 have been decreasing since a peak concentration of 8.7 ug/L in 2002, with a concentrations of 3.6 ug/L in 2015. Concentrations of TCE have generally decreased from 82.8 ug/L in 2000 to 6.7 ug/L in 2015. Concentrations of cis-1,2-DCE have fluctuated since a peak concentration of 39.2 ug/L in 2000. The concentration of cis-1,2-DCE was 3.2 ug/L in 2015. Concentrations of vinyl chloride have been low or below the detection limits since 2011.
- Since 2012, the concentrations of PCE, TCE, cis-1,2-DCE, and vinyl chloride in inactive extraction well TW-2 were low or below their respective detection limits.

**Downgradient Off-Site**

Monitoring wells GM-10, GM-16, GM-47, GM-50, GM-51, and GM-63 are located west or southwest of Landfill L1 and south of the closed South Settling Lagoon. Monitoring wells GM-47 and GM-50 are paired upper aquifer wells. Monitoring well GM-47 is screened just above the regional clay till, and monitoring well GM-50 is screened near the water table. These wells are used to monitor plume migration south of reactive zone RZ-4 East and RZ-3 West, within the Riverview Plat neighborhood (northwest of intersection of Main Street and Dryden Road - Figure 2).

- Concentrations of PCE in monitoring well GM-10 have been low or below the detection limit since 1999, with a concentration of 0.85 J ug/L in 2015. Concentrations of TCE have been decreasing since a peak concentration of 27 ug/L in 2001 to a concentration of 2.2 ug/L in 2015. Concentrations of cis-1,2-DCE and vinyl chloride have been relatively low or below the detection limits since 1999.
- Concentrations of PCE and TCE in monitoring well GM-16 have generally decreased from concentrations of 110 ug/L and 75 ug/L, respectively, in 2010 to concentrations of 35 ug/L and 8.3 ug/L, respectively, in 2015. Cis-1,2-DCE concentrations have fluctuated, with a peak concentration of 43 ug/L in 2007 and a concentration of 12 ug/L in 2015. The peak vinyl chloride concentration was observed in 2015 at 10 ug/L.
- Concentrations of PCE and TCE in monitoring well GM-47 have generally decreased from 78 ug/L and 50 ug/L, respectively, in 2006 to 49 ug/L and 8.3 ug/L, respectively, in 2015. Concentrations of cis-1,2-DCE have fluctuated, with a peak concentration of 170 ug/L in 2007 and a concentration of 46 ug/L in 2015. Concentrations of vinyl chloride have been low or below the reporting limits since 2006.
- PCE concentrations in monitoring well GM-50 have generally decreased since 2006, with a peak concentration of 180 ug/L in 2006 and a concentration of 26 ug/L in 2015. Concentrations of TCE have decreased since the peak concentration (140 ug/L) was observed in 2010, with a current concentration of 4.0 ug/L in 2015. Cis-1,2-DCE concentrations have fluctuated since 2006, with a peak concentration of 130 ug/L in 2007 and a concentration of 5.6 ug/L in 2015. Concentrations of vinyl chloride have been low or below the detection limits since 2006.
- Concentrations of PCE and cis-1,2-DCE in monitoring well GM-51 have been generally increasing since 2006 to peak concentrations of 63 ug/L and 6.5 ug/L in 2015, respectively. Concentrations of TCE decreased from a peak of 64 ug/L in 2013 to 16 ug/L in 2015. Concentrations of vinyl chloride have been below the detection limits since 2006.

- Concentrations of PCE have been generally decreasing in monitoring well GM-63 since a peak concentration of 160 ug/L in 2006 to a concentration of 46 ug/L in 2015. Concentrations of TCE have been decreasing since a peak concentration of 140 ug/L in 2010 to a concentration of 19 ug/L in 2015. Concentrations of cis-1,2-DCE have been generally decreasing since a peak concentration of 8.8 ug/L in 2006 to a concentration of 3.4 ug/L in 2015.

Additional off-site wells further delineate downgradient concentrations east and west of the Great Miami River (GM-26, GM-52, GM-55, GM-62R, GM-65S, GM-78, GM-79, and GM-80). PCE was detected in each of these monitoring wells, and concentrations ranged from 0.97J ug/L (GM-79) to 32 ug/L (GM-52) in 2015. TCE was detected in monitoring wells GM-52 (5.8 ug/L), GM-79 (31 ug/L), and GM-80 (15 ug/L) in 2015. TCE was not detected above the reporting limits in monitoring wells GM-55, GM-62R, GM-65S, and GM-78 in 2015. With the exception of the cis-1,2-DCE concentrations detected in monitoring wells GM-79 (7.4 ug/L) and GM-80 (2.9 ug/L), concentrations of cis-1,2-DCE and vinyl chloride were below detection limits for each of these off-site wells in 2015.

#### 2.2.3.2 Upper Aquifer Plume Distribution and MCL Comparison

At the request of the U.S. EPA, upper aquifer plume distribution is shown on constituent-specific isoconcentration maps in Appendix H. Isoconcentration maps were completed for PCE, TCE, cis-1,2-DCE, vinyl chloride, 1,1-DCE, and total site-specific CVOCs (Figures H-1 through H-6). The concentrations for the isoconcentration maps posted reflect 2015 groundwater sampling data, 2013 annual groundwater sampling data (applicable wells for 5-year event) and maximum interval concentrations for vertical aquifer profiling (VAP) groundwater samples. The isoconcentration contour interpretation includes CSM understanding (i.e. groundwater flow and interim measure operation). Isoconcentration maps for PCE, TCE, and total CVOCs were generated by three-dimensional model. . Non-detect concentrations were accounted for by contouring using half the reporting limit posted.

In upper aquifer monitoring wells, PCE was detected above the MCL (5 ug/L) in 25 wells (GM-59, GM-60, GM-71, GM-75S, GM-28R, GM-29, HR-17, W-3-S, W-4-S, HR-1, GM-43, GM-44, GM-45, GM-35, GM-16, GM-47, GM-50, GM-51, GM-52, GM-62R, GM-63, WSU-24, GM-78, GM-80, and RMW-89). These wells are shown on Table 3, Figure 9, and Figure H-1 in bold. Concentrations above the MCL ranged from 7.1 ug/L to 770 ug/L in wells GM-78 and GM-60, respectively. The data indicate that PCE is present across the Site from the former Process Sump Area, extending southwest off-site. The plume is partially bifurcated downgradient by reactive zones RZ-3 and RZ-4 East.

In upper aquifer monitoring wells, TCE was detected above the MCL (5 ug/L) in 32 wells (GM-59, GM-60, GM-67S, GM-71, GM-75S, GM-28R, GM-29, HR-3, GM-21, W-4-N, HR-17, W-2-S, W-3-S, W-4-S, HR-1, GM-43, GM-44, GM-45, GM-66, GM-31, GM-35, HR-7, GM-2, GM-16, GM-47, GM-51, GM-52, GM-63, GM-79, GM-80, RMW-89, RMW-90). These wells are shown on Table 3, Figure 9, and Figure H-2 in bold. Concentrations above the MCL ranged from 5.8 ug/L to 910 ug/L in wells GM-52 and GM-60, respectively. The data also indicate that TCE is present across the Site from both source areas (Former Oil House Area and former Process Sump Area), extending southwest off-site. The plume is partially bifurcated downgradient by reactive zones RZ-3 and RZ-4 East.

In upper aquifer monitoring wells, cis-1,2-DCE was detected above the MCL (70 ug/L) in five wells (GM-23, GM-29, HR-3, GM-66, and GM-35). These wells are shown on Table 3, Figure 9, and Figure H-3 in

bold. Concentrations above the MCL ranged from 82 ug/L to 440 ug/L in wells HR-3 and GM-29, respectively. As shown in Figure H-3, the data indicate that cis-1,2-DCE is present at the highest concentrations in active reactive zone RZ-1, with maximum concentrations exceeding 150 ug/L. The data also indicate that cis-1,2-DCE is present at the former Process Sump Area and in active reactive zones RZ-3 and RZ-4 East. The cis-1,2-DCE concentrations that are above the MCL are within the Site property boundary.

In upper aquifer monitoring wells, vinyl chloride was detected above the MCL (2 ug/L) in eight wells (GM-16, GM-19S, GM-21, GM-23, GM-29, GM-66, GM-35, and HR-3). These wells are shown on Table 3, Figure 9, and Figure H-4 in bold. Concentrations above the MCL ranged from 3.0 J ug/L to 120 ug/L in wells GM-66 and GM-23, respectively. As shown on Figure H-4, the data indicate that vinyl chloride is present at the highest concentrations near active reactive zone RZ-1. The data also indicate that vinyl chloride is present at the former Process Sump Area and in active reactive zones RZ-3 and RZ-4 East. The cis-1,2-DCE concentrations that are above the MCL are within the Site property boundary.

Concentrations of 1,1-DCE were not detected above the MCL (7 ug/L) in the groundwater samples collected from the upper aquifer during the 2015 annual groundwater sampling event. However, a plume map (Figure H-5) was generated using the 2015 annual groundwater sampling data, 2013 annual groundwater sampling data (applicable wells for 5-year event), maximum interval concentrations for VAP groundwater samples, and accounted for interim measures. Non-detect concentrations were accounted for by contouring using half the reporting limit posted.

The isoconcentration map for total site-specific CVOCs in the upper aquifer is shown on Figure H-6. The data indicate that CVOCs are present at the highest concentrations in the former Process Sump Area, extending southwest off-site. The plume is partially bifurcated downgradient by active reactive zones RZ-3 and RZ-4 East. The data also indicate that total site-specific CVOCs are present on the northern portion of the Site and off-site to the north.

#### 2.2.3.3 Lower Aquifer Groundwater Quality

Lower aquifer groundwater quality is discussed in the following sections by Site area. The groundwater data were also posted on the lower aquifer Site map to produce isoconcentration maps to graphically show the concentration distribution in relation to MCLs and interim measures. These isoconcentration maps are provided in Appendix H for PCE, TCE, cis-1,2-DCE, vinyl chloride, 1,1-DCE, and total VOCs and are also discussed in the following sections.

##### 2.2.3.3.1 Upgradient Contributions

In 2015, the upgradient lower aquifer monitoring wells HR-12, GM-76D, and RMW-88 were part of the site-wide monitoring program and exhibited the presence of site-specific VOCs (Figure 6). The detected VOCs in monitoring wells HR-12 and RMW-88 included 1,1-DCA, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride, suggesting that upgradient releases of chlorinated VOCs have occurred. The detected VOCs in monitoring well HR-12 are consistent with historical values for upgradient groundwater quality as indicated in the DOCC (Geraghty & Miller, Inc. 1991 and 1997b) and RFI Reports (ARCADIS Geraghty & Miller, Inc. 2000a and 2000b) for the Site. Monitoring well GM-76D was sampled for the third time in 2015. Concentrations of PCE and TCE increased from 0.63 J ug/L and 2.7 ug/L in 2007, respectively, to 49 ug/L and 6.9 ug/L, respectively. This indicates that upgradient sources of VOCs, not related to former

GM Corporation operations, continue to exist in the lower aquifer in the local area. Additionally, the types of VOCs detected upgradient are similar to those detected further downgradient beneath the Site, indicating that total VOC concentrations detected beneath the Site include both upgradient (off-site) and on-site contributions.

#### 2.2.3.3.2 Source Areas

On-site lower aquifer monitoring wells located near the upper aquifer source areas (Former Oil House Area and former Process Sump Area) that were part of the site-wide monitoring program in 2015 included monitoring wells GM-54, GM-67D, GM-68D, GM-75D, and RMW-85 (Figure 6). In 2015, PCE concentrations ranged from 1.7 ug/L in monitoring well GM-67D to 140 ug/L in monitoring well GM-75D. Concentrations of TCE ranged from 1.3 J ug/L in monitoring well GM-54 to 150 ug/L in monitoring well GM-75D. Concentrations of cis-1,2-DCE ranged from below detection limits in monitoring wells GM-54 and GM-68D to 140 F1 ug/L in monitoring well GM-67D. Vinyl chloride detections were below reporting limits, with the highest detected concentration in monitoring well GM-67D (0.70 J ug/L).

#### 2.2.3.3.3 Other On-Site Areas

Other on-site lower aquifer monitoring wells HR-15 (located south of the closed North Settling Lagoon), RMW-86 (located east of reactive zone RZ-4 East), RMW-87 (located west of former Delphi Thermal Building 14), and GM-19D (located south of reactive zone RZ-4 East) were sampled in 2015. Concentrations of PCE, TCE, cis-1,2-DCE, and vinyl chloride in monitoring well HR-15 were at low concentrations or below the detection limits in 2015. Concentrations of PCE and TCE in monitoring well RMW-86 were 40 ug/L and 110 ug/L, respectively. Concentrations of cis-1,2-DCE and vinyl chloride in monitoring well RMW-86 were 37 ug/L and 0.45 J, respectively. Concentrations of TCE, cis-1,2-DCE, and vinyl chloride were detected in RMW-87 at 10 ug/L, 58 ug/L, and 0.42 J ug/L, respectively. Concentrations of PCE, TCE, cis-1,2-DCE, and vinyl chloride were detected in GM-19D at 11 ug/L, 69 ug/L, 39 ug/L, and 1.0 J ug/L, respectively.

#### 2.2.3.3.4 Off-Site and Side-Gradient

Off-site and side-gradient wells sampled in 2015 included monitoring well GM-83D to the west and monitoring wells GM-84 and GM-77D to the east. The 2015 VOC concentrations were consistent with previous years. The only site-specific VOC detected in monitoring well GM-83D was vinyl chloride (2.0 ug/L). The only site-specific VOC detected in monitoring well GM-84 was TCE (5.0 ug/L). The only site-specific VOC detected in monitoring well GM-77D was PCE (18 ug/L).

#### 2.2.3.3.5 Off-Site and Downgradient

The off-site groundwater quality downgradient was evaluated with lower aquifer wells GM-11, GM-15, and GM-20D in 2015. Concentrations of PCE ranged from below reporting limits in monitoring well GM-15 to 2.5 ug/L in monitoring well GM-20D. Concentrations of TCE ranged from 1.6 ug/L in monitoring well GM-20D to 13 ug/L in monitoring well GM-11. Concentrations of cis-1,2-DCE ranged from below reporting limits in monitoring wells GM-11 and GM-20D to 7.7 ug/L in monitoring well GM-15. Concentrations of vinyl chloride ranged from below reporting limits in monitoring wells GM-11 and GM-20D to 0.47 J ug/L in monitoring well GM-15.

Off-site wells further downgradient that were sampled in 2015 included monitoring well GM-9 and extraction well DN-13. TCE and cis-1,2-DCE were detected in monitoring well GM-9 at concentrations of 12 ug/L and 0.26 J ug/L, respectively. Concentrations of PCE, TCE, cis-1,2-DCE, and vinyl chloride in extraction well DN-13 were 2.5 ug/L, 9.0 ug/L, 5.5 ug/L, and 0.70 J ug/L, respectively. Groundwater capture in the vicinity of these lower aquifer wells by extraction well DN-13 is discussed in Section 3.2.

#### 2.2.3.4 Lower Aquifer Plume Distribution and MCL Comparison

Lower aquifer plume distribution is shown on constituent-specific isoconcentration maps in Appendix H. At the request of the U.S. EPA, isoconcentration maps were completed for the lower aquifer for PCE, TCE, cis-1,2-DCE, vinyl chloride, 1,1-DCE, and total site-specific VOCs (Figures H-7 through H-12). The concentrations for the isoconcentration maps posted reflect 2015 groundwater sampling data, 2013 annual groundwater sampling data (applicable wells for 5-year event) and maximum interval concentrations for VAP groundwater samples., The isoconcentration contour interpretation includes CSM understanding (i.e. groundwater flow and interim measure operation). Isoconcentration maps for PCE, TCE, and total CVOCs were generated by three-dimensional model. Non-detect concentrations were accounted for by contouring using half the reporting limit posted.

In lower aquifer monitoring wells, PCE was detected above the MCL (5 ug/L) in eight wells (GM-76D, GM-54, GM-68D, GM-75D, RMW-85, GM-19D, RMW-86, and GM-77D). These wells are shown on Table 3, Figure 10, and Figure H-7 in bold. Detected concentrations above the MCL ranged from 11 ug/L to 140 ug/L in wells GM-19D and GM-75D, respectively. The data indicate that PCE is present across the Site from the former Process Sump Area, extending south and off-site to the southeast.

In lower aquifer monitoring wells, TCE was detected above the MCL (5 ug/L) in 11 wells (GM-76D, GM-67D, GM-75D, RMW-85, GM-19D, RMW-86, RMW-87, GM-15, GM-9, DN-13, and GM-11). These wells are shown on Table 3, Figure 10, and Figure H-8 in bold. Detected concentrations above the MCL ranged from 6.6 ug/L to 150 ug/L in wells GM-15 and GM-75D, respectively. The data indicate that TCE is present across the Site from the former Process Sump Area, extending southwest and southeast off-site.

In lower aquifer monitoring wells, cis-1,2-DCE was detected above the MCL in one well (GM-67D). This well is shown on Table 3, Figure 10, and Figure H-9 in bold. The cis-1,2-DCE concentration was 140 F1 ug/L in monitoring well GM-67D. The lower aquifer cis-1,2-DCE concentrations that exceed the MCL are limited to the central portion of the Site in a well located near the source areas.

Concentrations of 1,1-DCE and vinyl chloride (Figures H-10 and H-11) were not detected above their respective MCLs (7 ug/L and 2 ug/L) in the groundwater samples collected from the lower aquifer in association with the 2015 annual groundwater sampling event.

The isoconcentration map for total CVOCs in the lower aquifer is shown on Figure H-12. The data indicate that CVOCs are present at the highest concentrations in the former Process Sump Area, extending off-site to the north, southwest, southeast.

# 3 CORRECTIVE MEASURE PERFORMANCE

## 3.1 RZ Performance Results

A detailed assessment of the effectiveness of the reactive zones and the results of this monitoring are presented in Appendix A and summarized below. Results of the ERD microbial investigation completed in 2015 are presented in Appendix B.

- Aquifer conditions were strongly reducing within and downgradient of the reactive zones due to the introduction of carbohydrate, as evidenced by the presence of methane at concentrations significantly above background data.
- The target compounds (PCE and TCE) were reduced to daughter products (cis-1,2-DCE and vinyl chloride) and ultimately to end products (ethene and ethane) based on the VOC and light hydrocarbon data (ethene and ethane).
- Enhanced reductive dechlorination continued to achieve the desired reduction of VOC concentrations in groundwater.
- No significant change in anaerobic conditions (e.g., the concentration of methane) or treatment effectiveness (e.g., sustained reductions in chlorinated VOC concentrations with the observation of elevated ethene and/or ethane) were observed as a result of the quarterly injection frequency.

## 3.2 Capture Zone Performance Results

Pumping well DN-13 is utilized to capture site-specific VOCs in lower aquifer groundwater. To determine the effectiveness of DN-13 in this regard, several lines of evidence were evaluated following the general procedures outlined in the U.S. EPA guidance, A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems (U.S. EPA 2008).

1. Review Site data, CSM, and remedial objectives;
2. Define site-specific target capture zone(s);
3. Interpret groundwater levels;
4. Complete calculations for basis of hydraulic capture;
5. Evaluate groundwater concentration trends; and
6. Interpret Site capture.

### 3.2.1 Site Data and Conceptual Site Model

The initial steps for this capture zone analysis included review of Site data and the CSM, which consists of the hydrogeologic structure, hydrogeologic properties (e.g. hydraulic conductivity), site groundwater elevations (Table 6), site hydraulic gradients (horizontal [Tables 8 and 10] and vertical [Table 9]), and DN-13 operational data (e.g. pumping rates).

A depiction of the lower aquifer, including the location of the largely continuous regional clay till unit, and the screened interval of monitoring wells and DN-13 is presented in the 2012 CMP (ARCADIS, Inc. 2012a). The lower aquifer hydraulic conductivity ranges from approximately 260 to 440 feet/day (ft/day) (ARCADIS, Inc. 2012a and Geraghty & Miller, Inc. 1990). Site groundwater elevation contours (i.e., potentiometric surface map) for the lower aquifer are presented on Figure 8 and indicate that groundwater generally flows in a northeast to southwest direction across the Site.

The approximate run-time average flow rate (pump in operation) for DN-13 in 2015 was approximately 676 gallons per minute (gpm, [0.97 MGD]), while the average period (daily) rate (total flow volume averaged over the entire year – including downtime) for 2015 was approximately 646 gpm (0.93 MGD). The average period extraction rate for DN-13 for December 2015 was approximately 1,028 gpm (1.48 MGD), which coincides with the annual groundwater elevation monitoring. well DN-13 was operational throughout 2015 except for the periodic shutdowns related to power failures and for operation and maintenance activities detailed in Appendix I.

### 3.2.2 DN-13 Pumping Well Operation and Maintenance

Well DN-13 is a lower aquifer extraction well that is owned by Montgomery County and operated by Montgomery County and RACER Trust. Well DN-13 was part of the former Greater Moraine Water System located in the former North Dryden Road well field and has been used in a Pump-to-Waste Program since March 1990 in cooperation with former GM Corporation/MLC until March 31, 2011. The operation has continued since that time in cooperation with RACER Trust.

The interim measure for the lower aquifer at the Site consists of continued pumping of DN-13 to capture impacted groundwater. The outfall for DN-13 discharges to the Great Miami River and, as required by the NPDES permit regulated by the Ohio EPA, monthly and quarterly sampling is performed at the invert of the outfall and the sampling port of the DN-13 well head to monitor water quality along with the discharge flow rate.

An operation and maintenance plan has been defined in the Extraction Well DN-13 Operation and Maintenance Memorandum (ARCADIS, Inc. 2015b) and the Extraction Well DN-13 Operation and Maintenance Statue Memorandum (ARCADIS, Inc. 2015c). Data has been collected monthly since April 2015 and is used to evaluate the performance of extraction well DN-13 by: collecting specific data to monitor extraction well performance; establishing criteria to determine reduced performance and prompt corrective action; and developing protocols for corrective action. The performance and corrective actions are detailed in the Quarterly Progress Reports for Third and Fourth Quarter 2015 (RACER Trust 2015a and RACER Trust 2015b) with correction action summarized as follows:

Due to declining well performance in 2015, DN-13 was shut down for 15 days in November to conduct re-development activities. The Layne Christenson Company (Layne) removed biofouling and mineral scaling on the screen and within the surrounding formation by jetting and application of glycolic acid. In addition, the motor and pump were removed and inspected, and video logging of the well to assess screen conditions was completed prior to and after re-development. A step test was completed by Arcadis to determine the success of the re-development process and obtain new baseline parameters. Testing results demonstrated improvements in well performance by increasing specific capacity, allowing for higher flow rate operation. The instantaneous flow rate after re-development was approximately 1,030

gpm. The re-development activities were successful in improving flow rate and specific capacity, and additional modifications with regard to these two parameters are not recommended. On December 23, 2015, the DN-13 pump motor failed and was repaired in early 2016. Appendix I provides supporting details for DN-13 operation and maintenance.

### 3.2.3 Site-Specific Target Capture Zone

The target capture zone for DN-13 is defined as the extent of impacted groundwater in the lower aquifer containing total CVOC concentrations above 5 ug/L (Figure H-12 and Figure 17). The pumping program at DN-13 is intended to prevent further migration of the VOC plume and to capture the VOC impacted groundwater in the lower aquifer downgradient of the upper aquifer source areas at the Site. The maximum width (perpendicular to groundwater flow) of total CVOC concentrations greater than 5 ug/L in the lower aquifer was estimated to be 2,700 ft. To account for some uncertainty in the delineation, an additional 250 ft was added (i.e., 125 ft on each side), which results in an approximate plume width of 2,950 ft.

### 3.2.4 Interpreted Groundwater Levels

#### 3.2.4.1 Potentiometric Surface

Groundwater elevation data are measured on an annual basis at the Site, and this data can be used to support several lines of evidence to demonstrate hydraulic capture at the Site (Table 6). In general, groundwater in the lower aquifer flows primarily from the northeast to the southwest (Figure 8). Groundwater elevation data from the surrounding monitoring well network indicate that there is a localized cone of depression in the vicinity of DN-13 with groundwater flowing towards the pumping well. An inferred capture zone was delineated by drawing flow lines perpendicular to groundwater elevation contours in the lower aquifer and is shown on Figure 18. The inferred delineation results in an estimated capture width of approximately 3,250 ft just upgradient of DN-13.

#### 3.2.4.2 Horizontal Hydraulic Gradients

In addition to capture interpretation via potentiometric surface maps, observed water-level data were also used to approximate the extent of hydraulic capture by calculating the magnitude and direction of horizontal hydraulic gradients between sets of adjacent monitoring wells located in the vicinity of the extraction well DN-13. This triangular irregular network (TIN) analysis provides a means of evaluating observed water-level data free of bias that is inherent in hand-drawn potentiometric surface maps.

Generally, monitoring well pairs are used as gradient control points for capture evaluation (i.e., used to demonstrate inward gradients or inward flow towards the pumping well). However, the current distribution of monitoring wells in the vicinity of DN-13 prohibits the designation of practical well pairs. To provide an accurate measure of the extent of hydraulic influence that DN-13 has on the lower aquifer system, hydraulic gradients were calculated to evaluate the flow direction (gradient angle and magnitude) using water-level data from sets of three adjacent monitoring wells (Devlin 2003). This method of analysis is consistent with and presented in the U.S. EPA's capture zone guidance (U.S. EPA 2008). Seven sets of

adjacent monitoring wells (three per set) located in the vicinity of DN-13 were evaluated and are shown on Figure 19.

Horizontal hydraulic gradients were evaluated using 2015 groundwater elevation data. Results of the evaluation are presented, including the magnitude and direction, in Table 10 and on Figure 19. The groundwater flow directions (hydraulic gradients) in the lower aquifer indicated effective capture of groundwater by DN-13.

#### 3.2.4.3 Vertical Hydraulic Gradients

Vertical hydraulic gradients were calculated from available upper and lower aquifer well pairs within the vicinity of DN-13 including GM-10/GM-9, GM-16/GM-15, GM-18/GM-13, and GM-17/GM-11. The calculated vertical hydraulic gradients shown in Table 9 indicate that a downward (negative) gradient is present within the vicinity of DN-13. The magnitude of vertical hydraulic gradients in the vicinity of DN-13 compared to on-site are nearly one order of magnitude greater (GM-16/GM-15 and GM-18/GM-13 compared to GM-2/GM-1 and 4S/GM-5).

### 3.2.5 Calculations for Basis of Hydraulic Capture

To verify the interpretation of field data (i.e. potentiometric surface maps), flow calculations were also completed to evaluate the extent of capture and provide an additional line of evidence.

As outlined in the U.S. EPA guidance (U.S. EPA 2008), the simplest and most commonly applied horizontal capture zone calculation is the estimated flow rate calculation. Through application of Darcy's law, this calculation provides an estimated groundwater flux moving through the cross-sectional area of the target capture zone such that a pumping rate required to capture this flux can be determined. The estimated groundwater flux/required pumping rate can then be compared to the actual pumping rates measured in the field to assess whether or not the system is pumping at a rate sufficient to contain the target capture zone.

Simplified assumptions for this calculation include the following:

- Homogeneous, isotropic aquifer of infinite extent.
- Confined aquifer, uniform aquifer thickness.
- Fully penetrating recovery well(s).
- Uniform regional horizontal hydraulic gradient.
- Steady-state flow.
- Negligible vertical gradient.
- Net recharge is accounted for in the regional hydraulic gradient.
- No other sources of water to the recovery well (e.g., flux from rivers or from other aquifers), except as represented by the "factor" in the estimated flow rate calculation.

The required pumping rate/groundwater flux is calculated using the following equation:

Q = K*i*(b*w)**factor*

where:

Q is the volumetric recovery rate or groundwater flux (cubic feet/day [$ft^3$/day])

K is the hydraulic conductivity (ft/day)

i is the regional hydraulic gradient (ft/ft)

b is the saturated thickness (ft)

w is the plume width (ft)

The *factor* term is intended to account for other contributions to the pumping well such as flux from a river or induced vertical flow from other stratigraphic units. The assumed value for this term ranges from 1.5 to 2.0 (U.S. EPA 2008).

As noted in the U.S. EPA guidance document, this calculation requires an estimate of the regional hydraulic gradient, without the influence of pumping. Because regional hydraulic gradients often change with time, U.S. EPA (2008) suggests that, in some cases, water-level data obtained cross-gradient or even upgradient and collected during the remedy implementation may be more appropriate than pre-remedy groundwater level data for calculating regional hydraulic gradient. As such, the average horizontal hydraulic gradient, *i*, for the lower aquifer upgradient and outside the influence of DN-13 in 2015 is approximately $5.5x10^{-4}$ ft/ft (Table 8).

As previously noted, the hydraulic conductivity, *K*, for the lower aquifer ranges from approximately 260 to 440 ft/day.

As presented earlier, the width of the target capture zone, *w*, in the lower aquifer is conservatively estimated to be approximately 2,950 ft while the estimated saturated thickness (and, consequently, the impacted thickness), *b*, is approximately 85 ft.

Using the parameter values listed above, the groundwater flux/required pumping rate was calculated for the Site and shown in the table below.

| Condition | Hydraulic Conductivity (ft/day) | Hydraulic Gradient (ft/ft) | Saturated Thickness (ft) | Lower Aquifer Plume Width (ft) | Factor | Groundwater Flux/Pumping Rate (MGD/gpm) |
|---|---|---|---|---|---|---|
| 2015 Minimum | 260 | $5.5 \times 10^{-4}$ | 85 | 2,950 | 2 | 0.53/372 |
| 2015 Maximum (Conservative) | 440 | $5.5 \times 10^{-4}$ | 85 | 2,950 | 2 | 0.91/630 |

Note that a maximum *factor* of 2 was applied in both cases to provide a realistic range in groundwater flux. For the given range in hydraulic conductivity values, the minimum and maximum groundwater flux through the target capture zone are estimated to be approximately 0.53 and 0.91 MGD (372 and 630 gpm), respectively. Recall that the average period (daily) extraction rate for DN-13 for 2015 was calculated to be 0.93 MGD (646 gpm) while the period rate in December 2015 was 1.48 MGD (1,028 gpm). Compared to the estimated DN-13 groundwater flux/required pumping rates under both hydraulic conductivity conditions, the actual period extraction rates for 2015 exceed the maximum groundwater flux estimate. Therefore, even after incorporating an overly conservative set of parameters and applying a maximum value for the *factor*, the results of this calculation suggest that the current operation rate of DN-13 is sufficient to capture the target capture zone.

It is important to note that this mathematical model does not and cannot account for aquifer heterogeneities (e.g., changes in transmissivity) or system complexities (e.g., boundary effects, recharge, off-site sources, and off-site pumping). Therefore, these results represent a very simplified and idealized depiction of the actual groundwater flux through the aquifer.

### 3.2.6 VOC Concentration Trends

Because plume migration generally follows groundwater flow towards pumping well DN-13 (Appendix H), VOC concentration trends were statistically analyzed for three monitoring wells located cross-gradient of DN-13. The goal of this trend analysis was to determine if VOC concentrations were increasing, decreasing, or stable to provide an additional line of evidence for DN-13 capture.

Concentration data were statistically analyzed from three lower aquifer monitoring wells: GM-9, GM-15, and GM-20D. These monitoring wells were chosen based on two criteria: having a sufficient number of data points to allow for statistical testing and for their location relative to DN-13.

The statistical tests were performed for the total concentration of site-specific VOCs. The individual concentrations of the site-specific VOCs were added and are presented in Table J-1 of Appendix J. Concentrations that were J-flagged were taken to be quantitative for the purposes of this statistical evaluation. Non-detections were treated as zeroes in the summation.

Groundwater quality was evaluated using the Mann-Kendall test for trends. The purpose of the test was to identify statistically significant trends in the concentrations of constituents of concern. Statistical methods were employed following Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Unified Guidance (U.S. EPA, 2009), and this document will be referred to as the “Unified Guidance”.

The Mann-Kendall trend test is a non-parametric test for linear trends based upon the concept that a series of data points without a trend should fluctuate randomly around a constant mean. The test is non-parametric because there is no requirement that the data follow any specific underlying distribution. If an increasing trend were to exist, one would expect an earlier point to have a lower value than a later point. The converse would be true if a decreasing trend were present. A Mann-Kendall statistic *S* is computed by comparing each pair of data points in a data set and assigning a value of +1 or -1 if the earlier data point is less than the later data point or greater than the later one, respectively. If the two data points are equal, the pair is assigned a zero. The values assigned to the pairs are summed. If the total is positive, it implies that the majority of the differences between points are positive, indicating a positive trend.

Likewise, a negative sum indicates a decreasing trend. A value at or near zero indicates that the differences are roughly equal, implying that there is no trend. A critical value of *S* is determined based on the number of points in the data set and the level of significance ($\alpha$) of the test. If the Mann-Kendall statistic *S* exceeds the critical *S*, then an upward trend is statistically significant. Conversely, if the Mann-Kendall *S* is negative and its absolute value is greater than the critical *S*, then there is a statistically significant downward trend. An alpha of 0.05 was used with 0.025 significance on each of two tails, when the data sets analyzed had 10 or more members. For data sets with eight members, an alpha of 0.10 was used with 0.05 significance on each of two tails. Details concerning this test and how to conduct it can be found in Section 17.3.2 of the Unified Guidance. Calculations were made using a commercially available statistics software package, ChemStat, version 6.3.0.0, distributed by Starpoint Software, Inc.

For each data set, the coefficient of variation index was computed by dividing the standard deviation by the arithmetic mean of the data. If no statistically significant trend could be identified by the Mann-Kendall test and if the coefficient of variation was less than or equal to 1.0, then the data set was considered to be "stable." If no trend was identified and the coefficient of variation exceeded 1.0, then the analysis could only conclude that there was "no trend."

The results of the statistical tests are presented in Table J-2 of Appendix J and on Figure 19. The ChemStat outputs are included in Appendix J. When the full data set was analyzed, no statistically significant trend was identified by the Mann-Kendall test for monitoring wells GW-9 or GM-15. Because the coefficient of variation was less than 1.0 for both monitoring wells, the VOC concentration data were determined to be stable. For GM-20D, a statistically significant decreasing trend was observed. The three monitoring well data sets were tested using Sen's Slope Estimator as a second line of evidence. In all three cases, Sen's Slope Estimator confirmed the results obtained using the Mann-Kendall test.

It was of interest to examine the period beginning in July 2008, when Arcadis assumed control of the flow rate at the extraction well. However, there are only seven available data points for monitoring well GM-9. The Mann-Kendall test lacks statistical power with data sets with fewer than eight members. Therefore, an extra data point was included for monitoring well GM-9, and the test was run for the three wells using the most recent eight data points. The results are presented in Table J-2. The VOC concentrations were found to be stable for monitoring wells GM-9 and GM-15, and decreasing for monitoring well GM-20D, as in the scenario in which all of the data since 1999 were used. These results were confirmed using Sen's Slope Estimator.

No statistically significant increasing trends were identified. The data were found to be stable in monitoring wells GM-9 and GM-15. A statistically significant decreasing trend was identified in the data from monitoring well GM-20D. The results were the same for both time periods and were confirmed using an alternative statistical test as a second line of evidence. These results confirm VOC plume capture at DN-13.

### 3.2.7 Interpreted Capture

The lines of evidence evaluated indicate that DN-13 is providing sufficient capture within the lower aquifer to control and prevent further migration of the site-specific VOCs. The lines of evidence investigated as part of this analysis and their associated conclusions can be summarized as follows:

1. Interpret Groundwater Levels

a. Potentiometric Surface Map – The lower aquifer groundwater elevation data indicate that groundwater flows from the northeast to the southwest towards pumping well DN-13 and that the inferred capture zone encompasses the target capture zone

b. Horizontal Hydraulic Gradients – The horizontal hydraulic gradient evaluation indicates that DN-13 is providing effective capture in the downgradient region of the lower aquifer.

c. Vertical Hydraulic Gradients – The vertical hydraulic gradients calculated for monitoring well pairs in the vicinity of DN-13 indicate an overall downward (negative) vertical hydraulic gradient from the upper to the lower aquifer.

2. Groundwater Flux Calculation – The groundwater flux calculations, which were based on conservative parameter values, indicate that the 2015 average operating flow rate at DN-13 was sufficient to capture the groundwater flux of the total VOC groundwater plume moving through the target capture zone.

3. Evaluate Groundwater Concentration Trends – Results from the VOC concentration trend analysis show that VOC concentrations in the lower aquifer in the vicinity of DN-13 are decreasing or stable (based on the full data set as well as the most recent data), thereby indicating effective plume containment/capture.

Based on these multiple lines of evidence, an interpreted capture zone was delineated and shows containment of the target capture zone on Figure 20. The results of this updated analysis are consistent with previous analysis and the lines of evidence suggest that sufficient hydraulic capture within the lower aquifer at the Site has been achieved.

# 4 CORRECTIVE ACTION COMPLETION STRATEGY

## 4.1 Effectiveness of Interim Measure Activities

### 4.1.1 Background and Objectives

Updated Corrective Measures Objectives (CMOs) based on the RFI, Supplemental RFI, and supplemental investigation results, including the Baseline Risk Assessment (BRA) conclusions; Supplemental BRA conclusions; CMP supplemental risk assessment; requirements of the AOC; and U.S. EPA guidance (U.S. EPA 1994) have been provided in the 2012 CMP (ARCADIS, Inc. 2012a). The CMOs proposed in the CMP to address site-specific VOCs in groundwater are presented below.

The CMOs for the protection of human health for the upper aquifer are as follows:

1. Address VOC mass from historic releases from the primary source area (former Oil House Area), including the VOC mass delineated near the former Process Sump Area.
2. Limit future migration of VOCs from the primary source area to downgradient portions of the upper aquifer and into the lower aquifer.
3. Prevent the migration of VOCs at concentrations exceeding the MCLs beyond the existing plume boundary.
4. Continue implementing the final corrective measures until the CMOs are achieved on-site and MCLs can be met and maintained at the property line point of compliance without active remedial measures.

The CMOs for the protection of human health for the lower aquifer are as follows:

1. To maintain the lower aquifer as usable groundwater for potential off-site, downgradient drinking water uses.
2. Prevent the migration of VOCs at concentrations exceeding MCLs beyond the existing plume boundary.
3. To meet and maintain MCLs at the downgradient property line point of compliance without active remedial measures.

Implementation of the final remedy as outlined in the 2012 CMP is pending U.S. EPA approval.

### 4.1.2 Results

An evaluation of the data collected in 2015 is presented in Section 2.2.3. Current site-specific VOC groundwater distribution within the upper aquifer above MCLs is migrating downgradient (southwest) beyond the property boundary. For the lower aquifer, well DN-13 through several lines of evidence indicates sufficient capture within the lower aquifer exists to mitigate and control the migration of site-specific VOCs off-site (refer to Section 3.2).

## 4.2 Monitoring of Closed Lagoons

### 4.2.1 Background and Objectives

One additional component of the site-wide groundwater monitoring program is monitoring of other specific units (i.e., the closed lagoons). The Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) was developed to meet the objectives of the Ohio EPA post-closure monitoring for the closed North and South Settling Lagoons.

### 4.2.2 Methodology

As indicated above, this site-wide monitoring program was developed to meet the objectives of RCRA corrective action and the post-closure groundwater monitoring requirements for the closed lagoons. The site-wide program monitors potentially significant contributions of hazardous waste constituents to existing groundwater quality from the closed lagoons. To determine if the closed lagoons may be significant contributors of hazardous waste constituents to existing groundwater concentrations, monitoring data collected from the designated post-closure monitoring wells located downgradient of each of the closed lagoons are evaluated for temporal trends. The approach proposed in the Site-Wide Groundwater Monitoring Plan for this assessment includes, as an initial approach, the application of straight line regression to determine if the data suggests a strong positive correlation.

The monitoring wells identified in the Site-Wide Groundwater Monitoring Plan for monitoring each of the closed lagoons are:

- Closed North Settling Lagoon: HR-4 (upgradient), W-2-N, W-3-N, and W-4-N.
- Closed South Settling Lagoon: HR-17 (upgradient), W-2-S, W-3-S, and W-4-S.

Additionally, monitoring wells GM-63, HR-1, and HR-16 were sampled to better characterize the increased concentrations at monitoring wells HR-17 and W-4-S. Data collected from monitoring well GM-83S in 2013 was also used for this evaluation.

### 4.2.3 Results

As proposed in the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), post-closure monitoring data collected from those wells assigned to the closed North and South Settling Lagoons were reviewed for temporal trends. Data considered in the evaluation included results through the October to December 2015 monitoring event and data ranging back to the initial post-closure monitoring event conducted in November 2001. Currently, the data set collected since the lagoons were closed includes fifteen[2] data points for the monitoring well/constituent pairs. The data plots for key constituents are provided on Figure K-1 for the closed North Settling Lagoon and Figure K-2 for the closed South Settling Lagoon in Appendix K.

[2] With the exception of W-4-S which contains nineteen data points for each constituent.

As presented on Figure K-1, the linear regression analysis for the monitoring wells used to assess conditions at the North Settling Lagoon suggest increasing concentrations of trans-1,2-DCE in downgradient well W-2-N and increasing concentrations of 1,1-DCA and cis-1,2-DCE in downgradient well W-4-N. In each of these cases, the slope is positive and the linear regression had a correlation coefficient ($R^2$) greater than 0.5. As provided for in the Site Wide Groundwater Monitoring Plan (ARCADIS Inc. 2002), further assessment of these trends was performed using the Mann-Kendall trend test. The results of the trend tests are provided on Table K-1. The results of this test indicate a statistically significant increasing trend for the 1,1-DCA and cis-1,2-DCE concentrations in monitoring well W-4-N. The results indicate that the trend for trans-1,2-DCE concentrations in W-2-N indicated by the linear regression is not statistically significant. Therefore, these data and trend analyses do not indicate significant increases in groundwater concentrations of trans-1,2-DCE in W-2-N that would be attributable to the North Settling Lagoon.

In summary, the North Settling Lagoon data indicate a statistically significant increasing trend in 1,1-DCA and cis-1,2-DCE in downgradient monitoring well W-4-N. Two observations suggest a source other than the North Settling Lagoon for 1,1-DCA and cis-1,2-DCE in monitoring well W-4-N:

- The absence of detections of 1,1-DCA and cis-1,2-DCE above drinking water standards; and
- The fact that these two (1,1,-DCA and cis-1,2-DCE) constituents are daughter products of other constituents that have been detected upgradient of the North Settling Lagoon.

As presented on Figure K-2, the linear regression analysis for the monitoring wells used to assess conditions at the South Settling Lagoon suggest increasing concentrations of 1,1-DCA, cis-1,2-DCE, trans-1,2-DCE, PCE, and TCE in downgradient monitoring well W-4-S. Additionally, increasing concentrations of cis-1,2-DCE in monitoring well W-3-S were noted. Increasing concentrations of TCE and PCE in upgradient monitoring well HR-17 were also observed. In each of these cases, the slope is positive and the linear regression had a correlation coefficient ($R^2$) greater than 0.5. As provided for in the Site Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), further assessment of these trends was performed using the Mann-Kendall trend test. The results of the trend tests are provided on Table K-1. The trend tests confirmed that the eight correlated increases identified in the linear regressions are statistically significant (see Table K-1). Additionally, the Mann-Kendall test identified an increasing cis-1,2-DCE trend in W-2-S, an increasing toluene trend in W-4-S, an increasing TCE trend in W-3-S, and an increasing PCE trend in W-3-S.

The detected concentrations for PCE and TCE in upgradient monitoring well HR-17 in the 2015 sampling event were 150 μg/L and 160 μg/L, respectively. The trends of PCE and TCE concentration in that well are strongly positive and statistically significant. The observed concentration increases identified in downgradient monitoring well W-4-S for PCE and TCE appear to correlate with the concentrations and increasing trends also observed in upgradient well HR-17. The correlations between concentrations in HR-17 and W-4-S for PCE and TCE were tested statistically using Pearson correlation coefficients and were found to be statistically correlated at the five percent significance level. This correlation suggests a source other than the South Settling Lagoon for the PCE and TCE increases. Although the concentrations for cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCA in wells W-4-S and HR-17 are not

statistically correlated, the concentrations are still below the MCLs. Further, the presence of cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCA, is expected from the natural attenuation processes.

Data collected from monitoring well HR-1, approximately 1,000 feet upgradient of monitoring well HR-17 and the South Settling Lagoon corroborate the statistical analysis. TCE was detected at 210 μg/L, and PCE was detected at 76 μg/L; cis-1,2-DCE, trans-1,2-DCE and 1,1-DCA were detected at concentrations below MCLs, similar to the results in HR-17. Monitoring well GM-63, located near monitoring well W-4-S but side-gradient of the South Settling Lagoon, had results comparable to monitoring well W-4-S. TCE was detected at 19 μg/L in monitoring well GM-63 and at 72 μg/L in monitoring well W-4-S. PCE was detected at 46 μg/L in monitoring well GM-63 and 74 μg/L in monitoring well W-4-S. 1,1,1-TCA, cis-1,2-DCE, and 1,1-DCA were detected in both monitoring wells at levels below their respective MCLs. Combining the statistical analysis with the data from monitoring wells HR-1 and GW-63 it can be seen that concentrations downgradient of the South Settling Lagoon are due to upgradient groundwater impacts rather than being attributable to the South Settling Lagoon.

The plume from the upgradient source is delineated on the west side by monitoring wells GM-83S and HR-16. The concentrations of the main constituents of concern in these wells were 2.7 μg/L or less.

In conclusion, the monitoring of the closed North and South Settling Lagoons showed that the closed lagoons were not contributing hazardous waste constituents to existing groundwater concentrations in the area.

# 5 CONCLUSIONS AND RECOMMENDATIONS

This site-wide report presents the groundwater monitoring activities completed in 2015 at the RACER Trust Moraine Facilities located in Moraine, Ohio. This sampling was conducted to meet the five objectives presented in Section 1.2. Compliance with these objectives is presented for the closed lagoons, interim measures, and on-going site-wide groundwater monitoring in the following sections.

## 5.1 Post-Closure Monitoring

As proposed in the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002), post-closure monitoring data collected at the closed North and South Settling Lagoons were evaluated to determine if these closed units may be contributing site-specific VOCs to groundwater.

This evaluation determined that post-closure monitoring data indicate that these units are not affecting groundwater quality. Based on the results from the 2015 monitoring, no changes in the monitoring program for the closed lagoons are proposed.

## 5.2 Interim Measures Performance

The approach for RACER Trust in achieving its corrective action goals for the former Moraine Facilities is based on a combination of interim measures (in-situ treatment and hydraulic control) designed to reduce existing plume concentrations thereby achieving plume reduction and migration control.

### 5.2.1 In-Situ Treatment

Groundwater quality monitoring at and downgradient of the reductive dechlorination treatment zones indicates that this in-situ treatment program has been effective at reducing VOC concentrations in groundwater. As observed during the 2015 monitoring, the upper aquifer conditions in the areas downgradient of the in-situ reactive zones have been converted to strongly reducing conditions through the introduction of a carbon source, as evidenced by the presence of methane at concentrations significantly above baseline data and further supported qualitatively with field parameter data (e.g., low dissolved oxygen and oxidation-reduction potential). Further, the VOC results indicate that the target compounds (PCE and TCE) have been effectively reduced to daughter products (cis-1,2-DCE and vinyl chloride) and ultimately to ethene and ethane.

In general, the process of ERD has been successful in achieving reduction of VOC concentrations downgradient of source areas. The frequency of substrate injections will continue to be quarterly in 2016 based on the updated transport velocities in the updated CSM. The reactive zone performance monitoring data will continue to be evaluated in 2016 to confirm the interim measure remains effective with this amended schedule.

### 5.2.2 Hydraulic Capture

Groundwater elevation monitoring, horizontal and vertical hydraulic gradients, groundwater flux calculations, and lower aquifer VOC concentration trends indicate that the capture zone interim measure DN-13 continues to be effective at maintaining capture of the target capture zone in the lower aquifer.

Based on the effective performance of the pumping program during 2015, the current pumping program at DN-13 will continue to be implemented and evaluated in 2016.

The ongoing groundwater monitoring program includes the assessment of changes in site-specific VOCs in both the upper and lower aquifers at locations upgradient of the former Moraine Facilities, as well as on-site and downgradient of the former facilities. Data collected from upper and lower aquifer wells located upgradient of the former facilities confirms that upgradient sources of VOCs, not related to former GM Corporation operations, persist in the local area. Other than upgradient contributions of VOCs to on-site groundwater and areas evaluated as part of the former Process Sump Area source area, the monitoring data indicate a site-wide decrease in VOC concentrations since the baseline sampling event conducted in 1999 as a result of the interim measures. VOC concentrations remain above MCLs for off-site wells in the upper and lower aquifers. However, lower aquifer groundwater, downgradient beyond the property boundary, is captured by the lower aquifer capture zone well DN-13.

The overall decreasing concentrations in the wells downgradient of the Site since the interim measures were first implemented are likely attributable to the combined effects of interim measures that include pumping at TW-2 which began in January 1996 (inactive as of July 2012), pumping at DN-13, and ongoing ERD of the VOCs. However, concentrations in upper aquifer monitoring wells immediately downgradient of the Site to the southwest, as well as concentrations in lower aquifer wells remain above MCLs. Therefore, active measures to include a final proposed site-wide remedy are still required to achieve the corrective measures objectives.

Based on the evaluation of the site-wide groundwater quality, both the amended in-situ treatment and hydraulic capture (lower aquifer) will continue until modifications are implemented for the final site-wide remedy proposed in the 2012 CMP (ARCADIS, Inc. 2012a). A summary of the DN-13 operations and maintenance activities is provided in Appendix I.

## 5.3 Reassessment of Site-Wide Groundwater Monitoring Program

In accordance with the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) with modifications from the Site-Wide Groundwater Monitoring Report for 2008 (ARCADIS, Inc. 2009), groundwater monitoring was completed in 2015 to evaluate groundwater quality upgradient and downgradient of the closed lagoons and landfills, performance of the in-situ reactive zones, and performance of the capture zone. Based on the data collected during the 2015 monitoring period, the monitoring program has provided sufficient data for a comprehensive evaluation of the current corrective action objectives. To reassess the monitoring program in support of the proposed final corrective measures, the following is recommended:

- In 2015, the changes detailed in Section 2.1.3 were made, as recommended in the Site-Wide Groundwater Monitoring Report for 2014 (ARCADIS, U.S., Inc. 2015). A similar approach will be completed for the 2016 Site-Wide Groundwater Monitoring Program, as shown in Table 11, with the exceptions noted below.
    - Monitoring wells HR-1, HR-16, and GM-63 will continue to be sampled in 2016 to support the evaluation of VOC concentrations in proximity to the closed South Settling Lagoon.
    - Monitoring wells GM-30, GM-31, GM-51, and HR-3 are currently sampled every five years and had observed increases in VOC concentrations in 2013. In order to monitor these increasing

trends more closely, these wells were sampled in 2015 and will be included in the list of wells to be sampled in 2016.

- As discussed in U.S. EPA Technical Fact Sheet-1,4-Dioxane (U.S. EPA 2014), 1,4-dioxane has been identified as an emergent chemical associated with industrial processes that included use of VOCs and will be a constituent of concern for this site. The results of the 1,4-dioxane evaluation completed in 2015 are summarized in Appendix D. In 2016, the following wells will be sampled for 1,4-dioxane: HR-12, GM-6, GM-8, GM-9, GM-11, GM-15, GM-16, GM-21, GM-29, GM-35, GM-52, GM-60, GM-75D, GM-79, GM-80, GM-83D, RMW-86, RMW-87, and RMW-88. These wells were selected based on previous 1,4-dioxane detections and spatial distribution.
- Monitoring Well GM-24 was sampled as part of the ERD Microbial Investigation (Appendix D). Previous to 2015 the only previous time GM-24 had been sampled was in 1999, when there were no detections of VOCs. In 2015 detections of TCE (4.4 μg/L), cis-1,2-DCE (0.82 J μg/L), 1,1,1-TCA (8.8 μg/L), and 1,1-DCA (0.67 J μg/L) were observed. It is recommended that GM-24 be sampled as part of the site-wide groundwater monitoring program in 2016 to confirm these results.
- Future revisions to the site-wide groundwater monitoring program will be proposed for adjustment as appropriate and specifically evaluated as future remedial measures are contemplated and implemented.

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# TABLES

# Table 1
# Site-Wide Groundwater Monitoring Program for 2015
# RACER Trust
# Moraine, Ohio

## 2015 Site-Wide Annual Groundwater Sampling

Upper aquifer monitoring wells to be sampled for the site-specific list of VOCs(1) and field parameters(2) in 2015. Biogeochemical parameters(3) will be analyzed at select wells identified below:

| | | | | | | |
|---|---|---|---|---|---|---|
| W-1-N | HR-16 | GM-10 | GM-31 | GM-51 | GM-67S | RMW-89 |
| W-2-N | HR-17 | GM-16 | GM-32* | GM-52 | GM-71 | RMW-90 |
| W-3-N | W-2-S | GM-19S(3) | GM-35 | GM-55 | GM-72 | |
| W-4-N | W-3-S | GM-21(3) | GM-43 | GM-59(3) | GM-75S(3) | |
| HR-1 | W-4-S | GM-23(3) | GM-44 | GM-60(3) | GM-76S | |
| HR-2 | TW-2 | GM-26 | GM-45 | GM-62R | GM-78 | |
| HR-3 | GM-2 | GM-28R(3) | GM-46 | GM-63 | GM-79 | |
| HR-4 | GM-6 | GM-29(3) | GM-47 | GM-65S | GM-80 | |
| HR-7 | GM-8(3) | GM-30 | GM-50 | GM-66 | WSU-24 | |

Lower aquifer monitoring wells to be sampled for the site-specific list of VOCs(1) in 2015:

| | | | | |
|---|---|---|---|---|
| HR-12 | GM-11 | GM-54 | GM-76D | RMW-85 |
| HR-15 | GM-15 | GM-67D | GM-77D | RMW-86 |
| DN-13 | GM-19D | GM-68D | GM-83D | RMW-87 |
| GM-9 | GM-20D | GM-75D | GM-84 | RMW-88 |

## Analytical Methods

The following table presents the analytical methods to be used to analyze each parameter sampled during site-wide annual groundwater monitoring.

| Parameter | Analytical Method |
|---|---|
| Site-specific list of VOCs | EPA Method 8260B |
| Manganese, total and dissolved | EPA Method 6010B |
| Iron, total and dissolved | EPA Method 6010B |
| Sulfate | SM 375.4 |
| Sulfide | SM 376.1 |
| Total Organic Carbon | SM 415.1 |
| Chlorides | SM 325.2 |
| Ethane, Ethene, Methane | Method AM18G |
| Nitrate | EPA Method 300 |

## Notes

* Upper aquifer monitoring well GM-32 will be sampled for total organic carbon only.

1 - Site-specific list of VOCs for 2015 includes: benzene, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, ethylbenzene, tetrachloroethene, toluene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride, and xylenes.

2 - Field parameters include: pH, specific conductivity, dissolved oxygen, oxidation reduction potential, and temperature.

3 - Biogeochemical parameters include: nitrate, manganese (total and dissolved), iron (total and dissolved), sulfate, sulfide, total organic carbon, chlorides, ethane, ethene, and methane.

**Table 2**
**Carbon Source Solution Introduction Volumes for 2015**
**RACER Trust**
**Moraine, Ohio**

| Location | Injection Well | January | | February | | March | | April | | May | | June | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Injections[1] | | No Injections[2] | | Injection Event #160[3] | | No Injections[4] | | No Injections[5] | | Injection Event #161[6] | |
| | | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) |
| **Reactive Zone 1** | | | | | | | | | | | | | |
| | RZ-1C | --- | NA | --- | NA | 800 | 14.30 | --- | NA | --- | NA | 400 | 15.40 |
| | RZ-1D | --- | NA | --- | NA | 800 | 27.20 | --- | NA | --- | NA | 400 | 40.00 |
| | RZ-1E | --- | NA | --- | NA | 800 | 25.80 | --- | NA | --- | NA | 800 | 21.10 |
| | RZ-1F | --- | NA | --- | NA | 800 | 26.70 | --- | NA | --- | NA | 800 | 24.20 |
| | RZ-1G | --- | NA | --- | NA | 800 | 27.60 | --- | NA | --- | NA | 800 | 25.80 |
| | RZ-1H | --- | NA | --- | NA | 800 | 17.80 | --- | NA | --- | NA | 800 | 13.60 |
| | RZ-1I | --- | NA | --- | NA | 800 | 27.60 | --- | NA | --- | NA | 800 | 25.80 |
| | RZ-1J | --- | NA | --- | NA | 800 | 29.60 | --- | NA | --- | NA | 800 | 26.70 |
| | RZ-1K | --- | NA | --- | NA | 800 | 30.80 | --- | NA | --- | NA | 800 | 27.60 |
| | RZ-1L | --- | NA | --- | NA | 800 | 28.60 | --- | NA | --- | NA | 800 | 25.00 |
| | RZ-1M | --- | NA | --- | NA | 800 | 20.50 | --- | NA | --- | NA | 800 | 15.40 |
| | RZ-1N | --- | NA | --- | NA | 800 | 21.60 | --- | NA | --- | NA | 800 | 26.70 |
| | RZ-1O | --- | NA | --- | NA | 800 | 24.20 | --- | NA | --- | NA | 800 | 20.00 |
| | RZ-1P | --- | NA | --- | NA | 800 | 27.60 | --- | NA | --- | NA | 800 | 25.80 |
| | RZ-1Q | --- | NA | --- | NA | 800 | 20.00 | --- | NA | --- | NA | 800 | 22.90 |
| | RZ-1R | --- | NA | --- | NA | 800 | 28.60 | --- | NA | --- | NA | 800 | 28.60 |
| | RZ-1S | --- | NA | --- | NA | 800 | 25.80 | --- | NA | --- | NA | 800 | 21.10 |
| | RZ-1T | --- | NA | --- | NA | 800 | 32.00 | --- | NA | --- | NA | 800 | 28.60 |
| | RZ-1U | --- | NA | --- | NA | 800 | 27.60 | --- | NA | --- | NA | 800 | 24.20 |
| **Reactive Zone 3** | | | | | | | | | | | | | |
| | RZ-3A | --- | NA | --- | NA | 1600 | 28.80 | --- | NA | --- | NA | 1600 | 27.70 |
| | RZ-3B | --- | NA | --- | NA | 1600 | 27.90 | --- | NA | --- | NA | 1600 | 27.70 |
| | RZ-3C | --- | NA | --- | NA | 1600 | 27.20 | --- | NA | --- | NA | 1600 | 25.40 |
| | RZ-3D | --- | NA | --- | NA | 1600 | 18.40 | --- | NA | --- | NA | 400 | 4.00 |
| | RZ-3E | --- | NA | --- | NA | 500 | 16.10 | --- | NA | --- | NA | 1600 | 13.30 |
| | RZ-3F | --- | NA | --- | NA | 1100 | 22.40 | --- | NA | --- | NA | 1600 | 19.90 |
| | RZ-3G | --- | NA | --- | NA | 1600 | 19.60 | --- | NA | --- | NA | 1600 | 19.90 |
| | RZ-3H | --- | NA | --- | NA | 1600 | 29.60 | --- | NA | --- | NA | 1600 | 23.60 |
| | RZ-3I | --- | NA | --- | NA | 1600 | 25.40 | --- | NA | --- | NA | 1600 | 22.30 |
| | RZ-3J | --- | NA | --- | NA | 1600 | 29.70 | --- | NA | --- | NA | 1600 | 23.50 |
| | RZ-3K | --- | NA | --- | NA | 1600 | 25.50 | --- | NA | --- | NA | 1600 | 24.40 |
| | RZ-3L | --- | NA | --- | NA | 1600 | 29.60 | --- | NA | --- | NA | 1600 | 25.00 |
| | RZ-3M | --- | NA | --- | NA | 1600 | 28.20 | --- | NA | --- | NA | 1600 | 24.00 |
| | RZ-3N | --- | NA | --- | NA | 1600 | 26.50 | --- | NA | --- | NA | 1600 | 26.00 |
| | RZ-3O | --- | NA | --- | NA | 1600 | 25.60 | --- | NA | --- | NA | 1600 | 24.00 |
| | RZ-3P | --- | NA | --- | NA | 1600 | 21.90 | --- | NA | --- | NA | 1600 | 20.40 |
| | RZ-3Q | --- | NA | --- | NA | 1600 | 27.20 | --- | NA | --- | NA | 1600 | 27.20 |
| | RZ-3R | --- | NA | --- | NA | 1600 | 31.40 | --- | NA | --- | NA | 1600 | 26.20 |
| | RZ-3S | --- | NA | --- | NA | 1600 | 26.80 | --- | NA | --- | NA | 1600 | 27.20 |
| | RZ-3T | --- | NA | --- | NA | 1600 | 23.60 | --- | NA | --- | NA | 1600 | 24.40 |
| | RZ-3U | --- | NA | --- | NA | 1600 | 26.30 | --- | NA | --- | NA | 1600 | 28.60 |
| | RZ-3V | --- | NA | --- | NA | 1600 | 26.30 | --- | NA | --- | NA | 1600 | 27.20 |
| | RZ-3W | --- | NA | --- | NA | 1600 | 28.10 | --- | NA | --- | NA | 1600 | 28.10 |
| | RZ-3X | --- | NA | --- | NA | 1600 | 24.70 | --- | NA | --- | NA | 1600 | 25.50 |
| | RZ-3Y | --- | NA | --- | NA | 1600 | 26.40 | --- | NA | --- | NA | 1600 | 27.20 |
| | RZ-3Z | --- | NA | --- | NA | 1600 | 25.00 | --- | NA | --- | NA | 1600 | 26.40 |
| | RZ-3AA | --- | NA | --- | NA | 1600 | 25.90 | --- | NA | --- | NA | 1600 | 26.30 |
| | RZ-3BB | --- | NA | --- | NA | 1600 | 27.70 | --- | NA | --- | NA | 1600 | 27.60 |

**Table 2**
**Carbon Source Solution Introduction Volumes for 2015**
**RACER Trust**
**Moraine, Ohio**

| Location | Injection Well | January | | February | | March | | April | | May | | June | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Injections[1] | | No Injections[2] | | Injection Event #160[3] | | No Injections[4] | | No Injections[5] | | Injection Event #161[6] | |
| | | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) |
| **Reactive Zone 3** | | | | | | | | | | | | | |
| | RZ-3CC | --- | NA | --- | NA | 1600 | 28.80 | --- | NA | --- | NA | 1600 | 23.20 |
| | RZ-3DD | --- | NA | --- | NA | 1600 | 26.70 | --- | NA | --- | NA | 1600 | 27.70 |
| | RZ-3GG | --- | NA | --- | NA | 1600 | 29.20 | --- | NA | --- | NA | 1600 | 27.70 |
| | RZ-3HH | --- | NA | --- | NA | 1000 | 25.50 | --- | NA | --- | NA | 1000 | 25.50 |
| | RZ-3II | --- | NA | --- | NA | 1400 | 32.10 | --- | NA | --- | NA | 1400 | 28.20 |
| | RZ-3JJ | --- | NA | --- | NA | 1600 | 12.80 | --- | NA | --- | NA | 800 | 11.90 |
| | RZ-3KK | --- | NA | --- | NA | 1600 | 27.20 | --- | NA | --- | NA | 1600 | 24.00 |
| | RZ-3RR | --- | NA | --- | NA | 1600 | 26.90 | --- | NA | --- | NA | 1600 | 18.00 |
| | RZ-3SS | --- | NA | --- | NA | 1600 | 18.30 | --- | NA | --- | NA | 1600 | 15.20 |
| | RZ-3TT | --- | NA | --- | NA | 1600 | 15.30 | --- | NA | --- | NA | 1600 | 13.60 |
| | RZ-3UU | --- | NA | --- | NA | 1600 | 10.70 | --- | NA | --- | NA | 800 | 9.50 |
| | RZ-3VV | --- | NA | --- | NA | 1600 | 15.30 | --- | NA | --- | NA | 1600 | 12.80 |
| **Reactive Zone 4** | | | | | | | | | | | | | |
| | RZ-4A | --- | NA | --- | NA | 3000 | 24.70 | --- | NA | --- | NA | 3000 | 24.30 |
| | RZ-4B | --- | NA | --- | NA | 3000 | 25.70 | --- | NA | --- | NA | 3000 | 26.20 |
| | RZ-4C | --- | NA | --- | NA | 3000 | 25.60 | --- | NA | --- | NA | 3000 | 23.60 |
| | RZ-4D | --- | NA | --- | NA | 3000 | 26.50 | --- | NA | --- | NA | 3000 | 27.00 |
| | RZ-4E | --- | NA | --- | NA | 3000 | 28.40 | --- | NA | --- | NA | 3000 | 28.30 |
| | RZ-4F | --- | NA | --- | NA | 3000 | 25.00 | --- | NA | --- | NA | 3000 | 19.50 |
| | RZ-4G | --- | NA | --- | NA | 3000 | 26.20 | --- | NA | --- | NA | 3000 | 24.10 |
| | RZ-4H | --- | NA | --- | NA | 3000 | 30.30 | --- | NA | --- | NA | 3000 | 23.90 |
| Site-Wide Total | | NA | NA | NA | NA | 100,800 | NA | NA | NA | NA | NA | 98,800 | NA |

**Table 2**
**Carbon Source Solution Introduction Volumes for 2015**
**RACER Trust**
**Moraine, Ohio**

| Location | Injection Well | July | | August | | September | | October | | November | | December | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Injections[7] | | No Injections[8] | | Injection Event #162[9] | | No Injections[10] | | No Injections[11] | | Injection Event #163[12] | |
| | | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) |
| **Reactive Zone 1** | | | | | | | | | | | | | |
| | RZ-1C | --- | NA | --- | NA | 400 | 14.30 | --- | NA | --- | NA | 600 | 16.20 |
| | RZ-1D | --- | NA | --- | NA | 400 | 21.10 | --- | NA | --- | NA | 1000 | 18.50 |
| | RZ-1E | --- | NA | --- | NA | 800 | 19.00 | --- | NA | --- | NA | 800 | 18.60 |
| | RZ-1F | --- | NA | --- | NA | 800 | 19.50 | --- | NA | --- | NA | 800 | 19.50 |
| | RZ-1G | --- | NA | --- | NA | 800 | 19.00 | --- | NA | --- | NA | 800 | 18.20 |
| | RZ-1H | --- | NA | --- | NA | 800 | 19.50 | --- | NA | --- | NA | 800 | 10.00 |
| | RZ-1I | --- | NA | --- | NA | 800 | 21.10 | --- | NA | --- | NA | 800 | 22.20 |
| | RZ-1J | --- | NA | --- | NA | 800 | 20.50 | --- | NA | --- | NA | 800 | 19.00 |
| | RZ-1K | --- | NA | --- | NA | 800 | 20.50 | --- | NA | --- | NA | 800 | 22.20 |
| | RZ-1L | --- | NA | --- | NA | 800 | 19.50 | --- | NA | --- | NA | 800 | 21.60 |
| | RZ-1M | --- | NA | --- | NA | 800 | 15.70 | --- | NA | --- | NA | 800 | 17.00 |
| | RZ-1N | --- | NA | --- | NA | 800 | 13.80 | --- | NA | --- | NA | 800 | 19.00 |
| | RZ-1O | --- | NA | --- | NA | 800 | 16.70 | --- | NA | --- | NA | 800 | 19.00 |
| | RZ-1P | --- | NA | --- | NA | 800 | 17.00 | --- | NA | --- | NA | 800 | 21.10 |
| | RZ-1Q | --- | NA | --- | NA | 800 | 18.20 | --- | NA | --- | NA | 800 | 19.50 |
| | RZ-1R | --- | NA | --- | NA | 800 | 19.00 | --- | NA | --- | NA | 800 | 17.80 |
| | RZ-1S | --- | NA | --- | NA | 800 | 17.00 | --- | NA | --- | NA | 800 | 23.50 |
| | RZ-1T | --- | NA | --- | NA | 800 | 20.50 | --- | NA | --- | NA | 800 | 22.90 |
| | RZ-1U | --- | NA | --- | NA | 800 | 20.00 | --- | NA | --- | NA | 800 | 22.20 |
| **Reactive Zone 3** | | | | | | | | | | | | | |
| | RZ-3A | --- | NA | --- | NA | 1600 | 25.40 | --- | NA | --- | NA | 1600 | 19.00 |
| | RZ-3B | --- | NA | --- | NA | 1600 | 23.60 | --- | NA | --- | NA | 1600 | 18.20 |
| | RZ-3C | --- | NA | --- | NA | 1600 | 22.30 | --- | NA | --- | NA | 1600 | 17.50 |
| | RZ-3D | --- | NA | --- | NA | 400 | 3.80 | --- | NA | --- | NA | 800 | 11.60 |
| | RZ-3E | --- | NA | --- | NA | 1600 | 21.10 | --- | NA | --- | NA | 1100 | 9.30 |
| | RZ-3F | --- | NA | --- | NA | 1600 | 17.00 | --- | NA | --- | NA | 1300 | 14.50 |
| | RZ-3G | --- | NA | --- | NA | 1600 | 16.40 | --- | NA | --- | NA | 1600 | 12.00 |
| | RZ-3H | --- | NA | --- | NA | 1600 | 23.30 | --- | NA | --- | NA | 1600 | 16.20 |
| | RZ-3I | --- | NA | --- | NA | 1600 | 18.50 | --- | NA | --- | NA | 1600 | 14.70 |
| | RZ-3J | --- | NA | --- | NA | 1600 | 19.50 | --- | NA | --- | NA | 1600 | 14.60 |
| | RZ-3K | --- | NA | --- | NA | 1300 | 14.30 | --- | NA | --- | NA | 1600 | 13.30 |
| | RZ-3L | --- | NA | --- | NA | 1600 | 26.60 | --- | NA | --- | NA | 1600 | 19.90 |
| | RZ-3M | --- | NA | --- | NA | 1600 | 25.00 | --- | NA | --- | NA | 1600 | 15.90 |
| | RZ-3N | --- | NA | --- | NA | 1600 | 26.10 | --- | NA | --- | NA | 1600 | 20.00 |
| | RZ-3O | --- | NA | --- | NA | 1600 | 24.00 | --- | NA | --- | NA | 1600 | 19.50 |
| | RZ-3P | --- | NA | --- | NA | 1600 | 21.50 | --- | NA | --- | NA | 1600 | 16.70 |
| | RZ-3Q | --- | NA | --- | NA | 1600 | 25.00 | --- | NA | --- | NA | 1600 | 20.60 |
| | RZ-3R | --- | NA | --- | NA | 1600 | 27.20 | --- | NA | --- | NA | 1600 | 20.00 |
| | RZ-3S | --- | NA | --- | NA | 1600 | 25.00 | --- | NA | --- | NA | 1600 | 20.30 |
| | RZ-3T | --- | NA | --- | NA | 1600 | 24.00 | --- | NA | --- | NA | 1600 | 15.60 |
| | RZ-3U | --- | NA | --- | NA | 1600 | 25.80 | --- | NA | --- | NA | 1600 | 20.80 |
| | RZ-3V | --- | NA | --- | NA | 1600 | 25.00 | --- | NA | --- | NA | 1600 | 18.20 |
| | RZ-3W | --- | NA | --- | NA | 1600 | 26.70 | --- | NA | --- | NA | 1600 | 18.50 |
| | RZ-3X | --- | NA | --- | NA | 1600 | 24.60 | --- | NA | --- | NA | 1600 | 18.70 |
| | RZ-3Y | --- | NA | --- | NA | 1600 | 25.80 | --- | NA | --- | NA | 1600 | 19.40 |
| | RZ-3Z | --- | NA | --- | NA | 1600 | 23.60 | --- | NA | --- | NA | 1600 | 19.50 |
| | RZ-3AA | --- | NA | --- | NA | 1600 | 24.60 | --- | NA | --- | NA | 1600 | 19.50 |
| | RZ-3BB | --- | NA | --- | NA | 1600 | 23.30 | --- | NA | --- | NA | 1600 | 20.30 |

**Table 2**
**Carbon Source Solution Introduction Volumes for 2015**
**RACER Trust**
**Moraine, Ohio**

| Location | Injection Well | July | | August | | September | | October | | November | | December | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Injections[7] | | No Injections[8] | | Injection Event #162[9] | | No Injections[10] | | No Injections[11] | | Injection Event #163[12] | |
| | | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) | Volume (gal) | Flow Rate (gpm) |
| **Reactive Zone 3** | | | | | | | | | | | | | |
| | RZ-3CC | --- | NA | --- | NA | 1600 | 24.20 | --- | NA | --- | NA | 1600 | 21.40 |
| | RZ-3DD | --- | NA | --- | NA | 1600 | 25.40 | --- | NA | --- | NA | 1600 | 21.10 |
| | RZ-3GG | --- | NA | --- | NA | 1600 | 21.10 | --- | NA | --- | NA | 1600 | 18.60 |
| | RZ-3HH | --- | NA | --- | NA | 1600 | 20.60 | --- | NA | --- | NA | 1600 | 18.40 |
| | RZ-3II | --- | NA | --- | NA | 1600 | 20.90 | --- | NA | --- | NA | 1600 | 19.70 |
| | RZ-3JJ | --- | NA | --- | NA | 1600 | 16.90 | --- | NA | --- | NA | 1600 | 18.20 |
| | RZ-3KK | --- | NA | --- | NA | 1600 | 16.80 | --- | NA | --- | NA | 1600 | 18.70 |
| | RZ-3RR | --- | NA | --- | NA | 1600 | 14.70 | --- | NA | --- | NA | 1600 | 12.30 |
| | RZ-3SS | --- | NA | --- | NA | 1600 | 10.70 | --- | NA | --- | NA | 800 | 9.60 |
| | RZ-3TT | --- | NA | --- | NA | 800 | 9.90 | --- | NA | --- | NA | 800 | 10.40 |
| | RZ-3UU | --- | NA | --- | NA | 600 | 6.00 | --- | NA | --- | NA | 800 | 7.50 |
| | RZ-3VV | --- | NA | --- | NA | 800 | 9.50 | --- | NA | --- | NA | 1600 | 10.40 |
| **Reactive Zone 4** | | | | | | | | | | | | | |
| | RZ-4A | --- | NA | --- | NA | 3000 | 16.80 | --- | NA | --- | NA | 3000 | 14.50 |
| | RZ-4B | --- | NA | --- | NA | 3000 | 17.60 | --- | NA | --- | NA | 3000 | 15.90 |
| | RZ-4C | --- | NA | --- | NA | 3000 | 15.70 | --- | NA | --- | NA | 3000 | 17.20 |
| | RZ-4D | --- | NA | --- | NA | 3000 | 20.30 | --- | NA | --- | NA | 3000 | 20.90 |
| | RZ-4E | --- | NA | --- | NA | 3000 | 21.00 | --- | NA | --- | NA | 3000 | 26.10 |
| | RZ-4F | --- | NA | --- | NA | 3000 | 16.00 | --- | NA | --- | NA | 3000 | 17.80 |
| | RZ-4G | --- | NA | --- | NA | 3000 | 20.30 | --- | NA | --- | NA | 3000 | 21.70 |
| | RZ-4H | --- | NA | --- | NA | 3000 | 21.60 | --- | NA | --- | NA | 3000 | 21.50 |
| Site-Wide Total | | NA | NA | NA | NA | 98,300 | NA | NA | NA | NA | NA | 99,200 | NA |

**Table 2**
**Carbon Source Solution Introduction Volumes for 2015**
**RACER Trust**
**Moraine, Ohio**

Notes:
Carbon source introduced into each well is a 50:1 solution (potable water to molasses).
gpm - gallons per minute.
gal - gallons.
NA - Not Applicable.
--- Introduction well was not selected for introduction during this event.
(1) No injection event scheduled.
(2) No injection event scheduled.
(3) Injection Event #160 was completed on March 9th -13th, March 16th, March 18th, March 23rd - 27th, March 30th - 31st, April 1st, and April 4th, 2015.
(4) No injection event scheduled.
(5) No injection event scheduled.
(6) Injection Event #161 was completed on May 13th - 14th, May 18th - 19th, May 21st, May 26th - 27th, June 2nd, June 4th - 5th, June 8th - 11th, and June 15th - 16th, 2015.
(7) No injection event scheduled.
(8) No injection event scheduled.
(9)Injection Event #162 was completed on August 18th - 21st, August 27th - 28th, August 31st, September 8th, September 10th, September 14th - 18th, and September 21st - 25th, 2015.
(10) No injection event scheduled.
(11) No injection event scheduled.
(12) Injection Event #163 was completed on October 7th-8th, October 26th, November 1st, November 16th-20th, November 23rd-24th, November 30th-December 1st, December 15th-18th, December 22nd-23rd, and December 28th-31st 2015.

**Table 3**
**Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in 2015**
**RACER Trust**
**Moraine, Ohio**

| | Units | MCL[1] | Upgradient W-1-N 11/4/2015 Upper Aquifer | Source Areas | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | GM-23 12/8/2015 Upper Aquifer | GM-46 11/3/2015 Upper Aquifer | GM-59 12/8/2015 Upper Aquifer | GM-60 11/5/2015 Upper Aquifer | GM-67S 11/4/2015 Upper Aquifer | GM-71 11/3/2015 Upper Aquifer | GM-72 11/3/2015 Upper Aquifer | GM-75S 12/11/2015 Upper Aquifer | GM-76S 10/30/2015 Upper Aquifer | RMW-89 1/15/2016 Upper Aquifer | RMW-90 1/15/2016 Upper Aquifer |
| **Site-Specific Volatile Organic Compounds** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | 0.48 J | < 4.0 U | < 1.0 U | 0.51 J | < 1.0 U | 0.58 J | < 1.0 U | 0.99 J | 7.1 |
| 1,1-Dichloroethane | ug/L | | 4.2 | 15 | < 1.0 U | < 1.0 U | < 4.0 U | 2.1 | 0.35 J | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | 8.7 |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | 0.47 J | < 1.0 U | < 1.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | 0.49 J |
| Benzene | ug/L | 5 | < 1.0 U | 0.69 J | < 1.0 U | < 1.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | < 1.0 |
| cis-1,2-Dichloroethene | ug/L | 70 | 0.32 J | **100** | 0.41 J | 2.4 | 16 | 2.3 | 0.46 J | < 1.0 U | < 1.3 U | < 1.0 U | 2 | 38 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | < 1.0 |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | 0.58 J | 0.47 J | **270** | **770** | 1.6 | **19** | 2.2 | **420** | 1.1 | **46** | 0.86 J |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | < 1.0 |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | 13 | < 1.0 U | 0.34 J | < 4.0 U | 0.34 J | < 1.0 U | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | 1 |
| Trichloroethene | ug/L | 5 | 0.25 J | 5.0 | 0.30 J | **97** | **910** | **130** | **20** | < 1.0 U | **68** | 0.64 J | **22** | **29** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | **120** | < 1.0 U | < 1.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U | < 1.0 U | < 1.0 | 1 |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 8.0 U | < 2.0 UJ | < 2.0 U | < 2.0 U | < 2.5 U | < 2.0 U | < 2.0 | < 2.0 |
| Total Site-Specific VOCs | ug/L | | 4.8 | 254.7 | 1.2 | 370.2 | 1696.0 | 136.3 | 40.3 | 2.2 | 488.6 | 1.7 | 71.0 | 86.2 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
All QA/QC results for 2015 data are shown in Appendix C.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
J - Value is estimated.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high.
Actual concentration is expect lower.
U - Constituent not detected above laboratory reporting limit shown.

**Table 3**
**Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in 2015**
**RACER Trust**
**Moraine, Ohio**

| | Units | MCL[1] | Downgradient Reactive Zone Performance Wells | | | | | | | | Closed North Settling Lagoon Monitoring Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | GM-28R 12/28/2015 Upper Aquifer | GM-29 12/8/2015 Upper Aquifer | GM-30 12/11/2015 Upper Aquifer | HR-3 11/4/2015 Upper Aquifer | GM-21 12/11/2015 Upper Aquifer | GM-6 12/8/2015 Upper Aquifer | GM-8 12/8/2015 Upper Aquifer | GM-19S 12/8/2015 Upper Aquifer | HR-4 10/30/2015 Upper Aquifer | W-2-N 10/30/2015 Upper Aquifer | W-3-N 11/4/2015 Upper Aquifer | W-4-N 11/4/2015 Upper Aquifer |
| **Site-Specific Volatile Organic Compounds** | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | 9.9 | < 2.0 U | 7.3 | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 0.55 J | 10 | 3.0 | 9.6 | 12 | < 1.0 U | 0.43 J | 3.1 | 1.6 | < 1.0 U | < 1.0 U | 4.2 |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | 1.2 J | < 2.0 U | 0.68 J | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.7 U | 2.9 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 5.6 | **440** | < 2.0 U | **82** | 22 | 0.26 J | 0.31 J | 37 | 0.32 J | 1.4 | 29 | 7 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.7 U | 260 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | **49** | **11** | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.7 U | 0.87 J | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 0.38 J | 15 | < 2.0 U | 2.6 | 1.6 J | < 1.0 U | < 1.0 U | 0.66 J | < 1.0 U | < 1.0 U | 0.42 J | 0.51 J |
| Trichloroethene | ug/L | 5 | **24** | **270** | < 2.0 U | **200** | **16** | < 1.0 U | < 1.0 U | 1.3 | 0.33 J | 0.25 J | < 1.0 U | **12** |
| Vinyl chloride | ug/L | 2 | 0.99 J | **48** | < 2.0 U | **13** | **8.9** | < 1.0 U | 0.53 J | **6.4** | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 3.3 U | 14 | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 80.5 | 805.1 | 280.8 | 312.6 | 60.5 | 0.3 | 1.3 | 48.5 | 3.5 | 1.65 | 30.7 | 23.7 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
All QA/QC results for 2015 data are shown in Appendix C.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
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J - Value is estimated.
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Actual concentration is expect lower.
U - Constituent not detected above laboratory reporting limit shown.

**Table 3**
**Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in 2015**
**RACER Trust**
**Moraine, Ohio**

| | Units | MCL[1] | Closed South Settling Lagoon Monitoring Results | | | | | Downgradient On-Site | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HR-16 11/5/2015 Upper Aquifer | HR-17 11/4/2015 Upper Aquifer | W-2-S 11/5/2015 Upper Aquifer | W-3-S 11/4/2015 Upper Aquifer | W-4-S 11/4/2015 Upper Aquifer | HR-1 11/5/2015 Upper Aquifer | GM-43 11/5/2015 Upper Aquifer | GM-44 11/5/2015 Upper Aquifer | GM-45 11/4/2015 Upper Aquifer | GM-66 12/8/2015 Upper Aquifer | GM-31 12/8/2015 Upper Aquifer | GM-35 11/4/2015 Upper Aquifer | HR-2 10/30/2015 Upper Aquifer | HR-7 11/5/2015 Upper Aquifer |
| **Site-Specific Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | 1.9 J | 1.2 | 1.4 | 1.5 | 6.5 | < 1.0 U | 2.9 | 4 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 1.3 | 0.61 J | 0.63 J | 0.41 J | 2.3 | 0.51 J | 0.63 J | 0.94 J | 3.3 | 12 | 2.5 | 34 | 8.3 | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | 3.7 | < 1.0 U | < 1.0 UF2J |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.52 J | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 1 | 1.7 | 1.1 | 2.6 | 9.7 | 6.6 | 14 | 18 | 36 | **280** | 48 | **300** | 2.1 | 1.4 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | **150** | 0.36 J | **65** | **74** | **76** | **42** | **110** | **190** | < 1.0 U | < 1.0 U | **47** | < 1.0 U | < 1.0 U |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 0.63 J | 0.73 J | 0.47 J | 0.31 J | 1.4 J | 0.43 J | 0.89 J | 0.81 J | 2.7 | 11 | 1.5 | 19 | 0.30 J | < 1.0 U |
| Trichloroethene | ug/L | 5 | 2.7 | **160** | **23** | **97** | **72** | **210** | **270** | **180** | **180** | **110** | **75** | **200** | < 1.0 U | **6.9** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.50 J | **3.0** | 0.64 J | **14** | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 5.6 | 314.5 | 25.6 | 165.3 | 161.3 | 294.7 | 328.9 | 311.3 | 419.0 | 418.5 | 130.5 | 622.2 | 10.7 | 8.3 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
All QA/QC results for 2015 data are shown in Appendix C.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
J - Value is estimated.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high.
Actual concentration is expect lower.
U - Constituent not detected above laboratory reporting limit shown.

**Table 3**
**Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in 2015**
**RACER Trust**
**Moraine, Ohio**

| | Units | MCL[1] | Property Boundary | | Off-Site Downgradient of the Site | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | GM-2 12/8/2015 Upper Aquifer | TW-2 11/4/2015 Upper Aquifer | GM-10 11/3/2015 Upper Aquifer | GM-16 11/4/2015 Upper Aquifer | GM-47 11/4/2015 Upper Aquifer | GM-50 11/4/2015 Upper Aquifer | GM-51 10/30/2015 Upper Aquifer | GM-52 10/30/2015 Upper Aquifer | GM-62R 11/3/2015 Upper Aquifer | GM-63 11/4/2015 Upper Aquifer | GM-55 11/3/2015 Upper Aquifer | GM-65S 11/5/2015 Upper Aquifer | WSU-24 11/3/2015 Upper Aquifer | GM-78 11/3/2015 Upper Aquifer | GM-79 11/4/2015 Upper Aquifer | GM-80 11/4/2015 Upper Aquifer | GM-26 10/30/2015 Upper Aquifer |
| **Site-Specific Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | 2.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.71 J | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 0.40 J | 0.31 J | < 1.0 U | 1.5 | 4.9 | 4.0 | 2.8 | < 2.0 U | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | 0.96 J | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 3.2 | 0.27 J | < 1.0 U | 12 | 46 | 5.6 | 6.5 | < 2.0 U | < 1.0 U | 3.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 7.4 | 2.9 | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | 3.6 | < 1.0 U | 0.85 J | **35** | **49** | **26** | **63** | **32** | **13** | **46** | 2.5 | 3.8 | **8.4** | **7.1** | 0.97 J | **18** | 1.1 |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U | < 1.0 U | 0.34 J | 2.3 | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | **6.7** | < 1.0 U | 2.2 | **8.3** | **8.3** | 4.0 | **16** | **5.8** | < 1.0 U | **19** | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | **31** | **15** | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | 0.29 J | < 1.0 U | **10** | < 1.7 U | 1.7 | < 2.0 U | < 2.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 3.3 U | < 2.0 U | < 4.0 U | < 4.0 U | < 2.0 U | < 3.3 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.9 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 13.9 | 0.9 | 3.1 | 67.1 | 110.5 | 41.3 | 88.3 | 37.8 | 13.0 | 72.5 | 2.5 | 3.8 | 9.7 | 7.1 | 42.3 | 36.9 | 1.1 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
All QA/QC results for 2015 data are shown in Appendix C.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
J - Value is estimated.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high.
Actual concentration is expect lower.
U - Constituent not detected above laboratory reporting limit shown.

**Table 3**
**Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in 2015**
**RACER Trust**
**Moraine, Ohio**

| | Units | MCL[1] | Upgradient Contributions | | | On-Site Groundwater Quality | | | | | Lower Aquifer Groundwater Quality | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | RMW-88 10/30/2015 Lower Aquifer | HR-12 12/8/2015 Lower Aquifer | GM-76D 10/30/2015 Lower Aquifer | GM-54 11/3/2015 Lower Aquifer | GM-67D 11/4/2015 Lower Aquifer | GM-68D 11/3/2015 Lower Aquifer | GM-75D 12/8/2015 Lower Aquifer | RMW-85 12/8/2015 Lower Aquifer | HR-15 11/4/2015 Lower Aquifer | GM-19D 11/4/2015 Lower Aquifer | RMW-86 12/8/2015 Lower Aquifer | RMW-87 11/5/2015 Lower Aquifer | GM-15 11/4/2015 Lower Aquifer | GM-20D 11/3/2015 Lower Aquifer |
| **Site-Specific Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 2.0 U | < 1.0 U | < 2.0 U | < 2.0 U | 2.5 | 1.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | 6.1 | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 27 | 2.4 | < 2.0 U | < 2.0 U | 6.8 | < 1.0 U | < 1.0 U | 0.41 J | < 1.0 U | 3 | 11 | 7.8 | 1.8 | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 2.0 U | < 1.0 U | < 2.0 U | < 2.0 U | 1.8 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 2.0 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 61 | 1.5 | < 2.0 U | < 2.0 U | **140 F1K** | < 1.0 U | 22 | 18 | 3.5 | 39 | 37 | 58 | 7.7 | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 2.0 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 2.0 U | < 1.0 U | **49** | **62** | 1.7 | **30** | **140** | **49** | < 1.0 U | **11** | **40** | < 1.0 U | < 1.0 U | 2.5 |
| Toluene | ug/L | 1000 | < 2.0 U | < 1.0 U | < 2.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 3.2 | < 1.0 U | < 2.0 U | < 2.0 U | 4.6 | < 1.0 U | 0.38 J | < 1.0 U | < 1.0 U | 1.0 J | 1.3 | 2.1 | 0.77 J | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 2.0 U | < 1.0 U | **6.9** | 1.3 J | **76** | 2.2 | **150** | **82** | 1.5 | **69** | **110** | **10** | **6.6** | 1.6 |
| Vinyl chloride | ug/L | 2 | 1.5 J | 0.31 J | < 2.0 U | < 2.0 U | 0.70 J | < 1.0 U | 0.37 J | 0.31 J | 0.78 J | 1.0 J | 0.45 J | 0.42 J | 0.47 J | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 4.0 U | < 2.0 U | < 4.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 92.7 | 4.2 | 55.9 | 63.3 | 234.1 | 33.3 | 312.8 | 149.7 | 5.8 | 124.0 | 207.5 | 78.3 | 17.3 | 4.1 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
All QA/QC results for 2015 data are shown in Appendix C.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
J - Value is estimated.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high.
Actual concentration is expect lower.
U - Constituent not detected above laboratory reporting limit shown.

**Table 3**
**Summary of Groundwater VOC Analytical Results from Upper/Lower Aquifer Monitoring Wells in 2015**
**RACER Trust**
**Moraine, Ohio**

| | Units | MCL[1] | Downgradient Groundwater Quality | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | GM-9 12/11/2015 Lower Aquifer | DN-13 11/5/2015 Lower Aquifer | GM-83D 10/30/2015 Lower Aquifer | GM-84 10/30/2015 Lower Aquifer | GM-77D 11/3/2015 Lower Aquifer | GM-11 11/3/2015 Lower Aquifer |
| **Site-Specific Volatile Organic Compounds** | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 0.92 J | 0.81 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 0.26 J | 5.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | 2.5 | < 1.0 U | < 1.0 U | **18** | 0.89 J |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | 0.42 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | **12** | **9.0** | < 1.0 U | 5.0 | < 1.0 U | **13** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | 0.70 J | 2.0 | < 1.0 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 13.2 | 20.2 | 2.0 | 5.0 | 18.0 | 13.9 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
All QA/QC results for 2015 data are shown in Appendix C.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
J - Value is estimated.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high.
Actual concentration is expect lower.
U - Constituent not detected above laboratory reporting limit shown.

**Table 4**
**DN-13 Monthly Monitoring for 2015**
**RACER Trust**
**Moraine, Ohio**

| Volatile Organic Compound[1] | Units | 1/12/2015 | 2/3/2015 | 3/16/2015 | 4/14/2015 | 5/8/2015 | 6/4/2015 | 7/7/2015 | 8/27/2015 | 9/2/2015 | 10/6/2015 | 11/16/2015 | 12/7/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ug/L | < 5.0 U | < 5.0 U | < 5.0 U | 1.1 | < 1.0 U | 0.61 J | 0.50 J | 0.53 J | 0.67 J | 0.56 J | 0.55 J | < 1.0 U |
| 1,1-Dichloroethane | ug/L | 1.5 J | 1.3 J | 1.7 J | 1.7 | 1.2 | 1.2 | 1.1 | 1.0 | 1.1 | 0.98 J | 0.99 J | 0.89 J |
| Benzene | ug/L | < 5.0 U | < 5.0 U | < 5.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Chloroethane | ug/L | < 10 U | < 10 U | < 10 U | < 1.0 U | < 1.0 U | < 1.0 U | <1.0 U | < 1.0 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 5.7 | 6.0 | 7.0 | 6.4 | 5.0 | 4.8 | 4.5 | 4.2 | 4.5 | 4.4 | 3.8 | 3.6 |
| Ethylbenzene | ug/L | < 5.0 U | < 5.0 U | < 5.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 3.2 J | 2.4 J | 3.6 J | 3.5 | 1.9 | 2.1 | 1.6 | 1.4 | 1.4 | 1.6 | 1.1 | 0.85 J |
| Toluene | ug/L | < 5.0 U | < 5.0 U | < 5.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 8.5 | 7.6 | 9.5 | 10 | 6.5 | 7.0 | 5.9 | 5.9 | 6.3 | 5.8 | 5.4 | 6.1 |
| Vinyl chloride | ug/L | < 10 U | < 10 U | < 10 U | 1.3 | 0.36 J | 0.49 J | 0.42 J | 0.39 J | < 1.0 U | 0.29 J | 0.33 J | 0.32 J |
| Xylene (total) | ug/L | < 5.0 U | < 5.0 U | < 5.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| **Total VOCs** | **ug/L** | **18.9** | **17.3** | **21.8** | **24.0** | **15.0** | **16.2** | **14.0** | **13.4** | **14.0** | **13.6** | **12.2** | **11.8** |

1 - Analytical method for volatile organic compounds (VOC) analysis is Method 624.
All concentrations in micrograms per liter (ug/L) as reported by the laboratory.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
J - Estimated result less than reporting limit.

**Table 5**
**Monitoring Well Construction Details**
**RACER Trust**
**Moraine, Ohio**

| Well | Surface Elevation ft msl | TOC Elevation ft msl | Well Diameter inches | Screened Interval ft bls | Screened Interval ft bls | Screened Interval ft msl | Screened Interval ft msl | Borehole Depth ft bls | State Plane Coordinates Northing, y | State Plane Coordinates Easting, x | Geologic Modifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upper Aquifer Wells** | | | | | | | | | | | |
| W-1-N | 737.61 | 739.02 | 4 | 35 | 70 | 702.61 | 667.61 | 70 | 625116.2043 | 1483946.9943 | UA:TT |
| W-2-N | 729.68 | 731.68 | 4 | 35 | 60 | 694.68 | 669.68 | 60 | 623865.9104 | 1483351.6742 | UA |
| W-3-N | 731.98 | 733.66 | 4 | 32 | 57 | 699.98 | 674.98 | 57 | 623695.8796 | 1483607.3111 | UA |
| W-4-N | 729.88 | 731.63 | 4 | 40 | 65 | 689.88 | 664.88 | 65 | 623651.9134 | 1483795.0108 | UA:TT |
| HR-1 | 730.10 | 732.71 | 2 | 47 | 57 | 683.10 | 673.10 | 57 | 621967.7490 | 1483378.1275 | UA:TT |
| HR-2 | 732.62 | 734.75 | 2 | 47 | 57 | 685.62 | 675.62 | 58 | 623649.3090 | 1484030.9226 | UA:TT |
| HR-3 | 734.31 | 736.75 | 2 | 50 | 60 | 684.31 | 674.31 | 61 | 623612.1403 | 1484238.0984 | UA:TT |
| HR-4 | 740.61 | 742.60 | 2 | 55 | 65 | 685.61 | 675.61 | 67 | 624582.0074 | 1484003.5860 | UA:TT |
| HR-5 | 730.95 | 734.27 | 2 | 44 | 54 | 686.95 | 676.95 | 59 | 623354.8172 | 1483478.6541 | UA:TT |
| HR-6 | 730.18 | 732.66 | 2 | 43 | 53 | 687.18 | 677.18 | 59 | 622588.6622 | 1483298.8965 | UA:TT |
| HR-7 | 731.00 | 731.73 | 2 | 47 | 57 | 684.00 | 674.00 | 58 | 623373.8266 | 1483168.5266 | UA:TT |
| HR-11 | 740.90 | 743.33 | 2 | 60 | 70 | 680.90 | 670.90 | 75 | 625682.4858 | 1485262.9762 | UA |
| HR-16 | 724.60 | 727.01 | 4 | 42 | 62 | 682.60 | 662.60 | 70 | 621167.6648 | 1482171.8435 | UA:TT |
| HR-17 | 725.40 | 726.43 | 4 | 27 | 47 | 698.40 | 678.40 | 56 | 621128.4488 | 1482780.5158 | UA:TT |
| W-1-S | 728.23 | 729.29 | 4 | 25 | 60 | 703.23 | 668.23 | 60 | 621396.0291 | 1482990.4046 | UA:TT |
| W-2-S | 725.01 | 726.64 | 4 | 30 | 65 | 695.01 | 660.01 | 65 | 620618.7813 | 1482078.7622 | UA:TT |
| W-3-S[1] | 727.17 | 729.17 | 4 | 36 | 76 | 691.17 | 651.17 | 76 | 620466.6686 | 1482207.4451 | UA |
| W-4-S | 726.66 | 727.92 | 4 | 30 | 70 | 696.66 | 656.66 | 70 | 620394.9579 | 1482564.2035 | UA |
| GM-2[2] | NM | 735.81 | 2 | 45 | 55 | 688.00 | 678.00 | 55 | 619586.2208 | 1483427.9998 | UA |
| 4S[2] | NM | 731.36 | 4 | 30 | 65 | 699.00 | 664.00 | 65 | 619578.3226 | 1483129.6378 | UA |
| GM-6[2] | NM | 730.27 | 2 | 35 | 45 | 696.00 | 686.00 | 45 | 619627.6172 | 1482930.9571 | UA:TT |
| GM-8 | 735.17 | 735.17 | 2 | 40 | 50 | 695.17 | 685.17 | 50 | 619866.4552 | 1482965.5535 | UA:TT |
| GM-10[2] | NM | 723.90 | 2 | 40 | 50 | 681.00 | 671.00 | 50 | 618762.6410 | 1482667.7306 | UA:TT |
| GM-16[2] | NM | 725.30 | 2 | 48 | 58 | 678.00 | 668.00 | 58 | 619420.5576 | 1482149.1466 | UA |
| GM-17[2] | NM | 723.84 | 2 | 40 | 50 | 684.00 | 674.00 | 50 | 619311.8761 | 1482697.0210 | UA:TT |
| GM-18[2] | NM | 723.80 | 2 | 45 | 55 | 679.00 | 669.00 | 55 | 619229.5883 | 1482505.4542 | UA |
| GM-19S[2] | NM | 730.92 | 2 | 47 | 57 | 691.00 | 681.00 | 57 | 620339.5683 | 1483017.2551 | UA:TT |
| GM-21 | 725.36 | 725.00 | 2 | 45 | 55 | 680.36 | 670.36 | 55 | 619920.5937 | 1483764.5951 | UA:TT |
| GM-22 | 731.84 | 731.63 | 2 | 44 | 54 | 687.84 | 677.84 | 54 | 620840.4209 | 1484226.5683 | UA:TT |
| GM-23[2] | NM | 731.07 | 2 | 24 | 34 | 674.00 | 664.00 | 34 | 623699.2336 | 1484619.9213 | UA:TUT |
| GM-24 | 747.61 | 747.29 | 2 | 58 | 68 | 689.61 | 679.61 | 70 | 625945.0802 | 1486991.6971 | UA |
| GM-25 | 747.05 | 746.17 | 2 | 48 | 58 | 699.05 | 689.05 | 58 | 622786.2705 | 1486599.6865 | UA:TT |

**Table 5**
**Monitoring Well Construction Details**
**RACER Trust**
**Moraine, Ohio**

| Well | Surface Elevation ft msl | TOC Elevation ft msl | Well Diameter inches | Screened Interval ft bls | | Screened Interval ft msl | | Borehole Depth ft bls | State Plane Coordinates Northing, y | State Plane Coordinates Easting, x | Geologic Modifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upper Aquifer Wells** | | | | | | | | | | | |
| GM-26 | 722.29 | 722.29 | 2 | 50 | 60 | 672.29 | 662.29 | 60 | 617729.9788 | 1482129.0695 | UA |
| GM-27 | 731.03 | 730.57 | 2 | 40 | 50 | 691.03 | 681.03 | 58 | 623696.6136 | 1484630.7659 | UA:TT |
| GM-28[(2)(3)] | NM | 736.46 | 2 | 22 | 32 | 715.00 | 705.00 | 32 | 623392.3799 | 1484436.8617 | UA:TUT |
| GM-28R | 731.87 | 731.28 | 2 | 20 | 30 | 711.87 | 701.87 | 30.5 | 623340.7680 | 1484507.2070 | UA |
| GM-29 | 731.31 | 731.37 | 2 | 28 | 38 | 703.31 | 693.31 | 38 | 623534.4471 | 1484535.0727 | UA:TUT |
| GM-30[(2)(4)] | NM | 734.79 | 2 | 28 | 38 | 707.00 | 697.00 | 38 | 623876.3465 | 1484609.5933 | UA:TUT |
| GM-31[(4)] | 732.05 | 732.13 | 2 | 51 | 61 | 681.05 | 671.05 | 62 | 621336.9337 | 1483965.1322 | UA:TT |
| GM-32 | 732.47 | 732.08 | 2 | 51 | 61 | 681.47 | 671.47 | 51 | 620114.2493 | 1483379.9656 | UA:TT |
| GM-33 | 730.30 | 729.77 | 2 | 48 | 58 | 682.30 | 672.30 | 58 | 620761.9955 | 1483714.2282 | UA:TT |
| GM-34 | 731.06 | 730.56 | 2 | 26 | 36 | 705.06 | 695.06 | 36 | 620753.8480 | 1483727.5719 | UA:WT |
| GM-35 | 731.56 | 731.27 | 2 | 57 | 67 | 674.56 | 664.56 | 70 | 620389.3810 | 1483279.5201 | UA:TT |
| GM-36 | 731.44 | 731.11 | 2 | 25 | 35 | 706.44 | 696.44 | 35 | 620383.2312 | 1483300.8386 | UA:WT |
| GM-37 | 730.36 | 730.05 | 2 | 46 | 56 | 684.36 | 674.36 | 56 | 620407.3595 | 1483456.0282 | UA:TT |
| GM-38 | 730.31 | 729.88 | 2 | 24 | 34 | 706.31 | 696.31 | 34 | 620403.1387 | 1483471.6479 | UA:WT |
| GM-43 | 729.41 | 729.00 | 2 | 40 | 50 | 689.41 | 679.41 | 54 | 622192.2046 | 1483441.3723 | UA:TT |
| GM-44 | 729.30 | 728.77 | 2 | 51 | 61 | 678.30 | 668.30 | 62 | 621686.3425 | 1483331.5124 | UA:TT |
| GM-45 | 730.03 | 729.75 | 2 | 50 | 60 | 680.03 | 670.03 | 60 | 621409.1769 | 1483266.9285 | UA:TT |
| GM-46 | 728.13 | 727.79 | 2 | 19.8 | 29.8 | 708.33 | 698.33 | 29.8 | 623393.7601 | 1484777.0271 | UA:TUT |
| GM-47 | 727.03 | 726.75 | 2 | 49.4 | 59.4 | 677.63 | 667.63 | 59.4 | 620060.6143 | 1482479.3608 | UA:TT |
| GM-48 | 728.98 | 728.67 | 2 | 63.2 | 73.2 | 665.78 | 655.78 | 73.2 | 619488.4287 | 1481740.8154 | UA:TT |
| GM-49 | 728.28 | 727.88 | 2 | 66.9 | 76.9 | 661.38 | 651.38 | 76.9 | 618643.7266 | 1481742.8231 | UA:TT |
| GM-50 | 727.03 | 726.56 | 2 | 29.7 | 39.7 | 697.33 | 687.33 | 39.7 | 620065.0482 | 1482445.8840 | UA:WT |
| GM-51 | 728.82 | 728.30 | 2 | 34.3 | 44.3 | 694.52 | 684.52 | 44.3 | 619465.2399 | 1481753.1472 | UA:WT |
| GM-52 | 728.16 | 727.62 | 2 | 34 | 44 | 694.16 | 684.16 | 44 | 618604.5296 | 1481740.7235 | UA:WT |
| GM-53 | 730.53 | 730.35 | 2 | 23 | 33 | 707.53 | 697.53 | 33 | 621184.8324 | 1484855.6876 | UA:TT |
| GM-55 | 719.90 | 719.86 | 2 | 25 | 35 | 694.90 | 684.90 | 35 | 618008.2839 | 1482441.5719 | UA:WT |
| GM-57[(5)] | 719.41 | 721.40 | 2 | 25 | 35 | 694.41 | 684.41 | 35 | 617724.0851 | 1482132.1351 | UA:WT |
| GM-59 | 732.46 | 732.25 | 2 | 25 | 35 | 707.46 | 697.46 | 35 | 622761.5281 | 1484712.7729 | UA:WT |
| GM-60 | 732.46 | 732.24 | 2 | 42 | 52 | 690.46 | 680.46 | 52 | 622761.3002 | 1484712.7809 | UA:TT |
| GM-62[(6)] | 722.17 | 722.11 | 2 | 50 | 60 | 672.17 | 662.17 | 60 | 618397.3774 | 1482818.1330 | UA |
| GM-62R | 723.15 | 723.51 | 2 | 50 | 60 | NA | NA | 60 | 618423.9410 | 1482812.6470 | UA |
| GM-63 | 726.21 | 725.79 | 2 | 30 | 40 | 696.21 | 686.21 | 40 | 620283.7218 | 1482686.3290 | UA:WT |
| GM-64 | 726.38 | 725.95 | 2 | 50 | 60 | 676.38 | 666.38 | 60 | 620284.6106 | 1482681.2885 | UA:TT |
| GM-65S | 723.94 | 723.58 | 2 | 42 | 52 | 681.94 | 671.94 | 52 | 617392.2259 | 1481382.4271 | UA |
| GM-66 | 733.50 | 733.22 | 2 | 45 | 55 | 688.50 | 678.50 | 57 | 622780.3860 | 1484091.5572 | UA:TT |
| GM-67S | 732.54 | 732.06 | 2 | 44 | 54 | 688.54 | 678.54 | 54 | 623050.0533 | 1484547.2174 | UA:TT |
| GM-68S | 732.48 | 732.18 | 2 | 39.5 | 49.5 | 692.98 | 682.98 | 49.5 | 622326.2125 | 1484652.8528 | UA:TT |
| GM-71 | 737.19 | 736.82 | 2 | 21 | 31 | 716.19 | 706.19 | 37 | 622633.7567 | 1485222.9070 | UA:TUT |

**Table 5**
**Monitoring Well Construction Details**
**RACER Trust**
**Moraine, Ohio**

ARCADIS Design & Consultancy for natural and built assets

| Well | Surface Elevation ft msl | TOC Elevation ft msl | Well Diameter inches | Screened Interval ft bls | Screened Interval ft bls | Screened Interval ft msl | Screened Interval ft msl | Borehole Depth ft bls | State Plane Coordinates Northing, y | State Plane Coordinates Easting, x | Geologic Modifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upper Aquifer Wells** | | | | | | | | | | | |
| GM-72 | 737.05 | 736.78 | 2 | 52 | 62 | 685.05 | 675.05 | 67 | 622633.7567 | 1485233.9320 | UA:TT |
| GM-74S | 732.52 | 732.17 | 2 | 40 | 50 | 692.52 | 682.52 | 50 | 622444.5430 | 1484733.8601 | UA:TT |
| GM-75S | 738.26 | 737.69 | 2 | 42 | 52 | 696.26 | 686.26 | 52 | 622790.6745 | 1485039.3503 | UA:TT |
| GM-76S | 739.49 | 739.00 | 2 | 27 | 37 | 712.49 | 702.49 | 37 | 623538.7809 | 1485313.4176 | UA:TT |
| GM-77S | 741.49 | 741.14 | 2 | 33 | 43 | 708.49 | 698.49 | 43 | 621576.9342 | 1485892.0315 | UA:TT |
| GM-78 | 721.58 | 721.18 | 2 | 40 | 50 | 681.58 | 671.58 | 70 | 618257.5787 | 1483035.5947 | UA |
| GM-79 | 718.54 | 717.91 | 2 | 45 | 55 | 673.54 | 663.54 | 60 | 618970.9862 | 1481045.8893 | UA:TT |
| GM-80 | 716.23 | 715.82 | 2 | 15 | 25 | 701.23 | 691.23 | 25 | 617951.2997 | 1480939.3277 | UA:WT |
| GM-81 | 715.80 | 715.31 | 2 | 50 | 60 | 665.80 | 655.80 | 90 | 617934.8895 | 1480934.7439 | UA |
| GM-83S | 726.44 | 725.84 | 2 | 44 | 54 | 682.44 | 672.44 | 54 | 622568.7465 | 1482112.9569 | UA:TT |
| RMW-89 | 738.87 | 738.56 | 2 | 40.7 | 50.7 | 698.17 | 688.17 | 65 | 623394.9330 | 1484777.0130 | UA |
| RMW-90 | 727.45 | 727.05 | 2 | 43.5 | 53.5 | 683.95 | 673.95 | 100 | 623067.3300 | 1485313.5590 | UA |
| EAST | NM | 730.98 | 2 | NA | NA | NA | NA | 71 | 620545.6947 | 1483674.2190 | UA:TT |
| WEST | NM | 731.08 | 2 | NA | NA | NA | NA | 52 | 620509.6228 | 1483299.0985 | UA:TT |
| WSU-17 | 726.93 | 726.18 | 2 | 11.69 | 66.9 | 715.24 | 659.28 | 67 | 619558.2279 | 1482898.5384 | UA:TT |
| WSU-18 | 734.18 | 733.52 | 2 | 29.2 | 69.2 | 704.98 | 664.32 | 69 | 619554.9290 | 1483096.6469 | UA:TT |
| WSU-19 | 727.28 | 726.62 | 2 | 33.4 | 63.4 | 693.88 | 663.22 | 63 | 619736.8872 | 1482880.3995 | UA:TT |
| WSU-22 | 726.21 | 726.49 | 2 | NA | NA | NA | NA | 52 | 620311.4363 | 1482687.2293 | UA:TT |
| WSU-23 | 724.65 | 724.90 | 2 | NA | NA | NA | NA | 58 | 620381.0854 | 1481978.6336 | UA:TT |
| WSU-24 | 725.10 | 724.82 | 2 | NA | NA | NA | NA | 66 | 619124.1425 | 1483169.1107 | UA:TT |
| TW-2[(2)] | NM | 733.38 | 10 | 35 | 45 | 696.00 | 686.00 | 45 | 619568.4036 | 1482942.6663 | UA:TT |
| ME-2[(4)] | 732.38 | 732.08 | 2 | 27 | 37 | 705.38 | 695.38 | 37 | 621327.2669 | 1484014.6258 | UA:WT |
| ME-3[(4)] | 732.23 | 731.73 | 2 | 29 | 39 | 703.23 | 693.23 | 39 | 621288.3532 | 1483969.5620 | UA:WT |
| ME-4[(4)] | 732.05 | 732.24 | 2 | 26 | 36 | 706.05 | 696.05 | 36 | 621321.4422 | 1483952.3693 | UA:WT |
| ME-6[(4)] | 733.09 | 732.68 | 2 | 29 | 39 | 704.09 | 694.09 | 39 | 621706.9517 | 1484057.0461 | UA:WT |
| MW-1[(7)] | 713.60 | 715.53 | 2 | 61.2 | 71.2 | 652.40 | 642.40 | 71.7 | 621420.6144 | 1480209.1127 | UA:TT |
| MW-4[(7)] | 707.45 | 707.19 | 2 | 19.6 | 39.6 | 687.85 | 667.85 | 40 | 619035.3250 | 1478050.0733 | UA |
| MW-5[(7)] | 709.59 | 709.34 | 2 | 22.5 | 42.5 | 687.09 | 667.09 | 43 | 618787.9839 | 1478971.6197 | UA |
| MW-9[(7)] | 713.16 | 712.85 | 2 | 63 | 73 | 650.16 | 640.16 | 73.5 | 617169.4849 | 1478747.1452 | UA |
| GM-1 | NM | 735.74 | 2 | 90 | 100 | NA | NA | 100 | 619570.7118 | 1483421.8130 | LA |
| GM-3 | NM | 730.44 | 2 | 90 | 100 | NA | NA | 100 | 619621.9727 | 1482926.3542 | LA |
| GM-4 | NM | 731.46 | 2 | 140 | 150 | NA | NA | 150 | 619602.7099 | 1482922.7333 | LA |
| GM-5 | NM | 731.29 | 2 | 90 | 100 | NA | NA | 100 | 619588.6213 | 1483126.6107 | LA |
| GM-7R | NM | 735.61 | 2 | 80 | 90 | NA | NA | 91 | 619863.8298 | 1482962.1340 | LA |
| GM-9 | NM | 724.07 | 2 | 90 | 100 | NA | NA | 100 | 618771.8670 | 1482674.1902 | LA |
| GM-11 | NM | 723.71 | 2 | 90 | 100 | NA | NA | 100 | 619318.6270 | 1482694.0524 | LA |

**Table 5**
**Monitoring Well Construction Details**
**RACER Trust**
**Moraine, Ohio**

ARCADIS Design & Consultancy for natural and built assets

| Well | Surface Elevation ft msl | TOC Elevation ft msl | Well Diameter inches | Screened Interval ft bls | Screened Interval ft bls | Screened Interval ft msl | Screened Interval ft msl | Borehole Depth ft bls | State Plane Coordinates Northing, y | State Plane Coordinates Easting, x | Geologic Modifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lower Aquifer Wells** | | | | | | | | | | | |
| GM-13 | NM | 723.82 | 2 | 90 | 100 | NA | NA | 100 | 619239.1943 | 1482501.6168 | LA |
| GM-14 | NM | 723.50 | 2 | 140 | 150 | NA | NA | 150 | 619244.0886 | 1482515.5184 | LA |
| GM-15 | NM | 725.23 | 2 | 90 | 100 | NA | NA | 100 | 619427.7004 | 1482156.5128 | LA |
| GM-19D | NM | 730.73 | 4 | 145 | 150 | NA | NA | 150 | 620339.8625 | 1483063.5273 | LA |
| GM-20D | NM | 727.26 | 4 | 87 | 92 | NA | NA | 92 | 619177.7271 | 1483236.8889 | LA |
| GM-39 | 731.15 | 730.95 | 2 | 106 | 116 | 625.15 | 615.15 | 116 | 623705.5364 | 1484609.0626 | LA |
| GM-40 | 727.28 | 727.04 | 2 | 140 | 150 | 587.28 | 577.28 | 150 | 621693.8055 | 1483084.8121 | LA |
| GM-41 | 731.22 | 733.65 | 2 | 104 | 114 | 627.22 | 617.22 | 114 | 621635.7801 | 1484818.4021 | LA |
| GM-42 | 729.48 | 729.16 | 2 | 140 | 150 | 589.48 | 579.48 | 150 | 620810.1968 | 1483562.5296 | LA |
| GM-54 | 730.51 | 730.29 | 2 | 70 | 80 | 660.51 | 650.51 | 80 | 621182.1891 | 1484848.6752 | LA |
| GM-56 | 719.75 | 719.52 | 2 | 75 | 85 | 644.75 | 634.75 | 85 | 618006.1752 | 1482448.5647 | LA:NTP |
| GM-58 | 735.59 | 735.46 | 2 | 72 | 82 | 663.59 | 653.59 | 82 | 621541.9882 | 1485308.7468 | LA:BT |
| GM-61 | 732.48 | 732.23 | 2 | 70 | 80 | 662.48 | 652.48 | 80 | 622762.6947 | 1484707.4691 | LA:BT |
| GM-65D | 723.83 | 723.54 | 2 | 85 | 95 | 638.83 | 628.83 | 108 | 617389.5183 | 1481380.4746 | LA:NTP |
| GM-67D | 732.64 | 732.19 | 2 | 70 | 80 | 662.64 | 652.64 | 121 | 623053.5624 | 1484533.4779 | LA:BT |
| GM-68D | 732.46 | 732.27 | 2 | 64 | 74 | 668.46 | 658.46 | 150 | 622327.5383 | 1484645.8862 | LA:BT |
| GM-69 | 732.42 | 732.08 | 2 | 90 | 100 | 642.42 | 632.42 | 140 | 621314.8199 | 1484401.6371 | LA |
| GM-70 | 737.47 | 737.19 | 2 | 72 | 82 | 665.47 | 655.47 | 120 | 621944.0370 | 1485505.8829 | LA |
| GM-73 | 737.34 | 736.97 | 2 | 85 | 95 | 652.34 | 642.34 | 120 | 622635.9765 | 1485216.5022 | LA |
| GM-74D | 732.49 | 732.04 | 2 | 69 | 79 | 663.49 | 653.49 | 120 | 622450.0123 | 1484735.6502 | LA:BT |
| GM-75D | 738.13 | 737.68 | 2 | 85 | 95 | 653.13 | 643.13 | 120 | 622793.2406 | 1485027.5873 | LA |
| GM-76D | 739.48 | 738.94 | 2 | 70 | 80 | 669.48 | 659.48 | 120 | 623535.2043 | 1485312.4245 | LA:BT |
| GM-77D | 741.52 | 740.93 | 2 | 75 | 85 | 666.52 | 656.52 | 100 | 621574.4283 | 1485889.3662 | LA:BT |
| GM-82 | 732.55 | 732.14 | 2 | 85 | 95 | 647.55 | 637.55 | 119.5 | 621972.7146 | 1484304.7894 | LA |
| GM-83D | 726.41 | 725.77 | 2 | 110 | 120 | 616.41 | 606.41 | 120 | 622568.1953 | 1482120.4685 | LA |
| GM-84 | 740.44 | 739.92 | 2 | 96.5 | 106.5 | 643.94 | 633.94 | 120 | 620619.4561 | 1485522.1487 | LA:BT |
| RMW-85[8] | 736.28 | 736.65 | 2 | 85 | 95 | 651.28 | 641.28 | 105 | 622914.0083 | 1484978.1674 | LA |
| RMW-86[8] | 728.85 | 729.22 | 2 | 70 | 80 | 658.85 | 648.85 | 105 | 620409.7071 | 1483253.2715 | LA:BT |
| RMW-87[8] | 727.69 | 728.01 | 2 | 67 | 77 | 660.69 | 650.69 | 100 | 621671.6198 | 1483277.4116 | LA:BT |
| RMW-88[8] | 738.57 | 739.11 | 2 | 90 | 100 | 648.57 | 638.57 | 100 | 625051.9881 | 1484580.6683 | LA |

**Table 5**
**Monitoring Well Construction Details**
**RACER Trust**
**Moraine, Ohio**

| Well | Surface Elevation ft msl | TOC Elevation ft msl | Well Diameter inches | Screened Interval ft bls | Screened Interval ft bls | Screened Interval ft msl | Screened Interval ft msl | Borehole Depth ft bls | State Plane Coordinates Northing, y | State Plane Coordinates Easting, x | Geologic Modifiers |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lower Aquifer Wells** | | | | | | | | | | | |
| HR-12 | 741.00 | 742.64 | 4 | 120 | 130 | 621.00 | 611.00 | 130 | 625702.3993 | 1485250.0490 | LA |
| HR-13 | 733.20 | 735.03 | 4 | 75 | 85 | 658.20 | 648.20 | 85 | 623616.8315 | 1484215.3411 | LA:BT |
| HR-14 | 729.90 | 731.63 | 4 | 78 | 88 | 651.90 | 641.90 | 88 | 623675.4267 | 1483782.2839 | LA |
| HR-15 | 732.10 | 733.74 | 4 | 88 | 98 | 644.10 | 634.10 | 98 | 623712.7941 | 1483595.9072 | LA |
| M73C | NM | 716.55 | NA | NA | NA | NA | NA | NA | 618973.2537 | 1482114.3309 | LA |
| MT69[9] | 719.84 | 722.71 | 8 | NA | NA | NA | NA | 158 | 617749.1907 | 1482121.3945 | LA |
| MT576M | 750.00 | 751.46 | 5 | NA | NA | NA | NA | 114 | 622940.2909 | 1487799.4686 | LA |
| MT596M* | 759.18 | 757.73 | 5 | NA | NA | NA | NA | 89 | 624057.1091 | 1488849.1418 | LA |
| DN-13 | 724.09 | 727.54 | 20 | 110 | 170 | 614.09 | 554.09 | 170 | 619196.1959 | 1482267.5426 | LA |
| 11B | 744.50 | 742.56 | NA | NA | NA | NA | NA | 158 | 622501.4801 | 1485799.6814 | LA |
| 12A | 740.86 | 742.39 | 18 | 104 | 144 | 636.86 | 596.86 | 154 | 622804.0361 | 1485951.2100 | LA |
| A | NM | 739.00 | 20 | 155 | 205 | NA | NA | 205 | 624325.4108 | 1484805.7949 | LA |
| 31 | NM | 734.05 | 20 | 90 | 122 | NA | NA | 122 | 623727.4107 | 1485049.2752 | LA |
| 34 | NM | 733.46 | 20 | 107 | 140 | NA | NA | 140 | 622178.4664 | 1485017.7925 | LA |
| 39 | NM | 732.07 | 20 | 117 | 142 | NA | NA | 145 | 623442.4628 | 1484987.5777 | LA |
| 44 | 733.91 | 734.62 | 24 | 128 | 166 | 605.91 | 567.91 | NA | 624519.7322 | 1483988.8824 | LA |
| FW-1A | NM | 739.89 | 24 | 105 | 166 | NA | NA | 169 | 625357.5160 | 1486090.3366 | LA |
| FW-2 | NM | 737.48 | 20 | NA | 150 | NA | NA | 160 | 622516.4369 | 1485616.6642 | LA |
| FW-3 | NM | 739.26 | 20 | NA | 141 | NA | NA | 200 | 622675.0394 | 1484968.9430 | LA |
| FW-4 | NM | 731.62 | 14 | NA | 136 | NA | NA | 160 | 620605.0473 | 1484338.1137 | LA |

TOC - Top of Casing.
ft msl - Feet Above Mean Sea Level.
ft bls - Feet Below Land Surface.
(1) - Ground surface elevation estimated based on a 2-foot height of outer casing stick-up.
(2) - Elevations estimated.
(3) - Well flush mount damaged and obstructed at depth.
(4) - Depth of screened interval and total well depth have been modified from the well log due to site construction.
(5) - Well above grade construction damaged in 2011.
(6) - Well Abandoned in 2011 and replaced with GM-62R in 2013.
(7) - City of Moraine Monitoring Wells.
(8) - TOC Elevation is calculated based on adjacent well elevations and field measurements on November 26, 2012.
(9) - Well unusable - collapsed screen.
* Measuring point is top of cement housing.
Site coordinates based on site-specific benchmarks.
State plane coordinates in NAD 83 Ohio South.

UA - Upper Aquifer.
LA - Lower Aquifer.
TT - Top of Till (regional clay till).
TUT - Top of Upper Till (upper clay till).
BT - Below Till (regional clay till).
NTP - No Till Present.
NA - Not Available.
NM - Not Measured.
WT - Water Table (screened across the watertable interface).

**Table 6**
**Groundwater Level Measurements Collected During 2015**
**RACER Trust**
**Moraine, Ohio**

ARCADIS Design & Consultancy for natural and built assets

| Well | Measuring Point Elevation | Depth-to-Water (feet) | Total Depth (feet) | Groundwater Elevation (AMSL) |
|---|---|---|---|---|
| **Upper Aquifer Wells** | | | | |
| W-1-N | 739.02 | 29.46 | 70.00 | 709.56 |
| W-2-N | 731.68 | 22.54 | 59.70 | 709.14 |
| W-3-N | 733.66 | 24.49 | 57.60 | 709.17 |
| W-4-N | 731.63 | 22.36 | 66.60 | 709.27 |
| HR-1 | 732.71 | 24.36 | 59.00 | 708.35 |
| HR-2 | 734.75 | 25.46 | 58.70 | 709.29 |
| HR-3 | 736.75 | 27.45 | 62.20 | 709.30 |
| HR-4 | 742.60 | 32.99 | 66.80 | 709.61 |
| HR-5 | 734.27 | 25.21 | 57.80 | 709.06 |
| HR-6 | 732.66 | 24.20 | 55.45 | 708.46 |
| HR-7 | 731.73 | 22.87 | 57.40 | 708.86 |
| HR-11 | 743.33 | 33.13 | 69.10 | 710.20 |
| HR-16 | 727.01 | 19.39 | 65.00 | 707.62 |
| HR-17 | 726.43 | 18.50 | 59.55 | 707.93 |
| W-1-S | 729.29 | 21.14 | 59.55 | 708.15 |
| W-2-S | 726.64 | 19.53 | 67.00 | 707.11 |
| W-3-S | 729.17 | 21.97 | 76.40 | 707.20 |
| W-4-S | 727.92 | 20.40 | 72.50 | 707.52 |
| GM-2 | 735.81 | 28.16 | 56.30 | 707.65 |
| 4S | 731.36 | 24.04 | 68.40 | 707.32 |
| GM-6 | 730.27 | 24.12 | 46.30 | 706.15 |
| GM-8 | 735.17 | 28.02 | 50.00 | 707.15 |
| GM-10 | 723.90 | 17.07 | 50.20 | 706.83 |
| GM-16 | 725.30 | 18.55 | 58.00 | 706.75 |
| GM-17 | 723.84 | 16.84 | 50.05 | 707.00 |
| GM-18 | 723.80 | 16.95 | 54.86 | 706.85 |
| GM-19S | 730.92 | 23.16 | 57.00 | 707.76 |
| GM-21 | 725.00 | 17.15 | 53.30 | 707.85 |
| GM-22 | 731.63 | 23.00 | 57.20 | 708.63 |
| GM-23 | 731.07 | 21.52 | 32.20 | 709.55 |
| GM-24 | 747.29 | 36.47 | 68.05 | 710.82 |
| GM-25 | 746.17 | NM | NM | NM |
| GM-26 | 722.29 | 15.81 | 58.40 | 706.48 |
| GM-27 | 730.57 | 21.03 | 47.10 | 709.54 |
| GM-28R | 736.46 | NM | NM | NM |
| GM-29 | 731.37 | 21.81 | 32.60 | 709.56 |
| GM-30 | 734.79 | 25.24 | 36.00 | 709.55 |
| GM-31 | 732.13 | 23.80 | 63.20 | 708.33 |
| GM-32 | 732.08 | 24.32 | 56.50 | 707.76 |
| GM-33 | 729.77 | 21.59 | 54.30 | 708.18 |
| GM-34 | 730.56 | 24.34 | 35.25 | 706.22 |
| GM-35 | 731.27 | 23.58 | 65.40 | 707.69 |
| GM-36 | 731.11 | 23.27 | 34.45 | 707.84 |

**Table 6**
**Groundwater Level Measurements Collected During 2015**
**RACER Trust**
**Moraine, Ohio**

| Well | Measuring Point Elevation | Depth-to-Water (feet) | Total Depth (feet) | Groundwater Elevation (AMSL) |
|---|---|---|---|---|
| **Upper Aquifer Wells** | | | | |
| GM-37 | 730.05 | 22.11 | 34.25 | 707.94 |
| GM-38 | 729.88 | 21.94 | 56.10 | 707.94 |
| GM-43 | 729.00 | 20.60 | 49.70 | 708.40 |
| GM-44 | 728.77 | 20.60 | 60.90 | 708.17 |
| GM-45 | 729.75 | 21.00 | 60.00 | 708.75 |
| GM-46[1] | 727.79 | 17.95 | 27.70 | 709.84 |
| GM-47 | 726.75 | 19.71 | 59.40 | 707.04 |
| GM-48 | 728.67 | 22.41 | 73.02 | 706.26 |
| GM-49 | 727.88 | 21.28 | 76.29 | 706.60 |
| GM-50 | 726.56 | 19.57 | 39.50 | 706.99 |
| GM-51 | 728.30 | 21.97 | 44.20 | 706.33 |
| GM-52 | 727.62 | 21.48 | 44.00 | 706.14 |
| GM-53 | 730.35 | 21.66 | 32.55 | 708.69 |
| GM-55 | 719.86 | 13.32 | 35.10 | 706.54 |
| GM-57[2] | 721.74 | 16.02 | NM | 705.72 |
| GM-59 | 732.25 | 23.08 | 34.40 | 709.17 |
| GM-60 | 732.24 | 23.07 | 50.40 | 709.17 |
| GM-62 | 722.11 | 17.07 | 60.70 | 705.04 |
| GM-63 | 725.79 | 18.48 | 39.10 | 707.31 |
| GM-64 | 725.95 | 18.70 | 58.50 | 707.25 |
| GM-65S | 723.58 | 17.86 | 52.10 | 705.72 |
| GM-66 | 733.22 | 24.33 | 54.20 | 708.89 |
| GM-67S | 732.06 | 22.85 | 53.60 | 709.21 |
| GM-68S | 732.18 | 23.13 | 49.90 | 709.05 |
| GM-71 | 736.82 | 27.51 | 61.40 | 709.31 |
| GM-72 | 736.78 | 27.47 | 32.10 | 709.31 |
| GM-74S | 732.17 | 23.01 | 49.50 | 709.16 |
| GM-75S | 737.69 | 28.42 | 51.80 | 709.27 |
| GM-76S | 739.00 | 29.11 | 36.80 | 709.89 |
| GM-77S | 741.14 | 31.88 | 42.69 | 709.26 |
| GM-78 | 721.18 | 14.12 | 49.40 | 707.06 |
| GM-79 | 717.91 | 12.08 | 54.20 | 705.83 |
| GM-80 | 715.82 | 10.36 | 24.50 | 705.46 |
| GM-81 | 715.31 | 9.77 | 60.36 | 705.54 |
| GM-83S | 725.84 | 17.15 | 53.80 | 708.69 |
| RMW-89 | 738.56 | 29.86 | 50.30 | 708.70 |
| RMW-90 | 727.41 | 18.30 | 54.15 | 709.11 |
| EAST | 730.98 | 22.83 | 71.30 | 708.15 |
| WEST | 731.08 | 23.09 | 51.40 | 707.99 |
| WSU-17 | 726.18 | 19.90 | 46.25 | 706.28 |
| WSU-18 | 733.52 | 26.26 | 61.20 | 707.26 |
| WSU-19 | 726.62 | 29.80 | 63.10 | 696.82 |
| WSU-22 | NM | NM | NM | NM |
| WSU-23[1] | 724.90 | 17.99 | 57.40 | 706.91 |
| WSU-24 | 724.82 | 17.45 | 66.55 | 707.37 |
| TW-2 | 733.38 | 25.11 | 46.00 | 708.27 |
| ME-2 | 732.08 | 24.65 | NM | 707.43 |
| ME-3 | 731.73 | 23.42 | NM | 708.31 |
| ME-4 | 732.24 | 23.98 | NM | 708.26 |
| ME-6 | 732.68 | 24.47 | NM | 708.21 |

**Table 6**
**Groundwater Level Measurements Collected During 2015**
**RACER Trust**
**Moraine, Ohio**

| Well | Measuring Point Elevation | Depth-to-Water (feet) | Total Depth (feet) | Groundwater Elevation (AMSL) |
|---|---|---|---|---|
| **Lower Aquifer Wells** | | | | |
| GM-1 | 735.74 | 28.42 | 103.40 | 707.32 |
| GM-3 | 730.44 | 23.60 | 102.20 | 706.84 |
| GM-4 | 731.46 | 24.69 | 139.50 | 706.77 |
| GM-5 | 731.29 | 24.32 | 102.00 | 706.97 |
| GM-7R | 735.61 | 28.41 | 93.20 | 707.20 |
| GM-9 | 724.07 | 17.55 | 99.60 | 706.52 |
| GM-11 | 723.71 | 17.30 | 99.20 | 706.41 |
| GM-13 | 723.82 | 17.87 | 100.10 | 705.95 |
| GM-14 | 723.50 | 17.55 | NM | 705.95 |
| GM-15 | 725.23 | 19.56 | 98.90 | 705.67 |
| GM-19D | 730.73 | 23.02 | 148.00 | 707.71 |
| GM-20D | 727.26 | 19.76 | 100.80 | 707.50 |
| GM-39 | 730.95 | 21.42 | 118.40 | 709.53 |
| GM-40 | 727.04 | 19.32 | 150.30 | 707.72 |
| GM-41 | 733.65 | 24.88 | 16.30 | 708.77 |
| GM-42 | 729.16 | 21.56 | 152.30 | 707.60 |
| GM-54 | 730.29 | 21.50 | 80.00 | 708.79 |
| GM-56 | 719.52 | 13.05 | 86.44 | 706.47 |
| GM-58 | 735.46 | 26.35 | 82.00 | 709.11 |
| GM-61 | 732.23 | 23.05 | 78.94 | 709.18 |
| GM-65D | 723.54 | 17.85 | 96.51 | 705.69 |
| GM-67D | 732.19 | 22.97 | 79.20 | 709.22 |
| GM-68D | 732.27 | 23.27 | 70.80 | 709.00 |
| GM-69 | 732.08 | 23.70 | 100.79 | 708.38 |
| GM-70 | 737.19 | 27.90 | 81.80 | 709.29 |
| GM-73 | 736.97 | 27.57 | 96.50 | 709.40 |
| GM-74D | 732.04 | 22.96 | 80.21 | 709.08 |
| GM-75D | 737.68 | 28.30 | 94.30 | 709.38 |
| GM-76D | 738.94 | 29.24 | 80.10 | 709.70 |
| GM-77D | 740.93 | 31.57 | 86.30 | 709.36 |
| GM-82 | 732.14 | 23.58 | 96.87 | 708.56 |
| GM-83D | 725.77 | 18.02 | 119.70 | 707.75 |
| GM-84 | 739.92 | 31.20 | 106.80 | 708.72 |
| RMW-85 | 736.65 | 27.25 | 94.40 | 709.40 |
| RMW-86 | 729.22 | 21.79 | 80.10 | 707.43 |
| RMW-87 | 728.01 | 20.06 | 76.10 | 707.95 |
| RMW-88 | 739.11 | 29.20 | 102.70 | 709.91 |
| HR-12 | 742.64 | 32.44 | 134.61 | 710.20 |
| HR-13 | 735.03 | 25.66 | 87.00 | 709.37 |
| HR-14 | 731.63 | 22.45 | 91.20 | 709.18 |
| HR-15 | 733.74 | 24.71 | 102.20 | 709.03 |
| M73C | 716.55 | 10.55 | NM | 706.00 |
| MT576M[1] | 751.46 | 40.74 | NM | 710.72 |
| MT596M | 757.73 | 46.08 | NM | 711.65 |

**Table 6**
**Groundwater Level Measurements Collected During 2015**
**RACER Trust**
**Moraine, Ohio**

| Well | Measuring Point Elevation | Depth-to-Water (feet) | Total Depth (feet) | Groundwater Elevation (AMSL) |
|---|---|---|---|---|
| **Production and Fire Wells** | | | | |
| DN-13 (County Well) [ON] | 727.78 | NM | NM | NM |
| 11B | 742.56 | 32.59 | NM | 709.97 |
| 12A | 742.39 | NM | NM | NM |
| 31[1] | 734.05 | 24.09 | 87.2 | 709.96 |
| 34 | 733.46 | 24.33 | NM | 709.13 |
| 39 | 732.07 | 22.49 | NM | 709.58 |
| A | 739.00 | 27.73 | NM | 711.27 |
| FW-1A | 739.89 | NM | NM | NM |
| FW-2 | 737.48 | 27.96 | NM | 709.52 |
| FW-3 | 739.26 | 29.90 | NM | 709.36 |
| FW-4 | 731.62 | 23.65 | NM | 707.97 |
| **Stream Gauge*** | | | | |
| SG1[1] | 747.64 | NM | NA | NM |
| SG2 | 709.95 | 2.39 | NA | 707.56 |
| SG3 | 718.45 | NM | NA | NM |
| SG4 | 714.78 | NM | NA | NM |
| SG5[1] | 711.10 | 2.68 | NA | 708.42 |
| SG6 | 723.21 | 15.70 | NA | 707.51 |
| SG7 | 731.55 | 14.81 | NA | 716.74 |
| **IRZ Wells** | | | | |
| RZ-1D | 731.20 | 21.27 | NM | 709.93 |
| RZ-3F | 728.54 | 21.09 | NM | 707.45 |
| RZ-3N | 729.99 | 18.41 | NM | 711.58 |
| RZ-3MM | 726.92 | 19.19 | 48.96 | 707.73 |
| RZ-4A | 725.71 | 16.92 | 55.10 | 708.79 |
| RZ-4D | 727.07 | 18.58 | 53.90 | 708.49 |
| RZ-4G | 728.16 | 20.63 | NM | 707.53 |
| RZ-4O | 726.46 | 20.19 | NM | 706.27 |
| **Moraine City** | | | | |
| MW-1 | 715.53 | 8.92 | NM | 706.61 |
| MW-4 | 707.19 | 5.42 | NM | 701.77 |
| MW-5 | 709.34 | 5.77 | NM | 703.57 |
| MW-9 | 712.85 | 10.16 | NM | 702.69 |

Measuring point is to top of the well casing or surveyed measuring point.
Groundwater elevations are reported in feet above mean sea level (AMSL).
Groundwater levels were measured on December 9 and 10, 2015 using an electronic water level indicator (more than one meter was used and groundwater elevations reflect a calibration factor).
Groundwater level measurements are reported in feet below the measuring point.
1 - Well could not be located.
2 - Well damaged.
NM - Not Measured.
NA - Not Applicable.
*Surface water measurement.

**Table 7**
**Summary of Precipitation Measurements Recorded**
**by the National Weather Service during 2015 – Dayton, Ohio**
**RACER Trust**
**Moraine, Ohio**

| Date | Actual Precipitation | Average Precipitation | Departure from Average |
|---|---|---|---|
| January | 2.97 | 2.60 | 0.37 Above |
| February | 1.39 | 2.13 | 0.74 Below |
| March | 3.91 | 3.23 | 0.68 Above |
| April | 5.26 | 3.94 | 1.32 Above |
| May | 1.79 | 4.19 | 2.40 Below |
| June | 7.88 | 4.07 | 3.81 Above |
| July | 4.60 | 3.73 | 0.87 Above |
| August | 1.94 | 3.00 | 1.06 Below |
| September | 0.86 | 2.90 | 2.04 Below |
| October | 3.69 | 2.64 | 1.05 Above |
| November | 2.44 | 3.02 | 0.58 Below |
| December | 4.39 | 2.96 | 1.43 Above |
| **2014 Total** | **41.12** | **38.41** | **2.71 Above** |

All precipitation measurements are reported in inches.
Average precipitation Information obtained from the NOAA Website (http://www.ncdc.noaa.gov/IPS/lcd/lcd.html).

**Table 8**
**Horizontal Gradients for Upper/Lower Aquifer Well Pairs in 2015**
**RACER Trust**
**Moraine, Ohio**

| Horizontal Gradients - December 9 and 10, 2015 | ft./ft. |
|---|---|
| W-2-N/W-1-S | 4.0E-04 |
| W-3-N/HR-1 | 4.7E-04 |
| HR-5/HR-1 | 5.2E-04 |
| HR-6/W-1-S | 2.5E-04 |
| HR-4/HR-1 | 5.2E-04 |
| HR-7/W-1-S | 3.6E-04 |
| W-3-N/HR-6 | 6.2E-04 |
| HR-5/W-1-S | 4.6E-04 |
| HR-6/W-4-S | 4.0E-04 |
| HR-1/GM-16 | 5.7E-04 |
| GM-75S/GM-68S | 3.7E-04 |
| GM-53/4S | 5.7E-04 |
| ***Average Hydraulic Gradient for all Upper Aquifer Wells*** | **4.6E-04** |
| GM-58/GM-20D | 5.1E-04 |
| GM-39/GM-1 | 5.1E-04 |
| HR-15/GM-3 | 5.3E-04 |
| HR-14/GM-5 | 5.3E-04 |
| GM-67D/RMW-87 | 6.7E-04 |
| ***Average Hydraulic Gradient for Lower Aquifer Wells*** | **5.5E-04** |

ft. - Feet.

**Table 9**
**Vertical Gradients for Upper/Lower Aquifer Well Pairs in 2015**
**RACER Trust**
**Moraine, Ohio**

| Vertical Gradients - December 9 and 10, 2015 | | |
|---|---|---|
| **Upper/Lower Aquifer Wells** | **Direction** | **Gradient (ft./ft.)** |
| ***Upgradient*** | | |
| HR-11/HR-12 | NA | 0.0E+00 |
| ***On-Site*** | | |
| W-3-N/HR-15 | D | -2.9E-03 |
| HR-3/HR-13 | U | +2.8E-03 |
| GM-2/GM-1 | D | -7.3E-03 |
| GM-6/GM-3 | U | +1.3E-02 |
| 4S/GM-5 | D | -7.4E-03 |
| GM-75S/GM-75D | U | +2.6E-03 |
| ***Off-Site/Downgradient*** | | |
| GM-10/GM-9 | D | -6.2E-03 |
| GM-16/GM-15 | D | -2.6E-02 |
| GM-18/GM-13 | D | -2.0E-02 |
| GM-17/GM-11 | D | -1.2E-02 |
| GM-55/GM-56 | D | -1.5E-03 |
| GM-65S/GM-65D | D | -7.0E-04 |

D - Downward gradient (-).
U - Upward gradient (+).
NA - Not applicable.
ft. - Feet.
Upper/lower aquifer well pairs in the vicinity of DN-13 are GM/10/GM-9, GM-16/GM-15, GM-18/GM-13, and GM-17/GM-11.

**Table 10**
**Lower Aquifer Triangular Irregular Network Horizontal Hydraulic Gradients in 2015**
**RACER Trust**
**Moraine, Ohio**

| TIN Cell | Monitoring Well Groundwater Elevations (ft. AMSL) | | | Hydraulic Gradient | Flow Direction Azimuth (degrees) |
|---|---|---|---|---|---|
| TIN A | GM-19D | GM-4 | GM-1 | 2.0E-03 | 228 |
| | **707.71** | **706.77** | **707.32** | | |
| TIN B | GM-1 | GM-4 | GM-20D | 1.0E-03 | 312 |
| | **707.32** | **706.77** | **707.50** | | |
| TIN C | GM-4 | GM-20D | GM-14 | 2.1E-03 | 274 |
| | **706.77** | **707.50** | **705.95** | | |
| TIN D | GM-14 | GM-20D | GM-9 | 2.2E-03 | 283 |
| | **705.95** | **707.50** | **706.52** | | |
| TIN E | GM-9 | GM-14 | M73C | 1.2E-03 | 331 |
| | **706.52** | **705.95** | **706.00** | | |
| TIN F | GM-4 | GM-14 | GM-15 | 1.5E-03 | 234 |
| | **706.77** | **705.95** | **705.67** | | |
| TIN G | GM-19D | GM-15 | GM-4 | 1.6E-03 | 229 |
| | **707.71** | **705.67** | **706.77** | | |

TIN - Triangular irregular network.
ft. - Feet.
AMSL- Above mean sea level.

**Table 11**
**Site-Wide Groundwater Monitoring Program for 2016**
**RACER Trust**
**Moraine, Ohio**

Upper aquifer monitoring wells to be sampled in 2016:

| | | | | | | |
|---|---|---|---|---|---|---|
| W-1-N | HR-4 | TW-2 | GM-23 | GM-32** | GM-55 | GM-79 |
| W-2-N | HR-7 | GM-2 | GM-24 | GM-35* | GM-59 | GM-80* |
| W-3-N | HR-16 | GM-16* | GM-26 | GM-43 | GM-60* | RMW-89 |
| W-4-N | HR-17 | GM-6* | GM-28R*** | GM-47 | GM-63 | RMW-90 |
| HR-1 | W-2-S | GM-8* | GM-29* | GM-50 | GM-65S | |
| HR-2 | W-3-S | GM-19S | GM-30 | GM-51 | GM-75S | |
| HR-3 | W-4-S | GM-21* | GM-31 | GM-52* | GM-78 | |

Lower aquifer monitoring wells to be sampled in 2016:

| | | | | | |
|---|---|---|---|---|---|
| HR-12* | GM-9* | GM-19D | GM-68D | GM-83D* | RMW-86* |
| HR-15 | GM-11* | GM-20D | GM-75D* | GM-84 | RMW-87* |
| DN-13 | GM-15* | GM-54 | GM-77D | RMW-85 | RMW-88* |

Notes:

* To be sampled for analysis of 1,4-Dioxane in addition to the site-specific list of volatile organic compounds.

** Upper aquifer monitoring well GM-32 will be sampled for total organic carbon only.

***Upper aquifer monitoring well GM-28 will not be included in the 2016 Site-Wide Groundwater Monitoring Program due to an existing obstruction in the well that has prohibited the collection of a sample from that well since 2011. GM-28R will be sampled as a replacement.

Rationale for the selection of the upper and lower aquifer monitoring wells is included in Table 21 of the "Site-Wide Groundwater Monitoring Report for 2008, General Motors Corporation, Moraine, Ohio" (ARCADIS, Inc. 2009). Removal and addition of monitor wells to the program are discussed below.

Upper aquifer monitoring wells HR-1, HR-16, and GM-63 are included due to increased concentrations at HR-17 and W-4-S that were not attributed to the closed South Settling Lagoon.

Upper aquifer monitoring wells HR-3, GM-30, GM-31, and GM-51 are included due to the observed increase in volatile organic compound concentrations observed during the 2014 Annual Site-Wide Groundwater Monitoring Program.

Upper aquifer monitoring wells HR-8 and HR-9 were removed due to accessibility. These wells were replaced with upper aquifer monitoring well W-1-N.

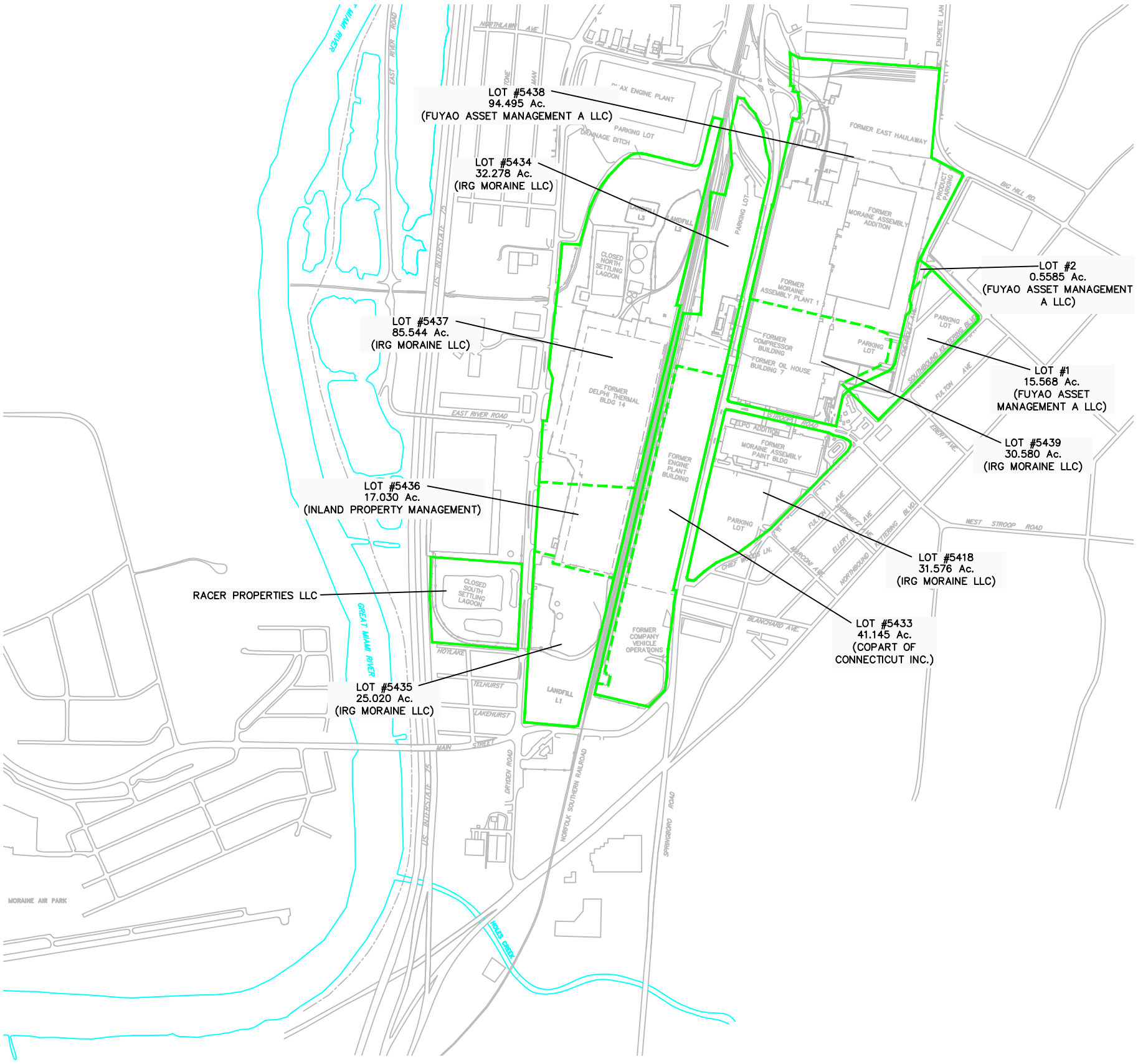
Lower aquifer monitoring well HR-10 was removed due to accessibility. This well was replaced with lower aquifer monitoring well RMW-88.

Lower aquifer monitoring wells GM-40 and GM-42 were removed and replaced with RMW-86 and RMW-87 due to the well depths of GM-40 and GM-42. RMW-86 and RMW-87 are shallower and better positioned to monitor lower aquifer plume migration.

Lower aquifer monitoring well RMW-85 is included due to its proximity to the lower aquifer source area.

# FIGURES

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-00.dwg LAYOUT: FIG 1 SITE LAYOUT SAVED: 2/17/2016 10:58 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/17/2016 12:21 PM BY: SMITH, BOB




0 200 1000ft

**LEGEND**

- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE

RACER TRUST
MORAINE, OHIO

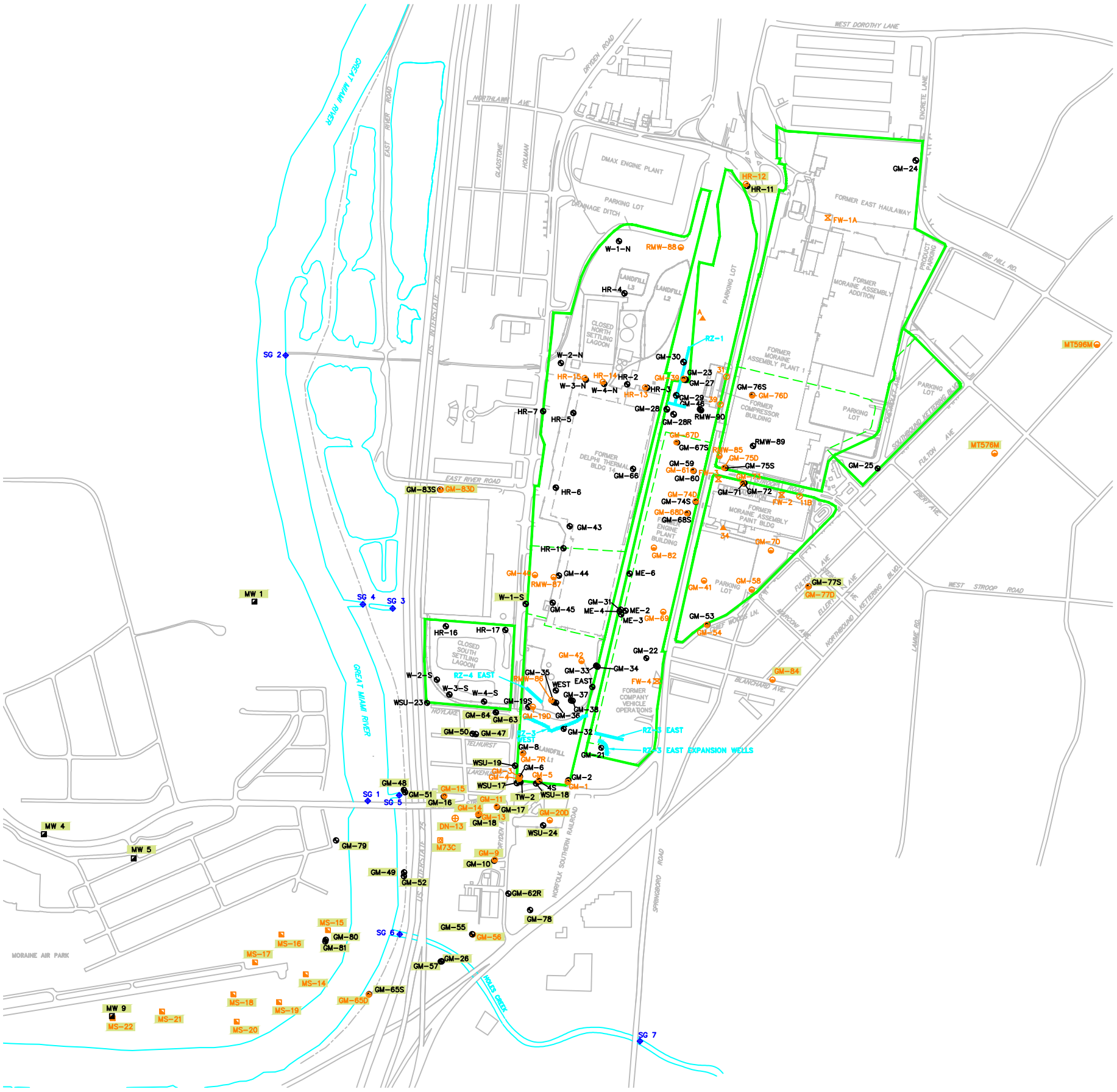
OH000294.2016

# SITE LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-00.dwg LAYOUT: FIG 2 SITEWIDE-C-M-ALL WELLS SAVED: 2/16/2016 2:04 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/16/2016 2:08 PM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- 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 AS A LOWER AQUIFER RECOVERY WELL)
- MONTGOMERY COUNTY WELL (INACTIVE MIAMI SHORES WELL FIELD – DAYTON PRIMARY PUBLIC SUPPLY BACKUP)
- STREAM GAUGE
- RIVER LEVEE
- CITY OF MORAINE MONITORING WELL
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- OFFSITE WELLS

NOTES:
1. ORANGE INDICATES LOWER AQUIFER WELLS.
2. BLACK INDICATES UPPER AQUIFER WELLS.

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MORAINE, OHIO

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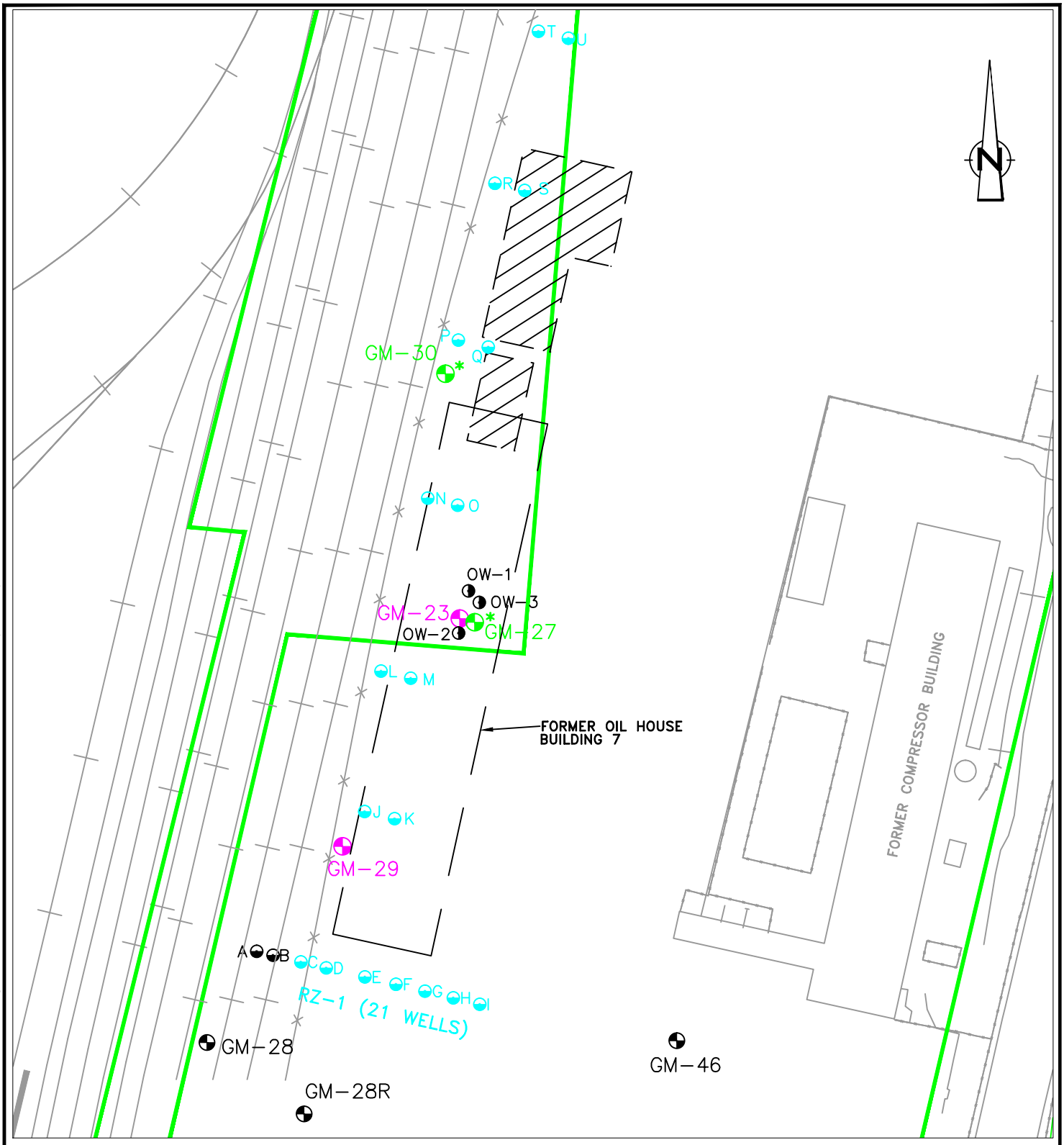
# SITE-WIDE CORRECTIVE MEASURES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2




**LEGEND**

- MONITORING WELL USED FOR SITE-WIDE ON AN ANNUAL BASIS (UPPER AQUIFER)
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON A FIVE-YEAR BASIS (UPPER AQUIFER)
- CARBON SOURCE INTRODUCTION WELL
- INACTIVE CARBON SOURCE INTRODUCTION WELL
- OXIDATION WELLS (INACTIVE)
- MONITORING WELL (UPPER AQUIFER)
- APPROXIMATE LOCATION OF FORMER MORAINE ENGINE TANK FARM
- MONITORING WELL UTILIZED FOR PERFORMANCE MONITORING
- PROPERTY BOUNDARY

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MORAINE, OHIO

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# REACTIVE ZONE #1

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

CITY:(COLUMBUS) DIV/GROUP:(SER2) DB:(R. SMITH) LD:(Opt) PIC:(Opt) PM:(N. GILLOTTI) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OHACTOH000294 - RACER\294-2015-04B-ANNUALWANN294-2016-03.dwg LAYOUT: REACTIVE ZONE 1 SAVED: 1/25/2016 2:41 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/16/2016 11:58 AM BY: SMITH, BOB
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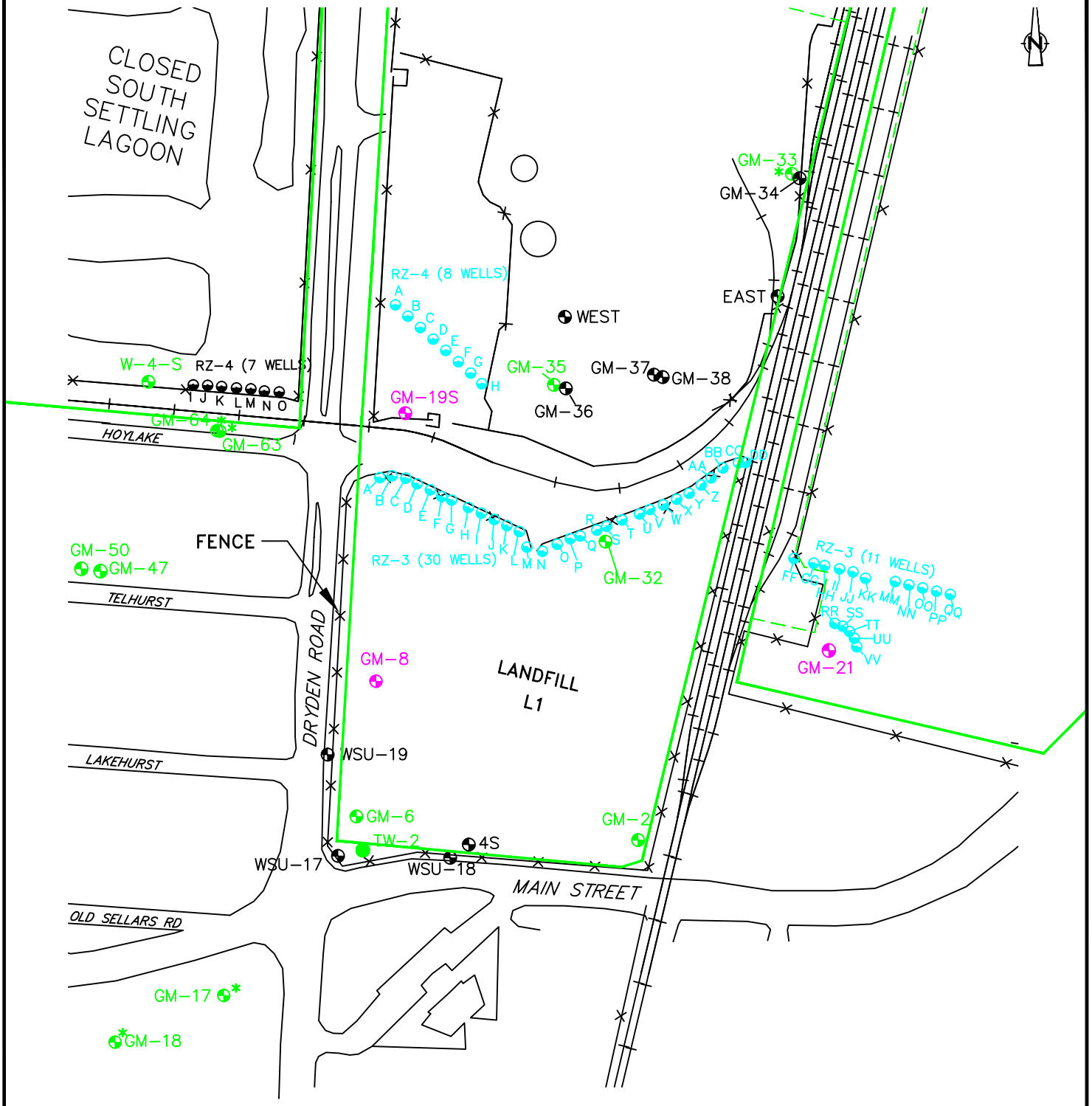
PROJECTNAME: ---




**LEGEND**

- MONITORING WELL USED FOR SITE-WIDE MONITORING ON AN ANNUAL BASIS (UPPER AQUIFER)
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON A FIVE-YEAR BASIS (UPPER AQUIFER)
- CARBON SOURCE INTRODUCTION WELLS
- INACTIVE CARBON SOURCE INTRODUCTION WELLS
- INACTIVE RECOVERY WELL (USED FOR SITE-WIDE MONITORING)
- MONITORING WELL (UPPER AQUIFER)
- MONITORING WELL UTILIZED FOR PERFORMANCE MONITORING
- PROPERTY BOUNDARY
- PARCEL BOUNDARY

NOTE: INTRODUCTION WELL RZ-3LL WAS NOT INSTALLED DUE TO PRESENCE OF UNDERGROUND UTILITIES.

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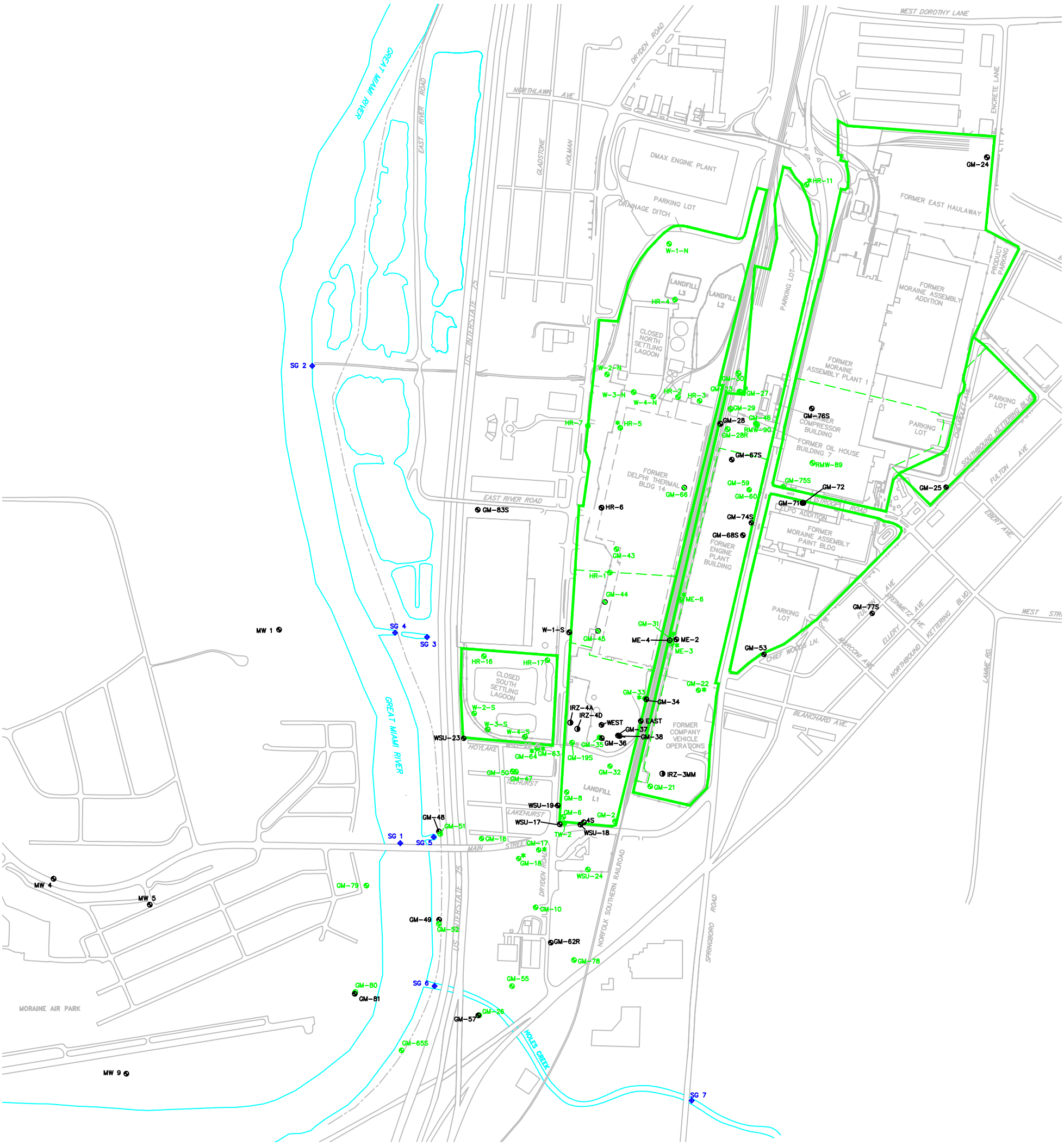
# REACTIVE ZONES #3 AND #4

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4

CITY:(COLUMBUS) DIV/GROUP:(SER2) DB:(R. SMITH) LD:(Opt) PIC:(Opt) PM:(N. GILLOTTI) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACTIVE\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-04.dwg LAYOUT: RZ-3 & 4 SAVED: 2/16/2016 11:57 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/26/2016 9:53 AM BY: SMITH, BOB
XREFS:
PROJECTNAME: ----

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-00.dwg LAYOUT: FIG 5 UPPER WELLS SAVED: 2/16/2016 2:13 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/16/2016 2:13 PM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (USED FOR SITE-WIDE MONITORING)
- STREAM GAUGE
- CARBON INTRODUCTION WELL
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON AN ANNUAL BASIS (UPPER AQUIFER)
- * MONITORING WELL USED FOR SITE-WIDE MONITORING ON A FIVE-YEAR BASIS (UPPER AQUIFER)
- FORMER BUILDING FOOTPRINT
- RIVER LEVEE
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY

N

0 200 1000ft

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MORAINE, OHIO

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# UPPER AQUIFER MONITORING WELLS FOR SITE-WIDE GROUNDWATER MONITORING

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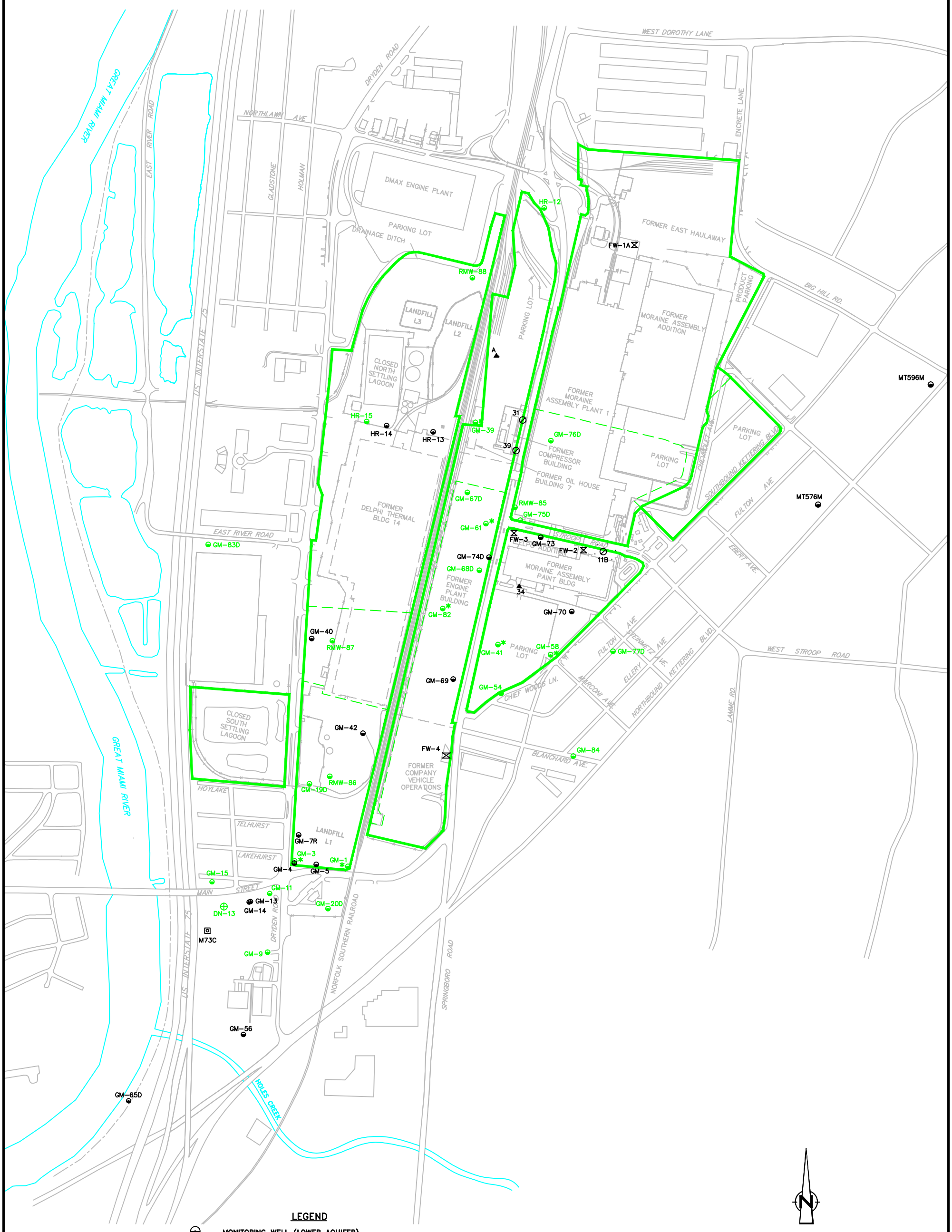
FIGURE
5

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-00.dwg LAYOUT: FIG 6 DEEP WELLS SAVED: 2/16/2016 2:14 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/16/2016 2:14 PM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL (31, 39, 11B, 12A)
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON AN ANNUAL BASIS (LOWER AQUIFER)
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON A FIVE-YEAR BASIS (LOWER AQUIFER)
- FORMER BUILDING FOOTPRINT
- RIVER LEVEE
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY

N

0 200 700ft

RACER TRUST
MORAINE, OHIO

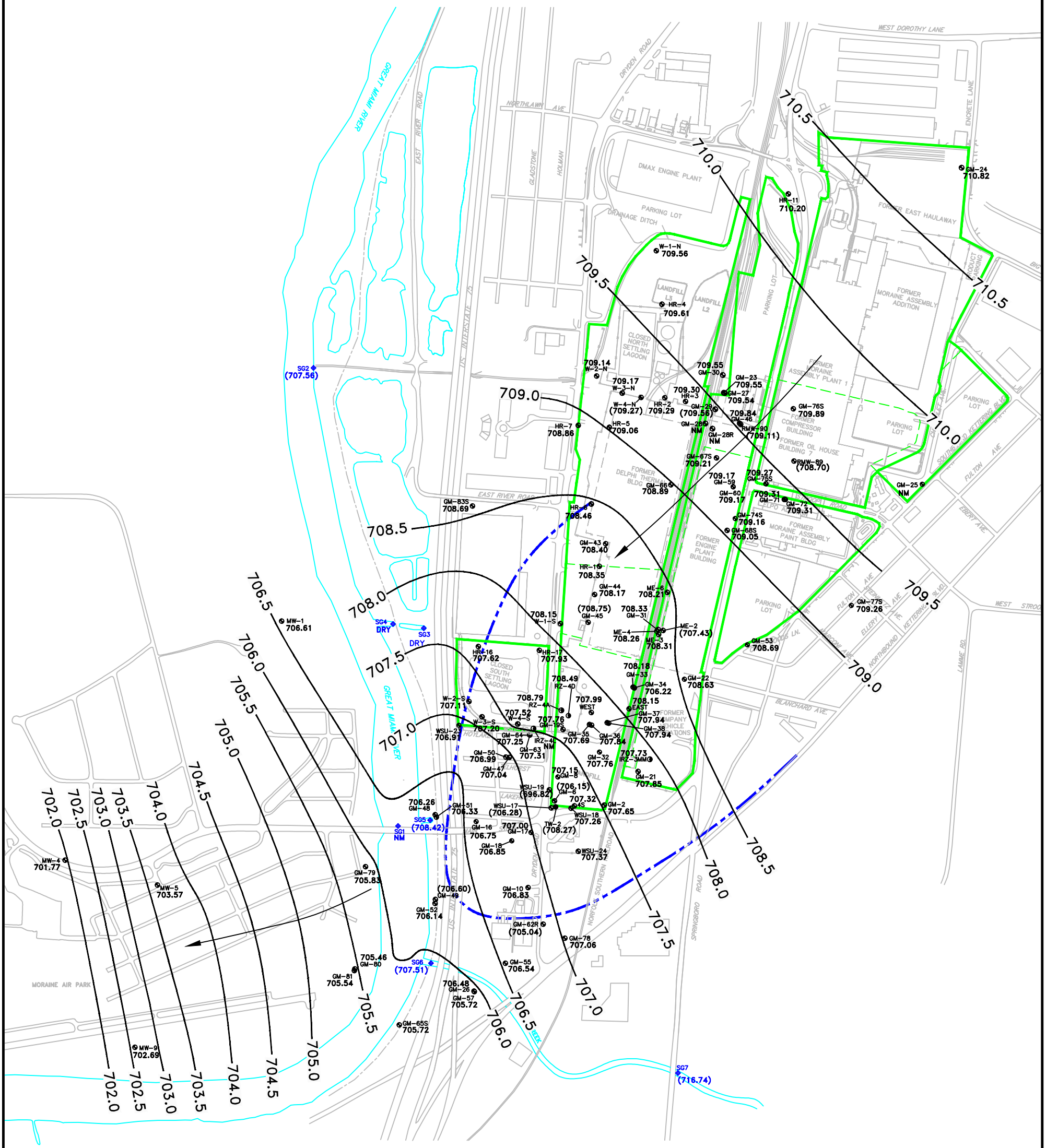
OH000294.2016

# LOWER AQUIFER MONITORING WELLS FOR SITE-WIDE GROUNDWATER MONITORING

ARCADIS Design & Consultancy for natural and built assets

FIGURE
6

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-08.dwg LAYOUT: FIG 7 GW ELEV 120015 SHAL SAVED: 2/18/2016 12:16 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/26/2016 11:47 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- 707.56 STREAM GAUGE AND STREAM GAUGE MEASUREMENT; NOT USED FOR CONTOURING
- CARBON INTRODUCTION WELL
- RIVER LEVEE
- PROPERTY BOUNDRY
- PARCEL BOUNDARY
- 706.83 GROUNDWATER ELEVATION (FEET MSL)
- 702.0 GROUNDWATER CONTOUR (FEET MSL) (DASHED WHERE INFERRED)
- ( ) NOT USED FOR CONTOURING
- NM NOT MEASURED
- FLOW DIRECTION
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE

CONTOUR INTERVAL = 0.5 FOOT

NOTE:
1. DEPTH TO WATER MEASUREMENTS COLLECTED FROM TOP OF WELL CASING ON DECEMBER 9-10, 2015.

RACER TRUST
MORAINE, OHIO

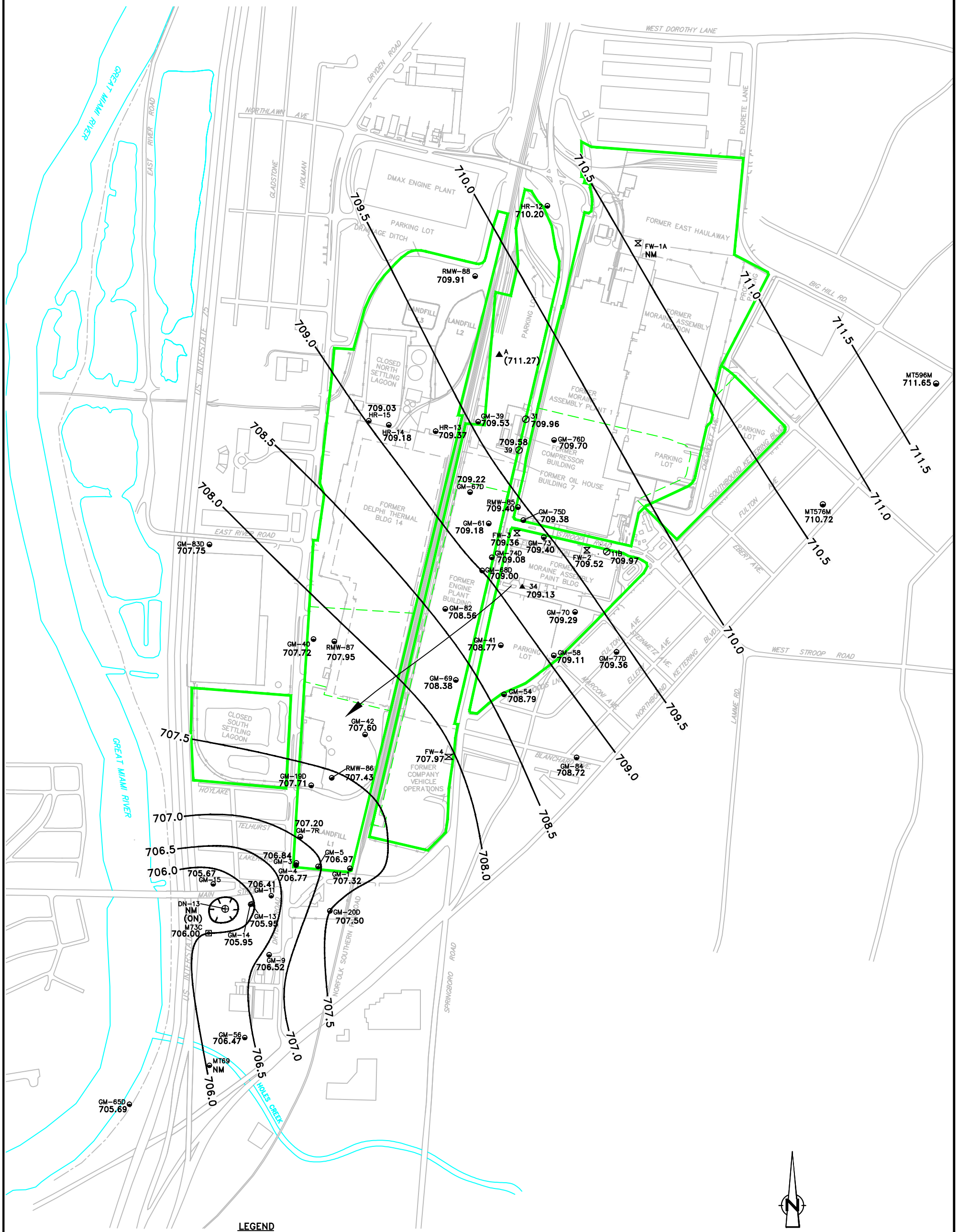
OH000294.2016

# POTENTIOMETRIC SURFACE (UPPER AQUIFER) DECEMBER 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE 7

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-08.dwg LAYOUT: FIG 8 GW ELEV 120015 DEEP SAVED: 2/16/2016 2:52 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/16/2016 2:52 PM BY: SMITH, BOB




LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- 707.19 GROUNDWATER ELEVATION (FEET MSL)
- NM NOT MEASURED
- 706.0 GROUNDWATER CONTOUR (FEET MSL) (DASHED WHERE INFERRED)
- CONE OF DEPRESSION (ESTIMATED INDIVIDUAL CONTOURS NOT SHOWN)
- FORMER BUILDING FOOTPRINT
- ( ) NOT USED FOR CONTOURING
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER FEATURE
- ON/OFF INDICATES WHETHER RECOVERY WELL IS IN OPERATION

CONTOUR INTERVAL = 0.5 FOOT

NOTES:
1. DN-13 DRAWN DOWN OVER 60 FEET, INDIVIDUAL CONTOURS NOT SHOWN.
2. DEPTH TO WATER MEASUREMENTS COLLECTED FROM TOP OF WELL CASING ON DECEMBER 9-10, 2015.

RACER TRUST
MORAINE, OHIO

OH000294.2016

# POTENTIOMETRIC SURFACE (LOWER AQUIFER) DECEMBER 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE 8

CITY:(COLUMBUS) DIV/GROUP:(SER2) DB:(R. SMITH) LD:(Opt) PIC:(Opt) PM:(N. GILLOTTI) TM:(J. MANZO) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACTIOH000294 - RACER\294-2015-04B-ANNUAL\DBUPPER-100015.dwg LAYOUT: MODEL SAVED: 2/25/2016 12:16 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/26/2016 12:25 PM BY: SMITH, BOB

HR-4: UA:TT (676–686)

| | 9/14/1999 | 9/20/2000 | 11/6/2001 | 9/27/2002 | 9/18/2003 | 9/16/2004 | 10/20/2005 | 9/25/2006 | 9/26/2007 | 9/30/2008 | 11/13/2009 | 9/28/2010 | 9/28/2011 | 9/7/2012 | 9/27/2013 | 10/7/2014 | 10/30/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1.00) U | 0.17 J | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.23 J | 0.29 J | 0.71 J | 1.2 |
| 1,1-Dichloroethane | ND (1.0) U | ND (1.00) U | ND (1) U | ND (1) U | ND (1) U | 0.77 J | 1.5 | 1.6 | 3.6 | 4.1 | 5.5 | 5.9 | 4.5 | 5.0 | 3.0 | 2 | 1.6 |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 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 (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 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 (1.00) U | 0.28 J | ND (0.5) U | ND (0.5) U | ND (1.0) U | 0.28 J | ND (1.0) U | 0.23 J | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.35 J | ND (1.0) U | 0.26 J | 0.32 J |
| Ethylbenzene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Tetrachloroethene | | 0.88 J | 0.59 J | 0.55 J | 1.3 | 0.39 J | 0.41 J | 0.33 J | 0.44 J | 0.37 J | 0.34 | ND (1.0) U | ND (1.0) U | 0.21 J | 0.28 J | ND (1.0) U | ND (1.0) U |
| Toluene | ND (1.0) U | ND (1.00) U | 0.95 J | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (0.50) U | ND (0.5) U | ND (0.5) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Trichloroethene | 12.0 J | 17.0 J | 13 J | 13 J | 13 J | 11 J | 13 J | 11 J | 1.1 J | 0.22 J | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.36 J | | | |
| Vinyl chloride | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Xylene (total) | ND (1.0) U | 2.0 J | ND (1.0) U | ND (1) U | ND (1) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

HR-11: UA (671–681)

| | 9/14/1999 | 9/18/2000 | 11/6/2001 | 9/28/2002 | 9/18/2003 | 9/15/2004 | 10/17/2005 | 9/25/2006 | 9/19/2007 | 9/25/2008 | 9/26/2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1.00) U | 0.36 J | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| 1,1-Dichloroethane | 13.5 | 32.9/36.8 | 27 | 18 | 10 | 7.3 | 6.5 | 6.7 | 7.1 | 5.2 | 4.4 |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | 0.41 J | 5.5 | 3.9 | 4.5 |
| Benzene | ND (1.0) U | ND (1.00) U | ND (1) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | | 18.5/20.9 | 18 | 6.1 | 1.7 | 0.45 J | 0.72 J | 0.31 J | ND (1.0) U | ND (1.0) U | 1.6 |
| Ethylbenzene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | 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 (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | 2.2 | 6.0 | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Toluene | ND (1.0) U | 6/ND (1.00) U | ND (1.0) U | 0.41 J | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (1.0) U | 2.6/2.8 | 2.3 | 0.72 | ND (0.5) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.24 J |
| Trichloroethene | 43 J | 130 | 110 | 39 | 11 | 3.9 | 3.6 | 3.5 | 3.6 | 2.7 | 2.8 |
| Vinyl chloride | ND (1.0) U | ND (1.00) U | 0.35 J | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Xylene (total) | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

GM-30: UA:TUT (697–707)[1]

| | 9/2/1999 | 9/20/2000 | 11/13/2001 | 9/27/2002 | 9/23/2003 | 9/14/2004 | 10/17/2005 | 9/20/2006 | 9/26/2007 | 10/8/2008 | 9/27/2013 | 10/9/2014 | 12/11/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | ND (10) U | ND (1.00) U | ND (25) U | ND (5) U | ND (5) U | ND (5.0) U | ND (50) U | ND (5.0) U | ND (33) U | ND (18) U | ND (10) U | ND (1.0) U | ND (2.0) U |
| 1,1-Dichloroethane | 53.8 | 50.6 | 31 | 34 | ND (120) U | 33 | 23 J | 25 J | 16 J | 11 | 5.3 | 3.2 | 1.2 |
| 1,1-Dichloroethene | ND (10) U | ND (1.00) U | ND (25) U | ND (5) U | ND (120) U | ND (5.0) U | ND (50) U | ND (5.0) U | ND (33) U | ND (18) U | ND (10) U | ND (1.4) U | ND (2.0) U |
| Benzene | ND (10) U | 2.7 | ND (25) U | ND (33) U | ND (120) U | ND (40) U | ND (50) U | ND (33) U | ND (33) U | ND (18) U | ND (10) U | 4.0 | 2.3 | 2.9 |
| cis-1,2-Dichloroethene | 7.5/ND (1.00) U | ND (1.00) U | ND (12) U | ND (17) U | ND (62) U | ND (20) U | ND (50) U | ND (33) U | ND (33) U | ND (18) U | ND (10) U | 0.29 J | ND (2.0) U |
| Ethylbenzene | 703/0 | 529/0 | 840 | 350 | 1800 | 530 | 620 | 570 | 380 | 300 | 20 | 54 | 0.69 J | 0.26 J |
| Tetrachloroethene | 9.5 | ND (1.00) U | ND (25) U | ND (33) U | ND (120) U | ND (40) U | ND (50) U | ND (33) U | ND (33) U | ND (18) U | 0.23 J/ND (1.4) U | ND (2.0) U | | |
| Toluene | 6850/ | 98.5 | 5.0 J | ND (33) U | 240 | ND (40) U | ND (50) U | 5.8 J | ND (18) U | ND (10) U | 1.1 | 0.71 J | 0.87 J | |
| trans-1,2-Dichloroethene | ND (10) U | ND (1.00) U | ND (12) U | ND (17) U | ND (62) U | ND (20) U | ND (50) U | ND (33) U | ND (18) U | ND (10) U | 0.63 J | 0.51 J | ND (2.0) U | |
| Trichloroethene | 1.8 J/ND (1.00) U | ND (1.00) U | 1.2 J | ND (33) U | ND (120) U | ND (40) U | ND (50) U | ND (33) U | ND (18) U | ND (10) U | 0.28 J | ND (1.4) U | ND (2.0) U | |
| Vinyl chloride | ND (10) U/ND (1.00) U | ND (1.00) U | ND (25) U | ND (33) U | ND (120) U | ND (40) U | ND (50) U | ND (33) U | ND (18) U | ND (10) U | 0.34 J | ND (1.4) U | ND (2.0) U | |
| Xylene (total) | 2330/ | 6770/ | 2000 | 1400 | 7000 | 3000 | 3800 | 2500 | 1300 | 670 | 7.2 | 12 | 14 | |

GM-23: UA:TUT (664–674)[1]

| | 9/2/1999 | 9/20/2000 | 11/12/2001 | 9/28/2002 | 9/23/2003 | 9/14/2004 | 10/17/2005 | 9/28/2006 | 9/27/2007 | 10/23/2008 | 11/17/2009 | 9/29/2010 | 9/30/2011 | 9/7/2012 | 9/27/2013 | 10/10/2014 | 12/8/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 7.2 | 2.0 ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (200) U | ND (62) U | ND (20) U | ND (22) U | ND (25) U | ND (25) U | ND (25) U | ND (10) U | ND (1.0) U | |
| 1,1-Dichloroethane | 32.5 | 16.3 ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (200) U | ND (62) U | 5.0 J | ND (22) U | ND (25) U | ND (25) U | 2.6 J | 8.4 J | 1.5 | |
| 1,1-Dichloroethene | 17.2 | 5.3 ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (200) U | ND (62) U | ND (20) U | ND (22) U | ND (25) U | ND (25) U | 1.7 J | ND (10) U | 0.47 J | |
| Benzene | 1.9/ND (1.00) U | ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (200) U | ND (62) U | ND (20) U | ND (22) U | ND (25) U | ND (25) U | 0.28 J | ND (10) U | 0.69 J | |
| cis-1,2-Dichloroethene | 7530/ | 5620/ | 8400/ | 7700/ | 5800/ | 4600/ | 19000/ | 11000/ | 4700/ | 2000/ | 1100/ | 490/ | 580/ | 470 J | 210/ | 100/ | |
| Ethylbenzene | ND (1.0) U/ND (1.00) U | ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (200) U | ND (62) U | ND (20) U | ND (22) U | ND (25) U | ND (25) U | ND (25) U | ND (10) U | ND (1.0) U | |
| Tetrachloroethene | 6250/ | 3470/ | 15000/ | 10000/ | 12000/ | 6700/ | 2500/ | 370/ | 280/ | 72/ | 19 J/ | 50/ | 57/ | 33/ | 37/ | 3.6 J | 0.58 J |
| Toluene | ND (1.0) U/ND (1.00) U | ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (200) U | ND (62) U | ND (20) U | ND (22) U | ND (25) U | ND (25) U | ND (25) U | ND (10) U | ND (1.0) U | |
| trans-1,2-Dichloroethene | 54.5/ | 33.2/ ND (210) U | ND (200) U | ND (250) U | ND (250) U | ND (280) U | ND (170) U | 270/ | 130/ | 58/ | 31/ | 16 J/ | 23/ | 15/ | 20/ | 13/ | |
| Trichloroethene | 1460/ | 609/ | 2200/ | 1700/ | 1600/ | 1100/ | 490 J/ | 95 J/ | 82 J/ | ND (62) U | 8.3 J/ | 17 J/ | 33/ | 15 J/ | 28/ | 4.1 J/ | 5.0 |
| Vinyl chloride | 250/ | 120/ | 540/ | 540/ | 690/ | 870/ | 2800/ | 4100/ | 2100/ | 1100/ | 500/ | 210/ | 340/ | 120/ | 210/ | 39/ | 120 |
| Xylene (total) | ND (1.0) U/ND (1.00) U | ND (420) U | ND (400) U | ND (500) U | ND (500) U | ND (560) U | ND (330) U | ND (670) U | ND (400) U | ND (120) U | ND (40) U | ND (44) U | ND (50) U | ND (2.0) U | ND (20) U | ND (2.0) U | |

GM-27: UA:TT (681–691)

| | 9/1/1999 | 9/20/2000 | 11/13/2001 | 9/26/2002 | 9/23/2003 | 9/15/2004 | 10/17/2005 | 9/28/2006 | 9/27/2007 | 10/23/2008 | 9/27/2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (2.5) U | ND (2.0) U/ND (2.5) U | ND (2.0) U | ND (1.4) U | ND (1.0) U |
| 1,1-Dichloroethane | 2.4 | 2.1/2.2 | 1.8 J/1.9 J | 1.7 J | 1.9 J | 2.2 J | ND (2.5) U | 2.3 J/2.5 J | 2.0 J | 2.3 J | 2.0 J |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (2.5) U | ND (2.0) U/ND (2.5) U | ND (2.0) U | ND (1.4) U | ND (1.0) U |
| Benzene | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (2.5) U | ND (2.0) U/ND (2.5) U | ND (2.0) U | ND (1.4) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 20.0/ | 13.5/13.9 | 13/14 | 14/ | 12/ | 13/ | 14/ | 14/14 | 12/ | 11/ | 12/ |
| Ethylbenzene | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (2.5) U | ND (2.0) U/ND (2.5) U | ND (2.0) U | ND (1.4) U | ND (1.0) U |
| Tetrachloroethene | 1.7 | 1.2 | 6.8/7.2 | ND (3.3) U | 2.1 | 1.8 J | 0.94 J | 0.94 J/1.0 J | 0.90 J | 1.8 | 0.90 J |
| Toluene | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (2.5) U | ND (2.0) U/ND (2.5) U | ND (2.0) U | ND (1.4) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1.7) U | ND (1.7) U | ND (2.5) U | ND (1.7) U | 0.49 J | 0.92 J/1.0 J | 0.41 J | 0.51 J | 0.51 J |
| Trichloroethene | 5.7 | 1.1/1.2 | 1.1/1.2 | 1.0 J | 1.1 J | 1.1 J | 0.82 J | 0.92 J/1.0 J | 0.71 J | 0.77 J | 0.84 J |
| Vinyl chloride | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (2.5) U | ND (2.0) U | ND (2.0) U | 0.44 J | 0.18 J |
| Xylene (total) | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (5) U | ND (3.3) U | ND (5.0) U | ND (4.0) U/ND (5.0) U | ND (4.0) U | ND (2.9) U | ND (2.0) U |

GM-29: UA:TUT (693–703)

| | 9/1/1999 | 9/21/2000 | 11/13/2001 | 9/25/2002 | 9/24/2003 | 9/15/2004 | 10/17/2005 | 9/28/2006 | 9/26/2007 | 10/8/2008 | 11/17/2009 | 9/29/2010 | 9/30/2011 | 9/26/2012 | 9/27/2013 | 10/9/2014 | 12/8/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 37.8 | 24.5 ND (50) U | 16 J | 18 J | 21 J | 19 J | 17 J | 15 J | 11 J/0.1 J | 12 J/10 J | 18 | 11 J | 11 J | 15 | 9.5 J | 9.9 | |
| 1,1-Dichloroethane | 4.3 | 16.8 ND (50) U | ND (40) U | ND (33) U | ND (50) U | 18 J | 15 J | 15 J | 3.1 J/ND (1.4) U | 2.2 J | 3.6 | 2.1 | 1.7 | 8.2 J | 12 | 9.5 J | 10 |
| 1,1-Dichloroethene | 1.3 | 3.1 ND (50) U | ND (40) U | ND (33) U | ND (50) U | ND (50) U | ND (33) U | ND (50) U/ND (33) U | ND (10) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | ND (20) U | 1.2 J |
| Benzene | ND (1.0) U/ND (1.00) U | ND (50) U | ND (40) U | ND (33) U | ND (50) U | ND (50) U | ND (33) U | ND (50) U/ND (33) U | ND (10) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | 0.20 J | ND (14) U | ND (1.7) U | |
| cis-1,2-Dichloroethene | 320/ | 287 J/ | 1600/ | 1200/ | 1200/ | 1500/ | 1200/ | 1300/ | 900/750 | 600/ | 530/ | 530/ | 480/ | 440/ | 540/ | 560/ | |
| Ethylbenzene | ND (1.0) U/ND (1.00) U | ND (50) U | ND (40) U | ND (33) U | ND (50) U | ND (50) U | ND (33) U | ND (50) U/ND (33) U | ND (10) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | ND (20) U | ND (1.0) U |
| Tetrachloroethene | ND (20) U | 20.6 J | 17 J | 18 J | 12 J | 15 J | 14 J | 13 J | 9.3 J/ND (1.4) U | 7.2 J | 8.2 | 5.6 J | 5.1 J | 6.8 J | 5.2 J | 5.2 J | 1.5 |
| Toluene | ND (1.0) U | 2.2 ND (50) U | ND (40) U | ND (33) U | ND (50) U | ND (50) U | ND (33) U | ND (50) U/ND (33) U | ND (10) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | ND (20) U | ND (13) U | ND (20) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 11 J | 14 J | 26 J | 27 J | 29 J | 31 J | 18 J | 16 J/14 J | 12 J | 9.8 J | 11 | 7.6 J | 7.2 J | 9.2 J | 7.6 J | 8.2 J | 1.2 J |
| Trichloroethene | 878 | 289 | 270 | 310 | 390 | 440 | 390 | 310 | 350 | 300/250 | 370 | 330 | 320 | 310 | 280 | 260 | 270 |
| Vinyl chloride | 3.8 | 59 J | 230 | 140 | 190 | 310 | 190 | 150/110 | 90 | 56/43 | 45 | 36 | 33 | 49 | 40 | 48 | 24 |
| Xylene (total) | ND (1.0) U | ND (1.00) U | 52 ND (40) U | ND (33) U | ND (100) U | ND (100) U | ND (67) U | ND (100) U/ND (67) U | ND (20) U | ND (40) U | ND (25) U | ND (40) U | ND (25) U | ND (40) U | ND (25) U | ND (40) U | ND (3.3) U |

GM-28: UA:TUT (705–715)[1]

| | 9/1/1999 | 9/21/2000 | 11/15/2001 | 9/24/2002 | 10/1/2003 | 9/15/2004 | 10/18/2005 | 9/27/2006 | 9/20/2007 | 10/22/2008 | 11/16/2009 | 9/28/2010 | 10/5/2011 | 9/27/2012 | 9/27/2013 | 10/9/2014 | 12/8/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 17.7 | 5.0 ND (10) U | ND (1) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (5.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | |
| 1,1-Dichloroethane | 3.3 | 9.9 ND (10) U | 2.7 | 3.3 | 3.3 | 4.0 | 4.2 | 4.6/4.5 | 2.2 J | 3.6 | 4.6 | 2.1 | 2.7 | 3.2 | 2.1 | 1.2 J | |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (10) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (5.0) U | ND (1.0) U | 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 (1.00) U | ND (10) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (5.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | |
| cis-1,2-Dichloroethene | 1170/ | 37.0/ ND (10) U | 5.0 | 1.1 | 0.58 | 0.41 J | 0.32 J | 0.26 J | ND (1.0) U | 0.72 J/0.76 J | 6.9 | 2.3 | 2.1 | 2.1 | 0.72 J | 0.56 J | |
| Ethylbenzene | 5.9 | 2.0 ND (10) U | ND (1) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (5.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | |
| Tetrachloroethene | 1310/ | 2.3 ND (10) U | ND (1) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | 0.88 J/1.0 J | ND (1.0) U | ND (5.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.63 J |
| Toluene | ND (1.0) U | 1.0 ND (10) U | ND (1) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (5.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 9.2 | 22.3 | 11 | 11 | 4 | 1.2 | 0.63 J | 0.66 J | 0.58 J/0.59 J | 1.3 J | 1.7 | 1.5 | 0.69 J | 1.2 | 0.58 J | 0.41 J | |
| Trichloroethene | 760 | 1.4 | 140 | 130 | 110 | 110 | 110 | 110 | 110 | 110/100 | 130 | 120 | 120 | 120 | 110 | 110 | 48 |
| Vinyl chloride | 3.2 | 12.4 | ND (10) U | ND (1) U | 0.53 J | 0.44 J | 1.1 | 0.42 J | 1.2 J/1.0 J | 0.56 J | 0.33 J | 2.2 | 0.57 J | 0.49 J | 0.29 J | 0.18 J | |
| Xylene (total) | ND (1.0) U | ND (1.00) U | ND (10) U | ND (1) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (10) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | |

GM-288: UA:TT (702–712)

| | 12/28/2015 |
|---|---|
| | ug/L |
| 1,1,1-Trichloroethane | ND (1.0) U |
| 1,1-Dichloroethane | 0.55 J |
| 1,1-Dichloroethene | ND (1.0) U |
| Benzene | ND (1.0) U |
| cis-1,2-Dichloroethene | 56.8 |
| Ethylbenzene | ND (1.0) U |
| Tetrachloroethene | 49 |
| Toluene | ND (1.0) U |
| trans-1,2-Dichloroethene | 0.38 J |
| Trichloroethene | 24 |
| Vinyl chloride | 0.99 J |
| Xylene (total) | ND (2.0) U |

GM-46: UA:TUT (698–708)

| | 3/2/06 | 11/30/2006 | 10/9/2014 | 11/3/2015 |
|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 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 | 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 |
| Benzene | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 6.8 | 5.2 | 0.30 J | 0.41 J |
| Ethylbenzene | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Tetrachloroethene | ND (1.0) U | 0.67 J | 0.46 J | 0.47 J |
| Toluene | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 2.3/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Trichloroethene | 2.2 | 1.5 | ND (1.0) UB | 0.30 J |
| Vinyl chloride | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Xylene (total) | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

RMW-90: LA (674–684)

| | 1/15/2016 |
|---|---|
| | ug/L |
| 1,1,1-Trichloroethane | 7.1 |
| 1,1-Dichloroethane | 8.7 |
| 1,1-Dichloroethene | 0.49 J |
| Benzene | ND (1.0) U |
| cis-1,2-Dichloroethene | 38 |
| Ethylbenzene | ND (1.0) U |
| Tetrachloroethene | 0.86 J |
| Toluene | ND (1.0) U |
| trans-1,2-Dichloroethene | 1 |
| Trichloroethene | 29 |
| Vinyl chloride | 1 |
| Xylene (total) | ND (2.0) U |

GM-765: UA:TT (702–712)

| | 9/23/2007 | 10/9/2014 | 12/8/2015 |
|---|---|---|---|
| | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| 1,1-Dichloroethane | 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 |
| Benzene | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 0.46 J | 0.66 J | 0.36 J |
| Ethylbenzene | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Tetrachloroethene | 6.9 | 6.2 | 4.5 |
| Toluene | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 0.43 J | 0.48 J | 0.26 J |
| Trichloroethene | 2.2 | 2.6 | 1.4 |
| Vinyl chloride | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Xylene (total) | ND (2.0) U | ND (2.0) U | ND (2.0) U |

GM-675: UA:TT (686–696)

| | 9/20/1999 | 9/26/2000 | 11/9/2001 | 9/20/2002 | 10/2/2003 | 9/14/2004 | 10/19/2005 | 9/26/2006 | 9/19/2007 | 9/25/2008 | 9/19/2013 | 10/9/2014 | 12/8/2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | 24.6 | 12.5 | 3.5 | 4 | 3.9 | 4.2 | 3.5 | 3.2 | 2.3 | 3.4 | 4.7 | 3.2 | 2.9 |
| 1,1-Dichloroethane | 33.2 | 13.0 | 14 | 20 | 18 | 21 | 16 | 20 | 16 | 18 | 15 | 11 | 9.8 |
| 1,1-Dichloroethene | 1.2 | ND (1.00) U | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 |
| Benzene | ND (1.00) U | ND (1.00) U | ND (1.0) U | 0.49 J | ND (1.0) U | 0.42 J | 0.36 J | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 7.8 | 4.2 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Ethylbenzene | 35.3 | 23.9 | 14 | 15 | 15 | 15 | 14 | 15 | 11 | 13 | 13 | 9.8 | 8.5 |
| Tetrachloroethene | 14.4 | 7.1 | 12 | 28 | 24 | 20 | 17 | 16 | 12 | 14 | 16 | 12 | 9.8 |
| Toluene | 1.4 | ND (1.00) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 2.2 | 1.8 | 1.6 J | 1.6 J | ND (1.0) U | 1.2 | 1.1 | 1.2 | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 |
| Trichloroethene | 131 | 115 | 93 | 98 | 77 | 53 | 45 | 41 | 17 | 7.5 | 8.3 | 6.2 | 4.4 |
| Vinyl chloride | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Xylene (total) | ND (1.0) U | ND (1.00) U | ND (3.3) U | ND (3.3) U | ND (3.3) U | ND (3.3) U | ND (2.5) U | ND (2.0) U | 0.75 J | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

GM-59: UA:WT (697–707)[1]

| | 9/15/2006 | 10/3/2008 | 11/17/2009 | 4/8/2010 | 9/29/2010 | 9/30/2011 | 9/7/2012 | 9/27/2013 | 10/10/2014 | 12/8/2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L |
| 1,1,1-Trichloroethane | ND (14) U | ND (50) U/ND (33) U | ND (6.7) U | ND (8.0) U | ND (15) U | ND (13) U/ND (13) U | ND (50) U | ND (1.0) U | ND (1.0) U | ND (2.0) U |
| 1,1-Dichloroethane | ND (14) U | ND (50) U/ND (33) U | ND (6.7) U | ND (8.0) U | ND (15) U | ND (13) U/ND (13) U | ND (50) U | ND (1.0) U | ND (1.0) U | ND (2.0) U |
| 1,1-Dichloroethene | ND (14) U | ND (50) U/ND (33) U | ND (6.7) U | ND (8.0) U | ND (15) U | ND (13) U/ND (13) U | ND (50) U | ND (1.0) U | ND (1.0) U | ND (2.0) U |
| Benzene | ND (14) U | ND (50) U/ND (33) U | ND (6.7) U | ND (8.0) U | ND (15) U | ND (13) U/ND (13) U | ND (50) U | ND (1.0) U | ND (1.0) U | ND (2.0) U |
| cis-1,2-Dichloroethene | 4.0 J

CITY:(COLUMBUS) DIV/GROUP:(SER2) DB:(R. SMITH) LD:(Opt) PIC:(Opt) PM:(N. GILLOTTI) TM:(J. MANZO) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\DBLOWER-100015.dwg LAYOUT: MODEL SAVED: 2/24/2016 1:52 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/24/2016 1:54 PM BY: SMITH, BOB

| HR-13: LA:BT (648-658) | 9/15/1999 ug/L | 9/29/2000 ug/L | 11/14/2001 ug/L | 9/30/2002 ug/L | 9/16/2003 ug/L | 9/21/2004 ug/L | 10/25/2005 ug/L | 9/25/2006 ug/L | 9/25/2007 ug/L |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | 1.6/1.6 | 1.7 | 0.74 J | 1.4 | 2.2 | 2.6 | 2.3 | 2.0 | ND (1.0) U |
| 1,1-Dichloroethane | 41.4/42.8 | 39.5 | 15 | 25 | 33 | 30 | 25 | 22 | 1.5 |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | 0.27 J | 0.25 J | 0.18 J | ND (1.0) U |
| Benzene | ND (1.0) U | ND (1.00) U | 0.18 J | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 20.8/21.2 | 14.1 | 6.5 | 11 | 12 | 12 | 11 | 9.0 | 1.1 |
| Ethylbenzene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Tetrachloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | 0.20 J | 0.20 J | ND (1.0) U |
| Toluene | ND (1.0) U | ND (1.00) U | ND (1.0) U | 0.4 U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 3.1/3.3 | 2.5 | 0.65 | 1.4 | 1.8 | 1.5 | 1.5 | 1.4 | ND (1.0) U |
| Trichloroethene | 3.3/3.4 | 2.0 | 1.2 | 3.6 | 5.7 | 21 | 20 | 15 | 5.1 |
| Vinyl chloride | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | 0.43 J | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Xylene (total) | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

| RMW-88: LA (639-649) | 9/26/2012 ug/L | 9/27/2013 ug/L | 10/8/2014 ug/L | 10/30/2015 ug/L |
|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (1.4) U | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| 1,1-Dichloroethane | 17 | 35 | 32 | 27 |
| 1,1-Dichloroethene | ND (1.4) U | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| Benzene | ND (1.4) U | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| cis-1,2-Dichloroethene | 43 | 75 | 78 | 61 |
| Ethylbenzene | ND (1.4) U | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| Tetrachloroethene | ND (1.4) U | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| Toluene | 0.21 J | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| trans-1,2-Dichloroethene | 1.5 | 4.5 | 4.3 | 3.2 |
| Trichloroethene | ND (1.4) U | ND (1.0) U | ND (2.5) U | ND (2.0) U |
| Vinyl chloride | 1.1 J | 2.0 | 1.2 J | 1.5 J |
| Xylene (total) | ND (2.9) U | ND (2.0) U | ND (5.0) U | ND (4.0) U |

| HR-12: LA (611-621) | 9/14/1999 ug/L | 9/28/2000 ug/L | 11/14/2001 ug/L | 9/26/2002 ug/L | 9/18/2003 ug/L | 9/21/2004 ug/L | 10/24/2005 ug/L | 9/26/2006 ug/L | 9/19/2007 ug/L | 9/25/2008 ug/L | 11/13/2009 ug/L | 9/28/2010 ug/L | 9/28/2011 ug/L | 9/7/2012 ug/L | 9/26/2013 ug/L | 10/8/2014 ug/L | 12/8/2015 ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1.0) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.39 J | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| 1,1-Dichloroethane | 2.7 | 2.0/2.2 | 3.6 | 2.4/2.5 | 1.7 | 1.8 | 2.1 | 2.1 | 2.2 | ND (1.0) U | 2.0 | 2.1 | 2.8 | 2.1 | 1.8 | 3.4 | 2.4 |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Benzene | 1.2 | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 2.0 | 2.1 | 2.8 | 2.1 | 1.8 | 3.4 |
| cis-1,2-Dichloroethene | 1.8 | 1.8/2.0 | 2.7 | 2.1/2.2 | 1.4 | 1.2 | 1.5 | 1.3 | 1.3 | ND (1.0) U | 1.1 | 1.2 | 1.6 | 0.31 J | 0.24 J | 1.9 | 1.5 |
| Ethylbenzene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 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 (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 1.3 | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Toluene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (0.5) U | ND (0.5) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Trichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 5.2 | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) UB | ND (1.0) U |
| Vinyl chloride | 1.7 | 2.5/2.6 | 3.8 | 1.7/1.8 | 1.6 | 1.1 | 0.36 J | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 0.31 J |
| Xylene (total) | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

| GM-39: LA (615-625) | 12/10/2003 ug/L | 9/20/2004 ug/L | 10/24/2005 ug/L | 9/27/2006 ug/L | 9/26/2007 ug/L | 10/1/2008 ug/L | 9/27/2013 ug/L |
|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (1) U | ND (1) U | ND (1.0) U | 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) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U |
| 1,1-Dichloroethene | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Benzene | ND (1) U | ND (1) U | ND (1.0) U | 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 (0.5) U | ND (0.5) U | ND (1.0) U | ND (1.0) U | 7.6 J/9 J | 0.67 J | ND (1.0) U |
| Ethylbenzene | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Tetrachloroethene | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Toluene | 0.18 J | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | 0.63 J |
| trans-1,2-Dichloroethene | ND (0.5) U | ND (0.5) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/0.23 J | ND (1.0) U | ND (1.0) U |
| Trichloroethene | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | 0.63 J |
| Vinyl chloride | 1.3 | 1.8 | 0.77 J | 1.7 | 2.5/1.6 | 3.2 | 1.5 |
| Xylene (total) | ND (1) U | ND (1) U | ND (2.0) U | ND (2.0) U | ND (2.0) U/ND (2.0) U | ND (2.0) U | ND (2.0) U |

| GM-67D: LA:BT (653-663) | 5/3/2007 ug/L | 10/10/2014 ug/L | 11/4/2015 ug/L |
|---|---|---|---|
| 1,1,1-Trichloroethane | 0.59 J | 1.2 J | 2.5 |
| 1,1-Dichloroethane | 3.0 | 3.7 | 6.8 |
| 1,1-Dichloroethene | 0.36 J | ND (3.3) U | 1.8 |
| Benzene | ND (1.7) U | ND (3.3) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 23 | 120 | 140 F1K |
| Ethylbenzene | ND (1.7) U | ND (3.3) U | ND (1.0) U |
| Tetrachloroethene | 54 | 0.84 J | 1.7 |
| Toluene | ND (1.7) U | ND (3.3) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 0.83 J | 2.6 J | 4.6 |
| Trichloroethene | 45 | 15 | 76 |
| Vinyl chloride | ND (1.7) U | 3.5 | 0.70 J |
| Xylene (total) | ND (3.3) U | ND (6.7) U | ND (2.0) U |

| HR-15: LA (634-644) | 9/15/1999 ug/L | 9/29/2000 ug/L | 11/14/2001 ug/L | 9/30/2002 ug/L | 9/17/2003 ug/L | 9/21/2004 ug/L | 10/25/2005 ug/L | 9/25/2006 ug/L | 9/26/2007 ug/L | 9/29/2008 ug/L | 11/13/2009 ug/L | 9/24/2010 ug/L | 9/28/2011 ug/L | 9/6/2012 ug/L | 9/26/2013 ug/L | 10/7/2014 ug/L | 11/4/2015 ug/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 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 (1.00) U | ND (1.0) U | ND (1) U/ND (1) UJ | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| 1,1-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 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 (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 2.5 | 2.8 | 0.86 | 0.98/1 | 2.2 | 2.5 | 2.2 | 2.1/2.2 | 2.5 | 3.6 | 3.1 | 3.0 | 3.5 | 3.9 | 3.5 | 3.5 | 3.5 |
| Ethylbenzene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | 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 (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Toluene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (1.0) U | ND (1.00) U | ND (0.50) U | ND (0.5) U | ND (0.5) U | ND (0.5) U | ND (0.5) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Trichloroethene | ND (1.0) U | ND (1.00) U | ND (1.0) U | ND (1) U | ND (1) U | ND (1) U | ND (1.0) U | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U | ND (1.0) U |
| Vinyl chloride | 1.5 | 1.5/1.5 | 1.0 | 1.1 | 2.1 | 2.0 | 1.8 | 1.7 | 1.9 | 2.6 | 2 | | | | | | |
| Xylene (total) | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U/ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U | ND (2.0) U |

| 31: LA (612-644)[1] | 9/29/2000 ug/L | 11/15/2001 ug/L |
|---|---|---|
| 1,1,1-Trichloroethane | ND (1.00) U | ND (1) U |
| 1,1-Dichloroethane | 7.4 | 3.1 |
| 1,1-Dichloroethene | ND (1.00) U | ND (1) U |
| Benzene | ND (1.00) U | ND (1) U |
| cis-1,2-Dichloroethene | 8.4 | 2.4 |
| Ethylbenzene | ND (1.00) U | ND (1) U |
| Tetrachloroethene | ND (1.00) U | ND (1) U |
| Toluene | ND (1.00) U | ND (1) U |
| trans-1,2-Dichloroethene | ND (1.00) U | ND (0.5) U |
| Trichloroethene | 12.9 | 5.1 |
| Vinyl chloride | 4.4 | 2.5 |
| Xylene (total) | ND (1.00) U | ND (1) U |

| 39: LA (590-615)[1] | 9/27/2002 ug/L | 9/24/2003 ug/L |
|---|---|---|
| 1,1,1-Trichloroethane | ND (1.0) U | ND (1) U |
| 1,1-Dichloroethane | 1.6 | 0.58 J |
| 1,1-Dichloroethene | ND (1.0) U | ND (1) U |
| Benzene | ND (1.0) U | ND (1) U |
| cis-1,2-Dichloroethene | 1.3 | 0.71 |
| Ethylbenzene | ND (1.0) U | ND (1) U |
| Tetrachloroethene | ND (1.0) U | ND (1) U |
| Toluene | ND (1.0) U | ND (1) U |
| trans-1,2-Dichloroethene | ND (0.5) U | ND (0.5) U |
| Trichloroethene | 3.8 | 0.89 J |
| Vinyl chloride | 0.51 J | ND (1) U |
| Xylene (total) | ND (1.0) U | ND (1) U |

| GM-76D: LA:BT (659-669) | 9/23/2007 ug/L | 10/9/2014 ug/L | 10/30/2015 ug/L |
|---|---|---|---|
| 1,1,1-Trichloroethane | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| 1,1-Dichloroethane | 1.6 | 0.29 J/0.30 J | ND (2.0) U |
| 1,1-Dichloroethene | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| Benzene | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| cis-1,2-Dichloroethene | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| Ethylbenzene | ND (1.0) U/ND (1.0) U | 0.24 J | ND (2.0) U |
| Tetrachloroethene | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| Toluene | 0.65 J/0.63 J | 35 | 49 |
| trans-1,2-Dichloroethene | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| Trichloroethene | ND (1.0) U/ND (1.0) U | ND (1.0) U | ND (2.0) U |
| Vinyl chloride | 0.77 J | 1.0 J | 0.41 J |
| Xylene (total) | ND (2.0) U/ND (2.0) U | ND (2.0) U | ND (4.0) U |

| GM-74D: LA:BT (653-663) | 9/27/2007 ug/L | 4/9/2010 ug/L |
|---|---|---|
| 1,1,1-Trichloroethane | ND (8.0) U | ND (2.5) U |
| 1,1-Dichloroethane | ND (8.0) U | ND (2.5) U |
| 1,1-Dichloroethene | ND (8.0) U | ND (2.5) U |
| Benzene | ND (8.0) U | ND (2.5) U |
| cis-1,2-Dichloroethene | ND (8.0) U | 8.0 |
| Ethylbenzene | ND (8.0) U | ND (2.5) U |
| Tetrachloroethene | 250 | 98 |
| Toluene | ND (8.0) U | ND (2.5) U |
| trans-1,2-Dichloroethene | ND (8.0) U | ND (2.5) U |
| Trichloroethene | 130 | 50 |
| Vinyl chloride | ND (8.0) U | ND (2.5) U |
| Xylene (total) | ND (16) U | ND (5.0) U |

| HR-14: LA (642-652) | 9/15/1999 ug/L | 9/30/2002 ug/L |
|---|---|---|
| 1,1,1-Trichloroethane | ND (1) U | ND (1) U |
| 1,1-Dichloroethane | ND (1) U | ND (1) U |
| 1,1-Dichloroethene | ND (1) U | ND (1) U |
| Benzene | ND (1) U | ND (1) U |
| cis-1,2-Dichloroethene | 7.9 | 3.6 |
| Ethylbenzene | ND (1) U | ND (1) U |
| Tetrachloroethene | ND (1) U | ND (1) U |
| Toluene | ND (1) U | 0.57 U |
| trans-1,2-Dichloroethene | ND (1) U | ND (0.5) U |
| Trichloroethene | 3.4 | 1.2 |
| Vinyl chloride | 11.5 | ND (1) U |
| Xylene (total) | ND (1) U | ND (1) U |

| GM-61: LA:BT (652-662) | 9/15/2006 ug/L | 9/26/2007 ug/L | 10/1/2008 ug/L | 9/26/2013 ug/L |
|---|---|---|---|---|
| 1,1,1-Trichloroethane | 0.54 J/0.50 J | 0.59 J | ND (1.0) U | ND (1.0) U |
| 1,1-Dichloroethane | 2.4/2.2 | 1.6 J | 0.94 J | 1.3 |
| 1,1-Dichloroethene | ND (1.4) U/ND (1.7) U | ND (1.7) U | 0.19 J | ND (1.0) U |
| Benzene | ND (1.4) U/ND (1.7) U | ND (1.7) U | ND (1.0) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 3.0/2.6 | 3.9 | 20 | 17 |
| Ethylbenzene | ND (1.4) U/ND (1.7) U | ND (1.7) U | ND (1.0) U | ND (1.0) U |
| Tetrachloroethene | 24/20 | 28 | 13 | 7.2 |
| Toluene | ND (1.4) U/0.44 J | ND (1.7) U | ND (1.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (1.4) U/ND (1.7) U | ND (1.7) U | 0.92 J | 1.1 |
| Trichloroethene | 40/36 | 56 | 23 | 5.2 |
| Vinyl chloride | ND (1.4) U/ND (1.7) U | ND (1.7) U | 0.75 J | 1.2 |
| Xylene (total) | ND (2.9) U/ND (3.3) U | ND (3.3) U | ND (2.0) U | ND (2.0) U |

| RMW-85: LA (641-651) | 9/26/2012 ug/L | 9/27/2013 ug/L | 10/9/2014 ug/L | 12/8/2015 ug/L |
|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (10) U | 0.19 J | ND (2.0) U | ND (1.0) U |
| 1,1-Dichloroethane | ND (10) U | 0.84 J | ND (2.0) U | 0.41 U |
| 1,1-Dichloroethene | ND (10) U | ND (1.0) U | ND (2.0) U | ND (1.0) U |
| Benzene | ND (10) U | ND (1.0) U | 0.75 J | ND (1.0) U |
| cis-1,2-Dichloroethene | ND (10) U | 60 | 55 | 18 |
| Ethylbenzene | ND (10) U | ND (1.0) U | ND (2.0) U | ND (1.0) U |
| Tetrachloroethene | 280 | 61 | 40 | 49 |
| Toluene | ND (10) U | ND (1.0) U | ND (2.0) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (10) U | 0.48 J | 1.8 J | ND (1.0) U |
| Trichloroethene | 120 | 95 | 78 | 82 |
| Vinyl chloride | ND (10) U | 0.31 J | 5 | 0.31 U |
| Xylene (total) | ND (20) U | ND (2.0) U | ND (4.0) U | ND (2.0) U |

| GM-68D: LA:BT (658-668) | 5/4/2007 ug/L | 10/3/2008 ug/L | 11/16/2009 ug/L | 9/29/2010 ug/L | 9/30/2011 ug/L | 9/7/2012 ug/L | 9/26/2013 ug/L | 10/10/2014 ug/L | 11/3/2015 ug/L |
|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | 0.47 J | 0.71 J | 1.1 |
| 1,1-Dichloroethane | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| 1,1-Dichloroethene | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| Benzene | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| cis-1,2-Dichloroethene | ND (50) U/ND (50) U | 14 | 4.5 | 3.0 J/2.8 J | 1.5 J | ND (3.3) U | 0.77 J | 1.1 J | ND (1.0) U |
| Ethylbenzene | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| Tetrachloroethene | 1500/1500 | 190 | 130 J | 100/100 | 62 | 49 | 45 | 36 | 30 |
| Toluene | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| Trichloroethene | 770/750 | 46 | 35 | 22/23 | 13 | 6.9 | 5.6 | 3.7 | 2.2 |
| Vinyl chloride | ND (50) U/ND (50) U | ND (5.0) U | ND (2.0) U | ND (3.3) U/ND (3.3) U | ND (1.7) U | ND (3.3) U | ND (1.0) U | ND (1.4) U | ND (1.0) U |
| Xylene (total) | ND (100) U/ND (100) U | ND (10) U | ND (4.0) U | ND (6.7) U/ND (6.7) U | ND (3.3) U | ND (6.7) U | ND (2.0) U | ND (2.9) U | ND (2.0) U |

| GM-69: LA (632-642) | 5/3/2007 ug/L |
|---|---|
| 1,1,1-Trichloroethane | ND (12) U |
| 1,1-Dichloroethane | 8.7 U |
| 1,1-Dichloroethene | ND (12) U |
| Benzene | ND (12) U |
| cis-1,2-Dichloroethene | 29 |
| Ethylbenzene | ND (12) U |
| Tetrachloroethene | 6.5 J |
| Toluene | ND (12) U |
| trans-1,2-Dichloroethene | ND (12) U |
| Trichloroethene | 300 |
| Vinyl chloride | ND (12) U |
| Xylene (total) | ND (24) U |

| GM-82: LA (638-648) | 2/26/2008 ug/L | 10/2/2008 ug/L | 9/26/2013 ug/L |
|---|---|---|---|
| 1,1,1-Trichloroethane | 2.4/ND (2.0) U | 1.0 J | 0.49 J |
| 1,1-Dichloroethane | 2.5/2.3 | 2.4 J | 1.4 |
| 1,1-Dichloroethene | 0.43 J/ND (2.0) U | 0.64 J | 0.60 J |
| Benzene | ND (2.0) U/ND (2.0) U | ND (3.3) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 47/47 | 46 | 41 |
| Ethylbenzene | ND (2.0) U/ND (2.0) U | ND (3.3) U | ND (1.0) U |
| Tetrachloroethene | 67/60 | 51 | 20 |
| Toluene | ND (2.0) U/ND (2.0) U | ND (3.3) U | ND (1.0) U |
| trans-1,2-Dichloroethene | 1.7 J/1.9 J | 2.0 J | 1.3 |
| Trichloroethene | 100/91 | 100 | 56 |
| Vinyl chloride | ND (2.0) U/ND (2.0) U | ND (3.3) U | 7.4 |
| Xylene (total) | ND (4.0) U/ND (4.0) U | ND (6.7) U | ND (2.0) U |

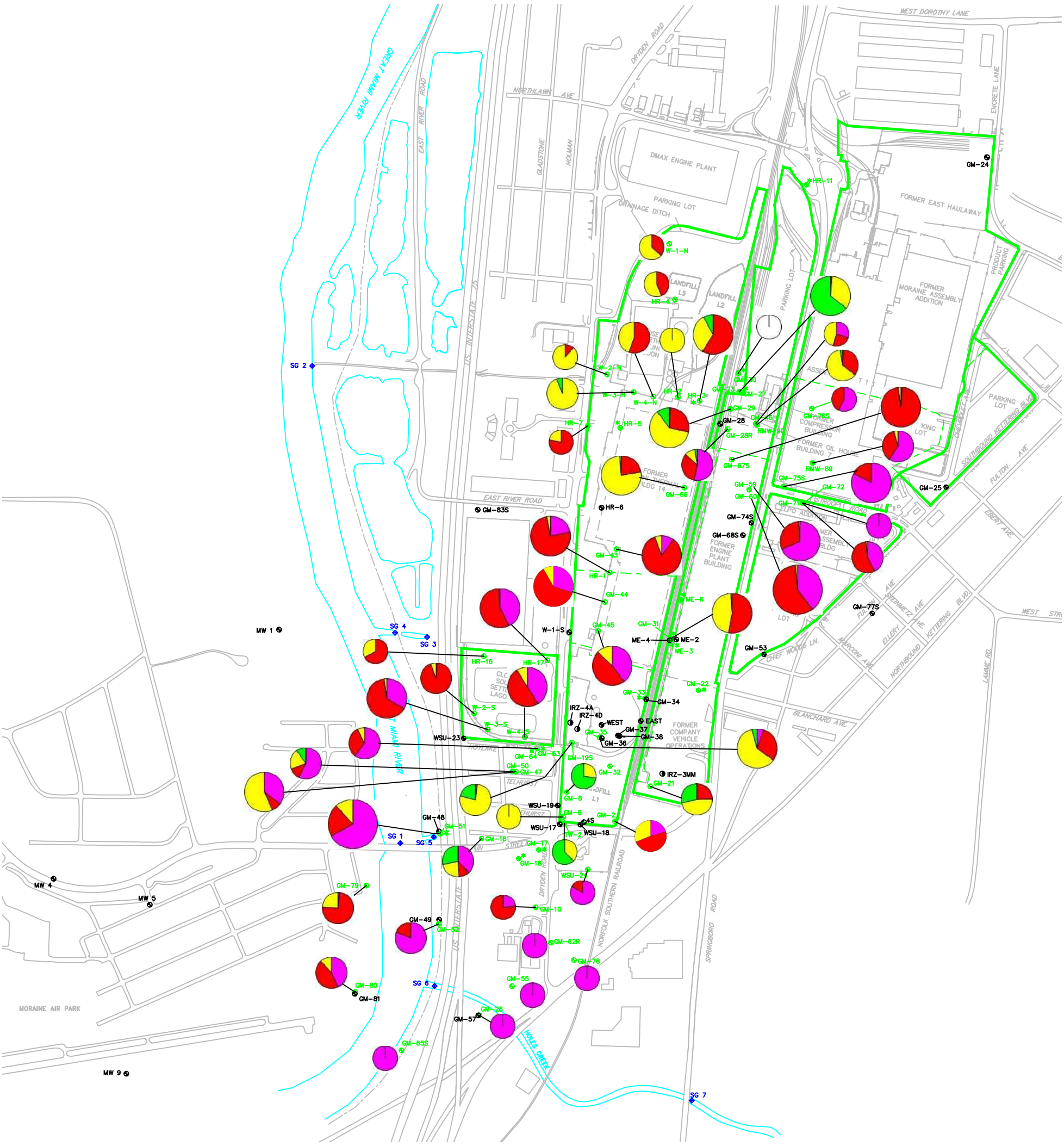
| GM-75D: LA (643-653) | 9/26/2007 ug/L | 10/6/2008 ug/L | 11/16/2009 ug/L | 4/8/2010 ug/L | 9/29/2010 ug/L | 9/30/2011 ug/L | 9/7/2012 ug/L | 9/27/2013 ug/L | 12/4/2014 ug/L | 12/8/2015 ug/L |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | ND (1.0) U | ND (5.7) U | ND (1.0) U |
| 1,1-Dichloroethane | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | 0.40 J | ND (5.7) U | ND (1.0) U |
| 1,1-Dichloroethene | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | 0.28 J | ND (5.7) U | ND (1.0) U |
| Benzene | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | ND (1.0) U | ND (5.7) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 14/15 | 19 | 12/11 | 12 | 31 | 25 | 11 | 22 | | |
| Ethylbenzene | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | ND (1.0) U | ND (5.7) U | ND (1.0) U |
| Tetrachloroethene | 470 | 220 | 310/320 | 320 | 260/270 | 200 | 150 | 180 | 190 | 140 |
| Toluene | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | ND (1.0) U | ND (5.7) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | ND (4.0) U | ND (11) U | 0.58 J | ND (5.7) U | 0.38 J |
| Trichloroethene | 1700 J | 750 | 200/210 | 200 | 190/200 | 180 | 150 | 180 | 180 | 150 |
| Vinyl chloride | ND (50) U | ND (33) U | ND (5.0) U/ND (5.0) U | ND (9.1) U | ND (9.1) U/ND (8.0) U | 2.1 J | 4.7 J | 3.2 | ND (5.7) U | 0.37 J |
| Xylene (total) | ND (100) U | ND (67) U | ND (10) U/ND (10) U | ND (18) U | ND (18) U/ND (16) U | ND (8.0) U | ND (22) U | ND (2.0) U | ND (11) U | ND (2.0) U |

| GM-41: LA (617-627) | 12/10/2003 ug/L | 9/21/2004 ug/L | 10/24/2005 ug/L | 9/18/2006 ug/L | 5/3/2007 ug/L | 9/20/2007 ug/L | 9/26/2008 ug/L | 9/27/2013 ug/L |
|---|---|---|---|---|---|---|---|---|
| 1,1,1-Trichloroethane | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| 1,1-Dichloroethane | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| 1,1-Dichloroethene | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| Benzene | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| cis-1,2-Dichloroethene | 24 | 16/17 | 11 | 10 | 17 | 12 | | |
| Ethylbenzene | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| Tetrachloroethene | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| Toluene | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | ND (6.7) U | ND (7.1) U | ND (1.0) U |
| trans-1,2-Dichloroethene | ND (5.6) U | ND (3.1) U | ND (10) U/ND (10) U | ND (4.0) U | ND (6.7) U | 1.4 J/ND (7.1) U | | 0.89 J |
| Trichloroethene | 320 | 180 | 250/290 | 210 | 170 | 230 | 180 | 79 |
| Vinyl chloride | ND (11) U | ND (6.2) U | ND (10) U/ND (10) U | ND (4.0) U | 2.4 J | 1.9 J/ND (7.1) U | | 1.9 |
| Xylene (total) | ND (11) U | ND (6.2) U | ND (20) U/ND (20) U | ND (8.0) U | ND (13) U | ND (13) U | ND (14) U | ND (2.0) U |

| GM-73: LA (642-652) | 10/23/2007 ug/L |
|---|---|
| 1,1,1-Trichloroethane | ND (6.7) U |
| 1,1-Dichloroethane | ND (6.7) U |
| 1,1-Dichloroethene | ND (6.7) U |
| Benzene | ND (6.7) U |
| cis-1,2-Dichloroethene | ND (6.7) U |
| Ethylbenzene | ND (6.7) U |
| Tetrachloroethene | 160 |
| Toluene | ND (6.7) U |
| trans-1,2-Dichloroethene | ND (6.7) U |
| Trichloroethene | 22 |
| Vinyl chloride | ND (6.7) U |
| Xylene (total) | ND (13) U |

| GM-70: LA (655-665

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-09.dwg LAYOUT: FIG - VOCS UPPER WELLS SAVED: 2/18/2016 3:05 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/29/2016 10:25 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (USED FOR SITE-WIDE MONITORING)
- STREAM GAUGE
- CARBON INTRODUCTION WELL
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON AN ANNUAL BASIS (UPPER AQUIFER)
- MONITORING WELL USED FOR SITE-WIDE MONITORING ON A FIVE-YEAR BASIS (UPPER AQUIFER)
- FORMER BUILDING FOOTPRINT
- RIVER LEVEE
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY

>1000 ug/L

101-1000 ug/L

11-100 ug/L

0-10 ug/L

MAGENTA: TETRACHLOROETHENE
RED: TRICHLOROETHENE
YELLOW: cis-1,2-DICHLOROETHENE
GREEN: VINYL CHLORIDE

VOC VOLATILE ORGANIC COMPOUND
ug/L MICROGRAMS PER LITER

NOTES:

1. THE SIZE OF THE PIE CHART REPRESENTS MAGNITUDE OF THE TOTAL VOC CONCENTRATION IN EACH WELL IN MICROGRAMS PER LITER (ug/L).
2. THE PIE PORTIONS REPRESENT THE MOLAR CONCENTRATION IN MICROGRAMS PER LITER OF THE SELECT VOC CONSTITUENTS IN EACH WELL.

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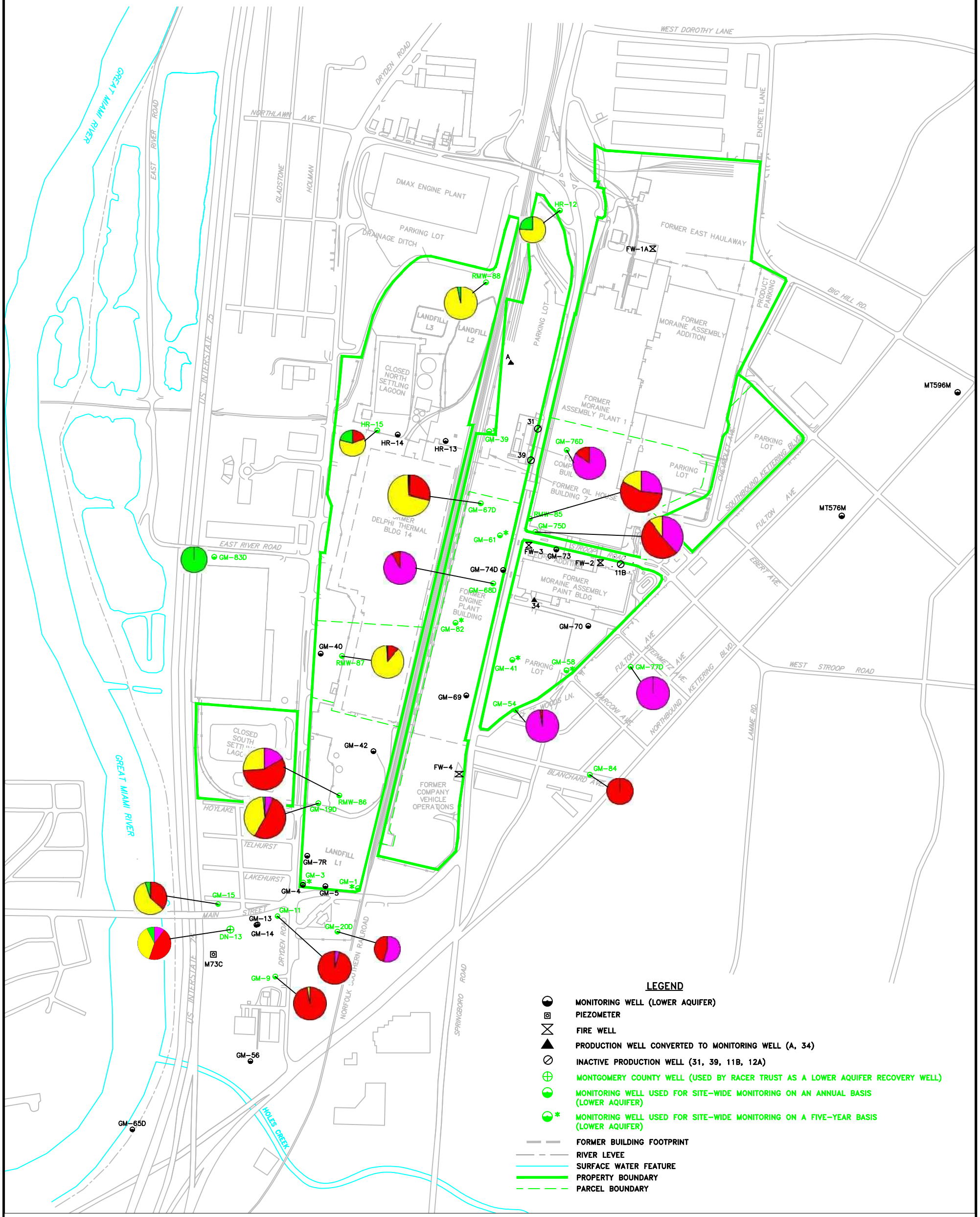
# SELECT VOC CONCENTRATIONS - UPPER AQUIFER

ARCADIS Design & Consultancy for natural and built assets

FIGURE
11

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-09.dwg LAYOUT: FIG - VOCS DEEP WELLS SAVED: 2/18/2016 3:05 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/29/2016 10:26 AM BY: SMITH, BOB




>1000 ug/L

101-1000 ug/L

11-100 ug/L

0-10 ug/L

MAGENTA: TETRACHLOROETHENE
RED: TRICHLOROETHENE
YELLOW: cis-1,2-DICHLOROETHENE
GREEN: VINYL CHLORIDE

VOC VOLATILE ORGANIC COMPOUND
ug/L MICROGRAMS PER LITER

NOTES:
1. THE SIZE OF THE PIE CHART REPRESENTS MAGNITUDE OF THE TOTAL VOC CONCENTRATION IN EACH WELL IN MICROGRAMS PER LITER (ug/L).
2. THE PIE PORTIONS REPRESENT THE MOLAR CONCENTRATION IN MICROGRAMS PER LITER OF THE SELECT VOC CONSTITUENTS IN EACH WELL.

N

0 200 700ft

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# SELECT VOC CONCENTRATIONS - LOWER AQUIFER

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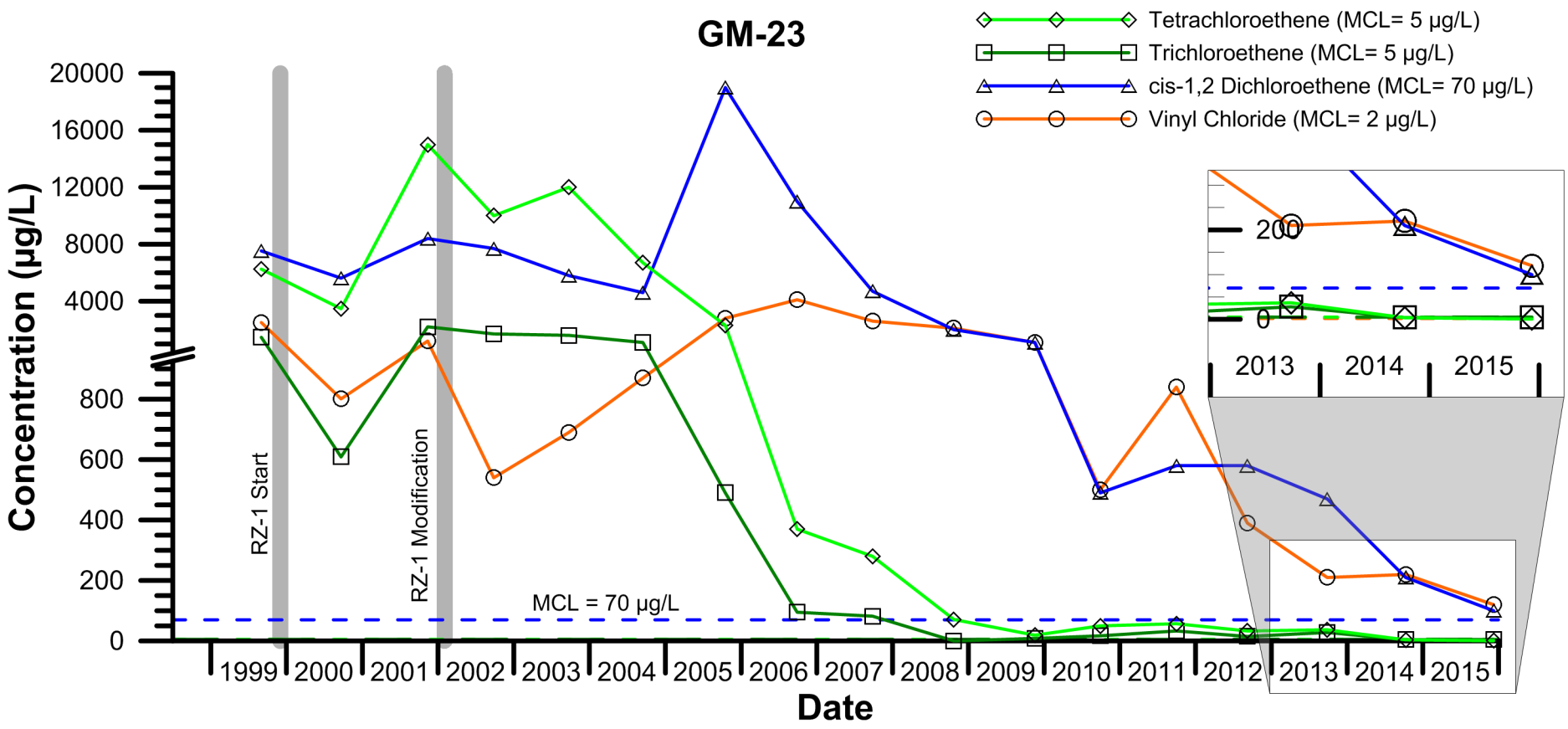
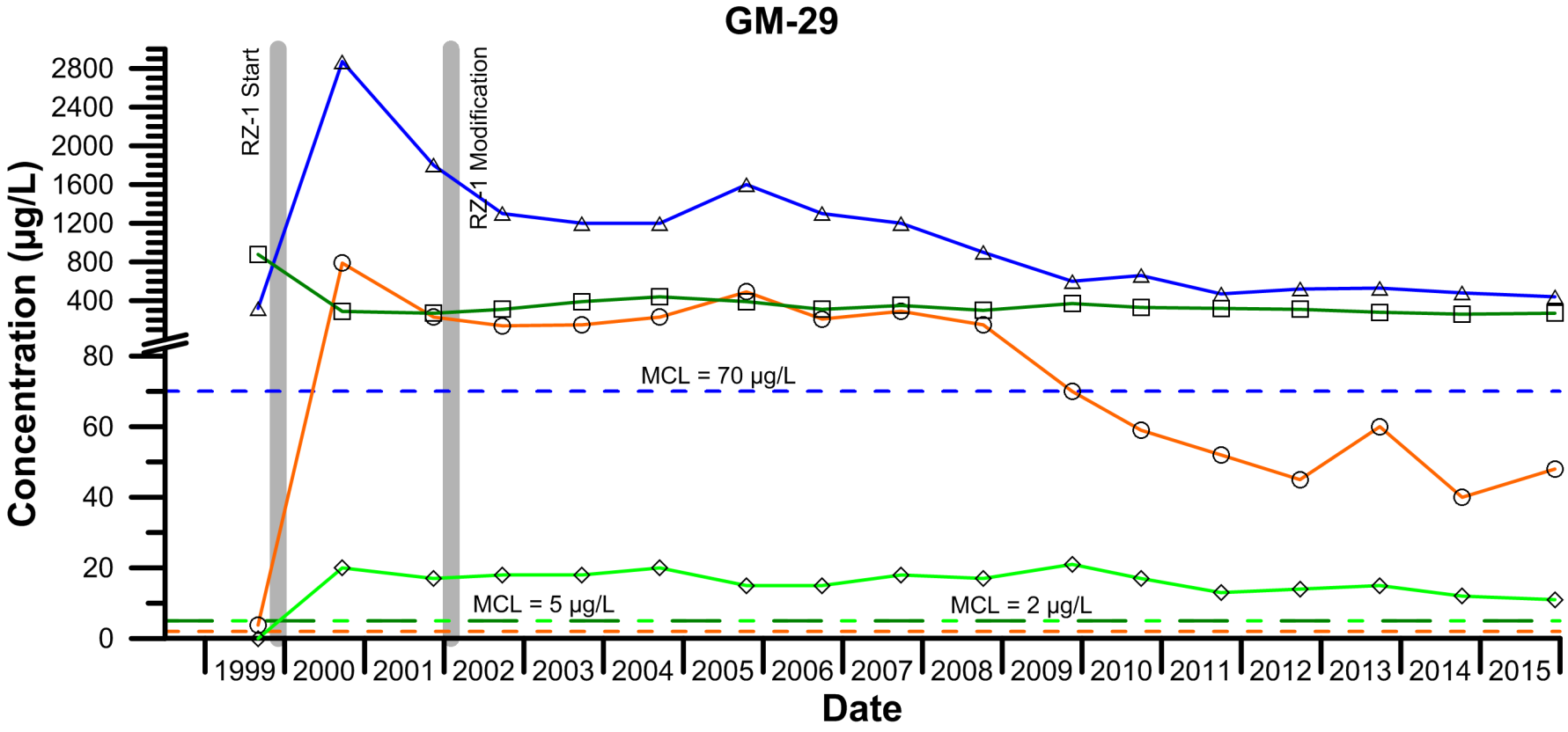
FIGURE
12

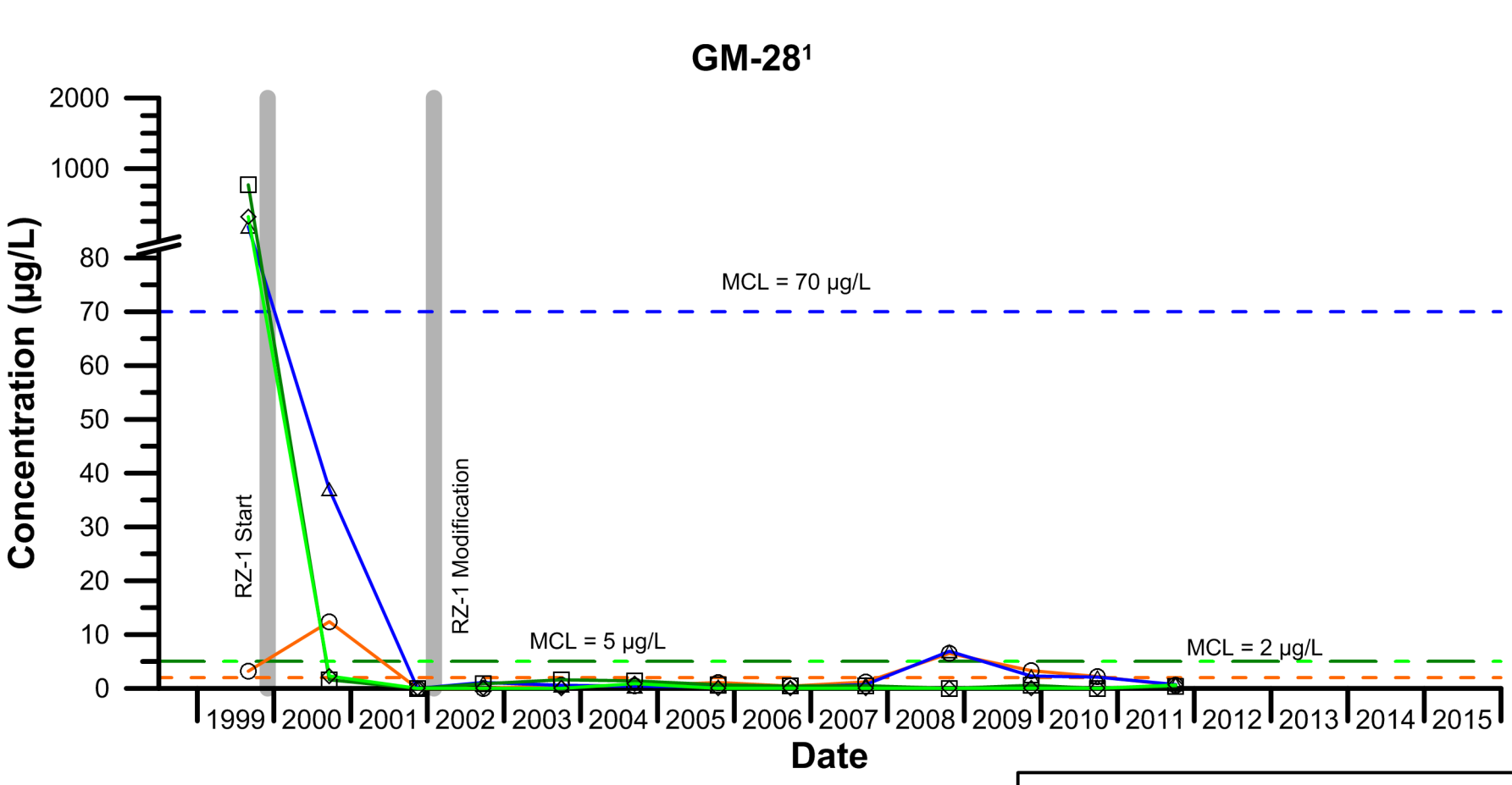
## GM-23




## GM-29




## GM-28[1]




1. Performance monitoring well GM-28 was not sampled in 2012 through 2015 due to an obstruction in the well. Monitoring well GM-28R was installed and sampled on December 28, 2015.

MCL = Maximum Contaminant Level
µg/L = micrograms per liter

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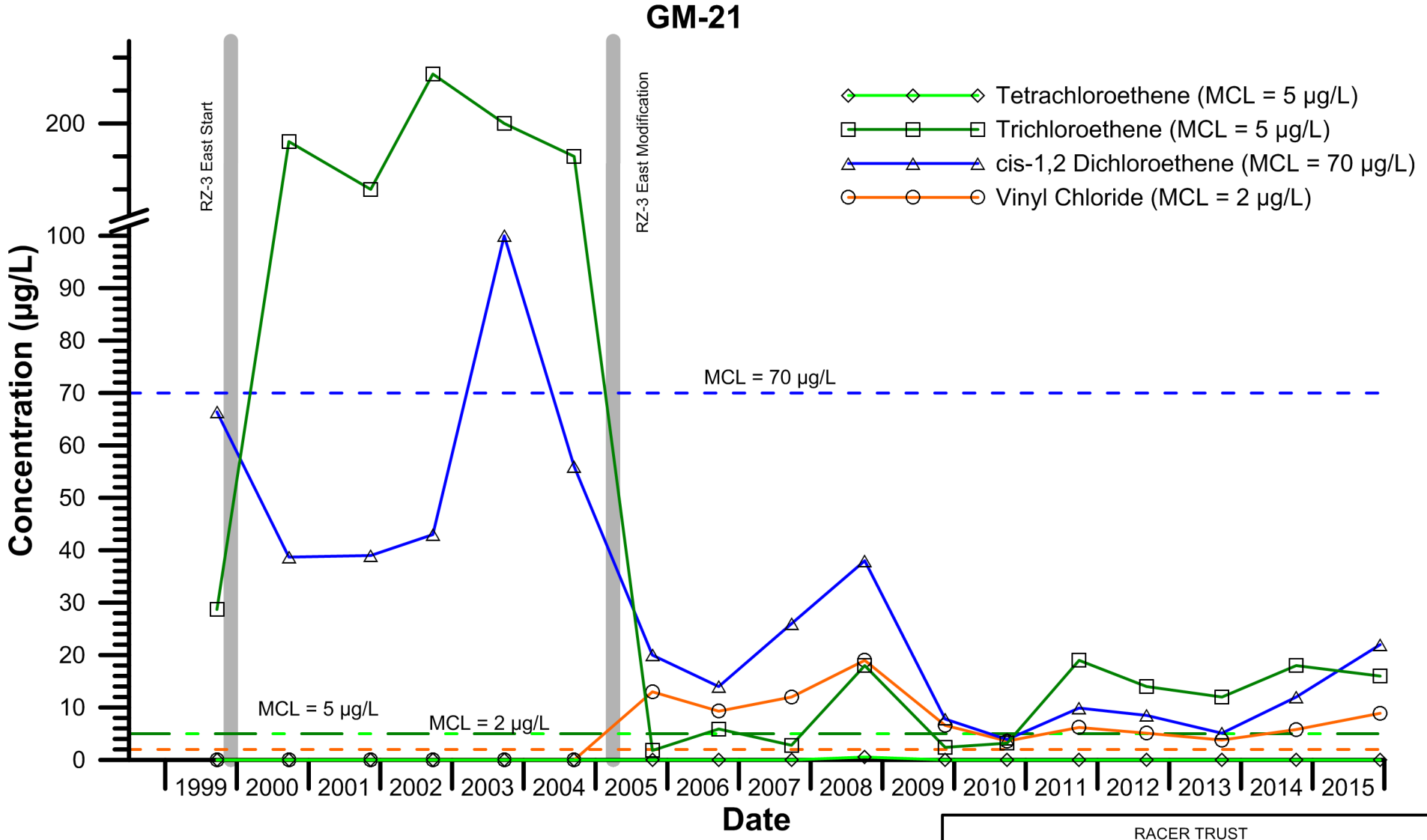
**RZ-1 AREA GROUNDWATER CONCENTRATION GRAPHS**

ARCADIS Design & Consultancy for natural and built assets

FIGURE
13




MCL = Maximum Contaminant Level
µg/L = micrograms per liter

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**RZ-3 EAST AREA GROUNDWATER CONCENTRATION GRAPH**

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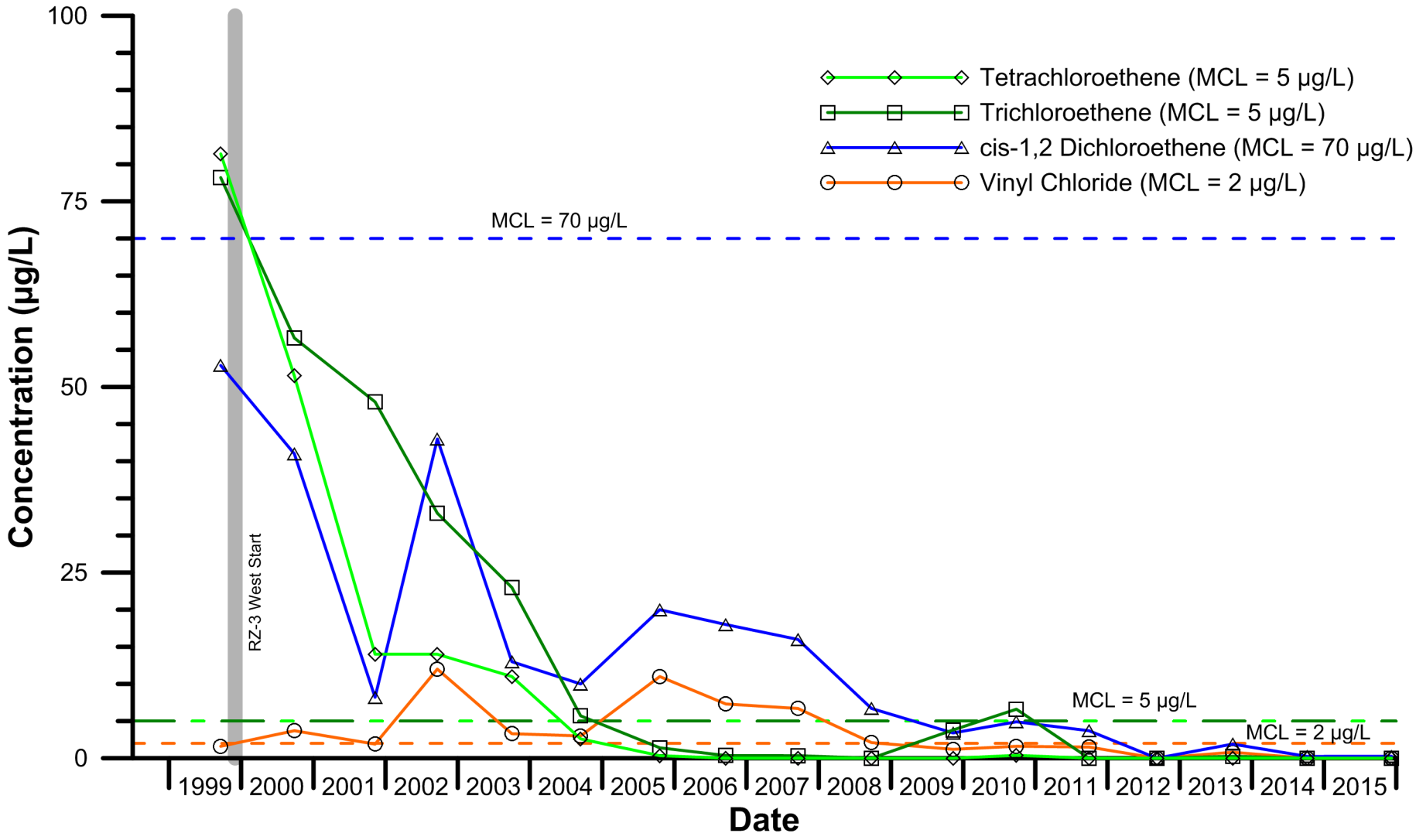
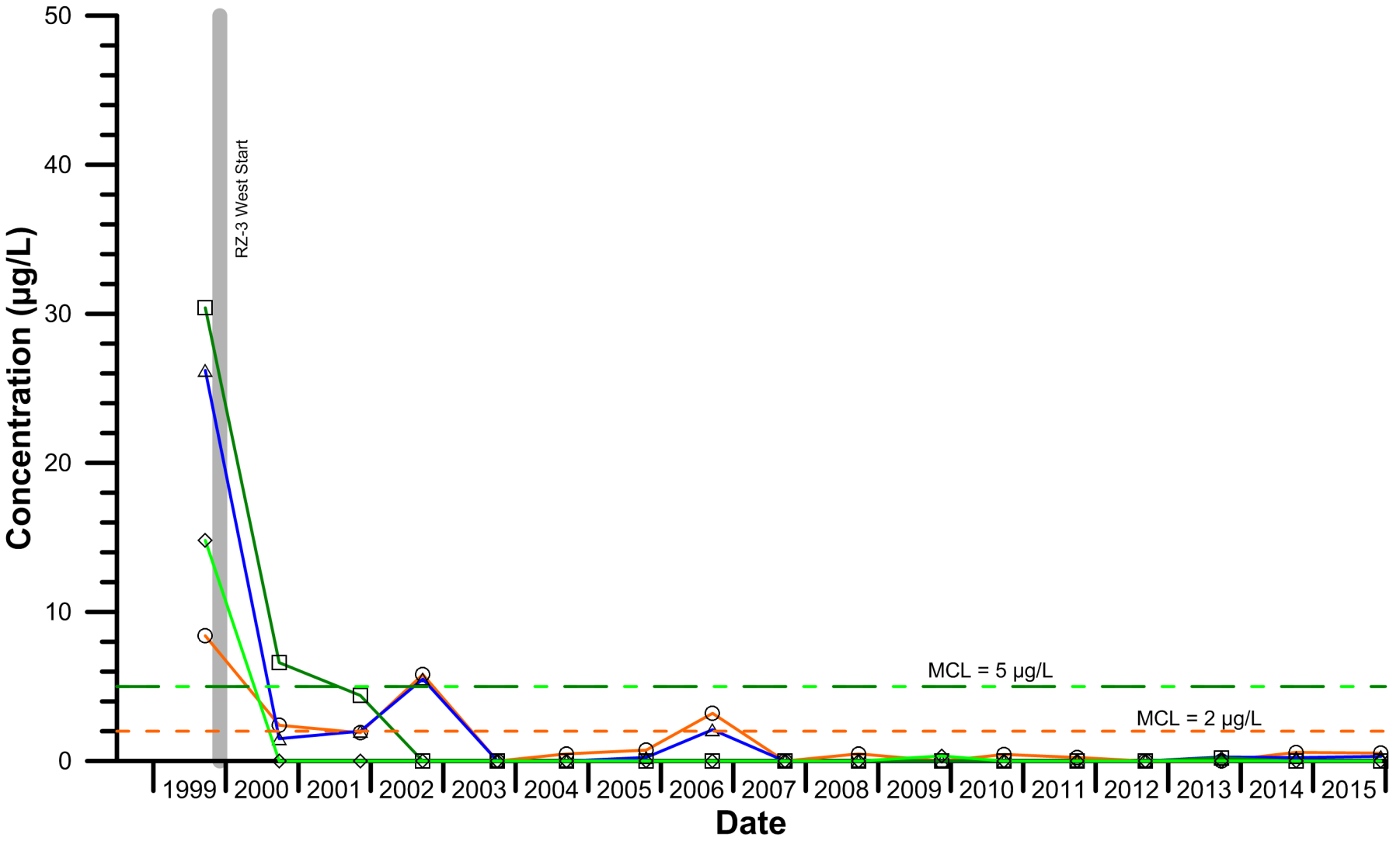
FIGURE
14

## GM-6




## GM-8




MCL = Maximum Contaminant Level
µg/L = micrograms per liter

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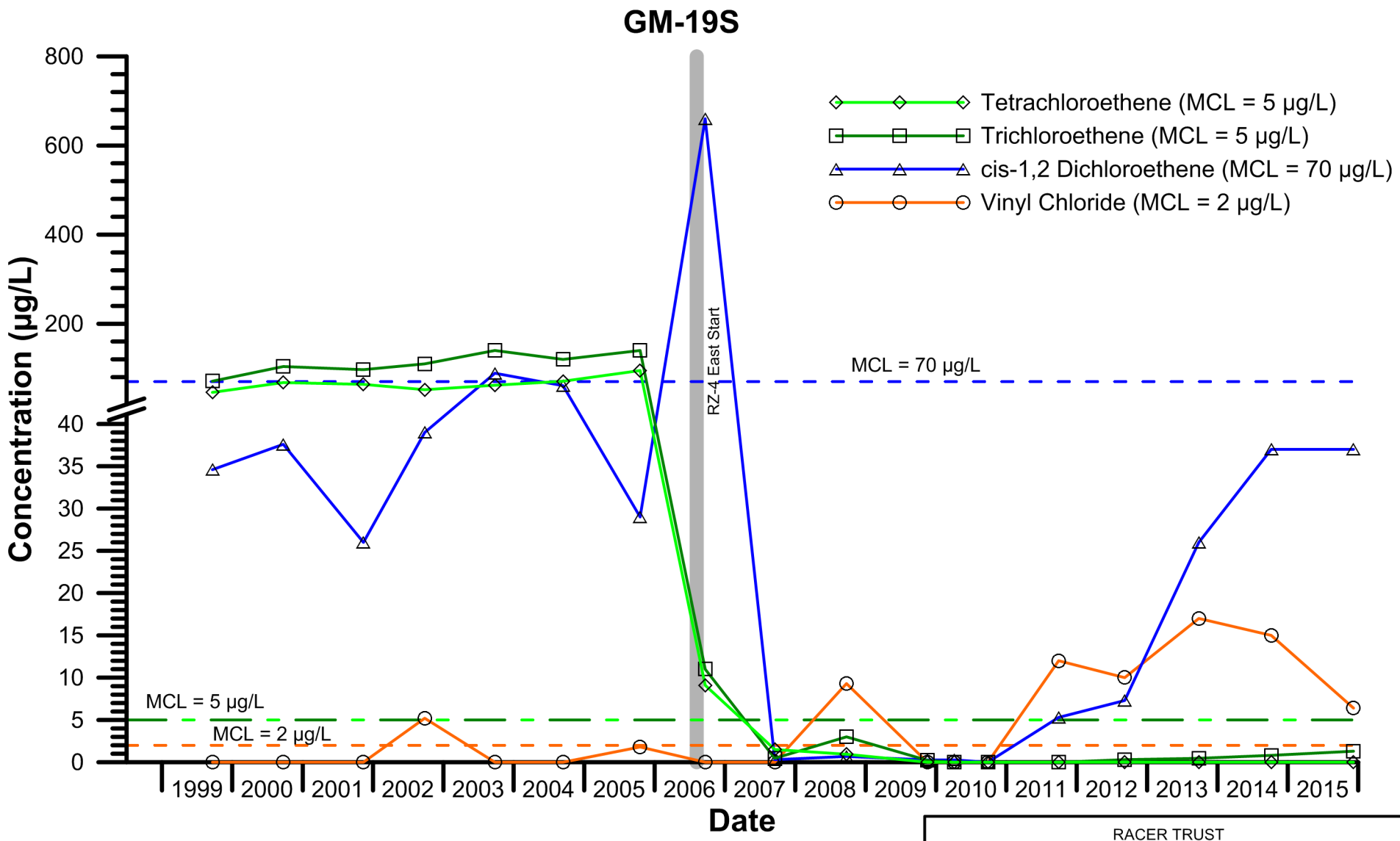
**RZ-3 WEST AREA GROUNDWATER CONCENTRATION GRAPHS**

ARCADIS Design & Consultancy for natural and built assets

FIGURE
**15**




MCL = Maximum Contaminant Level
µg/L = micrograms per liter

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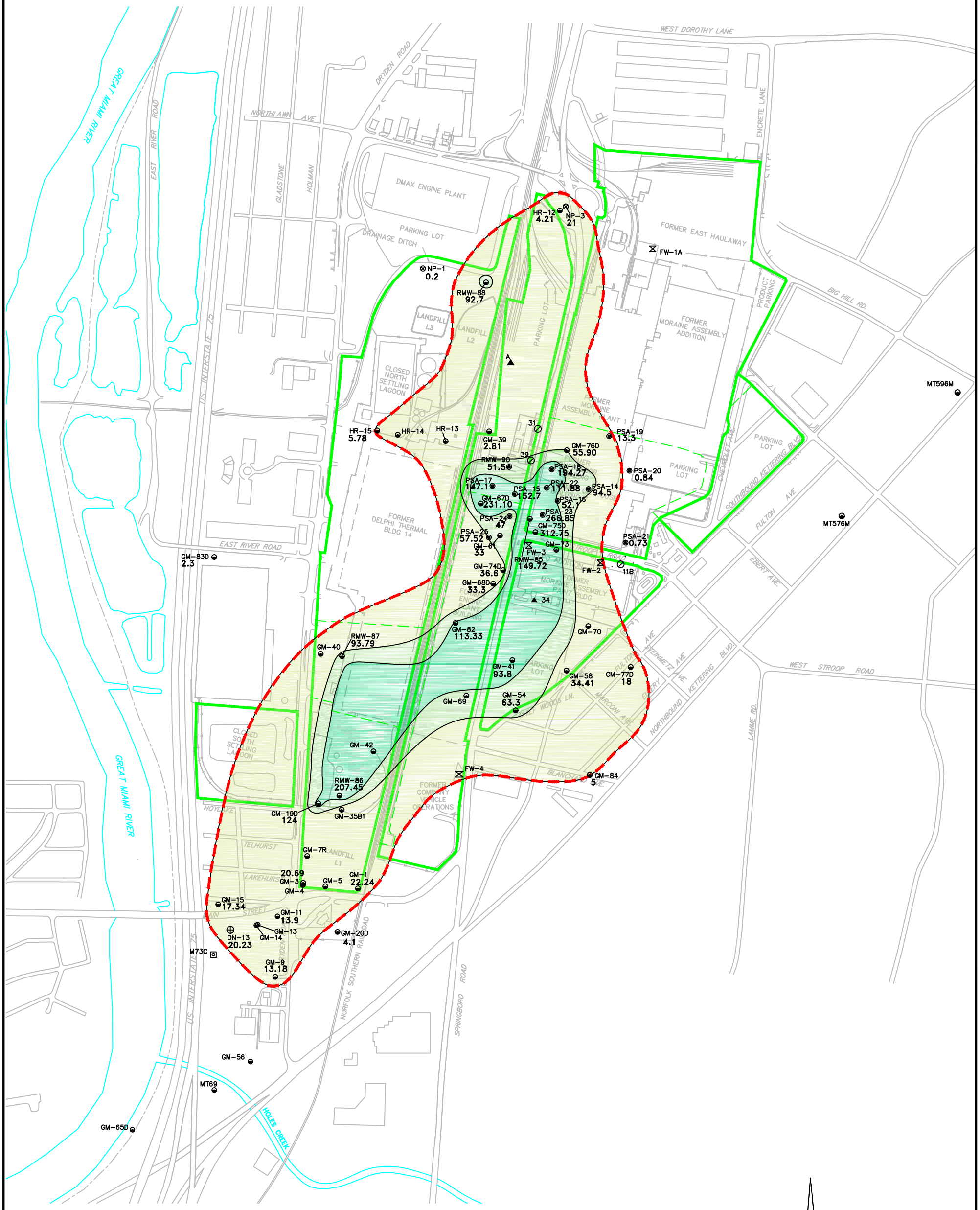
OH000294.2016

**RZ-4 EAST AREA GROUNDWATER CONCENTRATION GRAPH**

ARCADIS Design & Consultancy for natural and built assets

FIGURE
16

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: TARGET CAPTURE ZONE LOWER SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:44 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- LOWER AQUIFER TARGET CAPTURE ZONE

| | |
|---|---|
| ug/L | MICROGRAMS PER LITER |
| VOCs | VOLATILE ORGANIC COMPOUNDS |
| | >100 ug/L |
| | 50–100 ug/L |
| | 5–50 ug/L |

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

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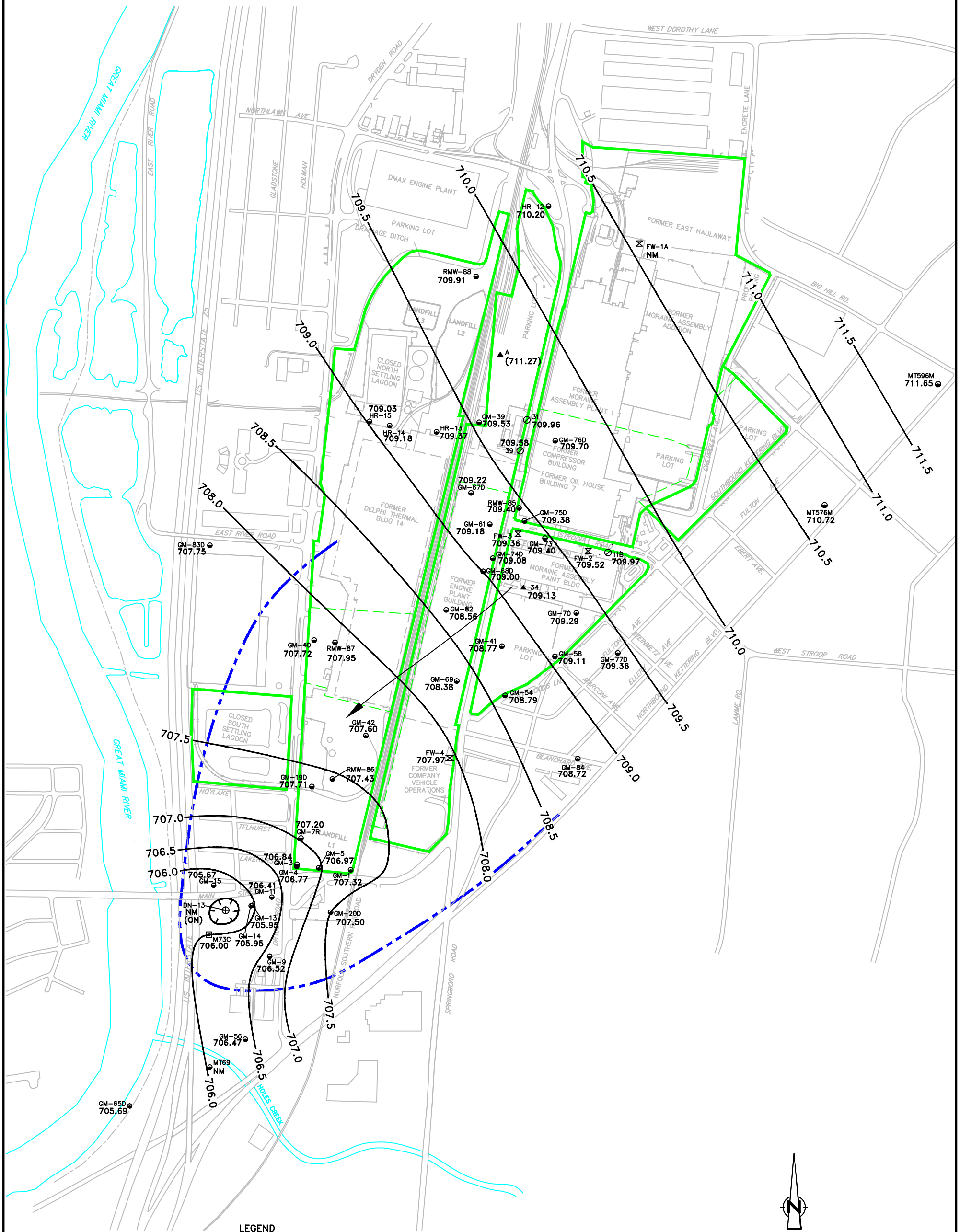
# LOWER AQUIFER TARGET CAPTURE ZONE

ARCADIS Design & Consultancy for natural and built assets

FIGURE
17

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-08.dwg LAYOUT: FIG 17 DEEP GW ELEV-CAPTURE ZONE SAVED: 2/17/2016 11:51 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/18/2016 12:16 PM BY: SMITH, BOB




LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- 707.19 GROUNDWATER ELEVATION (FEET MSL)
- NM NOT MEASURED
- 706.0 GROUNDWATER CONTOUR (FEET MSL) (DASHED WHERE INFERRED)
- CONE OF DEPRESSION (ESTIMATED INDIVIDUAL CONTOURS NOT SHOWN)
- FORMER BUILDING FOOTPRINT
- ( ) NOT USED FOR CONTOURING
- GROUNDWATER FLOW DIRECTION
- SURFACE WATER FEATURE
- ON/OFF INDICATES WHETHER RECOVERY WELL IS IN OPERATION

CONTOUR INTERVAL = 0.5 FOOT

NOTES:
1. DN-13 DRAWN DOWN OVER 60 FEET, INDIVIDUAL CONTOURS NOT SHOWN.
2. DEPTH TO WATER MEASUREMENTS COLLECTED FROM TOP OF WELL CASING ON DECEMBER 9-10, 2015.

N

0 100 850ft

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OH000294.2016

# POTENTIOMETRIC SURFACE (LOWER AQUIFER) DECEMBER 2015 WITH INFERRED CAPTURE ZONE

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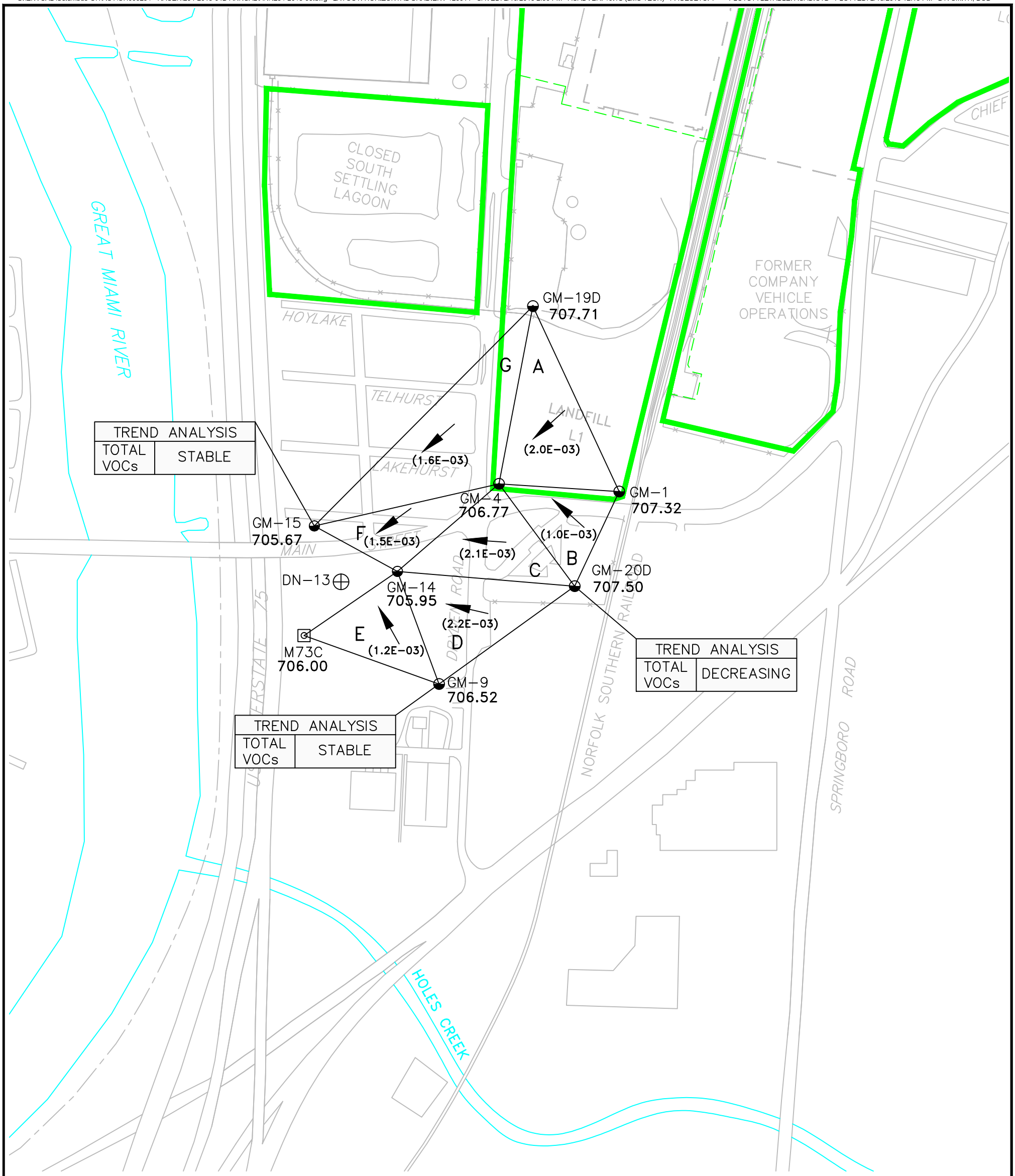
FIGURE 18

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-06.dwg LAYOUT: HORIZONTAL GRADIENT 120014 SAVED: 2/16/2016 2:56 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/18/2016 12:18 PM BY: SMITH, BOB




LEGEND

- GM-9 — MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER (LOWER AQUIFER)
- MONTGOMERY COUNTY WELL (LOWER AQUIFER CAPTURE WELL – NPDES OUTFALL DISCHARGE)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- A — TRIANGULAR IRREGULAR NETWORK (TIN) CELL ID
- (1.0E-0.3) — GRADIENT DIRECTION AND MAGNITUDE (FOOT/FOOT)
- TREND ANALYSIS: TOTAL VOCs — STABLE — MANN-KENDALL TEST RESULTS SEE SECTION 3.2.7 OF MAIN REPORT

N

0 200 400ft

RACER TRUST
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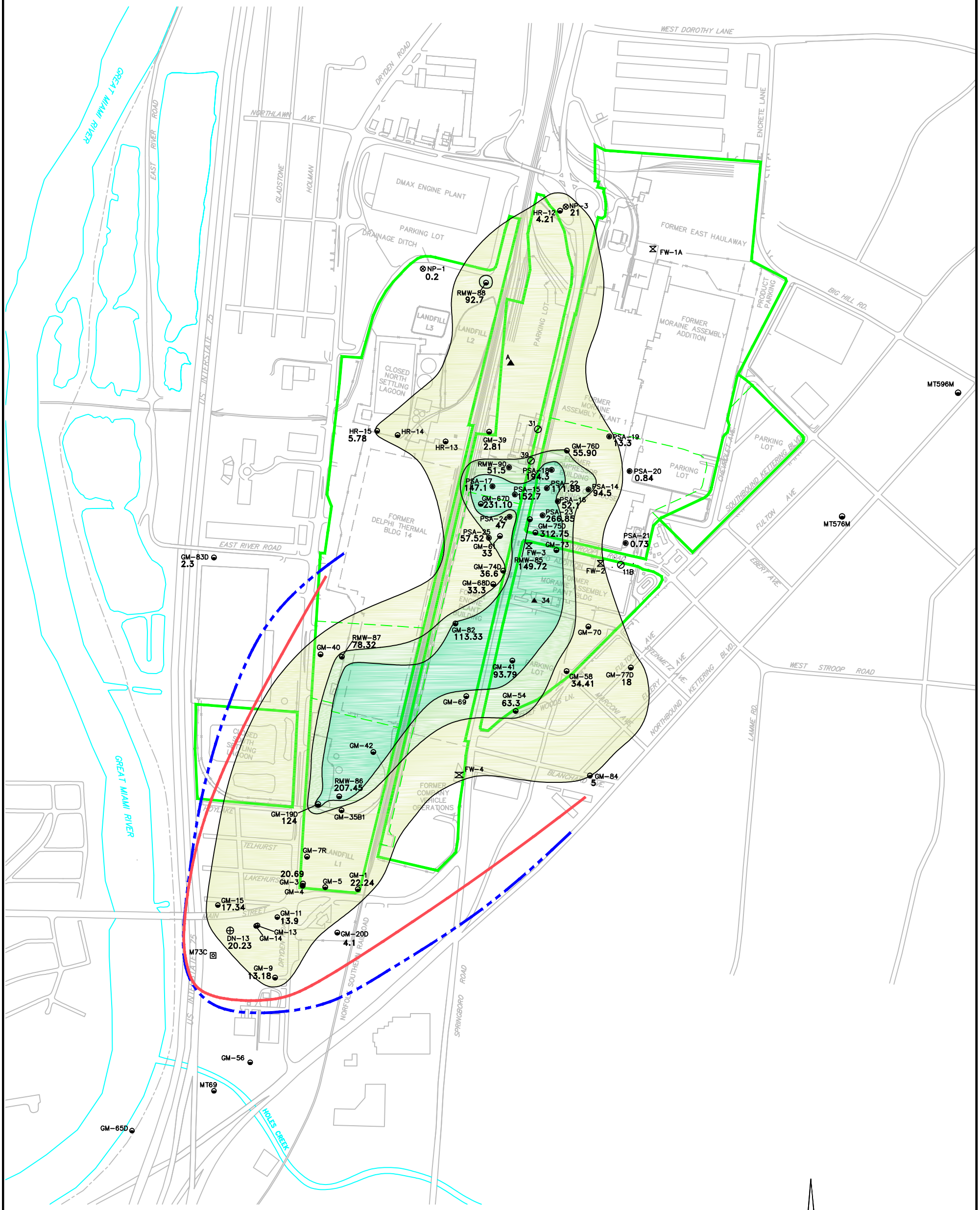
OH000294.2016

# LOWER AQUIFER HORIZONTAL GRADIENTS AND CONCENTRATION TREND ANALYSIS RESULTS DECEMBER 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE 19

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: INTERPRETED CAPTURE ZONE LOWER SAVED: 2/25/2016 11:49 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 1:41 PM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- LOWER AQUIFER TARGET CAPTURE ZONE
- INFERRED CAPTURE ZONE
- INTERPRETED CAPTURE ZONE

ug/L MICROGRAMS PER LITER
VOCs VOLATILE ORGANIC COMPOUNDS

- >100 ug/L
- 50–100 ug/L
- 5–50 ug/L

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

N

0 100 850ft

RACER TRUST
MORAINE, OHIO

OH000294.2016

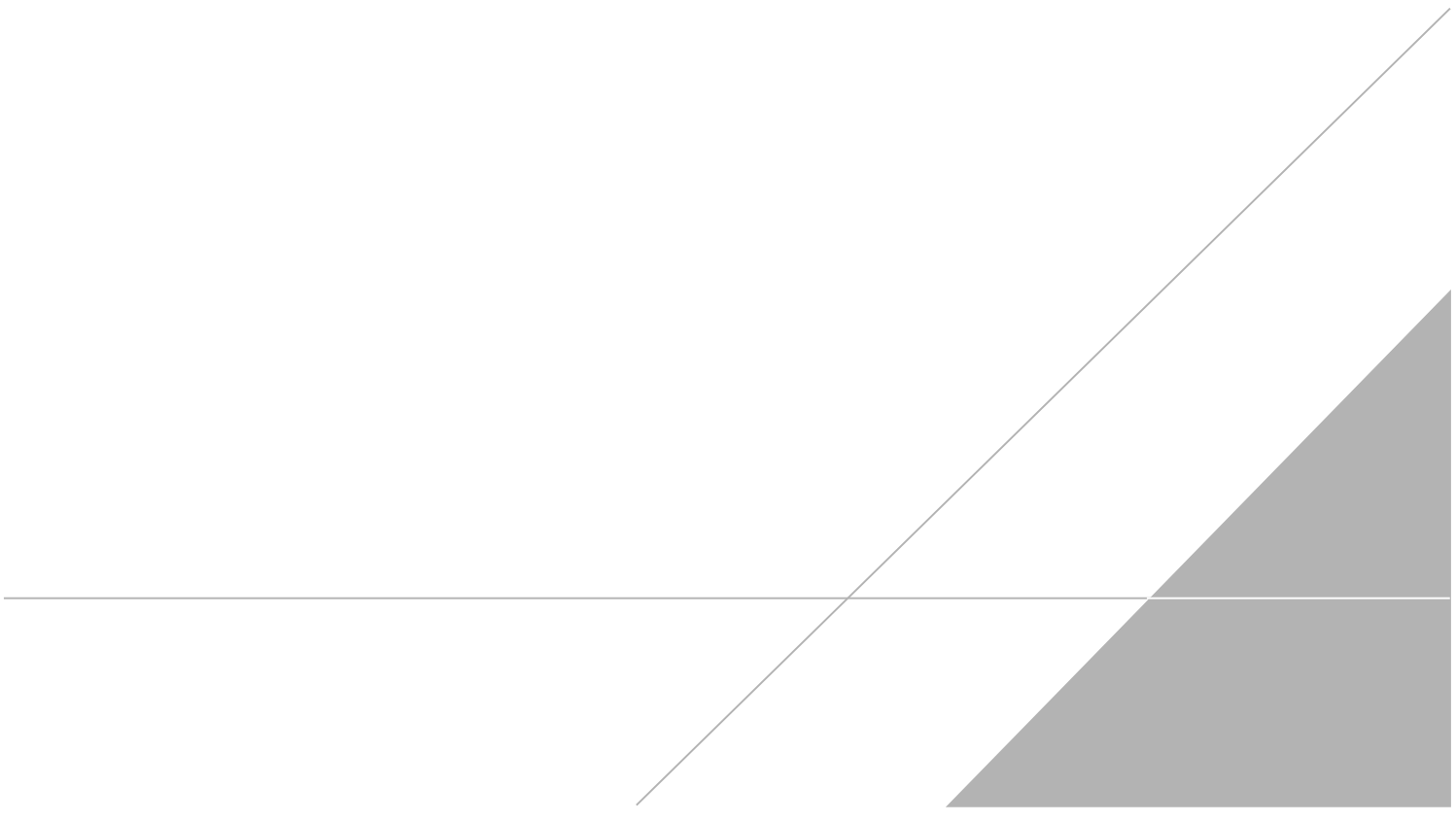
# INTERPRETED CAPTURE ZONE

ARCADIS Design & Consultancy for natural and built assets

FIGURE
20

# APPENDIX A

## In-Situ Reactive Zones Performance Results for 2015



**Appendix A**

In-Situ Reactive Zones
Performance Results for 2015

## In-Situ Reactive Zones Performance Results

As described in Section 1.4 of the Site-Wide Groundwater Monitoring Report for 2015 (Monitoring Report), the carbon solution delivery network consists of three reactive zones, RZ-1, RZ-3 (East and West), and RZ-4 (East). During 2015, a carbon solution was introduced into the groundwater through introduction wells at RZ-1, RZ-3 (East and West), and RZ-4 (East) shown on Figures 3 and 4 of the Monitoring Report, respectively. RZ-1 was originally installed in 1999 as a nine well barrier downgradient of the Former Oil House Area source area. Based on the performance of the enhanced reductive dechlorination (ERD) technology, RZ-1 was expanded into portions of the Former Oil House Area source area by the addition of 12 introduction wells in 2002. RZ-3 was originally installed in 1999 and has been operated as a cut-off barrier (30 wells in RZ-3 East and 11 wells in RZ-3 West) to mitigate further downgradient volatile organic compound (VOC) migration. In 2005, RZ-3 East was modified by the addition of 5 introduction wells (RZ-3RR through RZ-3VV) and cessation of introduction in 5 existing wells (RZ-3MM through RZ-3QQ) to improve performance at the far eastern edge of the plume. Using data obtained from the Supplemental Groundwater Investigation conducted in 2006, RZ-4 was designed and installed to address VOC concentrations present on the western side of the plume. RZ-4 consists of 15 introduction wells, 7 wells in RZ-4 West and 8 wells in RZ-4 East. The RZ-4 West wells are located in the southeast corner of the closed South Settling Lagoon and the RZ-4 East wells are located north of Landfill L1 and west of the Waste Pile/Staging Area. Introductions to RZ-4 began in August 2006. Operation at RZ-4 West was discontinued September 2007. The following sections discuss the monitoring completed to assess the effectiveness of the in-situ reactive zones and the results of this monitoring.

### Reactive Zone Monitoring

Operation of the reactive zones was monitored through the collection of field parameter measurements and laboratory analyses of biogeochemical indicator parameters and VOCs, according to the Site-Wide Groundwater Monitoring Plan (ARCADIS G&M, Inc. 2002) and as modified in subsequent annual Monitoring Reports. Field parameter measurements included: pH, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and temperature. Biogeochemical parameters, collected at select monitoring wells, included manganese (total and dissolved), iron (total and dissolved), sulfate, sulfide, total organic carbon (TOC), chlorides, light hydrocarbons (ethane and ethene), and methane. The monitored VOCs included: benzene, toluene, ethylbenzene, xylenes, tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride, 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-

DCA), 1,1-dichloroethene (1,1-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE). The VOC data collected from the RZ monitoring wells are presented in Tables A-3 through A-6 of this appendix. The bioattenuation parameter data collected from the RZ monitoring wells are presented on Tables A-7 through A-10. An evaluation of pertinent monitoring data is presented in the following sections.

The operational monitoring data collected, as indicated above, can be broadly categorized as: (i) "primary" operational monitoring data, which tracks the actual operation of the remediation system and determines whether the operation is proceeding as planned, and (ii) "secondary" operational monitoring data, which assists in the occasional troubleshooting of the system. The secondary data becomes important in the event that degradation of the VOCs is not proceeding as expected, and the cause cannot be determined from the primary operational monitoring data. The primary operational monitoring data includes pH, TOC, VOCs, ethene, ethane, and methane. Secondary operational monitoring data includes dissolved manganese, dissolved iron, sulfate, and ORP. The primary operational data for select RZ monitoring wells is discussed below and presented graphically on Figures A-1 through A-3.

Locations of the performance monitoring wells relative to each reactive zone are shown on Figures 3 and 4 of the Monitoring Report. The following wells are used for performance monitoring of the RZs.

- At RZ-1, monitoring wells GM-28, GM-29, and GM-23 are used for performance monitoring. GM-23 and GM-29 are located within the area of RZ-1 expansion wells. GM-28 is located downgradient of the original RZ-1 transect but was not sampled in 2015 due to an obstruction in the well. A replacement well, GM-28R was installed and sampled in 2015 and is used in this evaluation. At RZ-1, carbon is introduced into 19 injection wells designated as RZ-1C through RZ-1U.

- At RZ-3 West, monitoring well GM-32, which is within the introduction zone due to its location being constrained by the proximity of Landfill L1, is designated as the downgradient monitoring well. Monitoring well GM-32 is only analyzed for TOC, as this well is located in the early stages of the reactive zone due to its proximity to the introduction wells. Monitoring wells GM-6 and GM-8 are located further downgradient and are also utilized to monitor the performance of RZ-3 West. At RZ-3 West, carbon solution is introduced into 30 injection wells designated as RZ-3A through RZ-3DD.

- For RZ-3 East, monitoring well GM-21 is designated as the downgradient monitor well. At RZ-3 East, carbon solution is introduced into 10 injection wells which

include the original wells, RZ-3GG through RZ-3KK, and five additional wells, RZ-3RR through RZ-3VV.

- For RZ-4 East, monitoring well GM-19S is used at the downgradient monitoring well. At RZ-4 East, carbon is introduced into eight injection wells designated as RZ-4A through RZ-4H.

During 2015, a target volume of 800 gallons, 1,600 gallons, 1,600 gallons, and 3,000 gallons of a 2 percent molasses solution was injected per introduction well at RZ-1, RZ-3 West, RZ-3 East, and RZ-4 East, respectively. Injections were completed on a quarterly basis during the months of March, June, September, and November 2015 in accordance with the revised injection frequency which was determined through implementation of the In-Situ Reactive Zone Interim Measure Injection Frequency Evaluation dated January 13, 2014. See Section 1.4.1 of the Monitoring Report that details the results of this evaluation with data summarized in Tables A-1 and A-2. Table A-1 is a summary of the TOC analytical results collected during the evaluation period. Table A-2 is a summary of the summary of the half-life analysis.

Table 2 in the Monitoring Report presents the carbon solution introduction volumes for different introduction wells in 2015.

**Analysis of Primary Operational Monitoring Data**

The primary operational data are comprised of a limited number of variables that are monitored at a frequency necessary to supply the information required for the operation of the remediation system. The entire data set is presented in Tables A-3 through A-10. Figures A-1 through A-3 present the primary operational data (pH, TOC, methane, VOCs, ethane, and ethene) graphically for monitoring wells used for monitoring the effectiveness of each of the IRZs (GM-23, GM-29, GM-28, GM-8, GM-21, and GM-19S). The graphs are organized to allow a simple comparison of the trends in each monitoring well for pH, TOC, methane, VOCs, ethene, ethane, and total parent-daughter compound molarity. A discussion of the primary operational data is provided below.

*pH*

The preferred pH range for reductive dechlorination is between 6 and 8 standard units (s.u.), and the acceptable pH range extends from 5 to 9 s.u. All pH measurements collected in 2015 from performance monitoring wells were within the acceptable pH range.

## Appendix A

In-Situ Reactive Zones
Performance Results for 2015

*Total Organic Carbon and Anaerobic Indicator Parameters*

Organic carbon electron donor availability is considered the primary parameter that dictates the overall size and length of the in-situ reactive zones downgradient of each of the injection barriers. The size of the in-situ reactive zone has been historically determined based on evidence of injection influence (i.e., changes in TOC concentrations relative to the background conditions) at individual monitoring wells within each of the reactive zones. The most representative and straightforward method of assessing whether REDOX conditions are appropriate for reductive dechlorination is to continue reviewing whether detectable methane is present at a given well location and using this performance metric to document that highly anaerobic groundwater conditions exist at a given well location. Figure A-4 provides methane databoxes with historic concentrations in the performance monitoring wells. The depletion of sulfate in the IRZ is consistent with the methanogenic conditions necessary for efficient reductive dechlorination throughout each reaction zone's treatment area.

Ongoing ERD injection activities were initiated 1999 and were increased via several expansions in 2002 and 2006. In general, the background concentrations of bioattenuation indicator parameters exhibit some variability, but typical background TOC, methane and sulfate concentrations are less than 5 milligrams per liter (mg/L), less than 0.1 mg/L, and greater than 50 mg/L, respectively. There are multiple methods by which to assess changes in these parameters over the course of ERD operations, and most cases rely on a multiple lines of evidence approach to understand the development of the anaerobic conditions necessary to achieve dechlorination, determine the magnitude and longevity of residual carbon substrate concentrations in the subsurface, and to confirm transformation of parent chlorinated VOC compounds through their respective daughter products to end products. This multiple lines of evidence approach is reflected in the ongoing performance monitoring program at the Site.

As geochemical concentrations exhibit some variability in background groundwater, concentrations of these parameters (specifically sulfate and methane) are compared in relative terms to concentrations outside of the area of RZ influence. In order to demonstrate that reducing conditions are sufficient for dechlorination in this system, identified USGS benchmark concentrations will be referenced for comparison to Site data. According to these benchmarks, methane concentrations in excess of 0.2 mg/L and sulfate concentrations below 20 mg/L demonstrate that conditions are favorable for reductive dechlorination (USGS). It should be noted that while these concentrations are applicable as "rule of thumb" benchmarks for data assessment, these values do not actually preclude whether dechlorination can occur or whether

background electron acceptors are being consumed. While methane concentrations are expected to significantly exceed the 0.2 mg/L benchmark value within the treatment zone, complete ERD is achievable in systems with sulfate concentrations that are several-fold higher than the identified USGS value. For this reason, dissolved methane is commonly used as the best indicator to assess the degree of reducing condition development.

TOC values in the RZ-1 performance monitoring wells ranged from 6.9 to 12 mg/L and indicate concentrations were at background or slightly above background levels and indicate the carbon is being consumed rapidly by an active soil microbial community. Methane concentrations in GM-23, GM-28R,GM-29 were 5.4, 0.69, and 5.9 mg/L, respectively, are above the 0.2 mg/L benchmark, and remain significantly above the background levels observed in these monitoring wells in 1999 (e.g., sampling before the start of carbon introductions). Sulfate concentrations in GM-23, GM-28R, GM-29 were 15, 33, and 49 mg/L, respectively, and were near or above the benchmark value of 20 mg/L. The observed methane concentration demonstrates that background electron acceptors are being utilized sufficient to foster development of highly anaerobic conditions, and indicates conditions conducive for reductive dechlorination (e.g., methanogenic) are being maintained.

TOC concentrations at RZ-3 West performance monitoring wells indicate concentrations ranging from background levels (monitoring well GM-8 concentration of 4.7 mg/L) to above background levels (monitoring well GM-32 concentration of 6.0 mg/L). These data are anticipated and consistent with historical data. Specifically, monitoring well GM-8 is located greater than 300 feet downgradient of the injection wells and the carbon is consumed prior to reaching this location. Conversely, monitoring well GM-32 is located in close proximity to the injection wells and it is expected that elevated TOC (e.g., >20 milligrams per liter) be observed at this location. Methane remained significantly above background conditions at monitoring well GM-8 (2.1 mg/L) and the sulfate concentration at GM-8 was 32 mg/L. The observed methane concentration at GM-8 in spite of its considerable transport distance from the RZ-3 injection network demonstrates that conditions conducive for reductive dechlorination are being maintained in RZ-3 West.

TOC concentrations at RZ-3 East monitoring well GM-21 of 120 mg/L are significantly above baseline conditions and consistent with historical data. The increased TOC concentration at GM-21 is attributed to its close proximity to the RZ-3 east injection network. The increased TOC concentration is consistent with the observed methane concentration of 15 mg/L, which is significantly above the benchmark value of 0.2 mg/L. This indicates conditions conducive for reductive dechlorination are being maintained as a result of the carbon injections at RZ-3 East.

**Appendix A**

In-Situ Reactive Zones
Performance Results for 2015

Sulfate concentrations at GM-21 was below the detection limit. In conjunction with the increased methane concentration, these data demonstrate that highly anaerobic conditions are present in RZ-3.

The TOC concentration at RZ-4 East monitoring well GM-19S (2.5 mg/L) was similar to background concentrations and indicate the carbon is being consumed rapidly by an active soil microbial community. This concentration is consistent with the historical range of TOC values observed over the course of RZ-4 operation (from below detection to 22 mg/L). The concentration of methane at monitoring well GM-19S (1.2 mg/L) remained above the background levels and is above the 0.2 mg/L benchmark. The sulfate concentration for GM-19S (47 mg/L) was above the benchmark value of 20 mg/L. The observation of elevated methane concentrations demonstrates that highly anaerobic conditions are being developed downgradient of RZ-4 west. These data will continue to be monitored in 2015 to determine if additional troubleshooting is warranted for the RZ-4 East injection program.

*VOC Analytical Results*

The groundwater analytical data for the site-specific list of VOCs are presented in Table A-3 for RZ-1, Table A-4 for RZ-3 West, Table A-5 for RZ-3 East, and Table A-6 for RZ-4 East. Additionally, the degradation of PCE and TCE (parent compounds) to cis-1,2-DCE, vinyl chloride (daughter products), and ethene and ethane (end products) are provided with the pH, TOC, and methane data for performance monitoring wells in RZ-1 (GM-23, GM-29, and GM-28 Figure A-1), RZ-3 West (GM-8 Figure A-2), RZ-3 East (GM-21 Figure A-2), and RZ-4 East (GM-19S Figure A-3). These figures shows a comparison of degredation end-products ethane and ethene to VOCs per performance well based on molarity.

The following bullets summarize the observations and trends evident among the reactive zones at the Moraine Facilities which indicate that enhanced reduction of the targeted chlorinated VOCs is progressing as a result of the carbon introduction process:

- Degradation of the chlorinated VOCs was sustained throughout 2015 within the RZ-1 treatment area. The total chlorinated VOC concentrations in GM-29 were slightly lower in 2015 as compared to 2014 (805.1 micrograms per liter [ug/L] in 2015 and 825.6 ug/Lin 2014). The 2015 concentrations were primarily associated with cis-1,2-DCE (440 ug/L), TCE (270 ug/L), vinyl chloride (48 ug/L) and PCE (11 ug/L), which were all above their respective MCLs. Concentrations of ethene and ethane were 16 ug/L and 170 ug/L, respectively. This demonstrates that the

transformation of the parent species to daughter products is ongoing and complete transformation is being achieved.

- Total chlorinated VOC concentrations in GM-28R were 80.5 in 2015 and were primarily associated with PCE (49 ug/L) and TCE (24 ug/L) and cis-1,2-DCE (5.6 ug/L. The concentrations of PCE and TCE were above their respective MCLs. The concentration of ethene and ethane were 0.24 ug/L and 1.2 ug/L, respectively. These concentrations demonstrate that transformation of the parent species to daughter products is ongoing and complete transformation is being achieved.

- Total chlorinated VOC concentrations in GM-23 decreased from 466.1.6 ug/L in 2014 to 254.7 ug/L in 2015. It should be noted that total chlorinated VOC concentrations in GM-23 have decreased significantly from the maximum concentration of 26,800 ug/L observed in November 2001. The 2015 concentrations were primarily associated with cis-1,2-DCE (100 ug/L) and vinyl chloride (120 ug/L), which were above their respective MCLs. These concentrations demonstrate that transformation of the parent species to daughter products is ongoing. This is confirmed by the observation of ethene and ethane (140 ug/L and 88 ug/L, respectively), which demonstrates that complete transformation is being achieved (Figure A-1)

- Concentrations of total chlorinated VOCs at RZ-3 West monitoring well GM-8 remained stable in 2015 (1.3 ug/L) compared to 2014 (2.6 ug/L). These data continue to document the effectiveness of the carbon injections at RZ-3 West. Concentrations of ethene and ethane were 0.25 ug/L and 23 ug/L, respectively, and demonstrate complete transformation from parent products to end products is being achieved.

- Concentrations of total chlorinated VOCs at RZ-3 East monitoring well GM-21 have remained significantly lower compared to baseline conditions since the installation of introduction wells RZ-3RR through RZ-3VV. Total chlorinated VOC concentrations increased slightly in 2015 (60.5 ug/L) when compared to 2015 (53.4 ug/L) but remained significantly lower than the maximum concentration observed in 2000 (403.3 ug/L). The 2015 concentrations were primarily associated with cis-1,2- DCE (22 ug/L), TCE (16 ug/L) and vinyl chloride (8.9 ug/L). The concentrations of TCE and vinyl chloride were above their respective MCLs. These concentrations demonstrate that transformation of the parent species to daughter products is ongoing. This is confirmed by the observation of ethene and ethane (5.4 ug/L and 6.8 ug/L, respectively), which demonstrates that complete transformation is being achieved (Figure A-2).

**Appendix A**

In-Situ Reactive Zones
Performance Results for 2015

- Data from monitoring well GM-19S, downgradient of RZ-4 East, exhibited a decreasing trend in total chlorinated VOC concentrations falling from 706.8 ug/L in September 2006 to 9.96 ug/L in September 2010. Since 2010, concentrations of total chlorinated VOCs have remained over an order of magnitude below the September 2006 values. The total chlorinated VOC concentrations for GM-19S in 2015 was 48.5 ug/L compared to 61.3 ug/L in 2014. The 2015 concentrations were primarily associated with cis-1,2-DCE (37 ug/L). Concentrations of vinyl chloride (6.4 ug/L) were above MCLs. These concentrations demonstrate that transformation of the parent species to daughter products is ongoing.

## Conclusions

The following observations and conclusions can be made:

- Aquifer conditions were strongly reducing within and downgradient of the reactive zones due to the introduction of carbohydrate, as evidenced by the presence of methane at concentrations significantly above background data;

- The target compounds (PCE and TCE) were reduced to daughter products (cis-1,2-DCE and vinyl chloride) and ultimately to end products (ethene and ethane) based on the VOC and light hydrocarbon data;

- Enhanced reductive dechlorination continued to achieve the desired reduction of VOC concentrations in groundwater; and

- No significant change in anaerobic conditions (e.g., the concentration of methane) or treatment effectiveness (e.g., sustained reductions in chlorinated VOC concentrations with the observation of elevated ethene and/or ethane) were observed as a result of decreasing the injection frequency to quarterly. The data corroborate previous evaluations and indicate the quarterly injection frequency is appropriate for the site. However, the data will continue to be evaluated in 2016.

**Table A-1**
**TOC Data in the Reactive Zone**
**RACER Trust**
**Moraine, Ohio**

ARCADIS Design & Consultancy for natural and built assets

| Monitoring Location | Date | Days Since Injection | TOC (mg/L) |
|---|---|---|---|
| RZ-3D | 12/11/2013 | 0 | 3200 |
| | 1/9/2014 | 29 | 940 |
| | 2/11/2014 | 62 | 720 |
| RZ-3S | 12/11/2013 | 0 | 2600 |
| | 1/9/2014 | 29 | 1800 |
| | 2/11/2014 | 62 | 980 |
| RZ-3TT | 12/11/2013 | 0 | 3600 |
| | 1/9/2014 | 29 | 1900 |
| | 2/11/2014 | 62 | 370 |
| RZ-1E | 12/11/2013 | 0 | 2800 |
| | 1/9/2014 | 29 | 560 |
| | 2/11/2014 | 62 | 420 |
| RZ-4E | 12/11/2013 | 0 | 2300 |
| | 1/9/2014 | 29 | 1300 |
| | 2/11/2014 | 62 | 840 |

mg/L - Milligrams per Liter.
TOC - Total Organic Carbon.

**Table A-2**
**Reactive Zone TOC Decay and Required Carbon Introduction Frequency**
**RACER Trust**
**Moraine, Ohio**

| | | | Calculated Half-life | Estimated Days to Reach 20 mg/L from Last Sampling Date (t)[2] | Required Injection Frequency[3] |
|---|---|---|---|---|---|
| Monitoring Location | Recent Injection Date | Recent Sample Collection Date | k (day-1) [1] | (days) | (months) |
| RZ-3D | 12/9/2013 | 2/11/2014 | 0.0237 | 151.20 | 7.17 |
| RZ-3S | 12/9/2013 | 2/11/2014 | 0.0158 | 308.07 | 12.40 |
| RZ-3TT | 12/6/2013 | 2/11/2014 | 0.037 | 121.62 | 6.29 |
| RZ-1E | 12/9/2013 | 2/11/2014 | 0.0301 | 129.30 | 6.44 |
| RZ-4E | 12/10/2013 | 2/11/2014 | 0.0162 | 320.55 | 12.79 |
| | | | | Average (months) = | 9.02 |

(1) t = -(1/k)LN(C/C0)
C - target TOC concentration to trigger injection (i.e., 20 mg/L)
C0 - TOC cocentration from the previous sampling event
(2) Slope from k-value plots
(3) Required injection frequency = t + days between December 2013 injection event and February 2014 TOC sampling event
mg/L - Milligrams per Liter.
TOC - Total Organic Carbon

**Table A-3**
**Summary of Annual Groundwater Analytical Results from Reactive Zone 1 Wells**
**RACER Trust**
**Moraine, Ohio**

| RZ-1 | | | GM-29 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **MCL[1]** | **9/1/99** | **2/22/00** | **5/26/00** | **9/21/00** | **3/20/01** | **6/26/01** | **11/13/01** | **12/12/01** | **6/13/02** | **9/25/02** | **5/22/03** | **9/24/03** | **9/15/04** | **10/17/05** | **9/28/06** | **9/26/07** | **10/6/08** | **11/17/09** | **9/29/10** | **9/30/11** | **9/26/12** | **9/27/13** | **10/9/14** | **12/8/15** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 37.8 | 36.0 | 32.5 | 24.5 | 27.0 | 23.8J | <50 | 19J | 17 | 16J | < 50 | 18J | 21 J | 19 J | 17 J | 15 J | 12 J | 18 | 11 J | 11 J | 10 J | 15 | 9.1 J | 9.9 |
| 1,1-Dichloroethane | ug/L | | 4.3 | 4.1 | 6.3 | 16.6 | 10.8 | 6.3J | <50 | <50 | <50 | <40 | < 50 | <33 | < 50 U | 18 J | 15 J | 15 J | 11 J | 12 | 11 J | 8.5 J | 8.2 J | 12 | 9.5 J | 10 |
| 1,1-Dichloroethene | ug/L | 7 | 1.3 | 1.1 | 1.6 | 3.1 | 3.5 | 3.0J | <50 | <50 | <50 | <40 | < 50 | <33 | < 50 U | < 50 U | < 33 U | < 50 U | < 33 U | < 10 U | < 20 U | < 13 U | < 20 U | 1.7 | < 14 U | 1.2 J |
| Benzene | ug/L | 5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0UJ | <50 | <50 | <50 | <40 | < 50 | <33 | < 50 U | < 50 U | < 33 U | < 50 U | < 33 U | < 10 U | < 20 U | < 13 U | < 20 U | 0.20 J | < 14 U | < 1.7 U |
| cis-1,2-Dichloroethene | ug/L | **70** | **320** | **223** | **1,190J** | **2,871** | **2,170** | **2,050J** | **1,800** | **1,800** | **1,600** | **1,300** | **950** | **1,200** | **1,200** | **1,600** | **1,300** | **1,200** | **900** | **600** | **660** | **470** | **520** | **530** | **480** | **440** |
| Ethylbenzene | ug/L | 700 | <1.0 | 1.4 | <1.0 | <1.0 | <1.0 | <1.0UJ | 21J | <50 | <50 | <40 | < 50 | <33 | < 50 U | < 50 U | < 33 U | < 50 U | < 33 U | < 10 U | < 20 U | < 13 U | < 20 U | < 1.0 U | < 14 U | < 1.7 U |
| Tetrachloroethene | ug/L | **5** | <20 | **38.7** | **24.6** | **20.0** | **24.4** | **24.8J** | **17J** | **22J** | **22** | **18J** | **47J** | **18J** | **20 J** | **15 J** | **15 J** | **18 J** | **17 J** | **21 J** | **17 J** | **13** | **14 J** | **15** | **12 J** | **11** |
| Toluene | ug/L | 1000 | <1.0 | <1.0 | <1.0 | 2.2 | <1.0 | <1.0UJ | <50 | <50 | <50 | <40 | < 50 | <33 | < 50 U | < 50 U | < 33 U | < 50 U | < 33 U | < 10 U | < 20 U | < 13 U | < 20 U | < 1.0 U | < 14 U | < 1.7 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 11.1 | 9.1 | 8.9 | 14.4 | 20.4 | 25.6J | 26 | 24J | 21 | 21 | < 25 | 20 | 21 J | 27 J | 20 J | 19 J | 16 J | 20 | 19 J | 17 | 15 J | 20 | 15 | 15 |
| Trichloroethene | ug/L | **5** | **878** | **758** | **649J** | **289** | **354** | **437J** | **270** | **320** | **380** | **310** | **280** | **390** | **440** | **390** | **310** | **350** | **300** | **370** | **330** | **320** | **310** | **280** | **260** | **270** |
| Vinyl chloride | ug/L | **2** | **3.8** | 1.0 | 1.7 | **788** | **362** | **276J** | **230** | **280** | **140** | **140** | **99** | **150** | **230** | **490** | **210** | **290** | **150** | **70** | **59** | **52** | **45** | **60** | **40** | **48** |
| Xylenes | ug/L | 10,000 | <1.0 | 6.0 | <1.0 | <1.0 | <1.0 | <1.0UJ | 52 | <50 | <50 | <40 | < 50 | <33 | < 50 U | < 100 U | < 67 U | < 100 U | < 67 U | < 20 U | < 40 U | < 25 U | < 40 U | < 2.0 U | < 29 U | < 3.3 U |
| **Total VOCs** | ug/L | | 1,256.3 | 1,078.4 | 1,914.6 | 4,028.8 | 2,972.1 | 2,846.5 | 2,416 | 2,465 | 2,180 | 1,805 | 1,376 | 1,796 | 1,932 | 2,559 | 1,887 | 1,907 | 1,406 | 1,111 | 1,107 | 891.5 | 922.2 | 933.9 | 825.6 | 805.1 |

MCL - Maximum Contaminant Level.
ug/L - Micrograms per Liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit; reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) MCL not listed for 1,1-dichloroethene.
(2) Well GM-28R was installed on December 28, 2015.
**Bold -** Result above MCL.

**Table A-3**
**Summary of Annual Groundwater Analytical Results from Reactive Zone 1 Wells**
**RACER Trust**
**Moraine, Ohio**

| RZ-1 | | | GM-23 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **MCL[1]** | **9/2/99** | **2/21/00** | **5/31/00** | **9/20/00** | **3/20/01** | **6/26/01** | **11/12/01** | **12/12/01** | **6/13/02** | **9/26/02** | **5/22/03** | **9/23/03** | **9/14/04** | **10/17/05** | **9/28/06** | **9/27/07** | **10/23/08** | **11/17/09** | **9/29/10** | **9/30/11** | **9/7/12** | **9/27/13** | **10/10/14** | **12/8/15** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 7.2 | < 50 | < 20 | 2.0 | 3.1 | 1.5 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 560 U | < 330 U | < 200 U | < 62 U | < 20 U | < 22 U | < 20 U | < 25 U | < 1.0 U | < 10 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 32.5 | < 50 | 12.8 J | 16.3 | 17.9 | 3.7 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 560 U | < 330 U | < 200 U | < 62 U | 5.0 J | < 22 U | < 20 U | < 25 U | 2.6 | 8.4 J | 15 |
| 1,1-Dichloroethene | ug/L | 7 | 17.2 | <50 | 6.6 J | 5.1 | 15.9 | 16.3 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 560 U | < 330 U | < 200 U | < 62 U | < 20 U | < 22 U | < 20 U | < 25 U | 1.7 | < 10 U | 0.47 J |
| Benzene | ug/L | 5 | 1.9 | < 50 | < 20 | < 1.0 | 1.4 | < 1.0 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 560 U | < 330 U | < 200 U | < 62 U | < 20 U | < 22 U | < 20 U | < 25 U | 0.28 J | < 10 U | 0.69 J |
| cis-1,2-Dichloroethene | ug/L | **70** | **7,530** | **10,400 D** | **4,080 J** | **5,620** | **9,640** | **11,000** | **8,400** | **7,200** | **9,900** | **7,700** | **6,800** | **5,800** | **4,600** | **19,000** | **11,000** | **4,700** | **2,000** | **1,100** | **490** | **580** | **580** | **470** | **210** | **100** |
| Ethylbenzene | ug/L | 700 | < 1.0 | <50 | < 20 | < 1.0 | <1.0 | < 1.0 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 560 U | < 330 U | < 200 U | < 62 U | < 20 U | < 22 U | < 20 U | < 25 U | < 1.0 U | < 10 U | < 1.0 U |
| Tetrachloroethene | ug/L | **5** | **6,250** | **7,280 J** | **6,200 J** | **3,470** | **2,910** | **8,600** | **15,000** | **14,000** | **8,400** | **10,000** | **12,000** | **12,000** | **6,700** | **2,300** | **370** | **280** | **71** | **19 J** | **50** | **57** | **33** | **37** | 3.6 J | 0.58 J |
| Toluene | ug/L | 1000 | <1.0 | < 50 | < 20 | < 1.0 | < 1.0 | 2.3 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 560 U | < 330 U | < 200 U | < 62 U | < 20 U | < 22 U | < 20 U | < 25 U | < 1.0 U | < 10 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 54.5 | 118 J | 39.8 J | 33.2 | 85.5 | 60.8 | <210 | < 250 | <170 | < 200 | < 310 U | < 250 U | < 250 U | < 560 U | 270 J | 130 J | 58 J | 31 | 16 J | 21 | 21 J | 15 | 20 | 13 |
| Trichloroethene | ug/L | **5** | **1,460** | **1,350 D** | **1,480 J** | **609** | **745** | **1,780 J** | **2,200** | **2,100** | **1,900** | **1,700** | **1,500** | **1,600** | **1,100** | **490 J** | **95 J** | **82 J** | **< 62 U** | **8.3 J** | **17 J** | **33** | **15 J** | **28** | 4.1 J | 5.0 |
| Vinyl chloride | ug/L | **2** | **2,500** | **2,420 J** | **140 J** | **801** | **765** | **68** | **1200** | **< 500** | **810** | **540** | **1700** | **690** | **870** | **2,800** | **4,100** | **2,600** | **2,100** | **1,100** | **500** | **840** | **390** | **210** | **220** | **120** |
| Xylenes | ug/L | 10,000 | < 1.0 | < 50 | < 20 | < 1.0 | < 1.0 | 1.4 | < 420 | < 500 | < 330 | < 400 | < 620 U | < 500 U | < 500 U | < 1100 U | < 670 U | < 400 U | < 120 U | < 40 U | < 44 U | < 40 U | < 50 U | < 2.0 U | < 20 U | < 2.0 U |
| **Total VOCs** | ug/L | | 17,853.3 | 21,568 | 11,959.2 | 10,556.6 | 14,183.8 | 21,533.8 | 26,800 | 23,300 | 21,010 | 19,940 | 22,000 | 20,090 | 13,270 | 24,590 | 15,835 | 7,792 | 4,229 | 2,263 | 1,073 | 1,531 | 1,039 | 764.58 | 466.1 | 254.7 |

MCL - Maximum Contaminant Level.
ug/L - Micrograms per Liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit; reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) MCL not listed for 1,1-dichloroethene.
(2) Well GM-28R was installed on December 28, 2015.
**Bold -** Result above MCL.

**Table A-3**
**Summary of Annual Groundwater Analytical Results from Reactive Zone 1 Wells**
**RACER Trust**
**Moraine, Ohio**

| RZ-1 | | | GM-28 | | | | | | | | | | | | | | | | | | | | GM-28[(2)] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **MCL[1]** | **9/1/99** | **2/23/00** | **5/26/00** | **9/21/00** | **3/20/01** | **6/26/01** | **11/15/01** | **12/12/01** | **7/21/02** | **9/24/02** | **5/23/03** | **10/1/03** | **4/30/04** | **9/15/04** | **10/18/05** | **9/27/06** | **9/20/07** | **10/22/08** | **11/16/09** | **9/28/10** | **10/5/11** | **12/28/15** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 17.7 | 23.2 | 18.1 | 5.0 | <1.0 | <1.0 | <10 | <5.0UJ | <4.0 | <1 | < 1 | <1.0 | < 1 | < 1 U | < 1.0 U | < 1 U | < 1 U | < 5 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 3.3 | 4.2 | 11.8 | 9.9 | <1.0 | <1.0 | <10 | <5.0UJ | <4.0 | 2.7 | 4.2 | 3.3 | 3.5 | 3.3 | 4.0 | 4.2 | 4.6 | 2.2 J | 3.6 | 4.6 | 2.1 | 0.55 J |
| 1,1-Dichloroethene | ug/L | 7 | <1.0 | <1.0 | 3.8 | <1.0 | <1.0 | <1.0 | <10 | <5.0UJ | <4.0 | <1 | < 1 | <1.0 | < 1 | < 1 U | < 1.0 U | < 1 U | < 1 U | < 5 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <10 | <5.0UJ | <4.0 | <1 | < 1 | <1.0 | < 1 | < 1 U | < 1.0 U | < 1 U | < 1 U | < 5 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | **70** | **175** | **503** | **2,700** | 37.0 | 7.7 | **352** | <5.0 | 2.2UJ | <2.0 | 1.1 | 0.66 | 0.58 | 0.45 J | 0.41 J | 0.32 J | 0.26 J | 0.72 J | 6.9 | 2.3 | 2.1 | 0.72 J | 5.6 |
| Ethylbenzene | ug/L | 700 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <10 | <5.0UJ | <4.0 | <1 | < 1 | 0.28J | < 1 | < 1 U | < 1.0 U | < 1 U | < 1 U | < 5 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | **5** | **316** | **88.4** | **30.2** | 2.3 | 2.8 | <1.0 | <10 | <5.0UJ | <4.0 | <1 | 0.95J | <1.0 | < 1 | 0.88 J | < 1.0 U | < 1 U | < 1 U | < 5 U | < 1.0 U | < 1.0 U | 0.63 J | **49** |
| Toluene | ug/L | 1000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <10 | < 1.8UJ | <4.0 | <1.3 | 1 | 1.0 | < 1 | < 1 U | < 1.0 U | < 1 U | < 1 U | < 5 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 9.2 | 9.7 | 36.5 | 22.3 | 17.6 | <1.0 | 11 | 11J | 8.6 | 11 | 9.2 | 4.0 | 2.2 | 1.2 | 0.63 J | 0.66 J | 0.58 J | 1.3 J | 1.7 | 1.5 | 0.69 J | 0.38 J |
| Trichloroethene | ug/L | **5** | **768** | **833** | **14.8** | 1.6 | 1.8 | <1.0 | <10 | <5.0UJ | <4.0 | 0.86J | 3.1 | 1.6 | 1.6 | 1.4 | 0.66 J | 0.43 J | 0.51 J | < 5 U | 0.58 J | < 1.0 U | 0.41 J | **24** |
| Vinyl chloride | ug/L | **2** | **3.2** | <1.0 | 1.9 | **12.4** | **2.6** | <1.0 | <10 | <5.0UJ | <4.0 | <1 | < 1 | 0.53J | < 1 | 0.44 J | 1.1 | 0.42 J | 1.2 | **6.5** | **3.3** | **2.2** | 0.57 J | 0.99 J |
| Xylenes | ug/L | 10,000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <10 | <5.0UJ | <4.0 | <1.2 | 0.87J | 1.6 | < 1 | < 1 U | < 2.0 U | < 2 U | < 2 U | < 10 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| **Total VOCs** | ug/L | | 1,292.4 | 1,461.5 | 2,817.1 | 90.5 | 32.5 | 352 | 11 | 11 | 8.6 | 15.66 | 19.98 | 12.89 | 7.75 | 7.63 | 6.71 | 5.97 | 7.61 | 16.9 | 11.48 | 10.4 | 5.12 | 80.5 |

MCL - Maximum Contaminant Level.
ug/L - Micrograms per Liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit; reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) MCL not listed for 1,1-dichloroethene.
(2) Well GM-28R was installed on December 28, 2015.
**Bold -** Result above MCL.

**Table A-4**
**Summary of Annual Groundwater Analytical Results from Reactive Zone 3 West Wells**
**RACER Trust**
**Moraine, Ohio**

| RZ-3 West | | | GM-8 | | | | | | | | | | | | | | | | | GM-6 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **MCL[1]** | **3/6/98** | **9/20/99** | **9/26/00** | **11/9/01** | **9/20/02** | **10/1/03** | **9/14/04** | **10/19/05** | **9/19/06** | **9/18/07** | **9/23/08** | **11/16/09** | **9/27/10** | **9/29/11** | **9/6/12** | **9/26/13** | **10/7/14** | **12/8/15** | **3/6/98** | **9/20/99** | **9/26/00** | **11/9/01** | **9/20/02** | **10/2/03** | **9/14/04** | **10/19/05** | **9/19/06** | **9/18/07** | **9/24/08** | **11/11/09** | **9/27/10** | **9/29/11** | **9/6/12** | **9/25/13** | **10/7/14** | **12/8/15** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 6.7 | 1.9 | <1.0 | 0.40J | <2.0 | <2.0 | < 1 U | < 1.0 U | < 5 U | < 2 U | < 1 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 36.2 | 24.6 | 12.1 | 3.9 | 1.4J | 0.19J | < 1 U | < 1.0 U | < 1 U | < 1 U | < 1 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 49.3 | 30.2 | 36.5 | 40 | 63 | 48 | 15 | 16 | 18 | 9.1 | 1.7 | 2.9 | 3 | 1.9 | 0.66 J | 0.88 J | 0.59 J | 0.43 J | 35.3 | 33.2 | 13.0 | 14 | 60 | 20 | 18 | 21 | 16 | 26 | < 8.4 U | 6.9 | 6.2 | 4.5 | < 1.0 U | 0.66 J | 0.36 J | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | 1.0 | <1.0 | <1.0 | < 1.0 | <2.0 | <2.0 | < 1 U | < 1.0 U | < 5 U | < 2 U | < 1 U | <1.0 U | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | <1.0 | 1.2 | <1.0 | < 2.0 | <2.0 | <1.0 | < 1 U | < 1.0 U | < 1 U | < 1 U | < 1 U | <1.0 U | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | 2.3 | 3.4 | 1.1 | 0.78J | 5.5 | 5.4 | 4.2 | 3.5 | 2.1 J | 2.4 | 6.8 | 3.9 | 4.7 | 3.5 | 3.5 | 1.9 | 1.2 | < 1.0 U | <1.0 | <1.0 | <1.0 | < 2.0 | 2.2 | 1.0 | 1.7 | 0.49 J | < 1 U | 0.42 J | 1.2 | 1.3 | 1.1 | 1.0 | 2.5 | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | **70** | 56.1 | 26.2 | 1.5 | 2.0 | 5.5 | <1.0 | < 0.5 | 0.24 J | 2.1 J | < 2 U | < 1 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.27 J | 0.23 J | 0.31 J | **82.4** | 52.9 | 41.0 | 8.2 | 43 | 13 | 10 | 20 | 18 | 16 | 6.7 | 3.4 | 4.9 | 3.7 | < 1.0 U | 1.9 | 0.23 J | 0.26 J |
| Ethylbenzene | ug/L | 700 | 28.9 | 20.7 | 12.5 | 0.40J | 7.5 | 11 | 19 | 29 | < 5 U | 1.7 J | 8.6 | 5.5 | 0.33 J | 5.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | <1.0 | <10.0 | <1.0 | < 2.0 | <2.0 | 0.22J | < 1 U | < 1.0 U | < 1 U | < 1 U | < 1 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | **5** | **20.0** | **14.8** | <1.0 | < 1.0 | <2.0 | <2.0 | < 1 U | < 1.0 U | < 5 U | < 2 U | < 1 U | 0.34 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **94.0** | **81.4** | **51.5** | **14** | **14** | **11** | 2.6 | 0.34 J | < 1 U | < 1 U | < 1 U | <1.0 U | 0.38 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Toluene | ug/L | 1000 | <1.0 | <1.0 | <1.0 | < 1.0 | 1.8J | 1.2J | < 1 U | 0.39 J | < 5 U | < 2 U | < 1 U | 0.13 J | 0.18 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | <1.0 | <1.0 | <1.0 | < 2.0 | <2.0 | 0.83J | < 1 U | < 1.0 U | < 1 U | < 1 U | < 1 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 10.1 | 12.0 | 5.4 | 3.6 | 9 | 4.4 | 1.1 | 0.99 J | 1 J | 0.9 J | 0.27 J | 0.22 J | 0.29 J | 0.20 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.4 | 2.0 | 2.2 | 1.8 | 8.6 | 2.5 | 1.9 | 2.1 | 1.6 | 2.6 | 1.3 | 0.68 J | 0.89 J | 0.84 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | **5** | **95.2** | **30.4** | **6.6** | 4.4 | <2.0 | <2.0 | < 1 U | < 1.0 U | < 5 U | < 2 U | < 1 U | <1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.21 J | < 1.0 U | < 1.0 U | **119** | **78.2** | **56.6** | **48** | **33** | **23** | **5.7** | 1.4 | 0.35 J | 0.34 J | < 1 U | 3.8 | **6.6** | < 1.0 U | < 1.0 U | 0.26 J | < 1.0 U | < 1.0 U |
| Vinyl chloride | ug/L | **2** | **10.1** | **8.4** | **2.4** | 1.9 | **5.8** | <2.0 | 0.48 J | 0.73 J | 3.2 J | < 2 U | 0.48 J | <1.0 U | 0.44 J | 0.24 J | < 1.0 U | < 1.0 U | 0.58 J | 0.53 J | **2.3** | 1.6 | 3.7 | 1.9J | **12** | **3.3** | **3** | **11** | **7.3** | **6.7** | **2.1** | 1.2 | 1.6 | 1.5 | < 1.0 U | 0.79 J | < 1.0 U | < 1.0 U |
| Xylenes | ug/L | 10,000 | 10.3 | 2.3 | 1.9 | 0.39J | 1.5J | 2.0 | 1.1 | < 2.0 U | < 10 U | 0.9 J | 3.9 | 1.3 J | < 2.0 U | 0.99 J | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | <1.0 | <10 | <1.0 | < 2.0 | < 2.0 | 1.0 | < 1 U | < 2.0 U | < 2 U | < 2 U | < 2 U | <2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| **Total VOCs** | **ug/L** | | **290** | **150.3** | **67.9** | **53.87** | **99.6** | **72** | **40.88** | **50.85** | **26.4** | **15** | **21.75** | **14.29** | **8.94** | **12.2** | **4.2** | **3.3** | **2.6** | **1.3** | **371.6** | **275.1** | **180.1** | **91.8** | **174.2** | **76.04** | **42.9** | **56.33** | **43.25** | **52.06** | **11.3** | **17.28** | **21.67** | **11.5** | **2.5** | **3.6** | **0.6** | **0.3** |

MCL - Maximum Contaminant Level.
ug/L - Micrograms per Liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit; reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) MCL not listed for 1,1-dichloroethene.
**Bold -** Result above MCL.

**Table A-5**
**Summary of Annual Groundwater Analytical Results from Reactive Zone 3 East Wells**
**RACER Trust**
**Moraine, Ohio**

| RZ-3 East | | | GM-21 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **MCL[1]** | **9/22/99** | **2/23/00** | **5/26/00** | **9/22/00** | **3/19/01** | **6/25/01** | **11/13/01** | **12/11/01** | **6/12/02** | **9/25/02** | **5/22/03** | **9/24/03** | **9/14/04** | **10/17/05** | **9/20/06** | **12/1/06** | **9/26/07** | **10/3/08** | **11/16/09** | **9/28/10** | **9/29/11** | **9/7/12** | **9/26/13** | **10/9/14** | **12/11/15** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 53.1 | 15.4 | 27.9 | 15.7 | 7.0 | 7.7 | 6.9 | 1.2 | 23 | 31 | 18 | 31 | 26 | 4.3 | 12 | 4.7 | 8.5 | 8.7 | 2.4 | 0.75 J | 1 | < 2.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| 1,1-Dichloroethane | ug/L | | 9 | 5.8 | 6.8 | 5.6 | 5.1 | 4.1 | 3.8J | 0.71J | 5.4 | 5J | 4.1J | 6.9J | 4.2 J | 3.4 | 8.6 | 6.4 | 18 | 15 | 22 | 20 | 16 | 18 | 9.5 | 16 | 12 |
| 1,1-Dichloroethene | ug/L | 7 | 3.9 | 1.6 | 2.4 | 1.6 | 1.2 | <1.0 | <5.0 | <1.0 | 3.6 | 2.6J | < 6.7 | 2.0J | 3.1 J | < 1.0 U | 0.19 J | 0.2 J | < 1.4 U | 0.33 J | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| Benzene | ug/L | 5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <6.0 | <6.7 | < 6.7 | <8.0 | < 9.1 U | < 1.0 U | < 1 U | < 1 U | < 1.4 U | < 1.4 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 66.4 | 35.9 | 47.8 | 38.7 | 39.5 | 37.8 | 39 | 6.5 | 48 | 43 | 130 | **100** | 56 | 20 | 14 | 8.2 | 26 | 38 | 7.8 | 3.9 | 9.9 | 8.5 | 5.1 | 12 | 22 |
| Ethylbenzene | ug/L | 700 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <6.0 | <6.7 | < 6.7 | <8.0 | < 9.1 U | < 1.0 U | < 1 U | < 1 U | < 1.4 U | < 1.4 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| Tetrachloroethene | ug/L | 5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <6.0 | <6.7 | < 6.7 | **<8.0** | **< 9.1 U** | **< 1.0 U** | < 1 U | < 1 U | < 1.4 U | 0.56 J | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| Toluene | ug/L | 1000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <6.0 | <6.7 | < 6.7 | <8.0 | < 9.1 U | < 1.0 U | < 1 U | < 1 U | < 1.4 U | < 1.4 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 7.8 | 9.3 | 7.4 | 12.9 | 16.4 | 15.7 | 15 | 2.8 | 8.3 | 5.1 | 2.2J | 2.9J | 7.9 | 22 | 4.3 | 4.8 | 2.5 | 4.7 | 4.4 | 3 | 1.9 | 1.7 J | 1.1 | 1.6 | 1.6 J |
| Trichloroethene | ug/L | 5 | 28.7 | 283 | 311 | 189 | 169 | 158 | 160 | 28 | 210 | 230 | 79 | **200** | **180** | **1.8** | **5.9** | 0.8 J | 2.8 | 18 | 2.4 | 3.2 | 19 | 14 | 12 | 18 | 16 |
| Vinyl chloride | ug/L | 2 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <6.0 | <6.7 | < 6.7 | **<8.0** | **< 9.1 U** | **13** | **9.3** | 4.7 | **12** | 19 | 6.6 | 3.6 | 6.2 | 5.1 | 3.8 | 5.8 | 8.9 |
| Xylenes | ug/L | 10000 | <1.0 | 2.3 | <1.0 | <1.0 | <1.0 | <1.0 | <5.0 | <1.0 | <6.0 | <6.7 | < 6.7 | <8.0 | < 9.1 U | < 2.0 U | < 2 U | < 2 U | < 2.9 U | < 2.9 U | < 2.0 U | < 2.0 U | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 4.0 U |
| **Total VOCs** | **ug/L** | | **168.9** | **353.3** | **403.3** | **263.5** | **238.2** | **223.3** | **225** | **39.21** | **298.3** | **316.7** | **233.3** | **342.8** | **277** | **64.5** | **54.3** | **29.80** | **69.8** | **104** | **45.60** | **34.45** | **54** | **47.3** | **31.5** | **53.4** | **60.5** |

MCL - Maximum Contaminant Level.
ug/L - Micrograms per Liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit; reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) MCL not listed for 1,1-dichloroethene.
**Bold -** Result above MCL.

**Table A-6**
**Summary of Annual Groundwater Analytical Results for Reactive Zone 4 East Wells**
**RACER Trust**
**Moraine, Ohio**

| RZ-4 East | | | WEST | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **MCL[1]** | **9/20/99** | **5/24/00** | **9/22/00** | **3/19/01** | **6/25/01** | **11/12/01** | **6/12/02** | **9/26/02** | **5/21/03** | **09/25/03** | **09/13/04** | **10/18/05** | **09/21/06** | **09/17/07** | **09/23/08** | **11/17/09** | **4/7/10** | **9/27/10** | **9/29/11** | **41158** | **9/26/13** | **10/7/14** | **12/8/15** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 16 | 17.9 | 14.5 | 11.9 | 9.6 | 7.6 | 7.2 | 6.3 | 12 | 13 | 14 | 13 | 9.7 J | 0.59 J | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 7.7 | 7 | 4.4 | 4.1 | 2.9 | 2.9J | 3.7 | 6.3 | 8.4 | 8.3 | 8.1 | 9.0 | 7 J | 10 | 13 | 12 | 9.6 | 9.5 | 10.0 | 8.4 | 8.3 | 7.6 | 3.1 |
| 1,1-Dichloroethene | ug/L | 7 | 1 | 1.1 | <1.0 | <1.0 | <1.0 | <3.3 | 0.98 | <4 | < 4 | 1.6J | 1.9 J | 1.2 J | < 22 U | < 1 U | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U |
| Benzene | ug/L | 5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <3.3 | 0.62 | <4 | < 4 | <5.0 | < 4 U | < 1.7 U | < 22 U | < 1 U | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70.0 | 34.6 | 42.9 | 37.6 | 38.2 | 31.5 | 26 | 28 | 39 | 81 | 89 | 61 | 29 | 660 | 0.3 J | 0.68 J | 0.27 J | 0.27 J | < 1.0 U | 5.3 | 7.3 | 26 | 37 | 37 |
| Ethylbenzene | ug/L | 700.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <3.3 | <3.3 | <4 | < 4 | <5.0 | < 4 U | < 1.7 U | < 22 U | < 1 U | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | 46 | 57.1 | 68 | 67.6 | 71.7 | 64 | 60 | 52 | 62 | 62 | 71 | 95 | 9.1 J | 1.5 | 0.94 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U |
| Toluene | ug/L | 1000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <3.3 | <3.3 | <4 | < 4 | <5.0 | < 4 U | < 1.7 U | < 22 U | < 1 U | < 1 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100.0 | 2.3 | 2.7 | 2.6 | 3.0 | 2.4 | 2.0 | 2.3 | 2.7 | 2.5 | 2.9 | 2.4 | 1.0 J | 10 J | 0.29 J | 0.52 J | 0.37 J | 0.45 J | 0.46 J | 1.1 | 0.84 J | 1.1 | 0.91 J | 0.66 J |
| Trichloroethene | ug/L | 5 | 71.1 | 104 | 104 | 107 | 121 | 97 | 110 | 110 | 120 | 140 | 120 | 140 | 11 J | 0.46 J | 3 | 0.22 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.30 J | 0.46 J | 0.81 J | 1.3 |
| Vinyl chloride | ug/L | 2.0 | <1.0 | 1.4 | <1.0 | <1.0 | <1.0 | <3.3 | 0.70 | 5.2 | < 4 | <5.0 | < 4 U | 1.8 | < 22 U | < 1 U | 9.3 | < 1.0 U | < 1.0 U | < 1.0 U | 12 | 10 | 17 | 15 | 6.4 |
| Xylenes | ug/L | 10000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <3.3 | <3.3 | <4 | < 4 | <5.0 | < 4 U | < 3.3 U | < 44 U | < 2 U | < 2 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.9 U | < 2.0 U |
| **Total VOCs** | **ug/L** | | **178.7** | **234.1** | **231.1** | **231.8** | **239.1** | **199.5** | **213.5** | **221.5** | **285.9** | **316.8** | **278.4** | **290.0** | **707** | **13** | **27.4** | **12.9** | **10.3** | **10** | **28.4** | **26.84** | **52.86** | **61.32** | **48.46** |

MCL - Maximum Contaminant Level.
ug/L - Micrograms per Liter.
J - Value is estimated.
UJ - Constituent not detected above laboratory reporting limit; reporting limit estimated.
< - Constituent not detected above laboratory reporting limit shown.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September and October 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) MCL not listed for 1,1-dichloroethene.
**Bold -** Result above MCL.

**Table A-7**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 1**
**RACER Trust**
**Moraine, Ohio**

| RZ-1 | | GM-29 | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **9/1/99** | **2/22/00** | **5/26/00** | **9/21/00** | **3/20/01** | **6/26/01** | **11/13/01** | **12/12/01** | **6/13/02** | **9/25/02** | **5/22/03** | **9/24/03** | **9/15/04** | **9/29/99** | **2/22/00** | **5/26/00** | **10/17/05** | **9/28/06** | **9/26/07** | **10/6/08** | **11/17/09** | **9/29/10** | **9/30/11** | **9/26/12** | **9/27/13** | **10/9/14** | **12/8/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | 0 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | 0 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | <0.30 | <0.30 | <0.30 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <0.30 | 39.0 | 37.9 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | < 0.100 UH |
| Manganese (Total) | mg/L | 0.552 | 0.136 | 0.35 | 0.248 | 0.203 | 0.136 | 0.17B | 0.17 | 1.5B | 0.18B | 0.67J | 0.20J | 0.17 | 0.422 | 18.7 | 9.78 | 0.18 | 1.3 | 0.3 J | < 0.19 U | 0.296 | 0.451 | 0.18 | 0.170 | 0.190 | 0.190 | 0.22 |
| Manganese (Dissolved) | mg/L | 0.13 | 0.101 | 0.177 | 0.125 | 0.116 | 0.128 | 0.17B | 0.15 | 0.13B | 0.16B | 0.15J | 0.21J | 0.15 | 0.203 | 13.2 | 10.7 | 0.14 | 0.12 | 0.16 J | < 0.16 U | 0.118 | 0.113 | 0.11 | 0.110 | 0.110 | 0.130 | 0.12 |
| Iron (Total) | mg/L | 18 | 1.43 | 10.1 | 8.48 | 5.84 | 2.52 | 3.4 | 3.8 | 47.8B | 3.8 | 28.6 | 4.9 | 3.2 | 6.78 | 566 | 374 | 4.6 | < 0.1 U | 8.9 | < 5.4 U | 13.8 | 19.6 | 6.3 | 5 | 6.5 | 6.4 | 7.3 |
| Iron (Dissolved) | mg/L | 0.24 | 0.13 | 2.78 | 3.09 | <0.10 | 2.03 | 3.3 | 2.9 | 2.2B | 2.8 | 2.4 | 3.6 | 2.7 | <0.10 | 366 | 417 | 3.7 | 2.9 | 3.4 | < 3.9 U | 3.3 | 2.97 | 2.4 | 2.3 | 2.4 | 3.6 | 4 |
| Iron (Ferrous) | mg/L | 0.02 | 0 | 2.2 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 90 | 126 | 31 | 29 | 31 | 37 | 65 | 48 | 63 | 76 | 91J | 52 | 14 J | 61 | 508 | 140 | 51 | 70 | 65 | < 5 UJ | 68 | 72 | 64 | 58 | 55 | 41 | 49 |
| Sulfide | mg/L | <4 | <1 | <1 | <1 | <1 | <1 | 1.3 | <1 | <1 | <1 | 0.54B | 1.6 | < 1 U | <1 | <10 | 5.18 | < 1 U | < 1 U | < 1 U | < 1 U | 0.56 J | < 1.0 U | < 1.0 U | 0.80 J | < 1.0 U | < 1.0 U | < 1.0 U |
| Total Organic Carbon | mg/L | 18 | 11 | 22 | <1 | 7.57 | 7.3 | 10 | 10 | 8 | 8 | 7 | 9 | 9 | 6 | 14,100 | 5550 | 11 | 13 | 15 J | 16 | 9 | 8 | 8.5 | 9.4 | 12 | 16 | 12 |
| Chloride | mg/L | 254 | 426 | 508 | 373 | 337 | 262 | 600B | 460 | 490 | 490 | 490 | 560J | 540 | 397 | 1,560 | 1080 | 370 | 380 | 360 J | < 1 U | 210 | 160 | 130 | 130 B | 140 | 150 | 150 B |
| **Permanent Gases** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 46.52 | 49.87 | 44.05 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 16.96 | 999.4 | 918.87 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 1.02 | 0.66 | 1.41 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 8.23 | 0.20 | 0.17 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 20.29 | 18.7 | 15.61 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 14.51 | 7.13 | 6.19 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 0.01152 | 0.007699 | 0.00017 | 1.62 | 1.30 | 1.5 | 0.610 | 1.2 | 0.56 | 1.1 | 0.6 | 1.5 | 3.8 | 0.004308 | 0.02551 | 0.88 | 13 | 10 | NA | 16 | 8.1 | 5.7 | 3.1 | 3.7 | 4.5 | 6 | 5.9 |
| Carbon Monoxide | mg/L | <0.40 | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 5,641 | 1,861 | 751 | 639 | 460 | 17,000 | 20,000 | 28,000 | 14,000 | 16,000 | 7,400 | 9,900 | 13,000 | 1218 | 1495 | 770 | 170,000 | 350,000 | NA | 370,000 | 360,000 | 340,000 | 180,000 | 160,000 | 150,000 | 180,000 | 170,000 |
| Ethene | ng/L | 9,769 | 1,275 | 12,098 | 441,796 | 160,000 | 130,000 | 230,000 | 180,000 | 48,000 | 140,000 | 150,000 | 200,000 | 1,700,000 | 2458 | 1980 | 11737 | 1,600,000 J | 750,000 | NA | 420,000 | 140,000 | 59,000 | 20,000 | 18,000 | 17,000 | 16,000 | 16,000 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pH | S.U. | 6.99 | 7.02 | 6.86 | 7.24 | 7.31 | 7.20 | 7.47 | 7.57 | 7.14 | 7.22 | 6.32 | 6.88 | 6.85 | 7.24 | 5.76 | 5.48 | 6.80 | 6.94 | 6.63 | 7.1 | 6.91 | 7.09 | 6.59 | 6.69 | 6.87 | 6.94 | 7.19 |
| Specific Conductivity | umhos/cm | 1,502 | 3,044 | 2,388 | 1,942 | 1,733 | 1,291 | 2,703 | 2,860 | 1,977 | 2,354 | 2,303 | 2,278 | 2,580 | 2,033 | 28,360 | 11,895 | 2,200 | 2,170 | 2,350 | 1,870 | 1,264 | 1,427 | 1,651 | 960 | 1,302 | 1,341 | 1,460 |
| Dissolved Oxygen | mg/L | 0.35 | 0.51 | 0.45 | 3.44 | 8.20 | 0.40 | 0.22 | 0.01 | 3.57 | 1.40 | 1.38 | 0.13 | 0.04 | 0.82 | 2.84 | 4.32 | 0.00 | 0.29 | 0.4 | 0.11 | 0.16 | 2.00 | 0.15 | 0.70 | 0.21 | 0.11 | 0.00 |
| Redox Potential | mV | -526.6 | 19.6 | -105.4 | -35.0 | -158.2 | -166.4 | -129.7 | -168 | -122.9 | -91.3 | -157.8 | -118.6 | -134 | 175 | -118.4 | -65.4 | -153 | -168 | -139 | -54 | -140.1 | -163 | -14.2 | -60 | -108 | -102.1 | -124.0 |
| Temperature | °C | 17.8 | 16.9 | 17.97 | 17.64 | 20.04 | 20.47 | 16.42 | 17.13 | 19.33 | 17.63 | 18.23 | 16.81 | 16.4 | 18.33 | 20.24 | 21.74 | 16.8 | 16.69 | 18 | 16.78 | 16.50 | 18.00 | 21.1 | 21.0 | 24.0 | 17.2 | 16.7 |

mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) Monitoring Well GM-28R was installed on December 21, 2015 as a replacement for well GM-28.

**Table A-7**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 1**
**RACER Trust**
**Moraine, Ohio**

| RZ-1 | | GM-23 | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **9/2/99** | **2/21/00** | **5/31/00** | **3/20/01** | **6/13/02** | **9/26/02** | **5/22/03** | **9/23/03** | **9/14/04** | **10/17/05** | **9/28/06** | **9/27/07** | **10/23/08** | **11/17/09** | **9/29/10** | **9/30/11** | **9/7/12** | **9/27/13** | **10/10/14** | **12/5/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | 0.08 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | 3.83 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | <0.30 | 0.94 | 2.84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0.550 H |
| Manganese (Total) | mg/L | 4.71 | 0.887 | 0.121 | 0.469 | 1.5 J | 1.0 J | 1.5 J | 1.6 J | 1.3 J | 0.79 | 1.5 | 1.4 J | 0.89 | 0.539 | 0.508 | 0.57 | 0.410 B | 0.450 | 0.250 B | 0.14 |
| Manganese (Dissolved) | mg/L | 0.346 | 0.841 | 0.101 | 0.311 | 1.3 J | 0.68 J | 1.5 J | 1.7 J | 1.2 J | 0.81 | 1.5 | 1.3 J | 0.90 | 0.516 | 0.492 | 0.5 | 0.380 B | 0.440 | 0.240 B | 0.22 |
| Iron (Total) | mg/L | 13.6 | 0.53 | 0.18 | 0.48 | 0.16 J | 0.63 | 0.50 | 0.14 | 0.11 | 30.7 | 13.6 | 10.8 | 10.1 | 5.51 | 5.72 | 7.5 | 4.8 | 3.6 | 4.0 B | 4.2 |
| Iron (Dissolved) | mg/L | <0.10 | <0.10 | <0.10 | < 1.0 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | 34.2 | 13.2 | 10 | 10 | 5.21 | 5.33 | 6 | 4.7 | 3.7 | 4.1 B | 5.8 |
| Iron (Ferrous) | mg/L | 4 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 72 | 650 | 8040 | 1440 | 920 | 810 | 310 J | 650 | 430 J | 120 | 850 | 590 | 490 | 130 | 160 | 200 | 74 | 120 | 34 | 15 |
| Sulfide | mg/L | <4 | <1 | <1 | <1 | <1 | <1 | <1 U | 0.67 B | <1 | <1 | <1 U | < 1 U | < 1 U | 0.73 J | < 1.0 | < 1.0 U | <1.0 U | <1.0 U | 0.59 J | < 1.0 U |
| Total Organic Carbon | mg/L | 19 | 25 | 19 | 10.8 | 15 J | 15 | 15 | 13 | 10 J | 360 | 11 | 9 | 9 | 7 | 9 | 6.6 | 7.2 | 6.4 | 7.7 | 6.9 B |
| Chloride | mg/L | 118 | 143 | 85 | 232 | 180 | 190 | 220 | 140 J | 220 | 260 | 220 | 210 | 220 | 100 | 43 | 65 | 97 B | 39 | 150 B | 180 B |
| **Permanent Gases** | | | | | | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 88.47 | 264.8 | 323.79 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 0.96 | 1.56 | 17.78 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 20.22 | 13.75 | 3.13 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 0.1248 | 0.72 | 0.02083 | 0.780 | 1.6 | 2.1 | 2.7 | 1.8 | 1.5 | 1.3 | 0.91 | 0.64 | 1.9 | 1.7 | 2.5 | 2 | 2.6 | 0.840 | 5.50 | 5.40 |
| Carbon Monoxide | mg/L | <0.40 | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 6,878 | 14,644 | 1,037 | 11,000 | 25,000 | 32,000 | 44,000 | 23,000 | 17,000 | 16,000 | 12,000 | 7,100 | 21,000 | 31,000 | 36,000 | 25,000 | 71,000 | 16,000 | 100,000 | 88,000 |
| Ethene | ng/L | 580,916 | 439,458 | 569 | 260,000 | 230,000 | 230,000 | 1,200,000 | 270,000 | 260,000 | 500,000 | 900,000 | 370,000 J | 960,000 | 2,100,000 | 1,700,000 | 230,000 | 74,000 | 16,000 | 74,000 | 140,000 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| pH | S.U. | 6.80 | 6.62 | 6.31 | 6.64 | 6.81 | 6.76 | 5.59 | 6.73 | 7.04 | 5.66 | 6.69 | 6.34 | 7.74 | 6.80 | 6.89 | 6.52 | 9.13 | 6.76 | 6.98 | 7.43 |
| Specific Conductivity | umhos/cm | 1,160 | 2,856 | 6,720 | 3,448 | 2,290 | 2,390 | 1,683 | 2,258 | 2,130 | 2,570 | 2,740 | 2,470 | 1,465 | 1,184 | 1,395 | 1,812 | 1,310 | 1,228 | 1,321 | 1,530 |
| Dissolved Oxygen | mg/L | 0.65 | 0.78 | 10.48 | 8.38 | 4.23 | 0.42 | 1.76 | 0.85 | 0.00 | 0.00 | 0.40 | 0.44 | 0.11 | 0.16 | 0.23 | 0.54 | 2.83 | 0.40 | 0.23 | 0.00 |
| Redox Potential | mV | 122.2 | 158.7 | 194.2 | 160.4 | 346.5 | 215.6 | 247.9 | 198.8 | 57 | -108 | -108 | -91 | 189 | -90.1 | -104.2 | -52 | -161 | -49 | -63.8 | -79.0 |
| Temperature | $^{o}$C | 17.89 | 17.6 | 26.45 | 19.08 | 16.40 | 19.06 | 17.91 | 17.38 | 16.30 | 16.50 | 16.78 | 17.50 | 17.12 | 17.15 | 18.89 | 17.40 | 22.5 | 24.7 | 16.7 | 16.7 |

mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
$^{o}$C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) Monitoring Well GM-28R was installed on December 21, 2015 as a replacement for well GM-28.

**Table A-7**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 1**
**RACER Trust**
**Moraine, Ohio**

| RZ-1 | | GM-28 | | | | | | | | | | | | | | | | | | | | | GM-28R[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **9/1/99** | **2/23/00** | **5/26/00** | **9/21/00** | **3/20/01** | **6/26/01** | **11/15/01** | **12/12/01** | **7/21/02** | **9/24/02** | **5/23/03** | **10/1/03** | **4/30/04** | **9/15/04** | **10/18/05** | **9/27/06** | **9/20/07** | **10/22/08** | **11/16/09** | **9/28/10** | **10/5/11** | **12/28/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | 0.08 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | 0.06 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | <0.30 | <0.30 | 0.68 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese (Total) | mg/L | 3.2 | 1.15 | 6.26 | 4.1 | 0.594 | 2.24 | 0.58 | 0.47 | 1.1 | 0.48B | 0.69J | 0.42J | 0.34 | 0.37 | 0.45 | 0.46 | 0.44 J | 1.4 | 0.468 | 0.468 | 0.72 | 0.63 |
| Manganese (Dissolved) | mg/L | 0.068 | 0.449 | 6.71 | 3.94 | 0.477 | 1.76 | 0.61 | 0.49 | 1.1 | 0.41B | 0.29J | 0.40J | 0.32 | 0.36 | 0.45 | 0.43 | 0.43 J | 1.5 | 0.444 | 0.466 | 0.49 | 0.67 |
| Iron (Total) | mg/L | 106 | 25.3 | 22.7 | 58.9 | 29.6 | 59 | 23.6 | 23.5 | 36.2 | 28.7 | 47.9 | 23.4J | 17.6 | 15.7 | 16.1 | 14.5 | 11.7 | 23.4 | 11.3 | 11.6 | 22 | 4.6 |
| Iron (Dissolved) | mg/L | <0.10 | 0.59 | 23.3 | 48.3 | 2.65 | 49.8 | 23.3 | 23.7 | 34.7 | 23.4 | 16.7 | 22.4J | 16.4 | 15.1 | 15.2 | 13.1 | 10.7 | 23.7 | 10.2 | 10.6 | 5.5 | 3.5 |
| Iron (Ferrous) | mg/L | 0 | 0.03 | 2.6 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 89 | 43 | <5 | <5 | 9 | 106 | <5 | <5 | <5 | 18 | 65J | 31J | 89 | 93 J | 91 | 75 | 77 | 33 | 55 | 45 | 41 | 33 |
| Sulfide | mg/L | <4 | <1 | <1 | <1 | <1 | <1 | 1.5 | <1.0 | 2.0 | 4.3 | 2.5 | <1.0 | < 1 U | < 1 U | < 1.0 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1.0 | < 1.0 U | NA |
| Total Organic Carbon | mg/L | 15 | 24 | 742 | 571 | 90.0 | 360 | 74 | 68B | 140 | 23 | 15 | 17 | 15 J | 8 | 10 | 7 | 8 J | 310 | 6 | 7 | 9.1 | 3.9 |
| Chloride | mg/L | 208 | 664 | 805 | 782 | 1030 | 508 | 730B | 560 | 370 | 450 | 350 | 270J | 320 | 340 | 320 | 320 | 300 J | 260 | 220 | 170 | 130 | 70 |
| **Permanent Gases** | | | | | | | | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 41.52 | 63.57 | 16.51 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 2.32 | 0.59 | 0.64 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 19.42 | 16.39 | 19.82 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 0.002487 | 0.001832 | 0.21 | 1.70 | 13.0 | 13.0 | 13 | 20 | 19 | 14 | 8.9 | 11 | 7.9 | 6.6 | 2.8 | 2.5 | 2.3 | 2.9 | 4.2 | 2.3 | 0.76 | 0.69 |
| Carbon Monoxide | mg/L | <0.40 | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 750 | 493 | 865 | 1,198 | 42,000 | 39,000 | 91,000 | 98,000 | 420,000 | 300,000 | 310,000 | 230,000 | 160,000 | 150,000 | 81,000 | 73,000 | 72,000 | 52,000 | 73,000 | 53,000 | 14,000 | 1,200 |
| Ethene | ng/L | 48 | 98 | 646 | 1,794,606 | 57,000 | 5,000 | 1,100 | 1,400 | 8,800 | 12,000 | 74,000 | 430 | 160 | 54 | < 210 U | < 25 U | 62 | 9,300 | < 200 U | 150 | 86 | 240 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| pH | S.U. | 7.02 | 6.92 | 7.01 | 7.18 | 7.1 | 6.64 | 6.50 | 7.45 | 6.84 | 7.24 | 6.86 | 6.80 | NA | 6.85 | 5.47 | 7.08 | 6.72 | 6.49 | 7.04 | 7.16 | NA | 6.79 |
| Specific Conductivity | umhos/cm | 1,359 | 3,124 | 4,402 | 4,538 | 3,724 | 3,216 | 3,136 | 3,700 | 2,187 | 2,195 | 2,132 | 1,501 | NA | 2,030 | 2,230 | 1,880 | 2 | 1,428 | 1,821 | 1,615 | NA | 1080 |
| Dissolved Oxygen | mg/L | 0.95 | 1.45 | 2.52 | 6.78 | 4.36 | 0.41 | 0.83 | 0.20 | 0.68 | 0.35 | 1.41 | 0.34 | NA | 0 | 0 | 0.29 | 0.64 | 0.13 | 0.20 | 2.70 | NA | 0.22 |
| Redox Potential | mV | 90.5 | 56.0 | -93.7 | -200.1 | -70.6 | -177.8 | -148.2 | -203 | -153.3 | -135.3 | -93.1 | -146.9 | NA | -165 | -166 | -183 | -152 | 27 | -166.2 | -153.5 | NA | -78 |
| Temperature | °C | 16.4 | 18.48 | 19.24 | 20.21 | 18.93 | 19.04 | 19.24 | 18.92 | 20.44 | 18.68 | 16.88 | 17.97 | NA | 16.2 | 15.9 | 16.33 | 17.1 | 16.38 | 16.65 | 16.56 | NA | 16.79 |

mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.
(1) Monitoring Well GM-28R was installed on December 21, 2015 as a replacement for well GM-28.

**Table A-8**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 West RACER Trust**
**Moraine, Ohio**

| RZ-3 West | | GM-32 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **9/22/99** | **2/28/00** | **5/30/00** | **9/25/00** | **3/19/01** | **11/12/01** | **12/11/01** | **6/12/02** | **9/20/02** | **5/23/03** | **10/1/03** | **9/14/04** | **10/19/05** | **9/19/06** | **9/18/07** | **9/23/08** | **11/16/09** | **9/27/10** | **9/29/11** | **9/6/12** | **9/26/13** | **10/8/14** | **12/8/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | 2.29 | 2.00 | 19.3 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese (Total) | mg/L | 0.147 | 0.516 | 0.051 | 0.30 | 0.17 | 0.16B | 0.087B | 0.043B | 0.053B | 0.1J | 0.13J | 0.13 J | 0.076 | 0.088 | 0.077 J | 0.051 | NA | NA | NA | NA | NA | NA | NA |
| Manganese (Dissolved) | mg/L | 0.052 | 0.061 | 0.048 | 0.31 | <0.050 | 0.020B | 0.024B | 0.042B | 0.028B | 0.077J | 0.11J | 0.13 J | 0.067 | 0.078 | 0.072 J | 0.056 | NA | NA | NA | NA | NA | NA | NA |
| Iron (Total) | mg/L | 8.14 | 42.4 | 18.4 | 81.0 | 13 | 16.5 | 10.5 | 7.5 | 8.4B | 21.3 | 31.4J | 33.9 | 22.0 | 24.7 | 20 | 14 | NA | NA | NA | NA | NA | NA | NA |
| Iron (Dissolved) | mg/L | 3.53 | 0.59 | 17.1 | 81.6 | 3.17 | 5.2 | 6.5 | 8.1 | 6.8B | 18.7 | 30.5J | 34.5 | 19.8 | 24.5 | 19.5 | 13.6 | NA | NA | NA | NA | NA | NA | NA |
| Iron (Ferrous) | mg/L | 1.8 | 2.2 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 30 | <5 | <10 | <10 | <20 | 5 | 4J | 1J | <5 | <5 | <5 | < 5 U | < 5 U | < 5 U | < 5 U | 24 | NA | NA | NA | NA | NA | NA | NA |
| Sulfide | mg/L | <1 | <10 | <1 | <1 | 1.6 | <1 | <1.0 | 0.50J | 1.3 | 0.86B | 7.3 | 16 | 4.1 | 1 | 14 | 7.7 | NA | NA | NA | NA | NA | NA | NA |
| Total Organic Carbon | mg/L | 68 | 1200 | 2020 | 2720 | 1120 | 320B | 250 | 240 | 160 | 150 | 170 | 240 J | 300 | 260 | 290 J | 95 | 170 | 260 | 71 | 62 | 40 | 22 | 6.0 |
| Chloride | mg/L | 317 | 638 | 740 | 740 | 798 | 700B | 630 | 470 | 510 | 390 | 510J | 530 | 550 | 560 | 560 J | 400 | NA | NA | NA | NA | NA | NA | NA |
| **Permanent Gases** | | | | | | | | | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 39.79 | 8.94 | 24.32 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 1.67 | 0.85 | <0.15 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 14.93 | 15.23 | 2.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 2.73 | 7.06 | 14.91 | 16.84 | 29 | 29 | 38 | 24 | 32 | 24 | 19 | 25 | 30 J | 26 | 26 | 25 | NA | NA | NA | NA | NA | NA | NA |
| Carbon Monoxide | mg/L | <0.40 | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 1,649 | 9,965 | 1,029 | 189 | 7,900 | 42,000 | 72,000 | 84,000 | 94,000 | 74,000 | 46,000 | 57,000 | 85,000 J | 76,000 | 73,000 | 58,000 | NA | NA | NA | NA | NA | NA | NA |
| Ethene | ng/L | 86,509 | 163,855 | 472,312 | 510,593 | 150,000 | 130,000 | 90,000 | 93,000 | 49,000 | 9,900 | 3,400 | 2,000 | 1,900 J | 2,400 | 1,200 | 940 | NA | NA | NA | NA | NA | NA | NA |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | |
| pH | S.U. | 7.54 | 8.59 | 7.64 | 7.73 | 8.36 | 8.42 | 8.13 | 8.55 | 8.13 | 6.41 | 6.81 | 6.86 | 6.30 | 6.84 | 7.00 | 7.13 | 7.02 | 7.68 | 7.20 | 7.15 | 8.05 | 7.26 | 7.04 |
| Specific Conductivity | umhos/cm | 2,750 | 9,030 | 9,195 | 9,225 | 7,483 | 6,874 | 6,200 | 5,432 | 4,289 | 3,908 | 3,192 | 4,210 | 4,810 | 4,510 | 4,240 | 3,220 | 3,540 | 5,328 | 3,280 | 1,998 | 1,388 | 1,520 | 1,380 |
| Dissolved Oxygen | mg/L | 0.09 | 0.23 | 10.82 | 2.55 | 0.36 | 0.07 | 0.03 | 1.14 | 0.22 | 1.93 | 0.31 | 0 | 0 | 0.21 | 0.45 | 1.79 | 0.89 | 2.4 | 1.97 | 0.94 | 0.42 | 0.72 | 0.00 |
| Redox Potential | mV | -226.4 | -279.1 | -213.6 | -353.8 | -152.5 | -222.8 | -279 | -220.5 | -227.1 | -204.6 | -154.4 | -160 | -191 | -193 | -161 | -200 | -108 | -236.9 | -244 | -73 | -17 | -99 | -165.0 |
| Temperature | °C | 19.27 | 19.72 | 23.48 | 19.27 | 19.3 | 18.84 | 18.62 | 20.83 | 19.81 | 19.31 | 18.47 | 17.20 | 17.00 | 17.70 | 16.70 | 18.71 | 16.30 | 16.79 | 18.77 | 21.5 | 18.36 | 18.48 | 15.57 |

mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

**Table A-8**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 West RACER Trust**
**Moraine, Ohio**

| RZ-3 West | | GM-8 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **3/6/98** | **9/20/99** | **9/20/02** | **12/9/03** | **9/14/04** | **10/19/05** | **9/19/06** | **9/18/07** | **9/23/08** | **11/16/09** | **9/27/10** | **9/30/11** | **9/6/12** | **9/26/13** | **10/7/14** | **12/5/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | <4.4 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | <0.033 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | 1.69 | 1.95 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | < 0.100 UH |
| Manganese (Total) | mg/L | 0.204 | 0.125 | 0.085B | 0.21 | 0.13 | 0.17 | 0.16 | 0.12 J | 0.027 | 0.0617 | 0.14 | 0.035 | 0.025 | 0.037 | 0.061 | 0.086 |
| Manganese (Dissolved) | mg/L | 0.229 | 0.125 | 0.084B | 0.21 | 0.14 | 0.15 | 0.15 | 0.11 J | 0.026 | 0.0643 | 0.0604 | 0.031 | 0.025 | 0.036 | 0.061 | 0.09 |
| Iron (Total) | mg/L | 1.01 | 0.27 | 0.55B | 1.9 | 1.8 | 3.2 | 3.4 | 3.3 | 0.69 | 2.2 | 4.27 | 1.2 | 0.830 | 1.700 | 2.700 | 4.1 |
| Iron (Dissolved) | mg/L | 1.22 | 0.26 | 0.52B | 1.9 | 1.8 | 2.8 | 3.1 | 3 | 0.64 | 2.13 | 2.05 | 0.98 | 0.780 | 1.200 | 2.500 | 4.2 |
| Iron (Ferrous) | mg/L | <0.2 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 59 | 54 | 59 | <5 | 13 J | 27 | 24 | 49 | 32 | 23 | 22 | 24 | 27 | 22 | 28 | 32 |
| Sulfide | mg/L | <1 | <1 | <1.0 | <1.0 | 2 | < 1.0 U | 1.8 | 0.86 J | 0.54 J | 1.2 J | 1.4 | < 1.0 U | <1.0 U | <1.0 U | <1.0 U | < 1.0 U |
| Total Organic Carbon | mg/L | 7 | 8 | 16 | 20 | 19 J | 19 | 16 | 16 J | 12 | 15 | 19 | 17 | 8.2 | 9.8 | 5.8 | 4.7 |
| Chloride | mg/L | 248 | 216 | 180 | 180J | 190 | 260 | 320 | 360 J | 250 | 230 | 230 | 270 | 190 B | 150 | 150 | 170 B |
| **Permanent Gases** | | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 15.8 | 9.91 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 1.1 | 0.92 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 19.7 | 25.42 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 1.48 | 2.47 | 8.5 | 14 | 9 | 8.1 J | 7.2 | 9.1 | 4.4 | 7.8 | 6.7 | 4.7 | 2.5 | 1.8 | 2.3 | 2.1 |
| Carbon Monoxide | mg/L | <0.4 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 370 | 1,134 | 13,000 | 12,000 | 18,000 | 17,000 J | 7,200 | 10,000 | 22,000 | 11,000 | 19,000 | 26,000 | 10,000 | 12,000 | 12,000 | 23,000 |
| Ethene | ng/L | 12,233 | 39,617 | 3,700 | 440 | 56 | < 76 U J | 1,200 | 32 | 140 | < 220 U | 33 | 120 | 140 | 930 | 34 | 250 |
| **Field Parameters** | | | | | | | | | | | | | | | | | |
| pH | S.U. | 7.7 | 7.98 | 8.18 | 7.2 | 7.76 | 6.45 | 7.31 | 7.21 | 8.1 | 7.86 | 7.89 | 7.81 | 10.32 | 7.92 | 7.44 | 7.42 |
| Specific Conductivity | umhos/cm | 1,539 | 1,584 | 1,734 | 1,870 | 1,900 | 2,080 | 2,120 | 2,300 | 2,060 | 1,920 | 2,083 | 2,560 | 1,690 | 1,488 | 1,419 | 1,420 |
| Dissolved Oxygen | mg/L | 0.16 | 0.28 | 0.37 | 0.04 | 0 | 0 | 0.53 | 0.70 | 0 | 0 | 3.00 | 0.60 | 7.38 | 0.63 | 0.55 | 0.00 |
| Redox Potential | mV | -145 | -49.8 | -150.6 | -137 | -186 | -162 | -160 | -125 | -262 | -24 | -167.7 | -115 | -209 | -42.8 | -168.3 | -200.0 |
| Temperature | °C | 17.53 | 19.09 | 19.2 | 18.17 | 16.60 | 16.30 | 18.10 | 17.00 | 17.60 | 16.00 | 16.51 | 21.1 | 20.3 | 15.7 | 15.6 | 15.9 |

mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
°C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

**Table A-9**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 3 East**
**RACER Trust**
**Moraine, Ohio**

| RZ-3 East | | GM-21 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **9/22/99** | **2/23/00** | **5/26/00** | **9/22/00** | **3/19/01** | **11/13/01** | **12/11/01** | **10/3/08** | **11/16/09** | **9/28/10** | **9/29/11** | **9/7/12** | **9/26/13** | **10/9/14** | **12/11/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | 0 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | 0 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | <0.30 | <0.3 | <0.30 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | < 0.100 UH |
| Manganese (Total) | mg/L | 0.321 | 0.233 | 0.215 | 0.336 | 0.298 | 0.30B | 0.30B | 0.78 | 0.882 | 0.758 | 0.93 | 1.100 B | 1.1 | 1.1 B | 0.880 B |
| Manganese (Dissolved) | mg/L | 0.273 | 0.225 | 0.212 | 0.312 | 0.291 | 0.32B | 0.29B | 0.77 | 0.893 | 0.768 | 0.91 | 1.100 B | 1.0 | 1.1 B | 0.890 B |
| Iron (Total) | mg/L | 2.58 | 0.30 | 0.83 | 0.63 | 0.11 | <0.10 | 0.16 | 17.9 | 19.6 | 26.1 | 32 | 31 | 32 | 34 B | 29 B |
| Iron (Dissolved) | mg/L | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | 0.11 | 16.7 | 20.2 | 25.6 | 31 | 33 | 32 | 34 B | 29 B |
| Iron (Ferrous) | mg/L | 0.4 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 103 | 102 | 80 | 102 | 118 | 120 | 100 | 38 | 19 | 13 | 23 | 56 | 21 | < 50 U | 16 |
| Sulfide | mg/L | <1 | <1 | <1 | <1 | <1 | <1 | 1.9 | 1.5 | 4.0 J | < 1.0 | < 1.0 U | 14 | 1.0 | 1.6 | 0.47 J |
| Total Organic Carbon | mg/L | 1 | 3 | 2 | <1 | <1 | 2B | 1 | 18 | 45 | 91 | 100 | 86 | 120 | 120 | 110 |
| Chloride | mg/L | 136 | 145 | 126 | 129 | 165 | 140 | 150 | 240 | 220 | 230 | 300 | 240 B | 290 | 310 B | 300 B |
| **Permanent Gases** | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 37.04 | 37.40 | 18.70 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 1.41 | 0.99 | 1.89 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 23.40 | 21.67 | 23.64 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 0.03744 | 0.01769 | 0.01370 | 0.04218 | 0.048 | 0.049 | 0.035 | 28 | 28 | 23 | 15 | 12 | NA | 15 | 17 |
| Carbon Monoxide | mg/L | <0.40 | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 72 | 67 | 84 | 72 | 82 | 76 | 120 | 77,000 | 71,000 | 50,000 | 21,000 | 7,500 | NA | 6800 | 6300 |
| Ethene | ng/L | 169 | 38 | 70 | 69 | 46 | 46 | 100 | 13,000 | 6,700 | 3,600 | 3,100 | 5,800 | NA | 5400 | 8100 |
| **Field Parameters** | | | | | | | | | | | | | | | | |
| pH | S.U. | 6.99 | 7.22 | 7.06 | 7.21 | 7.85 | 7.50 | 7.45 | 6.05 | 6.40 | 6.46 | 6.50 | 6.36 | 6.38 | 7.12 | 6.95 |
| Specific Conductivity | umhos/cm | 1,188 | 1,299 | 1,048 | 1,096 | 1,067 | 1,190 | 1,360 | 1,405 | 2,088 | 2,424 | 2,974 | 2,511 | 1,373 | 2,853 | 1,280 |
| Dissolved Oxygen | mg/L | 0.66 | 0.60 | 0.40 | 0.99 | 0.57 | 0.04 | 0.04 | 0.12 | 0.24 | 3.60 | 0.30 | 0.12 | 0.47 | 0.28 | 0.00 |
| Redox Potential | mV | -26.9 | 113.3 | 167.1 | 153.9 | 218.5 | 168.8 | -25 | 68 | -92.1 | -95.1 | -13.7 | -12 | 22.6 | -29.3 | -151.0 |
| Temperature | $^{o}$C | 20.43 | 18.43 | 17.92 | 19.03 | 17.59 | 16.73 | 15.82 | 16.5 | 16.32 | 16.65 | 23.0 | 22.9 | 23.7 | 16.4 | 16.4 |

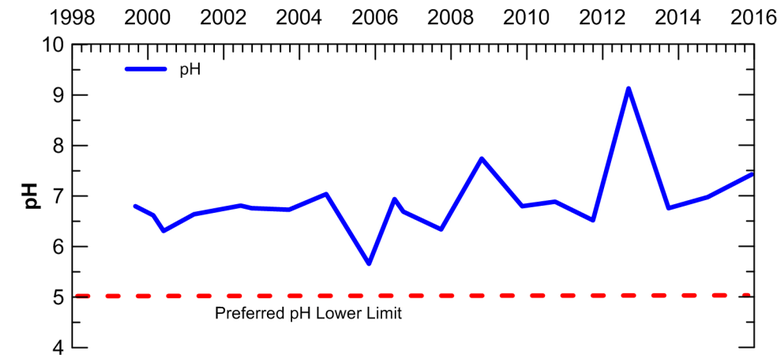
mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
$^{o}$C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

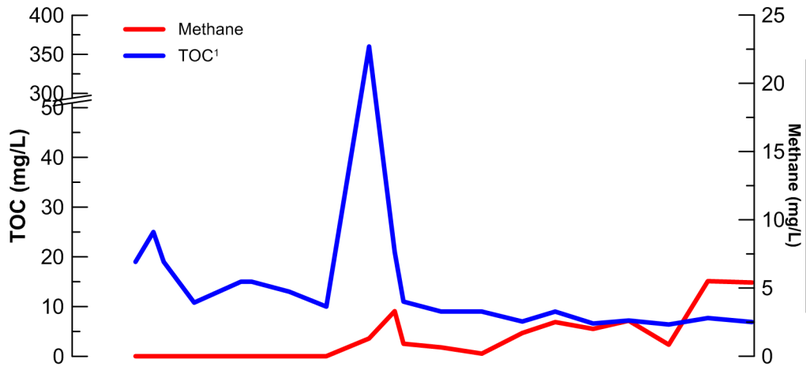
**Table A-10**
**Bioattenuation Parameter Results for Groundwater Samples Collected in Reactive Zone 4 East**
**RACER Trust**
**Moraine, Ohio**

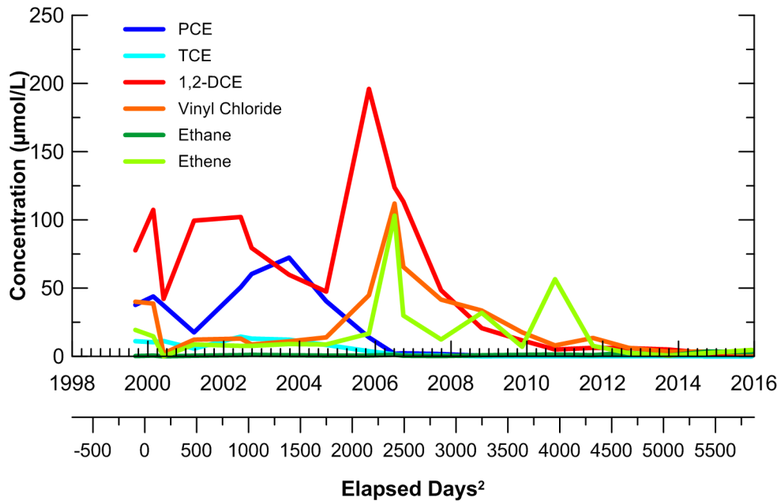
| RZ-4 East | | GM-19S | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Constituents** | **Units** | **9/20/99** | **2/23/00** | **5/24/00** | **9/22/00** | **3/19/01** | **11/20/01** | **12/11/01** | **6/12/02** | **9/26/02** | **5/21/03** | **9/25/03** | **9/13/04** | **10/18/05** | **9/21/06** | **9/17/07** | **9/23/08** | **11/17/09** | **4/7/10** | **9/27/10** | **9/29/11** | **9/6/12** | **9/26/13** | **10/7/14** | **12/5/15** |
| **Inorganics & TOC** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nitrate | mg/L | 11 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrite | mg/L | 0 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen, Ammonia | mg/L | <0.30 | <0.30 | <0.30 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | < 0.100 UH |
| Manganese (Total) | mg/L | 0.726 | 1.09 | 0.247 | 0.238 | 0.191 | 0.2 | 0.21B | 0.25B | 0.39B | 0.3J | 0.23J | 0.25 | 0.24 | 0.99 | 0.28 J | 0.16 | 0.0911 | NA | 0.169 | 0.17 | 0.130 | 0.110 | 0.15 | 0.14 |
| Manganese (Dissolved) | mg/L | 0.185 | 0.205 | 0.200 | 0.187 | 0.155 | 0.19 | 0.18B | 0.18B | 0.19B | 0.2J | 0.21J | 0.16 | 0.2 | 0.94 | 0.15 J | 0.16 | 0.0900 | NA | 0.170 | 0.14 | 0.130 | 0.110 | 0.15 | 0.18 |
| Iron (Total) | mg/L | 16.9 | 39.4 | 1.19 | 0.40 | 0.9 | 0.091 | 0.18 | 0.26 | 0.44 | 0.17 | 0.96 | 3 | 0.38 | 1.6 | 12.7 | 7.4 | 15.2 | NA | 18.9 | 11 | 6.7 | 5.5 | 7.4 | 6.7 |
| Iron (Dissolved) | mg/L | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.1 | <0.10 | < 0.1 U | < 0.10 U | 1.4 | 9.4 | 7.3 | 15.1 | NA | 18.3 | 9 | 6.4 | 5.4 | 5.7 | 6.4 |
| Iron (Ferrous) | mg/L | 0 | 0 | 0 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 127 | 131 | 131 | 118 | 113 | 100 | 90 | 110 | 110 | 150J | 150 | 110 J | 83 | 95 | 63 | 68 | 25 | NA | 21 | 58 | 84 | 76 | 43 | 47 |
| Sulfide | mg/L | <1 | <1 | <1 | <1 | <1 | <1 | 0.96J | <1.0 | <1.0 | <1 | 1.3 | 1.6 | < 1.0 U | < 1 U | < 1 U | < 1 U | 1.0 J | NA | 0.80 J | < 1.0 U | 0.75 J | < 1.0 U | < 1.0 U | < 1.0 U |
| Total Organic Carbon | mg/L | 2 | 7 | 5 | <1 | <1 | 2B | 1 | 1 | 3 | 2 | 2 | 1 | 3 | 22 | 6 J | 3 | 10 | NA | 14 | 4.6 | 2.6 | 3.2 | 2.2 | 2.5 |
| Chloride | mg/L | 247 | 197 | 168 | 165 | 158 | 130B | 150 | 140 | 210 | 270 | 300J | 310 | 320 | 350 | 400 J | 390 | 460 | NA | 390 | 340 | 290 B | 230 | 170 | 160 B |
| **Permanent Gases** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carbon Dioxide | mg/L | 41.85 | 57.12 | 50.12 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Oxygen | mg/L | 4.43 | 1.01 | 1.24 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Nitrogen | mg/L | 20.87 | 17.07 | 17.13 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Methane | mg/L | 0.00986 | 0.002712 | 0.003325 | 0.003706 | 0.039 | 0.005 | 0.0088 | 0.002 | 0.46 | 0.0021 | 0.0022 | 0.0014 | < 0.0065 U | 0.025 | 7.5 | 0.79 | 25 | NA | 19 | 1.3 | 0.009 | 0.220 | 0.54 | 1.2 |
| Carbon Monoxide | mg/L | <0.40 | <0.40 | <0.40 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Light Hydrocarbon Scan** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ethane | ng/L | 71 | 104 | 139 | 184 | 210 | 300 | 350 | 410 | 730 | 170 | 80 | 48 | < 250 U | 730 | 7,800 | 550 | 11,000 | NA | 9,300 | 870 | 53 | 85 | 91 | 160 |
| Ethene | ng/L | 55 | 45 | 43 | 36 | 61 | 34 | 27 | 130 | 770 | 78 | 45 | 51 | < 220 U | 550 | 22,000 | 30,000 | < 120 U | NA | 72 | 1,800 | 760 | 590 | 600 | 330 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| pH | S.U. | 7.05 | 7.05 | 7.00 | 7.19 | 7.14 | 7.28 | 7.31 | 7.09 | 7.02 | 6.71 | 6.93 | 7.13 | 5.97 | 6.84 | 7.03 | 7.1 | 6.93 | 6.78 | 7.47 | 6.33 | 7.11 | 8.43 | 6.85 | 6.95 |
| Specific Conductivity | umhos/cm | 1,500 | 1,784 | 1,548 | 1,235 | 1,097 | 1,190 | 1,350 | 1,052 | 1,474 | 1,706 | 1,726 | 1,970 | 1,940 | 2,150 | 2,010 | 2,290 | 1,951 | 2,370 | 1,986 | 2,150 | 1,377 | 1,539 | 1,280 | 1,280 |
| Dissolved Oxygen | mg/L | 0.92 | 0.30 | 1.94 | 1.36 | 0.96 | 1.75 | 0.06 | 0.9 | 0.47 | 2.01 | 1.87 | 0 | 0 | 0.3 | 0.43 | 1.87 | 0.33 | 0.80 | 0.67 | 2.08 | 0.54 | 0.54 | 0.32 | 0.00 |
| Redox Potential | mV | 31.3 | 149.6 | 200.1 | 187.7 | 320.8 | 195.6 | 13 | 446.3 | 259.6 | 178.3 | 135 | 160 | 122 | -82 | -145 | -153 | -137.9 | -157 | -112.5 | -150 | -26 | -64.1 | -79 | -151.0 |
| Temperature | $^{o}$C | 20.85 | 18.69 | 20.80 | 20.09 | 20.14 | 19.24 | 19.1 | 20.39 | 20.36 | 20.22 | 19.57 | 18.6 | 17.6 | 17.9 | 17.5 | 16.9 | 16.68 | 17.73 | 16.43 | 17.82 | 23.9 | 19.8 | 15.3 | 16.4 |

mg/L - Milligrams per Liter.
ng/L - Nanograms per Liter.
S.U. - Standard Units.
umhos/cm - Micromohs per Centimeter.
mV - Millivolts.
$^{o}$C - Degrees Celsius.
J - Value is estimated.
B - Blank Contamination.
NA - Not Analyzed.
< - Constituent not detected above laboratory reporting limit.
U - Constituent not detected above laboratory reporting limit shown.
Samples collected in September 1999 represent baseline conditions.
Carbon source introductions began in December 1999.

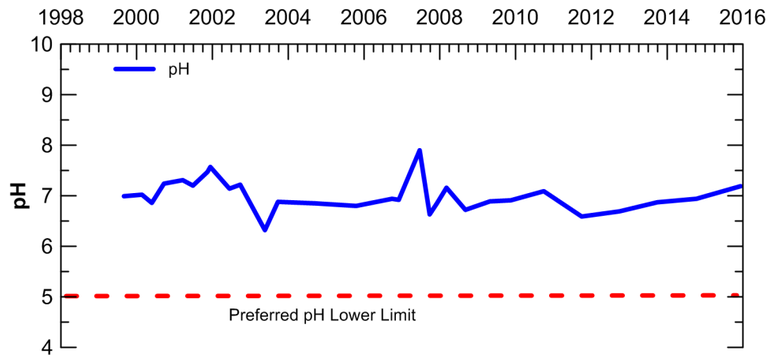
## GM-23 (Source Area)

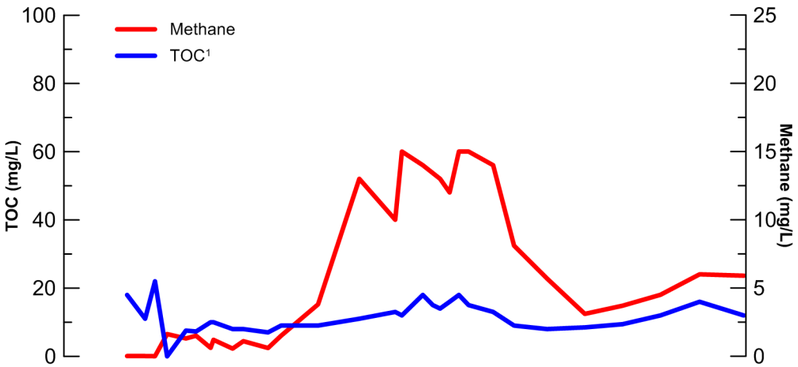


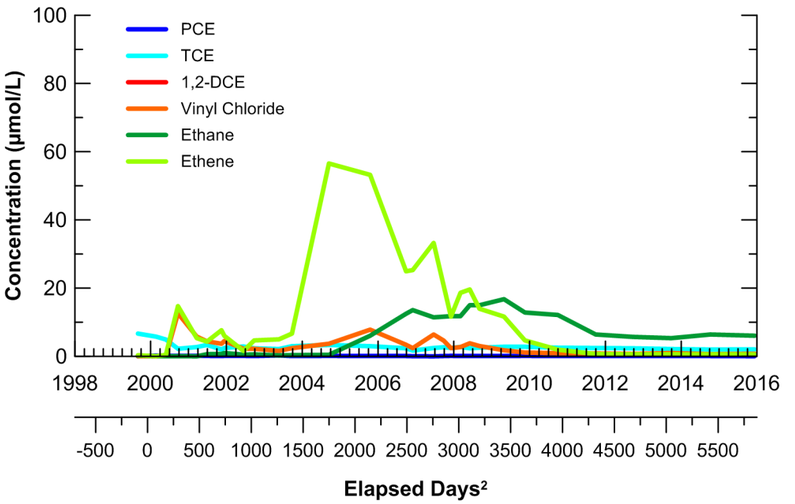



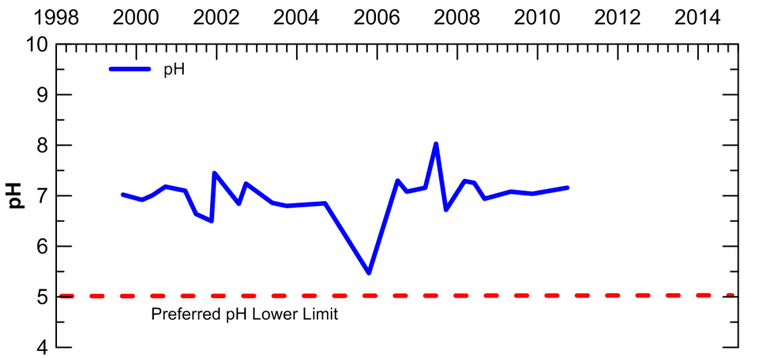

## GM-29 (Downgradient)

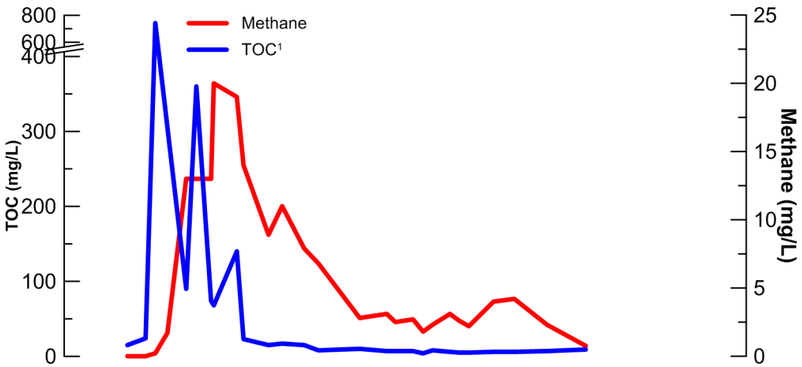


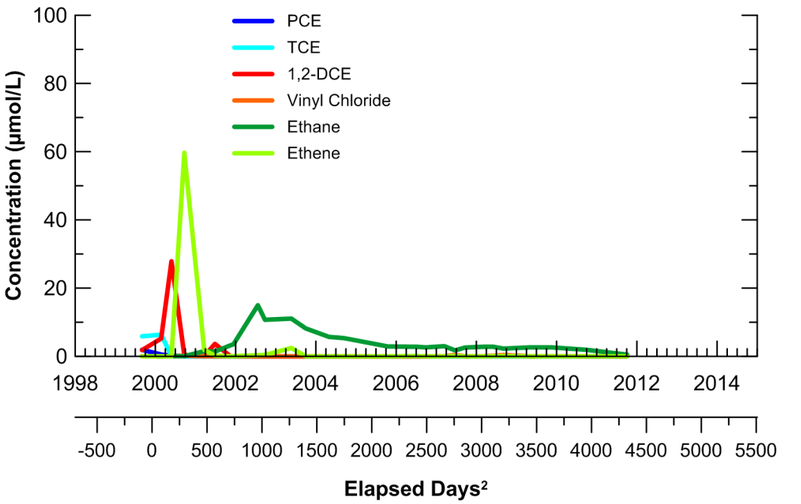




## GM-28 (Downgradient)




1 - TOC breakthrough is 20 mg/L.
2 - Days since RZ-1 ERD implementation.
ERD - Enhanced reductive dechlorination.
pH - Negative logarithm of the hydrogen-ion concentration.
mg/L - Milligram per liter.
Note: GM-28 has not been sampled since 2011.

µmol/L - micromoles per liter.
TOC - Total organic carbon.
PCE - Tetrachloroethene.
TCE - Trichloroethene.
1,2-DCE - cis and trans-1,2-Dichloroethene.

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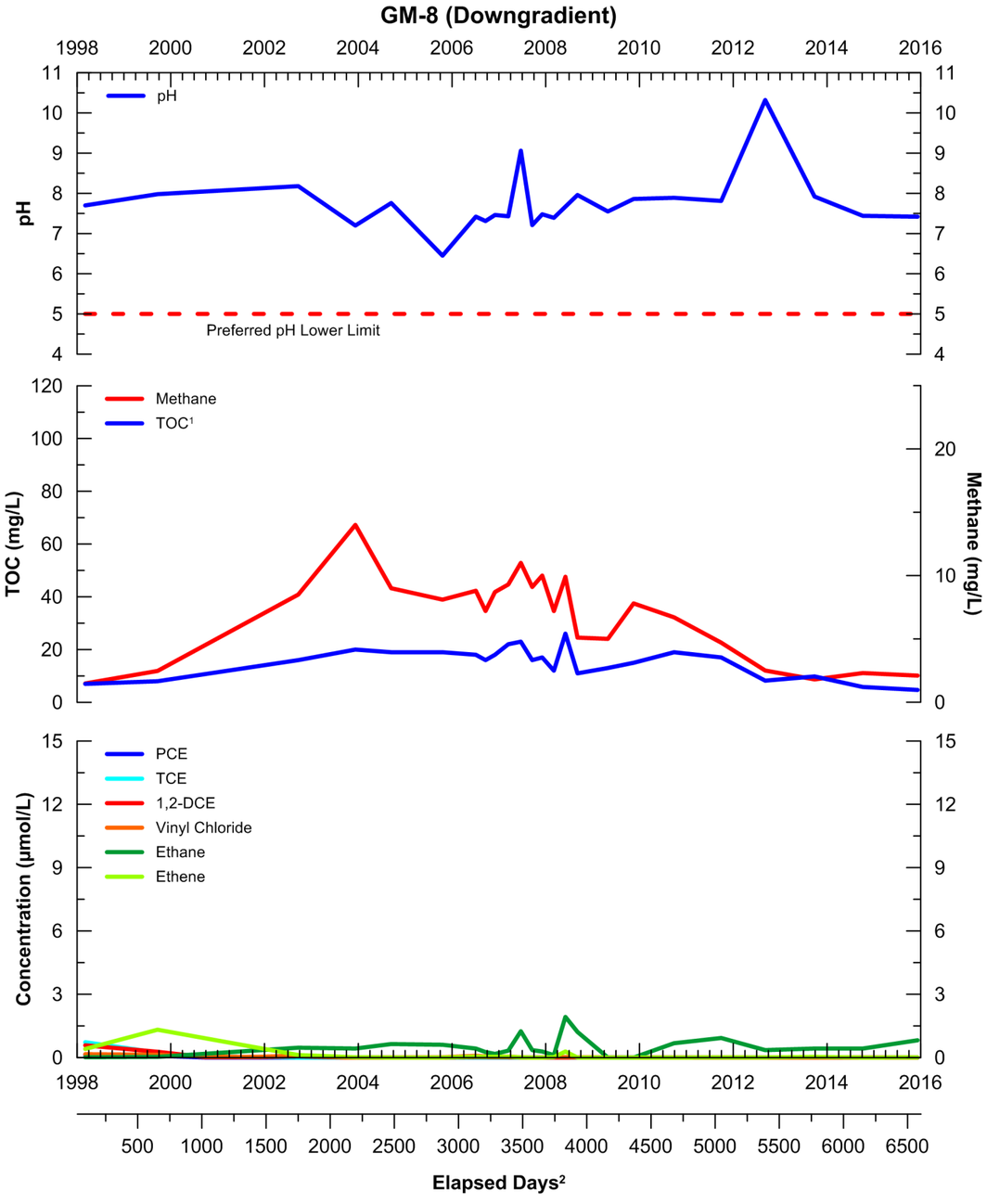
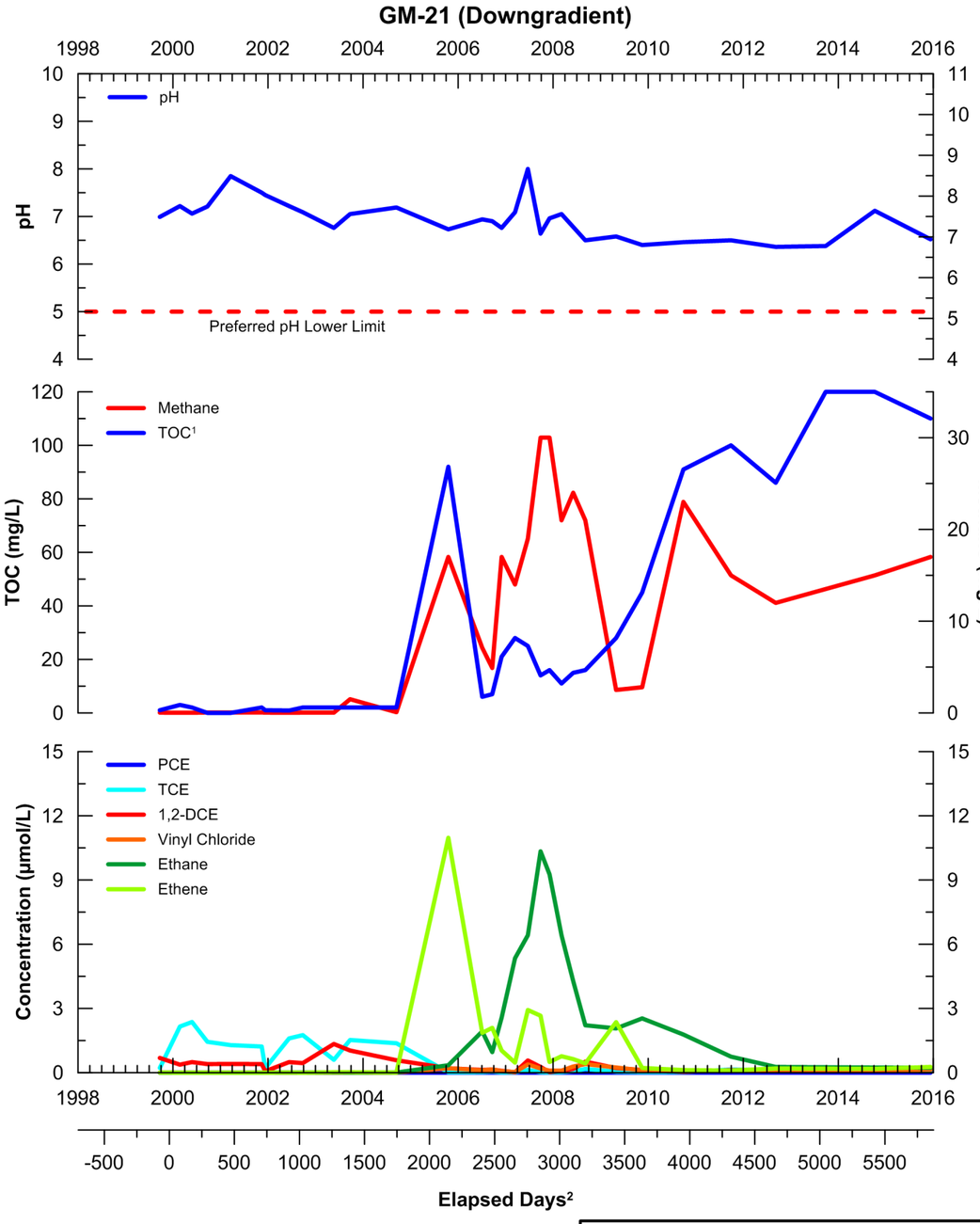
OH000294.2015

**RZ-1 ERD ANALYSIS**
**(GM-23, GM-29, GM-28)**

ARCADIS Design & Consultancy for natural and built assets

FIGURE
**A-1**




1 - TOC breakthrough is 20 mg/L.
2 - Days since RZ-3 ERD implementation.
ERD - Enhanced reductive dechlorination.
pH - Negative logarithm of the hydrogen-ion concentration.
mg/L - Milligram per liter.
µmol/L - micromoles per liter.
TOC - Total organic carbon.
PCE - Tetrachloroethene.
TCE - Trichloroethene.
1,2-DCE - cis and trans-1,2-Dichloroethene.

Note: Ethene, ethane, and methane parameters were not collected during the 2013 annual groundwater sampling event at GM-21.

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**RZ-3 WEST/EAST ERD ANALYSIS**
**GM-8 (WEST), GM-21(EAST)**

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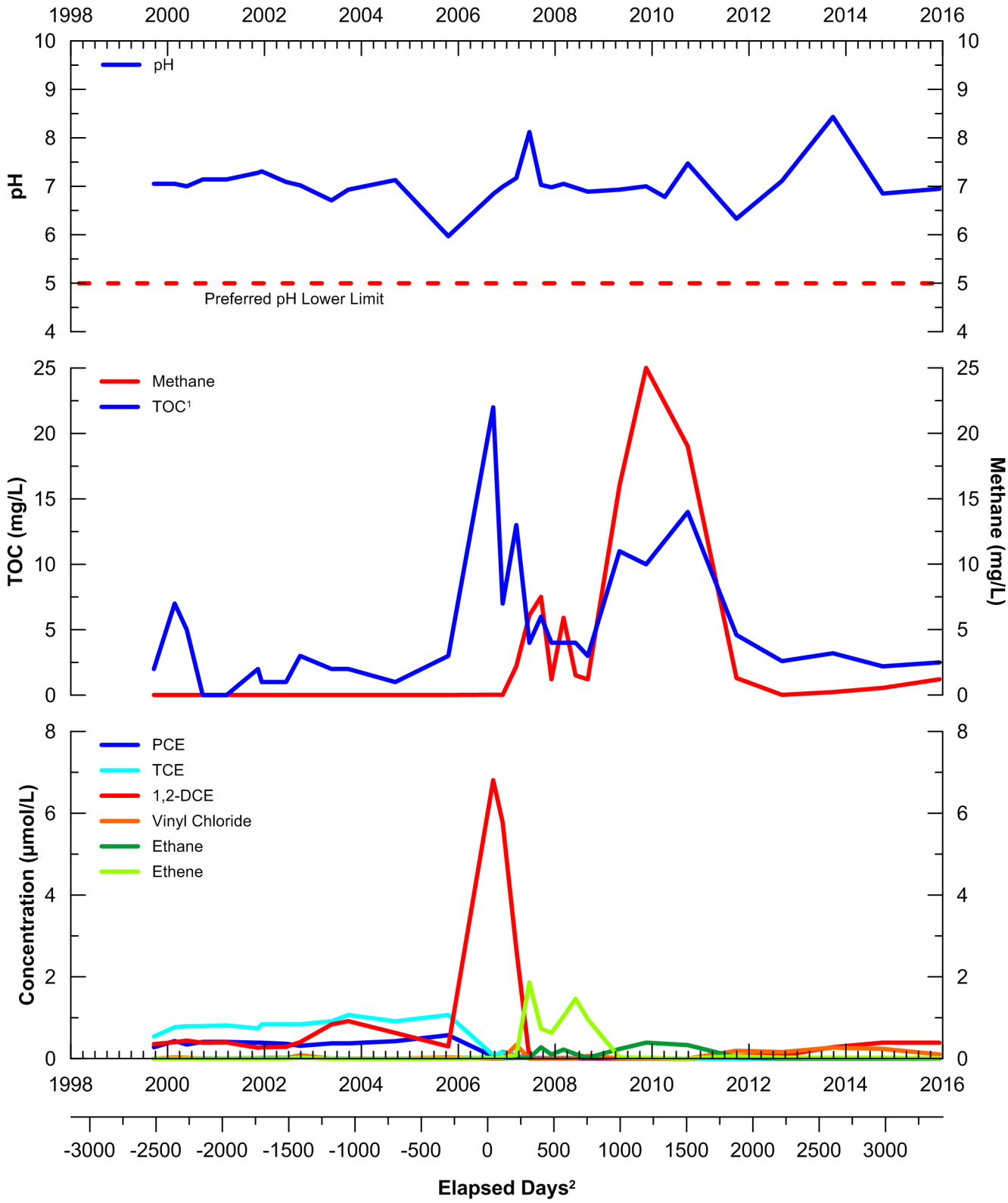
FIGURE
**A-2**




1 - TOC breakthrough is 20 mg/L.
2 - Days since RZ-4 ERD implementation.
ERD - Enhanced reductive dechlorination.
pH - Negative logarithm of the hydrogen-ion concentration.
mg/L - Milligram per liter.
µmol/L - micromoles per liter.
TOC - Total organic carbon.
PCE - Tetrachloroethene.
TCE - Trichloroethene.
cis-1,2-DCE - cis-1,2-Dichloroethene.

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OH000294.2015

**RZ-4 ERD ANALYSIS**
**(GM-19S - DOWNGRADIENT)**

ARCADIS Design & Consultancy for natural and built assets

FIGURE
**A-3**

G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\METHANE-UPPER-120815.dwg LAYOUT: 1 SAVED: 2/26/2016 1:04 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/26/2016 1:06 PM BY: SMITH, BOB
XREFS: IMAGES: PROJECTNAME: ----

| GM–23 | Methane (mg/L) |
|---|---|
| 9/2/99 | 0.1248 |
| 2/21/00 | 0.72 |
| 5/31/00 | 0.0208 |
| 3/20/01 | 0.780 |
| 6/13/02 | 1.6 |
| 9/26/02 | 2.1 |
| 5/22/03 | 2.7 |
| 9/23/03 | 1.8 |
| 9/14/04 | 1.5 |
| 10/17/05 | 1.3 |
| 9/28/06 | 0.91 |
| 9/27/07 | 0.64 |
| 10/23/08 | 1.9 |
| 11/17/09 | 1.7 |
| 9/29/10 | 2.5 |
| 9/29/99 | 0.0019 |
| 2/22/00 | 0.0234 |
| 5/26/00 | 2.59 |
| 9/30/11 | 2 |
| 9/7/12 | 2.6 |
| 9/27/13 | 0.840 |
| 10/10/14 | 5.50 |
| 12/5/15 | 5.40 |

| GM–28 | Methane (mg/L) |
|---|---|
| 9/1/99 | 0.0025 |
| 2/23/00 | 0.0018 |
| 5/26/00 | 0.21 |
| 9/21/00 | 1.70 |
| 3/20/01 | 13.0 |
| 6/26/01 | 13.0 |
| 11/15/01 | 13 |
| 12/12/01 | 20 |
| 7/21/02 | 19 |
| 9/24/02 | 14 |
| 5/23/03 | 8.9 |
| 10/1/03 | 11 |
| 4/30/04 | 7.9 |
| 9/15/04 | 6.6 |
| 10/18/05 | 2.8 |
| 9/27/06 | 2.5 |
| 9/20/07 | 2.3 |
| 10/22/08 | 2.9 |
| 11/16/09 | 4.2 |
| 9/28/10 | 2.3 |
| 10/5/11 | 0.76 |

| GM–28R | Methane (mg/L) |
|---|---|
| 12/5/15 | 0.690 |

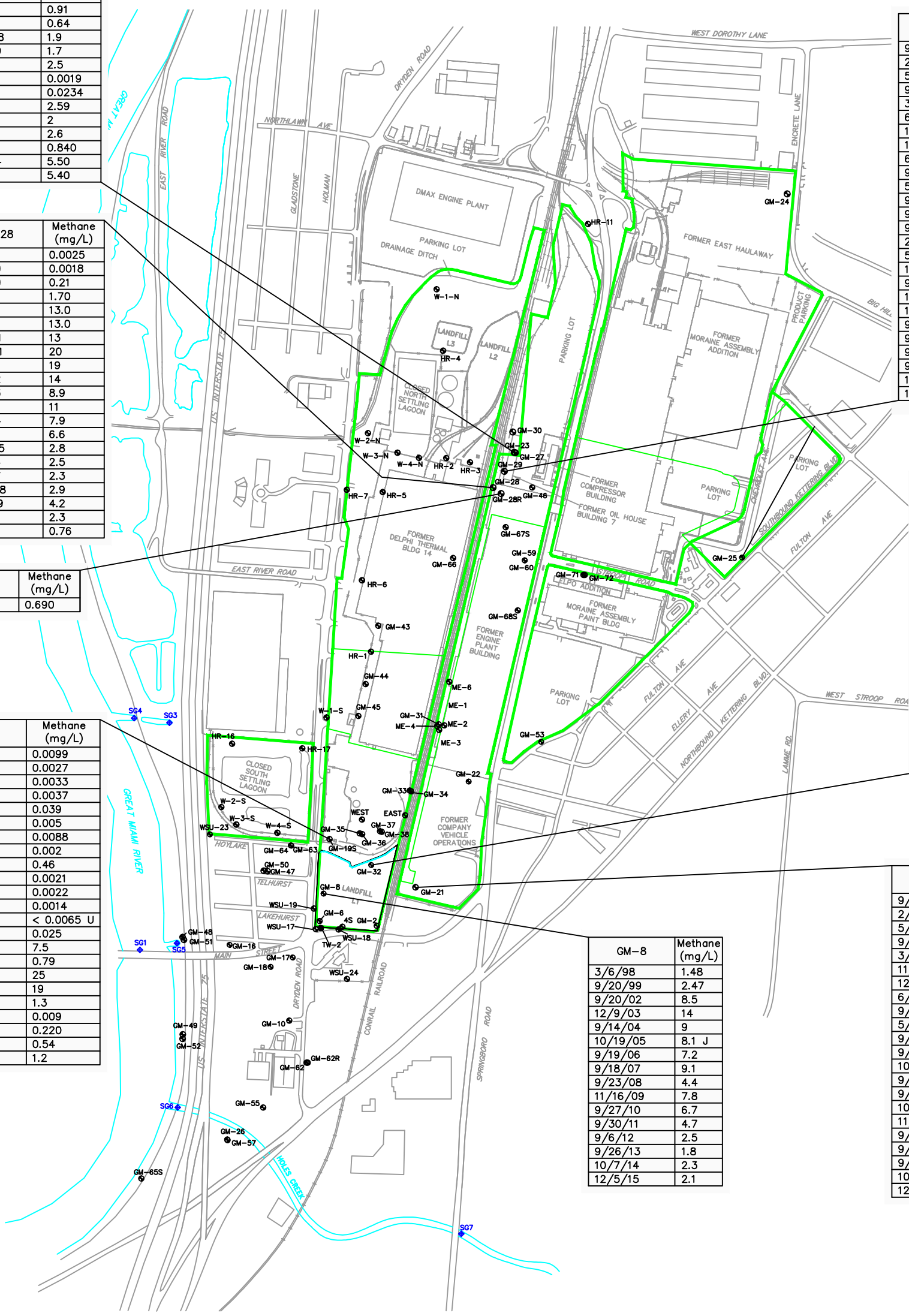
| GM–19S | Methane (mg/L) |
|---|---|
| 9/20/99 | 0.0099 |
| 2/23/00 | 0.0027 |
| 5/24/00 | 0.0033 |
| 9/22/00 | 0.0037 |
| 3/19/01 | 0.039 |
| 11/20/01 | 0.005 |
| 12/11/01 | 0.0088 |
| 6/12/02 | 0.002 |
| 9/26/02 | 0.46 |
| 5/21/03 | 0.0021 |
| 9/25/03 | 0.0022 |
| 9/13/04 | 0.0014 |
| 10/18/05 | < 0.0065 U |
| 9/21/06 | 0.025 |
| 9/17/07 | 7.5 |
| 9/23/08 | 0.79 |
| 11/17/09 | 25 |
| 9/27/10 | 19 |
| 9/29/11 | 1.3 |
| 9/6/12 | 0.009 |
| 9/26/13 | 0.220 |
| 10/7/14 | 0.54 |
| 12/5/15 | 1.2 |

| GM–8 | Methane (mg/L) |
|---|---|
| 3/6/98 | 1.48 |
| 9/20/99 | 2.47 |
| 9/20/02 | 8.5 |
| 12/9/03 | 14 |
| 9/14/04 | 9 |
| 10/19/05 | 8.1 J |
| 9/19/06 | 7.2 |
| 9/18/07 | 9.1 |
| 9/23/08 | 4.4 |
| 11/16/09 | 7.8 |
| 9/27/10 | 6.7 |
| 9/30/11 | 4.7 |
| 9/6/12 | 2.5 |
| 9/26/13 | 1.8 |
| 10/7/14 | 2.3 |
| 12/5/15 | 2.1 |

| GM–29 | Methane (mg/L) |
|---|---|
| 9/1/99 | 0.0115 |
| 2/22/00 | 0.0077 |
| 5/26/00 | 0.0002 |
| 9/21/00 | 1.62 |
| 3/20/01 | 1.30 |
| 6/26/01 | 1.5 |
| 11/13/01 | 0.610 |
| 12/12/01 | 1.2 |
| 6/13/02 | 0.56 |
| 9/25/02 | 1.1 |
| 5/22/03 | 0.6 |
| 9/24/03 | 1.5 |
| 9/15/04 | 3.8 |
| 9/29/99 | 0.0043 |
| 2/22/00 | 0.0255 |
| 5/26/00 | 0.88 |
| 10/17/05 | 13 |
| 9/28/06 | 10 |
| 10/6/08 | 16 |
| 11/17/09 | 8.1 |
| 9/29/10 | 5.7 |
| 9/30/11 | 3.1 |
| 9/26/12 | 3.7 |
| 9/27/13 | 4.5 |
| 10/9/14 | 6 |
| 12/5/15 | 5.9 |

| GM–32 | Methane (mg/L) |
|---|---|
| 9/22/99 | 2.73 |
| 2/28/00 | 7.06 |
| 5/30/00 | 14.91 |
| 9/25/00 | 16.84 |
| 3/19/01 | 29 |
| 11/12/01 | 29 |
| 12/11/01 | 38 |
| 6/12/02 | 24 |
| 9/20/02 | 32 |
| 5/23/03 | 24 |
| 10/1/03 | 19 |
| 9/14/04 | 25 |
| 10/19/05 | 30 J |
| 9/19/06 | 26 |
| 9/18/07 | 26 |
| 9/23/08 | 25 |
| 11/16/09 | NA |
| 9/27/10 | NA |
| 9/29/11 | NA |

| GM–21 | Methane (mg/L) |
|---|---|
| 9/22/99 | 0.037 |
| 2/23/00 | 0.0177 |
| 5/26/00 | 0.0137 |
| 9/22/00 | 0.0422 |
| 3/19/01 | 0.048 |
| 11/13/01 | 0.049 |
| 12/11/01 | 0.035 |
| 6/12/02 | 0.022 |
| 9/25/02 | 0.03 |
| 5/22/03 | 0.031 |
| 9/24/03 | 1.5 |
| 9/14/04 | 0.077 |
| 10/17/05 | 17 |
| 9/20/06 | 4.9 |
| 9/26/07 | 30 |
| 10/3/08 | 28 |
| 11/16/09 | 28 |
| 9/28/10 | 23 |
| 9/29/11 | 15 |
| 9/7/12 | 12 |
| 10/9/14 | 15 |
| 12/5/15 | 17 |




**LEGEND**

- MONITORING WELL (UPPER AQUIFER)
- RECOVERY WELL (TW–2)
- STREAM GAUGE
- FORMER BUILDING 14 FOOTPRINT
- RIVER LEVEE
- PROPERTY BOUNDARY (SOURCE: MONTGOMERY COUNTY AUDITOR'S WEBSITE, FEBRUARY 2015)
- PARCEL BOUNDARY (SOURCE: MONTGOMERY COUNTY AUDITOR'S WEBSITE, FEBRUARY 2015)
- SURFACE WATER FEATURE

RACER TRUST
MORAINE, OHIO

OH000294.2016

# UPPER AQUIFER METHANE RESULTS AT REACTIVE ZONE PERFORMANCE WELLS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
A-4

# APPENDIX B

## ERD Microbial Investigation Report

ARCADIS Design & Consultancy for natural and built assets

Revitalizing Auto Communities Environmental Response (RACER) Trust

# ENHANCED REDUCTIVE DECHLORINATION (ERD) MICROBIAL INVESTIGATION REPORT

RACER Facilities
Moraine, Ohio

February 29, 2016

,

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Figure B-1. Relative Abundance of Dechlorinating Species
Figure B-2. Relative Abundance of Reductase-Encoding Genes

# ATTACHMENTS

1 Microbial Abundance Bar Charts

# EXECUTIVE SUMMARY

This report summarizes a microbial genetic survey conducted by Arcadis U.S., Inc. during the fourth quarter of 2015 at the Revitalizing Auto Communities Environmental Response (RACER) Trust Facilities in Moraine, Ohio (Site). The objective of this work was to quantify the extent of the microbial community capable of reductive dechlorination within the treatment areas and in areas planned for future enhanced reductive dechlorination (ERD) treatment activities at the Site. This work provides a microbial genetics-based line of evidence to support historical data that has demonstrated the efficacy of the ERD site remedy and allows comparison of dechlorinating microorganisms in different areas of the Site.

Performance monitoring data collected over the course of the past 15 years demonstrate that the ERD technology is effective in promoting the degradation of chlorinated solvents present in saturated soil and groundwater. The addition of a microbial genetics-based line of evidence was requested by the United States Environmental Protection Agency during a conference call on September 18, 2015. Proposed activities to fulfill this request were presented in a letter dated October 7, 2015, from RACER Trust to the United States Environmental Protection Agency (USEPA; RACER Trust 2015). These activities included deployment of Bio-Trap® samplers to survey subsurface microbial communities at 14 upper aquifer and six lower aquifer monitoring wells, collection of groundwater samples for analysis of concentrations of Site-specific volatile organic compounds, and collection of groundwater samples for analysis of geochemical indicator parameters. Microbial genetic survey results were interpreted within the context of the results of concurrent groundwater sampling.

Results of this investigation provide an additional and strong line of evidence that ERD treatment at the site is effective. In the upper aquifer, injection of carbon substrate at each of the reactive zones (RZ) has stimulated microbial communities capable of full reductive dechlorination. Additionally, these results indicate that native populations outside of current treatment areas have a capacity for reductive dechlorination and suggest that their activity can be enhanced with the addition of an appropriate carbon substrate. In the lower aquifer, results indicate that in the absence of carbon addition, conditions are conducive for reductive dechlorination and a microbial community capable of mediating this process has developed in response to VOC concentrations originating from the former Process Sump Area (PSA).

# 1 INTRODUCTION

The purpose of this Enhanced Reductive Dechlorination (ERD) Microbial Investigation Report (report) is to summarize a microbial genetic survey conducted at the Revitalizing Auto Communities Environmental Response (RACER) Trust Facilities in Moraine, Ohio (Site, Figure 1).During a conference call on September 18, 2015, the U.S. EPA requested that additional ERD assessment activities be completed at the Site. Proposed activities to fulfill this request were presented in a letter dated October 7, 2015, from RACER Trust to the United States Environmental Protection Agency (USEPA; RACER Trust 2015).

Performance monitoring data collected over the course of the past 15 years demonstrate that the ERD technology is effective in promoting the degradation of chlorinated solvents present in saturated soil and groundwater. The objective for the October 2015 microbial sampling event was to quantify the extent of the microbial community capable of reductive dechlorination within the treatment areas and in areas planned for future ERD treatment activities. These data provide a microbial genetics-based line of evidence demonstrating that ERD is effective at the Site.

In addition to this Introduction, this report contains the following sections:

- Site Investigation Activities: Summarizes sampling conducted between October and December 2015 in support of this ERD microbial investigation,
- Investigation Results: Summarizes results of Site investigation activities, and
- Conclusions: Provides a summary of information gained from Site investigation activities.

# 2 SITE INVESTIGATION ACTIVITIES

Site investigation activities included deployment and retrieval of Bio-Trap® samplers for microbial genetics sampling, and groundwater sampling for concentrations of volatile organic compounds (VOC) and geochemical indicator parameters, as described in the following subsections.

## 2.1 Microbial Genetics Sampling and Analysis

Between October 27 and 29, 2015, Bio-Trap® samplers were deployed at 14 upper aquifer monitoring wells and at six lower aquifer monitoring wells. The rationale for the selection of these monitoring wells is presented in Table B-1. Groundwater was purged and field parameters were measured prior to Bio-Trap® deployment. Bio-Trap® samplers remained deployed for 39 to 41 days, and were retrieved on December 7, 2015. In the initial proposal (RACER 2015), it was indicated that Bio-Trap® samplers previously deployed for the 1,4-Dioxane evaluation at three monitoring wells (GM-8, GM-30, and GM-66) would also be used for the ERD microbial investigation. However, it was subsequently decided that re-deployment of new Bio-Trap® samplers at each of these monitoring wells would provide a more directly comparable dataset for this evaluation, with all Bio-Trap® samplers deployed over the same period.

Bio-Trap® samplers are a passive sampling tool used to survey subsurface microbial communities. These samplers consist of a plastic housing filled with Bio-Sep® beads. These beads are approximately 2 to 4 millimeters in diameter, are a composite of an inert structural material (Nomex®) covered with powdered activated carbon, and form a suitable surface for colonization by microbes.

Following retrieval, Bio-Trap® samplers were immediately shipped to Microbial Insights (MI; Knoxville. Tennessee), and deoxyribonucleic acid (DNA) was extracted from the Nomex® beads within 24 hours following removal from the Bio-Trap® samplers from monitoring wells. MI quantified copy numbers of relevant genes using the quantitative polymerase chain reaction (qPCR) method, and converted the results to an estimated number of cells per bead. Specifically, the following genetic targets were evaluated in DNA extracted from Bio-Trap® samplers retrieved from each of the monitoring wells:

- *Dehalococcoides* (DHC)
- *Dehalobacter* (DHBt)
- *Desulfitobacterium* (DSB)
- *Desulfuromonas* (DSM)
- A trichloroethene (TCE) reductase gene (tceA)
- Two vinyl chloride reductase genes (bvcA and vcrA)

The phylogenetic gene targets DHC, DHBt, DSB, and DSM quantify the majority of strains and species within the genera that they correspond to. Each of these genera includes strains and species known to have the capability to catalyze the reductive dechlorination of chlorinated ethenes, some also include strains and species able to catalyze other reductive dechlorination reactions. *Dehalococcoides* is the only microbial genera with species known to be capable of the full reductive dechlorination of tetrachloroethene (PCE) to the innocuous end-products ethene and ethane. Strains and species in the DSB and DSM genera have a relatively broad range of potential substrates and not all strains and species in these genera are capable of reductive dechlorination. In addition to the genera surveyed, there may be other microbial groups actively contributing to reductive dechlorination and other biodegradation reactions in Site groundwater. The functional genes tceA, bvcA, and vcrA encode reductase enzymes used by multiple strains of *Dehalococcoides* to catalyze the reductive dechlorination of TCE and vinyl chloride. These specific genes have been well characterized. However, it is likely that other genes encoding reductase enzymes are used by microorganisms in the environment and it is possible that not all of these genes are identified using assays designed to target three specific genes. Microbial genetic survey results are presented in Table B-2.

## 2.2 Groundwater Sampling and Analysis

On October 27 through 29, 2015, at each monitoring well, dissolved oxygen (DO) concentrations were measured using a downhole optical sensor (YSI ProODO), groundwater was purged from the monitoring well, a second DO measurement was made, and a Bio-Trap® sampler was deployed. DO concentrations measured prior to deployment are summarized in Table B-3. The purpose of using a downhole optical DO sensor was to facilitate rapid in situ measurements of this parameter. Optical DO sensors generally require less-frequent calibration and produce more accurate and repeatable measurements at low DO concentrations in groundwater than the standard flow-through cell measurement technique.

On December 7, 2015, following Bio-Trap® retrieval, DO was again measured using a downhole optical sensor (Table B-3). Over the following days, between December 8 and 11, 2015, each of the 20 groundwater monitoring wells where Bio-Trap® samplers were deployed were purged, field parameters were measured, and groundwater samples were collected in conjunction with the Site-wide annual sampling event. Groundwater samples for analysis of Site-specific VOC were collected at each of the 20

monitoring wells and duplicate samples were collected at two monitoring wells (Table B-4). Additionally, groundwater samples for analysis of geochemical indicator parameters were collected at a subset of eight upper aquifer monitoring wells, according to the annual monitoring schedule (Table B-5).

# 3 INVESTIGATION RESULTS

Results of this investigation indicate that injection of carbon substrate at each of the upper aquifer reactive zones (RZ) has stimulated microbial communities capable of reductive dechlorination. Results also suggest that outside of current treatment areas native populations in the upper aquifer have a capacity for reductive dechlorination and suggest that their activity can be enhanced with the addition of an appropriate carbon substrate. In the lower aquifer, results indicate that conditions are conducive for reductive dechlorination, and a microbial community capable of mediating this process has developed in response to VOC concentrations originating from the former Process Sump Area (PSA).

Results are discussed in further detail for the upper and lower aquifers in the following subsections. A discussion of the percentile ranking of Site microbial populations in comparison to other sites in the MI database is presented in the final subsection. The relative abundance of each microbial group and functional gene target is presented spatially in Figures B-1 and B-2. Bar charts illustrating the quantified number of cells per bead containing each genetic target are presented in Attachment 1.

## 3.1 Upper Aquifer

A Bio-Trap® sampler was deployed at hydraulically upgradient monitoring well GM-24 to assess for the presence of microorganisms capable of reductive dechlorination under ambient aquifer conditions and for comparison of population estimates at Site monitoring wells where VOC are present and/or where ERD treatment has been implemented. At monitoring well GM-24, groundwater oxidation-reduction (redox) conditions are generally oxidizing, as evidenced by positive oxidation reduction potential (ORP) (234 millivolts [mV]) and DO concentrations up to approximately 2 milligrams per liter (mg/L) (Table B-3). At monitoring well GM-24, there is a moderately-sized population of *Desulfuromonas* (Table B-2), but other organisms capable of reductive dechlorination and reductase genes were not detected above laboratory reporting limits.

Due to the injection of carbon substrate at RZ-1, geochemical conditions at downgradient performance monitoring wells are favorable for reductive dechlorination. Redox conditions at performance monitoring wells GM-23 and GM-29 are strongly reducing, as evidenced by: low DO concentrations and negative ORP values (Table B-3), elevated methane concentrations (5,400 to 5,900 µg/L; Table B-5), and a depleted sulfate concentration at monitoring well GM-23 (Table B-5). Total organic carbon (TOC) concentrations at RZ-1 performance monitoring wells GM-23 and GM-29 are elevated relative to downgradient monitoring locations (Table B-5). However, these TOC concentrations are similar to those measured prior to initiation of ERD treatment, indicating that the injected carbon substrate is rapidly consumed within the RZ-1 area prior to arrival at well GM-23. Bio-Traps® were deployed at RZ-1 monitoring wells GM-30, GM-23, and GM-29. At each of these monitoring wells, robust populations of *Dehalococcoides* are present and moderate to robust numbers of cells per bead contain tceA, bvcA, and vcrA reductase enzymes (Table B-2). These results indicate that the microbial community at RZ-1 has the capability to fully degrade PCE and TCE to innocuous end products. Elevated concentrations of ethene

(16 to 140 µg/L) and ethane (88 to 170 µg/L) measured at monitoring wells GM-23 and GM-29 (Table B-5) provide further evidence that full reductive dechlorination is occurring in this area. In addition, moderate to robust populations of *Dehalobacter*, *Desulfitobacterium*, and *Desulfuromonas* are present at RZ-1 monitoring wells, indicating that the microbial community contributing to reductive dechlorination is diverse and has been stimulated relative to background conditions.

Bio-Trap® samplers were deployed at PSA upper aquifer monitoring well GM-75S and at downgradient monitoring well GM-59. At these monitoring locations, concentrations of PCE and TCE are elevated and concentrations of the reductive dechlorination degradation products cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride are low (Table B-4), relative to monitoring wells in RZ areas. At each of these monitoring wells, TOC concentrations are low (310 J to 550 J µg/L; Table B-5), ORP values are positive (154 to 222 mV), and DO concentrations up to approximately 3 milligrams per liter (mg/L) were measured during this investigation (Table B-3). Furthermore, nitrate concentrations are elevated, and concentrations of dissolved iron and manganese are depleted relative to other Site monitoring locations. Taken together, VOC concentrations and geochemical indicator parameters indicate that conditions in this area are generally oxic, and therefore are not favorable for complete reductive dechlorination. This is corroborated by Bio-Trap® results, which indicate that the microbial community at these locations is similar to that at background monitoring well GM-24, with moderately sized populations of *Desulfuromonas;* there are also a low number of *Desulfitobacterium* at monitoring well GM-59. Establishment of a RZ in this area is planned for the future, will entail periodic delivery of organic carbon electron donor, and is expected to create conditions that stimulate reductive dechlorination consistent with other RZ areas.

Monitoring well GM-66 is located downgradient of both RZ-1 and of the PSA. Based on a negative ORP value and DO concentrations less than 1 mg/L (Table B-3), redox conditions at this location are more strongly reducing than at upgradient monitoring wells GM-75S and GM-59. Bio-Trap® results at monitoring well GM-66 indicate a larger population of microorganisms capable of reductive dechlorination than at monitoring wells GM-75S and GM-59, with a robust population of *Dehalobacter,* and a low but detectable population of *Dehalococcoides*.

Monitoring well GM-19S is a performance monitoring well for RZ-4-East. At this location, negative ORP, low DO and nitrate concentrations, and elevated dissolved iron, manganese, and methane concentrations provide evidence that redox conditions are strongly reducing (Tables B-3 and B-5). TOC concentrations are approximately equal to those measured during baseline monitoring, indicating that the injected carbon substrate at RZ-4-East is rapidly consumed prior to arrival at GM-19S and is consistent with historical results. At monitoring well GM-19S, concentrations of PCE and TCE are low relative to cis-1,2-DCE and vinyl chloride (Table B-4), and ethene and ethane are present, providing evidence that reductive dechlorination is occurring. Bio-Trap® results indicate that populations of *Dehalococcoides, Dehalobacter*, and *Desulfitobacterium* are robust, and that there is a moderately-sized population of *Desulfuromonas*. Additionally, the genes encoding tceA and vcrA were detected in a moderate number of cells per bead, indicating that the *Dehalococcoides* population in this area is capable of full reductive dechlorination.

Monitoring wells GM-32, GM-8, and GM-6 are performance monitoring wells for RZ-3-West, located with increasing distance downgradient. During the December 2015 monitoring event, concentrations of chlorinated ethenes were less than the MCL at each of these wells, providing strong evidence that the RZ is effective as a cut-off barrier. Redox conditions in this area are reducing to strongly reducing, based on

negative ORP values (-148 to -200 mV), DO concentrations less than 1 mg/L (Table B-3), and elevated concentrations of dissolved iron and methane at monitoring well GM-8 (Table B-5). Monitoring well GM-32 is located within the carbon introduction zone at RZ-3-West. At this monitoring well, Bio-Trap® results demonstrate that there is a robust community of *Dehalococcoides, Dehalobacter*, and *Desulfitobacterium*, and the detection of vcrA provides evidence that this community is capable of full reductive dechlorination. Population numbers for each of these groups decrease with distance downgradient; however, they are each still present at monitoring wells GM-8 and GM-6. At monitoring well GM-8, a relatively elevated ethane concentration (23 µg/L) provides evidence that the microbial community downgradient of RZ-3-West catalyzes full reductive dechlorination of chlorinated ethenes.

Monitoring well GM-21 is located downgradient of RZ-3-East. At this monitoring location TOC, dissolved iron and manganese, and methane concentrations are elevated while nitrate and sulfate concentrations are depleted (Table B-5), indicating strongly reducing conditions favorable for reductive dechlorination. Bio-Trap® results indicate a robust population of *Dehalococcoides*, and low- to moderately-sized populations of *Dehalobacter*, and *Desulfitobacterium, Desulfuromonas*. Concentrations of ethane and ethene (6.3 and 8.1 µg/L) confirm that full reductive dechlorination is stimulated at RZ-3-East.

Monitoring wells GM-2 and GM-18 are located downgradient of RZs. At monitoring well GM-2 there are robust populations of *Dehalobacter* and *Desulfitobacterium,* and low but detectable populations of *Dehalococcoides*. At GM-18, the furthest downgradient monitoring well sampled, the microbial community is similar to that at upgradient background monitoring well GM-24, with a moderately-sized population of *Desulfuromonas;* there are also a small number of *Dehalobacter.* These results provide evidence that microbial populations remain enhanced with distance downgradient of the RZs (e.g., at GM-2), but eventually resemble the native background community.

## 3.2 Lower Aquifer

A Bio-Trap® sampler was deployed at monitoring well HR-12 to compare the background microbial community in the lower aquifer to the upper aquifer, and to other lower aquifer sampling locations. Similar to upper zone background monitoring well GM-24, at monitoring well HR-12 there is a moderately-sized population of *Desulfuromonas* (Table B-2), but other organisms capable of reductive dechlorination and reductase genes were not detected above laboratory reporting limits.

Monitoring wells RMW-85 and GM-75D are located in the PSA source area. At each of these wells, Bio-Trap® results indicate moderate to robust populations of *Dehalococcoides*, *Dehalobacter*, *Desulfitobacterium,* and *Desulfuromonas*. Additionally, vcrA was detected at a moderate abundance at both monitoring wells, and tceA was detected at a moderate abundance at monitoring well GM-75D. These results provide evidence that, in contrast with the upper aquifer in the PSA, the there is a robust microbial population capable of full reductive dechlorination in the lower aquifer in this area.

Monitoring wells GM-82, RMW-86, and GM-9 are located with increasing distance downgradient of the PSA. Monitoring well GM-82 is located approximately 1,100 feet downgradient, monitoring well RMW-86 is located approximately 3,200 feet downgradient, and monitoring well GM-9 is located approximately 4,700 feet downgradient. At monitoring well GM-82, Bio-Trap® results indicate moderate to robust populations of *Dehalococcoides*, *Dehalobacter*, and *Desulfitobacterium;* and a robust abundance of tceA. These results indicate that a strong microbial population persists with distance downgradient of the PSA,

contributing to ongoing degradation of VOC as the plume migrates. At monitoring well RMW-86, results indicate a robust population of *Desulfitobacterium,* a moderately-sized population *Desulfuromonas,* and a low number of *Dehalobacter.* At monitoring well GM-9, results indicate a moderately-sized population *Desulfuromonas,* and a low number of *Dehalobacter.* These results indicate that the microbial community capable of full reductive dechlorination decreases in abundance with distance downgradient from the PSA source area.

## 3.3 Percentile Ranking of Microbial Population Sizes

MI maintains a database containing anonymous records of genetic survey results from each site from which they have received samples, and provides percentile rankings of the abundance of gene targets relative to samples analyzed from other sites. Percentile rankings for gene targets with a sufficient number of samples in the MI database for determination are presented in Table B-2. By comparing results from this investigation to results at a number of diverse sites around the country and the world, these rankings emphasize the conclusion that at the Site, and in response to carbon substrate introduction, microbial populations capable of reductive dechlorination are robust.

Compared with other sites where MI has analyzed for *Dehalococcoides*, upper aquifer treatment areas at the Site have above average abundance of this important organism capable of full reductive dechlorination. Populations of *Dehalococcoides* at RZ performance monitoring wells GM-30, GM-23, GM-29, GM-19S, and GM-21 each rank near or above the 50$^{th}$ percentile (Table B-2). At RZ-1 performance monitoring wells GM-30, GM-23, and GM-29, vinyl chloride reductase gene targets rank between the 21$^{st}$ and 61$^{st}$ percentile, directly demonstrating a substantial capacity for full reductive dechlorination. In the lower aquifer, at monitoring wells RMW-85, GM-75D, and GM-82, *Dehalococcoides* populations rank between the 29$^{th}$ and 47$^{th}$ percentile. These rankings are robust given that carbon substrate has not been added to the lower aquifer, and provide a strong line of evidence that conditions in the lower aquifer are favorable for *Dehalococcoides*, and naturally support reductive dechlorination.

In the upper aquifer, at both RZ performance monitoring wells GM-23, GM-29, GM-19S and at downgradient wells GM-66, and GM-2 the abundance of *Dehalobacter* is above average, with rankings between the 51$^{st}$ and 77$^{th}$ percentile. At lower aquifer monitoring wells RMW-85, GM-75D, and GM-82 the abundance of *Dehalobacter* ranks between the 30$^{th}$ and 61$^{st}$ percentiles. At upper aquifer monitoring well GM-29 and at lower aquifer well RMW-86 the abundance of *Desulfuromonas* is also above average, in the 78$^{th}$ and 92$^{nd}$ percentiles, respectively. These results provide additional evidence that in the upper aquifer, reductive dechlorination is enhanced by the creation of favorable conditions and in the lower aquifer, conditions are favorable for reductive dechlorination by a community that has responded to the presence of chlorinated ethene compounds.

# 4 CONCLUSIONS

Taken in the context of performance monitoring data collected over the course of the past 15 years demonstrating that the ERD technology is effective in promoting the degradation of chlorinated solvents present in saturated soil and groundwater, microbial genetic survey results provide an additional convincing line of evidence. The objective of the Site investigation activities described herein was to

quantify the extent of the dehalogenating microbial community at the Site. This objective was achieved and results indicate that:

- In the upper aquifer the establishment of RZ through injection of carbon substrate has stimulated a microbial community capable of full reductive dechlorination.
- In the lower aquifer, the presence of chlorinated ethenes and conditions that are naturally favorable support full reductive dechlorination at and downgradient of the PSA source zone.
- Although there is not a robust community capable of reductive dechlorintation in the upper aquifer in the PSA, results from existing RZ at the site provide a firm line of evidence that this treatment approach is highly effective at the site, and therefore establishment of a RZ in the upper aquifer in the PSA in the future is expected to stimulate reductive dechlorination.

# 5 REFERENCES

RACER Trust. 2015. 1,4-Dioxane Groundwater Delineation and Evaluation of Microbial Degradation Potential for 1,4-Dioxane and Establishment of a Microbial Genetics-Based Line of Evidence for the Efficacy of Enhanced Reductive Dechlorination. Letter to: Mirtha Càpiro, United States Environmental Protection Agency (USEPA) Region 5, Remediation and Reuse Branch, Land and Chemicals Division, LU-9J. October 7, 2015.

# TABLES

**Table B-1**
**Sampling Location Rationale**
**ERD Microbial Investigation Report**
**RACER Trust**
**Moraine, Ohio**

| | |
|---|---|
| **Upper Aquifer** | |
| **GM-24** | Comparison to background conditions. |
| **GM-30** | Located downgradient of RZs. |
| **GM-23** | Performance well for RZ-1. |
| **GM-29** | Performance well for RZ-1. |
| **GM-75S** | Comparison to background conditions; vicinity of planned future RZs (proposed final remedy). |
| **GM-59** | Located downgradient of RZs; downgradient of planned future RZs (proposed final remedy). |
| **GM-66** | Located downgradient of RZs. |
| **GM-19S** | Performance well for RZ-4-East. |
| **GM-32** | Performance well for RZ-3-West. |
| **GM-8** | Performance well for RZ-3-West. |
| **GM-6** | Performance well for RZ-3-West. |
| **GM-21** | Performance well for RZ-3-East. |
| **GM-2** | Located downgradient of RZs. |
| **GM-18** | Located downgradient of RZs. |
| **Lower Aquifer** | |
| **HR-12** | Comparison to background conditions. |
| **RMW-85** | Located in the PSA (source area). |
| **GM-75D** | Located in the PSA (source area). |
| **GM-82** | Located downgradient of the PSA (source area). |
| **RMW-86** | Located downgradient of the PSA (source area). |
| **GM-9** | Located at the downgradient extent of the plume. |

**Notes:**
PSA - Process Sump Area.
RZ - Reactive Zone.

**Table B-2**
**Microbial Genetic Survey Results Summary**
**ERD Microbial Investigation Report**
**RACER Trust**
**Moraine, Ohio**

| | DHC | | DHBt | | DSB | DSM | | tceA | | bvcA | | vcrA | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | cells/bead | Percentile Rank | cells/bead | Percentile Rank | cells/bead | cells/bead | Percentile Rank | cells/bead | Percentile Rank | cells/bead | Percentile Rank | cells/bead | Percentile Rank |
| **Upper Aquifer** | | | | | | | | | | | | | |
| **GM-24** | <2.50E+01 | -- | <2.50E+02 | -- | <2.50E+02 | **1.44E+02 J** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-30** | **2.89E+03** | 52 | **1.69E+02 J** | <6 | **1.32E+02 J** | **1.89E+03** | 31 | **5.47E+01** | <13 | **2.34E+02** | 44 | **9.30E+00 J** | <8 |
| **GM-23** | **8.04E+04** | 76 | **5.99E+04** | 70 | **7.51E+03** | **4.98E+02** | 12 | **5.88E+02** | 37 | **9.30E+02** | 61 | **5.05E+03** | 51 |
| **GM-29** | **8.87E+03** | 62 | **1.11E+04** | 51 | **3.09E+03** | **1.37E+05** | 78 | **2.15E+02** | 27 | **1.66E+01 J** | <7 | **1.95E+02** | 21 |
| **GM-75S** | <2.50E+01 | -- | <2.50E+02 | -- | <2.50E+02 | **1.54E+03** | 29 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-59** | <2.50E+01 | -- | <2.50E+02 | -- | **6.20E+01 J** | **1.83E+03** | 31 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-66** | **5.57E+01** | <8 | **6.33E+04** | 77 | **6.70E+03** | **7.40E+02** | 18 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-19S** | **1.56E+03** | 47 | **3.95E+04** | 66 | **4.44E+03** | **6.91E+02** | 17 | **2.89E+01** | <13 | <2.50E+01 | -- | **7.60E+00 J** | <8 |
| **GM-32** | **3.14E+02** | <30 | **2.82E+03** | 34 | **6.93E+02** | **1.81E+01 J** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | **1.02E+01 J** | <8 |
| **GM-8** | **5.74E+01** | 8 | **4.28E+02** | 10 | **1.42E+01 J** | **2.96E+03** | 38 | **2.75E+01** | <13 | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-6** | **2.62E+01** | <8 | **3.28E+02** | 7 | **1.44E+01 J** | **3.01E+02** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-21** | **3.52E+03** | 54 | **1.50E+02 J** | <6 | **8.39E+01 J** | **1.45E+02 J** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-2** | **3.06E+01** | <8 | **3.33E+04** | 64 | **5.24E+03** | **4.88E+02** | 11 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-18** | <2.50E+01 | -- | **7.30E+00 J** | <6 | <2.50E+02 | **2.92E+02** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **Lower Aquifer** | | | | | | | | | | | | | |
| **HR-12** | <2.50E+01 | -- | <2.50E+02 | -- | <2.50E+02 | **1.41E+02 J** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **RMW-85** | **1.62E+03** | 47 | **2.06E+03** | 30 | **1.25E+02 J** | **2.31E+02 J** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | **6.55E+01** | 9 |
| **GM-75D** | **5.98E+02** | 37 | **2.21E+03** | 31 | **7.26E+02** | **1.42E+02 J** | <6 | **2.78E+01** | <13 | <2.50E+01 | -- | **2.15E+01 J** | <8 |
| **GM-82** | **2.83E+02** | 29 | **2.65E+04** | 61 | **7.81E+03** | **6.29E+01 J** | <6 | **1.13E+02** | 21 | <2.50E+01 | -- | <2.50E+01 | -- |
| **RMW-86** | <2.50E+01 | -- | **7.21E+01 J** | -- | **6.39E+02** | **1.74E+06** | 92 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |
| **GM-9** | <2.50E+01 | -- | **1.58E+01 J** | <6 | <2.50E+02 | **3.22E+02** | <6 | <2.50E+01 | -- | <2.50E+01 | -- | <2.50E+01 | -- |

**Notes:**
DHC - *Dehalococcoides* genus.
DHBt - *Dehalobacter* genus.
DSB - *Desulfitobacterium* genus. Percentile rankings are not available for this group..
DSM - *Desulfuromonas* genus.
tceA - gene encoding a trichloroethene reductase enzyme.
bvcA - gene encoding BAV1 vinyl chloride reductase enzyme.
vcrA - gene encoding a vinyl chloride reductase enzyme.
< - Result is less than reporting limit or percentile rank posted.
J - Result is a qualified value less than the reporting limit, but greater than the detection limit .
-- - No percentile ranking due to non-detect concentration.
**Bold** - Indicates quantified detection.

**Table B-3**
**Field-Measured Water Quality Parameters**
**ERD Microbial Investigation Report**
**RACER Trust**
**Moraine, Ohio**

| Well ID | Flow-Through Cell December 2015[1] | | | | | Optical DO (mg/L) | | |
|---|---|---|---|---|---|---|---|---|
| | pH (s.u.) | Temp (°C) | ORP (mV) | Sp. Con. (mS/cm) | DO (mg/L) | Oct. 2015 Pre-Purge[2] | Oct. 2015 Post-Purge[2] | Dec. 2015 Pre-Purge[3] |
| **Upper Aquifer** | | | | | | | | |
| GM-24 | 6.25 | 15.9 | 234.0 | 1.14 | 0.09 | 2.01 | 1.92 | 1.69 |
| GM-30 | 6.23 | 17.5 | -69.0 | 2.20 | 0.00 | 0.25 | 0.26 | 0.15 |
| GM-23 | 7.43 | 16.7 | -79.0 | 1.53 | 0.00 | 0.47 | 0.12 | 0.26 |
| GM-29 | 7.19 | 16.7 | -124.0 | 1.46 | 0.00 | 0.44 | 0.35 | 0.28 |
| GM-66 | 6.98 | 15.8 | -50.0 | 1.39 | 0.00 | 0.56 | 0.31 | 0.68 |
| GM-59 | 8.54 | 15.7 | 222.0 | 1.08 | 1.14 | 0.59 | 0.85 | 1.12 |
| GM-75S | 7.36 | 14.9 | 154.0 | 1.01 | 3.08 | 2.61 | 2.61 | 0.37 |
| GM-19S | 6.95 | 16.4 | -151.0 | 1.28 | 0.00 | 0.16 | 0.37 | 0.43 |
| GM-32 | 7.04 | 15.57 | -165.0 | 1.38 | 0.00 | 0.26 | 0.38 | 0.51 |
| GM-8 | 7.42 | 15.9 | -200.0 | 1.42 | 0.00 | 0.4 | 0.71 | 0.48 |
| GM-21 | 6.52 | 15.6 | -91.0 | 2.51 | 1.30 | 0.84 | 0.68 | 0.59 |
| GM-6 | 7.08 | 15.6 | -148.0 | 1.41 | 0.00 | 0.5 | 0.79 | 0.43 |
| GM-2 | 7.14 | 15.5 | -32.0 | 1.52 | 0.00 | 0.44 | 0.3 | 0.59 |
| GM-18 | 6.74 | 16.1 | 97.0 | 1.07 | 0.00 | 0.45 | 0.42 | 0.83 |
| **Lower Aquifer** | | | | | | | | |
| HR-12 | 5.85 | 14.3 | -28.0 | 1.35 | 3.10 | 0.56 | 0.25 | 0.2 |
| RMW-85 | 4.58 | 14.8 | -36.0 | 1.23 | 5.86 | 1.93 | 0.52 | 0.46 |
| GM-75D | 4.56 | 15.0 | -8.0 | 1.22 | 5.57 | 2.82 | 0.46 | 0.36 |
| GM-82 | 7.04 | 16.30 | -13.0 | 1.23 | 1.25 | 0.24 | 0.31 | 0.47 |
| RMW-86 | 6.98 | 16.48 | 19.0 | 1.30 | 0.08 | 0.31 | 0.33 | 0.63 |
| GM-9 | 6.86 | 15.2 | 50.0 | 0.77 | 1.00 | 0.57 | 0.44 | 0.51 |

**Notes:**
1 - December 8 through 11, 2015.
2 - October 27 through 29, 2015.
3 - December 7, 2015.
s.u. - Standard Units.
Temp - Temperature.
ºC - Degrees Celsius.
ORP - Oxidation Reduction Potential.
mV - Millivolts.
mS/cm - Millisiemens per Centimeter.
DO - Dissolved Oxygen.
mg/L - Milligrams per Liter.

Table B-4
Concentrations of Site-Specific Volatile Organic Compounds
ERD Microbial Investigation Report
RACER Trust
Moraine, Ohio

| Location ID | MCL Date | Tetrachloroethene 5 µg/L | Trichloroethene 5 µg/L | cis-1,2-Dichloroethene 70 µg/L | trans-1,2-Dichloroethene 1000 µg/L | 1,1-Dichloroethene 7 µg/L | Vinyl chloride 2 µg/L | 1,1,1-Trichloroethane 200 µg/L | 1,1-Dichloroethane -- µg/L |
|---|---|---|---|---|---|---|---|---|---|
| **Upper Aquifer** | | | | | | | | | |
| GM-24 | 12/11/2015 | < 1.0 U | 4.4 | 0.82 J | < 1.0 U | < 1.0 U | < 1.0 U | 8.1 | 0.67 J |
| GM-30 | 12/11/2015 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | 3 |
| GM-23 | 12/8/2015 | 0.58 J | 5 | **100** | 13 | 0.47 J | **120** | < 1.0 U | 15 |
| GM-29 | 12/8/2015 | **11** | **270** | **440** | 15 | 1.2 J | **48** | 9.9 | 10 |
| GM-66 | 12/8/2015 | < 1.0 U | **110** | **280** | 11 | 2.5 | **3** | < 1.0 U | 12 |
| GM-59 | 12/8/2015 | **270** | **97** | 2.4 | 0.34 J | < 1.0 U | < 1.0 U | 0.48 J | < 1.0 U |
| GM-75S | 12/11/2015 | **420** | **68** | < 1.3 U | < 1.3 U | < 1.3 U | < 1.3 U | 0.58 J | < 1.3 U |
| GM-19S | 12/8/2015 | < 1.0 U | 1.3 | 37 | 0.66 J | < 1.0 U | **6.4** | < 1.0 U | 3.1 |
| GM-32 | 12/8/2015 | < 1.0 U | < 1.0 U | 0.42 J | < 1.0 U | < 1.0 U | 0.51 J | < 1.0 U | 0.88 J |
| GM-8 | 12/8/2015 | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | < 1.0 U | 0.53 J | < 1.0 U | 0.43 J |
| GM-21 | 12/11/2015 | < 2.0 U | **16** | 22 | 1.6 J | < 2.0 U | **8.9** | < 2.0 U | 12 |
| GM-06 | 12/8/2015 | < 1.0 U | < 1.0 U | 0.26 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| GM-2 | 12/8/2015 | 3.6 | **6.7** | 3.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.40 J |
| GM-18 | 12/11/2015 | **6.2** | **6.5** | 0.78 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| **Lower Aquifer** | | | | | | | | | |
| HR-12 | 12/8/2015 | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | 2.4 |
| RMW-85 | 12/8/2015 | **49** | **82** | 18 | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | 0.41 J |
| GM-75D | 12/8/2015 | **140** | **150** | 22 | 0.38 J | < 1.0 U | 0.37 J | < 1.0 U | < 1.0 U |
| GM-82 | 12/11/2015 | **23** | **57** | 30 | 1.2 J | < 2.0 U | 0.63 J | < 2.0 U | 1.5 J |
| RMW-86 | 12/8/2015 | **40** | **110** | 37 | 1.3 | 1.6 | 0.45 J | 6.1 | 11 |
| GM-9 | 12/11/2015 | < 1.0 U | **12** | 0.26 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.92 J | < 1.0 U |

**Notes:**
MCL - Maximum Contaminent Limit. A MCL is not listed for 1,1-dichloroethane.
µg/L - Micrograms per liter.
J - Estimated concentration less than the laboratory reporting limit but greater than the method detection limit.
< - less than the laboratory reporting limit noted.
U - non-detect less than the reporting limit.
**BOLD** - Result above MCL.

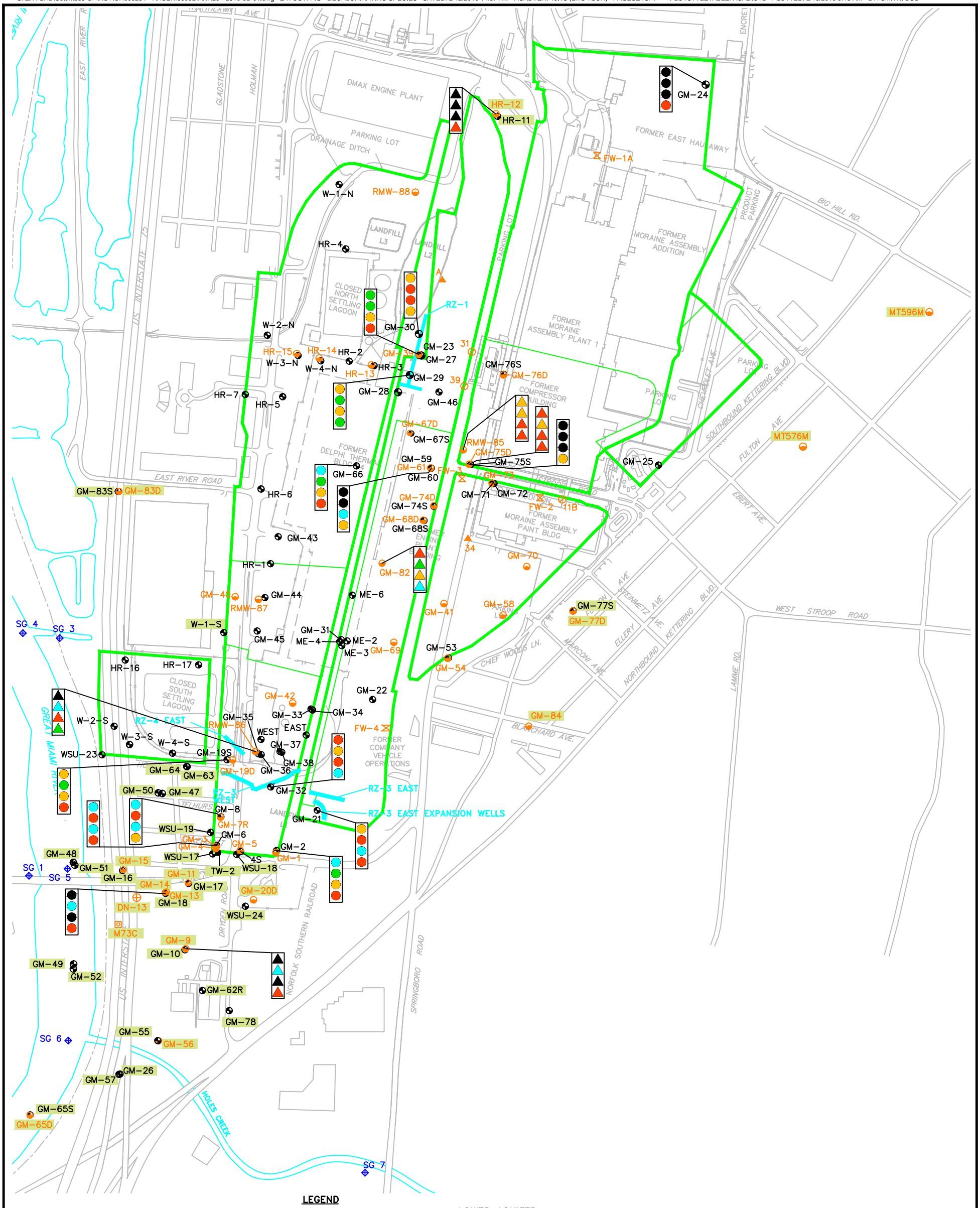
**Table B-5**
**Concentrations of Geochemical Indicator Paramters**
**ERD Microbial Investigation Report**
**RACER Trust**
**Moraine, Ohio**

| Location ID | Date | Total organic carbon | Nitrate (as N) | Iron | Iron (dissolved) | Manganese | Manganese (dissolved) | Sulfate | Sulfide | Methane | Ethane | Ethene | Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| **Upper Aquifer** | | | | | | | | | | | | | |
| GM-23 | 12/8/2015 | 6900 B | 550 H | 4200 | 5800 | 140 | 220 | 15000 | < 1000 U | 5400 | 88 | 140 | 180000 B |
| GM-29 | 12/8/2015 | 12000 | < 100 UH | 7300 | 4000 | 220 | 120 | 49000 | < 1000 U | 5900 | 170 | 16 | 150000 B |
| GM-59 | 12/8/2015 | 310 J | 3600 H | < 100 U | 400 | 1.3 J | 12 J | 69000 | < 1000 U | 0.55 | 0.019 J | < 0.10 U | 120000 B |
| GM-75S | 12/11/2015 | 550 J | 4900 H | 41 JB | < 100 U | 2.9 JB | 8.9 JB | 48000 | < 1000 U | 0.10 J | 0.0053 J | 0.0058 J | 150000 B |
| GM-19S | 12/8/2015 | 2500 | < 100 UH | 6700 | 6400 | 140 | 180 | 47000 | < 1000 U | 1200 | 0.16 | 0.33 | 160000 B |
| GM-19S FD | 12/8/2015 | 2300 B | 71 JH | 6400 | 6400 | 170 | 180 | 47000 | < 1000 U | 1100 | 0.14 | 0.24 | 170000 B |
| GM-08 | 12/8/2015 | 4700 | < 100 UH | 4100 | 4200 | 86 | 90 | 32000 | < 1000 U | 2100 | 23 | 0.25 | 170000 B |
| GM-21 | 12/11/2015 | 110000 | < 100 UH | 29000 B | 29000 B | 880 B | 890 B | 16000 | 470 J | 17000 | 6.3 | 8.1 | 300000 B |

**Notes:**
µg/L - Micrograms per liter.
B - Compound was found in the blank and sample.
H - Sample was prepped or analyzed beyond the specified holding time.
J - Estimated concentration less than the laboratory reporting limit but greater than the method detection limit.
< - less than the laboratory reporting limit noted.
U - non-detect less than the reporting limit.

# FIGURES

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\0003B\ANN294-2016-3B-01.dwg LAYOUT: FIG - DECHLORINATING SPECIES SAVED: 2/12/2016 11:37 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/18/2016 9:45 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- 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 AS A LOWER AQUIFER RECOVERY WELL)
- MONTGOMERY COUNTY WELL (INACTIVE MIAMI SHORES WELL FIELD – DAYTON PRIMARY PUBLIC SUPPLY BACKUP)
- STREAM GAUGE
- RIVER LEVEE
- CITY OF MORAINE MONITORING WELL
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- OFFSITE WELLS

| UPPER AQUIFER | LOWER AQUIFER |
|---|---|
| DHC | DHC |
| DHBt | DHBt |
| DSB | DSB |
| DSM | DSM |

| | |
|---|---|
| DHC | DEHALOCOCCOIDES SPECIES |
| DHBt | DEHALOBACTER SPECIES |
| DSB | DESULFITOBACTERIUM SPECIES |
| DSM | DESULFUROMONAS SPECIES |

**ROBUST ABUNDANCE**
GREEN >10,000 CELLS/BEAD
YELLOW 1,000–10,000 CELLS/BEAD

**MODERATE ABUNDANCE**
ORANGE 100–1,000 CELLS/BEAD

**PRESENT BUT LOW ABUNDANCE**
BLUE <100 (QUANTIFIED)

**NO EVIDENCE OF PRESENCE**
BLACK ND <25 (DHC)
BLACK <250 (DHBt, DSB, DSM)

N

0 200 800 FT

NOTES:
1. ORANGE INDICATES LOWER AQUIFER WELLS.
2. BLACK INDICATES UPPER AQUIFER WELLS.

RACER TRUST
MORAINE, OHIO

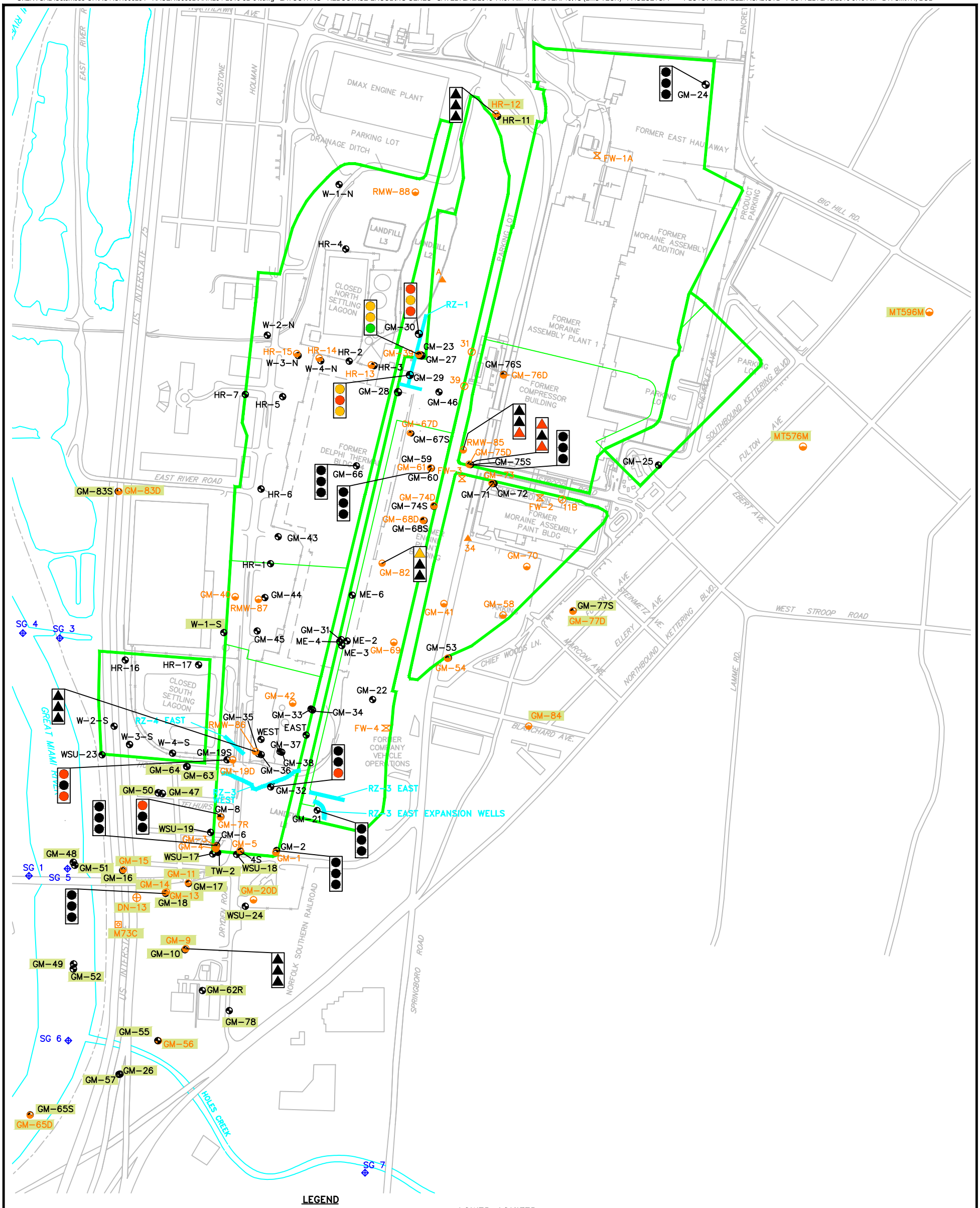
OH000294.2016

# RELATIVE ABUNDANCE OF DECHLORINATING SPECIES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
B-1

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\0003B\ANN294-2016-3B-01.dwg LAYOUT: FIG - REDUCTASE-ENCODING GENES SAVED: 2/12/2016 11:37 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/18/2016 9:46 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- CARBON SOURCE INTRODUCTION WELLS, REACTIVE ZONES (RZ-1, RZ-3, AND RZ-4)
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- STREAM GAUGE
- RIVER LEVEE
- CITY OF MORAINE MONITORING WELL
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- OFFSITE WELLS

| UPPER AQUIFER | LOWER AQUIFER |
|---|---|
| tceA | tceA |
| bvcA | bvcA |
| vcrA | vcrA |

tceA GENE ENCODING A TCE REDUCTASE ENZYME
bvcA GENE ENCODING BAV1 VINYL CHLORIDE REDUCTASE ENZYME
vcrA GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

**ROBUST ABUNDANCE**
GREEN >1,000 CELLS/BEAD
YELLOW 100–1,000 CELLS/BEAD

**MODERATE ABUNDANCE**
ORANGE <100 CELLS/BEAD

**NO EVIDENCE OF PRESENCE**
BLACK ND <25

N

0 200 800 FT

NOTES:
1. ORANGE INDICATES LOWER AQUIFER WELLS.
2. BLACK INDICATES UPPER AQUIFER WELLS.

RACER TRUST
MORAINE, OHIO

OH000294.2016

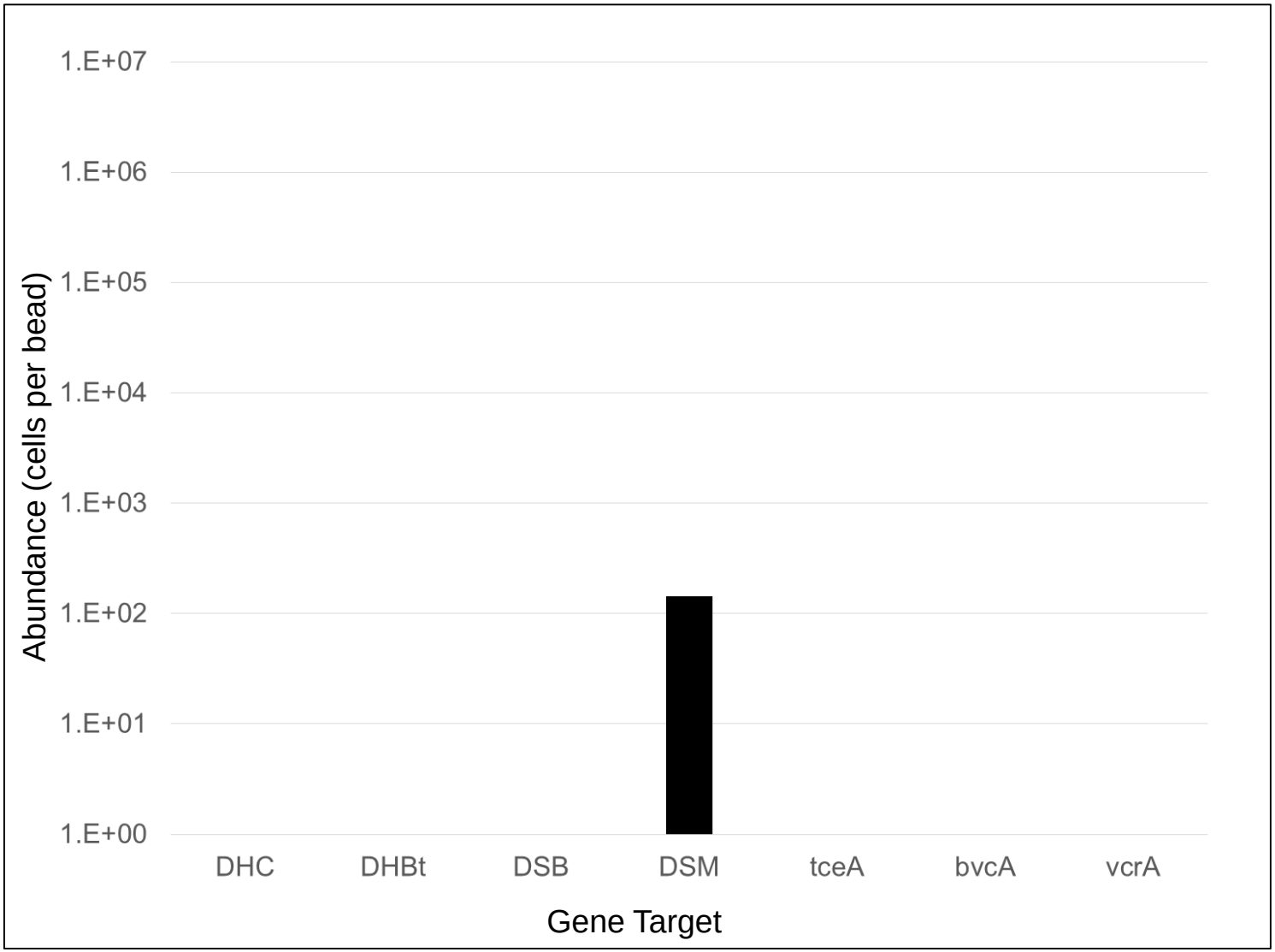
# RELATIVE ABUNDANCE OF REDUCTASE-ENCODING GENES

ARCADIS Design & Consultancy for natural and built assets

FIGURE
B-2

# ATTACHMENT 1

## Microbial Abundance Bar Charts




NOTES:
DHC – DEHALOCOCCOIDES
DHBt – DEHALOBACTER
DSB – DESULFITOBACTERIUM
DSM – DESULFUROMONAS
tceA – GENE ENCODING A TRICHLOROETHENE REDUCTASE ENZYME
bvcA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME
vcrA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

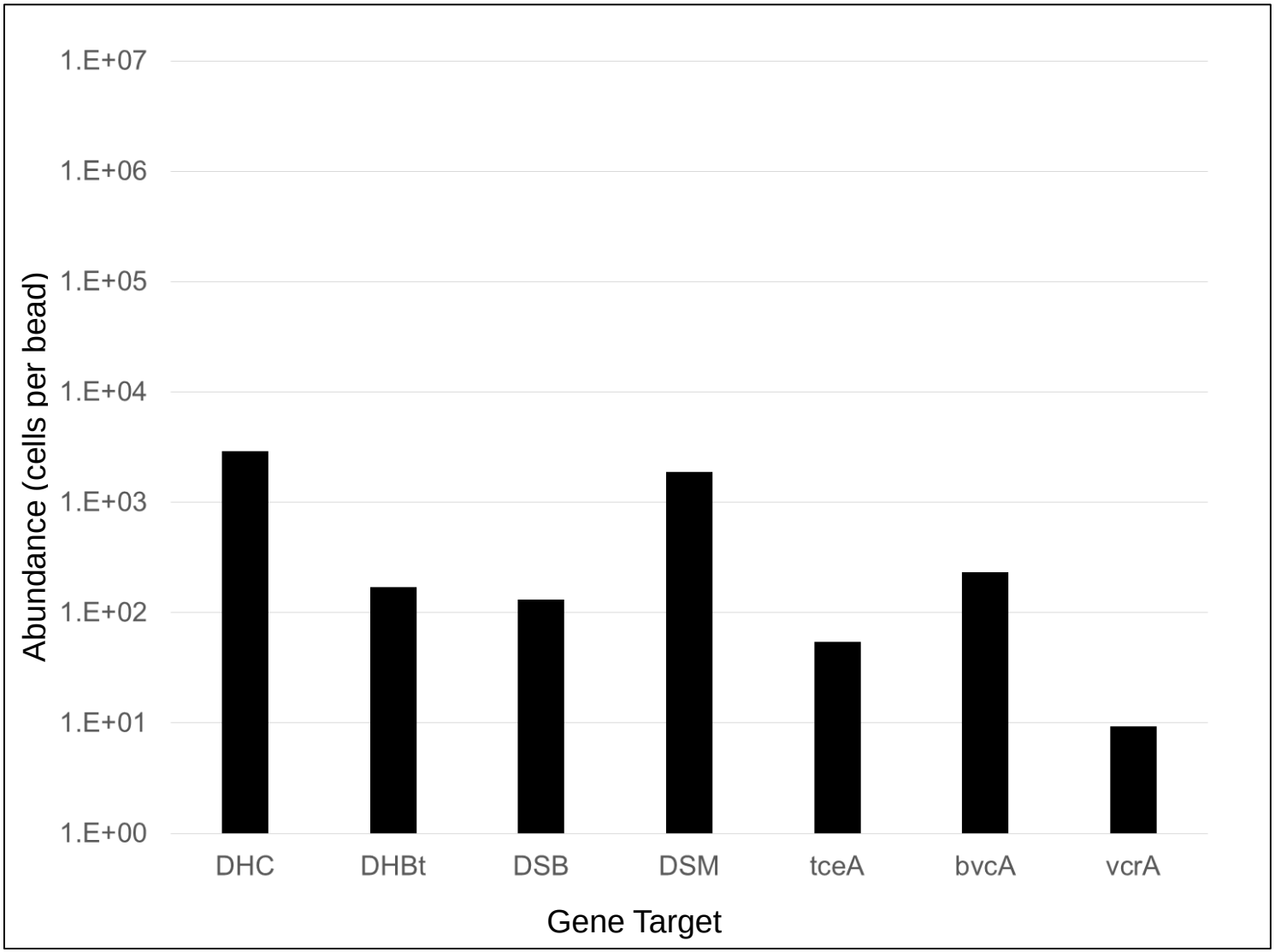
RACER TRUST
MORAINE, OHIO

0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-24**

ARCADIS Design & Consultancy for natural and built assets

CHART 1




NOTES:
DHC – DEHALOCOCCOIDES
DHBt – DEHALOBACTER
DSB – DESULFITOBACTERIUM
DSM – DESULFUROMONAS
tceA – GENE ENCODING A TRICHLOROETHENE REDUCTASE ENZYME
bvcA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME
vcrA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

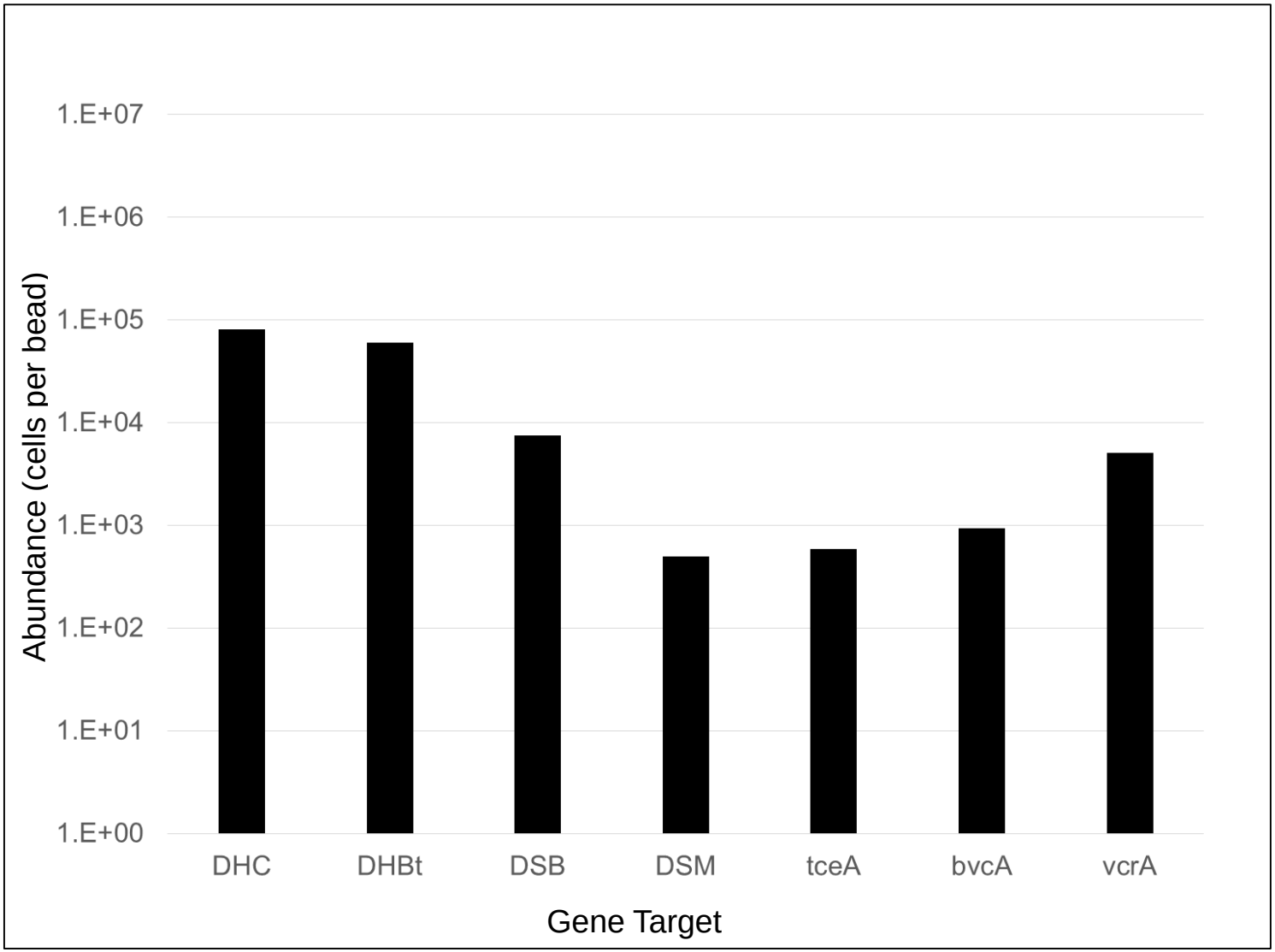
RACER TRUST
MORAINE, OHIO

0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-30**

ARCADIS Design & Consultancy for natural and built assets

CHART 2




NOTES:
DHC – DEHALOCOCCOIDES
DHBt – DEHALOBACTER
DSB – DESULFITOBACTERIUM
DSM – DESULFUROMONAS
tceA – GENE ENCODING A TRICHLOROETHENE REDUCTASE ENZYME
bvcA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME
vcrA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

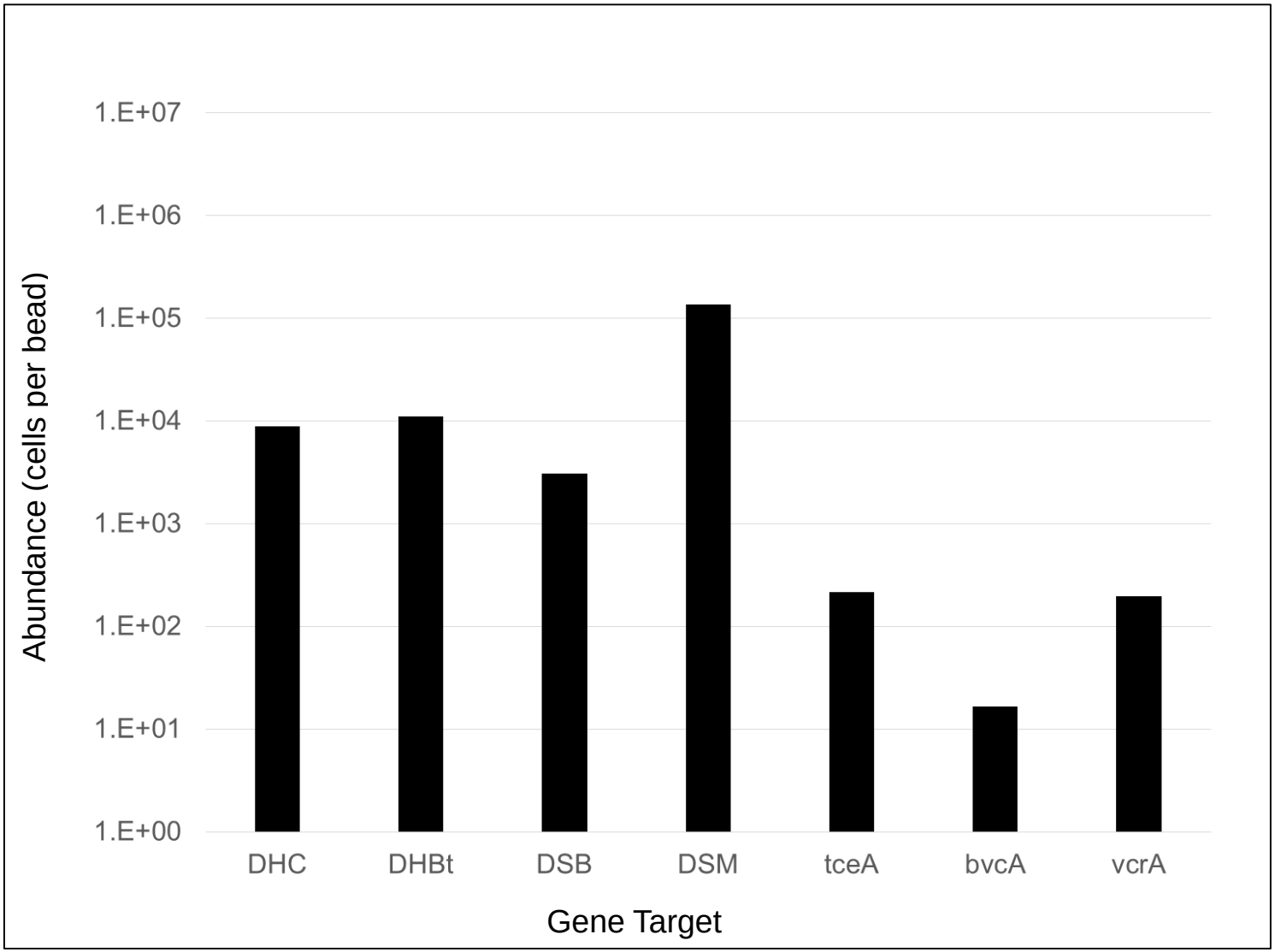
RACER TRUST
MORAINE, OHIO

0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-23**

ARCADIS Design & Consultancy for natural and built assets

CHART 3




NOTES:
DHC – DEHALOCOCCOIDES
DHBt – DEHALOBACTER
DSB – DESULFITOBACTERIUM
DSM – DESULFUROMONAS
tceA – GENE ENCODING A TRICHLOROETHENE REDUCTASE ENZYME
bvcA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME
vcrA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

RACER TRUST
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0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-29**

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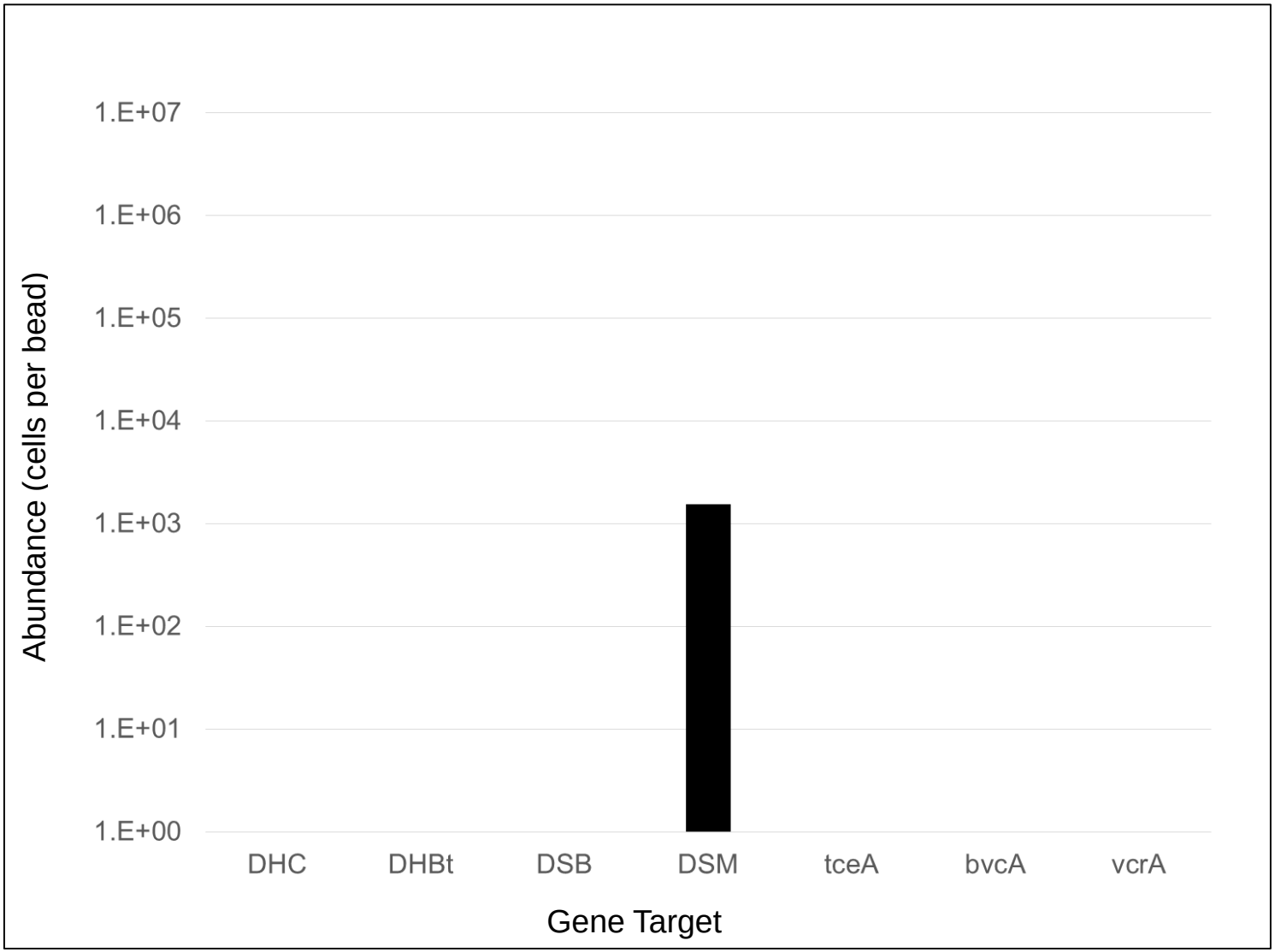
CHART 4




NOTES:
DHC – DEHALOCOCCOIDES
DHBt – DEHALOBACTER
DSB – DESULFITOBACTERIUM
DSM – DESULFUROMONAS
tceA – GENE ENCODING A TRICHLOROETHENE REDUCTASE ENZYME
bvcA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME
vcrA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-75S**

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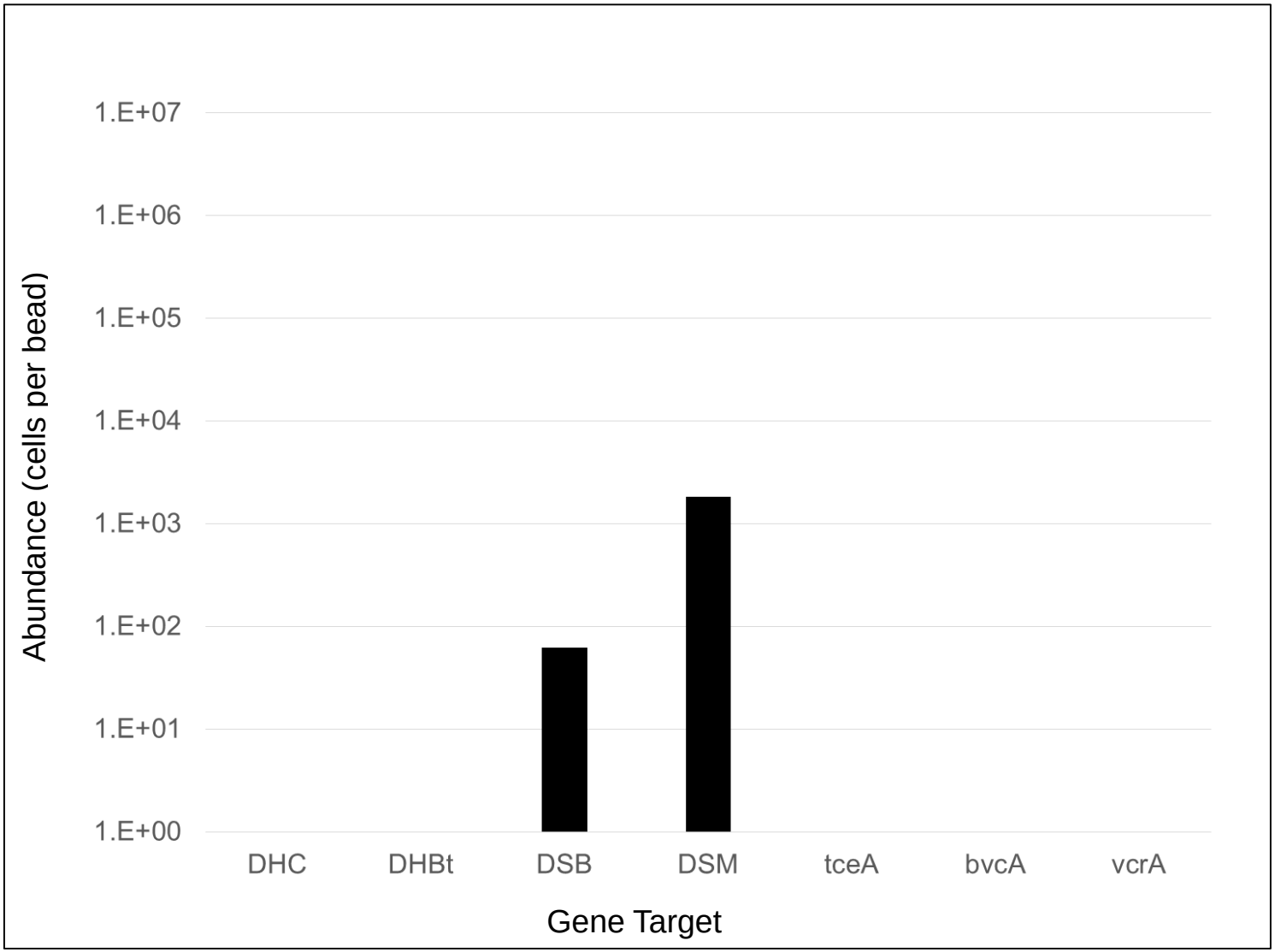
CHART 5




NOTES:
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DSM – DESULFUROMONAS
tceA – GENE ENCODING A TRICHLOROETHENE REDUCTASE ENZYME
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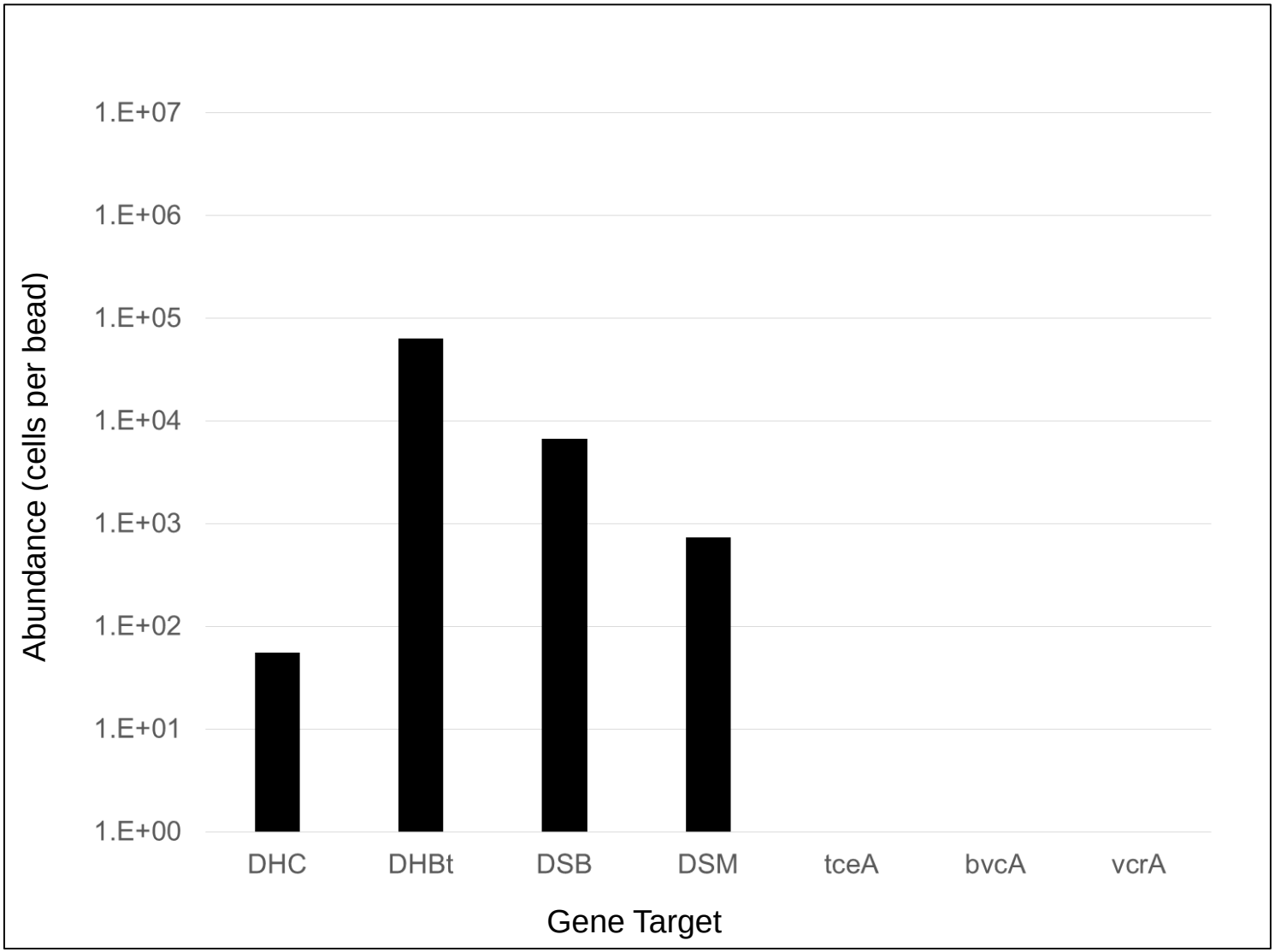
**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-59**

ARCADIS Design & Consultancy for natural and built assets

CHART 6

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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-66**

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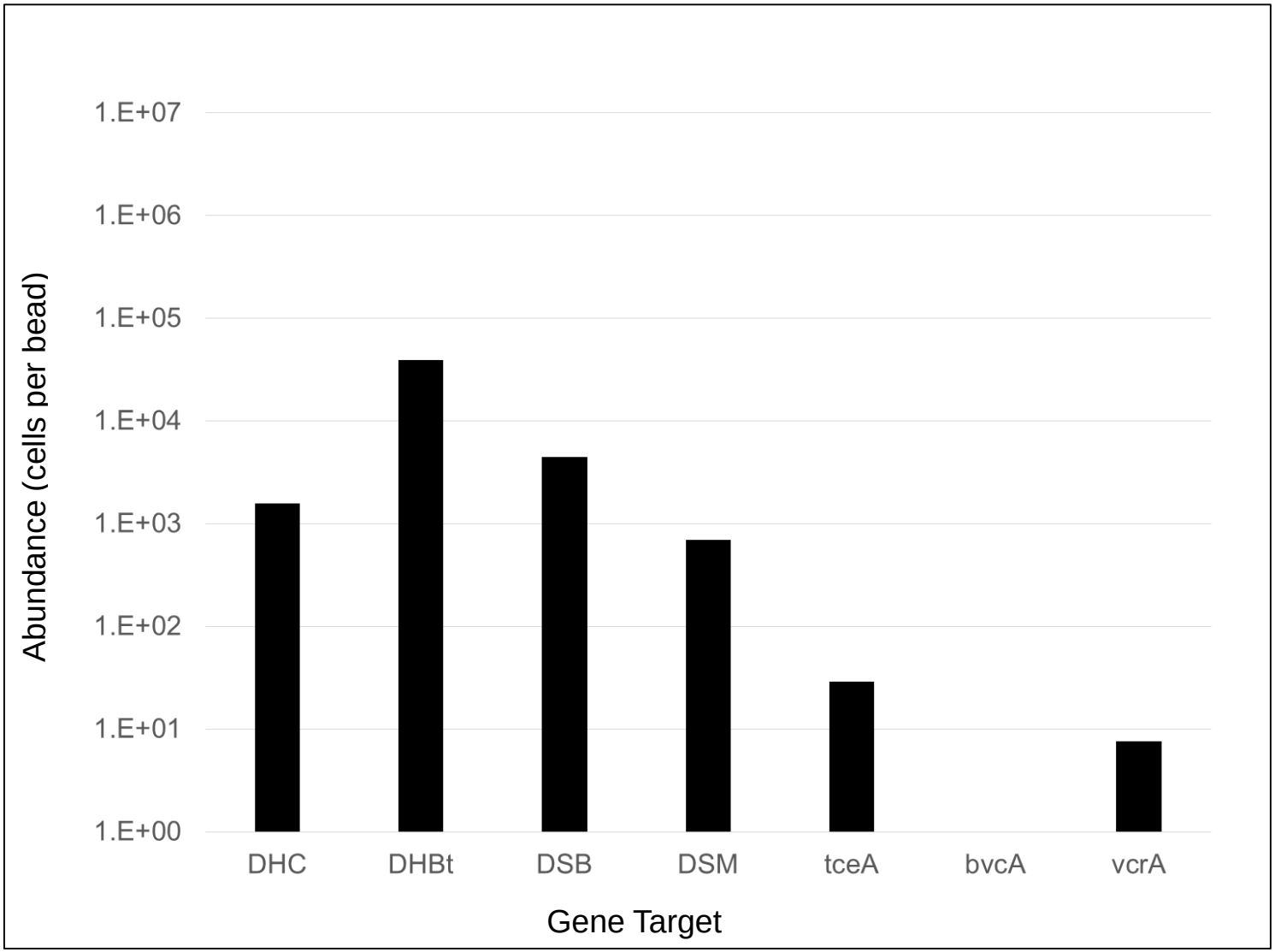
CHART 7




NOTES:
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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-19S**

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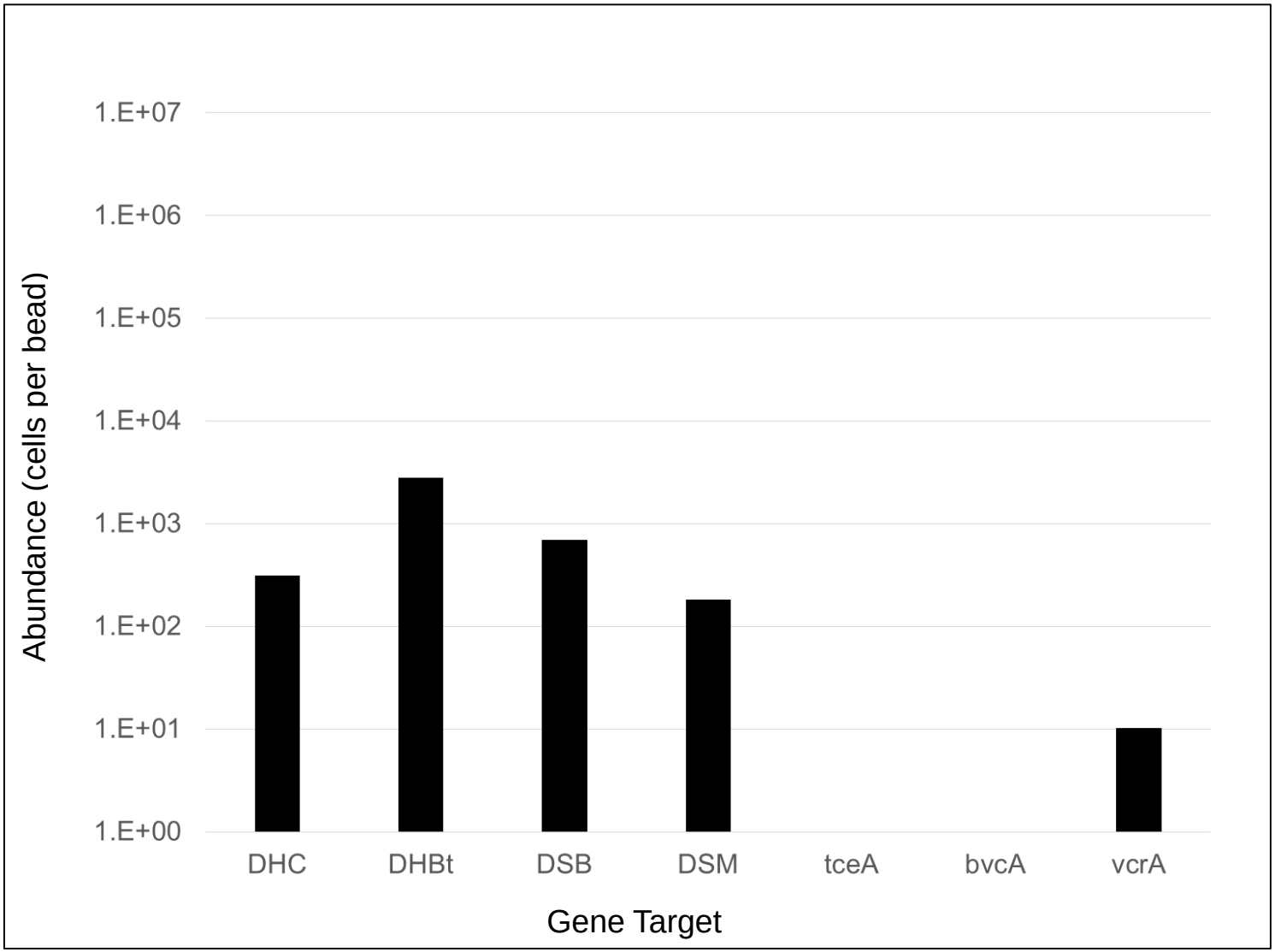
CHART 8

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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-32**

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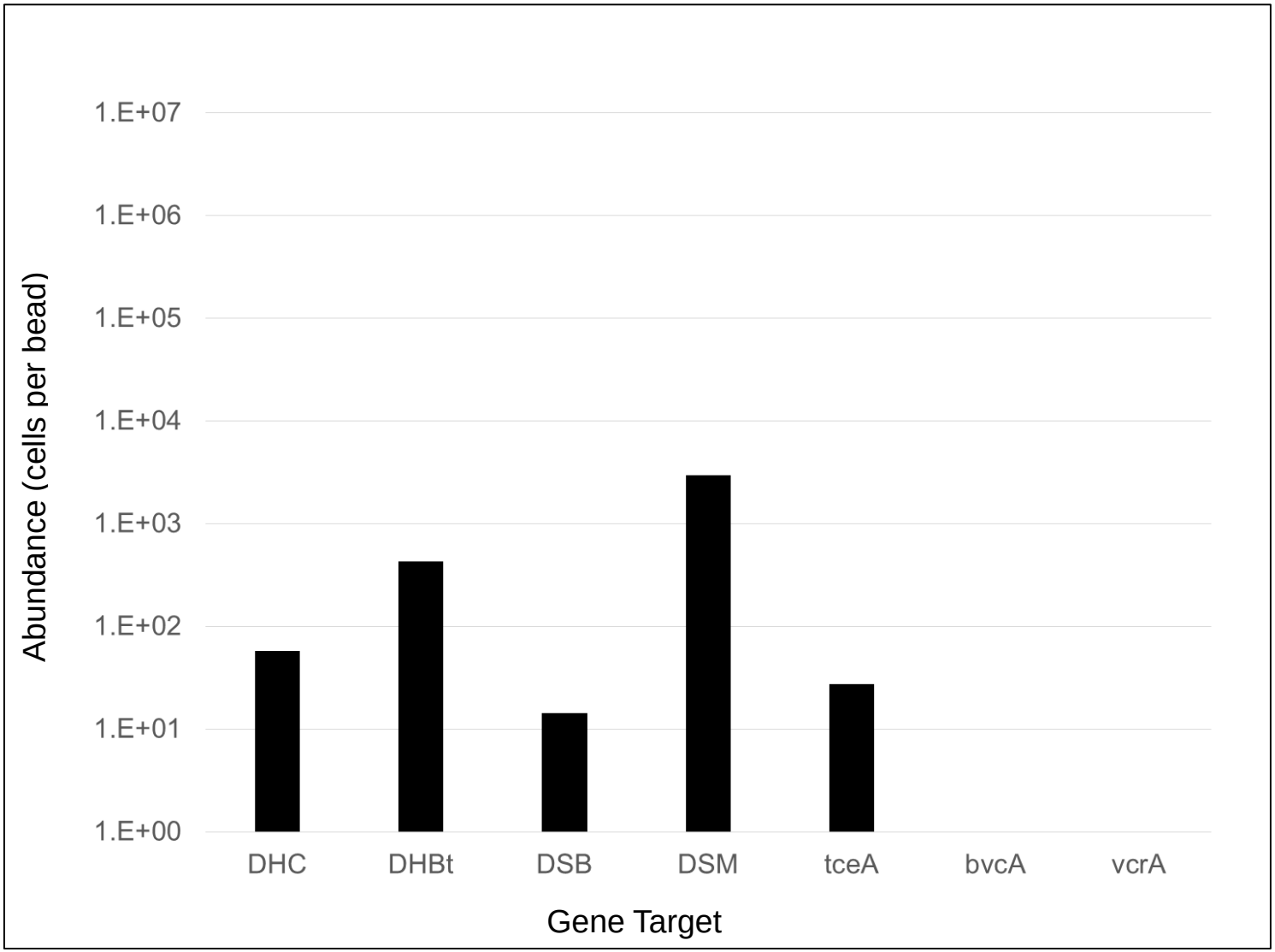
CHART 9

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vcrA - GENE ENCODING A VINYL CHLORIDE REDUCTASE ENZYME

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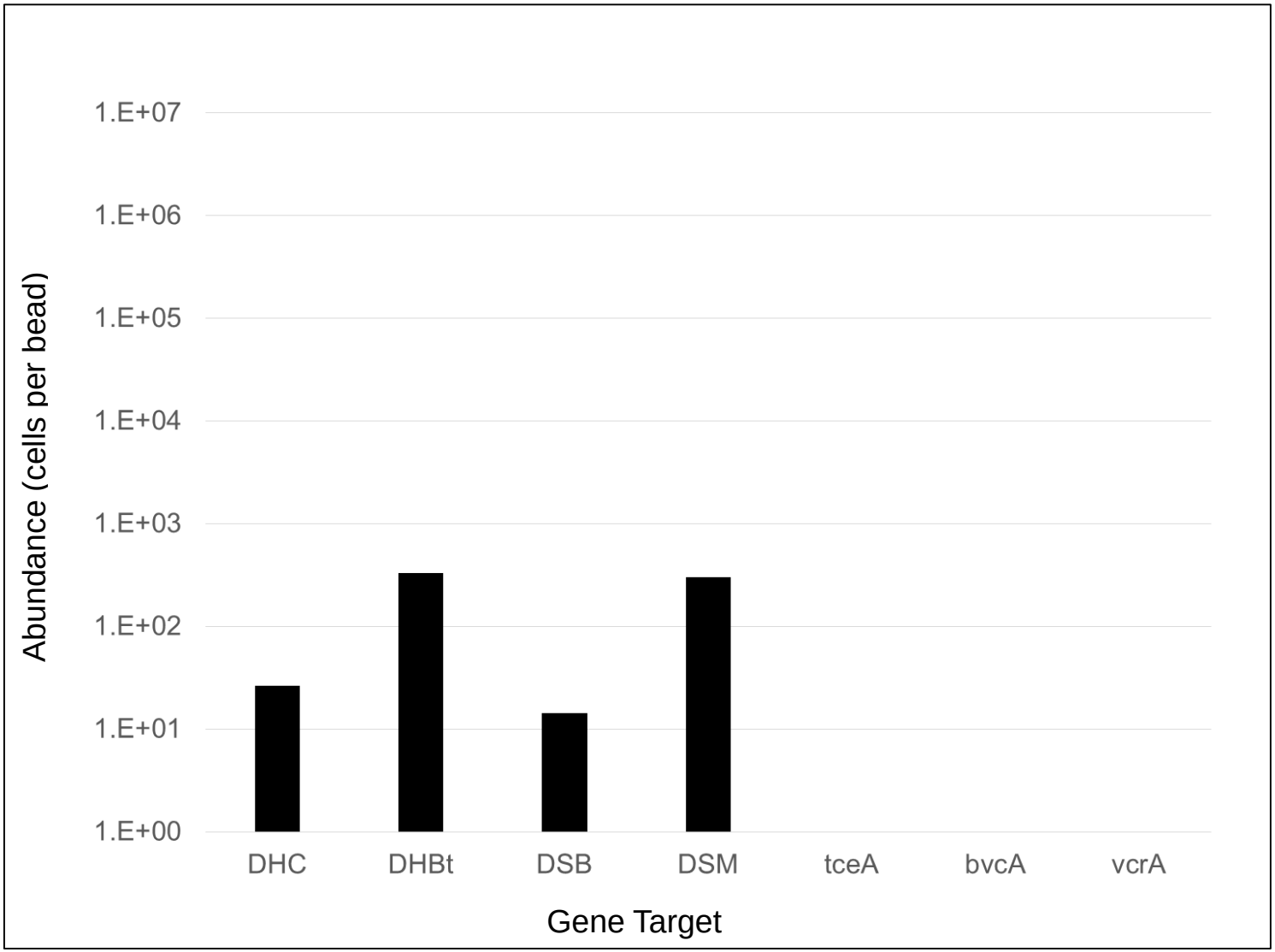
**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-8**

ARCADIS Design & Consultancy for natural and built assets

CHART 10

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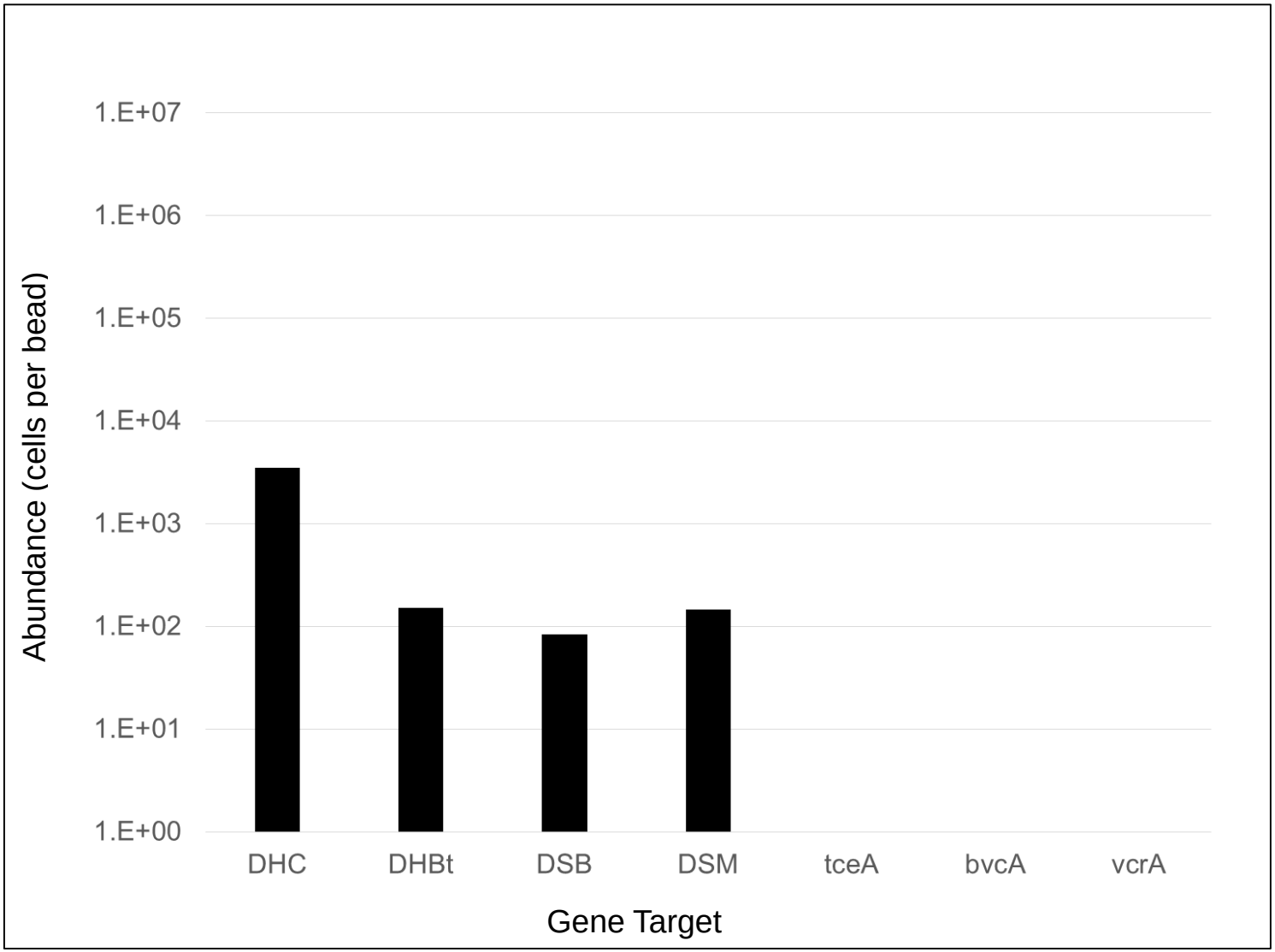
**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-6**

ARCADIS Design & Consultancy for natural and built assets

CHART 11




NOTES:
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DSM – DESULFUROMONAS
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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-21**

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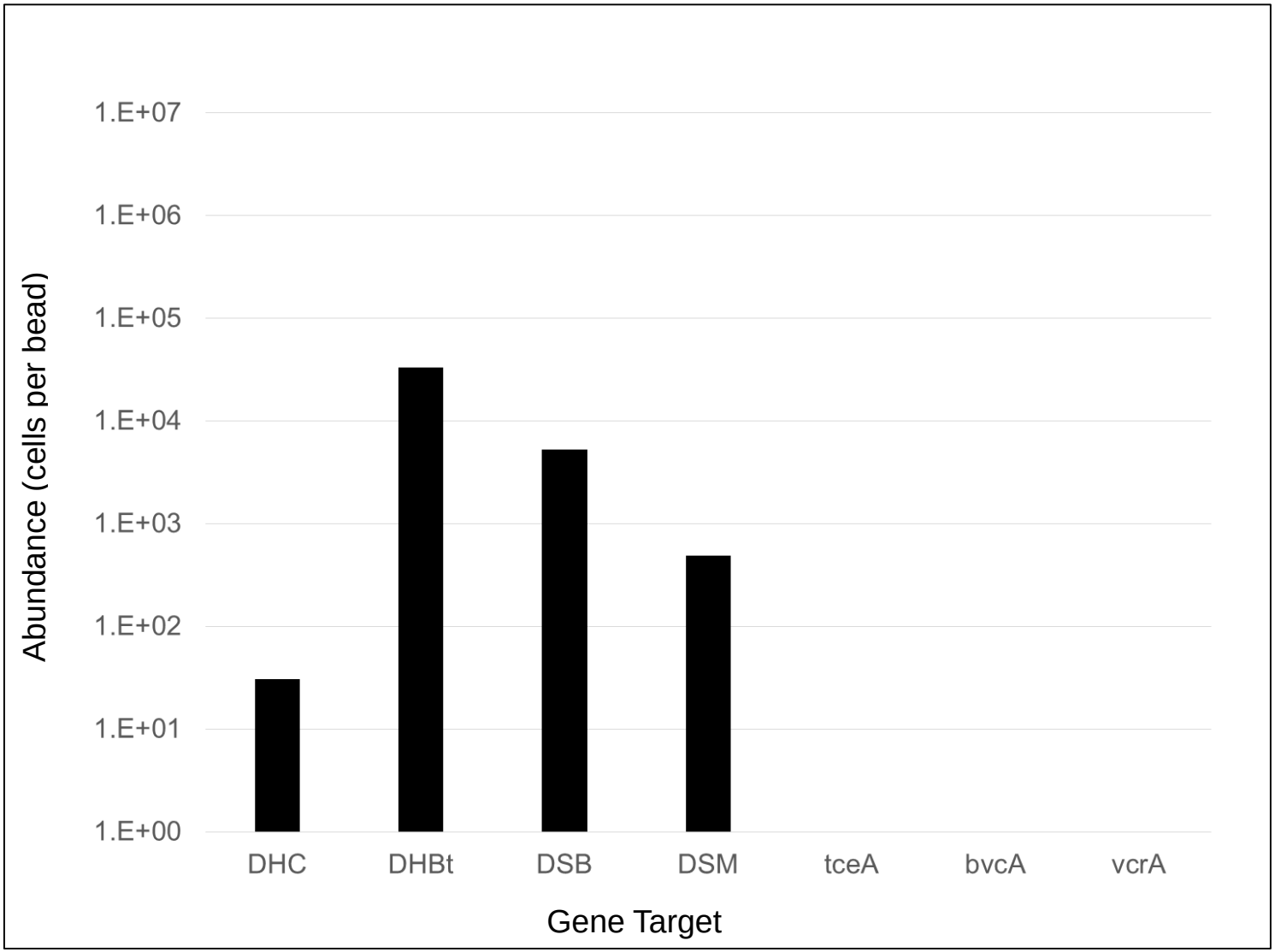
CHART 12

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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-2**

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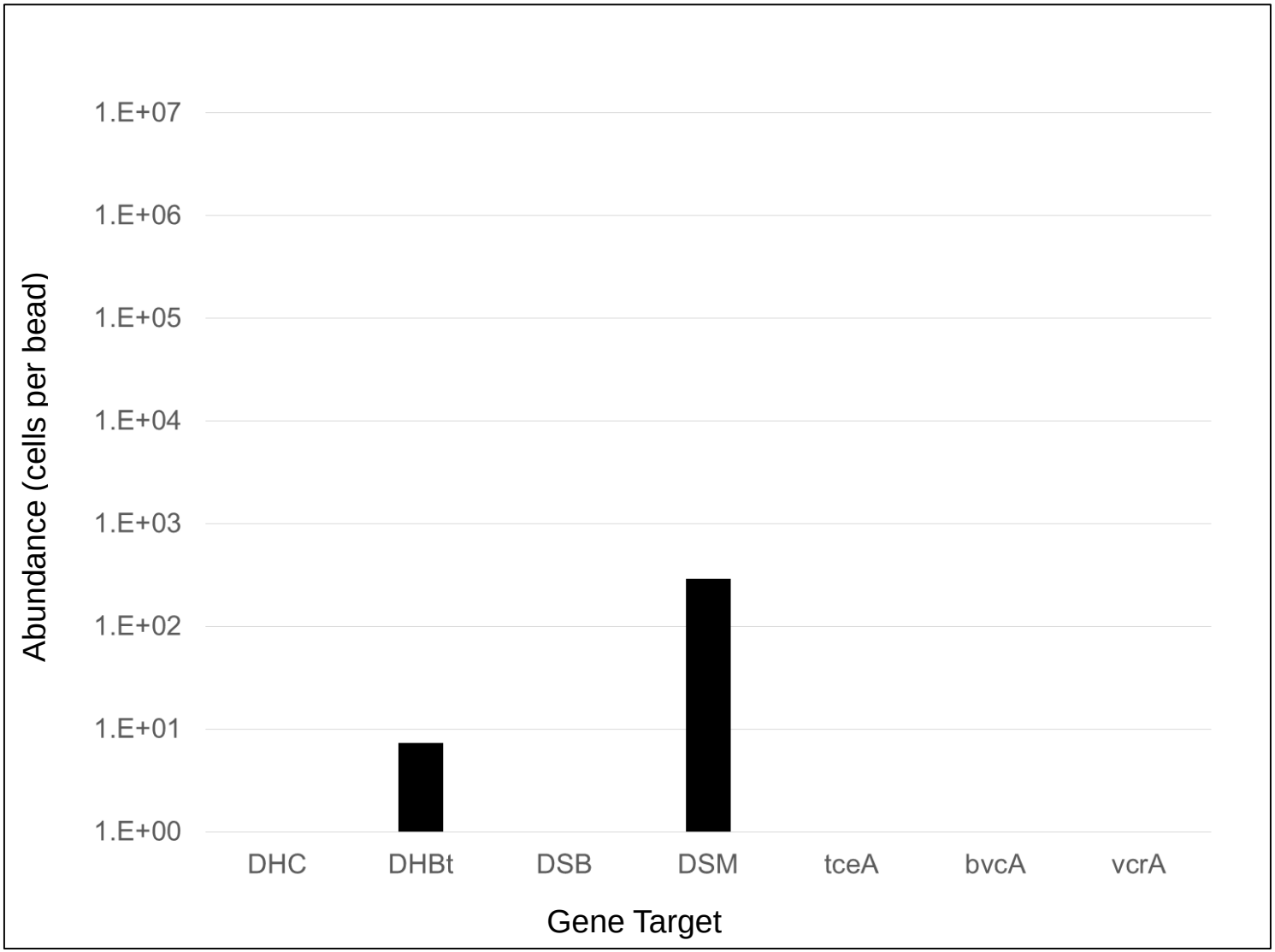
CHART
13

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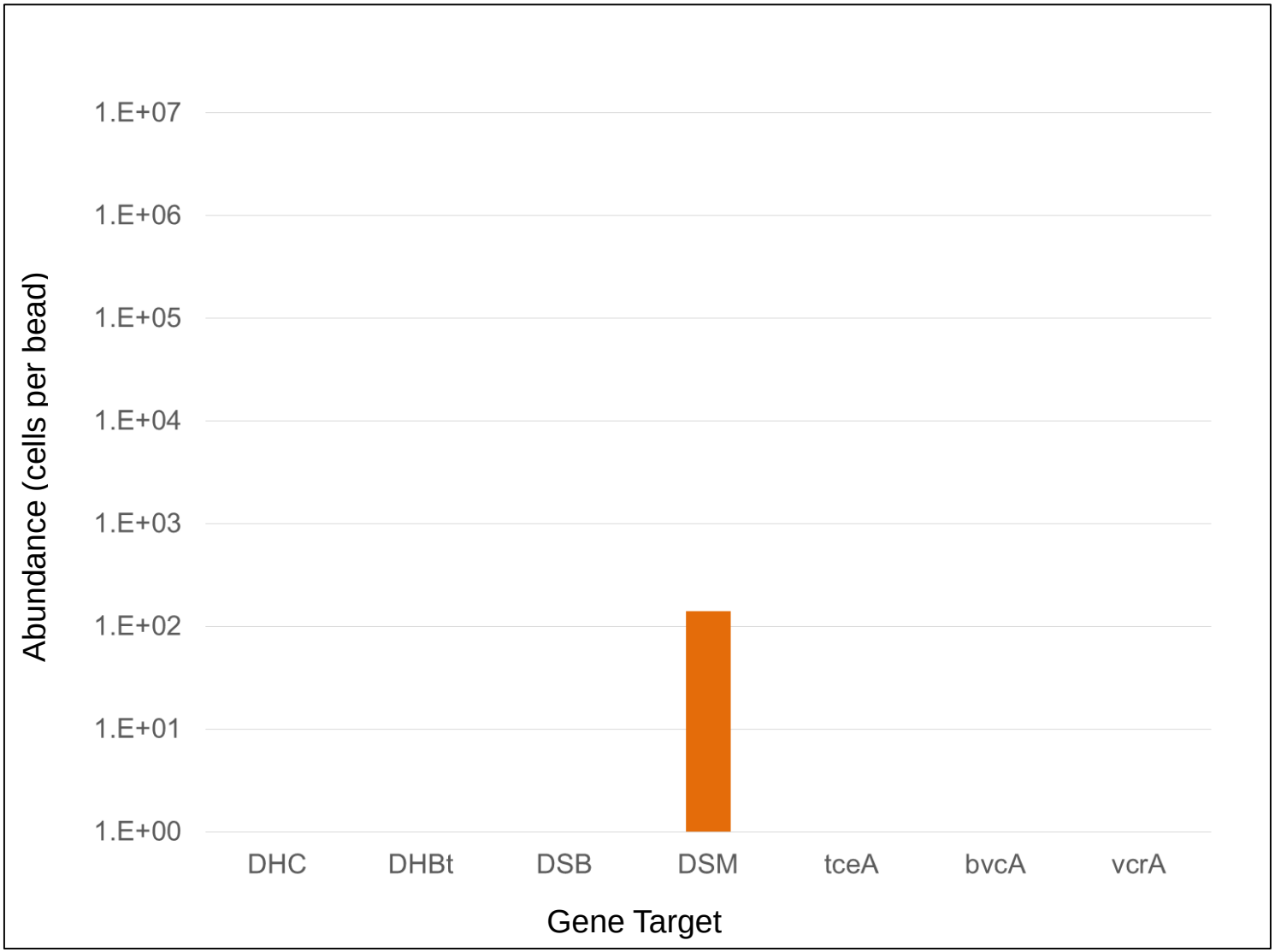
**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-18**

ARCADIS Design & Consultancy for natural and built assets

CHART
14




NOTES:
DHC – DEHALOCOCCOIDES
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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL HR-12**

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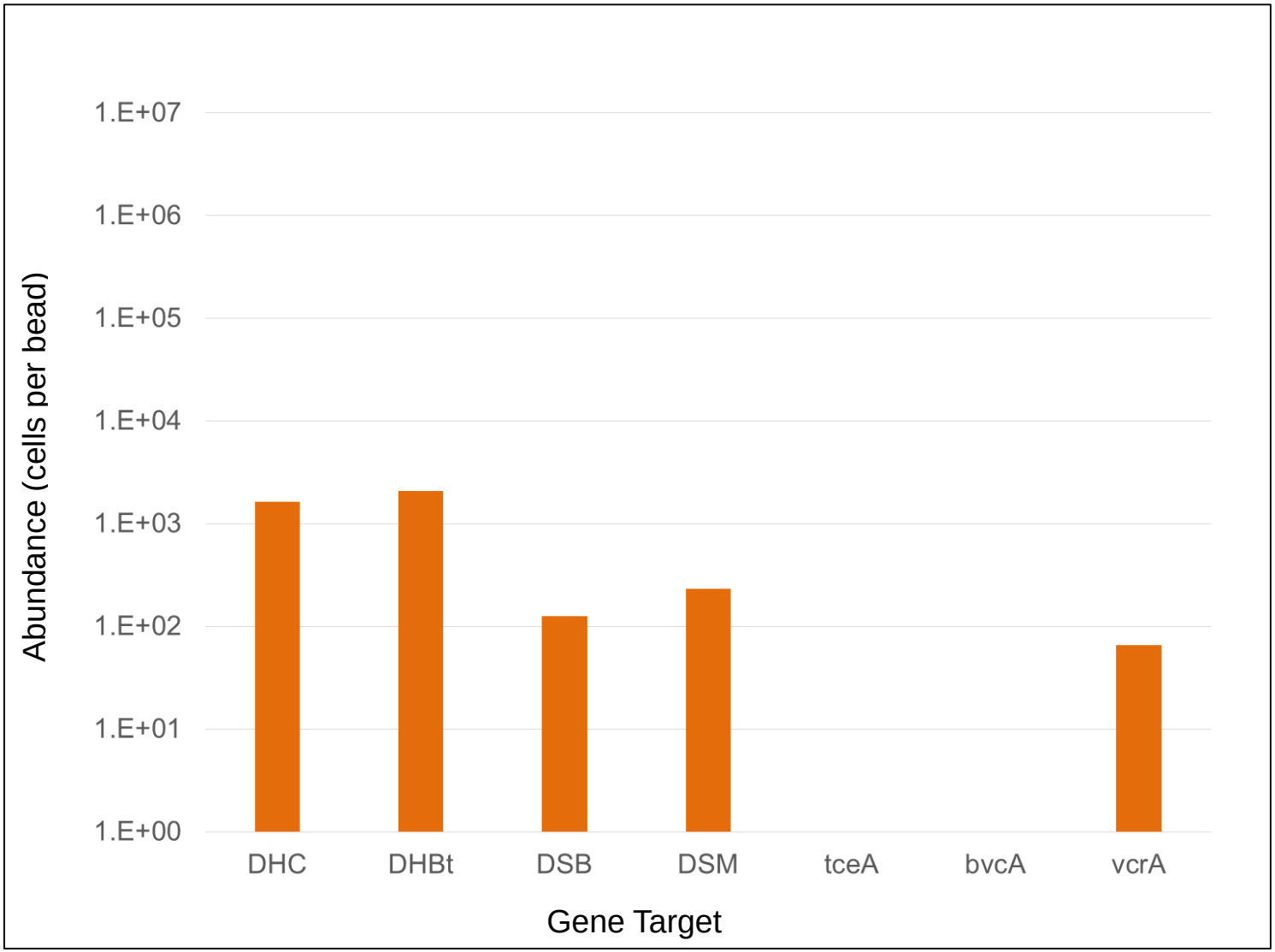
CHART
15




NOTES:
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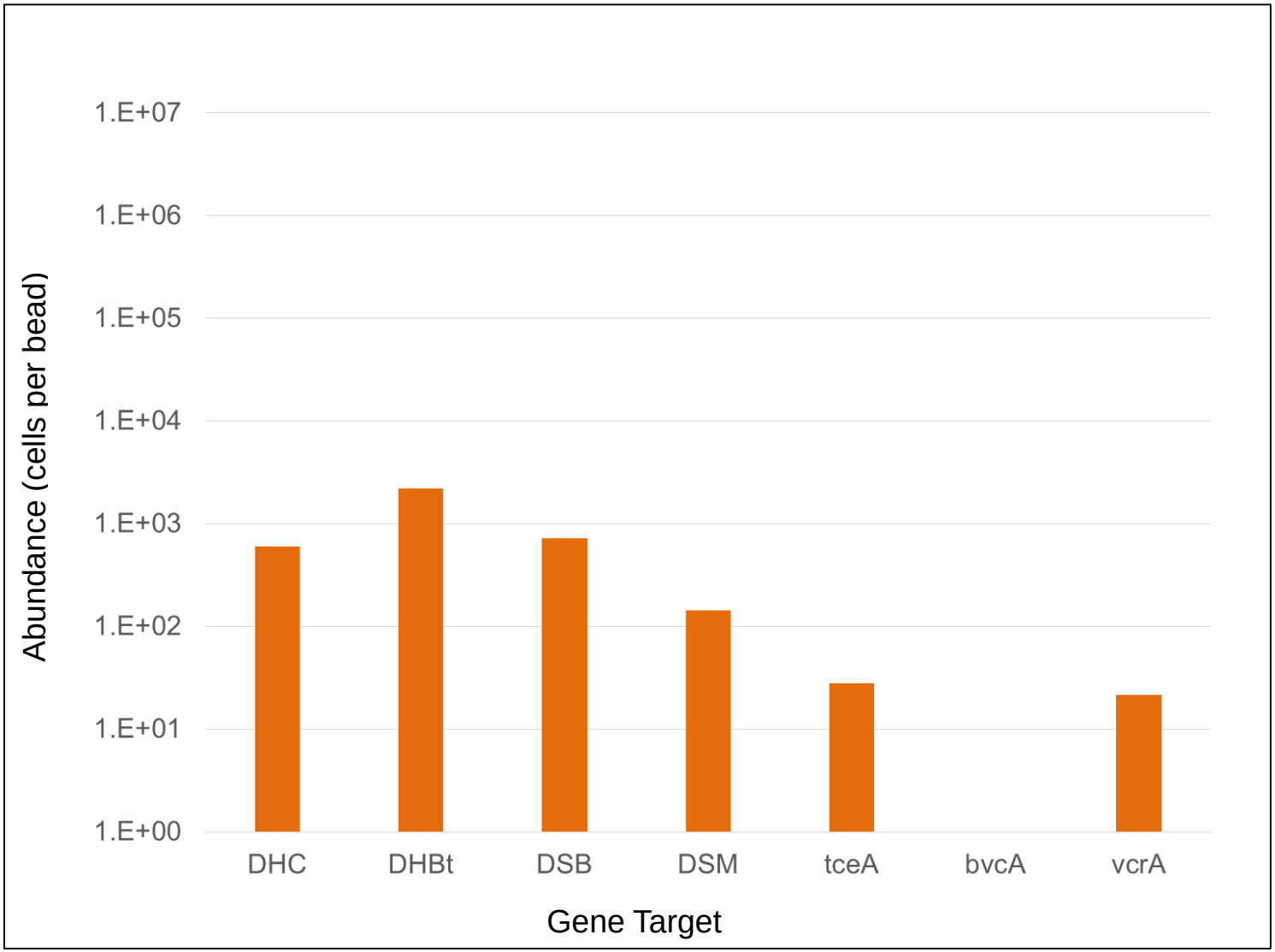
0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL RMW-85**

ARCADIS Design & Consultancy for natural and built assets

CHART 16




NOTES:
DHC – DEHALOCOCCOIDES
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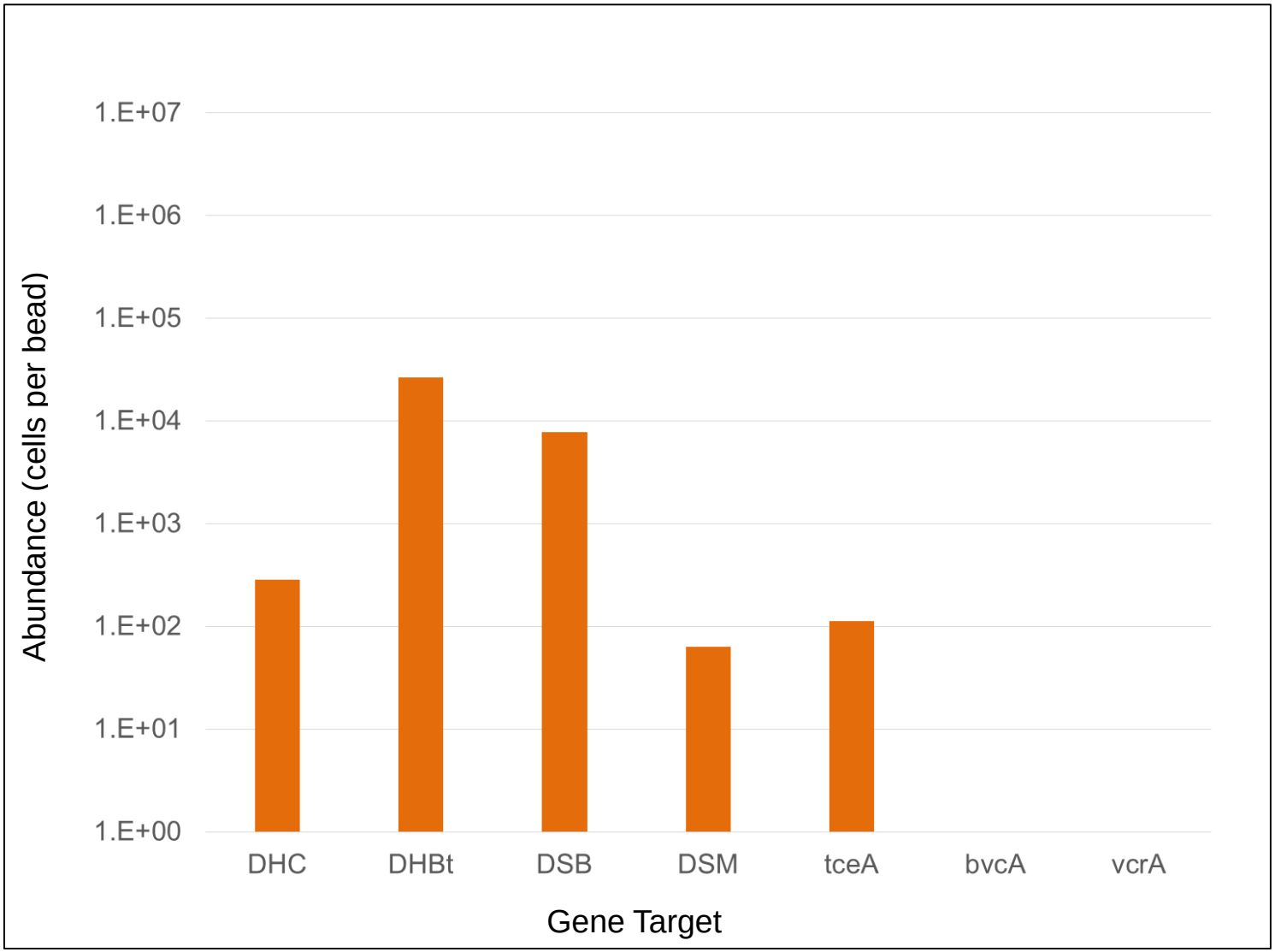
0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-75D**

ARCADIS Design & Consultancy for natural and built assets

CHART 17




NOTES:
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0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-82**

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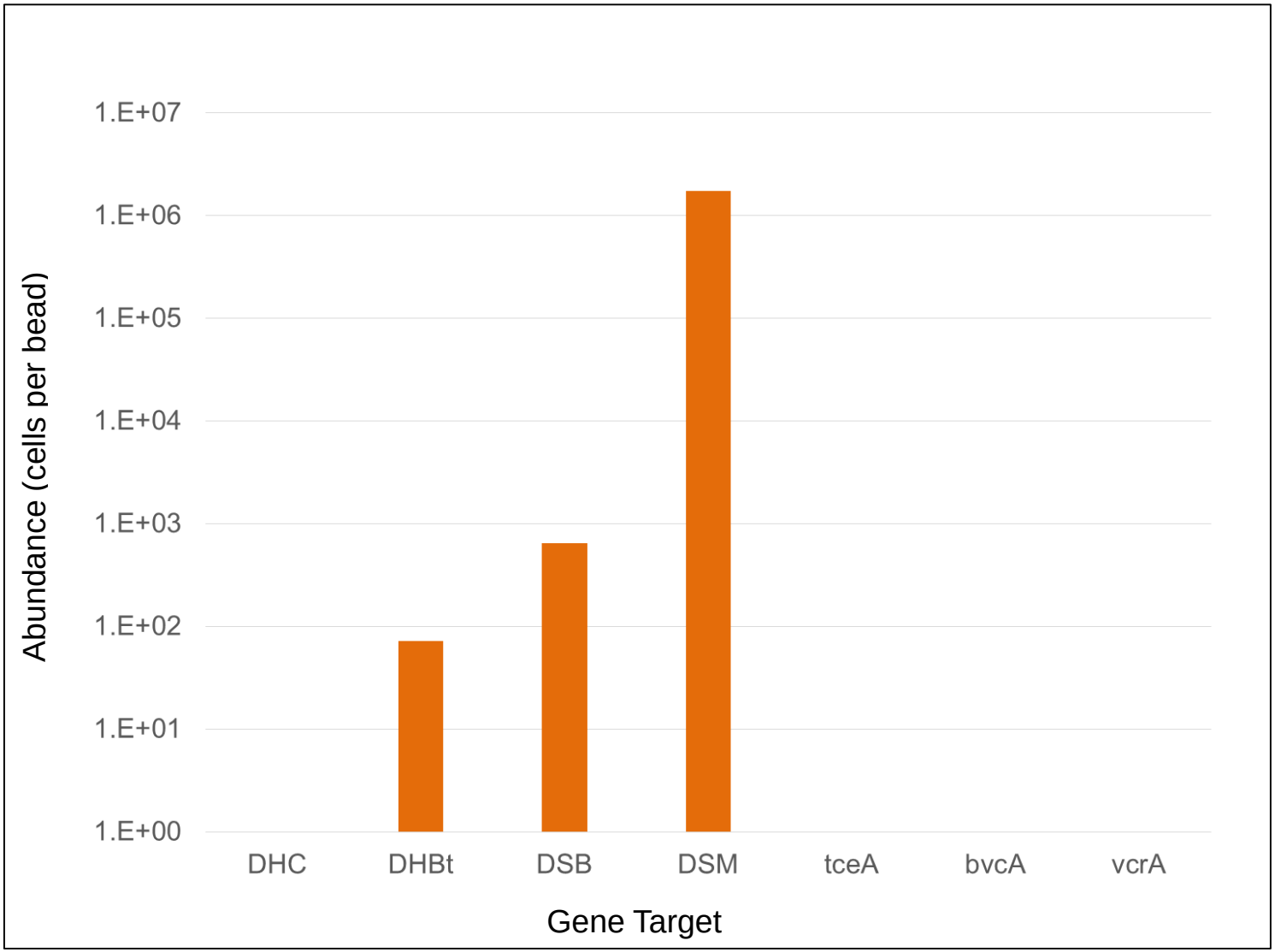
CHART 18




NOTES:
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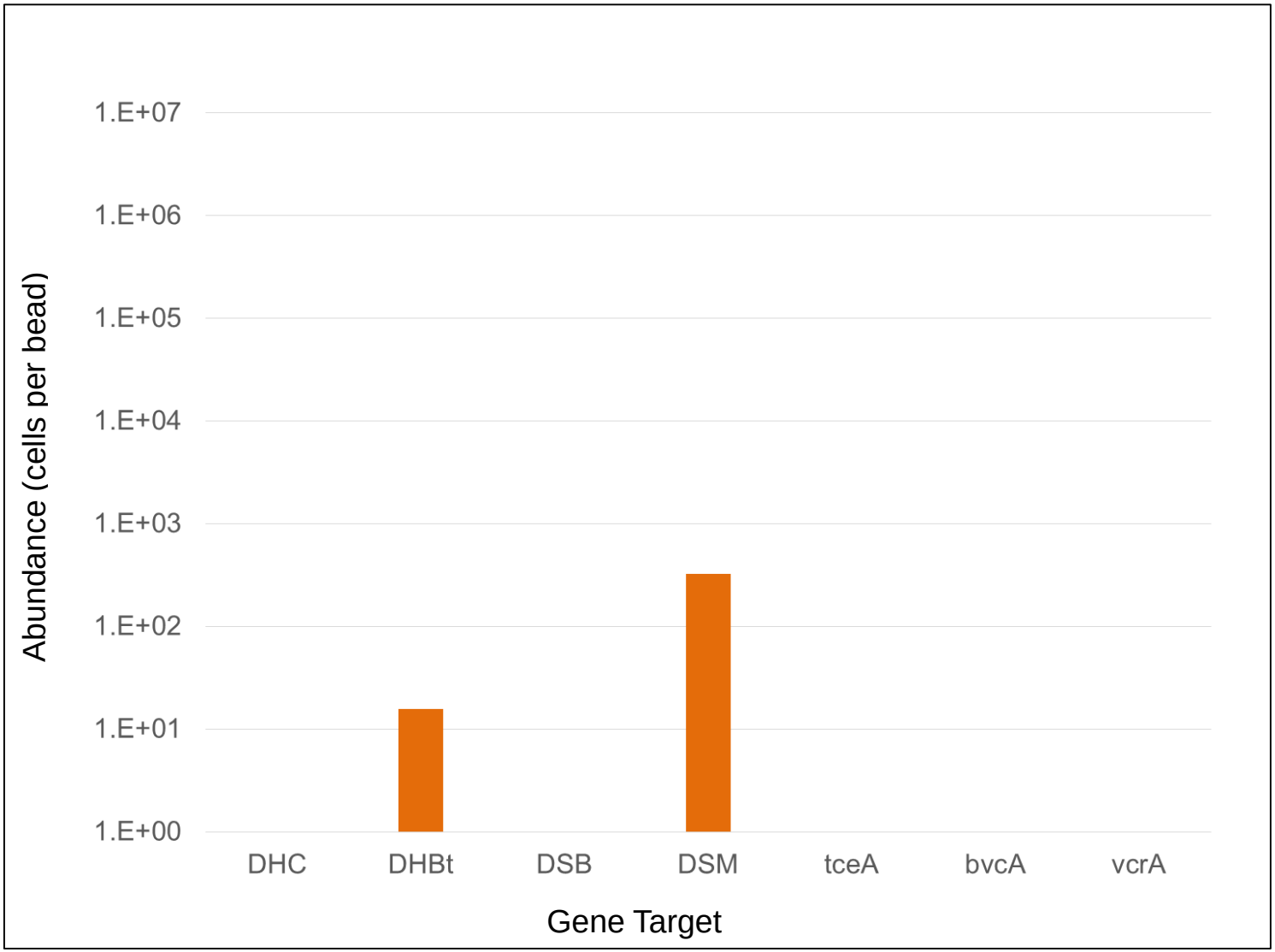
0H000294.2016

**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL RMW-86**

ARCADIS Design & Consultancy for natural and built assets

CHART 19

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**ABUNDANCE OF MICROBIAL GENE TARGETS AT MONITORING WELL GM-9**

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CHART 20

# APPENDIX C

## Site-Wide Groundwater VOC Analytical Results from 1999 to 2014

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| **Upgradient of the Site** | | | | | | | | | | | | | |
| HR-11 | 9/14/1999 | <1.0 | 13.5 | <1.0 | <1.0 | 3.3 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/18/2000 | <1.0 | 32.9 | <1.0 | <1.0 | 18.5 | <1.0 | <1.0 | <1.0 | 2.6 | <1.0 | <1.0 | <1.0 |
| | 11/6/2001 | 0.30J | 33 | <1.0 | < 1.0 | 18 | < 1.0 | < 1.0 | < 1.0 | 2.3 | < 1.0 | < 1.0 | < 1.0 |
| | 9/26/2002 | < 1 | 18 | < 1 | < 1 | 6.1 | < 1 | < 1 | < 1 | 0.72 | < 1 | < 1 | < 1 |
| | 9/18/2003 | < 1 U | 10 | < 1 U | < 1 U | 1.7 | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 9/15/2004 | < 1 U | 7.3 | < 1 U | < 1 U | 0.45 J | < 1 U | 2.2 | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 10/17/2005 | < 1.0 U | 6.5 | < 1.0 U | < 1.0 U | 0.72 J | < 1.0 U | **6.0** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/25/2006 | < 1 U | 6.7 | < 1 U | < 1 U | 0.31 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/19/2007 | < 1 U | 7.1 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/25/2008 | < 1 U | 5.2 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/26/2013 | < 1.0 U | 4.4 | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | 0.24 J | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-24 | 9/23/1999 | 2.7 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| **On-Site** | | | | | | | | | | | | | |
| W-1-N | 9/17/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/19/2002 | < 1.0 | 0.36J | < 1.0 | < 1.0 | < 0.50 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | < 1.0 | < 1.0 |
| | 9/27/2013 | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | 0.27 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/8/2014 | < 1.0 U | 1.8 | < 1.0 U | < 1.0 U | 0.21 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 UB | < 1.0 U | < 2.0 U |
| HR-4 | 9/14/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1.2 | <1.0 | <1.0 | 1.4 | <1.0 | <1.0 |
| | 9/20/2000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 11/6/2001 | 0.17J | < 1.0 | < 1.0 | < 1.0 | 0.28J | < 1.0 | 0.88J | < 1.0 | < 0.50 | 1.0 | < 1.0 | < 1.0 |
| | 9/27/2002 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | 0.59J | < 1 | < 0.5 | 0.71J | < 1 | < 1 |
| | 9/18/2003 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 0.55 J | < 1 U | < 0.5 U | 0.71 J | < 1 U | < 1 U |
| | 9/16/2004 | < 1 U | 0.77 J | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.3 | < 1 U | < 0.5 U | 0.5 J | < 1 U | < 1 U |
| | 10/20/2005 | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.39 J | < 1.0 U | < 1.0 U | 0.32 J | < 1.0 U | < 2.0 U |
| | 9/25/2006 | < 1 U | 1.6 | < 1 U | < 1 U | 0.26 J | < 1 U | 0.41 J | < 1 U | < 1 U | 0.34 J | < 1 U | < 2 U |
| | 9/26/2007 | < 1 U | 3.6 | < 1 U | < 1 U | < 1 U | < 1 U | 0.33 J | < 1 U | < 1 U | 0.31 J | < 1 U | < 2 U |
| | 9/30/2008 | < 1 U | 4.1 | < 1 U | < 1 U | 0.23 J | < 1 U | 0.44 J | < 1 U | < 1 U | 0.31 J | < 1 U | < 2 U |
| | 11/13/2009 | < 1.0 U | 5.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.37 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2010 | < 1.0 U | 3.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.34 J | < 1.0 U | < 1.0 U | 0.28 J | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 4.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.27 J | < 1.0 U | < 2.0 U |
| | 9/7/2012 | 0.23 J | 5 | < 1.0 U | < 1.0 U | 0.35 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.32 J | < 1.0 U | < 2.0 U |
| | 9/27/2013 | 0.29 J | 3.0 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.21 J | < 1.0 U | < 1.0 U | 0.27 J | < 1.0 U | < 2.0 U |
| | 10/7/2014 | 0.71 J | 2.0 | < 1.0 U | < 1.0 U | 0.26 J | < 1.0 U | 0.28 J | < 1.0 U | < 1.0 U | < 1.0 UB | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| W-2-N | 9/14/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 1.6 | <1.0 | <1.0 | <1.0 | <1.0 | 1.7 | <1.0 | <1.0 |
| | 9/19/2000 | <1.0 | <1.0 | <1.0 | <1.0 | 1.2 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 11/6/2001 | 0.48J | 0.33J | < 1.0 | < 1.0 | 1.1 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | 1.3 | < 1.0 | < 1.0 |
| | 9/19/2002 | < 1.0 | 0.31J | < 1.0 | < 1.0 | 1.6 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | 1.4 | < 1.0 | < 1.0 |
| | 9/18/2003 | < 1 U | < 1 U | < 1 U | < 1 U | 1.3 | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 9/16/2004 | 0.3 J | 0.36 J | < 1 U | < 1 U | 1.8 | < 1 U | 0.31 J | < 1 U | 0.2 J | 1.4 | < 1 U | < 1 U |
| | 10/20/2005 | < 1.0 U | 0.28 J | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.91 J | < 1.0 U | < 2.0 U |
| | 9/22/2006 | 0.25 J | 0.29 J | < 1 UJ | < 1 UJ | 1.4 J | < 1 UJ | < 1 UJ | < 1 UJ | 0.18 J | 1 J | < 1 UJ | < 2 UJ |
| | 9/25/2007 | < 1 U | 0.22 J | < 1 U | < 1 U | 1.6 | < 1 U | < 1 U | 0.28J | < 1 U | 0.88J | < 1 U | < 2 U |
| | 9/29/2008 | < 1 U | < 1 U | < 1 U | < 1 U | 1.7 | < 1 U | < 1 U | < 1 U | < 1 U | 0.47 J | < 1 U | < 2 U |
| | 11/13/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.37 J | < 1.0 U | < 2.0 U |
| | 9/24/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/6/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.89 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/7/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.20 J | < 1.0 U | < 2.0 U |
| W-3-N | 9/17/1999 | <1.0 | <1.0 | <1.0 | <1.0 | **291** | <1.0 | 2.5 | <1.0 | 2.6 | <1.0 | **12.8** | <1.0 |
| | 9/19/2000 | <1.0 | <1.0 | <1.0 | <1.0 | **282** | <1.0 | <1.0 | <1.0 | 3.9 | <1.0 | **24.0** | <1.0 |
| | 11/7/2001 | < 5.6 | < 5.6 | < 5.6 | < 5.6 | **160** | < 5.6 | **9.0** | < 5.6 | 2.2J | 2.1J | **7.6** | < 5.6 |
| | 9/23/2002 | < 6.7 | < 6.7 | < 6.7 | < 6.7 | **150** | < 6.7 | < 6.7 | < 6.7 | < 3.3 | < 6.7 | **6.5J** | < 6.7 |
| | 9/17/2003 | < 4 U | < 4 U | < 4 U | < 4 U | **100** | < 4 U | **5.1** | < 4 U | 1.6 J | 1.7 J | **6.6** | < 4 U |
| | 9/16/2004 | < 4 U | < 4 U | < 4 U | < 4 U | **120** | < 4 U | 0.94 J | < 4 U | 1.6 J | < 4 U | **6.1** | < 4 U |
| | 10/20/2005 | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | **84** | < 4.0 U | 1.4 J | < 4.0 U | 1.0 J | < 4.0 U | **8.0** | < 8.0 U |
| | 9/25/2006 | < 5 U | < 5 U | < 5 U | < 5 U | **140** | < 5 U | < 5 U | < 5 U | 1.9 J | < 5 U | **9.6** | < 10 U |
| | 9/26/2007 | < 4 U | < 4 U | < 4 U | < 4 U | **110** | < 4 U | < 4 U | < 4 U | 1.4 J | < 4 U | **5.6** | < 8 U |
| | 9/29/2008 | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | **98** | < 3.3 U | < 3.3 U | < 3.3 U | 1.4 J | < 3.3 U | **3.8** | < 6.7 U |
| | 11/13/2009 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | **72** | < 2.0 U | < 2.0 U | < 2.0 U | 0.99 J | < 2.0 U | **3.2** | < 4.0 U |
| | 9/24/2010 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | 56 | < 2.0 U | < 2.0 U | < 2.0 U | 0.79 J | < 2.0 U | **2.4** | < 4.0 U |
| | 9/28/2011 | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | 53 | < 2.5 U | 0.94 J | < 2.5 U | 0.80 J | < 2.5 U | **2.7** | < 5.0 U |
| | 9/6/2012 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | 41 | < 2.0 U | 0.60 J | < 2.0 U | 0.79 J | < 2.0 U | 1.4 J | < 4.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 34 | < 1.0 U | 0.96 J | < 1.0 U | 0.64 J | < 1.0 U | 1.6 | < 2.0 U |
| | 10/7/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 31 | < 1.0 U | 0.52 J | < 1.0 U | 0.47 J | < 1.0 U | 1 | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| W-4-N | 9/17/1999 | <1.0 | 1.3 | <1.0 | <1.0 | 2.2 | <1.0 | 2.1 | <1.0 | <1.0 | **9.8** | <1.0 | <1.0 |
| | 9/19/2000 | <1.0 | <1.0 | <1.0 | <1.0 | 2.0 | <1.0 | <1.0 | <1.0 | <1.0 | **7.3** | <1.0 | <1.0 |
| | 11/7/2001 | 0.33J | 0.89J | < 1.0 | < 1.0 | 1.6 | < 1.0 | 0.92J | < 1.0 | < 0.50 | **7.1** | < 1.0 | < 1.0 |
| | 9/24/2002 | 0.44J | 1.7 | < 1 | < 1 | 5.2 | < 1 | 0.94J | < 1 | 0.33J | **8.5** | 0.77J | < 1 |
| | 9/17/2003 | 0.26 J | 0.94 J | < 1 U | < 1 U | 1.7 | < 1 U | 1.1 | < 1 U | < 0.5 U | **8.1** | 0.48 J | < 1 U |
| | 9/16/2004 | 0.4 J | 1.7 | < 1 U | < 1 U | 5.8 | < 1 U | 1.7 | < 1 U | 0.38 J | **12** | 0.49 J | < 1 U |
| | 10/20/2005 | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | 2.0 | < 1.0 U | 1.0 | < 1.0 U | < 1.0 U | **7.2** | 0.54 J | < 2.0 U |
| | 9/25/2006 | < 1 U | 1.3 | < 1 U | < 1 U | 2.4 | < 1 U | 0.96 J | < 1 U | 0.19 J | **7.6** | 0.56 J | < 2 U |
| | 9/26/2007 | 0.34J | 1.6 | < 1 U | < 1 U | 2.6 | < 1 U | 0.88 J | < 1 U | 0.24 J | **10** | 0.96 J | < 2 U |
| | 9/29/2008 | 0.39 J | 1.9 | < 1 U | < 1 U | 11 | < 1 U | 0.38 J | < 1 U | 0.92 J | **8.4** | 0.34 J | < 2 U |
| | 11/13/2009 | 0.47 J | 1.6 | < 1.0 U | < 1.0 U | 5.7 | < 1.0 U | 0.68 J | < 1.0 U | 0.39 J | **15** | 0.25 J | < 2.0 U |
| | 9/24/2010 | 0.41 J | 2.1 | < 1.0 U | < 1.0 U | 7.9 | < 1.0 U | 0.67 J | < 1.0 U | 0.51 J | **13** | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 2.4 | < 1.0 U | < 1.0 U | 9.7 | < 1.0 U | 1.1 | < 1.0 U | 0.59 J | **9.9** | < 1.0 U | < 2.0 U |
| | 9/7/2012 | < 1.0 U | 5.6 | < 1.0 U | < 1.0 U | 14 | < 1.0 U | 0.52 J | < 1.0 U | 1.2 | **6.3** | < 1.0 U | < 2.0 U |
| | 9/27/2013 | < 1.0 U | 7.1 | < 1.0 U | < 1.0 U | 11 | < 1.0 U | 0.63 J | < 1.0 U | 0.76 J | **7.4** | 0.18 J | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 5.7 | < 1.0 U | < 1.0 U | 11 | < 1.0 U | 0.49 J | < 1.0 U | 0.69 J | **9.2** | < 1.0 U | < 2.0 U |
| HR-2 | 9/16/1999 | <1.0 | 3.9 | <1.0 | <1.0 | 9.6 | <1.0 | <1.0 | <1.0 | 1.5 | <1.0 | <1.0 | <1.0 |
| | 9/19/2000 | <1.0 | 4.6 | <1.0 | <1.0 | 8.6 | <1.0 | <1.0 | <1.0 | 1.1 | <1.0 | <1.0 | <1.0 |
| | 11/7/2001 | < 1.0 | 4.2 | < 1.0 | < 1.0 | 8.3 | < 1.0 | < 1.0 | < 1.0 | 1.1 | 0.56J | < 1.0 | < 1.0 |
| | 9/24/2002 | < 1 | 4.9 | < 1 | < 1 | 8.8 | < 1 | < 1 | < 1 | 1.2 | 0.46J | < 1 | < 1 |
| | 9/16/2003 | < 1 U | 4.5 | < 1 U | < 1 U | 7.2 | < 1 U | < 1 U | < 1 U | 0.96 | 0.4 J | < 1 U | < 1 U |
| | 9/16/2004 | < 1 U | 5.6 | < 1 U | < 1 U | 7.8 | < 1 U | 0.37 J | < 1 U | 1.1 | 0.53 J | 0.23 J | < 1 U |
| | 10/20/2005 | < 1.0 U | 4.4 | < 1.0 U | < 1.0 U | 5.0 | < 1.0 U | < 1.0 U | < 1.0 U | 0.78 J | 0.35 J | 0.29 J | < 2.0 U |
| | 9/25/2006 | < 1 U | 5.2 | < 1 U | < 1 U | 5.6 | < 1 U | < 1 U | < 1 U | 0.79 J | 0.48 J | < 1 U | < 2 U |
| | 9/26/2007 | < 1 U | 5.3 | < 1 U | < 1 U | 5.0 | < 1 U | < 1 U | < 1 U | 0.76J | 0.45J | < 1 U | < 2 U |
| | 10/1/2008 | < 1 U | 4.6 | < 1 U | < 1 U | 3.4 | < 1 U | < 1 U | < 1 U | 0.47 J | 0.36 J | < 1 U | < 2 U |
| | 11/13/2009 | < 1.0 U | 5.6 | < 1.0 U | < 1.0 U | 3.7 | < 1.0 U | < 1.0 U | < 1.0 U | 0.58 J | 0.45 J | < 1.0 U | < 2.0 U |
| | 9/28/2010 | < 1.0 U | 5.6 | < 1.0 U | < 1.0 U | 2.8 | < 1.0 U | < 1.0 U | < 1.0 U | 0.41 J | 0.39 J | < 1.0 U | < 1.0 U |
| | 9/28/2011 | < 1.0 U | 6.4 | < 1.0 U | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | < 1.0 U | 0.32 J | 0.43 J | < 1.0 U | < 2.0 U |
| | 9/7/2012 | < 1.0 U | 7.7 | < 1.0 U | < 1.0 U | 1.8 | < 1.0 U | < 1.0 U | < 1.0 U | 0.28 J | 0.41 J | < 1.0 U | < 2.0 U |
| | 9/27/2013 | < 1.0 U | 7.5 | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | 0.28 J | 0.40 J | < 1.0 U | < 2.0 U |
| | 10/8/2014 | < 1.0 U | 7.3 | < 1.0 U | < 1.0 U | 1.8 | < 1.0 U | < 1.0 U | < 1.0 U | 0.29 J | < 1.0 UB | < 1.0 U | < 2.0 U |
| HR-3 | 9/16/1999 | <1.0 | 6.2 | <1.0 | <1.0 | 6.1 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/19/2000 | <1.0 | 5.1 | <1.0 | <1.0 | 4.6 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 11/7/2001 | < 1.0 | 6.9 | < 1.0 | < 1.0 | 5.1 | < 1.0 | < 1.0 | < 1.0 | 0.60 | 0.66J | < 1.0 | < 1.0 |
| | 9/24/2002 | < 1 | 15 | < 1 | < 1 | 9.9 | < 1 | < 1 | < 1 | 1 | 1.4 | < 1 | < 1 |
| | 9/16/2003 | < 1 U | 13 | < 1 U | < 1 U | 9.9 | < 1 U | < 1 U | < 1 U | 1.1 | 1.6 | < 1 U | < 1 U |
| | 9/16/2004 | 0.27 J | 23 | < 1 U | < 1 U | 18 | < 1 U | 0.32 J | < 1 U | 1.8 | **8.1** | < 1 U | < 1 U |
| | 10/20/2005 | 0.34 J | 18 | < 1.0 U | < 1.0 U | 11 | < 1.0 U | < 1.0 U | < 1.0 U | 1.5 | **10** | < 1.0 U | < 2.0 U |
| | 9/25/2006 | < 1 U | 10 | < 1 U | < 1 U | 8.2 | < 1 U | < 1 U | < 1 U | 0.99 J | **7.2** | < 1 U | < 2 U |
| | 10/2/2008 | 0.84 J | 16 | 0.27 J | < 1 UJ | 17 | < 1 U | < 1 U | < 1 U | 1.6 | **32** | **2.2** | < 2 U |
| | 9/27/2013 | 6.9 | 12 | 0.51 J | < 1.0 U | 59 | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | **190** | 0.93 J | < 2.0 U |
| | 10/8/2014 | 7.6 J | 11 | < 10 U | < 10 U | 82 | < 10 U | < 10 U | < 10 U | 2.7 J | **220** | 6.4 J | < 20 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-30 | 9/2/1999 | <10 | 53.8J | <10 | <10 | 7.5J | **7030J** | **9.5J** | **6950J** | <10 | <10 | <10 | **23300J** |
| | 9/20/2000 | <1.0 | 50.6 | <1.0 | 2.7 | <1.0 | **2290** | <1.0 | 98.9 | <1.0 | <1.0 | <1.0 | 6770 |
| | 11/13/2001 | < 25 | 31 | < 25 | < 25 | < 12 | **840** | < 25 | 5.0J | < 12 | **12J** | < 25 | 2000 |
| | 9/27/2002 | < 33 | 34 | < 33 | < 33 | < 17 | 350 | < 33 | < 33 | < 17 | < 33 | < 33 | 1400 |
| | 9/23/2003 | < 120 U | < 120 U | < 120 U | < 120 U | < 62 U | **1000** | < 120 U | 240 | < 62 U | < 120 U | < 120 U | 7000 |
| | 9/14/2004 | < 40 U | 33 J | < 40 U | < 40 U | < 20 U | 530 | < 40 U | < 40 U | < 20 U | < 40 U | < 40 U | 3000 |
| | 10/17/2005 | < 50 U | 23 J | < 50 U | < 50 U | < 50 U | 620 | < 50 U | < 50 U | < 50 U | < 50 U | < 50 U | 3800 |
| | 9/20/2006 | < 33 U | 25 J | < 33 U | < 33 U | < 33 U | 570 | < 33 U | 5.8 J | < 33 U | < 33 U | < 33 U | 2500 |
| | 9/26/2007 | < 18 U | 16 J | < 18 U | < 18 U | < 18 U | 380 | < 18 U | < 18 U | < 18 U | < 18 U | < 18 U | 1300 |
| | 10/6/2008 | < 10 U | 11 | < 10 U | < 10 U | < 10 U | 300 | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | 670 |
| | 9/27/2013 | < 1.0 U | 5.3 | < 1.0 U | 4.0 | < 1.0 U | 20 | 0.23 J | 1.1 | 0.63 J | 0.28 J | 0.34 J | 7.2 |
| | 10/9/2014 | < 1.4 U | 3.2 | < 1.4 U | 2.3 | 0.29 J | 54 | < 1.4 U | 0.71 J | 0.51 J | < 1.4 U | < 1.4 U | 12 |
| GM-23 | 9/2/1999 | 7.2 | 32.5 | **17.2** | 1.9 | **7530** | <1.0 | **6250** | <1.0 | 54.5 | **1460** | **2500** | 7.0 |
| | 9/20/2000 | 2.0 | 16.3 | 5.1 | <1.0 | **5620** | <1.0 | **3470** | <1.0 | 33.2 | **609** | **801** | <1.0 |
| | 11/12/2001 | < 420 | < 420 | < 420 | < 420 | **8400** | < 420 | **15000** | < 420 | < 210 | **2200** | **1200** | < 420 |
| | 9/26/2002 | < 400 | < 400 | < 400 | < 400 | **7700** | < 400 | **10000** | < 400 | < 200 | **1700** | **540** | < 400 |
| | 9/23/2003 | < 500 U | < 500 U | < 500 U | < 500 U | **5800** | < 500 U | **12000** | < 500 U | < 250 U | **1600** | **690** | < 500 U |
| | 9/14/2004 | < 500 U | < 500 U | < 500 U | < 500 U | **4600** | < 500 U | **6700** | < 500 U | < 250 U | **1100** | **870** | < 500 U |
| | 10/17/2005 | < 560 U | < 560 U | < 560 U | < 560 U | **19000** | < 560 U | **2300** | < 560 U | < 560 U | **490 J** | **2800** | < 1100 U |
| | 9/28/2006 | < 330 U | < 330 U | < 330 U | < 330 U | **11000** | < 330 U | **370** | < 330 U | **270 J** | **95 J** | **4100** | < 670 U |
| | 9/27/2007 | < 200 U | < 200 U | < 200 U | < 200 U | **4700** | < 200 U | **280** | < 200 U | **130 J** | **82 J** | **2600** | < 400 U |
| | 10/23/2008 | < 62 U | < 62 U | < 62 U | < 62 U | **2000** | < 62 U | **71** | < 62 U | 58 J | < 62 U | **2100** | < 120 U |
| | 11/17/2009 | < 20 U | 5.0 J | < 20 U | < 20 U | **1100** | < 20 U | **19 J** | < 20 U | 31 | **8.3 J** | **1100** | < 40 U |
| | 9/29/2010 | < 22 U | < 22 U | < 22 U | < 22 U | **490** | < 22 U | **50** | < 22 U | 16 J | **17 J** | **500** | < 44 U |
| | 9/30/2011 | < 20 U | < 20 U | < 20 U | < 20 U | **580** | < 20 U | **57** | < 20 U | 21 | **33** | **840** | < 40 U |
| | 9/7/2012 | < 25 U | < 25 U | < 25 U | < 25 U | **580** | < 25 U | **33** | < 25 U | 21 J | **15 J** | **390** | < 50 U |
| | 9/27/2013 | < 1.0 U | 2.6 | 1.7 | 0.28 J | **470** | < 1.0 U | **37** | < 1.0 U | 15 | **28** | **210** | < 2.0 U |
| | 10/10/2014 | < 10 U | 8.4 J | < 10 U | < 10 U | **210** | < 10 U | **3.6 J** | < 10 U | 20 | **4.1 J** | **220** | < 20 U |
| GM-27 | 9/1/1999 | <1.0 | 2.4 | <1.0 | <1.0 | 20.6 | <1.0 | 1.7 | <1.0 | <1.0 | **121** | <1.0 | <1.0 |
| | 9/20/2000 | <1.0 | 2.2 | <1.0 | <1.0 | 13.9 | <1.0 | 1.2 | <1.0 | <1.0 | **112** | <1.0 | <1.0 |
| | 11/13/2001 | < 3.3 | 1.8J | < 3.3 | < 3.3 | 13 | < 3.3 | **6.8** | < 3.3 | < 1.7 | **110** | < 3.3 | < 3.3 |
| | 9/26/2002 | < 3.3 | 1.7J | < 3.3 | < 3.3 | 14 | < 3.3 | < 3.3 | < 3.3 | < 1.7 | **100** | < 3.3 | < 3.3 |
| | 9/23/2003 | < 5 U | 1.9 J | < 5 U | < 5 U | 12 | < 5 U | 2.1 J | < 5 U | < 2.5 U | **100** | < 5 U | < 5 U |
| | 9/15/2004 | < 3.3 U | 2 J | < 3.3 U | < 3.3 U | 13 | < 3.3 U | 1.8 J | < 3.3 U | < 1.7 U | **81** | < 3.3 U | < 3.3 U |
| | 10/17/2005 | < 2.5 U | 2.2 J | < 2.5 U | < 2.5 U | 14 | < 2.5 U | 0.94 J | < 2.5 U | 0.49 J | **76** | 0.82 J | < 5.0 U |
| | 9/28/2006 | < 2.5 U | 2.6 | < 2.5 U | < 2.5 U | 14 | < 2.5 U | 1 J | < 2.5 U | 1 J | **80** | < 2.5 U | < 5 U |
| | 9/27/2007 | < 2 U | 2.3 | < 2 U | < 2 U | 12 | < 2 U | 0.9 J | < 2 U | 0.41 J | **70** | < 2 U | < 4 U |
| | 10/23/2008 | < 1.4 U | 2 | < 1.4 U | < 1.4 U | 11 | < 1.4 U | 0.9 J | < 1.4 U | 0.51 J | **57** | 0.44 J | < 2.9 U |
| | 9/27/2013 | < 1.0 U | 2.3 | < 1.0 U | < 1.0 U | 12 | < 1.0 U | 1.8 | < 1.0 UB | 0.51 J | **42** | 0.18 J | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-29 | 9/1/1999 | 37.8 | 4.3 | 1.3 | <1.0 | **320** | <1.0 | <20 | <1.0 | 11.1 | **878** | **3.8** | <1.0 |
| | 9/21/2000 | 24.5 | 16.6 | 3.1 | <1.0 | **2871** | <1.0 | **20.0** | 2.2 | 14.4 | **289** | **788** | <1.0 |
| | 11/13/2001 | < 50 | < 50 | < 50 | < 50 | **1800** | 21J | **17J** | < 50 | 26 | **270** | **230** | 52 |
| | 9/25/2002 | 16J | < 40 | < 40 | < 40 | **1300** | < 40 | **18J** | < 40 | 21 | **310** | **140** | < 40 |
| | 9/24/2003 | 18 J | < 33 U | < 33 U | < 33 U | **1200** | < 33 U | **18 J** | < 33 U | 20 | **390** | **150** | < 33 U |
| | 9/15/2004 | 21 J | < 50 U | < 50 U | < 50 U | **1200** | < 50 U | **20 J** | < 50 U | 21 J | **440** | **230** | < 50 U |
| | 10/17/2005 | 19 J | 18 J | < 50 U | < 50 U | **1600** | < 50 U | **15 J** | < 50 U | 27 J | **390** | **490** | < 100 U |
| | 9/28/2006 | 17 J | 15 J | < 33 U | < 33 U | **1300** | < 33 U | **15 J** | < 33 U | 20 J | **310** | **210** | < 67 U |
| | 9/26/2007 | 15 J | 15 J | < 50 U | < 50 U | **1200** | < 50 U | **18 J** | < 50 U | 19 J | **350** | **290** | < 100 U |
| | 10/6/2008 | 12 J | 11 J | < 33 U | < 33 U | **900** | < 33 U | **17 J** | < 33 U | 16 J | **300** | **150** | < 67 U |
| | 11/17/2009 | 18 | 12 | < 10 U | < 10 U | **600** | < 10 U | **21 J** | < 10 U | 20 | **370** | **70** | < 20 U |
| | 9/29/2010 | 11 J | 11 J | < 20 U | < 20 U | **660** | < 20 U | **17 J** | < 20 U | 19 J | **330** | **59** | < 40 U |
| | 9/30/2011 | 11 J | 8.5 J | < 13 U | < 13 U | **470** | < 13 U | **13** | < 13 U | 17 | **320** | **52** | < 25 U |
| | 9/26/2012 | 10 J | 8.2 J | < 20 U | < 20 U | **520** | < 20 U | **14 J** | < 20 U | 15 J | **310** | **45** | < 40 U |
| | 9/27/2013 | 15 | 12 | 1.7 | 0.20 J | **530** | < 1.0 U | **15** | < 1.0 U | 20 | **280** | **60** | < 2.0 U |
| | 10/9/2014 | 9.1 J | 9.5 J | < 14 U | < 14 U | **480** | < 14 U | **12 J** | < 14 U | 15 | **260** | **40** | < 29 U |
| GM-28 | 9/1/1999 | 17.7 | 3.3 | <1.0 | <1.0 | **175** | <1.0 | **316** | <1.0 | 9.2 | **768** | **3.2** | <1.0 |
| | 9/21/2000 | 5.0 | 9.9 | <1.0 | <1.0 | 37.0 | <1.0 | 2.3 | <1.0 | 22.3 | 1.6 | **12.4** | <1.0 |
| | 11/15/2001 | < 10 | < 10 | < 10 | < 10 | < 5.0 | < 10 | < 10 | < 10 | 11 | < 10 | < 10 | < 10 |
| | 9/24/2002 | < 1 | 2.7 | < 1 | < 1 | 1.1 | < 1 | < 1 | < 1.3 U | 11 | 0.86J | < 1 | < 1.2 U |
| | 10/1/2003 | < 1 U | 3.3 | < 1 U | < 1 U | 0.58 | < 1 U | < 1 U | < 1 U | 4 | 1.6 | 0.53 J | < 1 U |
| | 9/15/2004 | < 1 U | 3.3 | < 1 U | < 1 U | 0.41 J | < 1 U | 0.88 J | < 1 U | 1.2 | 1.4 | 0.44 J | < 1 U |
| | 10/18/2005 | < 1.0 U | 4.0 | < 1.0 U | < 1.0 U | 0.32 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.63 J | 0.66 J | 1.1 | < 2.0 U |
| | 9/27/2006 | < 1 U | 4.2 | < 1 U | < 1 U | 0.26 J | < 1 U | < 1 U | < 1 U | 0.66 J | 0.43 J | 0.42 J | < 2 U |
| | 9/20/2007 | < 1 U | 4.6 | < 1 U | < 1 U | 0.72 J | < 1 U | < 1 U | < 1 U | 0.58 J | 0.51 J | 1.2 | < 2 U |
| | 10/22/2008 | < 5 U | 2.2 J | < 5 U | < 5 U | 6.9 | < 5 U | < 5 U | < 5 U | 1.3 J | < 5 U | **6.5** | < 10 U |
| | 11/16/2009 | < 1.0 U | 3.6 | < 1.0 U | < 1.0 U | 2.3 | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | 0.58 J | **3.3** | < 2.0 U |
| | 9/28/2010 | < 1.0 U | 4.6 | < 1.0 U | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | **2.2** | < 2.0 U |
| | 10/5/2011 | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | 0.72 J | < 1.0 U | 0.63 J | < 1.0 U | 0.69 J | 0.41 J | 0.57 J | < 2.0 U |
| GM-25 | 9/22/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/21/2010 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| HR-7 | 9/17/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **9.8** | <1.0 | <1.0 |
| | 9/19/2002 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0.65 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | **9.4** | < 1.0 | < 1.0 |
| | 9/19/2002 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0.65 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | **9.4** | < 1.0 | < 1.0 |
| | 2/26/2008 | < 1 U | 0.26 J | < 1 U | < 1 U | 0.94 J | < 1 U | < 1 U | < 1 U | < 1 U | **7.3** | < 1 U | < 2 U |
| | 9/23/2010 | < 1.0 U | 0.26 J | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **7.5** | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **7.3** | < 1.0 U | < 2.0 U |
| | 9/6/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **7** | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | 0.35 J | < 1.0 U | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.2** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 0.27 J | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.2** | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| HR-5 | 9/16/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 10.5 | <1.0 | <1.0 | <1.0 | 1.1 | **12.0** | <1.0 | <1.0 |
| | 9/19/2000 | <1.0 | <1.0 | <1.0 | <1.0 | 5.6 | <1.0 | <1.0 | 3.0 | <1.0 | **8.1** | <1.0 | 2.0 |
| | 11/7/2001 | 0.17J | 0.55J | < 1.0 | < 1.0 | 7.8 | < 1.0 | < 1.0 | < 1.0 | 0.74 | **11** | < 1.0 | < 1.0 |
| | 9/23/2002 | < 1 | 0.55J | < 1 | < 1 | 7.5 | < 1 | < 1 | < 1 | 0.58 | **13** | < 1 | < 1 |
| | 9/18/2003 | < 1 U | 0.42 J | < 1 U | < 1 U | 5 | < 1 U | < 1 U | < 1 U | 0.46 J | **11** | < 1 U | < 1 U |
| | 9/13/2004 | < 1 U | 0.43 J | < 1 U | < 1 U | 4.8 | < 1 U | < 1 U | < 1 U | 0.44 J | **11** | < 1 U | < 1 U |
| | 10/18/2005 | < 1.0 U | 0.54 J | < 1.0 U | < 1.0 U | 4.6 | < 1.0 U | < 1.0 U | < 1.0 U | 0.52 J | **13** | 1.1 | < 2.0 U |
| | 9/22/2006 | < 1 UJ | 0.41 J | < 1 UJ | < 1 UJ | 5.2 J | < 1 UJ | 0.27 J | < 1 UJ | 0.46 J | **13 J** | 0.22 J | < 2 UJ |
| | 9/24/2007 | < 1 U | 0.51J | < 1 U | < 1 U | 5.4 | < 1 U | < 1 U | < 1 U | 0.41J | **13** | < 1 U | < 2 U |
| | 9/29/2008 | < 1 U | 0.48 J | < 1 U | < 1 U | 5.4 | < 1 U | < 1 U | < 1 U | 0.59 J | **13** | < 1 U | < 2 U |
| | 9/26/2013 | < 1.0 U | 0.70 J | < 1.0 U | < 1.0 U | 7.0 | < 1.0 U | 0.57 J | < 1.0 U | 0.63 J | **14** | 0.36 J | < 2.0 U |
| HR-6 | 9/16/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 2.0 | <1.0 | <1.0 |
| | 9/23/2002 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | < 1 | < 1 | < 0.5 | 1.5 | < 1 | < 1 |
| HR-1 | 9/16/1999 | 1.6 | 2.4 | <1.0 | <1.0 | 5.8 | <1.0 | **44.3** | <1.0 | 3.9 | **56.0** | <1.0 | <1.0 |
| | 9/25/2000 | 1.3 | 2.4 | <1.0 | <1.0 | 8.5 | <1.0 | **32.6** | <1.0 | 3.2 | **56.4** | <1.0 | <1.0 |
| | 11/8/2001 | 2.2J | 2.8J | < 3.3 | < 3.3 | 9.9 | < 3.3 | **36** | < 3.3 | 2.8 | **86B** | < 3.3 | < 3.3 |
| | 9/23/2002 | < 2 | 2.8 | < 2 | < 2 | 4.5 | < 2 | **33** | < 2 | 3.2 | **33** | < 2 | < 2 |
| | 9/18/2003 | 1 J | 2.6 | < 2 U | < 2 U | 2.3 | < 2 U | **27** | < 2 U | 3.2 | **56** | < 2 U | < 2 U |
| | 9/13/2004 | 0.56 J | 2.5 | < 1 U | < 1 UJ | 24 | < 1 U | **23** | < 1 U | 2.3 | **30** | 0.55 J | < 1 U |
| | 10/18/2005 | 1.2 | 2.7 | < 1.0 U | < 1.0 U | 19 | < 1.0 U | **28** | < 1.0 U | 2.3 | **43** | 1.1 | < 2.0 U |
| | 9/25/2006 | 0.57 J | 1.7 | < 1.7 U | < 1.7 U | 14 | < 1.7 U | < 1.7 U | < 1.7 U | 1.4 J | **50** | < 1.7 U | < 3.3 U |
| | 9/24/2007 | 0.45J | 2.2 | 0.21J | < 1 U | 9.5 | < 1 U | **20** | < 1 U | 1.9 | **40** | < 1 U | < 2 U |
| | 9/29/2008 | 0.77 J | 1.8 J | < 2.5 U | < 2.5 U | 5 | < 2.5 U | **27** | < 2.5 U | 2 J | **70** | < 2.5 U | < 5 U |
| | 9/26/2013 | 0.99 J | 1.2 | < 1.0 U | < 1.0 U | 3.1 | < 1.0 U | **30** | < 1.0 U | 0.90 J | **100** | < 1.0 U | < 2.0 U |
| | 10/8/2014 | 1.3 J | 1.4 J | < 5.0 U | < 5.0 U | 20 | < 5.0 U | **36** | < 5.0 U | 1.5 J | **120** | < 5.0 U | < 10 U |
| W-1-S | 9/22/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 8.0 | <1.0 | **30.9** | <1.0 | 1.1 | **11.6** | <1.0 | <1.0 |
| | 9/19/2002 | < 2.0 | 0.97J | < 2.0 | < 2.0 | 6.0 | < 2.0 | **62** | < 2.0 | 1.3 | **16** | < 2.0 | < 2.0 |
| ME-6 | 8/31/1999 | 2.9 | <1.0 | <1.0 | <1.0 | **255** | <1.0 | **213** | <1.0 | <1.0 | **474** | <1.0 | <1.0 |
| | 9/21/2000 | <1.0 | <1.0 | <1.0 | <1.0 | **98.8** | <1.0 | **6.7** | 1.9 | 2.5 | **19.0** | **6.1** | <1.0 |
| | 11/15/2001 | 2.2 | 2.7 | < 2.0 | < 2.0 | 65 | < 2.0 | **8.2** | 0.42J | 1.8 | **23** | **13** | < 2.0 |
| | 9/25/2002 | < 10 | < 10 | < 10 | < 10 | 5.2 | < 10 | < 10 | 6.6J | < 5 | < 10 | < 10 | < 10 |
| | 10/1/2003 | 13 | 7.2 | < 2 U | 0.46 J | 20 | < 2 U | **12** | < 2 U | < 1 U | **31** | **2.9** | < 2 U |
| | 9/15/2004 | 4.1 | 6.3 | 0.26 J | < 1 U | 14 | < 1 U | **5.3** | < 1 U | 0.56 | **9.2** | **2.4** | < 1 U |
| | 10/18/2005 | 2.2 | 7.0 | < 1.0 U | < 1.0 U | 13 | < 1.0 U | **9.8** | < 1.0 U | 0.93 J | **25** | **5.6** | < 2.0 U |
| | 9/27/2006 | 1.4 | 6.3 | < 1.4 U | < 1.4 U | 27 | < 1.4 U | **13** | < 1.4 U | 1.3 J | **32** | **11** | < 2.9 U |
| | 9/20/2007 | 0.61 J | 6.4 | < 1 U | < 1 U | 9.2 | < 1 U | 4.5 | < 1 U | 0.51 J | **12** | **4.5** | < 2 U |
| | 10/22/2008 | 2.7 | 11 | < 1 U | < 1 U | 5.2 | < 1 U | **7.7** | < 1 U | 0.25 J | **9** | 1.7 | < 2 U |
| | 9/27/2013 | 5.9 | 20 | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | **5.1** | < 1.0 U | < 1.0 U | 2.8 | 0.28 J | < 2.0 U |
| ME-1 | 8/31/1999 | 13.5 | 2.4 | <1.0 | <1.0 | 38.2 | <1.0 | **83.6** | <1.0 | 1.5 | **292** | **36** | <1.0 |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-31 | 9/1/1999 | <1.0 | 1.3 | <1.0 | <1.0 | 7.8 | <1.0 | 1.3 | <1.0 | <1.0 | **27.2** | <1.0 | <1.0 |
| | 9/21/2000 | <1.0 | 1.1 | <1.0 | <1.0 | 40.2 | <1.0 | <1.0 | <1.0 | <1.0 | **8.5** | <1.0 | <1.0 |
| | 11/15/2001 | < 4.0 | 3.1J | < 4.0 | < 4.0 | **120** | < 4.0 | < 4.0 | < 4.0 | 1.8J | **11** | **7.4** | < 4.0 |
| | 9/24/2002 | < 6 | 5.9J | < 6 | < 6 | **200** | < 6 | < 6 | < 6 | 3.5 | **10** | **19** | < 6 |
| | 10/1/2003 | < 5 U | 6 | < 5 U | < 5 U | **170** | < 5 U | < 5 U | < 5 U | 3.5 | **28** | **10** | < 5 U |
| | 9/15/2004 | 1.4 J | 4 J | < 5 U | < 5 U | **120** | < 5 U | 2.5 J | < 5 U | 2.7 | **29** | **2.4 J** | < 5 U |
| | 10/18/2005 | 3.4 | 6.2 | 0.42 J | < 2.0 U | **120** | < 2.0 U | < 2.0 U | < 2.0 U | 3.7 | **67** | **3.1** | < 4.0 U |
| | 9/27/2006 | 2.3 J | 5.1 | < 4 U | < 4 U | **110** | < 4 U | < 4 U | < 4 U | 2.9 J | **65** | 1.2 J | < 8 U |
| | 9/20/2007 | 3.7 | 4.8 | < 3.3 U | < 3.3 U | **100** | < 3.3 U | < 3.3 U | < 3.3 U | 2.8 J | **90** | 1.1 J | 6.7 U |
| | 10/23/2008 | 2.9 | 3.2 | < 2.5 U | < 2.5 U | **76** | < 2.5 U | < 2.5 U | < 2.5 U | 3 | **78** | 0.9 J | < 5 U |
| | 9/27/2013 | 9.8 | 2.3 | < 1.0 U | < 1.0 U | 21 | < 1.0 U | 0.43 J | < 1.0 U | 1.2 | **120** | < 1.0 U | < 2.0 U |
| | 10/9/2014 | 3.8 | 2.8 | < 2.0 U | < 2.0 U | 54 | < 2.0 U | 0.48 J | < 2.0 U | 1.6 J | **79** | < 2.0 U | < 4.0 U |
| ME-3 | 8/31/1999 | 42.5 | 6.1 | <1.0 | <1.0 | 5.7 | <1.0 | **57.9** | <1.0 | <1.0 | **47.5** | <1.0 | <1.0 |
| | 9/21/2000 | 6.4 | 3.4 | <1.0 | <1.0 | 2.9 | <1.0 | <1.0 | 1.4 | 2.9 | <1.0 | **2.1** | <1.0 |
| | 11/15/2001 | 1.6 | 5.9 | < 1.0 | < 1.0 | 16 | < 1.0 | 1.3 | 0.34J | 2.7 | 3.8 | **7.3** | < 1.0 |
| | 9/24/2002 | < 2.5 | < 2.5 | < 2.5 | < 2.5 | < 1.2 | < 2.5 | < 2.5 | < 2.5 | < 1.2 | < 2.5 | < 2.5 | < 2.5 |
| | 10/1/2003 | 0.31 J | 24 | < 1 U | 0.6 J | 0.96 | < 1 U | < 1 U | < 1 U | < 0.5 U | 1.5 | < 1 U | < 1 U |
| | 9/15/2004 | 0.53 J | 18 | < 1 U | < 1 U | 2.2 | < 1 U | 0.21 J | < 1 U | < 0.5 U | 1.5 | 1.1 | < 1 U |
| | 10/18/2005 | 1.6 | 15 | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.9 | 1.6 | < 2.0 U |
| | 9/27/2006 | 1.1 | 8.5 | < 1 U | < 1 U | 3.5 | < 1 U | 1.9 | < 1 U | 0.34 J | 2.4 | **2.2** | < 2 U |
| | 9/20/2007 | 2 | 3.8 | < 1 U | < 1 U | 1.2 | < 1 U | **5.2** | < 1 U | < 1 U | 3.6 | 0.82 J | < 2 U |
| | 10/22/2008 | 2.1 | 1.8 | < 1 U | < 1 U | 1.4 | < 1 U | **8.1** | < 1 U | < 1 U | 4.9 | 0.7 J | < 2 U |
| | 9/27/2013 | 1.0 | 0.41 J | < 1.0 U | < 1.0 U | 0.35 J | < 1.0 U | **7.1** | < 1.0 U | < 1.0 U | 4.6 | < 1.0 U | < 2.0 U |
| GM-43 | 8/19/2004 | < 9.1 U | 6.9 J | < 9.1 U | < 9.1 U | **210** | < 9.1 U | **16** | < 9.1 U | 8.7 | **100** | **2.8 J** | < 9.1 U |
| | 9/22/2006 | < 5 UJ | 3.7 J | < 5 UJ | < 5 UJ | **120 J** | < 5 UJ | **21 J** | < 5 UJ | 5.7 J | **98 J** | < 5 UJ | < 10 UJ |
| | 11/17/2009 | 2.5 | 5.7 | 0.74 J | <2.5 U | **150** | <2.5 U | **28 J** | <2.5 U | 6.2 | **180** | 1.0 J | <5.0 U |
| | 9/24/2010 | < 8.0 U | 6.8 J | < 8.0 U | < 8.0 U | **220** | < 8.0 U | **26** | < 8.0 U | 8.1 | **170** | < 8.0 U | < 16 U |
| | 9/30/2011 | < 4.0 U | 4.2 | 1.0 J | < 4.0 U | **130** | < 4.0 U | **22** | < 4.0 U | 5.3 | **180** | 1.0 J | < 8.0 U |
| | 9/6/2012 | < 10 U | < 10 U | < 10 U | < 10 U | **79** | < 10 U | **28** | < 10 U | 4.1 J | **230** | < 10 U | < 20 U |
| | 9/26/2013 | 1.0 | 2.0 | < 1.0 U | < 1.0 U | 32 | < 1.0 U | **22** | < 1.0 U | 3.7 | **170** | 0.21 J | < 2.0 U |
| | 10/8/2014 | 1.8 J | < 5.7 U | < 5.7 U | < 5.7 U | 25 | < 5.7 U | **35** | < 5.7 U | 1.5 J | **220** | < 5.7 U | < 11 U |
| GM-44 | 8/19/2004 | 4 J | 3.3 J | < 6 U | < 6 U | **130** | < 6 U | **57** | < 6 U | 4.4 | **140** | < 6 U | < 6 U |
| | 4/9/2010 | 1.8 J | 2.5 J | 0.70 J | < 3.3 U | 48 | < 3.3 U | **70** | < 3.3 U | 4.4 | **110** | < 3.3 U | < 6.7 U |
| | 10/8/2014 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | 16 | < 6.7 U | **100** | < 6.7 U | < 6.7 U | **180** | < 6.7 U | < 13 U |
| GM-45 | 9/22/2006 | 3.5 J | 3.1 J | < 8 UJ | < 8 UJ | 54 J | < 8 UJ | **230 J** | < 8 UJ | 2.7 J | **230 J** | < 8 UJ | < 16 UJ |
| | 4/9/2010 | 2.7 J | 2.5 J | < 5.7 U | < 5.7 U | 36 | < 5.7 U | **200** | < 5.7 U | 3.3 J | **180** | < 5.7 U | < 11 U |
| | 10/8/2014 | 3.2 J | 2.2 J | < 4.0 U | < 4.0 U | 37 | < 4.0 U | **150** | < 4.0 U | 2.0 J | **140** | < 4.0 U | < 8.0 U |
| HR-16 | 9/23/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 2.7 | <1.0 | <1.0 |
| | 9/18/2002 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0.46J | < 1.0 | < 1.0 | < 1.0 | < 0.50 | 1.5 | < 1.0 | < 1.0 |
| | 1/21/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.3 | < 1 U | < 2 U |
| | 9/6/2012 | 0.62 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 0.61 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.14 J | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 2.0 U |
| | 10/7/2014 | 0.58 J | 0.64 J | < 1.0 U | < 1.0 U | 0.44 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.9 | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| HR-17 | 9/23/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 6.2 | <1.0 | **15.5** | <1.0 | <1.0 | **7.4** | <1.0 | <1.0 |
| | 9/28/2000 | 1.9 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 3.7 | <1.0 | <1.0 | 4.4 | <1.0 | <1.0 |
| | 11/8/2001 | 1.4 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 3.3 | < 1.0 | < 0.50 | 4.2B | < 1.0 | < 1.0 |
| | 9/18/2002 | 0.39J | 1.5 | < 1.0 | < 1.0 | 5.1 | < 1.0 | **22** | < 1.0 | 1.4 | **12** | < 1.0 | < 1.0 |
| | 9/25/2003 | < 2 U | 0.75 J | < 2 U | < 2 U | 2.2 | < 2 U | **64** | < 2 U | 0.7 J | **10** | < 2 U | < 2 U |
| | 9/17/2004 | < 5 U | 2 J | < 5 U | < 5 U | 7.1 | < 5 U | **82** | < 5 U | 1.6 J | **18** | < 5 U | < 5 U |
| | 10/19/2005 | < 1.8 U | 0.70 J | < 1.8 U | < 1.8 U | 3.1 | < 1.8 U | **45** | < 1.8 U | 0.57 J | **8.3** | < 1.8 U | < 3.7 U |
| | 9/18/2006 | < 1 U | 0.6 J | < 1 U | < 1 U | 4.6 | < 1 U | **34** | < 1 U | 0.46 J | **5.6** | < 1 U | < 2 U |
| | 9/25/2007 | < 2.5 U | 1.2 J | < 2.5 U | < 2.5 U | 1.9 J | < 2.5 U | **51** | < 2.5 U | 0.69 J | **16** | < 2.5 U | < 5 U |
| | 9/26/2008 | < 4 U | 1.1 J | < 4 U | < 4 U | 2.7 J | < 4 U | **120** | < 4 U | 1 J | **31** | < 4 U | < 8 U |
| | 11/12/2009 | < 2.5 U | 1.7 J | < 2.5 U | < 2.5 U | 1.9 J | < 2.5 U | **85** | < 2.5 U | 1.3 J | **21** | < 2.5 U | < 5.0 U |
| | 9/23/2010 | < 1.7 U | 1.9 | < 1.7 U | < 1.7 U | 2.2 | < 1.7 U | **60** | < 1.7 U | 1.2 J | **18** | < 1.7 U | < 3.3 U |
| | 9/29/2011 | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | **110** | < 5.7 U | < 5.7 U | **57** | < 5.7 U | < 11 U |
| | 9/6/2012 | < 9.1 U | < 9.1 U | < 9.1 U | < 9.1 U | 2.4 J | < 9.1 U | **140** | < 9.1 U | < 9.1 U | **75** | < 9.1 U | < 18 U |
| | 9/25/2013 | 1.3 | 0.93 J | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | **150** | < 1.0 U | 0.92 J | **100** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | < 5.0 U | 2.0 J | < 5.0 U | < 5.0 U | 2.2 J | < 5.0 U | **170** | < 5.0 U | < 5.0 U | **160** | < 5.0 U | < 10 U |
| W-2-S | 9/23/1999 | 1.9J | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **6.1** | <1.0 | <1.0 |
| | 9/27/2000 | 1.6 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 5.0 | <1.0 | <1.0 |
| | 11/8/2001 | 1.7 | 0.58J | < 1.0 | < 1.0 | 0.49J | < 1.0 | < 1.0 | < 1.0 | < 0.50 | **5.2B** | < 1.0 | < 1.0 |
| | 9/18/2002 | 1.5 | 0.98J | < 1.0 | < 1.0 | 0.90 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | 4.9 | < 1.0 | < 1.0 |
| | 9/26/2003 | 1.4 | 0.99 J | < 1 U | < 1 U | 0.74 | < 1 U | < 1 U | 0.25 J | < 0.5 U | **5.5** | < 1 U | < 1 U |
| | 9/17/2004 | 1.5 | 1.3 | < 1 U | < 1 U | 1.1 | < 1 U | 0.55 J | < 1 U | < 0.5 U | **6.0** | < 1 U | < 1 U |
| | 10/19/2005 | 1.6 | 1.2 | < 1.0 U | < 1.0 U | 0.78 J | < 1.0 U | 0.36 J | < 1.0 U | < 1.0 U | **5.4** | < 1.0 U | < 2.0 U |
| | 9/18/2006 | 1.8 | 1.2 | < 1 U | < 1 U | 1.2 | < 1 U | < 1 U | < 1 U | < 1 U | **5.1** | < 1 U | < 2 U |
| | 9/24/2007 | 1.4 | 1.1 | < 1 U | < 1 U | 0.89 J | < 1 U | < 1 U | < 1 U | < 1 U | **5.3** | < 1 U | < 2 U |
| | 9/25/2008 | 1.4 | 0.92 J | < 1 U | < 1 U | 0.78 J | < 1 U | < 1 U | < 1 U | < 1 U | **5.2** | < 1 U | < 2 U |
| | 11/12/2009 | 1.7 | 1.2 | < 1.0 U | 0.43 J | 0.9 J | < 1.0 UJ | 0.35 J | < 1.0 U | < 1.0 U | **6.6** | < 1.0 U | < 2.0 U |
| | 9/24/2010 | 1.4 | 1.1 | < 1.0 U | < 1.0 U | 0.82 J | < 1.0 U | 0.33 J | < 1.0 U | < 1.0 U | **5.9** | < 1.0 U | < 2.0 U |
| | 9/29/2011 | 1.6 | 1.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.44 J | < 1.0 U | < 1.0 U | **7.1** | < 1.0 U | < 2.0 U |
| | 9/6/2012 | 1.6 | 1.1 | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | 0.35 J | < 1.0 U | < 1.0 U | **6.1** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 1.8 | 0.86 J | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | 0.31 J | < 1.0 U | < 1.0 U | **6.4** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | 0.79 J | 0.80 J | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | 0.33 J | < 1.0 U | 0.34 J | **5** | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| W-3-S | 9/23/1999 | 3.9 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1.1 | <1.0 | <1.0 | 2.6 | <1.0 | <1.0 |
| | 9/28/2000 | 2.8 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 2.5 | <1.0 | <1.0 |
| | 11/8/2001 | 1.6 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 0.44J | < 1.0 | < 0.50 | 1.5B | < 1.0 | < 1.0 |
| | 9/18/2002 | 2.1 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 0.61J | < 1.0 | < 0.50 | 2.4 | < 1.0 | < 1.0 |
| | 9/26/2003 | 1.8 | < 1 U | < 1 U | < 1 U | 0.34 J | < 1 U | 0.81 J | < 1 U | < 0.5 U | 2.0 | < 1 U | < 1 U |
| | 9/17/2004 | 2.4 | 0.21 J | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.2 | < 1 U | < 0.5 U | 2.9 | < 1 U | < 1 U |
| | 10/19/2005 | 2.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.0 | < 1.0 U | < 1.0 U | 2.9 | < 1.0 U | < 2.0 U |
| | 9/18/2006 | 2.5 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.6 J | < 1 U | < 1 U | 3.4 | < 1 U | < 2 U |
| | 9/24/2007 | 1.4 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.72 J | < 1 U | < 1 U | 2.0 | < 1 U | < 2 U |
| | 9/26/2008 | 1.2 | 0.21 J | < 1 U | < 1 U | 0.52 J | < 1 U | 1.3 | < 1 U | < 1 U | 2.1 | < 1 U | < 2 U |
| | 11/12/2009 | 1.2 | < 1.0 U | < 1.0 U | < 1.0 U | 0.33 J | < 1.0 UJ | 0.87 J | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | < 2.0 U |
| | 9/23/2010 | 0.87 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.95 J | < 1.0 U | < 1.0 U | 2.3 | < 1.0 U | < 2.0 U |
| | 9/29/2011 | 0.51 J | 0.38 J | < 1.0 U | < 1.0 U | 0.72 J | < 1.0 U | 2.8 | < 1.0 U | 0.19 J | 2.6 | < 1.0 U | < 2.0 U |
| | 9/6/2012 | 0.60 J | 0.89 J | < 1.0 U | < 1.0 U | 1 | < 1.0 U | 4.4 | < 1.0 U | 0.49 J | **5.7** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 0.49 J | 1.2 | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | **25** | < 1.0 U | 0.59 J | **21** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | 0.76 J | 0.96 J | < 1.0 U | < 1.0 U | 2.3 | < 1.0 U | **38** | < 1.0 U | 0.59 J | **35** | < 1.0 U | < 2.0 U |
| W-4-S | 9/23/1999 | 3.3 | 1.2 | <1.0 | <1.0 | 4.4 | <1.0 | **30.5J** | <1.0 | <1.0 | **14.7J** | <1.0 | <1.0 |
| | 9/28/2000 | 3.0 | 1.0 | <1.0 | <1.0 | 4.0 | <1.0 | **15.4** | <1.0 | <1.0 | **11.3** | <1.0 | <1.0 |
| | 11/8/2001 | 2.9 | 1.1 | < 1.0 | < 1.0 | 3.3 | < 1.0 | **13** | < 1.0 | 0.43J | **8.9B** | < 1.0 | < 1.0 |
| | 9/18/2002 | 2.3 | 0.87J | < 1.0 | < 1.0 | 3.6 | < 1.0 | **17** | < 1.0 | 0.60 | **9.8** | < 1.0 | < 1.0 |
| | 9/26/2003 | 2 | 0.92 J | < 1 U | < 1 U | 3.6 | < 1 U | **24** | 0.25 J | 0.78 | **13** | < 1 U | < 1 U |
| | 9/17/2004 | 2.3 | 1.2 | < 1 U | < 1 U | 4.4 | < 1 U | **18** | < 1 U | 0.97 | **13** | < 1 U | < 1 U |
| | 10/19/2005 | 2.4 | 1.4 | < 1.0 U | < 1.0 U | 4.3 | < 1.0 U | **20** | < 1.0 U | 1.1 | **13** | < 1.0 U | < 2.0 U |
| | 9/19/2006 | 1.7 | 1.3 | < 1 U | < 1 U | 4.3 | < 1 U | **18** | < 1 U | 1 | **12** | < 1 U | < 2 U |
| | 9/24/2007 | 1.5 | 1.8 | < 1 U | < 1 U | 5.9 | < 1 U | **26** | < 1 U | 1.3 | **16** | < 1 U | < 2 U |
| | 9/26/2008 | 0.95 J | 1.3 | 0.21 J | < 1 U | 6 | < 1 U | **32** | < 1 U | 1.2 | **16** | < 1 U | < 2 U |
| | 11/12/2009 | 1.3 | 1.6 | < 1.0 U | < 1.0 U | 9.1 | < 1.0 U | **39** | < 1.0 U | 1.5 | **23** | < 1.0 U | < 2.0 U |
| | 9/23/2010 | 1.1 | 1.6 | < 1.0 U | < 1.0 U | 9.1 | < 1.0 U | **31** | < 1.0 U | 1.5 | **20** | < 1.0 U | < 2.0 U |
| | 9/29/2011 | 1.1 | 1.5 | < 1.0 U | < 1.0 U | 8.9 | < 1.0 U | **31** | < 1.0 U | 1.4 | **21** | < 1.0 U | < 2.0 U |
| | 9/6/2012 | 1.0 J | 1.6 J | < 1.7 U | < 1.7 U | 9.4 | < 1.7 U | **26** | < 1.7 U | 1.4 J | **21** | < 1.7 U | < 3.3 U |
| | 9/25/2013 | 1.6 | 1.9 | < 1.0 U | < 1.0 U | 6.3 | < 1.0 U | **60** | < 1.0 U | 1.2 | **50** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | 1.4 J | 1.3 J | < 2.5 U | < 2.5 U | 6.1 | < 2.5 U | **65** | < 2.5 U | 1.1 J | **63** | < 2.5 U | < 5.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-19S | 9/20/1999 | 16.0 | 7.7 | 1.0 | <1.0 | 34.6 | <10 | **46.0** | <1.0 | 2.3 | **71.1** | <1.0 | <10 |
| | 9/22/2000 | 14.5 | 4.4 | <1.0 | <1.0 | 37.6 | <1.0 | **68.0** | <1.0 | 2.6 | **104** | <1.0 | <1.0 |
| | 11/12/2001 | 7.6 | 2.9J | < 3.3 | < 3.3 | 26 | < 3.3 | **64** | < 3.3 | 2.0 | **97** | < 3.3 | < 3.3 |
| | 9/26/2002 | 6.3 | 6.3 | < 4 | < 4 | 39 | < 4 | **52** | < 4 | 2.7 | **110** | **5.2** | < 4 |
| | 9/25/2003 | 13 | 8.3 | 1.6 J | < 5 U | **89** | < 5 U | **62** | < 5 U | 2.9 | **140** | < 5 U | < 5 U |
| | 9/13/2004 | 14 | 8.1 | 1.9 J | < 4 U | 61 | < 4 U | **71** | < 4 U | 2.4 | **120** | < 4 U | < 4 U |
| | 10/18/2005 | 13 | 9.0 | 1.2 J | < 1.7 U | 29 | < 1.7 U | **95** | < 1.7 U | 1.0 J | **140** | 1.8 | < 3.3 U |
| | 9/21/2006 | 9.7 J | 7 J | < 22 U | < 22 U | **660** | < 22 U | **9.1 J** | < 22 U | 10 J | **11 J** | < 22 U | < 44 U |
| | 9/17/2007 | 0.59 J | 10 | < 1 U | < 1 U | 0.3 J | < 1 U | 1.5 | < 1 U | 0.29 J | 0.46 J | < 1 U | < 2 U |
| | 9/23/2008 | < 1 U | 13 | < 1 U | < 1 U | 0.68 J | < 1 U | 0.94 J | < 1 U | 0.52 J | 3 | **9.3** | < 2 U |
| | 11/17/2009 | < 1.0 U | 12 | < 1.0 U | < 1.0 U | 0.27 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.37 J | 0.22 J | < 1.0 U | < 2.0 U |
| | 4/7/2010 | < 1.0 U | 9.6 | < 1.0 U | < 1.0 U | 0.27 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.45 J | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/27/2010 | < 1.0 U | 9.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.46 J | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/29/2011 | < 1.0 U | 10 | < 1.0 U | < 1.0 U | 5.3 | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | **12** | < 2.0 U |
| | 9/6/2012 | < 1.0 U | 8.4 | < 1.0 U | < 1.0 U | 7.3 | < 1.0 U | < 1.0 U | < 1.0 U | 0.84 J | 0.30 J | **10** | < 2.0 U |
| | 9/26/2013 | < 1.0 U | 8.3 | < 1.0 U | < 1.0 U | 26 | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | 0.46 J | **17** | < 2.0 U |
| | 10/7/2014 | < 1.4 U | 7.6 | < 1.4 U | < 1.4 U | 37 | < 1.4 U | < 1.4 U | < 1.4 U | 0.91 J | 0.81 J | **15** | < 2.9 U |
| EAST | 9/21/1999 | 21.0 | 5.4 | <1.0 | <1.0 | 9.1 | <1.0 | **61.0** | <1.0 | <1.0 | **56.1** | <1.0 | <1.0 |
| | 9/22/2000 | 22.2 | 7.7 | 1.2 | <1.0 | **77.3** | <1.0 | **55.8** | <1.0 | 1.8 | **97.2** | **3.0** | <1.0 |
| | 11/12/2001 | 13 | 6.2 | 0.90J | < 3.3 | 51 | < 3.3 | **56** | < 3.3 | 2.7 | **92** | 1.5J | < 3.3 |
| | 9/23/2002 | 10 | 3.9 | 0.73J | < 2 | 8.8 | < 2 | **49** | < 2 | < 1 | **46** | < 2 | < 2 |
| | 9/25/2003 | 7.1 | 2.3 | < 2 U | < 2 U | 4.3 | < 2 U | **47** | < 2 U | < 1 U | **35** | < 2 U | < 2 U |
| | 9/13/2004 | 5.7 | 0.72 J | 0.34 J | < 1 U | 1.6 | < 1 U | **40** | < 1 U | < 0.5 U | **23** | < 1 U | < 1 U |
| | 10/18/2005 | 5.9 | 3.0 | < 1.0 U | < 1.0 U | 3.1 | < 1.0 U | **47** | < 1.0 U | < 1.0 U | **23** | 1.2 | < 2.0 U |
| | 9/21/2006 | 10 | 3.2 | 0.59 J | < 1.4 U | 4.1 | < 1.4 U | **41** | < 1.4 U | < 1.4 U | **29** | < 1.4 U | < 2.9 U |
| WEST | 9/21/1999 | 24.8 | 25.6 | <1.0 | <1.0 | **125** | <1.0 | **41.3** | <1.0 | <1.0 | **37.3** | <1.0 | <1.0 |
| GM-33 | 9/25/2003 | 21 | 8.4 | 1 J | < 2.5 U | 19 | < 2.5 U | **37** | < 2.5 U | 0.72 J | **75** | < 2.5 U | < 2.5 U |
| | 9/13/2004 | 17 | 5.4 | 1.1 J | < 2 U | 9.5 | < 2 U | **37** | < 2 U | 0.45 J | **55** | < 2 U | < 2 U |
| | 10/18/2005 | 18 | 6.4 | 0.69 J | < 1.0 U | 7.4 | < 1.0 U | **50** | < 1.0 U | 0.36 J | **71** | 1.0 | < 2.0 U |
| | 9/21/2006 | 18 | 4.5 | 1.1 J | < 1.7 U | 6.9 | < 1.7 U | **37** | < 1.7 U | 0.44 J | **64** | < 1.7 U | < 3.3 U |
| | 9/24/2007 | 15 | 4.9 | 0.68 J | < 1.7 U | 5.5 | < 1.7 U | **32** | < 1.7 U | 0.34 J | **49** | < 1.7 U | < 3.3 U |
| | 10/23/2008 | 8.4 | 2.9 | 0.58 J | < 1.4 U | 4.1 | < 1.4 U | **38** | < 1.4 U | < 1.4 U | **36** | < 1.4 U | < 2.9 U |
| | 9/26/2013 | 3.4 | 1.1 | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | **28** | < 1.0 U | < 1.0 U | **14** | < 1.0 U | < 2.0 U |
| GM-35 | 9/25/2003 | 17 | 46 | 4 J | < 8 U | **300** | < 8 U | **21** | < 8 U | 12 | **270** | **59** | < 8 U |
| | 9/13/2004 | 17 | 36 | 4.1 J | < 11 U | **270** | < 11 U | **21** | < 11 U | 9.1 | **230** | **50** | < 11 U |
| | 10/18/2005 | 12 | 36 | 1.8 J | < 5.0 U | **190** | < 5.0 U | **29** | < 5.0 U | 9.3 | **240** | **23** | < 10 U |
| | 9/22/2006 | 5.5 J | 26 J | < 5 UJ | < 5 UJ | **160 J** | < 5 UJ | **14 J** | < 5 UJ | 11 J | **130 J** | **13 J** | < 10 UJ |
| | 9/24/2007 | 5.8 J | 26 | < 10 U | < 10 U | **140** | < 10 U | **22** | < 10 U | 8 J | **110** | **12** | < 20 U |
| | 9/29/2008 | 4.6 J | 20 | < 10 U | < 10 U | **92** | < 10 U | **20** | < 10 U | 9.4 J | **88** | **7.9 J** | < 20 U |
| | 11/13/2009 | 4.7 | 17 | 1.0 J | < 3.3 U | **74** | < 3.3 U | **33** | < 3.3 U | 8.2 | **120** | **4.6** | < 6.7 U |
| | 9/27/2010 | 4.8 | 19 | 0.97 J | < 4.0 U | **73** | < 4.0 U | **37** | < 4.0 U | 8.9 | **120** | **4.3** | < 8.0 U |
| | 9/30/2011 | 2.6 J | 20 | 0.64 J | < 3.3 U | 66 | < 3.3 U | **17** | < 3.3 U | 11 | **59** | **7.7** | < 6.7 U |
| | 9/6/2012 | < 20 U | 27 | < 20 U | < 20 U | **84** | < 20 U | < 20 U | < 20 U | 17 J | **9.9 J** | **14 J** | < 40 U |
| | 9/26/2013 | < 50 U | 30 J | < 50 U | < 50 U | 69 | < 50 U | < 50 U | < 50 U | 18 J | **18 J** | **11 J** | < 100 U |
| | 10/8/2014 | < 25 U | 22 J | < 25 U | < 25 U | 57 | < 25 U | 6.0 J | < 25 U | 14 J | **28** | **< 25 U** | < 50 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-32 | 9/22/1999 | <1.0 | 3.3 | <1.0 | <1.0 | 2.6 | <1.0 | 1.2 | 1.0 | 4.2 | 3.2 | **3.0** | <1.0 |
| | 9/25/2000 | <1.0 | 35.9 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 10.4 | 20.3 | <1.0 | <1.0 | <1.0 |
| | 11/12/2001 | < 5.0 | 6.2 | < 5.0 | 4.3J | < 2.5 | 0.79J | < 5.0 | 12 | 2.9 | < 5.0 | 1.1J | 3.0J |
| | 9/20/2002 | < 10 | 9.7J | < 10 | < 10 | < 5 | < 10 | < 10 | < 10 | < 5 | < 10 | < 10 | < 10 |
| | 10/1/2003 | < 2 U | 5.5 | < 2 U | 1.5 J | < 1 U | < 2 U | < 2 U | < 2 U | 1 | < 2 U | < 2 U | < 2 U |
| | 9/14/2004 | < 10 U | 3 J | < 10 U | < 10 U | < 5 U | < 10 U | < 10 U | < 10 U | < 5 U | < 10 U | < 10 U | < 10 U |
| | 10/19/2005 | < 10 U | 4.9 J | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 20 U |
| | 9/19/2006 | < 10 U | 3.7 J | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 20 U |
| | 9/18/2007 | < 5 U | 4.3 J | < 5 U | 1.6 J | < 5 U | < 5 U | < 5 U | < 5 U | 1 J | < 5 U | < 5 U | 3.4 J |
| | 9/23/2008 | < 10 U | 4 J | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 20 U |
| GM-22 | 9/1/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 3.6 | <1.0 | <1.0 | 4.0 | <1.0 | <1.0 |
| | 9/21/2000 | <1.0 | 2.4 | <1.0 | <1.0 | 1.9 | <1.0 | 1.6 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 11/13/2001 | 4.4 | 6.8 | 0.58J | < 1.0 | 8.5 | < 1.0 | 4.9 | < 1.0 | 0.17J | **7.5** | 0.60J | < 1.0 |
| | 9/25/2002 | 0.93J | < 2 | < 2 | < 2 | < 1 | < 2 | 2.3 | < 2 | < 1 | **7.6** | < 2 | < 2 |
| | 9/24/2003 | 1.2 | 1 | < 1 U | < 1 U | 0.45 J | < 1 U | 2.9 | < 1 U | < 0.5 U | **7.6** | < 1 U | < 1 U |
| | 9/14/2004 | 1.7 | 2.1 | < 1 U | < 1 U | 0.9 | < 1 U | 2.9 | < 1 U | < 0.5 U | **10** | < 1 U | < 1 U |
| | 10/17/2005 | 0.96 J | 1.0 | < 1.0 U | < 1.0 U | 0.36 J | < 1.0 U | 3.6 | < 1.0 U | < 1.0 U | 4.7 | < 1.0 U | < 2.0 U |
| | 9/20/2006 | 0.47 J | 1.1 | < 1 U | < 1 U | 0.28 J | < 1 U | 3.2 | < 1 U | < 1 U | 3 | < 1 U | < 2 U |
| | 9/26/2007 | 0.66 J | 0.72 J | < 1 U | < 1 U | 0.24 J | < 1 U | 3.3 | < 1 U | < 1 U | 3.3 | < 1 U | < 2 U |
| | 10/3/2008 | 0.73 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **5.7** | < 1 U | < 1 U | **5.7** | < 1 U | < 2 U |
| | 9/26/2013 | 0.65 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.3 | < 1.0 U | < 1.0 U | 3.9 | < 1.0 U | < 2.0 U |
| GM-21 | 9/22/1999 | 53.1 | 9.0 | 3.9 | <1.0 | 66.4 | <1.0 | <1.0 | <1.0 | 7.8 | **28.7** | <1.0 | <1.0 |
| | 9/22/2000 | 15.7 | 5.6 | 1.6 | <1.0 | 38.7 | <1.0 | <1.0 | <1.0 | 12.9 | **189** | <1.0 | <1.0 |
| | 11/13/2001 | 6.9 | 3.8J | < 5.0 | < 5.0 | 39 | < 5.0 | < 5.0 | < 5.0 | 15 | **160** | < 5.0 | < 5.0 |
| | 9/25/2002 | 31 | 5J | 2.6J | < 6.7 | 43 | < 6.7 | < 6.7 | < 6.7 | 5.1 | **230** | < 6.7 | < 6.7 |
| | 9/24/2003 | 31 | 6.9 J | 2 J | < 8 U | **100** | < 8 U | < 8 U | < 8 U | 2.9 J | **200** | < 8 U | < 8 U |
| | 9/14/2004 | 26 | 4.2 J | 3.1 J | < 9.1 U | 56 | < 9.1 U | < 9.1 U | < 9.1 U | 7.9 | **180** | < 9.1 U | < 9.1 U |
| | 10/17/2005 | 4.3 | 3.4 | < 1.0 U | < 1.0 U | 20 | < 1.0 U | < 1.0 U | < 1.0 U | 22 | 1.8 | **13** | < 2.0 U |
| | 9/20/2006 | 12 | 8.6 | 0.19 J | < 1 U | 14 | < 1 U | < 1 U | < 1 U | 4.3 | **5.9** | **9.3** | < 2 U |
| | 9/26/2007 | 8.5 | 18 | <1.4 U | <1.4 U | 26 | <1.4 U | <1.4 U | <1.4 U | 2.5 | 2.8 | **12** | < 2.9 U |
| | 10/3/2008 | 8.7 | 15 | 0.33 J | < 1.4 U | 38 | < 1.4 U | 0.56 J | < 1.4 U | 4.7 | **18** | **19** | < 2.9 U |
| | 11/16/2009 | 2.4 | 22 | < 1.0 U | < 1.0 U | 7.8 | < 1.0 U | < 1.0 U | < 1.0 U | 4.4 | 2.4 | **6.6** | < 2.0 U |
| | 9/28/2010 | 0.75 J | 20 | < 1.0 U | < 1.0 U | 3.9 | < 1.0 U | < 1.0 U | < 1.0 U | 3 | 3.2 | **3.6** | < 2.0 U |
| | 9/29/2011 | 1.0 | 16 | < 1.0 U | < 1.0 U | 9.9 | < 1.0 U | < 1.0 U | < 1.0 U | 1.9 | **19** | **6.2** | < 2.0 U |
| | 9/7/2012 | < 2.0 U | 18 | < 2.0 U | < 2.0 U | 8.5 | < 2.0 U | < 2.0 U | < 2.0 U | 1.7 J | **14** | **5.1** | < 4.0 U |
| | 9/26/2013 | < 1.0 U | 9.5 | < 1.0 U | < 1.0 U | 5.1 | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | **12** | **3.8** | < 2.0 U |
| | 10/9/2014 | < 1.0 U | 16 | < 1.0 U | < 1.0 U | 12 | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | **18** | **5.8** | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-8 | 9/20/1999 | 1.9 | 30.2 | <1.0 | 3.4 | 26.2 | 20.7 | **14.8** | <1.0 | 12.0 | **30.4** | **8.4** | 2.3 |
| | 9/26/2000 | <1.0 | 36.5 | <1.0 | 1.1 | 1.5 | 12.5 | <1.0 | <1.0 | 5.4 | **6.6** | **2.4** | 1.9 |
| | 11/9/2001 | 0.40J | 40 | < 1.0 | 0.78J | 2.0 | 0.40J | < 1.0 | < 1.0 | 3.6 | 4.4 | 1.9 | 0.39J |
| | 9/20/2002 | < 2 | 63 | < 2 | **5.5** | 5.5 | 7.5 | < 2 | 1.8J | 9 | < 2 | **5.8** | 1.5J |
| | 10/1/2003 | < 2 U | 48 | < 2 U | **5.4** | < 1 U | 11 | < 2 U | < 2 U | 4.4 | < 2 U | < 2 U | < 2 U |
| | 9/14/2004 | < 1 U | 15 | < 1 U | 4.2 | < 0.5 U | 19 | < 1 U | < 1 U | 1.1 | < 1 U | 0.48 J | 1.1 |
| | 10/19/2005 | < 1.0 U | 16 | < 1.0 U | 3.5 | 0.24 J | 29 | < 1.0 U | 0.39 J | 0.99 J | < 1.0 U | 0.73 J | < 2.0 U |
| | 9/19/2006 | < 5 U | 18 | < 5 U | 2.1 J | 2.1 J | < 5 U | < 5 U | < 5 U | 1 J | < 5 U | **3.2 J** | < 10 U |
| | 9/18/2007 | < 2 U | 9.1 | < 2 U | 2.4 | < 2 U | 1.7 J | < 2 U | < 2 U | 0.9 J | < 2 U | < 2 U | 0.9 J |
| | 9/23/2008 | < 1 U | 1.7 | < 1 U | **6.8** | < 1 U | 8.6 | < 1 U | < 1 U | 0.27 J | < 1 U | 0.48 J | 3.9 |
| | 11/16/2009 | <1.0 U | 2.9 | <1.0 U | 3.9 | <1.0 U | 5.5 | 0.34 J | 0.13 J | 0.22 J | <1.0 U | <1.0 U | 1.3 J |
| | 9/27/2010 | < 1.0 U | 3 | < 1 U | 4.7 | < 1.0 U | 0.33 J | < 1.0 U | 0.18 J | 0.29 J | < 1.0 U | 0.44 J | < 2.0 U |
| | 9/29/2011 | < 1.0 U | 1.9 | < 1.0 U | 3.5 | < 1.0 U | 5.4 | < 1.0 U | < 1.0 U | 0.20 J | < 1.0 U | 0.24 J | 0.99 J |
| | 9/6/2012 | < 1.0 U | 0.66 J | < 1.0 U | 3.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | 0.88 J | < 1.0 U | 1.9 | 0.27 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.21 J | < 1.0 U | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 0.59 J | < 1.0 U | 1.2 | 0.23 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.58 J | < 2.0 U |
| GM-6 | 9/20/1999 | 24.6 | 33.2 | 1.2 | <1.0 | 52.9 | <10 | **81.4** | <1.0 | 2.0 | **78.2** | 1.6 | <10 |
| | 9/26/2000 | 12.1 | 13.0 | <1.0 | <1.0 | 41.0 | <1.0 | **51.5** | <1.0 | 2.2 | **56.6** | **3.7** | <1.0 |
| | 11/9/2001 | 3.9 | 14 | < 2.0 | < 2.0 | 8.2 | < 2.0 | **14** | < 2.0 | 1.8 | **48** | 1.9J | < 2.0 |
| | 9/20/2002 | 1.4J | 60 | < 2 | 2.2 | 43 | < 2 | **14** | < 2 | 8.6 | **33** | **12** | < 2 |
| | 10/2/2003 | 0.19 J | 20 | < 1 U | 1 | 13 | 0.22 J | **11** | < 1 U | 2.5 | **23** | **3.3** | < 1 U |
| | 9/14/2004 | < 1 U | 18 | < 1 U | 1.7 | 10 | < 1 U | 2.6 | < 1 U | 1.9 | **5.7** | **3** | < 1 U |
| | 10/19/2005 | < 1.0 U | 21 | < 1.0 U | 0.49 J | 20 | < 1.0 U | 0.34 J | < 1.0 U | 2.1 | 1.4 | **11** | < 2.0 U |
| | 9/19/2006 | < 1 U | 16 | < 1 U | < 1 U | 18 | < 1 U | < 1 U | < 1 U | 1.6 | 0.35 J | **7.3** | < 2 U |
| | 9/18/2007 | < 1 U | 26 | < 1 U | 0.42 J | 16 | < 1 U | < 1 U | < 1 U | 2.6 | 0.34 J | **6.7** | < 2 U |
| | 9/24/2008 | < 1 U | < 8.4 U | < 1 U | 1.2 | 6.7 | < 1 U | < 1 U | < 1 U | 1.3 | < 1 U | **2.1** | < 2 U |
| | 11/11/2009 | <1.0 U | 6.9 | <1.0 U | 1.3 | 3.4 | <1.0 U | <1.0 U | <1.0 U | 0.68 J | 3.8 | 1.2 | <2.0 U |
| | 9/27/2010 | < 1.0 U | 6.2 | < 1 U | 1.1 | 4.9 | < 1.0 U | 0.38 J | < 1.0 U | 0.89 J | **6.6** | 1.6 | < 2.0 U |
| | 9/29/2011 | < 1.0 U | 4.5 | < 1.0 U | 1.0 | 3.7 | < 1.0 U | < 1.0 U | < 1.0 U | 0.84 J | < 1.0 U | 1.5 | < 2.0 U |
| | 9/6/2012 | < 1.0 U | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | 0.66 J | < 1.0 U | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.26 J | 0.79 J | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 0.36 J | < 1.0 U | < 1.0 U | 0.23 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-53 | 9/14/2006 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-59 | 9/15/2006 | < 14 U | < 14 U | < 14 U | < 14 U | 4 J | < 14 U | **310** | < 14 U | < 14 U | **94** | < 14 U | < 29 U |
| | 10/3/2008 | < 33 U | < 33 U | < 33 U | < 33 U | 41 | < 33 U | **750** | < 33 U | < 33 U | **750** | < 33 U | < 67 U |
| | 11/17/2009 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | 3.3 J | < 6.7 U | **500 J** | < 6.7 U | < 6.7 U | **170** | < 6.7 U | < 13 U |
| | 4/8/2010 | < 8.0 U | < 8.0 U | < 8.0 U | < 8.0 U | 2.9 J | < 8.0 U | **280** | < 8.0 U | < 8.0 U | **69** | < 8.0 U | < 16 U |
| | 9/29/2010 | < 15 U | < 15 U | < 15 U | < 15 U | 5.7 J | < 15 U | **520** | < 15 U | < 15 U | **350** | < 15 U | < 31 U |
| | 9/30/2011 | < 13 U | < 13 U | < 13 U | < 13 U | 6.4 J | < 13 U | **520** | < 13 U | < 13 U | **510** | < 13 U | < 25 U |
| | 9/7/2012 | < 50 U | < 50 U | < 50 U | < 50 U | 16 J | < 50 U | **800** | < 50 U | < 50 U | **710** | < 50 U | < 100 U |
| | 9/27/2013 | 1.0 | < 1.0 U | < 1.0 U | < 1.0 U | 11 | < 1.0 U | **1000** | < 1.0 U | 0.56 J | **1100** | < 1.0 U | < 2.0 U |
| | 10/10/2014 | < 13 U | < 13 U | < 13 U | < 13 U | 6.7 J | < 13 U | **420** | < 13 U | < 13 U | **110** | < 13 U | < 27 U |

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**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-60 | 9/15/2006 | < 25 U | < 25 U | < 25 U | < 25 U | **220** | < 25 U | **510** | < 25 U | < 25 U | **570** | < 25 U | < 50 U |
| | 10/3/2008 | < 25 U | < 25 U | < 25 U | < 25 U | **360** | < 25 U | **900** | < 25 U | < 25 U | **920** | < 25 U | < 50 U |
| | 11/17/2009 | < 20 U | < 20 U | < 20 U | < 20 U | **160** | < 20 U | **1100 J** | < 20 U | < 20 U | **1400** | < 20 U | < 40 U |
| | 4/8/2010 | < 22 U | < 22 U | < 22 U | < 22 U | 17 J | < 22 U | **820** | < 22 U | < 22 U | **740** | < 22 U | < 44 U |
| | 9/29/2010 | < 40 U | < 40 U | < 40 U | < 40 U | **940** | < 40 U | **970** | < 40 U | 10 J | **1300** | **18 J** | < 80 U |
| | 9/30/2011 | < 20 U | < 20 U | < 20 U | < 20 U | **370** | < 20 U | **620** | < 20 U | 3.8 J | **810** | **11 J** | < 40 U |
| | 9/7/2012 | < 59 U | < 59 U | < 59 U | < 59 U | **480** | < 59 U | **610** | < 59 U | < 59 U | **980** | < 59 U | < 120 U |
| | 9/27/2013 | 1.4 | 1.3 | 1.5 | < 1.0 U | **400** | < 1.0 U | **670** | < 1.0 U | 4.2 | **1100** | **2.1** | < 2.0 U |
| | 10/9/2014 | < 67 U | < 67 U | < 67 U | < 67 U | **96** | < 67 U | **860** | < 67 U | < 67 U | **1400** | **< 67 U** | < 130 U |
| GM-66 | 5/2/2007 | < 2.9 U | 8.3 | < 2.9 U | < 2.9 U | **84** | < 2.9 U | < 2.9 U | < 2.9 U | 3.3 | **31** | **4.1** | < 5.7 U |
| | 10/8/2014 | < 10 U | 12 | < 10 U | < 10 U | **280** | < 10 U | < 10 U | < 10 U | 11 | **110** | **3.0 J** | < 20 U |
| GM-67S | 5/3/2007 | < 5.7 U | 2.8 J | < 5.7 U | < 5.7 U | 5.2 J | < 5.7 U | 1.1 J | < 5.7 U | < 5.7 U | **140** | < 5.7 U | < 11 U |
| | 10/10/2014 | < 5.0 U | 1.6 J | < 5.0 U | < 5.0 U | 2.3 J | < 5.0 U | 1.1 J | < 5.0 U | < 5.0 U | **140** | < 5.0 U | < 10 U |
| GM-68S | 5/4/2007 | 0.62 J | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | **28** | < 2.5 U | < 2.5 U | **78** | < 2.5 U | < 5 U |
| GM-71 | 5/3/2007 | < 2 U | < 2 U | < 2 U | < 2 U | < 2 U | < 2 U | **62** | < 2 U | < 2 U | **11** | < 2 U | < 4 U |
| | 10/9/2014 | 0.31 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.21 J | < 1.0 U | **19** | < 1.0 U | < 1.0 U | **12** | < 1.0 U | < 2.0 U |
| GM-72 | 5/3/2007 | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | **53** | < 1.7 U | < 1.7 U | 0.66 J | < 1.7 U | < 3.3 U |
| | 10/9/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **2.1** | < 1.0 U | < 1.0 U | < 1.0 UB | < 1.0 U | < 2.0 U |
| GM-74S | 9/27/2007 | < 4 U | < 4 U | < 4 U | < 4 U | < 4 U | < 4 U | **140** | < 4 U | < 4 U | **83** | < 4 U | < 8 U |
| | 4/9/2010 | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | **200** | < 5.7 U | < 5.7 U | **44** | < 5.7 U | < 11 U |
| GM-75S | 9/26/2007 | < 14 U | < 14 U | < 14 U | < 14 U | < 14 U | < 14 U | **490** | < 14 U | < 14 U | **210** | < 14 U | < 29 U |
| | 10/6/2008 | < 20 U | < 20 U | < 20 U | < 20 U | < 20 U | < 20 U | **690** | < 20 U | < 20 U | **250** | < 20 U | < 40 U |
| | 11/16/2009 | < 10 U | < 10 U | < 10 U | < 10 U | 4.9 J | < 10 U | **640** | < 10 U | < 10 U | **260** | < 10 U | < 20 U |
| | 9/29/2010 | < 29 U | < 29 U | < 29 U | < 29 U | 14 J | < 29 U | **650** | < 29 U | < 29 U | **890** | < 29 U | < 57 U |
| | 9/30/2011 | < 17 U | < 17 U | < 17 U | < 17 U | 4.4 J | < 17 U | **430** | < 17 U | < 17 U | **720** | < 17 U | < 33 U |
| | 9/7/2012 | < 29 U | < 29 U | < 29 U | < 29 U | < 29 U | < 29 U | **420** | < 29 U | < 29 U | **250** | < 29 U | < 57 U |
| | 9/27/2013 | 1.8 | 0.53 J | < 1.0 U | < 1.0 U | 4.5 | < 1.0 U | **480** | < 1.0 U | 0.29 J | **350** | < 1.0 U | < 2.0 U |
| | 10/9/2014 | < 20 U | < 20 U | < 20 U | < 20 U | < 20 U | < 20 U | **460** | < 20 U | < 20 U | **170** | < 20 U | < 40 U |
| GM-76S | 9/23/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.2 | < 1 U | < 1 U | 1.6 | < 1 U | < 2 U |
| | 10/9/2014 | < 1.0 U | < 1.0 U | < 1.0 U | 0.39 J | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 2.0 U |
| GM-83S | 2/26/2008 | < 1 U | < 1 U | < 1 U | < 1 U | 2.9 | < 1 U | < 1 U | 0.18 J | 0.3 J | < 1 U | < 1 U | < 2 U |
| | 9/7/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | 0.45 J | < 1.0 U | 0.19 J | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| **Downgradient of the Site** | | | | | | | | | | | | | |
| TW-2 | 9/26/2000 | 4.5 | 27.8 | <1.0 | <1.0 | 22.5 | 10.4 | 5.0 | <1.0 | 2.9 | **43.1** | **5.9** | 3.2 |
| | 11/9/2001 | 3.9 | 20 | < 2.0 | < 2.0 | 8.8 | 0.38J | **8.5** | < 2.0 | 2.4 | **48** | **2.7** | < 2.0 |
| | 9/20/2002 | 2.2 | 9 | < 2 | < 2 | 26 | < 2 | **5.9** | < 2 | 1.4 | **70** | **2.5** | < 2 |
| | 10/2/2003 | 0.66 J | 5.7 | < 1 U | 1.5 | 8.3 | 0.86 J | 4.7 | < 1 U | 0.59 | **24** | 1.4 | < 1 U |
| | 9/14/2004 | < 1 U | 22 | < 1 U | 2.9 | 5.5 | < 1 U | < 1 U | < 1 U | 2 | 1.5 | **2.5** | < 1 U |
| | 10/20/2005 | < 1.0 U | 12 | < 1.0 U | 2.5 | 5.3 | 12 | < 1.0 U | 3.4 | 1.4 | < 1.0 U | **4.4** | 5.0 |
| | 9/19/2006 | 0.55 J | 3.4 | < 1 U | < 1 U | 11 | < 1 U | **7** | < 1 U | 0.38 J | **32** | 0.27 J | < 2 U |
| | 9/18/2007 | < 1 U | 1.7 | < 1 U | 0.81 J | 7.9 | < 1 U | 1.9 | < 1 U | 0.25 J | **24** | 0.97 J | < 2 U |
| | 9/24/2008 | < 1 U | < 1.9 U | < 1 U | 1.4 | < 5.2 U | 0.76 J | 1.4 | < 1 U | 0.36 J | **7.5** | 1 | < 2 U |
| | 11/11/2009 | < 2.5 U | 1.1 J | < 2.5 U | < 2.5 U | 1.6 J | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | 1.1 J | < 2.5 U | < 5.0 U |
| | 9/28/2010 | < 1.0 U | 2 | < 1.0 U | 1.2 | 2.1 | < 1.0 U | 0.52 J | < 1.0 U | 0.30 J | 1.6 | 0.71 J | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 1.8 | < 1.0 U | 1.2 | 5.7 | 0.45 J | 1.2 | < 1.0 U | 0.25 J | **5.9** | 1.1 | < 2.0 U |
| | 9/6/2012 | < 1.0 U | 1.3 | < 1.0 U | 0.51 J | 3.6 | < 1.0 U | < 1.0 U | 0.18 J | 0.23 J | 0.26 J | 0.56 J | < 2.0 U |
| | 9/25/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/9/2014 | < 1.0 U | 0.48 J | < 1.0 U | < 1.0 U | 0.56 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 UB | 0.64 J | < 2.0 U |
| 4S | 9/20/1999 | <1.0 | 1.6 | <1.0 | 1.6 | <1.0 | <10 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <10 |
| | 10/2/2003 | < 2 U | 7 | < 2 U | 1.6 J | < 1 U | 1.7 J | < 2 U | < 2 U | 1.7 | < 2 U | < 2 U | < 2 U |
| | 9/14/2004 | < 5 U | 7.5 | < 5 U | 4.5 J | < 2.5 U | 4.7 J | < 5 U | 1.1 J | < 2.5 U | < 5 U | < 5 U | 2.4 J |
| | 10/19/2005 | < 4.0 U | 2.3 J | < 4.0 U | 1.6 J | < 4.0 U | 1.6 J | < 4.0 U | < 4.0 U | 0.95 J | < 4.0 U | < 4.0 U | < 8.0 U |
| | 9/20/2006 | < 1 U | 5.6 | < 1 U | 0.7 J | 0.25 J | 0.52 J | < 1 U | < 1 U | 0.75 J | < 1 U | < 1 U | < 2 U |
| GM-2 | 9/20/1999 | 5.5 | 1.4 | <1.0 | <1.0 | 8.4 | <10 | **6.0** | <1.0 | <1.0 | **61.6** | <1.0 | <10 |
| | 9/25/2000 | 5.7 | 3.7 | <1.0 | <1.0 | 39.2 | <1.0 | **7.7** | <1.0 | 1.3 | **82.8** | 1.7 | <1.0 |
| | 11/9/2001 | 6.1 | 6.1 | < 3.3 | < 3.3 | 26 | < 3.3 | **8.4** | < 3.3 | 1.1J | **65** | < 3.3 | < 3.3 |
| | 9/20/2002 | 0.75J | 3.4 | < 1 | < 1 | 7.6 | < 1 | **8.7** | < 1 | 0.37J | **26** | < 1 | < 1 |
| | 10/2/2003 | 0.21 J | 1.7 | < 1 U | < 1 U | 4.7 | 0.21 J | **5.7** | < 1 U | < 0.5 U | **13** | 0.46 J | < 1 U |
| | 9/14/2004 | < 1 U | 1.6 | < 1 U | < 1 U | 5.6 | < 1 U | 4 | < 1 U | 0.23 J | **6.2** | < 1 U | < 1 U |
| | 10/19/2005 | < 1.0 U | 2.0 | < 1.0 U | < 1.0 U | 6.8 | < 1.0 U | 3.6 | < 1.0 U | 0.26 J | 4.6 | 0.24 J | < 2.0 U |
| | 9/20/2006 | < 1 U | 2.1 | < 1 U | < 1 U | 7.7 | < 1 U | 2.6 | < 1 U | 0.34 J | **5.1** | 0.61 J | < 2 U |
| | 9/18/2007 | < 1 U | 1.4 | < 1 U | < 1 U | 4.9 | < 1 U | 1.6 | < 1 U | 0.28 J | 2.3 | 1.1 | < 2 U |
| | 9/24/2008 | < 1 U | < 1.1 U | < 1 U | < 1 U | 6.7 | < 1 U | 1.3 | < 1 U | 0.19 J | 2.4 | < 1 U | < 2 U |
| | 11/11/2009 | <1.0 U | 1 | <1.0 U | <1.0 U | 3.2 | <1.0 U | 0.90 J | <1.0 U | <1.0 U | 1.4 | **2.3** | <2.0 U |
| | 9/27/2010 | < 1.0 U | 1.2 | < 1 U | < 1.0 U | 3.8 | < 1.0 U | 0.44 J | < 1.0 U | < 1.0 U | 0.95 J | **2.5** | < 2.0 U |
| | 9/29/2011 | < 1.0 U | 0.92 J | < 1.0 U | < 1.0 U | 9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.75 J | 0.69 J | < 2.0 U |
| | 9/6/2012 | < 1.0 U | 0.71 J | < 1.0 U | < 1.0 U | 15.0 | < 1.0 U | < 1.0 U | 0.46 J | < 1.0 U | 0.96 J | 1.2 | < 2.0 U |
| | 9/25/2013 | < 1.0 U | 1.0 | < 1.0 U | < 1.0 U | 13 | < 1.0 U | 0.31 J | < 1.0 U | 0.26 J | 0.70 J | 1.3 | < 2.0 U |
| | 10/7/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.9 | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-16 | 9/21/1999 | 2.2 | <1.0 | <1.0 | <1.0 | 1.7 | <1.0 | **44.1** | <1.0 | <1.0 | **8.5** | <1.0 | <1.0 |
| | 9/26/2000 | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **16.2** | <1.0 | <1.0 | 3.5 | <1.0 | <1.0 |
| | 11/8/2001 | 2.2 | 0.31J | < 1.0 | < 1.0 | 0.39J | < 1.0 | **17** | < 1.0 | < 0.50 | 3.6 | < 1.0 | < 1.0 |
| | 9/24/2002 | 1.4J | 4.1 | < 2 | < 2 | 6.2 | < 2 | **63** | < 2 | 1.6 | **28** | < 2 | < 2 |
| | 9/22/2003 | 1.9 J | 2.8 J | < 4 U | < 4 U | 5.8 | < 4 U | **110** | < 4 U | 1.1 J | **57** | < 4 U | < 4 U |
| | 9/16/2004 | 3.1 J | 4.3 | < 3.3 U | < 3.3 U | 7.4 | < 3.3 U | **130** | < 3.3 U | 1 J | **90** | < 3.3 U | < 3.3 U |
| | 10/19/2005 | 1.7 J | 1.1 J | < 3.3 U | < 3.3 U | 2.8 J | < 3.3 U | **100** | < 3.3 U | 0.90 J | **55** | < 3.3 U | < 6.7 U |
| | 9/18/2006 | 2.1 | 1.1 J | < 1.4 U | < 1.4 U | 3.8 | < 1.4 U | **98** | < 1.4 U | 1 J | **51** | < 1.4 U | < 2.9 U |
| | 9/25/2007 | 1.4 J | 1.5 J | < 4 U | < 4 UJ | 43 | < 4 U | **94** | < 4 U | 1.3 J | **52** | < 4 U | < 8 U |
| | 9/30/2008 | 1.8 J | 3.8 | < 3.3 U | < 3.3 U | 20 | < 3.3 U | **100** | < 3.3 U | 1.1 J | **48** | < 3.3 U | < 6.7 U |
| | 11/16/2009 | 1.4 J | 1.6 J | < 3.3 U | < 3.3 U | 12 | < 3.3 U | **110** | < 3.3 U | 1.5 J | **74** | < 3.3 U | < 6.7 U |
| | 9/23/2010 | 1.1 J | 1.3 J | < 4.0 U | < 4.0 U | 2.2 J | < 4.0 U | **110** | < 4.0 U | 1.2 J | **75** | < 4.0 U | < 8.0 U |
| | 9/29/2011 | < 3.3 U | 5.5 | < 3.3 U | < 3.3 U | 23 | < 3.3 U | **64** | < 3.3 U | 0.77 J | **45** | 1.2 J | < 6.7 U |
| | 9/5/2012 | 0.94 J | 3.8 J | < 4.0 U | < 4.0 U | 12 | < 4.0 U | **66** | < 4.0 U | < 4.0 U | **41** | < 4.0 U | < 8.0 U |
| | 9/25/2013 | 0.36 J | 4.4 | < 1.0 U | < 1.0 U | 12 | < 1.0 U | **51** | < 1.0 U | 0.40 J | **17** | 0.55 J | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 1.4 | < 1.0 U | < 1.0 U | 7.7 | < 1.0 U | **31** | < 1.0 U | 0.26 J | **7.5** | 0.97 J | < 2.0 U |
| GM-17 | 9/21/1999 | 6.4 | 26.4 | <1.0 | <1.0 | 30.0 | <1.0 | <1.0 | <1.0 | 2.6 | **28.7** | 1.4 | <1.0 |
| | 9/27/2000 | 6.7 | 23.9 | <1.0 | <1.0 | 41.6 | <1.0 | **24.6** | <1.0 | 2.5 | **48.4** | <1.0 | <1.0 |
| | 11/8/2001 | 6.8 | 7.3 | < 3.3 | < 3.3 | 16 | < 3.3 | **48** | < 3.3 | 1.8 | **79** | < 3.3 | < 3.3 |
| | 9/19/2002 | 2.3 | 6.0 | < 1.2 | < 1.2 | 13 | < 1.2 | **22** | < 1.2 | 0.67 | **39** | 0.79J | < 1.2 |
| | 9/24/2003 | 1.3 | 1.2 | < 1 U | < 1 U | 2.9 | < 1 U | **12** | < 1 U | < 0.5 U | **24** | < 1 U | < 1 U |
| | 9/15/2004 | 1.1 | 4 | < 1 U | < 1 U | 11 | < 1 U | 3.6 | < 1 U | 0.64 | **22** | 0.49 J | < 1 U |
| | 10/20/2005 | 1.4 | 5.5 | < 1.0 U | < 1.0 U | 9.0 | < 1.0 U | **8.1** | < 1.0 U | 0.57 J | **29** | 2.0 | < 2.0 U |
| | 9/27/2006 | 0.46 J | 3.2 | < 1 U | < 1 U | 9.5 | < 1 U | **11** | < 1 U | 0.49 J | **24** | 0.54 J | < 2 U |
| | 9/18/2007 | 0.31 J | 1.5 | < 1 U | < 1 U | 4 | < 1 U | **7.3** | < 1 U | 0.22 J | **15** | < 1 U | < 2 U |
| | 9/24/2008 | 0.29 J | < 1 U | < 1 U | < 1 U | < 1.9 U | < 1 U | 4.8 | < 1 U | < 1 U | **10** | < 1 U | < 2 U |
| | 9/27/2013 | < 1.0 U | 0.36 J | < 1.0 U | < 1.0 U | 2.6 | < 1.0 U | 2.8 | < 1.0 U | < 1.0 U | 4.7 | < 1.0 U | < 2.0 U |
| GM-18 | 9/22/1999 | 42.6 | 22.6 | 1.3 | <1.0 | 35.3 | <1.0 | 4.9 | <1.0 | 2.2 | **131** | <1.0 | <1.0 |
| | 9/27/2000 | 31.8 | 10.4 | <1.0 | <1.0 | 23.9 | <1.0 | **7.8** | <1.0 | 1.8 | **115** | <1.0 | <1.0 |
| | 11/8/2001 | 23 | 3.3 | 1.3J | < 3.3 | 14 | < 3.3 | **12** | < 3.3 | 1.6J | **93** | < 3.3 | < 3.3 |
| | 9/19/2002 | 18 | 6.0 | < 3.3 | < 3.3 | 15 | < 3.3 | **28** | < 3.3 | 1.6J | **98** | < 3.3 | < 3.3 |
| | 9/22/2003 | 10 | 3.7 | < 2 U | < 2 U | 8.8 | < 2 U | **24** | < 2 U | < 1 U | **77** | 0.75 J | < 2 U |
| | 9/15/2004 | 5.2 | 2.2 | 0.46 J | < 2 U | 5.9 | < 2 U | **20** | < 2 U | < 1 U | **53** | < 2 U | < 2 U |
| | 10/20/2005 | 7.0 | 15 | 0.30 J | < 1.0 U | 14 | < 1.0 U | **21** | < 1.0 U | 1.2 | **70 J** | **3.0** | < 2.0 U |
| | 9/27/2006 | 6.2 | 17 | < 2.9 U | < 2.9 U | 21 | < 2.9 U | **15** | < 2.9 U | 2 J | **72** | **2.5 J** | < 5.7 U |
| | 9/19/2007 | 5.4 | 13 | < 2.5 U | < 2.5 U | 19 | < 2.5 U | **14** | < 2.5 U | 1.2 J | **64** | 1.1 J | < 5 U |
| | 9/24/2008 | 2.3 | < 6.1 U | < 1.4 U | < 1.4 U | 13 | < 1.4 U | **16** | < 1.4 U | 0.79 J | **38** | < 1.4 U | < 2.9 U |
| | 9/25/2013 | 0.22 J | 0.68 J | < 1.0 U | < 1.0 U | 3.7 | < 1.0 U | **17** | < 1.0 U | < 1.0 U | **10** | < 1.0 U | < 2.0 U |
| WSU-22 | 3/1/2006 | 3.1 | 1.7 | < 1.7 U | < 1.7 U | 4.3 | < 1.7 U | **110** | < 1.7 U | 1.2 J | **88** | < 1.7 U | < 3.3 U |
| WSU-23 | 3/1/2006 | 2.5 | 0.97 J | < 1 U | < 1 U | 0.44 J | < 1 U | < 1 U | < 1 U | < 1 U | **7.1** | < 1 U | < 2 U |
| | 11/30/2006 | 2.1 | 0.73 J | 0.2 J | < 1 U | 0.46 J | < 1 U | < 1 U | < 1 U | < 1 U | **6.1** | < 1 U | < 2 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| WSU-24 | 9/23/1999 | 2.4 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1.9 | <1.0 | <1.0 | **17.0** | <1.0 | <1.0 |
| | 9/26/2000 | 2.1 | <1.0 | <1.0 | <1.0 | 2.7 | <1.0 | 1.2. | <1.0 | <1.0 | **16.8** | <1.0 | <1.0 |
| | 11/9/2001 | 2.4 | 0.81J | < 1.0 | < 1.0 | 4.0 | < 1.0 | 1.6 | < 1.0 | < 0.50 | **18** | < 1.0 | < 1.0 |
| | 9/24/2002 | 1.4 | < 1 | < 1 | < 1 | < 0.5 | < 1 | 1.2 | < 1 | < 0.5 | **13** | < 1 | < 1 |
| | 9/22/2003 | 0.67 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 1 | < 1 U | < 0.5 U | **7.9** | < 1 U | < 1 U |
| | 9/16/2004 | 0.58 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.3 | < 1 U | < 0.5 U | **8** | < 1 U | < 1 U |
| | 10/20/2005 | 1.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | **11** | < 1.0 U | < 2.0 U |
| | 9/26/2006 | 0.65 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.81 J | < 1 U | < 1 U | **10** | < 1 U | < 2 U |
| | 9/19/2007 | 0.66 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.89 J | < 1 U | < 1 U | **7.9** | < 1 U | < 2 U |
| | 9/25/2008 | 0.62 J | 0.85 J | < 1 U | < 1 U | 2.4 J | < 1 U | 1.7 | < 1 U | 0.35 J | **12 J** | < 1 U | < 2 U |
| | 9/25/2013 | 0.23 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **13** | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | < 2.0 U |
| | 12/4/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **7.2** | < 1.0 U | < 1.0 U | 2.0 | < 1.0 U | < 2.0 U |
| GM-10 | 9/21/1999 | 1.7 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **14.8** | <1.0 | <1.0 |
| | 9/27/2000 | 2.5 | 1.4 | <1.0 | <1.0 | 5.7 | <1.0 | 1.4 | <1.0 | <1.0 | **23.2** | <1.0 | <1.0 |
| | 11/8/2001 | 2.7 | 3.4 | < 1.0 | < 1.0 | 16 | < 1.0 | 1.9 | < 1.0 | 0.93 | **27** | 1.2 | < 1.0 |
| | 9/18/2002 | 1.8 | 0.61J | < 1.0 | < 1.0 | 2.3 | < 1.0 | 1.1 | < 1.0 | < 0.50 | **19** | < 1.0 | < 1.0 |
| | 9/24/2003 | 0.96 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 2.2 | < 1 U | < 0.5 U | **33** | < 1 U | < 1 U |
| | 9/14/2004 | 1.2 | < 1 U | < 1 U | < 1 U | 0.38 J | < 1 U | 1.5 | < 1 U | < 0.5 U | **15** | < 1 U | < 1 U |
| | 10/20/2005 | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | **12** | < 1.0 U | < 2.0 U |
| | 9/27/2006 | 0.9 J | 0.29 J | < 1 U | < 1 U | 0.77 J | < 1 U | 0.98 J | < 1 U | < 1 U | **11** | < 1 U | < 2 U |
| | 9/19/2007 | 0.75 J | < 1 U | < 1 U | < 1 U | 0.35 J | < 1 U | 0.93 J | < 1 U | < 1 U | **8.8** | < 1 U | < 2 U |
| | 9/24/2008 | 0.53 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.85 J | < 1 U | < 1 U | **5.9** | < 1 U | < 2 U |
| | 9/25/2013 | 0.20 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | 3.1 | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1 | < 1.0 U | < 1.0 U | 3.1 | < 1.0 U | < 2.0 U |
| GM-25 | 9/22/1999 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| | 10/21/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-26 | 9/22/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 9/27/2000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 11/12/2001 | 0.19J | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 1.1 | < 1.0 | < 0.50 | < 1.0 | < 1.0 | < 1.0 |
| | 9/25/2002 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | 0.92J | < 1 | < 0.5 | < 1 | < 1 | < 1 |
| | 10/1/2003 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 0.85 J | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 9/16/2004 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.3 | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 10/20/2005 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.0 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/21/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.91 J | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/27/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.2 | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 1/21/2008 | < 1 U | < 1 U | < 1 U | < 1 UJ | < 1 U | < 1 U | 1.2 | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 10/1/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.4 | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 11/12/2009 | < 1.0 U | < 1.0 U | < 1.0 U | 0.51 J | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/22/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/5/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-46 | 3/2/2006 | < 1 U | 2.7 | < 1 U | < 1 U | 6.8 | < 1 U | < 1 U | < 1 U | 0.35 J | **22** | 1.9 | < 2 U |
| | 11/30/2006 | < 1 U | 0.43 J | < 1 U | < 1 U | 5.2 | < 1 U | 0.67 J | < 1 U | < 1 U | 1.5 | 1.5 | < 2 U |
| | 10/9/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.30 J | < 1.0 U | 0.46 J | < 1.0 U | < 1.0 U | < 1.0 UB | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-47 | 3/1/2006 | 2.2 | 1.8 | < 1.0 U | < 1.0 U | 7.2 | < 1.0 U | **78** | 0.28 J | 1.5 | **50** | < 1.0 U | < 2.0 U |
| | 9/19/2006 | 2.2 | 1.7 J | < 2.0 U | < 2.0 U | 9.5 | < 2.0 U | **64** | < 2.0 U | 1.4 J | **44** | < 2.0 U | < 4.0 U |
| | 11/30/2006 | 1.9 J | 1.7 J | < 2.0 U | < 2.0 U | 8.9 | < 2.0 U | **69** | < 2.0 U | 1.4 J | **51** | < 2.0 U | < 4.0 U |
| | 9/25/2007 | 2.2 J | 2.4 J | < 7.1 U | < 7.1 U | **170** | < 7.1 U | **71** | < 7.1 U | 4.6 J | **53** | < 7.1 U | < 14 U |
| | 10/1/2008 | 1.4 J | 2 J | < 5 U | < 5 U | **160** | < 5 U | **86** | < 5 U | 3.9 J | **36** | 1.9 J | < 10 U |
| | 11/13/2009 | 1.0 J | 2.4 J | < 2.5 U | < 2.5 U | 61 | < 2.5 U | **61** | < 2.5 U | 2.8 | **29** | 0.66 J | < 5.0 U |
| | 1/28/2010 | 0.85 J | 2.3 J | < 2.5 U | < 2.5 U | 51 | < 2.5 U | **60** | < 2.5 U | 2.5 | **24** | < 2.5 U | < 5.0 U |
| | 9/23/2010 | 0.77 J | 2.7 | < 1.7 U | < 1.7 U | 42 | < 1.7 U | **60** | < 1.7 U | 2.4 | **22** | 0.39 J | < 3.3 U |
| | 9/29/2011 | < 2.5 U | 2.9 | < 2.5 U | < 2.5 U | 34 | < 2.5 U | **52** | < 2.5 U | 2.3 J | **18** | < 2.5 U | < 5.0 U |
| | 9/6/2012 | < 2.5 U | 3 | < 2.5 U | < 2.5 U | 23 | < 2.5 U | **42** | < 2.5 U | 2.0 J | **13** | < 2.5 U | < 5.0 U |
| | 9/25/2013 | 0.65 J | 3.7 | < 1.0 U | < 1.0 U | 26 | < 1.0 U | **47** | < 1.0 U | 2.4 | **14** | 0.42 J | < 2.0 U |
| | 10/7/2014 | < 1.7 U | 4.5 | < 1.7 U | < 1.7 U | 28 | < 1.7 U | **46** | < 1.7 U | 1.8 | **8.1** | < 1.7 U | < 3.3 U |
| GM-48 | 3/1/2006 | 0.62 J | 0.71 J | < 1 U | < 1 U | 0.7 J | < 1 U | < 1 U | 0.25 J | < 1 U | 2.1 | < 1 U | < 2 U |
| | 11/30/2006 | 0.97 J | 0.72 J | < 1 U | < 1 U | 0.83 J | < 1 U | 0.26 J | < 1 U | 0.19 J | 2.4 | < 1 U | < 2 U |
| GM-49 | 3/1/2006 | 2.4 | 3.4 | < 1 U | < 1 U | 4.7 | < 1 U | 2.5 | 0.25 J | 0.66 J | **8.4** | < 1 U | < 2 U |
| | 11/30/2006 | 1.8 | 2.6 | < 1 U | < 1 U | 3.8 | < 1 U | 3.1 | < 1 U | 0.53 J | **11** | < 1 U | < 2 U |
| GM-50 | 4/28/2006 | 2.4 J | 1.9 J | < 5.0 U | < 5.0 U | 5.2 | < 5.0 U | **180** | < 5.0 U | 1.6 J | **120** | < 5.0 U | < 10 U |
| | 9/19/2006 | 1.4 J | 1.5 J | < 5.6 U | < 5.6 U | 13 | < 5.6 U | **150** | < 5.6 U | 1.7 J | **84** | < 5.6 U | < 11 U |
| | 11/30/2006 | 1.6 J | 1.5 J | < 5.0 U | < 5.0 U | 34 | < 5.0 U | **140** | < 5.0 U | 1.5 J | **86** | < 5.0 U | < 10 U |
| | 9/25/2007 | 1.4 J | 1.9 J | < 5.9 U | < 5.9 U | **130** | < 5.9 U | **100** | < 5.9 U | 2.5 J | **44** | < 5.9 U | < 12 U |
| | 10/1/2008 | 1.6 J | 1.7 J | < 2.5 U | < 2.5 U | 13 | < 2.5 U | **82** | < 2.5 U | 0.68 J | **54** | < 2.5 U | < 5 U |
| | 11/13/2009 | 1.8 J | 1.3 J | < 5.0 U | < 5.0 U | 11 | < 5.0 U | **110** | < 5.0 U | < 5.0 U | **120** | < 5.0 U | < 10 U |
| | 1/28/2010 | 1.5 J | 1.2 J | < 5.0 U | < 5.0 U | 8.1 | < 5.0 U | **130** | < 5.0 U | < 5.0 U | **120** | < 5.0 U | < 10 U |
| | 9/23/2010 | 1.6 J | < 5.0 U | < 5.0 U | < 5.0 U | 4.0 J | < 5.0 U | **130** | < 5.0 U | 0.95 J | **140** | < 5.0 U | < 10 U |
| | 9/30/2011 | 1.7 J | 2.3 | < 2.0 U | < 2.0 U | 7.1 | < 2.0 U | **95** | < 2.0 U | 0.62 J | **86** | < 2.0 U | < 4.0 U |
| | 9/6/2012 | 2.7 J | < 5.0 U | < 5.0 U | < 5.0 U | 3.4 J | < 5.0 U | **84** | < 5.0 U | < 5.0 U | **63** | < 5.0 U | < 10 U |
| | 9/25/2013 | 2.5 | 3.5 | < 1.0 U | < 1.0 U | 5.7 | < 1.0 U | **73** | < 1.0 U | 0.29 J | **40** | 0.30 J | < 2.0 U |
| | 10/7/2014 | < 1.4 U | 7.1 | < 1.4 U | < 1.4 U | 5.1 | < 1.4 U | **39** | < 1.4 U | < 1.4 U | **5.5** | 1.8 | < 2.9 U |
| GM-51 | 4/28/2006 | 0.9 J | < 1 U | < 1 U | < 1 U | 0.32 J | < 1 U | **6.7** | < 1 U | < 1 U | 4.9 | < 1 U | < 2 U |
| | 11/30/2006 | 0.76 J | < 1 U | < 1 U | < 1 U | 0.26 J | < 1 U | **6.6** | < 1 U | < 1 U | 5 | < 1 U | < 2 U |
| | 9/27/2007 | 0.61 J | 0.23 J | < 1 U | < 1 U | 1 | < 1 U | **7.2** | 0.29 J | < 1 U | 3.9 | < 1 U | < 2 U |
| | 9/30/2008 | 0.6 J | 0.78 J | < 1 U | < 1 U | 2 | < 1 U | **9.3** | < 1 U | 0.7 J | **7.7** | < 1 U | < 2 U |
| | 9/25/2013 | 1.9 | 1.8 | < 1.0 U | < 1.0 U | 2.8 | < 1.0 U | **46** | < 1.0 U | 0.30 J | **64** | < 1.0 U | < 2.0 U |
| | 10/6/2014 | 0.70 J | 1.7 J | < 2.0 U | < 2.0 U | 5 | < 2.0 U | **67** | < 2.0 U | < 2.0 U | **33** | < 2.0 U | < 4.0 U |
| GM-52 | 4/28/2006 | 2 | 0.94 J | < 2 U | < 2 U | 1.9 J | < 2 U | **75** | < 2 U | 0.67 J | **61** | < 2 U | < 4 U |
| | 11/30/2006 | 1.3 J | 0.93 J | < 2 U | < 2 U | 2.7 | < 2 U | **67** | < 2 U | 0.76 J | **47** | < 2 U | < 4 U |
| | 9/26/2007 | 1.3 J | 1.5 J | < 2.5 U | < 2.5 U | 18 | < 2.5 U | **88** | < 2.5 U | 1 J | **47** | < 2.5 U | < 5 U |
| | 9/30/2008 | 1.9 J | 3 | < 2.5 U | < 2.5 U | 14 | < 2.5 U | **88** | < 2.5 U | < 2.5 U | **43** | < 2.5 U | < 5 U |
| | 11/12/2009 | 1.1 J | 1.1 J | < 2.5 U | < 2.5 U | 1.5 J | < 2.5 U | **94** | < 2.5 U | 0.83 J | **43** | < 2.5 U | < 5.0 U |
| | 1/27/2010 | 1.0 J | 1.0 J | < 4.0 U | < 4.0 U | 1.6 J | < 4.0 U | **94** | < 4.0 U | 0.99 J | **42** | < 4.0 U | < 8.0 U |
| | 9/22/2010 | 0.92 J | 0.94 J | < 3.3 U | < 3.3 U | 1.8 J | < 3.3 U | **90** | < 3.3 U | 0.74 J | **50** | < 3.3 U | < 6.7 U |
| | 9/29/2011 | < 4.0 U | 1.9 J | < 4.0 U | < 4.0 U | 4.2 | < 4.0 U | **73** | < 4.0 U | < 4.0 U | **38** | < 4.0 U | < 8.0 U |
| | 9/5/2012 | < 4.0 U | 4.1 | < 4.0 U | < 4.0 U | 7.9 | < 4.0 U | **66** | < 4.0 U | < 4.0 U | **29** | < 4.0 U | < 8.0 U |
| | 9/25/2013 | 0.47 J | 1.2 | < 1.0 U | < 1.0 U | 3.1 | < 1.0 U | **53** | < 1.0 U | < 1.0 U | **18** | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | **44** | < 2.0 U | < 2.0 U | **8.2** | < 2.0 U | < 4.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-55 | 9/14/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **7.4** | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 11/12/2009 | < 1.0 U | < 1.0 U | < 1.0 U | 0.46 J | < 1.0 U | < 1.0 UJ | **7.7** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/22/2010 | < 1.0 U | < 1.0 U | < 1.0 U | 0.23 J | < 1.0 U | < 1.0 U | **7.2** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.1** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/5/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.6 | 0.26 J | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.6 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.3 | 0.34 J | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-57 | 9/14/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.21 J | 1.9 | 0.48 J | < 1 U | < 1 U | < 1 U | < 2 U |
| | 1/21/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.9 | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| GM-62[(1)] | 9/14/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **15** | 0.24 J | < 1 U | < 1 U | < 1 U | < 2 U |
| | 4/8/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **20** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **12** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-63 | 9/14/2006 | 2.3 J | 1.9 J | < 5 U | < 5 U | 5.6 | < 5 U | **160** | < 5 U | 1.4 J | **120** | < 5 U | < 10 U |
| | 12/1/2006 | 2.3 J | 1.9 J | < 4 U | < 4 U | 8.8 | < 4 U | **140** | < 4 U | 1.3 J | **100** | < 4 U | < 8 U |
| | 9/25/2007 | 2.7 J | 1.8 J | < 6.7 U | < 6.7 U | 5 J | < 6.7 U | **130** | < 6.7 U | < 6.7 U | **120** | < 6.7 U | < 13 U |
| | 10/1/2008 | 4 J | 2.2 J | < 5 U | < 5 U | 4.9 J | < 5 U | **140** | < 5 U | < 5 U | **92** | < 5 U | < 10 U |
| | 1/28/2010 | 2.0 J | < 5.7 U | < 5.7 U | < 5.7 U | 3.2 J | < 5.7 U | **150** | < 5.7 U | < 5.7 U | **140** | < 5.7 U | < 11 U |
| | 9/6/2012 | 3.2 J | 1.6 J | < 5.7 U | < 5.7 U | 2.2 J | < 5.7 U | **89** | < 5.7 U | < 5.7 U | **58** | < 5.7 U | < 11 U |
| | 9/25/2013 | 4.4 | 1.6 | < 1.0 U | < 1.0 U | 1.9 | < 1.0 U | **81** | < 1.0 U | 0.33 J | **48** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | 2.8 | 1.9 | < 1.4 U | < 1.4 U | 2.4 | < 1.4 U | **53** | < 1.4 U | < 1.4 U | **20** | < 1.4 U | < 2.9 U |
| GM-64 | 9/14/2006 | 1.8 J | 1.8 J | < 2.5 U | < 2.5 U | 16 | < 2.5 U | **77** | < 2.5 U | 1.6 J | **34** | < 2.5 U | < 5 U |
| | 12/1/2006 | 2.1 J | 2.1 J | < 2.5 U | < 2.5 U | 42 | < 2.5 U | **85** | < 2.5 U | 2 J | **35** | < 2.5 U | < 5 U |
| | 9/25/2007 | < 3.3 U | 2.7 J | < 3.3 U | < 3.3 U | **74** | < 3.3 U | **11** | < 3.3 U | 6.6 | 4.5 | **18** | < 6.7 U |
| | 10/1/2008 | 0.55 J | 2.7 | < 1 U | < 1 U | 15 | < 1 U | **31** | < 1 U | 2.3 | **14** | **2.3** | < 2 U |
| | 9/26/2013 | 0.71 J | 4.2 | < 1.0 U | < 1.0 U | 44 | < 1.0 U | **41** | < 1.0 U | 2.8 | **31** | **5.8** | < 2.0 U |
| GM-65S | 5/2/2007 | 0.62 J | 0.78 J | < 1 U | < 1 U | 1.7 | < 1 U | **11** | < 1 U | < 1 U | **8** | < 1 U | < 2 U |
| | 1/21/2008 | 0.58 J | 0.54 J | < 1 U | < 1 U | 1.5 | < 1 U | **13** | < 1 U | < 1 U | **7.9** | < 1 U | < 2 U |
| | 10/6/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **8.7** | < 1 U | < 1 U | 3.8 | < 1 U | < 2 U |
| | 11/12/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 UJ | **11** | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | < 2.0 U |
| | 1/27/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.22 J | < 1.0 U | **13** | < 1.0 U | < 1.0 U | 2.8 | < 1.0 U | < 2.0 U |
| | 9/22/2010 | < 1.0 U | 0.34 J | < 1.0 U | < 1.0 U | 0.63 J | < 1.0 U | **9.9** | < 1.0 U | < 1.0 U | 2.3 | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 0.16 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **7.8** | < 1.0 U | < 1.0 U | 2.3 | < 1.0 U | < 2.0 U |
| | 9/5/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.5** | < 1.0 U | < 1.0 U | 2 | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **5.6** | < 1.0 U | < 1.0 U | 0.82 J | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **5.4** | < 1.0 U | < 1.0 U | 0.24 J | < 1.0 U | < 2.0 U |

**Table C-1**
**Annual Groundwater Analytical Results for the Upper Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes (total) |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-77S | 9/27/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 10/21/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-78 | 10/23/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **8.9** | 0.23 J | < 1 U | < 1 U | < 1 U | < 2 U |
| | 1/21/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **11** | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 10/2/2008 | < 1 U | < 1 U | < 1 U | < 1 UJ | < 1 U | < 1 U | **11** | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 11/12/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 UJ | **12** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **11** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/29/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.3 | 0.18 J | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/5/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **9.5** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **11** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/6/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **9.5** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| GM-79 | 10/23/2007 | 0.66 J | 0.24 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.6 | < 1 U | < 2 U |
| | 10/2/2008 | 0.65 J | < 1 U | < 1 U | < 1 UJ | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.8 | < 1 U | < 2 U |
| | 11/12/2009 | 0.72 J | 0.31 J | < 1.0 U | 0.48 J | 0.28 J | < 1.0 UJ | < 1.0 U | < 1.0 U | < 1.0 U | 2.1 | < 1.0 U | < 2.0 U |
| | 9/22/2010 | 0.51 J | 0.23 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 0.22 J | < 1.0 U | < 1.0 U | 0.19 J | < 1.0 U | 0.34 J | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 2.0 U |
| | 9/5/2012 | 0.72 J | 0.94 J | < 1.0 U | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | < 1.0 U | 0.29 J | 2.2 | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 0.88 J | 1.1 | < 1.0 U | < 1.0 U | 1.4 | < 1.0 U | 0.31 J | < 1.0 U | 0.42 J | 3.9 | < 1.0 U | < 2.0 U |
| | 10/6/2014 | 1 | 3.2 | < 1.0 U | < 1.0 U | 8.4 | < 1.0 U | 1 | < 1.0 U | 0.43 J | 23 | < 1.0 U | < 2.0 U |
| GM-80 | 10/23/2007 | < 1 U | 0.38 J | < 1 U | < 1 U | 1.5 | < 1 U | 0.68 J | < 1 U | 0.21 J | 4 | < 1 U | < 2 U |
| | 9/22/2008 | < 1 U | 0.39 J | < 1 U | < 1 U | 3.6 | < 1 U | 0.93 J | < 1 U | 0.19 J | **5.4** | < 1 U | < 2 U |
| | 11/12/2009 | 0.24 J | 0.55 J | < 1.0 U | < 1.0 U | 3.2 | < 1.0 U | 1.6 | < 1.0 U | 0.25 J | **9.8** | < 1.0 U | < 2.0 U |
| | 4/9/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.85 J | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | **6.6** | < 1.0 U | < 2.0 U |
| | 9/21/2010 | < 1.0 U | 0.30 J | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | 2.6 | < 1.0 U | < 1.0 U | **6** | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 0.47 J | < 1.0 U | < 1.0 U | 2.7 | < 1.0 U | 4.1 | < 1.0 U | 0.24 J | **5.9** | < 1.0 U | < 2.0 U |
| | 9/5/2012 | 0.43 J | 1.7 | < 1.0 U | < 1.0 U | 8.3 | < 1.0 U | **5.2** | < 1.0 U | 0.30 J | **13** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.7** | < 1.0 U | < 1.0 U | 4.6 | < 1.0 U | < 2.0 U |
| | 10/6/2014 | 0.50 J | 0.66 J | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | **3.5** | < 1.0 U | < 1.0 U | 12 | < 1.0 U | < 2.0 U |
| GM-81 | 10/23/2007 | 0.22 J | 0.93 J | < 1 U | < 1 U | 0.98 J | < 1 U | < 1 U | < 1 U | < 1 U | 0.61 J | < 1 U | < 2 U |
| | 4/9/2010 | 0.23 J | 0.92 J | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.2 | < 1.0 U | < 2.0 U |

(1) - Well abandoned.
All concentrations presented in micrograms per liter.
VOCs - Volatile Organic Compounds.
1,1,1-TCA - 1,1,1-Trichloroethane.
1,1-DCA - 1,1-Dichloroethane.
1,1-DCE - 1,1-Dichloroethene.
cis-1,2-DCE - cis-1,1-Dichloroethene.
PCE - Tetrachloroethene.
trans-1,2-DCE - trans-1,2-Dichloroethene.
TCE - Trichloroethene.
< - Constituent not detected above laboratory reporting limit shown.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| **Upgradient of the Site** | | | | | | | | | | | | | |
| RMW-88 | 9/26/2012 | < 1.4 U | 17 | < 1.4 U | < 1.4 U | 43 | < 1.4 U | < 1.4 U | 0.21 J | 1.5 | < 1.4 U | 1.1 J | < 2.9 U |
| | 9/27/2013 | < 1.0 U | 35 | < 1.0 U | < 1.0 U | **75** | < 1.0 U | < 1.0 U | < 1.0 U | 4.5 | < 1.0 U | 2.0 | < 2.0 U |
| | 10/8/2014 | < 2.5 U | 32 | < 2.5 U | < 2.5 U | **78** | < 2.5 U | < 2.5 U | < 2.5 U | 4.3 | < 2.5 U | 1.2 J | < 5.0 U |
| HR-12 | 9/14/1999 | <1.0UJ | 2.7 | <1.0 | 1.2 | 1.8 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1.7 | <1.0 |
| | 9/28/2000 | <1.0 | 2.2 | <1.0 | <1.0 | 2.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **2.5** | <1.0 |
| | 11/14/2001 | < 1.0 | 3.6 | < 1.0 | < 1.0 | 2.7 | < 1.0 | < 1.0 | < 1.0 | 0.23 | < 1.0 | **3.8** | < 1.0 |
| | 9/26/2002 | < 1 | 2.4 | < 1 | < 1 | 2.1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | 1.7 | < 1 |
| | 9/18/2003 | < 1 U | 1.7 | < 1 U | < 1 U | 1.4 | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.6 | < 1 U |
| | 9/21/2004 | < 1 U | 1.8 | < 1 U | < 1 U | 1.2 | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.1 | < 1 U |
| | 10/24/2005 | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.36 J | < 2.0 U |
| | 9/26/2006 | < 1 U | 2.1 | < 1 U | < 1 U | 1.3 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/19/2007 | < 1 U | 2.2 | < 1 U | < 1 U | 1.3 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/25/2008 | 0.39 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.3 | < 1 U | < 1 U | **5.1** | < 1 U | < 2 U |
| | 11/13/2009 | < 1.0 U | 2 | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2010 | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 2.8 | < 1.0 U | < 1.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U | 0.24 J | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/7/2012 | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | 1.8 | < 1.0 U | < 1.0 U | 0.24 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/8/2014 | < 1.0 U | 3.4 | < 1.0 U | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 UB | < 1.0 U | < 2.0 U |
| **On-Site** | | | | | | | | | | | | | |
| HR-14 | 9/15/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 7.9 | <1.0 | <1.0 | <1.0 | <1.0 | 3.4 | **11.5** | <1.0 |
| | 9/30/2002 | < 1 | < 1 | < 1 | < 1 | 3.6 | < 1 | < 1 | < 1 | < 0.5 | 1.2 | < 1 | < 1 |
| HR-15 | 9/15/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **11.0** | <1.0 |
| | 9/29/2000 | <1.0 | <1.0 | <1.0 | <1.0 | 2.8 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **11.2** | <1.0 |
| | 11/14/2001 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0.86 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | < 1.0 | < 1.0 |
| | 9/30/2002 | < 1 | < 1UJ | < 1 | < 1 | 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | < 1 | < 1 |
| | 9/17/2003 | < 1 U | < 1 U | < 1 U | < 1 U | 2.2 | < 1 U | < 1 U | < 1 U | < 0.5 U | 0.29 J | **14** | < 1 U |
| | 9/21/2004 | < 1 U | < 1 U | < 1 U | < 1 U | 2.5 | < 1 U | < 1 U | < 1 U | < 0.5 U | 0.38 J | **19** | < 1 U |
| | 10/25/2005 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.40 J | **14** | < 2.0 U |
| | 9/25/2006 | < 1 U | < 1 U | < 1 U | < 1 U | 2.2 | < 1 U | < 1 U | < 1 U | < 1 U | 0.5 J | **13** | < 2 U |
| | 9/26/2007 | < 1 U | < 1 U | < 1 U | < 1 U | 2.5 | < 1 U | < 1 U | < 1 U | < 1 U | 0.37 J | **15** | < 2 U |
| | 9/29/2008 | < 1 U | < 1 U | < 1 U | < 1 U | 3.6 | < 1 U | < 1 U | < 1 U | < 1 U | 0.47 J | **9.7** | < 2 U |
| | 11/13/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.7 J | **6.5** | < 2.0 U |
| | 9/24/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.60 J | **3.8** | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.78 J | **2.4** | < 2.0 U |
| | 9/6/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.87 J | 1.1 | < 2.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.75 J | 1.4 | < 2.0 U |
| | 10/7/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.71 J | 1.9 | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| HR-13 | 9/15/1999 | 1.6 | 41.4 | <1.0 | <1.0 | 20.8 | <1.0 | <1.0 | <1.0 | 3.1 | 3.4 | <1.0 | <1.0 |
| | 9/29/2000 | 1.7 | 39.5 | <1.0 | <1.0 | 14.1 | <1.0 | <1.0 | <1.0 | 2.5 | 2.0 | <1.0 | <1.0 |
| | 11/14/2001 | 0.74J | 15 | < 1.0 | 0.18J | 6.5 | < 1.0 | < 1.0 | < 1.0 | 0.65 | 1.2 | < 1.0 | < 1.0 |
| | 9/30/2002 | 1.4 | 25 | < 1 | < 1 | 11 | < 1 | < 1 | < 1 | 1.4 | 3.6 | < 1 | < 1 |
| | 9/16/2003 | 2.2 | 33 | < 1 U | < 1 U | 12 | < 1 U | < 1 U | < 1 U | 1.8 | **5.7** | < 1 U | < 1 U |
| | 9/21/2004 | 2.6 | 30 | 0.27 J | < 1 U | 12 | < 1 U | < 1 U | < 1 U | 1.5 | **21** | 0.43 J | < 1 U |
| | 10/25/2005 | 2.3 | 25 | 0.25 J | < 1.0 U | 11 | < 1.0 U | 0.20 J | < 1.0 U | 1.5 | **20** | < 1.0 U | < 2.0 U |
| | 9/25/2006 | 2 | 22 | 0.18 J | < 1 U | 9 | < 1 U | 0.2 J | < 1 U | 1.4 | **15** | < 1 U | < 2 U |
| | 9/25/2007 | < 1 U | 1.5 | < 1 U | < 1 U | 1.1 | < 1 U | < 1 U | < 1 U | < 1 U | **5.1** | < 1 U | < 2 U |
| 31 | 9/29/2000 | <1.0 | 7.4 | <1.0 | <1.0 | 8.4 | <1.0 | <1.0 | <1.0 | <1.0 | **12.9** | **4.4** | <1.0 |
| | 11/15/2001 | < 1.0 | 3.1 | < 1.0 | < 1.0 | 2.4 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | **5.1** | **2.5** | < 1.0 |
| 39 | 9/27/2002 | < 1 | 1.6 | < 1 | < 1 | 1.3 | < 1 | < 1 | < 1 | < 0.5 | 3.8 | 0.51J | < 1 |
| | 9/24/2003 | < 1 U | 0.58 J | < 1 U | < 1 U | 0.71 | < 1 U | < 1 U | < 1 U | < 0.5 U | 0.89 J | < 1 U | < 1 U |
| GM-39 | 12/10/2003 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | 0.18 J | < 0.5 U | < 1 U | 1.3 | < 1 U |
| | 9/20/2004 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 1.8 | < 1 U |
| | 10/24/2005 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.77 J | < 2.0 U |
| | 9/27/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.7 | < 2 U |
| | 9/26/2007 | < 1 U | < 1 U | < 1 U | < 1 U | 19 J | < 1 U | < 1 U | < 1 U | 0.23 J | < 1 U | 1.6 | < 2 U |
| | 10/1/2008 | < 1 U | < 1 U | < 1 U | < 1 U | 0.67 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **3.2** | < 2 U |
| | 9/27/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.68 J | < 1.0 U | < 1.0 U | 0.63 J | 1.5 | < 2.0 U |
| GM-40 | 12/10/2003 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | **3.1** | < 1 U |
| | 9/20/2004 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | **3.2** | < 1 U |
| | 10/25/2005 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **2.9** | < 2.0 U |
| | 9/26/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **3.9** | < 2 U |
| | 9/25/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **4** | < 2 U |
| | 9/30/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **3.6** | < 2 U |
| GM-61 | 9/15/2006 | 0.5 J | 2.2 | < 1.7 U | < 1.7 U | 2.6 | < 1.7 U | **20** | 0.44 J | < 1.7 U | **36** | < 1.7 U | < 3.3 U |
| | 9/26/2007 | 0.59 J | 1.6 J | < 1.7 U | < 1.7 U | 3.9 | < 1.7 U | **28** | < 1.7 U | < 1.7 U | **56** | < 1.7 U | < 3.3 U |
| | 10/1/2008 | < 1 U | 0.94 J | 0.19 J | < 1 U | 20 | < 1 U | **13** | < 1 U | 0.92 J | **23** | 0.75 J | < 2 U |
| | 9/26/2013 | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | 17 | < 1.0 U | **7.2** | < 1.0 U | 1.1 | **5.2** | 1.2 | < 2.0 U |
| GM-41 | 12/10/2003 | < 11 U | < 11 U | < 11 U | < 1 U | 10 | < 11 U | < 11 U | < 11 U | < 5.6 U | **320** | < 11 U | < 11 U |
| | 9/21/2004 | < 6.2 U | < 6.2 U | < 6.2 U | < 6.2 U | 24 | < 6.2 U | < 6.2 U | < 6.2 U | < 3.1 U | **180** | < 6.2 U | < 6.2 U |
| | 10/24/2005 | < 10 U | < 10 U | < 10 U | < 10 U | 16 | < 10 U | < 10 U | < 10 U | < 10 U | **250** | < 10 U | < 20 U |
| | 9/18/2006 | < 4 U | < 4 U | < 4 U | < 4 U | 11 | < 4 U | < 4 U | < 4 U | < 4 U | **210** | < 4 U | < 8 U |
| | 5/3/2007 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | 15 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | **170** | **2.4 J** | < 13 U |
| | 9/20/2007 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | 17 | < 6.7 U | < 6.7 U | < 6.7 U | 1.4 J | **230** | 1.9 J | < 13 U |
| | 9/26/2008 | < 7.1 U | < 7.1 U | < 7.1 U | < 7.1 U | 11 | < 7.1 U | < 7.1 U | < 7.1 U | < 7.1 U | **180** | < 7.1 U | < 14 U |
| | 9/27/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 12 | < 1.0 U | < 1.0 U | < 1.0 U | 0.89 J | **79** | 1.9 | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-58 | 9/14/2006 | < 1 U | < 1 U | < 1 U | < 1 U | 0.73 J | < 1 U | 4.4 | 0.4 J | < 1 U | 0.72 J | < 1 U | < 2 U |
| | 11/30/2006 | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | **85** | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 6.7 U |
| | 5/3/2007 | < 2.9 U | < 2.9 U | < 2.9 U | < 2.9 U | < 2.9 U | < 2.9 U | **82** | < 2.9 U | < 2.9 U | < 2.9 U | < 2.9 U | < 5.7 U |
| | 9/20/2007 | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | **69** | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 6.7 U |
| | 9/26/2008 | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | **80** | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | < 5 U |
| | 9/27/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **34** | < 1.0 U | < 1.0 U | 0.41 J | < 1.0 U | < 2.0 U |
| RMW-86 | 9/26/2012 | 12 | 13 | 1.6 J | < 6.7 U | 52 | < 6.7 U | **48** | < 6.7 U | 1.6 J | **190** | < 6.7 U | < 13 U |
| | 9/26/2013 | 15 | 16 | 2.3 | < 1.0 U | **110** | < 1.0 U | **41** | < 1.0 U | 2.9 | **190** | 1.3 | < 2.0 U |
| | 10/8/2014 | 9.4 | 7.6 | < 6.7 U | < 6.7 U | **33** | < 6.7 U | **29** | < 6.7 U | < 6.7 U | **140** | < 6.7 U | < 13 U |
| RMW-87 | 9/26/2012 | < 1.0 U | 15 | < 1.0 U | 0.13 J | 23 | < 1.0 U | < 1.0 U | 0.39 J | 1.3 | **7.5** | 0.93 J | < 2.0 U |
| | 9/26/2013 | < 1.0 U | 18 | < 1.0 U | < 1.0 U | 43 | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | **9.8** | 1.3 | < 2.0 U |
| | 10/9/2014 | < 2.2 U | 13 | < 2.2 U | < 2.2 U | 62 | < 2.2 U | < 2.2 U | < 2.2 U | 2.7 | **10.0** | < 2.2 U | < 4.4 U |
| GM-54 | 9/14/2006 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | **180** | < 6.7 U | < 6.7 U | 3.2 J | < 6.7 U | < 13 U |
| | 5/2/2007 | < 5 U | < 5 U | < 5 U | < 5 U | < 5 U | < 5 U | **160** | < 5 U | < 5 U | 2.9 J | < 5 U | < 10 U |
| | 9/20/2007 | < 5 U | < 5 U | < 5 U | < 5 U | < 5 U | ` | **150** | < 5 U | < 5 U | 2.4 J | < 5 U | < 10 U |
| | 9/30/2008 | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | **190** | < 5.7 U | < 5.7 U | 2.5 J | < 5.7 U | < 11 U |
| | 11/13/2009 | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | **120** | < 5.0 U | < 5.0 U | 2.9 J | < 5.0 U | < 10 U |
| | 1/28/2010 | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | **120** | < 5.0 U | < 5.0 U | 2.4 J | < 5.0 U | < 10 U |
| | 9/23/2010 | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | **92** | < 2.5 U | < 2.5 U | 2.2 J | < 2.5 U | < 5.0 U |
| | 9/29/2011 | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | **83** | < 4.0 U | < 4.0 U | 2.6 J | < 4.0 U | < 8.0 U |
| | 9/7/2012 | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | **64** | < 4.0 U | < 4.0 U | 2.8 J | < 4.0 U | < 8.0 U |
| | 9/26/2013 | < 1.0 U | 0.31 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **69** | < 1.0 U | < 1.0 U | 2.7 | < 1.0 U | < 2.0 U |
| | 10/8/2014 | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | **66** | < 1.7 U | < 1.7 U | < 1.7 UB | < 1.7 U | < 3.3 U |
| GM-42 | 12/9/2003 | < 1 U | 0.46 J | < 1 U | < 1 U | 11 | < 1 U | 0.27 J | < 1 U | 0.34 J | 0.37 J | 1 | < 1 U |
| | 9/20/2004 | < 1 U | 0.7 J | 0.25 J | < 1 U | 16 | < 1 U | < 1 U | < 1 U | 0.44 J | 0.43 J | 0.92 J | < 1 U |
| | 10/25/2005 | < 1.0 U | 0.64 J | 0.21 J | < 1.0 U | 17 | < 1.0 U | 0.19 J | < 1.0 U | 0.59 J | 0.85 J | 0.56 J | < 2.0 U |
| | 9/26/2006 | < 1 U | 0.5 J | < 1 U | < 1 U | 14 | < 1 U | < 1 U | < 1 U | 0.44 J | 0.64 J | 0.45 J | < 2 U |
| | 9/25/2007 | < 1 U | 0.67 J | < 1 U | < 1 U | 18 | < 1 U | < 1 U | 0.18 J | 0.69 J | 2.2 | 0.44 J | < 2 U |
| | 9/30/2008 | < 1 U | 0.66 J | 0.53 J | < 1 U | 20 | < 1 U | < 1 U | < 1 U | 0.89 J | **9.9** | 0.31 J | < 2 U |
| | 9/6/2012 | < 1.0 U | 0.41 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.25 J | < 1.0 U | **6.4** | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-19D | 9/28/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 1.2 | <1.0 | <1.0 | <1.0 | <1.0 | **13.5** | 1.5 | <1.0 |
| | 10/2/2000 | <1.0 | <1.0 | <1.0 | <1.0 | 3.5 | <1.0 | <1.0 | <1.0 | <1.0 | 2.9 | **15.7** | <1.0 |
| | 11/14/2001 | 0.18J | < 1.0 | < 1.0 | < 1.0 | 0.92 | < 1.0 | < 1.0 | 0.38J | < 0.50 | 3.7 | **13** | < 1.0 |
| | 9/26/2002 | < 1 | < 1 | < 1 | < 1 | 0.81 | < 1 | < 1 | < 1 | < 0.5 | 3.1 | 0.36J | < 1 |
| | 9/25/2003 | < 1 U | < 1 U | < 1 U | < 1 U | 1.8 | < 1 U | < 1 U | < 1 U | < 0.5 U | 0.24 J | **17** | < 1 U |
| | 9/20/2004 | 0.31 J | < 1 U | < 1 U | < 1 U | 2 | < 1 U | < 1 U | < 1 U | < 0.5 U | 3.5 | **18** | < 1 U |
| | 10/25/2005 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.2 | **15** | < 2.0 U |
| | 9/26/2006 | < 1 U | < 1 U | < 1 U | < 1 U | 2 | < 1 U | < 1 U | < 1 U | < 1 U | 1.4 | **18** | < 2 U |
| | 9/17/2007 | 0.25 J | < 1 U | < 1 U | < 1 U | 1.4 | < 1 U | < 1 U | < 1 U | < 1 U | 3.2 | **16** | < 2 U |
| | 9/23/2008 | < 1 U | < 1 U | < 1 U | < 1 U | 2.4 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **9.8** | < 2 U |
| | 11/11/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | **14** | < 2.0 U |
| | 9/27/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.98 J | **9.9** | < 2.0 U |
| | 9/29/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.8 | **8.6** | < 2.0 U |
| | 9/6/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.5 | < 1.0 U | < 1.0 U | 0.82 J | < 1.0 U | **7.4** | **2.4** | 0.32 J |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.0 | **7.8** | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 0.27 J | < 1.0 U | < 1.0 U | 5.8 | < 1.0 U | 0.36 J | < 1.0 U | < 1.0 U | 5.0 | **4.1** | < 2.0 U |
| GM-7R | 9/28/1999 | 4.2 | <1.0 | <1.0 | <1.0 | 2.1 | <1.0 | <1.0 | <1.0 | <1.0 | **76.1** | <1.0 | <1.0 |
| GM-67D | 5/3/2007 | 0.59 J | 3 | 0.36 J | < 1.7 U | 23 | < 1.7 U | **54** | < 1.7 U | 0.83 J | **45** | < 1.7 U | < 3.3 U |
| | 10/10/2014 | 1.2 J | 3.7 | < 3.3 U | < 3.3 U | 120.0 | < 3.3 U | **0.84 J** | < 3.3 U | 2.6 J | **15.0** | 3.5 | < 6.7 U |
| GM-68D | 5/4/2007 | < 50 U | < 50 U | < 50 U | < 50 U | < 50 U | < 50 U | **1500** | < 50 U | < 50 U | **750** | < 50 U | < 100 U |
| | 10/3/2008 | < 5 U | < 5 U | < 5 U | < 5 U | 14 | < 5 U | **190** | < 5 U | < 5 U | **46** | < 5 U | < 10 U |
| | 11/16/2009 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | 4.5 | < 2.0 U | **130 J** | < 2.0 U | < 2.0 U | **35** | < 2.0 U | < 4.0 U |
| | 9/29/2010 | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | 3.0 J | < 3.3 U | **100** | < 3.3 U | < 3.3 U | **22** | < 3.3 U | < 6.7 U |
| | 9/30/2011 | < 1.7 U | < 1.7 U | < 1.7 U | < 1.7 U | 1.5 J | < 1.7 U | **62** | < 1.7 U | < 1.7 U | **13** | < 1.7 U | < 3.3 U |
| | 9/7/2012 | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | < 3.3 U | **49** | < 3.3 U | < 3.3 U | **6.9** | < 3.3 U | < 6.7 U |
| | 9/26/2013 | 0.47 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.77 J | < 1.0 U | **45** | < 1.0 U | < 1.0 U | **5.6** | < 1.0 U | < 2.0 U |
| | 10/10/2014 | 0.71 J | < 1.4 U | < 1.4 U | < 1.4 U | 1.1 J | < 1.4 U | **36** | < 1.4 U | < 1.4 U | **3.7** | < 1.4 U | < 2.9 U |
| GM-69 | 5/3/2007 | < 12 U | 8.7 J | < 12 U | < 12 U | 29 | < 12 U | **6.5 J** | < 12 U | < 12 U | **300** | < 12 U | < 24 U |
| GM-70 | 5/3/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **11** | < 1 U | < 1 U | 0.32 J | < 1 U | < 2 U |
| GM-73 | 10/23/2007 | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | < 6.7 U | **160** | < 6.7 U | < 6.7 U | **22** | < 6.7 U | < 13 U |
| GM-74D | 9/27/2007 | < 8 U | < 8 U | < 8 U | < 8 U | < 8 U | < 8 U | **250** | < 8 U | < 8 U | **130** | < 8 U | < 16 U |
| | 4/9/2010 | < 2.5 U | < 2.5 U | < 2.5 U | < 2.5 U | 8.0 | < 2.5 U | **98** | < 2.5 U | < 2.5 U | **50** | < 2.5 U | < 5.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-75D | 9/26/2007 | < 50 U | < 50 U | < 50 U | < 50 U | 24 J | < 50 U | **470** | < 50 U | < 50 U | **1700 J** | < 50 U | < 100 U |
| | 10/6/2008 | < 33 U | < 33 U | < 33 U | < 33 U | **120** | < 33 U | **220** | < 33 U | < 33 U | **750** | < 33 U | < 67 U |
| | 11/16/2009 | < 5.0 U | < 5.0 U | < 5.0 U | < 5.0 U | 15 | < 5.0 U | **320** | < 5.0 U | < 5.0 U | **210** | < 5.0 U | < 10 U |
| | 4/8/2010 | < 9.1 U | < 9.1 U | < 9.1 U | < 9.1 U | 19 | < 9.1 U | **320** | < 9.1 U | < 9.1 U | **200** | < 9.1 U | < 18 U |
| | 9/29/2010 | < 9.1 U | < 9.1 U | < 9.1 U | < 9.1 U | 12 | < 9.1 U | **260** | < 9.1 U | < 9.1 U | **190** | < 9.1 U | < 18 U |
| | 9/30/2011 | < 4.0 U | < 4.0 U | < 4.0 U | < 4.0 U | 12 | < 4.0 U | **200** | < 4.0 U | < 4.0 U | **180** | **2.1 J** | < 8.0 U |
| | 9/7/2012 | < 11 U | < 11 U | < 11 U | < 11 U | 31 | < 11 U | **150** | < 11 U | < 11 U | **150** | **4.7 J** | < 22 U |
| | 9/27/2013 | < 1.0 U | 0.40 J | 0.28 J | < 1.0 U | 25 | < 1.0 U | **180** | < 1.0 U | 0.58 J | **180** | **3.2** | < 2.0 U |
| | 12/4/2014 | < 5.7 U | < 5.7 U | < 5.7 U | < 5.7 U | 11 | < 5.7 U | **190** | < 5.7 U | < 5.7 U | **180** | **< 5.7 U** | < 11 U |
| GM-76D | 9/23/2007 | < 1 U | 0.3 J | < 1 U | < 1 U | < 1 U | < 1 U | 0.63 J | < 1 U | < 1 U | 2.7 | < 1 U | < 2 U |
| | 10/9/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.24 J | < 1.0 U | 35 | < 1.0 U | < 1.0 U | 8.5 | < 1.0 U | < 2.0 U |
| GM-82 | 2/26/2008 | < 2 U | 2.3 | < 2 U | < 2 U | 47 | < 2 U | **60** | < 2 U | 1.9 J | **91** | < 2 U | < 4 U |
| | 10/2/2008 | 1 J | 2.4 J | 0.64 J | < 3.3 U | 46 | < 3.3 U | **51** | < 3.3 U | 2 J | **100** | < 3.3 U | < 6.7 U |
| | 9/26/2013 | 0.49 J | 1.4 | 0.60 J | < 1.0 U | 41 | < 1.0 U | **20** | < 1.0 U | 1.3 | **56** | **7.4** | < 2.0 U |
| RMW-85 | 9/26/2012 | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | < 10 U | **280** | < 10 U | < 10 U | **120** | < 10 U | < 20 U |
| | 9/27/2013 | 0.19 J | 0.84 J | 0.26 J | < 1.0 U | 60 | < 1.0 U | **61** | < 1.0 U | 0.48 J | **95** | 0.31 J | < 2.0 U |
| | 10/9/2014 | < 2.0 U | < 2.0 U | < 2.0 U | 0.75 J | 55 | < 2.0 U | **40** | < 2.0 U | 1.8 J | **78** | 5 | < 4.0 U |
| GM-83D | 2/26/2008 | < 1 U | < 1 U | < 1 U | < 1 U | 0.28 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.5 | < 2 U |
| | 10/2/2008 | < 1 U | < 1 U | < 1 U | < 1 UJ | 0.3 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.3 | < 2 U |
| | 11/11/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **2.1** | < 2.0 U |
| | 9/22/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.31 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2 | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.8 | < 2.0 U |
| | 9/7/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | < 2.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.9 | < 2.0 U |
| | 10/9/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.6 | < 2.0 U |
| GM-84 | 2/26/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.57 J | < 1 U | **5.5** | < 1 U | < 2 U |
| | 10/2/2008 | < 1 U | < 1 U | < 1 U | < 1 UJ | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **6.6** | < 1 U | < 2 U |
| | 11/16/2009 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.3** | < 1.0 U | < 2.0 U |
| | 1/27/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.4** | < 1.0 U | < 2.0 U |
| | 9/23/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **5.9** | < 1.0 U | < 2.0 U |
| | 9/29/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **5.7** | < 1.0 U | < 2.0 U |
| | 9/7/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.9 | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.6 | < 1.0 U | < 2.0 U |
| | 10/8/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.9 | < 1.0 U | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| **Downgradient of the Site** | | | | | | | | | | | | | |
| GM-3 | 9/28/1999 | 1.7 | <1.0 | <1.0 | <1.0 | 1.1 | <1.0 | 1.2 | <1.0 | <1.0 | **7.5** | <1.0 | <1.0 |
| | 10/2/2000 | 1.0 | 2.1 | <1.0 | <1.0 | 8.3 | <1.0 | 1.5 | <1.0 | 1.1 | **9.4** | <1.0 | <1.0 |
| | 11/14/2001 | 0.16J | 0.95J | < 1.0 | < 1.0 | 2.6 | < 1.0 | 0.48J | < 1.0 | 0.25J | 2.9 | < 1.0 | < 1.0 |
| | 10/1/2002 | 0.74J | 1.8 | < 1 | < 1 | 8.9 | < 1 | 1.4 | < 1 | 1.2 | **9.5** | 0.63J | < 1 |
| | 10/2/2003 | 0.96 J | 1.6 | < 1 U | < 1 U | 5.5 | 0.26 J | 1.7 | < 1 U | 0.77 | **12** | < 1 U | < 1 U |
| | 9/21/2004 | 1 | 1.8 | < 1 U | < 1 U | 4.9 | < 1 U | 2 | < 1 U | 0.75 | **13** | < 1 U | < 1 U |
| | 10/25/2005 | 0.83 J | 1.6 | < 1.0 U | < 1.0 U | 4.7 | < 1.0 U | 2.0 | < 1.0 U | 0.66 J | **14** | < 1.0 U | < 2.0 U |
| | 9/22/2006 | 0.59 J | 2 J | < 1 UJ | < 1 UJ | 6.1 J | < 1 UJ | 2.1 J | < 1 UJ | 1 J | **13 J** | 0.27 J | < 2 UJ |
| | 9/18/2007 | 0.67 J | 1.5 | < 1 U | < 1 U | 3.8 | < 1 U | 1.9 | < 1 U | 0.77 J | **14** | < 1 U | < 2 U |
| | 9/24/2008 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 UJ | < 1 U | < 1 U | < 1 UJ | < 1 U | < 2 U |
| | 9/25/2013 | 0.54 J | 0.86 J | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | 2.3 | < 1.0 U | 0.29 J | **15** | < 1.0 U | < 2.0 U |
| GM-4 | 9/28/1999 | <1.0 | <1.0 | <1.0 | <1.0 | 2.3 | <1.0 | <1.0 | <1.0 | <1.0 | **13.4** | <1.0 | <1.0 |
| GM-5 | 9/28/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 3.9 | <1.0 | 1.3 | <1.0 | <1.0 |
| GM-1 | 9/28/1999 | 1.1 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 2.0 | 5.2 | <1.0 | **30.6** | <1.0 | <1.0 |
| | 10/2/2000 | 2.2 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 2.8 | <1.0 | <1.0 | **37.2** | <1.0 | <1.0 |
| | 11/14/2001 | 0.80J | 0.29J | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 1.3 | < 1.0 | < 0.50 | **19** | < 1.0 | < 1.0 |
| | 10/1/2002 | 1.3 J | 0.48 J | < 1.4 U | < 1.4 U | 0.95 | < 1.4 U | 2.3 | < 1.4 U | < 0.72 U | **39** | < 1.4 U | < 1.4 U |
| | 10/2/2003 | 1.2 | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 2 | < 1 U | < 0.5 U | **34** | < 1 U | < 1 U |
| | 9/21/2004 | 1.2 | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 2.1 | < 1 U | < 0.5 U | **35** | < 1 U | < 1 U |
| | 10/25/2005 | 0.95 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.1 | < 1.0 U | < 1.0 U | **34** | < 1.0 U | < 2.0 U |
| | 9/20/2006 | 0.76 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 2.1 | < 1 U | < 1 U | **34** | < 1 U | < 2 U |
| | 9/18/2007 | 0.74 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.8 | < 1 U | < 1 U | **32** | < 1 U | < 2 U |
| | 9/24/2008 | 0.69 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.8 | < 1 U | < 1 U | **31** | < 1 U | < 2 U |
| | 9/5/2012 | 0.42 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | **26** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 0.41 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.83 J | < 1.0 U | < 1.0 U | **21** | < 1.0 U | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-15 | 9/24/1999 | <1.0 | 2.4 | <1.0 | <1.0 | 4.3 | <1.0 | <1.0 | <1.0 | <1.0 | 4.1 | <1.0 | <1.0 |
| | 10/2/2000 | <1.0 | 2.3 | <1.0 | <1.0 | 2.6 | <1.0 | <1.0 | <1.0 | <1.0 | 4.7 | <1.0 | <1.0 |
| | 11/14/2001 | < 1.0 | 1.4 | < 1.0 | < 1.0 | 1.2 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | 4.9 | < 1.0 | < 1.0 |
| | 9/27/2002 | < 1 | 1.6 | < 1 | < 1 | 1.8 | < 1 | < 1 | < 1 | < 0.5 | 4.7 | < 1 | < 1 |
| | 9/22/2003 | < 1 U | 1.7 | < 1 U | < 1 U | 1.6 | < 1 U | < 1 U | < 1 U | < 0.5 U | **5.9** | < 1 U | < 1 U |
| | 9/20/2004 | < 1 U | 1.8 | < 1 U | < 1 U | 1.4 | < 1 U | < 1 U | < 1 U | < 0.5 U | **5.8** | < 1 U | < 1 U |
| | 10/26/2005 | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **5.9** | < 1.0 U | < 2.0 U |
| | 9/18/2006 | < 1 U | 1.6 | < 1 U | < 1 U | 1.2 | < 1 U | < 1 U | < 1 U | < 1 U | **6.3** | < 1 U | < 2 U |
| | 9/25/2007 | < 1 U | 1.5 | < 1 U | < 1 U | 1.1 | < 1 U | < 1 U | < 1 U | < 1 U | **5.1** | < 1 U | < 2 U |
| | 9/30/2008 | < 1 U | 1.1 | < 1 U | < 1 U | 0.79 J | < 1 U | < 1 U | < 1 U | < 1 U | **6.2** | < 1 U | < 2 U |
| | 11/13/2009 | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | 1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.5** | < 1.0 U | < 2.0 U |
| | 9/23/2010 | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | 1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **6.5** | < 1.0 U | < 2.0 U |
| | 9/29/2011 | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.7 | < 1.0 U | < 2.0 U |
| | 9/5/2012 | 0.23 J | 1.3 | < 1.0 U | < 1.0 U | 2.2 | < 1.0 U | < 1.0 U | 0.33 J | 0.31 J | **6.1** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | 1.8 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 4.5 | 0.19 J | < 2.0 U |
| | 10/7/2014 | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | 2.4 | < 1.0 U | < 1.0 U | < 1.0 U | 0.42 J | 4.1 | 0.38 J | < 2.0 U |
| GM-14 | 9/24/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| GM-13 | 9/24/1999 | 1.9 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 3.6 | <1.0 | <1.0 | **31.0** | <1.0 | <1.0 |
| GM-11 | 9/24/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1.5 | <1.0 | <1.0 | **14.5** | <1.0 | <1.0 |
| | 10/2/2000 | 1.4 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 3.0 | <1.0 | <1.0 | **41.3** | <1.0 | <1.0 |
| | 11/14/2001 | 0.33J | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 1.0 | < 1.0 | < 0.50 | **12** | < 1.0 | < 1.0 |
| | 10/1/2002 | 1 | 0.34J | < 1 | < 1 | 0.62 | < 1 | 2.2 | < 1 | < 0.5 | **35** | < 1 | < 1 |
| | 9/24/2003 | 0.96 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 2.2 | < 1 U | < 0.5 U | **33** | < 1 U | < 1 U |
| | 9/21/2004 | 0.89 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 2.1 | < 1 U | < 0.5 U | **33** | < 1 U | < 1 U |
| | 10/26/2005 | 0.75 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | **32** | < 1.0 U | < 2.0 U |
| | 9/25/2006 | 0.75 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 2 | < 1 U | < 1 U | **34** | < 1 U | < 2 U |
| | 9/18/2007 | 0.6 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.5 | < 1 U | < 1 U | **35** | < 1 U | < 2 U |
| | 9/24/2008 | 0.47 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 1.7 | < 1 U | < 1 U | **31** | < 1 U | < 2 U |
| | 11/12/2009 | 0.47 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.8 | < 1.0 U | < 1.0 U | **37** | < 1.0 U | < 2.0 U |
| | 9/22/2010 | 0.36 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | **31** | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | 1.1 J | < 1.4 U | < 1.4 U | **24** | < 1.4 U | < 2.9 U |
| | 9/5/2012 | 0.32 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.39 J | < 1.0 U | 1.2 | < 1.0 U | < 1.0 U | **25** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 0.32 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.40 J | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | **23** | < 1.0 U | < 2.0 U |
| | 10/7/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | **17** | < 1.0 U | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-20D | 9/24/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/3/2000 | 1.6 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 4.2 | <1.0 | <1.0 | **14.3** | <1.0 | <1.0 |
| | 11/14/2001 | 0.64J | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | 2.0 | < 1.0 | < 0.50 | **5.9** | < 1.0 | < 1.0 |
| | 9/30/2002 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | 1.3 | < 1 | < 0.5 | 3.8 | < 1 | < 1 |
| | 9/22/2003 | 0.89 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 3.6 | < 1 U | < 0.5 U | **12** | < 1 U | < 1 U |
| | 9/21/2004 | 0.96 J | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | 2.9 | < 1 U | < 0.5 U | **11** | < 1 U | < 1 U |
| | 10/26/2005 | 0.73 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.7 | < 1.0 U | < 1.0 U | **11** | < 1.0 U | < 2.0 U |
| | 9/26/2006 | 0.51 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 2.1 | < 1 U | < 1 U | **11** | < 1 U | < 2 U |
| | 9/19/2007 | 0.5 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 2.1 | < 1 U | < 1 U | **9.2** | < 1 U | < 2 U |
| | 9/25/2008 | 0.45 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 2.6 | < 1 U | < 1 U | **6.6** | < 1 U | < 2 U |
| | 11/13/2009 | 0.4 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 UJ | 2 | < 1.0 U | < 1.0 U | **7.6** | < 1.0 U | < 2.0 U |
| | 9/22/2010 | 0.32 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | < 1.0 U | < 1.0 U | **6.5** | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | < 1.0 U | < 1.0 U | 5.0 | < 1.0 U | < 2.0 U |
| | 9/5/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 3.7 | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 0.32 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | **5.3** | < 1.0 U | < 2.0 U |
| | 10/6/2014 | 0.32 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.7 | < 1.0 U | < 1.0 U | **3.1** | < 1.0 U | < 2.0 U |
| GM-56 | 9/14/2006 | 0.35 J | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | 0.57 J | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/5/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.4 | 0.47 J | < 1.0 U | < 1.0 U | < 1.0 U | 0.28 J |
| GM-65D | 5/2/2007 | 0.4 J | 1.4 | < 1 U | < 1 U | 1.5 | < 1 U | < 1 U | < 1 U | 0.21 J | 1.3 | < 1 U | < 2 U |
| | 1/21/2008 | 0.32 J | 0.94 J | < 1 U | < 1 U | 1 | < 1 U | < 1 U | < 1 U | < 1 U | 1.1 | < 1 U | < 2 U |
| | 1/27/2010 | 0.88 J | 1.2 | < 1.0 U | < 1.0 U | 1.1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 2.0 U |
| DN-13 | 11/14/2001 | 1.1 | 2.5 | < 1.0 | < 1.0 | 6.2 | < 1.0 | < 1.0 | < 1.0 | 0.37J | 5.0 | 1.2 | < 1.0 |
| | 9/27/2002 | 1.1 | 2.5 | < 1 | < 1 | 7.3 | < 1 | < 1 | < 1 | 0.48J | **6.1** | 1.3 | < 1 |
| | 9/22/2003 | 1.1 | 2.4 | < 1 U | < 1 U | 6.8 | < 1 U | 0.31 J | < 1 U | 0.4 J | **6.4** | 1.1 | < 1 U |
| | 9/16/2004 | 0.84 J | 2.2 | < 1 U | < 1 U | 6.7 | < 1 U | 0.44 J | < 1 U | 0.49 J | **6.8** | **2.1** | < 1 U |
| | 10/20/2005 | 1.5 | 2.0 | < 1.0 U | < 1.0 U | 5.5 | < 1.0 U | 0.38 J | < 1.0 U | < 1.0 U | **7.2** | **2.6** | < 2.0 U |
| | 9/27/2006 | 0.51 J | 1.5 | < 1 U | < 1 U | 6.1 | < 1 U | 0.33 J | < 1 U | 0.41 J | **5.7** | **2.3** | < 2 U |
| | 9/19/2007 | 0.48 J | 2 | < 1 U | < 1 U | 6.4 | < 1 U | < 1 U | < 1 U | 0.4 J | 3.3 | **2.6** | < 2 U |
| | 9/24/2008 | 0.63 J | < 1.7 U | < 1 U | < 1 U | 6.2 | < 1 U | < 1 U | < 1 U | 0.44 J | 4.5 | 1.4 | < 2 U |
| | 11/11/2009 | 0.77 J | 2.1 | < 1.0 U | < 1.0 U | 7.9 | < 1.0 U | 0.33 J | < 1.0 U | 0.50 J | **6.5** | 1.7 | < 2.0 U |
| | 9/22/2010 | 0.48 J | 1.6 | < 1.0 U | < 1.0 U | 6.9 | < 1.0 U | < 1.0 U | < 1.0 U | 0.44 J | 5 | 1.3 | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | 6.3 | < 1.0 U | 0.40 J | < 1.0 U | 0.38 J | 4.8 | 1.3 | < 2.0 U |
| | 9/6/2012 | 0.99 J | 2 | < 1.0 U | < 1.0 U | 7.5 | < 1.0 U | 0.76 J | < 1.0 U | 0.47 J | **7.9** | 1.2 | < 2.0 U |
| | 9/27/2013 | 0.93 J | 1.9 | < 1.0 U | < 1.0 U | 6.9 | < 1.0 U | 0.58 J | < 1.0 U | 0.55 J | **8.4** | 1.1 | < 2.0 U |
| | 12/4/2014 | 0.86 J | 1.6 | < 1.0 U | < 1.0 U | 5.9 | < 1.0 U | 3.5 | < 1.0 U | 0.41 J | **10.0** | 0.79 J | < 2.0 U |

**Table C-2**
**Annual Groundwater Analytical Results for the Lower Aquifer Wells from 1999-2014**
**RACER Trust**
**Moraine, Ohio**

| Well | Date | VOCs (ug/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1,1,1-TCA | 1,1-DCA | 1,1-DCE | Benzene | cis-1,2-DCE | Ethyl-benzene | PCE | Toluene | trans-1,2-DCE | TCE | Vinyl Chloride | Xylenes |
| MCL | | 200 | | 7 | 5 | 70 | 700 | 5 | 1000 | 100 | 5 | 2 | 10,000 |
| GM-9 | 9/24/1999 | 1.0 | <1.0 | <1.0 | <1.0 | 1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **13.8** | <1.0 | <1.0 |
| | 10/3/2000 | 1.2 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | **17.2** | <1.0 | <1.0 |
| | 11/14/2001 | 0.48J | 0.58J | < 1.0 | < 1.0 | 1.1 | < 1.0 | 0.38J | < 1.0 | < 0.50 | **8.6** | < 1.0 | < 1.0 |
| | 9/30/2002 | 0.99J | 0.48J | < 1 | < 1 | 0.66 | < 1 | < 1 | < 1 | < 0.5 | **16** | < 1 | < 1 |
| | 9/24/2003 | 1.3 | 0.45 J | < 1 U | < 1 U | 0.56 | < 1 U | < 1 U | < 1 U | < 0.5 U | **20** | < 1 U | < 1 U |
| | 9/21/2004 | 1.1 | 0.6 J | < 1 U | < 1 U | 0.97 | < 1 U | < 1 U | < 1 U | < 0.5 U | **16** | < 1 U | < 1 U |
| | 10/26/2005 | 0.85 J | 0.59 J | < 1.0 U | < 1.0 U | 0.99 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **15** | < 1.0 U | < 2.0 U |
| | 9/25/2006 | 0.44 J | 0.48 J | < 1 U | < 1 U | 0.85 J | < 1 U | < 1 U | < 1 U | < 1 U | **6.6** | < 1 U | < 2 U |
| | 9/19/2007 | 1.2 | 0.48 J | < 1 U | < 1 U | 0.71 J | < 1 U | < 1 U | < 1 U | < 1 U | **18** | < 1 U | < 2 U |
| | 9/24/2008 | 1.2 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | **18** | < 1 U | < 2 U |
| | 9/22/2010 | 1 | 0.35 J | < 1.0 U | < 1.0 U | 0.46 J | < 1.0 U | < 1.0 UJ | < 1.0 U | < 1.0 U | **17 J** | < 1.0 U | < 2.0 U |
| | 9/28/2011 | < 1.0 U | 0.50 J | < 1.0 U | < 1.0 U | 1 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **13** | < 1.0 U | < 2.0 U |
| | 9/5/2012 | 24 | <22 U | <22 U | <22 U | 7.9 J | <22 U | <22 U | <22 U | <22 U | **340** | <22 U | <44 U |
| | 9/26/2012 | 1.1 | 0.24 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **16.0** | < 1.0 U | < 2.0 U |
| | 9/25/2013 | 1.4 | < 1.0 U | < 1.0 U | < 1.0 U | 0.44 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **19** | < 1.0 U | < 2.0 U |
| | 10/6/2014 | 1.2 | 0.39 J | < 1.0 U | < 1.0 U | 0.54 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **17** | < 1.0 U | < 2.0 U |
| MT-69 (1) | 9/24/1999 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 10/3/2000 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| | 11/15/2001 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | < 1.0 | < 1.0 | < 0.50 | < 1.0 | < 1.0 | < 1.0 |
| | 9/30/2002 | < 1 | < 1 | < 1 | < 1 | < 0.5 | < 1 | < 1 | < 1 | < 0.5 | < 1 | < 1 | < 1 |
| | 10/1/2003 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 9/27/2004 | < 1 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U | < 0.5 U | < 1 U | < 1 U | < 1 U |
| | 10/24/2005 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/26/2006 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| | 9/27/2007 | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 1 U | < 2 U |
| GM-77D | 9/27/2007 | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | **45** | < 1.4 U | < 1.4 U | < 1.4 U | < 1.4 U | < 2.9 U |
| | 1/28/2010 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **18** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/7/2012 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **11** | 0.17 J | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 9/26/2013 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **12** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| | 10/8/2014 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **14** | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |

(1) - Well unusable - collapsed screen.
All concentrations presented in micrograms per liter.
VOCs - Volatile Organic Compounds.
1,1,1-TCA - 1,1,1-Trichloroethane.
1,1-DCA - 1,1-Dichloroethane.
1,1-DCE - 1,1-Dichloroethene.
cis-1,2-DCE - cis-1,1-Dichloroethene.
ug/L - Micrograms per Liter.

< - Constituent not detected above laboratory reporting limit shown.
J - Value is estimated.
U - Constituent not detected above laboratory limit shown.
PCE - Tetrachloroethene.
trans-1,2-DCE - trans-1,2-Dichloroethene.
TCE - Trichloroethene.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.

# APPENDIX D

## 1,4-Dioxane Evaluation Report

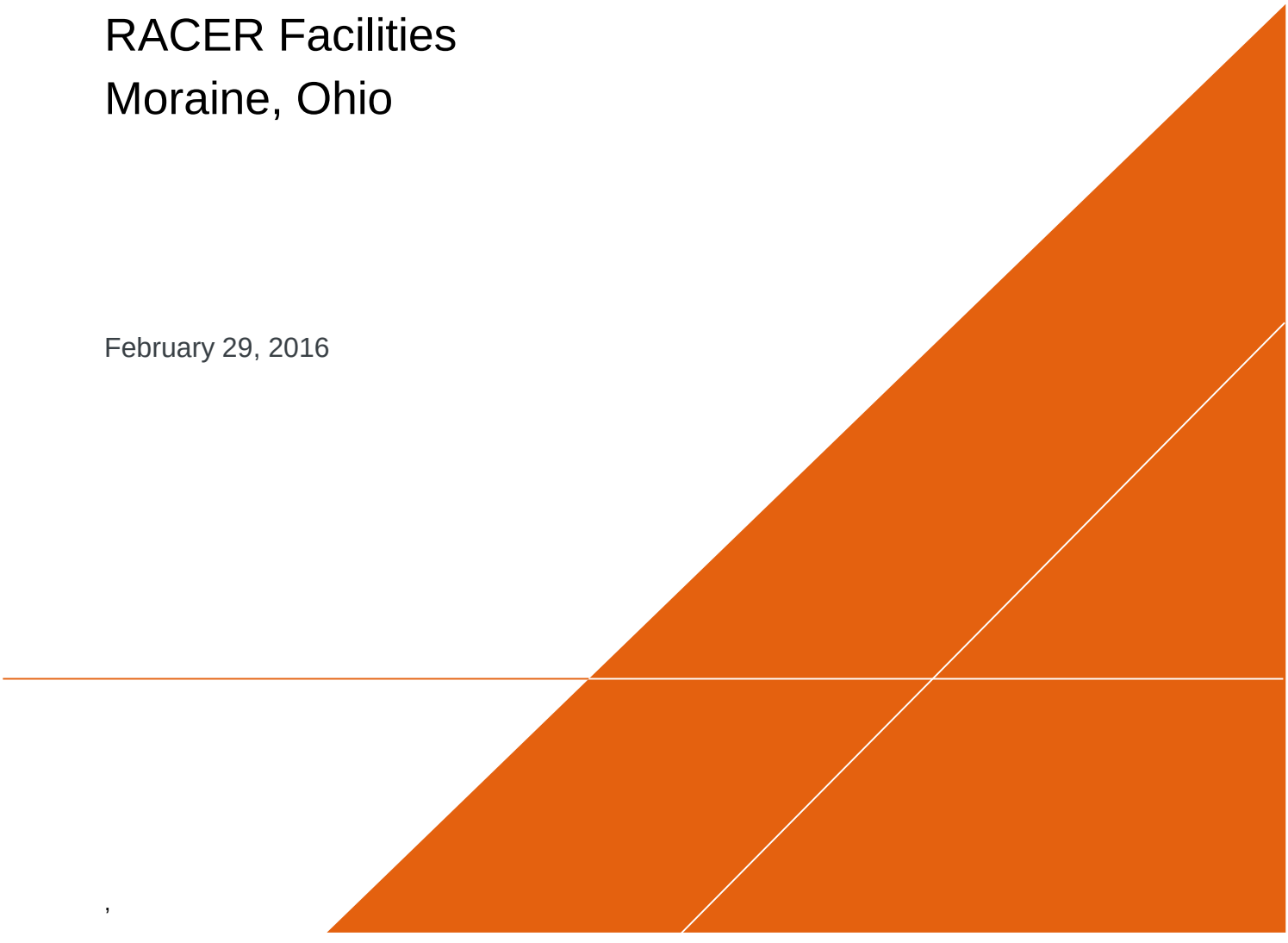
ARCADIS Design & Consultancy for natural and built assets

Revitalizing Auto Communities Environmental Response (RACER) Trust

# 1,4-DIOXANE EVALUATION REPORT

RACER Facilities
Moraine, Ohio

February 29, 2016



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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| 1,4-D | 1,4-Dioxane |
| bgs | Below ground surface |
| DNA | Deoxyribonucleic acid |
| DXMO | Gene encoding a dioxane monooxygenase enzyme |
| LRL | Laboratory reporting limit |
| MI | Microbial Insights |
| µg/kg | Micrograms per kilogram |
| µg/L | Micrograms per liter |
| mRNA | Messenger ribonucleic acid |
| PPO | Gene encoding a propane monooxygenase enzyme |
| PSA | Process Sump Area |
| qPCR | Quantitative polymerase chain reaction |
| RACER | Revitalizing Auto Communities Environmental Response |
| RDEG | Gene encoding a toluene monooxygenase enzyme |
| report | 1,4-Dioxane Evaluation Report |
| RMO | Gene encoding a toluene monooxygenase enzyme |
| Site | RACER Trust Facilities in Moraine, Ohio |
| SMMO | Gene encoding soluble methane monooxygenase enzymes |
| U.S. EPA | United States Environmental Protection Agency |
| VAP | Vertical Aquifer Profile |
| VOC | Volatile Organic Compounds |

# EXECUTIVE SUMMARY

This report summarizes sampling conducted by Arcadis U.S., Inc between August and December 2015 to characterize the occurrence and fate of 1,4-Dioxane (1,4-D) in soil and groundwater at the Revitalizing Auto Communities Environmental Response (RACER) Trust Facilities in Moraine, Ohio (Site). The activities described in this report were proposed in a letter dated October 7, 2015, from RACER Trust to the United States Environmental Protection Agency. These activities included collection and analysis of groundwater samples from 24 monitoring wells, collection of Vertical Aquifer Profile groundwater samples from three to five discrete depth intervals from six soil borings, use of Bio-Trap® samplers to survey subsurface microbial communities at 14 monitoring wells, and collection of soil samples from one to four depth intervals from six locations.

In the upper aquifer, groundwater sampling results provide delineation of 1,4-D concentrations to the Site-specific action level, including in the area of maximum concentrations at monitoring well GM-35. These results indicate that 1,4-D concentrations in the upper aquifer are limited in lateral extent, and based on a comparison with results from two previous sampling events (October 2014 and June 2015) dissolved 1,4-D concentrations in the upper aquifer are stable.

In the lower aquifer, groundwater sampling results suggest that 1,4-D is migrating onsite from an area to the northeast at concentrations between approximately 30 to 50 micrograms per liter (µg/L). In the northern portion of the Site, in the vicinity of the process sump area (PSA), moderate 1,4-D concentrations were measured in groundwater. Although sampling did not achieve full delineation of 1,4-D concentrations to the action level in the lower aquifer in the northern portion of the Site, 1,4-D concentrations decrease with distance from the apparent northern offsite source toward the PSA. In the southern portion of the Site, moderate 1,4-D concentrations observed at one monitoring well were delineated to the action level in the hydraulically downgradient direction.

Bio-Trap® samplers were used to obtain samples of the subsurface microbial community to assess for the presence and activity of key groups of microorganisms known to have the potential to biodegrade 1,4-D. Based on the results of this investigation, there is not evidence of a microbial community capable of metabolic (i.e., those that specifically target and utilize 1,4-D for microbial growth and cellular activity) degradation of 1,4-D in groundwater at the Site. There is evidence of the presence of groups of known microorganisms that may contribute to 1,4-D biodegradation via cometabolism (i.e., indirect degradation associated with fortuitous contact between enzymes and 1,4-D), including methane, propane and toluene oxidizing bacteria. However, there is not robust evidence that these microorganisms were actively expressing the genes required to produce the enzymes responsible for catalyzing cometabolic 1,4-D biodegradation during the sampling period.

Soil sampling results indicate that there is not evidence for a secondary 1,4-D source in soil in either the monitoring well GM-35 area or the PSA; 1,4-D concentrations were below laboratory reporting limits.

Taken together, results of this stage of 1,4-D Site investigation activities provide insight into the distribution of 1,4-D concentrations at the Site, suggest that 1,4-D attenuation in groundwater is occurring primarily via physical processes, and indicate that soil is not an identified source of 1,4-D to groundwater in two key areas of the Site.

# 1 INTRODUCTION

The purpose of this 1,4-Dioxane Evaluation Report (report) is to summarize 1,4-Dioxane (1,4-D) investigation and characterization activities at the Revitalizing Auto Communities Environmental Response (RACER) Trust Facilities in Moraine, Ohio (Site, Figure D-1). Activities described in this report were proposed in a letter dated October 7, 2015, from RACER Trust to the United States Environmental Protection Agency (U.S. EPA; RACER Trust 2015). In addition to this Introduction, this report contains the following sections:

- Background Information: Summarizes 1,4-D characterization activities conducted prior to August 2015;
- Site Investigation Activities: Summarizes sampling conducted between August and December 2015 to characterize the occurrence and fate of 1,4-D in soil and groundwater;
- Investigation Results: Summarizes results of Site investigation activities;
- Identified Data Gaps: Summarizes remaining data gaps; and
- Summary and Conclusions: Provides a summary of the current state-of-knowledge for the occurrence and fate of 1,4-D at the Site, and conclusions drawn from the investigation activities described herein.

# 2 BACKGROUND INFORMATION

At the request of the U.S. EPA, 10 monitoring wells (GM-8, GM-16, GM-21, GM-23, GM-29, GM-31, GM-59, GM-60, GM-75S, and W-1-N) were sampled during the October 2014 annual sampling event. The purpose of the sampling was to determine if 1,4-D was present in groundwater as it has been identified as an emergent chemical associated with industrial processes that include the use of volatile organic compounds (VOC). Well selection was determined based on a known subset of locations that adequately represent the horizontal and vertical distribution of chlorinated VOCs in groundwater within the upper and lower aquifers to obtain a general understanding of 1,4-D concentrations at the Site. The results were reported in the Site-Wide Groundwater Monitoring Report for 2014 (ARCADIS U.S., Inc 2015).

Based on results from the October 2014 sampling event and on previous detections of 1,1,1-trichloroethane, a common co-contaminant with 1,4-D, 29 wells were sampled for 1,4-D in June 2015. The purpose of this sampling event was to confirm previous detections (GM-8, GM-16, and GM-21), further delineate the horizontal extent of 1,4-D within the upper aquifer based on the October 2014 sampling event, and to provide vertical delineation by sampling selected lower aquifer wells (GM-13, GM-61, GM-65D, HR-13, and RMW-86).

Based on October 2014 and June 2015 sampling results, further 1,4-D Site investigation activities were conducted between August and December 2015. These activities are summarized the following sections of this report. Table D-1 presents a summary of samples collected at the Site in support of 1,4-D investigation activities, to date. Figure D-2 presents 1,4-D concentrations measured in groundwater and soil, to date.

# 3 SITE INVESTIGATION ACTIVITIES

Site investigation activities included groundwater sampling, deployment of Bio-Trap® samplers for microbial genetics sampling, and soil sampling, as described in the following subsections.

## 3.1 Groundwater Sampling and Analysis

Between August 24 and 26, 2015, 24 groundwater monitoring wells were gauged, field parameters were measured using a flow-through cell, and groundwater samples were collected using a low-flow sampling method (Table D-1). Two equipment blank samples and two field duplicate samples were collected during this sampling event; field duplicate samples were collected at monitoring wells GM-11 and HR-16. Groundwater samples were analyzed by TestAmerica (North Canton, Ohio) for 1,4-D by U.S. EPA Method 8260B SIM, and total VOC by U.S. EPA 8260B. Groundwater samples were analyzed by Pace Analytical/Microseeps (Pittsburgh, PA) for light hydrocarbon gasses by method AM20GAX. Laboratory reports are presented in Appendix A. Groundwater sampling logs are presented in Appendix B.

Vertical Aquifer Profile (VAP) groundwater samples were collected during the advancement of six soil borings. Specifically, VAP groundwater samples were collected at the following soil boring locations (Table D-1):

- PSA-11, between December 29 and 30, 2014, at three depth intervals between 28 and 64 feet below ground surface (bgs);
- PSA-23, between November 18 and 20, 2015, at five depth intervals between 70 and 139 feet bgs;
- GM-35B-2, between December 8 and 9, 2015, at four depth intervals between 30 and 65 feet bgs;
- GM-35B-1, between December 10 and 12, 2015, at four depth intervals between 28 and 68 feet bgs;
- PSA-22, between December 15 and 19, 2015, at six depth intervals between 60 and 130 feet bgs;
- GM-35B-3, on December 29, 2015, at three depth intervals between 28 and 57 feet bgs.

VAP groundwater samples were analyzed by TestAmerica for VOC by U.S. EPA 8260B and for 1,4-D by U.S. EPA 8260B-SIM; laboratory reports are presented in Appendix A.

## 3.2 Microbial Genetics Sampling and Analysis

On August 25 and 26, 2015, Bio-Trap® samplers were deployed at 14 monitoring wells (Table D-1). These samplers remained deployed for 54 to 55 days, and were retrieved on October 19, 2015. Also on October 19, 2015, dissolved oxygen (DO) concentrations in groundwater were measured at each monitoring well where a Bio-Trap® was retrieved using a downhole optical sensor (YSI ProODO). Bio-Trap® samplers are a passive sampling tool used to survey subsurface microbial communities. These samplers consist of a plastic housing filled with Bio-Sep® beads. These beads are approximately 2 to 4 millimeters in diameter, are a composite of an inert structural material (Nomex®) covered with powdered activated carbon, and form a suitable surface for colonization by microbes. The purpose of using a downhole optical DO sensor was to facilitate rapid in situ measurements of this parameter. Optical DO

sensors generally require less-frequent calibration and produce more accurate and repeatable measurements at low DO concentrations in groundwater than the standard flow-through cell measurement technique.

Following retrieval, Bio-Trap® samplers were immediately shipped to Microbial Insights (MI; Knoxville, Tennessee), and deoxyribonucleic acid (DNA) and messenger ribonucleic acid (mRNA), were extracted from the Nomex® beads within 24 hours following removal from monitoring wells. Relevant gene (DNA) and gene transcript (mRNA) copy numbers were quantified by MI using the quantitative polymerase chain reaction (qPCR) method. Specifically, the following genetic targets were evaluated:

- Dioxane monooxygenase (DXMO) at each of the 14 monitoring wells sampled,
- Soluble methane monooxygenase (SMMO) at each of the 14 monitoring wells sampled,
- Propane monooxygenase (PPO) at monitoring well GM-8, where dissolved propane was detected,
- Ring-hydroxylating toluene monooxygenases (RMO and RDEG) at monitoring well GM-30, where dissolved toluene was detected.

Additionally, mRNA gene transcript copy numbers for total Eubacteria were quantified at each of the 14 monitoring wells samples, to assess the overall activity of the bacterial community. Microbial Insights laboratory reports are included in Appendix A.

## 3.3 Soil Sampling and Analysis

Soil samples were collected, as follows, and were analyzed by U.S. EPA Method 8260B:

- On October 29, 2014, a soil sample was collected at PSA-11 between ground surface and 2 feet bgs. On December 29, 2014, soil samples were collected at PSA-11 at three depth intervals between 18 and 54 feet bgs; and
- On November 12, 2015, soil samples were collected between ground surface and 2 feet bgs at soil boring locations GM-35B-1, GM-35B-2, and GM-35B-4.

Soil samples were collected, as follows, and were analyzed by U.S. EPA Method 8260B-SIM:

- On December 7, 2015, soil samples were collected at GM-35B-2 at two depth intervals between 8 and 28 feet bgs;
- On December 10, 2015, soil samples were collected at GM-35B-1 at three depth intervals between 8 and 28 feet bgs;
- On December 14, 2015, soil samples were collected at PSA-22 at four depth intervals between 8 and 40 feet bgs; and
- On December 29, 2015, soil samples were collected at GM-35B-3 at two depth intervals between 8 and 28 feet bgs.

Soil sampling intervals were selected based on field observations including changing lithology and depth to groundwater. Soil boring logs are presented in Appendix C. Soil samples were analyzed by TestAmerica, and laboratory reports are presented in Appendix A

# 4 INVESTIGATION RESULTS

Results of the Site investigation activities conducted between August and December 2015 served to further delineate and provide insight into temporal variability in 1,4-D concentrations in groundwater. These results also provide evidence that 1,4-D concentrations in groundwater in key areas of the Site are not related to a localized soil source, and suggest that biodegradation of 1,4-D in Site groundwater by currently understood mechanisms is limited. Results are discussed in detail in the following subsections.

## 4.1 Groundwater

As described in Section 2, initial 1,4-D groundwater sampling was conducted at a select subset of wells during October 2014 to evaluate whether 1,4-D was present in groundwater at the Site. Positive detections of 1,4-D during the October 2014 event led to a second sampling event during June 2015, and a third event during August 2015 to provide better delineation in upper and lower aquifer groundwater and to assess temporal variability of 1,4-D concentrations in groundwater (when compared to the October 2014 event). Figure D-2 and Table D-2 present 1,4-D concentrations measured at Site monitoring wells in October 2014, June 2015, and August 2015 and Table D-2 includes the sampling rationale for 1,4-D at each monitoring location (RACER Trust 2015). Concentrations of methane, propane, and toluene are also presented in Table D-2, as these substrates are known to have the potential to stimulate cometabolism of 1,4-D (Mahendra and Alvarez-Cohen 2006). Based on guidance from the U.S. EPA, the current Site-specific action level for 1,4-D in groundwater is 4.6 micrograms per liter (µg/L).

### 4.1.1 1,4-D in the Upper Aquifer

During the August 2015 sampling event, measured 1,4-D concentrations in upper aquifer monitoring wells were between an estimated concentration of 0.51 J and 590 µg/L, in wells GM-37 and GM-35, respectively. Concentrations exceeding the action level were measured at monitoring wells GM-8 (25 µg/L), GM-16 (10 µg/L), GM-35 (590 µg/L), and GM-66 (6.4 µg/L). The 1,4-D concentration measured at monitoring well GM-8 is consistent with the two previous sampling events. The 1,4-D concentration measured at monitoring well GM-16 is consistent with the concentration measured during the October 2014 sampling event. The lower concentration measured at this monitoring location in June 2015 may be attributable to temporal variability and will be evaluated in the context of future monitoring results. Monitoring well GM-35 continues to have the maximum 1,4-D concentration measured at the Site. As shown in Table D-2, the objectives behind sampling each of the additional upper aquifer monitoring wells were to delineate 1,4-D to concentrations below the action level (GM-19S, GM-30, GM-33, GM-37) and to confirm plume fringe stability (GM-52, HR-16, and W-1-N). Both of these objectives were achieved with the measurement of 1,4-D concentrations below the action level at each of these monitoring locations.

Maximum concentrations of 1,4-D were delineated in groundwater in the area surrounding monitoring well GM-35 with concentrations less than 2 µg/L at monitoring well GM-33 and a concentration of 0.51 J µg/L at monitoring well GM-37. Additionally, VAP groundwater samples were collected during the advancement of soil borings in the area (Table D-3).

Soil boring GM-35B-1 is located adjacent to monitoring well MW-35. VAP groundwater samples collected at this location show 1,4-D concentrations below the 2 µg/L laboratory reporting limit (LRL) between 28 and 50 feet bgs, and increasing concentrations with depth with a concentration of 82 µg/L measured

between 56 and 61 feet bgs and a concentration of 570 µg/L measured between 63 and 68 feet bgs. Monitoring well GM-35 is screened between approximately 57 and 67 feet bgs and as discussed above shows a 1,4-D concentration consistent with that measured in the deepest VAP groundwater sample collected. As shown in the boring log for GM-35B-1 (Appendix B), the elevated 1,4-D concentration measured appears to be associated with finer-grained materials, with the sand grain size decreasing from medium- to very coarse-grained between 56 and 61 feet bgs to fine- to very fine-grained between 63 and 68 feet bgs.

Soil boring GM-35B-2 is located approximately 66 feet northeast of monitoring well GM-35. VAP groundwater samples collected at this location show 1,4-D concentrations below the 2 µg/L LRL between 30 and 50 feet bgs, a concentration of 2.5 µg/L between 53.5 and 58.5 feet bgs, and a concentration of 9.6 µg/L between 60 and 65 feet bgs. As shown in the boring log for GM-35B-2 (Appendix B), the 1,4-D concentration exceeding the action level at this location appears to be associated with an approximately 4 foot thick, fine- to medium-grained well sorted sand layer, bounded above and below by clay.

Soil boring GM-35B-3 is located approximately 78 feet north of soil boring GM-35B-2, and adjacent to the former liquid waste burner. VAP groundwater samples collected between 28 and 57 feet bgs at this location show 1,4-D concentrations less than 2 µg/L.

Considered collectively, these results indicate that 1,4-D concentrations exceeding the action level in upper aquifer groundwater in the area of monitoring well GM-35 are limited in both lateral and vertical extent. Based on this investigation, there is not evidence that 1,4-D concentrations in this area are related to the former liquid waste burner.

VAP groundwater samples were collected in the upper aquifer at soil borings PSA-11 and PSA-22, located in the process sump area (PSA; Table D-3). At PSA-11, between 28 and 33 feet bgs the 1,4-D concentration was less than the 2 µg/L LRL, between 43 and 48 feet bgs an estimated 1,4-D concentration of 1.7 J was measured, and between 59 and 64 feet bgs a 1,4-D concentration of 5.1 µg/L was measured. Between 60 and 65 feet bgs at PSA-22, a 1,4-D concentration of 29 µg/L was measured, and between 65 and 70 feet bgs a concentration of 1.5 µg/L was measured. There are not upper aquifer monitoring wells installed in the immediate vicinity of these soil borings. However, upper aquifer 1,4-D concentrations are delineated to less than 2 µg/L at upgradient monitoring well GM-76S (October 2014) and at downgradient monitoring well GM-59 (October 2014).

### 4.1.2 1,4-D in the Lower Aquifer

During the August 2015 sampling event, measured 1,4-D concentrations in lower aquifer monitoring wells were between an estimated concentration of 0.78 J and 46 µg/L, in wells GM-74D and HR-12, respectively. During this monitoring event, the maximum lower aquifer 1,4-D concentration was measured at the furthest upgradient monitoring well sampled (HR-12). Both HR-12 and monitoring well RMW-88, where a 1,4-D concentration of 29 µg/L was measured, were sampled with the objective of characterizing upgradient plume stability and to understand the potential contribution of upgradient, offsite 1,4-D sources to the lower aquifer plume. Neither of these wells were previously sampled for 1,4-D. Based on the historically documented hydraulic gradient at the Site, from the northeast toward the southwest and extraction well DN-13, it appears that 1,4-D is migrating onsite from an offsite source at concentrations of approximately 30 to 50 µg/L.

Monitoring well GM-7R was sampled to monitor a moderate 1,4-D concentration measured in June 2015 (9.3 µg/L), and a consistent concentration (14 µg/L) was measured in August 2015. Monitoring wells GM-11 and GM-15 were sampled to delineate 1,4-D concentrations and begin to evaluate plume stability downgradient of GM-7R and upgradient of the extraction well DN-13. Concentrations of 1,4-D at these wells were less than 2 µg/L and 2.8 µg/L, respectively.

Monitoring well HR-13 was sampled to monitor a moderate 1,4-D concentration measured in June 2015 (20 µg/L), and a consistent concentration (16 µg/L) was measured in August 2015. Monitoring well HR-14 was sampled to delineate 1,4-D concentrations west of HR-13 and a concentration of 11 µg/L was measured. Monitoring well MW-76D was sampled to delineate 1,4-D concentrations upgradient and sidegradient of monitoring wells HR-13 and GM-61 and a concentration of 7.8 µg/L was measured.

Monitoring well GM-61 was sampled to monitor a moderate 1,4-D concentration measured in June 2015 (22 µg/L), and a consistent concentration (26 µg/L) was measured in August 2015. Monitoring well GM-67D was sampled to delineate 1,4-D concentrations north of GM-61, and a concentration of 33 µg/L was measured. Monitoring well GM-75D was sampled to delineate 1,4-D concentrations east of GM-61, and a concentration of 31 µg/L was measured. As discussed below, soil borings PSA-22 and PSA-23 were advanced and VAP groundwater samples were collected to further characterized 1,4-D concentrations in the PSA cross-gradient and upgradient of monitoring wells GM-61, GM-67D, and GM-75D. Monitoring well GM-74D was sampled to delineate 1,4-D concentrations downgradient of the PSA and monitoring well GM-61, and a concentration of 0.78 J µg/L was measured. Monitoring well RMW-87 is located southwest (downgradient) of areas in the northern portion of the Site where moderate 1,4-D concentrations have been measured in groundwater, and was sampled in an effort to delineate 1,4-D concentrations in this direction. The 1,4-D concentration measured at RMW-87 was 29 µg/L.

VAP groundwater samples were collected in the lower aquifer at soil borings PSA-22 and PSA-23, located in the PSA (Table D-3). At soil boring PSA-22, VAP groundwater samples showed concentrations between 26 and 32 µg/L between 80 and 130 feet bgs. At soil boring PSA-23, the VAP groundwater sample collected between 70 and 75 feet bgs showed a 1,4-D an estimated concentration of 1.1 J µg/L, while samples collected between 89 and 139 feet bgs showed concentrations between 21 to 31 µg/L. These concentrations are consistent with those measured in lower aquifer monitoring wells in this area.

### 4.1.3 Summary of 1,4-D Delineation and Characterization in Groundwater

During the August 2015 sampling event, 12 upper aquifer and 13 lower aquifer monitoring wells were sampled. In the upper aquifer, 1,4-D concentrations are delineated to the 4.6 µg/L action level in the areas surrounding monitoring wells GM-16 and GM-8, where low to moderate concentrations greater than the action level have been measured. Upper aquifer 1,4-D concentrations are also delineated in the immediate vicinity of GM-35, where the maximum 1,4-D concentrations have been measured. In the lower aquifer, 1,4-D impacted groundwater is migrating onsite from the northeast. Concentrations of 1,4-D migrating onto the site are not fully delineated to the action level at the Site, although concentrations appear to decrease with distance downgradient, from north to south. In the southern area of the Site, low to moderate 1,4-D concentrations greater than the action level at monitoring well GM-7R are delineated by downgradient monitoring wells GM-15 and GM-11.

## 4.2 Microbial Genetics

Relevant gene (DNA) and gene transcript (mRNA) copy numbers were quantified from each of the 14 Bio-Trap® samplers deployed at the Site between August and October, 2015 (Table D-5). DNA and mRNA are biological molecules that contain valuable information for identifying members of microbial communities, and determining if specific types of biodegradation processes are likely active. This information is present in the form of genes, subunits of DNA that contain the information needed to perform specific biological processes. When microorganisms express particular genes, specific types of enzymes are produced, and these enzymes mediate degradation reactions. Quantification of the number of copies of particular genes (DNA), provides confirmation that the community has the genetic capacity to produce specific enzymes. Quantification of the number of gene transcripts (mRNA), provides evidence that the microbial community is actively expressing genes of interest to produce enzymes implicated in particular biodegradation reactions.

Monooxygenase enzymes have been linked to both metabolic and cometabolic 1,4-D biodegradation. When a substrate is degraded metabolically, it is used for cell maintenance and growth. Microorganisms able to metabolically oxidize 1,4-D using DXMO have been discovered (Gedalanga et al. 2014; Li et al. 2014). When enzymes produced for the purpose of catalyzing metabolic degradation have relaxed substrate specificity, as many monooxygenase enzymes do, they may cometabolize compounds that are not specifically targeted for microbial energy or biomass purposes (Hazen 2010). There is evidence that the following groups of microorganisms have the capacity to mediate 1,4-D cometabolism (Mahendra and Alvarez-Cohen 2006):

- Methane oxidizing bacteria (methanotrophs) producing SMMO.
- Propane oxidizing bacteria (propanotrophs) producing PPO.
- Toluene oxidizing bacteria producing RMO and RDEG.

In this investigation, DNA and mRNA for the gene encoding DXMO were not detected above the LRL of $2.5x10^2$ cells per bead and transcript copies per bead, respectively. DNA results indicate that methanotrophs with the capability to produce SMMO are present, with this gene target detected in each of the 14 Bio-Trap® samplers at concentrations between 7.86 $x10^2$ to 3.73 $x10^4$ cells per bead. However, this gene was not expressed by the methanotrophic community during the Bio-Trap® deployment (all results less than the LRL of $2.5x10^2$ transcript copies bead). Because dissolved propane was detected in groundwater at monitoring well GM-08 (0.11 µg/L), PPO was analyzed at this location. Results indicate that the microbial community has the capacity to produce the PPO enzyme (DNA: $2.84x10^2$ cells per bead), however the gene was not expressed during the Bio-Trap® deployment (less $2.5x10^2$ transcript copies bead). Because dissolved toluene was detected in groundwater at monitoring well GM-30, RMO and RDEG were analyzed at this location. Results indicate that the microbial community has the capacity to produce RMO and RDEG with DNA concentrations indicating $2.53x10^4$ and 5.32 $x10^2$ cells per bead, respectively. Additionally, there is evidence for a low level of expression of the RDEG gene at this location with an estimated mRNA concentration of approximately 44 cells per bead.

The activity of the total Eubacterial community was assessed based on mRNA expression of a key phylogenetic gene sequence characteristic this broad group. Based on this analysis, the Eubacterial community is active with between $6.04x10^5$ and $3.84x10^6$ gene transcripts per bead. The positive mRNA

expression by the Eubacterial community is presented as a quality control check to confirm the significance of the mRNA results for the monooxygenase enzymes. The positive Eubacterial mRNA data and non-detect SMMO gene transcripts demonstrate that the monooxygenase data is valid, as opposed to representing a false negative associated with the lab methodology.

It is likely that the combination of relatively low DO concentrations and a relatively short residence time for groundwater at the Site contribute to the absence of robust methanotrophic expression of SMMO, in addition to other unidentified factors. Even in the absence of expression, the presence of this gene suggests that it may be possible to stimulate cometabolism by methanotrophs.

## 4.3 Soil

Soil samples were collected in November and December 2015 in two areas:

- The area surrounding monitoring well GM-35, and near the former liquid waste burner, where maximum 1,4-D concentrations have been measured in groundwater in the upper aquifer. Soil borings GM-35B-1, GM-35B-2, GM-35B-3, GM-35B-4.
- The PSA, where moderate 1,4-D concentrations have been measured in groundwater in the lower aquifer. Soil borings PSA-11 and PSA-22.

As shown in Table D-4, 1,4-D concentrations were below LRL in each of the soil samples collected. Soil samples collected between 8 and 28 feet bgs at soil boring GM-35B-1, between 8 and 28 feet bgs at soil boring GM-35B-2, between ground surface and 28 feet bgs at soil boring GM-35B-3, and between 8 and 40 feet bgs at soil boring PSA-22 had 1,4-D concentrations less than LRL between 5.1 and 6.3 micrograms per kilogram (µg/kg). Soil samples collected between ground surface and 2 feet bgs at soil borings GM-35B-1, GM-35B-2, and GM-35B-4 and at three depth intervals between ground surface and 28 feet bgs at soil boring PSA-11 had 1,4-D concentrations less than the LRL between 200 and 250 µg/kg. At PSA-11, the 1,4-D concentration in the soil sample collected between 52 and 54 feet bgs was less than 130,000 µg/kg.

Based on these results, there is not evidence that surface and vadose zone soils are a source of 1,4-D to groundwater in the vicinity of Site maximum 1,4-D concentrations measured in groundwater in the upper and lower aquifers.

# 5 IDENTIFIED DATA GAPS

The investigation described herein provided 1,4-D delineation in the upper aquifer. This investigation also provided valuable information regarding the absence of 1,4-D impacts to soil in key locations at the Site, and the absence of detectable expression of genes relevant to potential biodegradation processes. However, data gaps remain, and include:

- The origin of maximum 1,4-D concentrations in upper aquifer in vicinity of monitoring well GM-35, and other potential onsite source areas for 1,4-D in upper and lower aquifers,
- The origin and magnitude of the identified potential upgradient, offsite 1,4-D source, and
- The relationship between the lower aquifer upgradient 1,4-D source and groundwater concentrations measured in the lower aquifer onsite.

# 6 SUMMARY AND CONCLUSIONS

Results of this stage of 1,4-D Site investigation activities provide insight into the distribution of 1,4-D concentrations at the Site, including: delineation to the action level in the upper aquifer, and identification of an apparent offsite 1,4-D source in the lower aquifer emanating from the hydraulic upgradient direction (northwest). Microbial genetics results suggest that 1,4-D attenuation in groundwater is primarily a physical process. Soil sampling results indicate that soil is not an identified source of 1,4-D to groundwater in two key areas of the Site: adjacent to monitoring well GM-35, and the former liquid waste burner, and in the PSA. However, data gaps remain regarding the origins of 1,4-D concentrations in Site groundwater and full delineation to the groundwater action level in the lower aquifer.

# 7 REFERENCES

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# TABLES

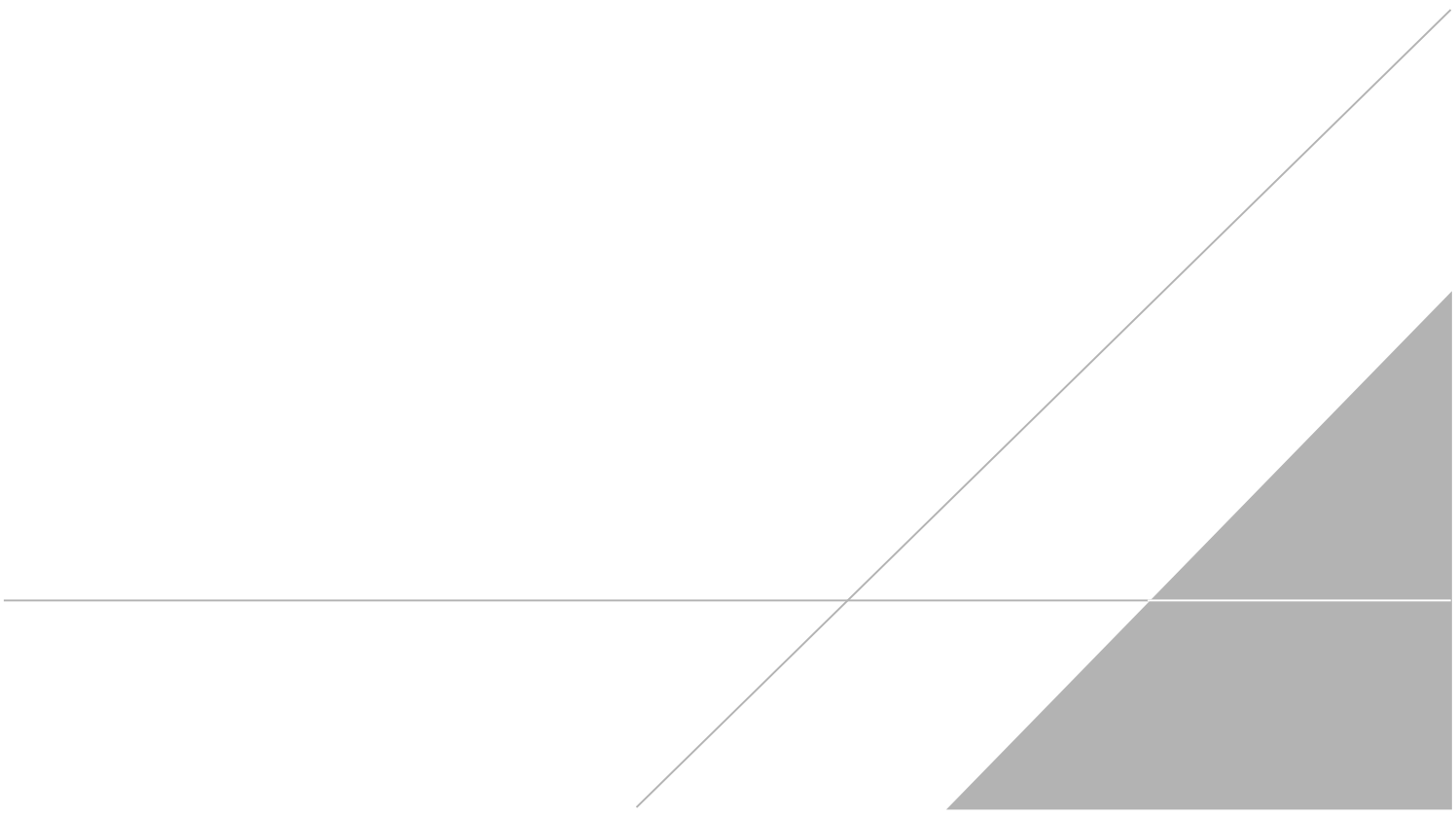


**Table D-1**
**Summary of 1,4-Dioxane Investigation Sampling**
**1,4-Dioxane Evaluation Report**
**RACER Trust**
**Moraine, Ohio**

ARCADIS Design & Consultancy for natural and built assets

| Monitoring Well Sampling | | | | | | |
|---|---|---|---|---|---|---|
| Well ID | Aquifer | October 2014 1,4-D Sampling | June 2015 1,4-D Sampling | August 2015 1,4-D Sampling | August 2015 LHG & VOC Sampling | August through October 2015 Bio-Trap® Deployment |
| GM-8 | U | X | X | X | X | X |
| GM-10 | U | | X | | | |
| GM-16 | U | X | X | X | X | X |
| GM-17 | U | | X | | | |
| GM-18 | U | | X | | | |
| GM-19S | U | | | X | X | |
| GM-2 | U | | X | | | |
| GM-21 | U | X | X | | | |
| GM-23 | U | X | | | | |
| GM-29 | U | X | | | | |
| GM-30 | U | | | X | X | X |
| GM-31 | U | X | | | | |
| GM-33 | U | | | X | X | |
| GM-35 | U | | X | X | X | X |
| GM-37 | U | | | X | X | |
| GM-48 | U | | X | | | |
| GM-50 | U | | X | | | |
| GM-51 | U | | X | | | |
| GM-52 | U | | X | X | X | X |
| GM-55 | U | | X | | | |
| GM-59 | U | X | | | | |
| GM-60 | U | X | | | | |
| GM-63 | U | | X | | | |
| GM-65S | U | | X | | | |
| GM-66 | U | | | X | X | X |
| GM-75S | U | X | | | | |
| GM-78 | U | | X | | | |
| GM-79 | U | | X | | | |
| GM-80 | U | | X | | | |
| GM-81 | U | | X | | | |
| HR-16 | U | | X | X | X | X |
| HR-17 | U | | X | | | |
| W-1-N | U | X | | X | X | X |
| W-3-S | U | | X | | | |
| GM-11 | L | | | X | X | |
| GM-13 | L | | X | | | |
| GM-15 | L | | X | X | X | X |
| GM-61 | L | | X | X | X | X |
| GM-65D | L | | X | | | |
| GM-67D | L | | | X | X | |
| GM-74D | L | | | X | X | |
| GM-75D | L | | | X | X | |
| GM-76D | L | | | X | X | |
| GM-7R | L | | X | X | X | X |
| HR-12 | L | | | X | X | |
| HR-13 | L | | X | X | X | X |
| HR-14 | L | | | X | X | |
| RMW-86 | L | | X | | | |
| RMW-87 | L | | | X | X | X |
| RMW-88 | L | | | X | X | X |

| Vertical Aquifer Profile Groundwater Sampling | | |
|---|---|---|
| Location ID | Sampling Date | Depth Interval Sampled (ft bgs) |
| GM-35B-1 | 12/10/2015 | 28-33 |
| GM-35B-1 | 12/10/2015 | 45-50 |
| GM-35B-1 | 12/11/2015 | 56-61 |
| GM-35B-1 | 12/12/2015 | 63-68 |
| GM-35B-2 | 12/8/2015 | 30-35 |
| GM-35B-2 | 12/8/2015 | 45-50 |
| GM-35B-2 | 12/9/2015 | 53.5-58.5 |
| GM-35B-2 | 12/9/2015 | 60-65 |
| GM-35B-3 | 12/29/2015 | 28-33 |
| GM-35B-3 | 12/29/2015 | 45-50 |
| GM-35B-3 | 12/29/2015 | 52-57 |
| PSA-22 | 12/15/2015 | 60-65 |
| PSA-22 | 12/17/2015 | 65-70 |
| PSA-22 | 12/18/2015 | 80-85 |
| PSA-22 | 12/18/2015 | 95-100 |
| PSA-22 | 12/19/2015 | 110-115 |
| PSA-22 | 12/19/2015 | 125-130 |
| PSA-23 | 11/18/2015 | 70-75 |
| PSA-23 | 11/19/2015 | 89-94 |
| PSA-23 | 11/19/2015 | 104-109 |
| PSA-23 | 11/19/2015 | 119-124 |
| PSA-23 | 11/20/2015 | 134-139 |
| PSA-11 | 12/29/2014 | 28-33 |
| PSA-11 | 12/29/2014 | 13-48 |
| PSA-11 | 12/30/2014 | 29-64 |

| Soil Sampling | | |
|---|---|---|
| Location ID | Sampling Date | Depth Interval Sampled (ft bgs) |
| GM-35B-1 | 11/12/2015 | 0-2 |
| GM-35B-1 | 12/10/2015 | 8-10 |
| GM-35B-1 | 12/10/2015 | 20-22 |
| GM-35B-1 | 12/10/2015 | 26-28 |
| GM-35B-2 | 11/12/2015 | 0-2 |
| GM-35B-2 | 12/7/2015 | 8-10 |
| GM-35B-2 | 12/7/2015 | 26-28 |
| GM-35B-3 | 12/10/2015 | 0-2 |
| GM-35B-3 | 12/29/2015 | 8-10 |
| GM-35B-3 | 12/29/2015 | 26-28 |
| PSA-22 | 12/14/2015 | 8-10 |
| PSA-22 | 12/14/2015 | 24-26 |
| PSA-22 | 12/14/2015 | 36-38 |
| PSA-22 | 12/14/2015 | 38-40 |
| PSA-11 | 10/29/2014 | 0-2 |
| PSA-11 | 12/29/2014 | 18-20 |
| PSA-11 | 12/29/2014 | 26-28 |
| PSA-11 | 12/29/2014 | 52-54 |

**Notes:**
1,4-D - 1,4-Dioxane.
LHG - Light hydrocarbon gas.
VOC - Volatile organic compounds.
ft bgs - Feet below ground surface.
U - Upper aquifer monitoring well.
L - Lower aquifer monitoring well.

**Table D-2**
**August 2015 Groundwater Sampling Results**
**1,4-Dioxane Report**
**RACER Trust**
**Moraine, Ohio**

| | Rationale for 1,4-D Sampling | Location ID | Date | 1,4-D | Methane | Propane | Toluene |
|---|---|---|---|---|---|---|---|
| | | | | µg/L | | | |
| Upper Aquifer | Moderate 1,4-D concentrations measured during previous sampling events | GM-8 | 8/25/2015 | **25** | 2200 | 0.11 | < 1.0 U |
| | Variable 1,4-D concentrations measured during previous sampling events | GM-16 | 8/25/2015 | **10** | 690 | 0.042 J | < 1.0 U |
| | Downgradient delineation of elevated 1,4-D concentrations measured at GM-35 in June 2015 | GM-19S | 8/24/2015 | < 2.0 U | 740 | 0.010 J | < 1.0 U |
| | Delineation of 1,4-D near former oil house building 7 | GM-30 | 8/26/2015 | 1.1 J | 24,000 | < 0.10 U | 0.65 J |
| | Upgradient delineation of elevated 1,4-D concentrations measured at GM-35 in June 2015 | GM-33 | 8/24/2015 | < 2.0 U | 0.31 J | 0.0044 J | < 1.0 U |
| | Confirmation of elevated 1,4-D concentrations measured in June 2015 | GM-35 | 8/25/2015 | **590** | 5200 | < 0.10 U | < 100 U |
| | Upgradient delineation of elevated 1,4-D concentrations measured at GM-35 in June 2015 | GM-37 | 8/24/2015 | 0.51 J | 0.18 J | < 0.10 U | < 1.0 U |
| | Characterization of plume stability at downgradient fringe | GM-52 | 8/25/2015 | 0.90 J | 0.076 J | < 0.10 U | < 1.0 U |
| | Delineation of 1,4-D in mid-site area between northern and southern RZ | GM-66 | 8/26/2015 | **6.4** | 60 | 0.028 J | < 1.0 U |
| | Characterization of plume stability at downgradient fringe | HR-16 | 8/25/2015 | 3.0 | 0.24 J | < 0.10 U | < 1.0 U |
| | | HR-16 (FD) | 8/25/2015 | 3.0 | 0.21 J | 0.0046 J | < 1.0 U |
| | Characterization of plume stability at upgradient fringe | W-1-N | 8/26/2015 | 1.2 J | 0.25 J | < 0.10 U | < 1.0 U |
| Lower Aquifer | Downgradient delineation of 1,4-D | GM-11 | 8/24/2015 | < 2.0 U | 0.045 J | < 0.10 U | < 1.0 U |
| | | GM-11 (FD) | 8/24/2015 | < 2.0 U | < 0.50 U | < 0.10 U | < 1.0 U |
| | Characterization of plume stability at downgradient fringe | GM-15 | 8/25/2015 | 2.8 | 670 | 0.030 J | < 1.0 U |
| | Monitoring of moderate 1,4-D concentrations measured during June 2015 sampling event | GM-61 | 8/26/2015 | **26** | 18 | 0.024 J | < 1.0 U |
| | Characterization of 1,4-D concentrations between wells GM-61 and HR-12 | GM-67D | 8/24/2015 | **33** | 21 | 0.018 J | < 1.0 U |
| | Delineation of 1,4-D concentrations downgradient of GM-61 | GM-74D | 8/24/2015 | 0.78 J | 0.66 | < 0.10 U | < 1.0 U |
| | Delineation of 1,4-D concentrations side-gradient of GM-61 | GM-75D | 8/25/2015 | **31** | 20 | 0.011 J | < 1.0 U |
| | Delineation of 1,4-D concentrations side-gradient of HR-13 | GM-76D | 8/24/2015 | **7.8** | 1.1 | < 0.10 U | < 1.0 U |
| | Monitoring of moderate 1,4-D concentrations measured in southern plume during June 2015. | GM-7R | 8/25/2015 | **14** | 2.6 | < 0.10 U | < 1.0 U |
| | Characterization of plume stability at upgradient fringe | HR-12 | 8/24/2015 | **46** | 24 | < 0.10 U | < 1.0 U |
| | Monitoring of moderate 1,4-D concentrations measured during June 2015 sampling event | HR-13 | 8/26/2015 | **16** | 50 | < 0.10 U | < 1.0 U |
| | Delineation of 1,4-D concentrations side-gradient of HR-13 | HR-14 | 8/26/2015 | **11** | 5.7 | < 0.10 U | < 1.0 U |
| | Characterization of plume stability at downgradient fringe | RMW-87 | 8/26/2015 | **29** | 9.2 | 0.025 J | < 1.0 U |
| | Characterization of plume stability at upgradient fringe | RMW-88 | 8/26/2015 | **29** | 19 | 0.028 J | < 1.0 U |

**Notes:**
1,4-D - 1,4-Dioxane.
RZ - Reactive Zone.
FD - Field duplicate sample.
J - Estimated concentration greater than the method detection limit, but less than the laboratory reporting limit.
< - Concentration is less than the laboratory reporting limit noted.
U - Non-detect less than the laboratory reporting limit.
µg/L - micrograms per liter.
**Bold** - Concentration is greater than the 4.6 µg/L action level.

**Table D-3**
**1,4-Dioxane Concentrations in**
**Vertical Aquifer Profile Groundwater Samples**
**1,4-Dioxane Evaluation Report**
**RACER Trust**
**Moraine, Ohio**

| Location ID | Date | Depth Interval | 1,4-Dioxane |
|---|---|---|---|
| | | feet bgs | µg/L |
| GM-35B-1 | 12/10/2015 | 28-33 | < 2.0 U |
| GM-35B-1 | 12/10/2015 | 45-50 | < 2.0 U |
| GM-35B-1 | 12/11/2015 | 56-61 | **82** |
| GM-35B-1 | 12/12/2015 | 63-68 | **570** |
| | | | |
| GM-35B-2 | 12/8/2015 | 30-35 | < 2.0 U |
| GM-35B-2 | 12/8/2015 | 45-50 | < 2.0 U |
| GM-35B-2 | 12/9/2015 | 53.5-58.5 | 2.5 |
| GM-35B-2 | 12/9/2015 | 60-65 | **9.6** |
| | | | |
| GM-35B-3 | 12/29/2015 | 28-33 | < 2.0 U |
| GM-35B-3 | 12/29/2015 | 45-50 | 0.69 JB |
| GM-35B-3 | 12/29/2015 | 52-57 | 1.0 JB |
| | | | |
| PSA-11 | 12/29/2014 | 28-33 | < 2.0 U |
| PSA-11 | 12/29/2014 | 43-48 | 1.7 J |
| PSA-11 | 12/30/2014 | 59-64 | **5.1** |
| | | | |
| PSA-22 | 12/15/2015 | 60-65 | **29** |
| PSA-22 | 12/17/2015 | 65-70 | 1.5 J |
| PSA-22 | 12/18/2015 | 80-85 | **30** |
| PSA-22 | 12/18/2015 | 95-100 | **32** |
| PSA-22 | 12/19/2015 | 110-115 | **31** |
| PSA-22 | 12/19/2015 | 125-130 | **26** |
| | | | |
| PSA-23 | 11/18/2015 | 70-75 | 1.1 J |
| PSA-23 | 11/19/2015 | 89-94 | **31** |
| PSA-23 | 11/19/2015 | 104-109 | **23** |
| PSA-23 | 11/19/2015 | 119-124 | **21** |
| PSA-23 | 11/20/2015 | 134-139 | **28** |

**Notes:**
bgs - Below ground surface.
µg/L - Micrograms per liter.
J - Estimated concentration greater than the method detection limit, but less than the laboratory reporting limit.
B - Constituent detected in trip blank sample.
< - Concentration is less than the laboratory reporting limit noted.
U - Non-detect less than the laboratory reporting limit.

**Table D-4**
**1,4-Dioxane Concentrations in Soil Samples**
**1,4-Dioxane Evaluation Report**
**RACER Trust**
**Moraine, Ohio**

| Location ID | Date | Depth Interval | 1,4-Dioxane |
|---|---|---|---|
| | | feet bgs | µg/kg |
| GM-35B-1 | 11/12/2015 | 0-2 | <230 U[1] |
| GM-35B-1 | 12/10/2015 | 8-10 | < 6.0 U |
| GM-35B-1 | 12/10/2015 | 20-22 | < 5.5 U |
| GM-35B-1 | 12/10/2015 | 26-28 | < 5.2 U |
| | | | |
| GM-35B-2 | 11/12/2015 | 0-2 | <250 U[1] |
| GM-35B-2 | 12/7/2015 | 8-10 | < 6.3 U |
| GM-35B-2 | 12/7/2015 | 26-28 | < 5.4 U |
| | | | |
| GM-35B-3 | 12/10/2015 | 0-2 | < 5.6 U |
| GM-35B-3 | 12/29/2015 | 8-10 | < 5.6 U |
| GM-35B-3 | 12/29/2015 | 26-28 | < 5.7 U |
| | | | |
| GM-35B-4 | 11/12/2015 | 0-2 | < 230 U[1] |
| | | | |
| PSA-11 | 10/29/2014 | 0-2 | < 230 U[1] |
| PSA-11 | 12/29/2014 | 18-20 | < 220 U[1] |
| PSA-11 | 12/29/2014 | 26-28 | < 200 U[1] |
| PSA-11 | 12/29/2014 | 52-54 | < 130,000 U[1] |
| | | | |
| PSA-22 | 12/14/2015 | 8-10 | < 5.3 U |
| PSA-22 | 12/14/2015 | 24-26 | < 5.1 U |
| PSA-22 | 12/14/2015 | 36-38 | < 5.5 U |
| PSA-22 | 12/14/2015 | 38-40 | < 5.6 U |

**Notes:**
bgs - Below ground surface.
µg/kg - Micrograms per kilogram.
< - Concentration is less than the laboratory reporting limit noted.
U - Non-detect less than the laboratory reporting limit.
U[1] - Analyzed using Method 8260B rather than 8260B-SIM.

Table D-5
Microbial Genetics Results with Supporting Biogeochemical Data
1,4-Dioxane Evaluation Report
RACER Trust
Moraine, Ohio

| Well ID | Aquifer | 1,4-D Concentration (µg/L) | Methane Concentration (µg/L) | DO Concentration (mg/L) | Propane Concentration (µg/L) | Toluene Concentration (µg/L) | Gene Target | DNA Results (cells/bead) | mRNA Results (transcript copies/bead) |
|---|---|---|---|---|---|---|---|---|---|
| GM-8 | U | 25 | 2,200 | 0.32 | 0.11 | < 1.0 U | SMMO | **1.31E+04** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | PPO | **2.84E+02** | < 2.5E+02 |
| | | | | | | | EBAC | **--** | **6.84E+05** |
| GM-16 | U | 10 | 690 | 0.37 | 0.042 J | < 1.0 U | SMMO | **1.40E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **6.29E+05** |
| GM-30 | U | 1.1 J | 24,000 | 0.27 | < 0.10 U | 0.65 J | SMMO | **8.04E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | RDEG | **2.53E+04** | **4.37E+01 J** |
| | | | | | | | RMO | **5.32E+02** | < 2.5E+02 |
| | | | | | | | EBAC | **--** | **6.86E+05** |
| GM-35 | U | 590 | 5,200 | 0.28 | < 0.10 U | < 100 U | SMMO | **3.59E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **1.04E+06** |
| GM-52 | U | 0.90 J | 0.076 J | 4.00 | < 0.10 U | < 1.0 U | SMMO | **1.55E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | **--** | **7.30E+05** |
| GM-66 | U | 6.4 | 60 | 0.43 | 0.028 J | < 1.0 U | SMMO | **6.44E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **6.78E+05** |
| HR-16 | U | 3.0 | 0.24 J | 0.44 | < 0.10 U | < 1.0 U | SMMO | **3.41E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | **--** | **6.04E+05** |
| W-1-N | U | 1.2 J | 0.25 J | 0.36 | < 0.10 U | < 1.0 U | SMMO | **2.44E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **7.31E+05** |
| GM-15 | L | 2.8 | 670 | 0.24 | 0.030 J | < 1.0 U | SMMO | **7.86E+02** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | **--** | **8.40E+05** |
| GM-61 | L | 26 | 18 | 0.35 | 0.024 J | < 1.0 U | SMMO | **3.95E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **6.37E+05** |
| GM-7R | L | 14 | 2.6 | 0.27 | < 0.10 U | < 1.0 U | SMMO | **4.93E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | **--** | **7.34E+05** |
| HR-13 | L | 16 | 50 | 3.18 | < 0.10 U | < 1.0 U | SMMO | **3.73E+04** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | **--** | **3.84E+06** |
| RMW-87 | L | 29 | 9.2 | 0.44 | 0.025 J | < 1.0 U | SMMO | **6.98E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **6.54E+05** |
| RMW-88 | L | 29 | 19 | 0.35 | 0.028 J | < 1.0 U | SMMO | **6.52E+03** | < 2.50E+02 |
| | | | | | | | DXMO | < 2.50E+02 | < 2.50E+02 |
| | | | | | | | EBAC | -- | **6.90E+05** |

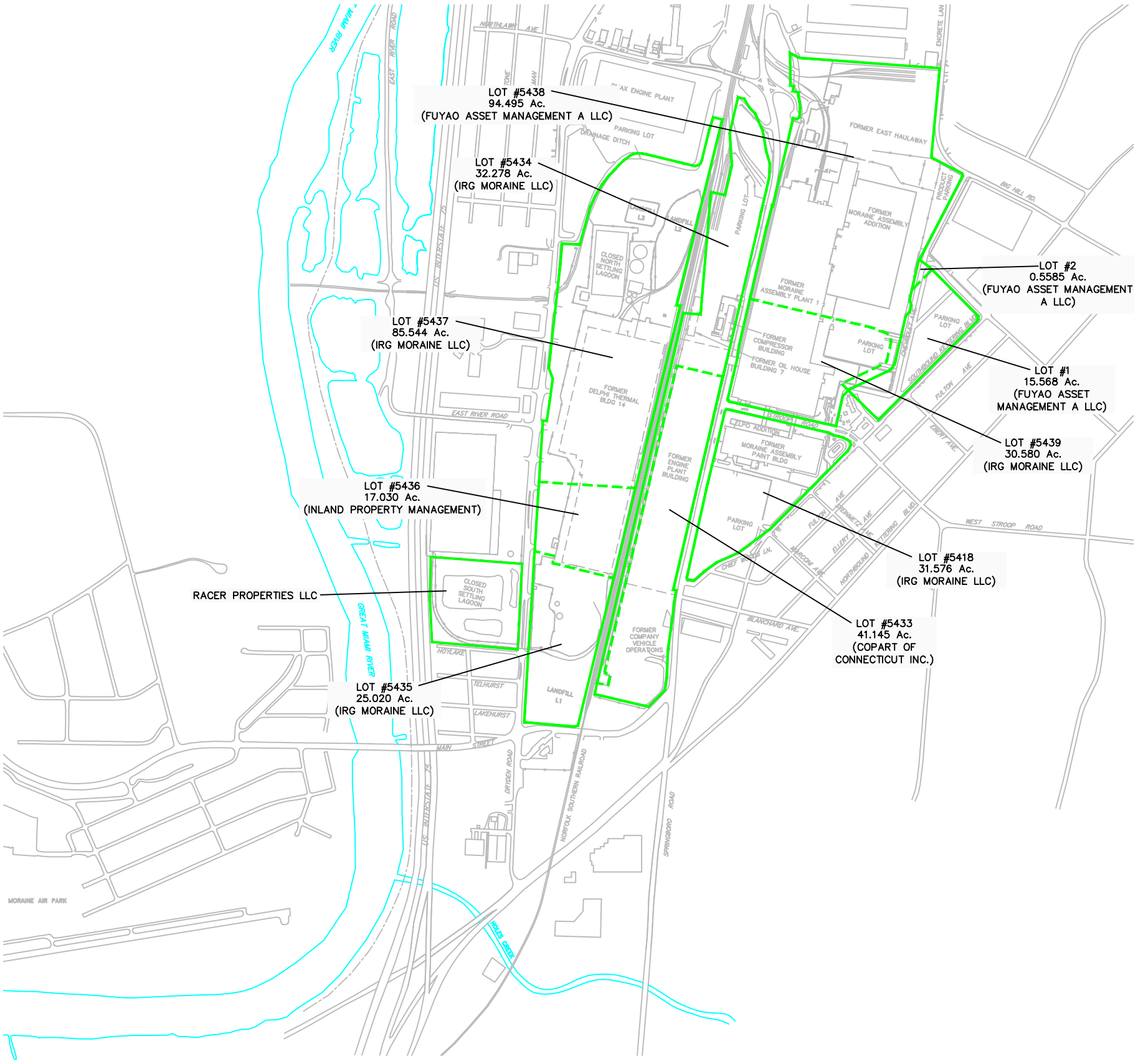
**Notes:**

(1) Not all monitoring wells sampled for 1,4-D in October 2014, June 2015, and August 2015 are presented in this table, only wells where Bio-Trap® samplers were deployed.
(2) Concentrations of methane, 1,4-D, propane, and toluene measured from samples collected between August 24 and 26, 2015.
(3) Bio-Trap® samplers deployed between August 25 and 26, 2015, and retrieved on October 19, 2015.
(4) DO concentrations measured on October 19, 2015 using a downhole optical sensor.

1,4-D - 1,4-Dioxane.
DO - Dissolved oxygen.
µg/L - Micrograms per liter.
mg/L - milligrams per liter.
U - Upper aquifer monitoring well.
L - Lower aquifer monitoring well.
SMMO - Gene encoding soluble methane monooxygenase enzymes.
DXMO - Gene encoding a dioxane monooxygenase enzyme.
PPO - Gene encoding a propane monooxygenase enzyme.
RDEG - Gene encoding a toluene monooxygenase enzyme.
RMO - Gene encoding a toluene monooxygenase enzyme.
EBAC - Total Eubacteria.
**Bold -** Quantified result greater than the method detection limit.
< - less than the laboratory reporting limit noted.
J - Estimated concentration greater than the method detection limit, but less than the laboratory reporting limit.
U - Non-detect less than the laboratory reporting limit.

# FIGURES

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-00.dwg LAYOUT: FIG 1 SITE LAYOUT SAVED: 2/26/2016 9:21 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/26/2016 3:55 PM BY: SMITH, BOB




**LEGEND**

- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE

RACER TRUST
MORAINE, OHIO

OH000294.2016

# SITE LAYOUT

ARCADIS Design & Consultancy for natural and built assets

FIGURE
D-1

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-10.dwg LAYOUT: 1-4-DIOXANE-SAMPLING (2) SAVED: 2/26/2016 11:37 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/29/2016 12:58 PM BY: SMITH, BOB

| PSA-11 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | SOIL | | | | GROUNDWATER | | |
| | 10/29/14 | 10/29/14 | 10/29/14 | 10/29/14 | 10/29/14 | 10/29/14 | 10/29/14 |
| | 0-2' | 18-20' | 26-28' | 52-54' | 28-33' | 43-48' | 59-64' |
| 1,4-Dioxane | <230 | <200 | <220 | <130,000 | <2.0 U | 1.7 J | 5.1 |

| PSA-23 | | | | | |
|---|---|---|---|---|---|
| | GROUNDWATER | | | | |
| | 11/18/15 | 11/19/15 | 11/19/15 | 11/19/15 | 11/20/15 |
| | 70-75' | 89-94' | 104-109' | 119-124' | 134-139' |
| 1,4-Dioxane | 1.1 J | 31 | 23 | 21 | 28 |

| PSA-22 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SOIL | | | | GROUNDWATER | | | | | |
| | 12/14/15 | 12/14/15 | 12/14/15 | 12/14/15 | 12/15/15 | 12/17/15 | 12/18/15 | 12/18/15 | 12/19/15 | 12/19/15 |
| | 8-10' | 24-26' | 36-38' | 38-40' | 60-65' | 65-70' | 80-85' | 95-100' | 110-115' | 125-130' |
| 1,4-Dioxane | < 5.3 U | < 5.1 U | < 5.5 U | < 5.6 U | 29 | 1.5 J | 30 | 32 | 31 | 26 |

| W-1-N | | |
|---|---|---|
| | 10/8/14 | 8/26/15 |
| 1,4-Dioxane | 0.96 J | 1.2 J |

| GM-29 | |
|---|---|
| | 10/9/14 |
| 1,4-Dioxane | < 2.0 U |

| GM-30 | |
|---|---|
| | 8/26/15 |
| 1,4-Dioxane | 1.1 J |

| GM-23 | |
|---|---|
| | 10/10/14 |
| 1,4-Dioxane | 0.87 J |

| GM-67D | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | 33 |

| RMW-88 | |
|---|---|
| | 8/26/15 |
| 1,4-Dioxane | 29 |

| HR-14 | |
|---|---|
| | 8/26/15 |
| 1,4-Dioxane | 11 |

| HR-13 | | |
|---|---|---|
| | 6/30/15 | 8/26/15 |
| 1,4-Dioxane | **20** | **16** |

| GM-76D | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | 7.8 |

| GM-75D | |
|---|---|
| | 8/25/15 |
| 1,4-Dioxane | 31 |

| HR-12 | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | 46 |

| GM-61 | | |
|---|---|---|
| | 6/26/15 | 8/26/15 |
| 1,4-Dioxane | 22 | 26 |

| GM-59 | |
|---|---|
| | 10/10/14 |
| 1,4-Dioxane | < 2.0 U |

| GM-75S | |
|---|---|
| | 10/9/14 |
| 1,4-Dioxane | < 2.0 U |

| RMW-87 | |
|---|---|
| | 8/26/15 |
| 1,4-Dioxane | **29** |

| GM-66 | |
|---|---|
| | 8/26/15 |
| 1,4-Dioxane | **6.4** |

| GM-60 | |
|---|---|
| | 10/9/14 |
| 1,4-Dioxane | 1.3 J |

| GM-74D | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | 0.78 J |

| GM-19S | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | < 2.0 |

| HR-17 | |
|---|---|
| | 6/25/15 |
| 1,4-Dioxane | < 2.0 |

| GM-33 | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | < 2.0 |

| GM-31 | |
|---|---|
| | 10/9/14 |
| 1,4-Dioxane | 0.95 J |

| HR-16 | | |
|---|---|---|
| | 6/24/15 | 8/25/15 |
| 1,4-Dioxane | 2.8 | 3.0 |

| GM-63 | |
|---|---|
| | 6/30/15 |
| 1,4-Dioxane | < 2.0 |

| RMW-86 | |
|---|---|
| | 6/25/15 |
| 1,4-Dioxane | 5.2 |

| GM-50 | |
|---|---|
| | 6/30/15 |
| 1,4-Dioxane | < 2.0 |

| W-3-S | |
|---|---|
| | 6/25/15 |
| 1,4-Dioxane | < 2.0 |

| GM-8 | | | |
|---|---|---|---|
| | 10/7/14 | 6/26/15 | 8/25/15 |
| 1,4-Dioxane | 18 | 22 | 25 |

| GM-37 | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | 0.51 J |

| GM-7R | | |
|---|---|---|
| | 6/26/15 | 8/25/15 |
| 1,4-Dioxane | 9.3 | 14 |

| GM-15 | | |
|---|---|---|
| | 6/30/15 | 8/25/15 |
| 1,4-Dioxane | 3.1 | 2.8 |

| GM-16 | | | |
|---|---|---|---|
| | 10/7/14 | 6/30/15 | 8/25/15 |
| 1,4-Dioxane | 9.1 | 2.2 | 10 |

| GM-48 | |
|---|---|
| | 6/29/15 |
| 1,4-Dioxane | 0.65 J |

| GM-51 | |
|---|---|
| | 6/29/15 |
| 1,4-Dioxane | < 2.0 |

| GM-79 | |
|---|---|
| | 6/24/15 |
| 1,4-Dioxane | 1.9 J |

| GM-11 | |
|---|---|
| | 8/24/15 |
| 1,4-Dioxane | < 2.0 |

| GM-17 | |
|---|---|
| | 6/24/15 |
| 1,4-Dioxane | < 2.0 |

| GM-35 | | |
|---|---|---|
| | 6/25/15 | 8/25/15 |
| 1,4-Dioxane | 420 | 590 |

| GM-52 | | |
|---|---|---|
| | 6/29/15 | 8/25/15 |
| 1,4-Dioxane | 0.76 J | 0.90 J |

| GM-35B-3 | | | | | | |
|---|---|---|---|---|---|---|
| | SOIL | | | GROUNDWATER | | |
| | 12/10/15 | 12/29/15 | 12/29/15 | 12/29/15 | 12/29/15 | 12/29/15 |
| | 0-2' | 8-10' | 26-28' | 28-33' | 45-50' | 52-57' |
| 1,4-Dioxane | < 5.6 U | < 5.6 U | < 5.7 U | < 2.0 U | 0.69 JB | 1.0 JB |

| GM-35B-2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | SOIL | | | GROUNDWATER | | | |
| | 11/12/15 | 12/7/15 | 12/7/15 | 12/8/15 | 12/8/15 | 12/9/15 | 12/9/15 |
| | 0-2' | 8-10' | 26-28' | 30-35' | 45-50' | 53.5-58.5' | 60-65' |
| 1,4-Dioxane | < 250 U | < 6.3 U | < 5.4 U | < 2.0 U | < 2.0 U | 2.5 | 9.6 |

| GM-35B-4 | |
|---|---|
| | SOIL |
| | 11/12/15 |
| | 0-2' |
| 1,4-Dioxane | < 230 |

| GM-35B-1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SOIL | | | | GROUNDWATER | | | |
| | 11/12/15 | 12/10/15 | 12/10/15 | 12/10/15 | 12/10/15 | 12/10/15 | 12/11/15 | 12/12/15 |
| | 0-2' | 8-10' | 20-22' | 26-28' | 28-33' | 45-50' | 56-61' | 63-68' |
| 1,4-Dioxane | < 230 U | < 6.0 U | < 5.5 U | < 5.2 U | < 2.0 U | < 2.0 U | 82 | 570 |

| GM-80 | |
|---|---|
| | 6/25/15 |
| 1,4-Dioxane | < 2.0 |

| GM-18 | |
|---|---|
| | 6/24/15 |
| 1,4-Dioxane | 0.56 J |

| GM-55 | |
|---|---|
| | 6/25/15 |
| 1,4-Dioxane | < 2.0 |

| GM-21 | | |
|---|---|---|
| | 10/9/14 | 6/26/15 |
| 1,4-Dioxane | 1.3 J | 0.51 J |

| GM-81 | |
|---|---|
| | 6/25/15 |
| 1,4-Dioxane | < 2.0 |

| GM-65D | |
|---|---|
| | 6/29/15 |
| 1,4-Dioxane | < 2.0 |

| GM-10 | |
|---|---|
| | 6/24/15 |
| 1,4-Dioxane | < 2.0 |

| GM-13 | |
|---|---|
| | 6/24/15 |
| 1,4-Dioxane | < 2.0 |

| GM-65S | |
|---|---|
| | 6/29/15 |
| 1,4-Dioxane | < 2.0 |

| GM-78 | |
|---|---|
| | 6/30/15 |
| 1,4-Dioxane | < 2.0 |

| GM-2 | |
|---|---|
| | 6/26/15 |
| 1,4-Dioxane | < 2.0 |

## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- MONITORING WELL (LOWER AQUIFER)
- LOWER AQUIFER MONITORING WELLS
- UPPER AQUIFER MONITORING WELLS
- INACTIVE RECOVERY WELL
- STREAM GAUGE
- CARBON INTRODUCTION WELL
- SOIL BORING
- FORMER BUILDING FOOTPRINT
- RIVER LEVEE
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY (SOURCE: MONTGOMERY COUNTY AUDITOR'S WEBSITE, FEBRUARY 2015)
- PARCEL BOUNDARY (SOURCE: MONTGOMERY COUNTY AUDITOR'S WEBSITE, FEBRUARY 2015)

| | |
|---|---|
| ug/L | MICROGRAMS PER LITER |
| J | VALUE IS ESTIMATED |
| < | CONSTITUENT NOT DETECTED ABOVE THE LABORATORY REPORTING LIMIT |
| 0-2' | DEPTH OF SOIL OR GROUNDWATER SAMPLE BELOW GROUND SURFACE |
| **BOLD** | CONCENTRATION EXCEEDS INDIVIDUAL DRINKING WATER ACTION LEVEL OF 4.6 ug/L |
| | SOIL ANALYTICAL RESULTS |

N

0 200 1000ft

RACER TRUST
MORAINE, OHIO

OH000294.2016

# 1,4-DIOXANE MONITORING RESULTS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
D-2

# APPENDIX E

## GM-28R Well Construction and Well Development Logs

# WELL CONSTRUCTION LOG

WELL NO.: **GMW-28R**

TOTAL DEPTH: **30.5 feet bls**

ARCADIS

## PROJECT INFORMATION

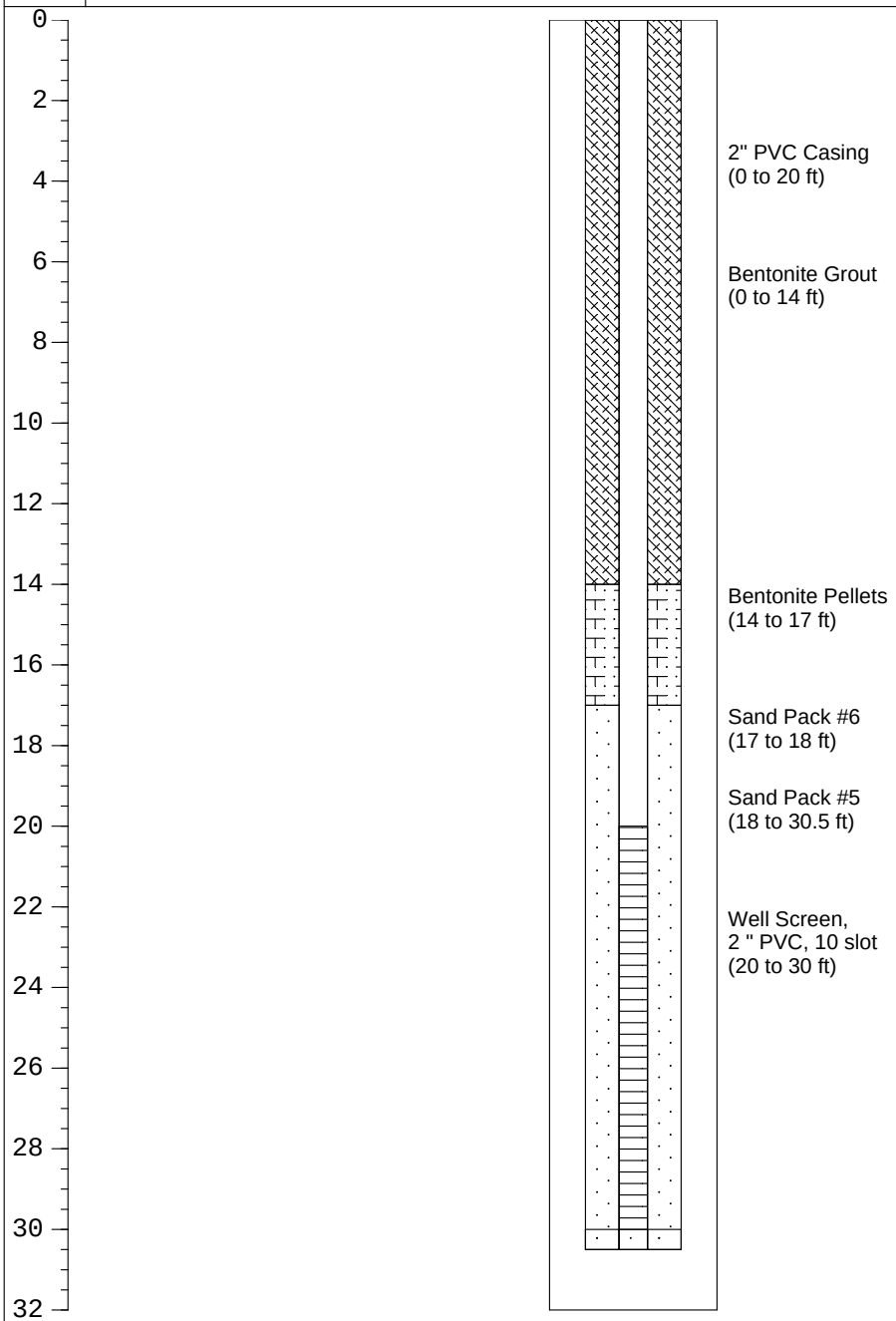
| | |
|---|---|
| CLIENT: | **RACER Trust** |
| SITE LOCATION: | **Process Sump Area Investigation** |
| CITY, STATE: | **Moraine, Ohio** |
| PROJECT NUMBER: | **OH000294.2015** |
| LOGGED BY: | **Allen Sisson** |

## DRILLING INFORMATION

| | |
|---|---|
| DRILLING CO.: | **Envirocore** |
| DRILLER: | **Jason McDaniel** |
| DRILLING METHOD: | **Hollow Stem Auger** |
| DATE STARTED: | **12/21/2015** |
| DATE COMPLETED: | **12/21/2015** |

Depth (feet)

WELL CONSTRUCTION DETAILS




Notes: ppm: parts per million N/A: Not applicable ft: feet NM: Not measured
*Indicates sample submitted for laboratory analysis. PID: Photo-ionization Detector HA: Hand auger
bls: below land surface USCS: Unified Soil Classification System

# WELL DEVELOPMENT LOG

Site/Well No. GMW-28R

Project Racer | Project No. OH000294.2015 | Page 1 of 1

Site Location Dayton, Ohio | Date 12/23/2015

Weather Rain and Overcast | Development Time Begin 1030 | End 1330

**Evacuation Data**

| | | | |
|---|---|---|---|
| Measuring Point | Top of Casing | Sample Pump Intake Setting (ft bmp) | 22/25/27 |
| MP Elevation (ft) | NM | Pumping Rate (gpm) | 0.75 GPM |
| Land Surface Elevation (ft) | NM | Evacuation Method | SS Pump |
| Sounded Well Depth (ft bmp) | 29.70 | | |
| Depth to Water (ft bmp) | 22.94 | | |
| Water-Level Elevation (ft) | NM | **Field Parameters** | |
| Water Column in Well (ft) | 6.76 | Color | Tan - Clear |
| Casing Diameter/Type | 2" PVC | Odor | None Observed |
| Gallons in Well | 1.102 | Appearance | Very Turbid at Start |

| Well Volume | Total Gallons Removed | pH (s.u.) | Conductivity (mS/cm or umhos/cm) | Turbidity (NTU) | Temperature ($^{o}$F/$^{o}$C) | Depth To Water | Remarks |
|---|---|---|---|---|---|---|---|
| Initial | 0.0 | 6.66 | 1.158 | Out of Range | 15.86 | 23.18 | Very Turbid - Sand |
| 1st | 1.5 | 6.99 | 1.119 | Out of Range | 16.76 | 23.16 | Very Turbid - Sand |
| 2nd | 3.0 | 6.98 | 1.103 | Out of Range | 16.75 | 23.12 | Very Turbid - Sand |
| 3rd | 3.7 | 6.98 | 1.065 | 720 | 16.75 | 23.26 | Clearing Up |
| 4th | 5.0 | 6.99 | 1.025 | 109 | 16.75 | 23.30 | Clear |
| 5th | 6.6 | 6.99 | 1.004 | 60.9 | 16.71 | 23.32 | Clear |
| 6th | 7.8 | 6.99 | 1.000 | 22.3 | 16.72 | 23.35 | Clear |
| 7th | 8.5 | 6.95 | 0.993 | 10.8 | 16.88 | 23.38 | Clear |
| 8th | 10.0 | 6.99 | 0.989 | 8.7 | 16.81 | 23.39 | Clear |
| 9th | | | | | | | |
| 10th | | | | | | | |

Development Personnel: Allen Sisson

Notes:

**Well Casing Volumes (gallon/feet)**

| | | | |
|---|---|---|---|
| 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 | mililiter | 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 |
| gpm | Gallons per minute | N/A | Not Applicable | umhos/cm | Micromhos per centimeter |
| mg/L | Miligrams per liter | NM | Not Measured | VOC | Volatile Organic Compounds |

# APPENDIX F

## Annual Groundwater Sampling Event Field Parameters Data Sheet for 2015

**Appendix F**
**Annual Groundwater Sampling Event Field Parameters Data Sheet for 2015**
**RACER Trust**
**Moraine, Ohio**

ARCADIS Design & Consultancy for natural and built assets

| Well ID | Sample ID | pH (s.u.) | Temp (°C) | ORP (mV) | Conductivity (mS/cm) | DO (mg/L) | Purge Rate (L/min) | Time Start Purge | Time End Purge | Volume Purged (L) | Sample Date | Time Sampled | Sampler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upper Aquifer Wells** | | | | | | | | | | | | | |
| GM-2 | GM-2/12082015/ | 7.14 | 15.5 | -32.0 | 1.520 | 0.00 | 0.284 | 15:25 | 15:45 | 5.7 | 12/8/2015 | 15:55 | S. Clark |
| GM-6 | GM-6/12082015/ | 7.08 | 15.6 | -148.0 | 1.410 | 0.00 | 0.183 | 15:20 | 15:50 | 5.7 | 12/8/2015 | 15:51 | T. Runge |
| GM-8 | GM-8/12082015/ | 7.42 | 15.9 | -200.0 | 1.420 | 0.00 | 0.184 | 12:38 | 13:13 | 6.6 | 12/8/2015 | 13:15 | T. Runge |
| GM-10 | GM-10/11032015/ | 7.30 | 16.7 | 187.0 | 0.649 | 15.86 | 0.232 | 15:05 | 15:45 | 9.3 | 11/3/2015 | 15:47 | T. Runge |
| GM-16 | GM-16/11042015/ | 7.15 | 15.7 | 113.0 | 0.848 | 0.00 | 0.227 | 14:50 | 15:45 | 12.5 | 11/4/2015 | 15:47 | T. Runge |
| GM-19S | GM-19S/12082015/ | 6.95 | 16.4 | -151.0 | 1.280 | 0.00 | 0.185 | 9:51 | 10:30 | 7.6 | 12/8/2015 | 10:35 | T. Runge |
| GM-21 | GM-21/12112015/ | 6.52 | 15.6 | -91.0 | 2.510 | 1.30 | 0.454 | 11:38 | 12:03 | 11.4 | 12/11/2015 | 12:05 | C. Pribulick |
| GM-23 | GM-23/12082015/ | 7.43 | 16.7 | -79.0 | 1.530 | 0.00 | 0.142 | 12:50 | 13:10 | 2.8 | 12/8/2015 | 13:20 | S. Clark |
| GM-26 | GM-26/10302015/ | 7.12 | 16.1 | 265.0 | 0.725 | 13.41 | 0.231 | 13:25 | 14:10 | 11.5 | 10/30/2015 | 14:15 | T. Runge |
| GM-28R | GM-28/12282015/ | 6.79 | 16.79 | -78 | 1.08 | 0.22 | 0.539 | 11:58 | 12:38 | 21.6 | 12/28/2015 | 12:40 | C. Pribulick |
| GM-29 | GM-29/12082015/ | 7.19 | 16.7 | -124.0 | 1.460 | 0.00 | 0.442 | 11:50 | 12:05 | 6.6 | 12/8/2015 | 12:20 | S. Clark |
| GM-30 | GM-30/12112015/ | 6.23 | 17.5 | -69.0 | 2.200 | 0.00 | 0.487 | 10:25 | 11:00 | 17.0 | 12/11/2015 | 11:10 | S. Clark |
| GM-31 | GM-31/12082015/ | 4.53 | 15.9 | -13.0 | 1.300 | 5.70 | 0.754 | 13:43 | 14:38 | 41.5 | 12/8/2015 | 14:45 | C. Pribulick/S. Clark |
| GM-32 | GM-32/12082015/ | 7.04 | 15.57 | -165.0 | 1.380 | 0.00 | 0.182 | 16:08 | 16:34 | 4.7 | 12/8/2015 | 16:36 | T. Runge |
| GM-35 | GM-35/11042015/ | 8.44 | 17.40 | -154.0 | 2.840 | 0.00 | 0.256 | 10:54 | 11:25 | 7.9 | 11/4/2015 | 11:30 | T. Runge |
| GM-43 | GM-43/11052015/ | 7.02 | 18.2 | 30.0 | 1.260 | 3.16 | 0.310 | 13:42 | 14:37 | 17.0 | 11/5/2015 | 14:40 | C. Pribulick |
| GM-44 | GM-44/11052015/ | 7.01 | 18.1 | 110.0 | 1.490 | 0.00 | 0.355 | 16:01 | 16:41 | 14.2 | 11/5/2015 | 16:45 | C. Pribulick |
| GM-45 | GM-45/11042015/ | 7.03 | 18.5 | 117.0 | 1.280 | 0.00 | 0.276 | 12:39 | 13:14 | 9.7 | 11/4/2015 | 13:15 | T. Runge |
| GM-46 | GM-46/11032015/ | 6.99 | 20.6 | -93.0 | 0.318 | 0.00 | 0.379 | 15:40 | 16:10 | 11.4 | 11/3/2015 | 16:10 | C. Pribulick |
| GM-47 | GM-47/11042015/ | 7.12 | 16.9 | -12.0 | 1.260 | 0.00 | 0.757 | 10:45 | 11:08 | 15.1 | 11/4/2015 | 11:10 | S. Clark |
| GM-50 | GM-50/11042015/ | 7.07 | 17.6 | 49.0 | 0.935 | 0.00 | 1.073 | 11:25 | 11:55 | 32.2 | 11/4/2015 | 12:00 | S. Clark |
| GM-51 | GM-51/10302015/ | 7.08 | 16.7 | 144.0 | 0.816 | 0.50 | 0.703 | 9:18 | 9:53 | 24.6 | 10/30/2015 | 9:55 | C. Pribulick/T. Runge |
| GM-52 | GM-52/10302015/ | 7.12 | 15.4 | 230.0 | 0.831 | 12.84 | 0.404 | 10:19 | 10:49 | 12.1 | 10/30/2015 | 10:50 | C. Pribulick |
| GM-55 | GM-55/11032015/ | 7.24 | 14.0 | 162.0 | 0.646 | 10.40 | 0.238 | 13:02 | 13:36 | 8.3 | 11/3/2015 | 13:40 | T. Runge |
| GM-59 | GM-59/12082015/ | 8.54 | 15.7 | 222.0 | 1.080 | 1.14 | 0.221 | 10:05 | 10:35 | 6.6 | 12/8/2015 | 11:00 | S. Clark |
| GM-60 | GM-60/11052015/ | 7.04 | 16.7 | 152.0 | 1.180 | 0.00 | 0.413 | 9:18 | 10:13 | 22.7 | 11/5/2015 | 10:15 | C. Pribulick |
| GM-62R | GM-62R/11032015/ | 7.24 | 14.9 | 166.0 | 0.662 | 9.32 | 0.263 | 11:54 | 12:35 | 10.8 | 11/3/2015 | 12:37 | T. Runge |
| GM-63 | GM-63/11042015/ | 7.11 | 17.6 | 130.0 | 0.977 | 0.00 | 0.473 | 12:25 | 12:49 | 9.5 | 11/4/2015 | 12:55 | S. Clark |
| GM-65S | GM-65S/11052015/ | 7.13 | 14.9 | 192.0 | 0.716 | 8.95 | 0.222 | 12:55 | 13:30 | 8.9 | 11/5/2015 | 13:35 | T. Runge |
| GM-66 | GM-66/12082015/ | 6.98 | 15.8 | -50.0 | 1.390 | 0.00 | 0.183 | 14:11 | 14:42 | 5.7 | 12/8/2015 | 14:45 | T. Runge |
| GM-67S | GM-67S/11042015/ | 6.98 | 17.3 | 42.0 | 1.090 | 2.07 | 0.452 | 8:21 | 9:41 | 36.2 | 11/4/2015 | 9:45 | C. Pribulick |
| GM-71 | GM-71/11032015/ | 7.03 | 16.7 | 169.0 | 1.670 | 17.02 | 0.510 | 11:47 | 13:02 | 38.2 | 11/3/2015 | 13:05 | C. Pribulick |
| GM-72 | GM-72/11032015/ | 7.05 | 17.2 | 161.0 | 1.680 | 20.59 | 0.535 | 10:52 | 11:32 | 21.4 | 11/3/2015 | 11:35 | T. Runge |
| GM-75S | GM-75S/12112015/ | 7.36 | 14.9 | 154.0 | 1.010 | 3.08 | 0.297 | 9:43 | 10:18 | 10.4 | 12/11/2015 | 10:20 | C. Pribulick |
| GM-76S | GM-76S/10302015/ | 7.93 | 17.6 | 140.0 | 0.268 | 2.75 | 0.536 | 12:58 | 13:28 | 16.1 | 10/30/2015 | 13:30 | C. Pribulick |
| GM-78 | GM-78/11032015/ | 7.38 | 15.9 | 163.0 | 0.638 | 25.68 | 0.263 | 10:52 | 11:33 | 10.8 | 11/3/2015 | 11:37 | T. Runge |
| GM-79 | GM-79/11042015/ | 7.16 | 17.1 | 77.0 | 0.916 | 3.20 | 0.379 | 9:30 | 10:07 | 13.2 | 11/4/2015 | 10:10 | S. Clark |
| GM-80 | GM-80/11042015/ | 7.22 | 16.3 | 58.0 | 0.877 | 0.00 | 0.379 | 8:25 | 8:50 | 7.6 | 11/4/2015 | 9:05 | S. Clark |
| HR-2 | HR-2/10302015/ | 7.08 | 13.00 | 4.0 | 1.150 | 3.80 | 0.237 | 13:30 | 13:50 | 4.7 | 10/30/2015 | 14:00 | S. Clark |
| HR-3 | HR-3/11042015/ | 6.91 | 16.31 | 93.0 | 1.340 | 0.00 | 0.426 | 15:39 | 15:59 | 8.5 | 11/4/2015 | 16:00 | C. Pribulick |
| HR-4 | HR-4/10302015/ | 7.16 | 13.70 | 53.0 | 0.980 | 4.60 | 0.189 | 10:58 | 11:13 | 2.8 | 10/30/2015 | 11:25 | S. Clark |
| HR-7 | HR-7/11052015/ | 6.95 | 16.9 | 100.0 | 1.130 | 0.00 | 0.524 | 12:40 | 13:10 | 15.7 | 11/5/2015 | 13:15 | C. Pribulick |
| HR-16 | HR-16/11052015/ | 7.03 | 17.2 | 143.0 | 0.867 | 1.00 | 0.189 | 9:20 | 9:55 | 6.6 | 11/5/2015 | 10:13 | T. Runge |
| HR-17 | HR-17/11042015/ | 7.14 | 18.1 | 151.0 | 1.120 | 2.90 | 0.379 | 13:39 | 14:09 | 11.4 | 11/4/2015 | 14:15 | S. Clark |
| TW-2 | TW-2/1104/2015/ | 7.22 | 16.9 | -112.0 | 1.060 | 10.49 | 0.262 | 9:45 | 10:39 | 14.4 | 11/4/2015 | 10:43 | T. Runge |
| W-1-N | W-1-N/11042015/ | 7.01 | 16.29 | 103.0 | 1.340 | 0.00 | 0.278 | 11:50 | 12:20 | 8.3 | 11/4/2015 | 12:20 | C. Pribulick |
| W-2-N | W-2-N/10302015/ | 7.18 | 14.70 | -93.0 | 0.940 | 4.40 | 0.237 | 12:07 | 12:27 | 4.7 | 10/30/2015 | 12:40 | S. Clark |
| W-2-S | W-2-S/11052015/ | 7.12 | 16.97 | 146.0 | 0.761 | 0.16 | 0.227 | 10:50 | 11:30 | 9.1 | 11/5/2015 | 11:35 | T. Runge |
| W-3-N | W-3-N/11042015/ | 7.04 | 16.4 | -103.0 | 1.130 | 0.00 | 0.492 | 13:42 | 14:02 | 9.8 | 11/4/2015 | 14:05 | C. Pribulick |
| W-3-S | W-3-S/11042015/ | 7.20 | 20.90 | 197.0 | 0.927 | 0.00 | 0.227 | 15:35 | 16:05 | 5.7 | 11/4/2015 | 16:10 | S. Clark |
| W-4-N | W-4-N/11042015/ | 6.89 | 16.3 | 22.0 | 1.400 | 0.00 | 0.284 | 14:28 | 14:58 | 8.5 | 11/4/2015 | 15:00 | C. Pribulick |
| W-4-S | W-4-S/11042015/ | 7.13 | 19.6 | 192.0 | 1.160 | 0.00 | 0.757 | 14:45 | 15:05 | 11.4 | 11/4/2015 | 15:10 | S. Clark |
| WSU-24 | WSU-24/11032015/ | 7.06 | 19.6 | 185.0 | 0.870 | 15.84 | 0.227 | 16:13 | 16:33 | 4.5 | 11/3/2015 | 16:35 | T. Runge |

| Well ID | Sample ID | pH (s.u.) | Temp (°C) | ORP (mV) | Conductivity (mS/cm) | DO (mg/L) | Purge Rate (L/min) | Time Start Purge | Time End Purge | Volume Purged (L) | Sample Date | Time Sampled | Sampler |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lower Aquifer Wells** | | | | | | | | | | | | | |
| DN-13 | DN-13/11052015/ | 7.20 | 15.74 | 103.0 | 0.84 | 10.08 | NM | NM | NM | 0.0 | 11/5/2015 | 15:15 | T. Runge |
| GM-9 | GM-9/12112015/ | 6.86 | 15.2 | 50.0 | 0.770 | 1.00 | 0.331 | 12:30 | 13:10 | 13.2 | 12/11/2015 | 13:20 | S. Clark |
| GM-11 | GM-11/11032015/ | 7.08 | 23.2 | 158.0 | 0.787 | 2.22 | 0.240 | 14:06 | 14:51 | 10.8 | 11/3/2015 | 14:53 | T. Runge |
| GM-15 | GM-15/11042015/ | 6.98 | 16.7 | -12.0 | 1.090 | 0.00 | 0.246 | 16:05 | 16:45 | 9.8 | 11/4/2015 | 16:47 | T. Runge |
| GM-19D | GM-19D/11042015/ | 6.93 | 16.80 | 88.0 | 1.100 | 0.71 | 0.270 | 7:45 | 8:20 | 9.5 | 11/4/2015 | 8:25 | T. Runge |
| GM-20D | GM-20D/11032015/ | 7.02 | 16.2 | 159.0 | 0.774 | 0.00 | 0.265 | 16:47 | 17:12 | 6.6 | 11/3/2015 | 17:15 | T. Runge |
| GM-54 | GM-54/11032015/ | 6.96 | 17.3 | 114.0 | 1.210 | 0.00 | 0.631 | 13:27 | 13:57 | 18.9 | 11/3/2015 | 14:00 | C. Pribulick |
| GM-67D | GM-67D/11042015/ | 6.76 | 18.0 | -54.0 | 1.390 | 0.00 | 0.347 | 10:08 | 10:38 | 10.4 | 11/4/2015 | 10:40 | C. Pribulick |
| GM-68D | GM-68D/11032015/ | 8.10 | 17.3 | 42.0 | 1.270 | 0.10 | 0.257 | 16:58 | 18:08 | 18.0 | 11/3/2015 | 18:10 | C. Pribulick |
| GM-75D | GM-75D/12082015/ | 4.56 | 15.0 | -8.0 | 1.220 | 5.57 | 0.341 | 15:51 | 16:16 | 8.5 | 12/8/2015 | 16:20 | C. Pribulick |
| GM-76D | GM-76D/10302015/ | 7.01 | 16.5 | -16.0 | 1.270 | 0.00 | 0.639 | 14:16 | 14:56 | 25.6 | 10/30/2015 | 15:00 | C. Pribulick |
| GM-77D | GM-77D/11032015/ | 6.91 | 16.4 | 150.0 | 1.350 | 3.18 | 0.406 | 14:28 | 15:03 | 14.2 | 11/3/2015 | 15:05 | C. Pribulick |
| GM-83D | GM-83D/10302015/ | 7.23 | 14.9 | -113.0 | 0.900 | 3.90 | 0.757 | 15:44 | 15:59 | 11.4 | 10/30/2015 | 16:10 | S. Clark |
| GM-84 | GM-84/10302015/ | 7.06 | 14.7 | 69.0 | 0.757 | 0.00 | 0.241 | 15:00 | 15:40 | 9.7 | 10/30/2015 | 15:40 | T. Runge |
| HR-1 | HR-1/11052015/ | 7.00 | 17.8 | 93.0 | 1.100 | 20.94 | 0.397 | 14:55 | 15:35 | 15.9 | 11/5/2015 | 15:35 | C. Pribulick |
| HR-12 | HR-12/12082015/ | 5.85 | 14.3 | -28.0 | 1.350 | 3.10 | 0.213 | 15:40 | 16:20 | 8.5 | 12/8/2015 | 16:30 | S. Clark |
| HR-15 | HR-15/11042015/ | 6.85 | 16.1 | -79.0 | 1.340 | 0.00 | 0.315 | 12:49 | 13:19 | 9.5 | 11/4/2015 | 13:20 | C. Pribulick |
| RMW-85 | RMW-85/12082015/ | 4.58 | 14.8 | -36.0 | 1.230 | 5.86 | 0.379 | 16:37 | 16:57 | 7.6 | 12/8/2015 | 17:00 | C. Pribulick |
| RMW-86 | RMW-86/12082015/ | 6.98 | 16.48 | 19.0 | 1.300 | 0.08 | 0.185 | 13:12 | 13:58 | 8.5 | 12/8/2015 | 14:00 | T. Runge |
| RMW-87 | RMW-87/11052015/ | 6.87 | 18.3 | 23.0 | 1.170 | 0.20 | 0.227 | 13:54 | 14:29 | 7.9 | 11/5/2015 | 14:33 | T. Runge |
| RMW-88 | RMW-88/10302015/ | 6.96 | 13.10 | -67.0 | 1.040 | 5.90 | 0.379 | 9:29 | 9:59 | 11.4 | 10/30/2015 | 10:10 | S. Clark |
| RMW-89 | RMW-89/01152016/ | 6.90 | 13.70 | -90.0 | 0.830 | 1.70 | 0.158 | 11:30 | 12:05 | 4.7 | 1/15/2016 | 12:20 | S. Clark |
| RMW-90 | RMW-90/01152016/ | 6.84 | 14.70 | -213.0 | 0.990 | 1.40 | 0.221 | 13:03 | 13:35 | 6.6 | 1/15/2016 | 13:50 | S. Clark |

**Notes:**
s.u. - Standard Units.
Temp - Temperature.
ºC - Degrees Celsius.
ORP - Oxidation Reduction Potential.
mV - Millivolts.
mS/cm - Millisiemens per Centimeter.
DO - Dissolved Oxygen.
mg/L - Milligrams per Liter.
L/min - Liters per Minute.
L - Liters.
NM - Not Measured.

# APPENDIX G

## Groundwater Analytical Database for 2015

| | Units | MCL[1] | Upgradient W-1-N 11/4/2015 Upper Aquifer | Source Areas | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | GM-23 12/8/2015 Upper Aquifer | GM-46 11/3/2015 Upper Aquifer | GM-59 12/8/2015 Upper Aquifer | GM-60 11/5/2015 Upper Aquifer | Duplicate 11/5/2015 Upper Aquifer | GM-67S 11/4/2015 Upper Aquifer | Duplicate 11/4/2015 Upper Aquifer | GM-71 11/3/2015 Upper Aquifer | GM-72 11/3/2015 Upper Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | 0.48 J | < 4.0 U | < 4.0 U | < 1.0 U | 0.76 J | 0.51 J | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 4.2 | 15 | < 1.0 U | < 1.0 U | < 4.0 U | < 4.0 U | 2.1 | 1.8 | 0.35 J | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | 0.47 J | < 1.0 U | < 1.0 U | < 4.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | 0.69 J | < 1.0 U | < 1.0 U | < 4.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 0.32 J | **100** | 0.41 J | 2.4 | 16 | 15 | 2.3 | 2.2 | 0.46 J | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 4.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | 0.58 J | 0.47 J | **270** | **770** | **760** | 1.6 | 1.4 | **19** | 2.2 |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 4.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | 13 | < 1.0 U | 0.34 J | < 4.0 U | < 4.0 U | 0.34 J | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | 0.25 J | 5.0 | 0.30 J | **97** | **910** | **990** | **130** | **120** | **20** | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | **120** | < 1.0 U | < 1.0 U | < 4.0 U | < 4.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 8.0 U | < 8.0 U | < 2.0 UJ | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 4.8 | 254.7 | 1.2 | 370.2 | 1696.0 | 1765.0 | 136.3 | 126.2 | 40.3 | 2.2 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Source Areas | | | Downgradient Reactive Zone Performance Wells | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | GM-76S 10/30/2015 Upper Aquifer | GM-75S 12/11/2015 Upper Aquifer | Duplicate 12/11/2015 Upper Aquifer | GM-28R 12/28/2015 Upper Aquifer | GM-29 12/8/2015 Upper Aquifer | GM-30 12/11/2015 Upper Aquifer | HR-3 11/4/2015 Upper Aquifer | GM-21 12/11/2015 Upper Aquifer | GM-6 12/8/2015 Upper Aquifer | GM-8 12/8/2015 Upper Aquifer | GM-19S 12/8/2015 Upper Aquifer | Duplicate 12/8/2015 Upper Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | 0.58 J | < 1.3 U | < 1.0 U | 9.9 | < 2.0 U | 7.3 | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U |
| 1,1-Dichloroethane | ug/L | | < 1.0 U | < 1.3 U | < 1.3 U | 0.55 J | 10 | 3 | 9.6 | 12 | < 1.0 U | 0.43 J | 3.1 | 3.5 |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.3 U | < 1.3 U | < 1.0 U | 1.2 J | < 2.0 U | 0.68 J | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.3 U | < 1.3 U | < 1.0 U | < 1.7 U | 2.9 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U |
| cis-1,2-Dichloroethene | ug/L | 70 | < 1.0 U | < 1.3 U | < 1.3 U | 5.6 | **440** | < 2.0 U | **82** | 22 | 0.26 J | 0.31 J | 37 | 42 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.3 U | < 1.3 U | < 1.0 U | < 1.7 U | 260 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U |
| Tetrachloroethene | ug/L | 5 | 1.1 | **420** | **410** | **49** | **11** | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.3 U | < 1.3 U | < 1.0 U | < 1.7 U | 0.87 J | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.3 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.3 U | < 1.3 U | 0.38 J | 15 | < 2.0 U | 2.6 | 1.6 J | < 1.0 U | < 1.0 U | 0.66 J | 0.70 J |
| Trichloroethene | ug/L | 5 | 0.64 J | **68** | **67** | **24** | **270** | < 2.0 U | **200** | **16** | < 1.0 U | < 1.0 U | 1.3 | 1.3 |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.3 U | < 1.3 U | 0.99 J | **48** | < 2.0 U | **13** | **8.9** | < 1.0 U | 0.53 J | **6.4** | **7** |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.5 U | < 2.5 U | < 2.0 U | < 3.3 U | 14 | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.5 U |
| Total Site-Specific VOCs | ug/L | | 1.7 | 488.6 | 477.0 | 80.5 | 805.1 | 280.8 | 312.6 | 60.5 | 0.3 | 1.3 | 48.5 | 54.5 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Closed North Settling Lagoon Monitoring Results | | | | Closed South Settling Lagoon Monitoring Results | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HR-4 10/30/2015 Upper Aquifer | W-2-N 10/3/2015 Upper Aquifer | W-3-N 11/4/2015 Upper Aquifer | W-4-N 11/4/2015 Upper Aquifer | HR-16 11/5/2015 Upper Aquifer | HR-17 11/4/2015 Upper Aquifer | W-2-S 11/5/2015 Upper Aquifer | W-3-S 11/4/2015 Upper Aquifer | W-4-S 11/4/2015 Upper Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 1.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 1.5 | < 1.0 U | < 1.0 U | 1.9 J |
| 1,1-Dichloroethane | ug/L | | 1.6 | < 1.0 U | < 1.0 U | 4.2 | 1.3 | 0.61 J | 0.63 J | 0.41 J | 2.3 |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 0.32 J | 1.4 | 29 | 7 | 1 | 1.7 | 1.1 | 2.6 | 9.7 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **150** | 0.36 J | **65** | **74** |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U | 0.42 J | 0.51 J | 0.63 J | 0.73 J | 0.47 J | 0.31 J | 1.4 J |
| Trichloroethene | ug/L | 5 | 0.33 J | 0.25 J | < 1.0 U | **12** | 2.7 | **160** | **23** | **97** | **72** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 2.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 4.0 U |
| Total Site-Specific VOCs | ug/L | | 3.5 | 1.65 | 30.7 | 23.7 | 5.6 | 314.5 | 25.6 | 165.3 | 161.3 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Downgradient On-Site | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | HR-1 11/5/2015 Upper Aquifer | GM-43 11/5/2015 Upper Aquifer | GM-44 11/5/2015 Upper Aquifer | GM-45 11/4/2015 Upper Aquifer | GM-66 12/8/2015 Upper Aquifer | GM-31 12/8/2015 Upper Aquifer | GM-35 11/4/2015 Upper Aquifer | HR-2 10/30/2015 Upper Aquifer | HR-7 11/5/2015 Upper Aquifer | Duplicate 11/5/2015 Upper Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 1.2 | 1.4 | 1.5 | 6.5 | < 1.0 U | 2.9 | 4 | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 0.51 J | 0.63 J | 0.94 J | 3.3 | 12 | 2.5 | 34 | 8.3 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.5 | < 1.0 U | 3.7 | < 1.0 U | < 1.0 UJ | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.52 J | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 6.6 | 14 | 18 | 36 | **280** | 48 | **300** | 2.1 | 1.4 | 1.3 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | **76** | **42** | **110** | **190** | < 1.0 U | < 1.0 U | **47** | < 1.0 U | < 1.0 U | < 1.0 U |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 0.43 J | 0.89 J | 0.81 J | 2.7 | 11 | 1.5 | 19 | 0.30 J | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | **210** | **270** | **180** | **180** | **110** | **75** | **200** | < 1.0 U | **6.9** | **6.8** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U | < 1.0 U | 0.50 J | **3** | 0.64 J | **14** | < 1.0 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 294.7 | 328.9 | 311.3 | 419.0 | 418.5 | 130.5 | 622.2 | 10.7 | 8.3 | 8.1 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Property Boundary | | Off-Site Downgradient of the Site | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | GM-2 12/8/2015 Upper Aquifer | TW-2 11/4/2015 Upper Aquifer | GM-10 11/3/2015 Upper Aquifer | GM-16 11/4/2015 Upper Aquifer | GM-47 11/4/2015 Upper Aquifer | GM-50 11/4/2015 Upper Aquifer | GM-51 10/30/2015 Upper Aquifer | GM-52 10/30/2015 Upper Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U |
| 1,1-Dichloroethane | ug/L | | 0.40 J | 0.31 J | < 1.0 U | 1.5 | 4.9 | 4 | 2.8 | < 2.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 3.2 | 0.27 J | < 1.0 U | 12 | 46 | 5.6 | 6.5 | < 2.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U |
| Tetrachloroethene | ug/L | 5 | 3.6 | < 1.0 U | 0.85 J | **35** | **49** | **26** | **63** | **32** |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.7 U | < 1.0 U | < 2.0 U | < 2.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U | < 1.0 U | 0.34 J | 2.3 | < 1.0 U | < 2.0 U | < 2.0 U |
| Trichloroethene | ug/L | 5 | **6.7** | < 1.0 U | 2.2 | **8.3** | **8.3** | 4 | **16** | **5.8** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | 0.29 J | < 1.0 U | **10** | < 1.7 U | 1.7 | < 2.0 U | < 2.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 3.3 U | < 2.0 U | < 4.0 U | < 4.0 U |
| Total Site-Specific VOCs | ug/L | | 13.9 | 0.9 | 3.1 | 67.1 | 110.5 | 41.3 | 88.3 | 37.8 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | GM-62R 11/3/2015 Upper Aquifer | Off-Site Downgradient of the Site | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | GM-63 11/4/2015 Upper Aquifer | GM-55 11/3/2015 Upper Aquifer | GM-65S 11/5/2015 Upper Aquifer | WSU-24 11/3/2015 Upper Aquifer | GM-78 11/3/2015 Upper Aquifer | Duplicate 11/3/2015 Upper Aquifer | GM-79 11/4/2015 Upper Aquifer | GM-80 11/4/2015 Upper Aquifer | GM-26 10/30/2015 Upper Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | 2.2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.71 J | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | < 1.0 U | 1.9 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2.2 | 0.96 J | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | < 1.0 U | 3.4 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 7.4 | 2.9 | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | **13** | **46** | 2.5 | 3.8 | **8.4** | **7.1** | **7.1** | 0.97 J | **18** | 1.1 |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 1.0 U | **19** | < 1.0 U | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | **31** | **15** | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.7 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.4 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 3.3 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.9 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 13.0 | 72.5 | 2.5 | 3.8 | 9.7 | 7.1 | 7.1 | 42.3 | 36.9 | 1.1 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Upgradient Contributions | | | | On-Site Groundwater Quality | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | RMW-88 10/30/2015 Lower Aquifer | HR-12 12/8/2015 Lower Aquifer | GM-76D 10/30/2015 Lower Aquifer | Duplicate 10/30/2015 Upper Aquifer | GM-54 11/3/2015 Lower Aquifer | GM-67D 11/4/2015 Lower Aquifer | Duplicate 11/4/2015 Lower Aquifer | GM-68D 11/3/2015 Lower Aquifer | GM-75D 12/8/2015 Lower Aquifer | RMW-85 12/8/2015 Lower Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 2.0 U | 2.5 | 2.4 | 1.1 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | 27 | 2.4 | < 2.0 U | < 1.0 U | < 2.0 U | 6.8 | 6.4 | < 1.0 U | < 1.0 U | 0.41 J |
| 1,1-Dichloroethene | ug/L | 7 | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 2.0 U | 1.8 | 1.8 | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 61 | 1.5 | < 2.0 U | < 1.0 U | < 2.0 U | **140 K** | **160** | < 1.0 U | 22 | 18 |
| Ethylbenzene | ug/L | 700 | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 2.0 U | < 1.0 U | **49** | 23 | **62** | 1.7 | 1.7 | **30** | **140** | **49** |
| Toluene | ug/L | 1000 | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | 3.2 | < 1.0 U | < 2.0 U | < 1.0 U | < 2.0 U | 4.6 | 4.3 | < 1.0 U | 0.38 J | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 2.0 U | < 1.0 U | **6.9** | 3.5 | 1.3 J | **76** | **74** | 2.2 | **150** | **82** |
| Vinyl chloride | ug/L | 2 | 1.5 J | 0.31 J | < 2.0 U | < 1.0 U | < 2.0 U | 0.70 J | 0.69 J | < 1.0 U | 0.37 J | 0.31 J |
| Xylene (total) | ug/L | 10,000 | < 4.0 U | < 2.0 U | < 4.0 U | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 92.7 | 4.2 | 55.9 | 26.5 | 63.3 | 234.1 | 251.3 | 33.3 | 312.8 | 149.7 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Lower Aquifer Groundwater Quality | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | HR-15 11/4/2015 Lower Aquifer | GM-19D 11/4/2015 Lower Aquifer | RMW-86 12/8/2015 Lower Aquifer | RMW-87 11/5/2015 Lower Aquifer | GM-15 11/4/2015 Lower Aquifer | GM-20D 11/3/2015 Lower Aquifer |
| Site-Specific Volatile Organic Compounds | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 2.0 U | 6.1 | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | < 1.0 U | 3 | 11 | 7.8 | 1.8 | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 2.0 U | 1.6 | < 1.0 U | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | 3.5 | 39 | 37 | 58 | 7.7 | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | **11** | **40** | < 1.0 U | < 1.0 U | 2.5 |
| Toluene | ug/L | 1000 | < 1.0 U | < 2.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | 1.0 J | 1.3 | 2.1 | 0.77 J | < 1.0 U |
| Trichloroethene | ug/L | 5 | 1.5 | **69** | **110** | **10** | **6.6** | 1.6 |
| Vinyl chloride | ug/L | 2 | 0.78 J | 1.0 J | 0.45 J | 0.42 J | 0.47 J | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 4.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 5.8 | 124.0 | 207.5 | 78.3 | 17.3 | 4.1 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Downgradient Groundwater Quality | | | | | | | | RMW-89 1/15/2016 Upper Aquifer | RMW-90 1/15/2016 Lower Aquifer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | GM-9 12/11/2015 Lower Aquifer | DN-13 11/5/2015 Lower Aquifer | GM-83D 10/30/2015 Lower Aquifer | Duplicate 10/30/2015 Lower Aquifer | GM-84 10/30/2015 Lower Aquifer | Duplicate 10/30/2015 Lower Aquifer | GM-77D 11/3/2015 Lower Aquifer | GM-11 11/3/2015 Lower Aquifer | | |
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | 0.92 J | 0.81 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 0.99 J | 7.1 |
| 1,1-Dichloroethane | ug/L | | < 1.0 U | 1.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | 8.7 |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | 0.49 J |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | < 1.0 |
| cis-1,2-Dichloroethene | ug/L | 70 | 0.26 J | 5.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | 2 | 38 |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | < 1.0 |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | 2.5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | **18** | 0.89 J | **46** | 0.86 J |
| Toluene | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | < 1.0 |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | 0.42 J | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | 1 |
| Trichloroethene | ug/L | 5 | **12** | **9** | < 1.0 U | < 1.0 U | 5 | 4.5 | < 1.0 U | **13** | **22** | **29** |
| Vinyl chloride | ug/L | 2 | < 1.0 U | 0.70 J | 2 | 2.3 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 | 1 |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 | < 2.0 |
| Total Site-Specific VOCs | ug/L | | 13.2 | 20.2 | 2.0 | 2.3 | 5.0 | 4.5 | 18.0 | 13.9 | 71.0 | 86.2 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

| | Units | MCL[1] | Equipment Blank 10/30/2015 QAQC | Equipment Blank 10/30/2015 QAQC | Equipment Blank 10/30/2015 QAQC | Trip Blank 10/30/2015 QAQC | Equipment Blank 11/3/2015 QAQC | Equipment Blank 11/3/2015 QAQC | Trip Blank 11/3/2015 QAQC | Equipment Blank 11/4/2015 QAQC | Equipment Blank 11/4/2015 QAQC | Equipment Blank 11/4/2015 QAQC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/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 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 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 | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 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 | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

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| | Units | MCL[1] | Trip Blank 11/4/2015 QAQC | Equipment Blank 11/5/2015 QAQC | Equipment Blank 11/5/2015 QAQC | Trip Blank 11/5/2015 QAQC | Equipment Blank 12/8/2015 QAQC | Equipment Blank 12/8/2015 QAQC | Trip Blank 12/8/2015 QAQC | Trip Blank 12/8/2015 QAQC | Trip Blank 12/8/2015 QAQC | Trip Blank 12/8/2015 QAQC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/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 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 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 | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 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 | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

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| | Units | MCL[1] | Equipment Blank 12/8/2015 QAQC | Equipment Blank 12/8/2015 QAQC | Equipment Blank 12/8/2015 QAQC | Trip Blank 12/8/2015 QAQC | Equipment Blank 12/11/2015 QAQC | Equipment Blank 12/11/2015 QAQC | Trip Blank 12/11/2015 QAQC | Equipment Blank 12/28/2015 QAQC | Equipment Blank 12/28/2015 QAQC | Trip Blank 12/28/2015 QAQC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site-Specific Volatile Organic Compounds | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/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 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U | < 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 | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 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 | ug/L | 1000 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

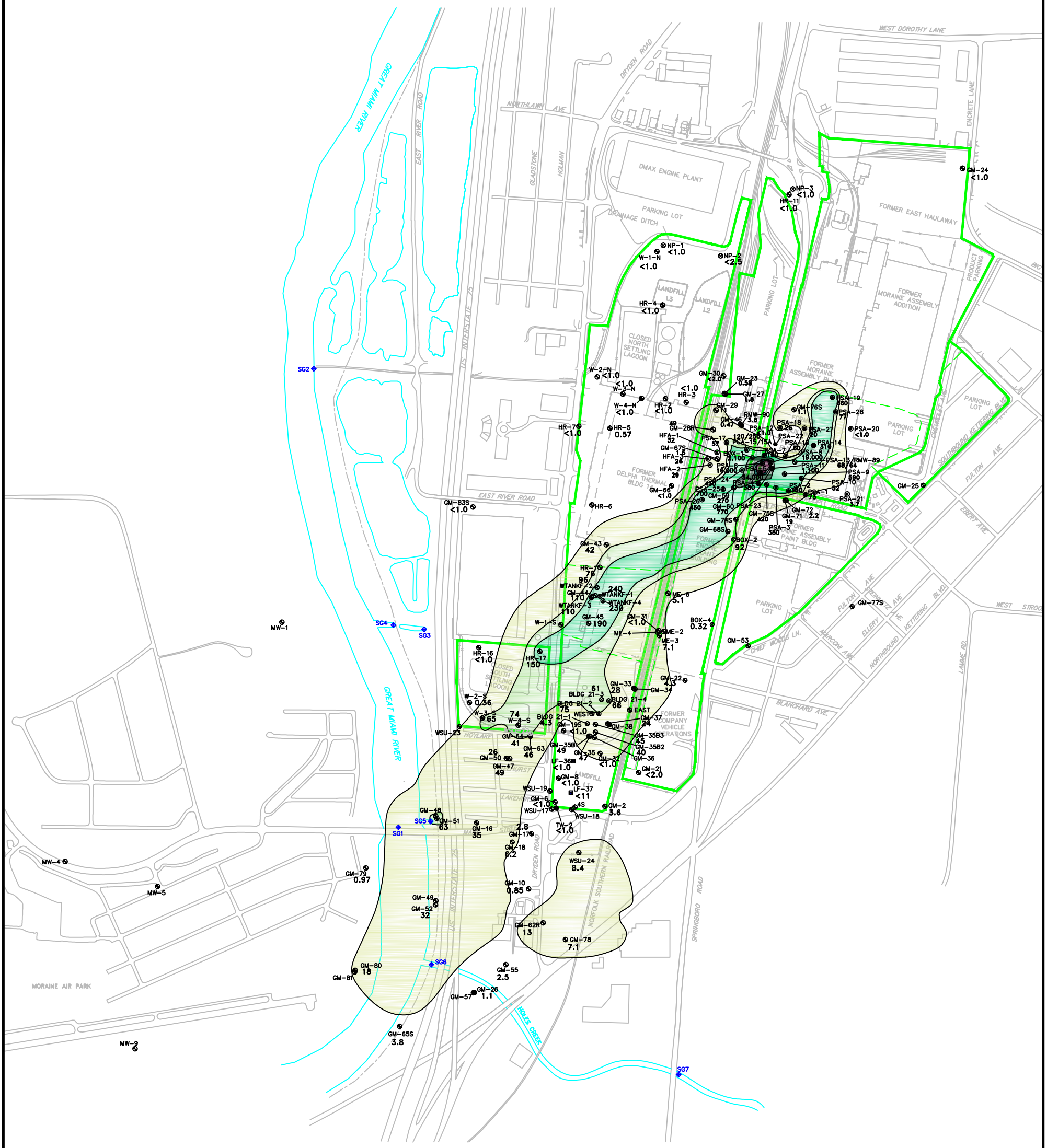
| | Units | MCL[1] | Trip Blank 12/28/2015 QAQC | Equipment Blank 1/15/2016 QAQC |
|---|---|---|---|---|
| Site-Specific Volatile Organic Compounds | | | | |
| 1,1,1-Trichloroethane | ug/L | 200 | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethane | ug/L | | < 1.0 U | < 1.0 U |
| 1,1-Dichloroethene | ug/L | 7 | < 1.0 U | < 1.0 U |
| Benzene | ug/L | 5 | < 1.0 U | < 1.0 U |
| cis-1,2-Dichloroethene | ug/L | 70 | < 1.0 U | < 1.0 U |
| Ethylbenzene | ug/L | 700 | < 1.0 U | < 1.0 U |
| Tetrachloroethene | ug/L | 5 | < 1.0 U | < 1.0 U |
| Toluene | ug/L | 1000 | < 1.0 U | 0.27 J |
| trans-1,2-Dichloroethene | ug/L | 100 | < 1.0 U | < 1.0 U |
| Trichloroethene | ug/L | 5 | < 1.0 U | < 1.0 U |
| Vinyl chloride | ug/L | 2 | < 1.0 U | < 1.0 U |
| Xylene (total) | ug/L | 10,000 | < 2.0 U | < 2.0 U |
| Total Site-Specific VOCs | ug/L | | 0.0 | 0.0 |

1 - A MCL is not listed for 1,1-dichloroethane.
ug/L - Micrograms per Liter.
MCL - Maximum Contaminant Level.
**BOLD** - Result above MCL.
< - Constituent not detected above laboratory reporting limit shown.
F1 - MS and/or MSD Recovery is outside acceptance limits.
F2 - MS/MSD Relative Percent Difference exceeds control limits.
K - The compound was positively identified; however, the associated numerical value is an estimated concentration only and the reported value may be biased high. Actual concentration is expect lower.
J - Value is estimated.
U - Constituent not detected above laboratory reporting limit shown.

# APPENDIX H

## Isocencentration Maps

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-A.dwg LAYOUT: UPPER PCE 2015 SAVED: 2/25/2016 10:49 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 10:51 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- STREAM GAUGE
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- ug/L — MICROGRAMS PER LITER
- <1.0 — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN
- MCL — MAXIMUM CONTAMINANT LEVEL
- >10000 ug/L
- 5000–10000 ug/L
- 1000–5000 ug/L
- 100–1000 ug/L
- 50–100 ug/L
- 5–50 ug/L

| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

RACER TRUST
MORAINE, OHIO

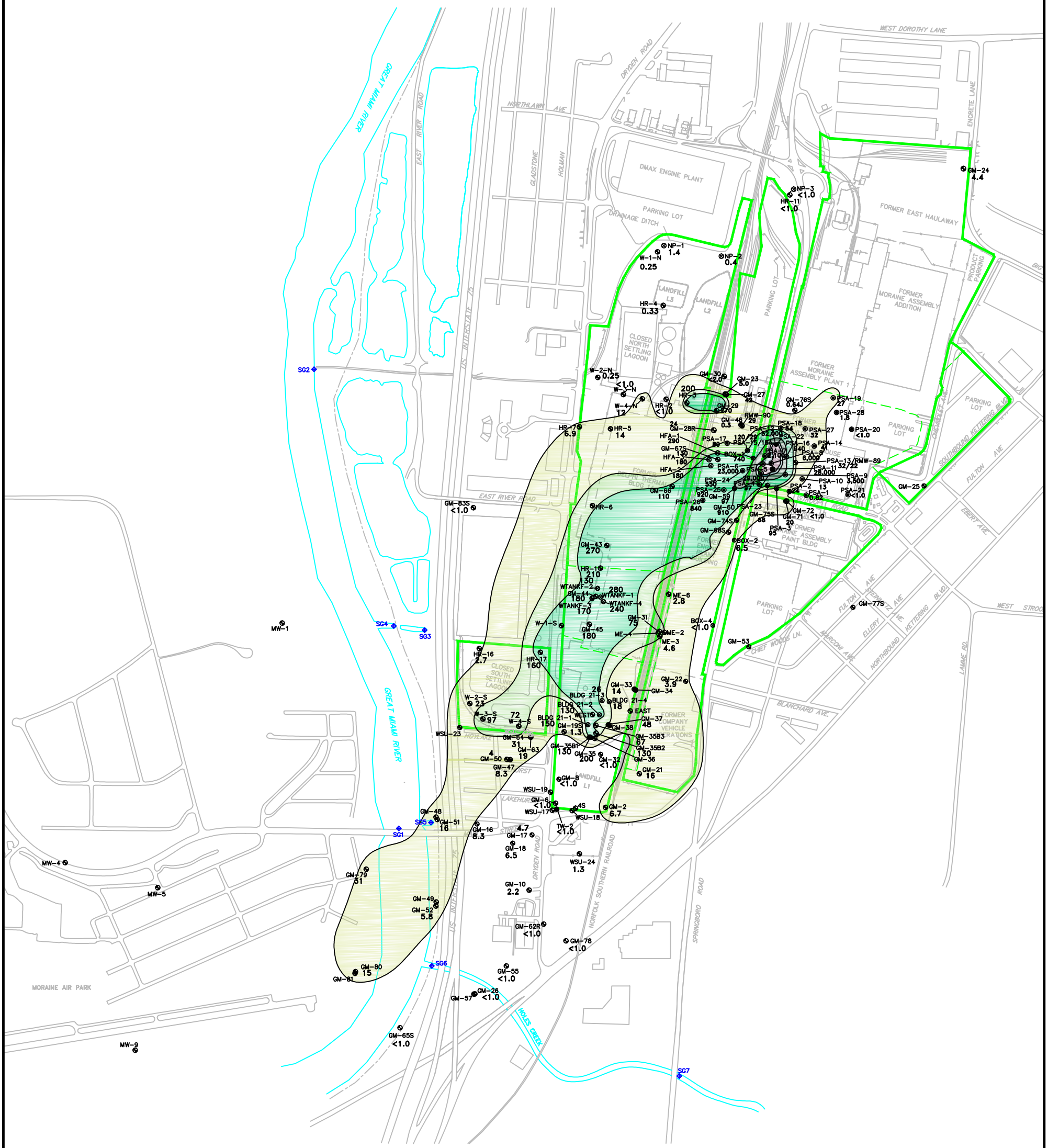
OH000294.2016

# ISOCONCENTRATION MAP (UPPER AQUIFER) TETRACHLOROETHENE - 2015

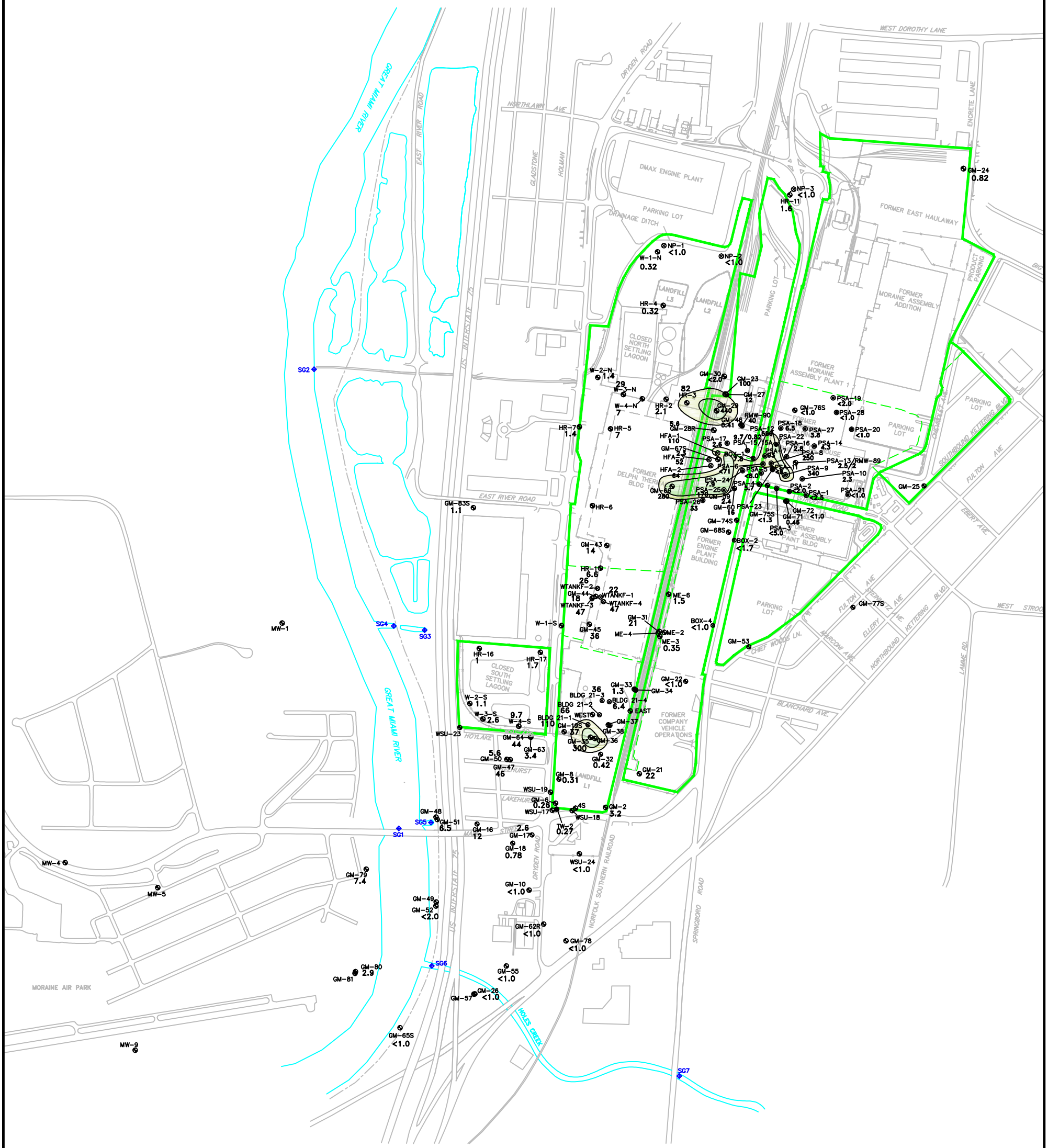
ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-1

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-A.dwg LAYOUT: UPPER TCE 2015 SAVED: 2/25/2016 10:49 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 10:56 AM BY: SMITH, BOB


GREAT MIAMI RIVER
EAST RIVER ROAD
US INTERSTATE 75
NORTHLAWN AVE
DRYDEN ROAD
GLADSTONE
HOLMAN
WEST DOROTHY LANE
ENCRETE LANE
DMAX ENGINE PLANT
PARKING LOT
DRAINAGE DITCH
FORMER EAST HAULAWAY
PRODUCT PARKING
FORMER MORAINE ASSEMBLY ADDITION
FORMER MORAINE ASSEMBLY PLANT 1
FORMER MORAINE ASSEMBLY PAINT BLDG
FORMER DELPHI-THERMAL BLDG
FORMER ENGINE MANUFACTURING BUILDING
FORMER COMPANY VEHICLE OPERATIONS
CLOSED NORTH SETTLING LAGOON
CLOSED SOUTH SETTLING LAGOON
LANDFILL L1
LANDFILL L2
LANDFILL L3
LAKEHURST
PARKING LOT
SOUTHBOUND KETTERING BLVD.
NORTHBOUND KETTERING BLVD.
FULTON AVE
EBERT AVE.
ELLERY AVE.
MARCONI AVE.
CHIEF WOODS LN.
BLANCHARD AVE.
LAMME RD.
WEST STROC
BIG
GREAT MIAMI RIVER
DRYDEN ROAD
NORFOLK SOUTHERN RAILROAD
SPRINGBORO ROAD
HOLES CREEK
MORAINE AIR PARK
SG1
SG2
SG3
SG4
SG5
SG6
SG7
MW-1
MW-4
MW-5
MW-9
HR-1 210
HR-2 <1.0
HR-3 200
HR-4 0.33
HR-5 14
HR-6
HR-7 6.9
HR-16 2.7
HR-17 160
HR-18 130
HR-19 1.3
HR-20 26
HR-21 18
HR-22 130
HR-23 72
HR-24 150
HR-25 4
HR-26 8.3
HR-27 4.7
HR-28 6.5
HR-29 1.3
HR-30 2.2
HR-31 <1.0
HR-32 <1.0
HR-33 <1.0
HR-34 <1.0
HR-35 <1.0
HR-36 <1.0
HR-37 <1.0
HR-38 <1.0
HR-39 <1.0
HR-40 <1.0
HR-41 <1.0
HR-42 <1.0
HR-43 <1.0
HR-44 <1.0
HR-45 <1.0
HR-46 <1.0
HR-47 <1.0
HR-48 <1.0
HR-49 <1.0
HR-50 <1.0

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-A.dwg LAYOUT: SHAL CIS-1-2-DICHLOROETHENE 2015 SAVED: 2/25/2016 10:59 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:00 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- STREAM GAUGE
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN
- ug/L — MICROGRAMS PER LITER
- MCL — MAXIMUM CONTAMINANT LEVEL
- >150 ug/L
- 70–150 ug/L

| SITE–SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1–Trichloroethane | 200 |
| 1,1–Dichloroethane | -- |
| 1,1–Dichloroethene | 7 |
| Benzene | 5 |
| cis–1,2–Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans–1,2–Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5–YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE–DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON–DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

RACER TRUST
MORAINE, OHIO

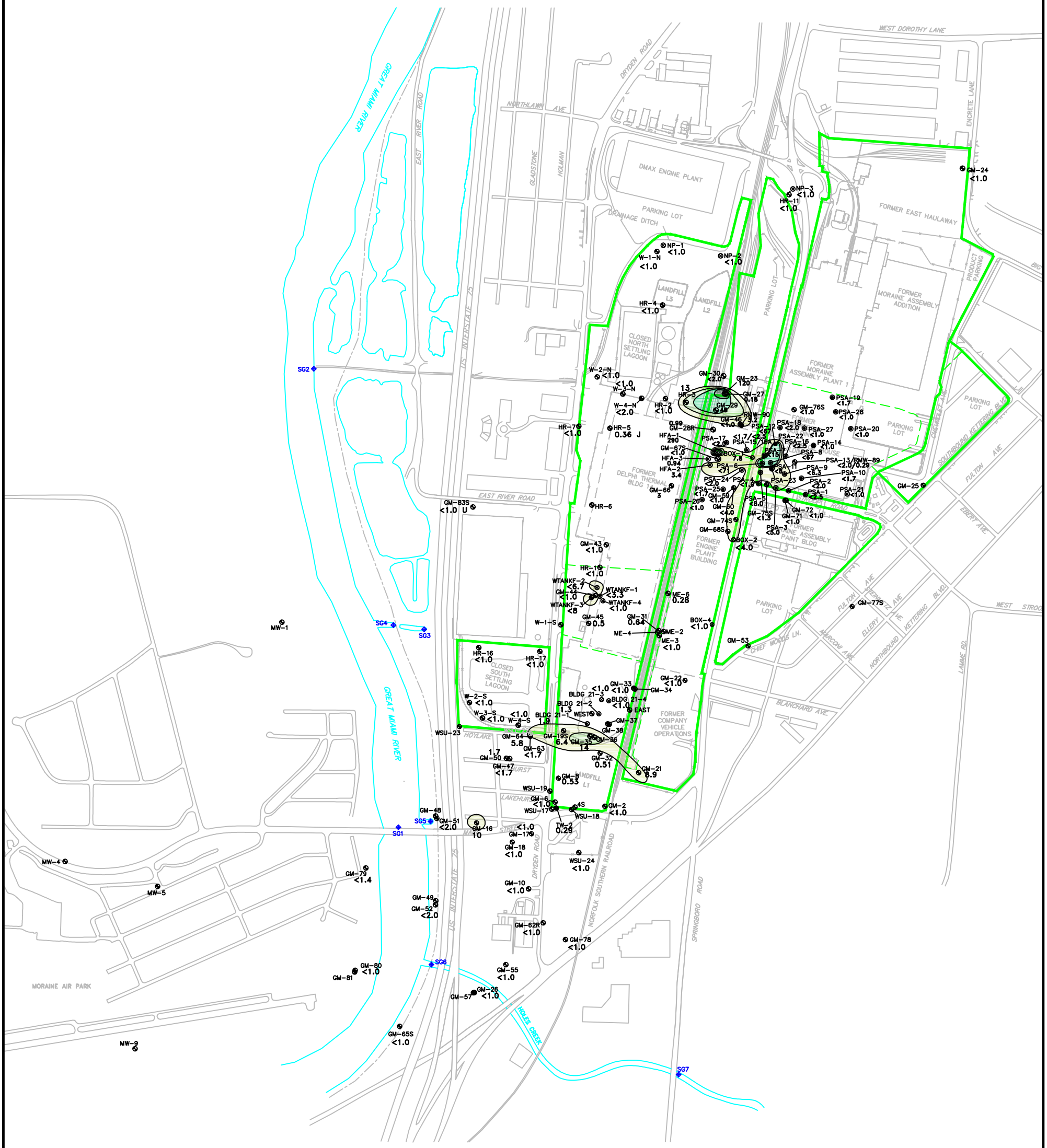
OH000294.2016

# ISOCONCENTRATION MAP (UPPER AQUIFER) cis-1,2-DICHLOROETHENE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-3

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-A.dwg LAYOUT: SHAL VINYL CHLORIDE 2015 SAVED: 2/25/2016 10:59 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:08 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- STREAM GAUGE
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN
- ug/L — MICROGRAMS PER LITER
- MCL — MAXIMUM CONTAMINANT LEVEL
- >50 ug/L
- 20–50 ug/L
- 10–20 ug/L
- 2–10 ug/L

| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

RACER TRUST
MORAINE, OHIO

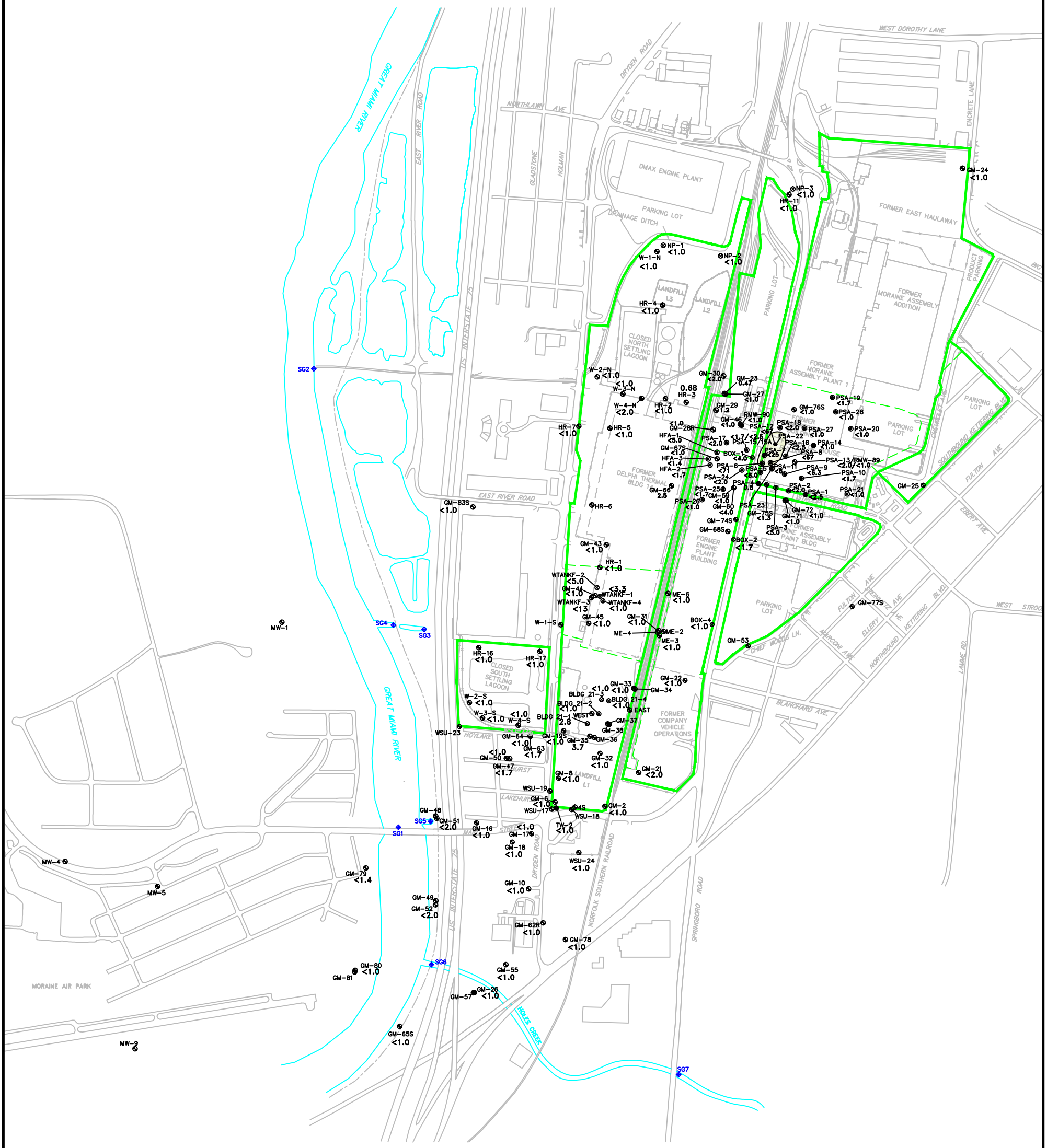
OH000294.2016

# ISOCONCENTRATION MAP (UPPER AQUIFER) VINYL CHLORIDE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-4

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-A.dwg LAYOUT: SHAL 1-1-DICHLOROETHENE 2015 SAVED: 2/25/2016 10:59 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:10 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- STREAM GAUGE
- CARBON INTRODUCTION WELL
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN
- ug/L — MICROGRAMS PER LITER
- MCL — MAXIMUM CONTAMINANT LEVEL
- >50 ug/L
- 7–50 ug/L

| SITE–SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1–Trichloroethane | 200 |
| 1,1–Dichloroethane | -- |
| 1,1–Dichloroethene | 7 |
| Benzene | 5 |
| cis–1,2–Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans–1,2–Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5–YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE–DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON–DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

N

0 200 1000ft

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MORAINE, OHIO

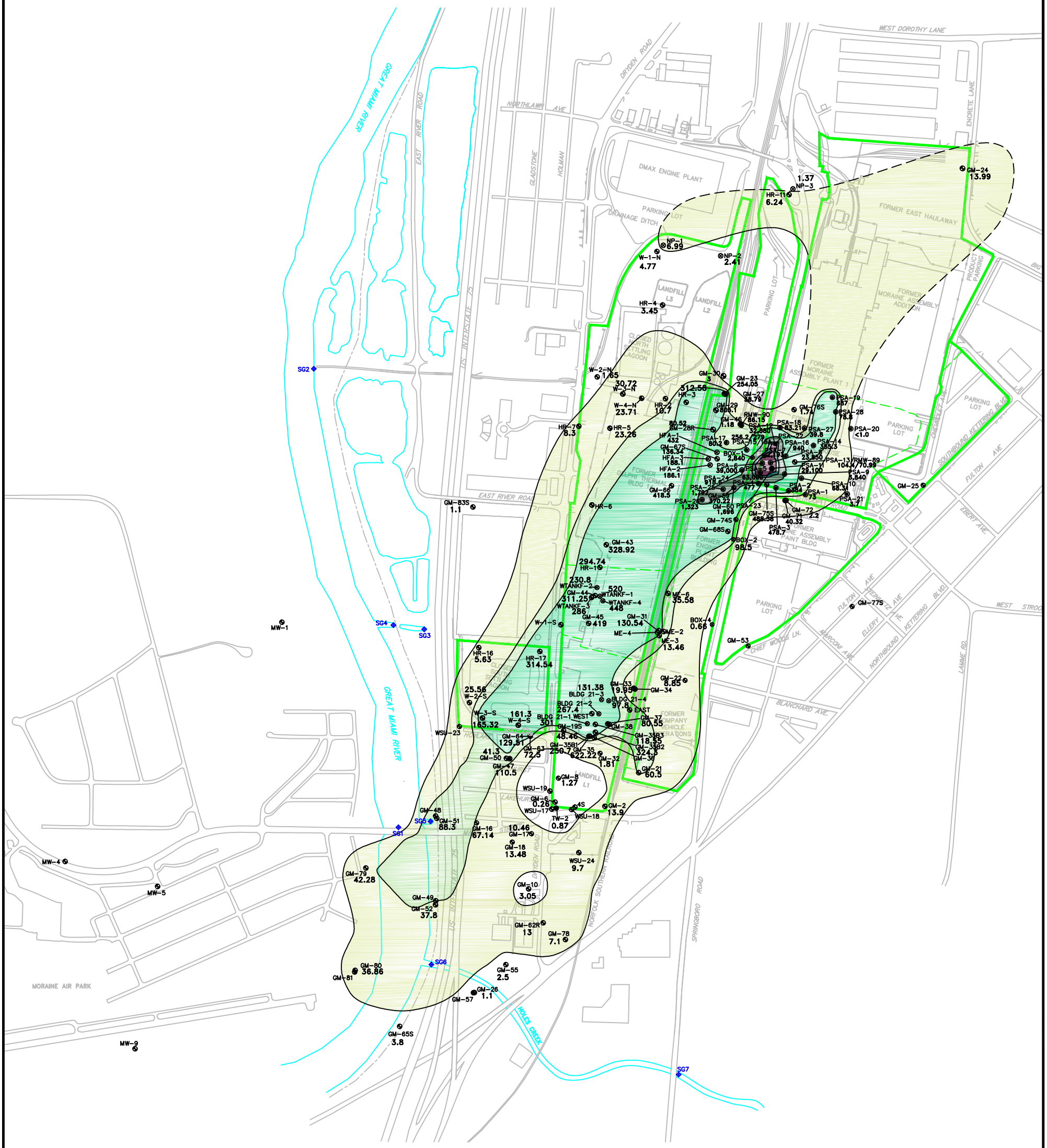
OH000294.2016

# ISOCONCENTRATION MAP (UPPER AQUIFER) 1,1-DICHLOROETHENE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-5

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-A.dwg LAYOUT: UPPER TOTAL VOCS SAVED: 2/25/2016 11:28 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/26/2016 1:42 PM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (UPPER AQUIFER)
- INACTIVE RECOVERY WELL (TW-2)
- STREAM GAUGE
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- ug/L — MICROGRAMS PER LITER
- <1.0 — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN
- >10000 ug/L
- 5000–10000 ug/L
- 1000–5000 ug/L
- 100–1000 ug/L
- 50–100 ug/L
- 5–50 ug/L

N

0 200 1000ft

**NOTE:**
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

RACER TRUST
MORAINE, OHIO

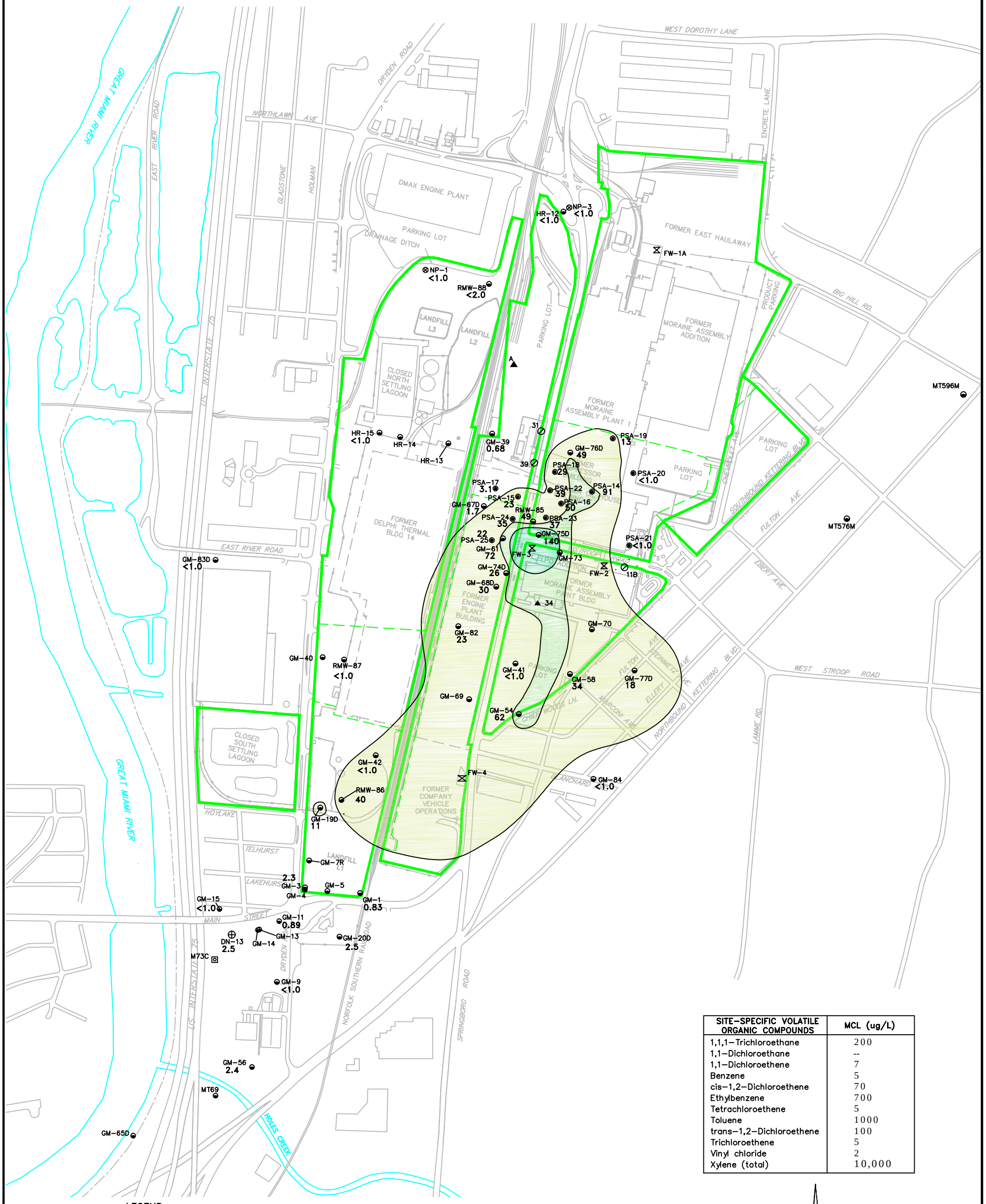
OH000294.2016

# ISOCONCENTRATION MAP (UPPER AQUIFER) TOTAL CHLORINATED VOCs - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-6

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: PCE 2015 SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: -- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:32 AM BY: SMITH, BOB




| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

N

0 100 850ft

LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 ug/L MCL — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN; MICROGRAMS PER LITER; MAXIMUM CONTAMINANT LEVEL
- >100 ug/L
- 50-100 ug/L
- 5-50 ug/L

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

RACER TRUST
MORAINE, OHIO

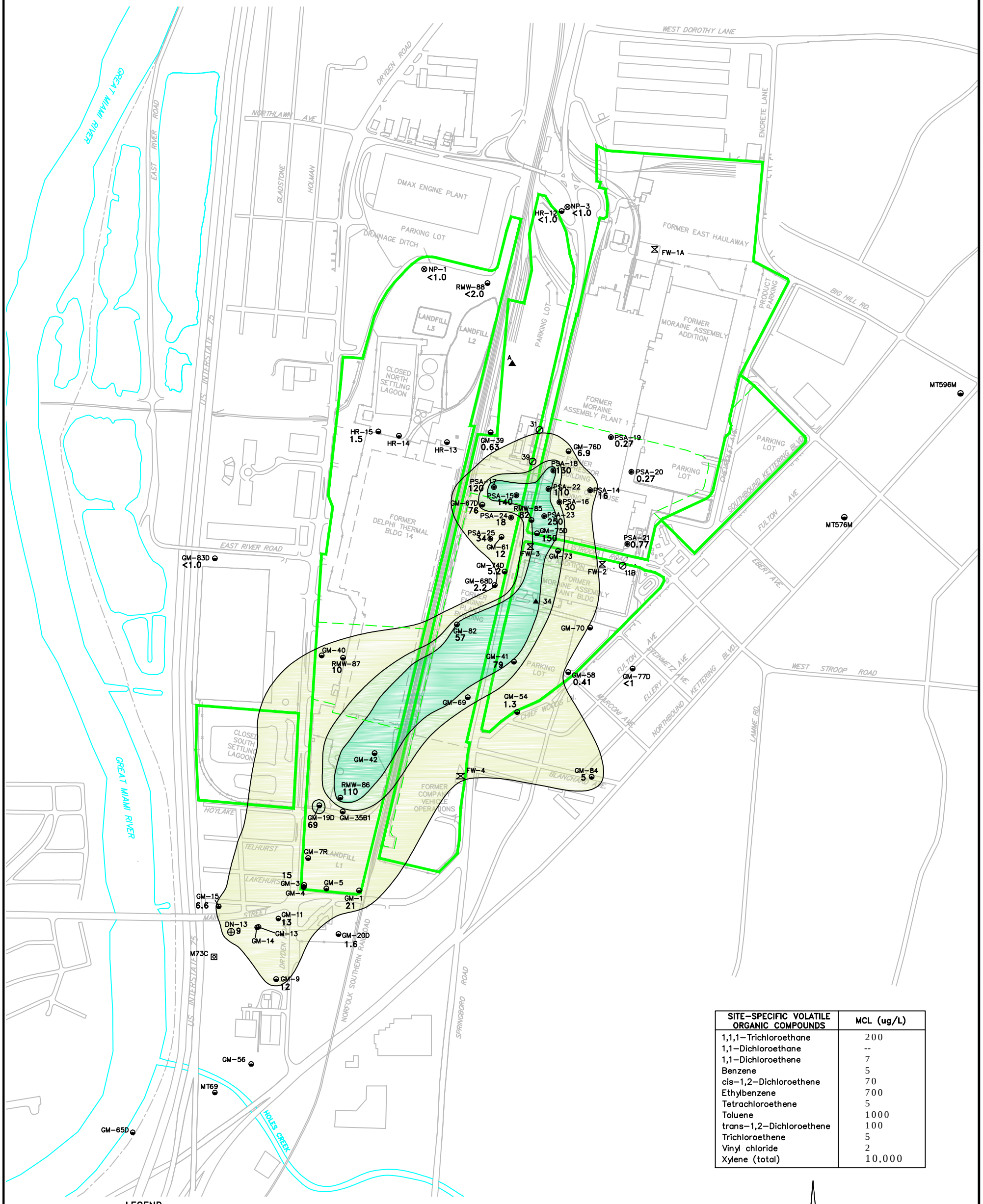
OH000294.2016

# ISOCONCENTRATION MAP (LOWER AQUIFER) TETRACHLOROETHENE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-7

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: TCE 2015 SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:33 AM BY: SMITH, BOB




| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

N

0 100 850ft

LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 ug/L MCL — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN; MICROGRAMS PER LITER; MAXIMUM CONTAMINANT LEVEL
- >100 ug/L
- 50-100 ug/L
- 5-50 ug/L

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

RACER TRUST
MORAINE, OHIO

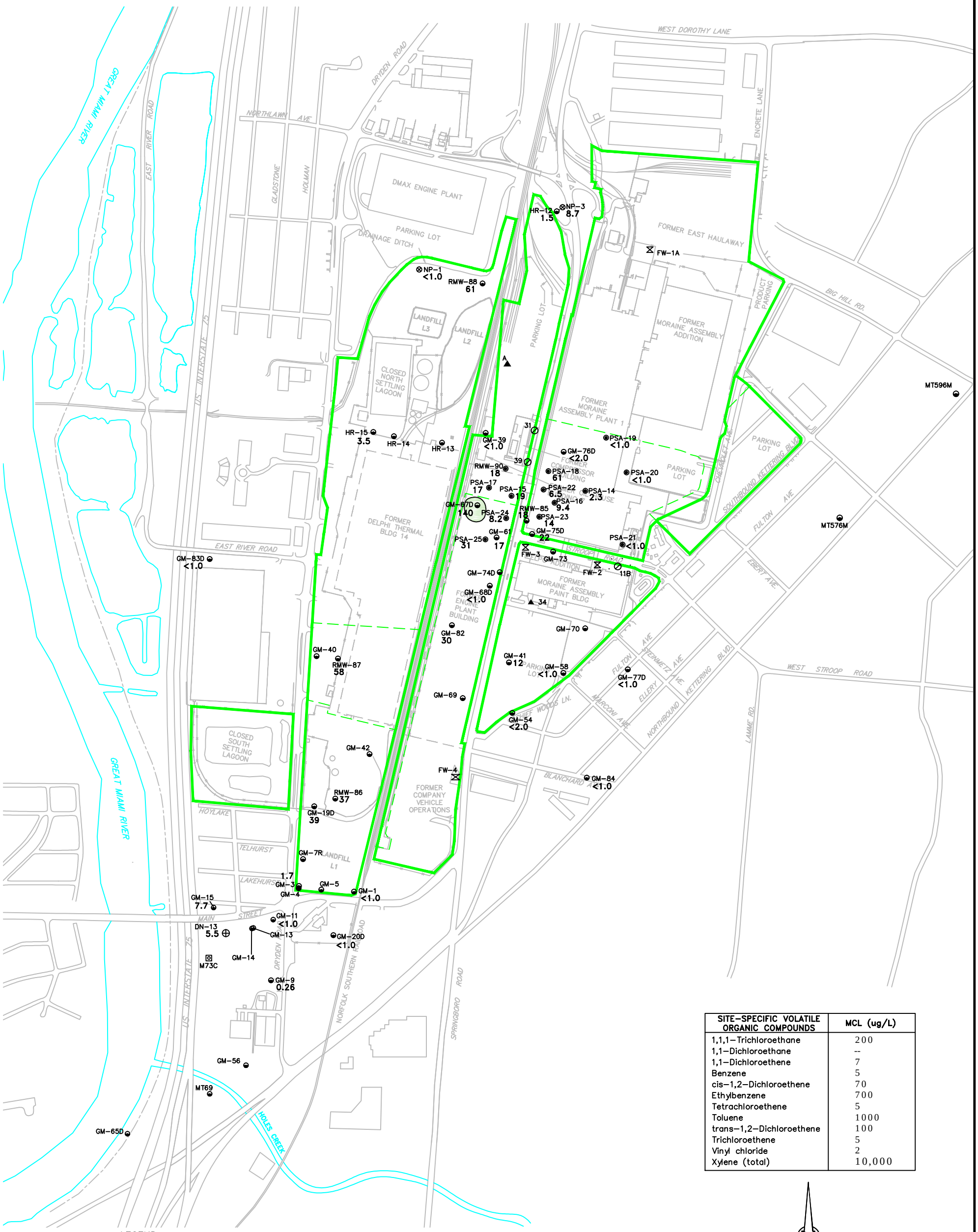
OH000294.2016

# ISOCONCENTRATION MAP (LOWER AQUIFER) TRICHLOROETHENE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-8

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: CIS-1-2-DICHLOROETHENE SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:35 AM BY: SMITH, BOB




| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 ug/L MCL — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN — MICROGRAMS PER LITER — MAXIMUM CONTAMINANT LEVEL
- 70-150 ug/L

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

N

0 100 850ft

RACER TRUST
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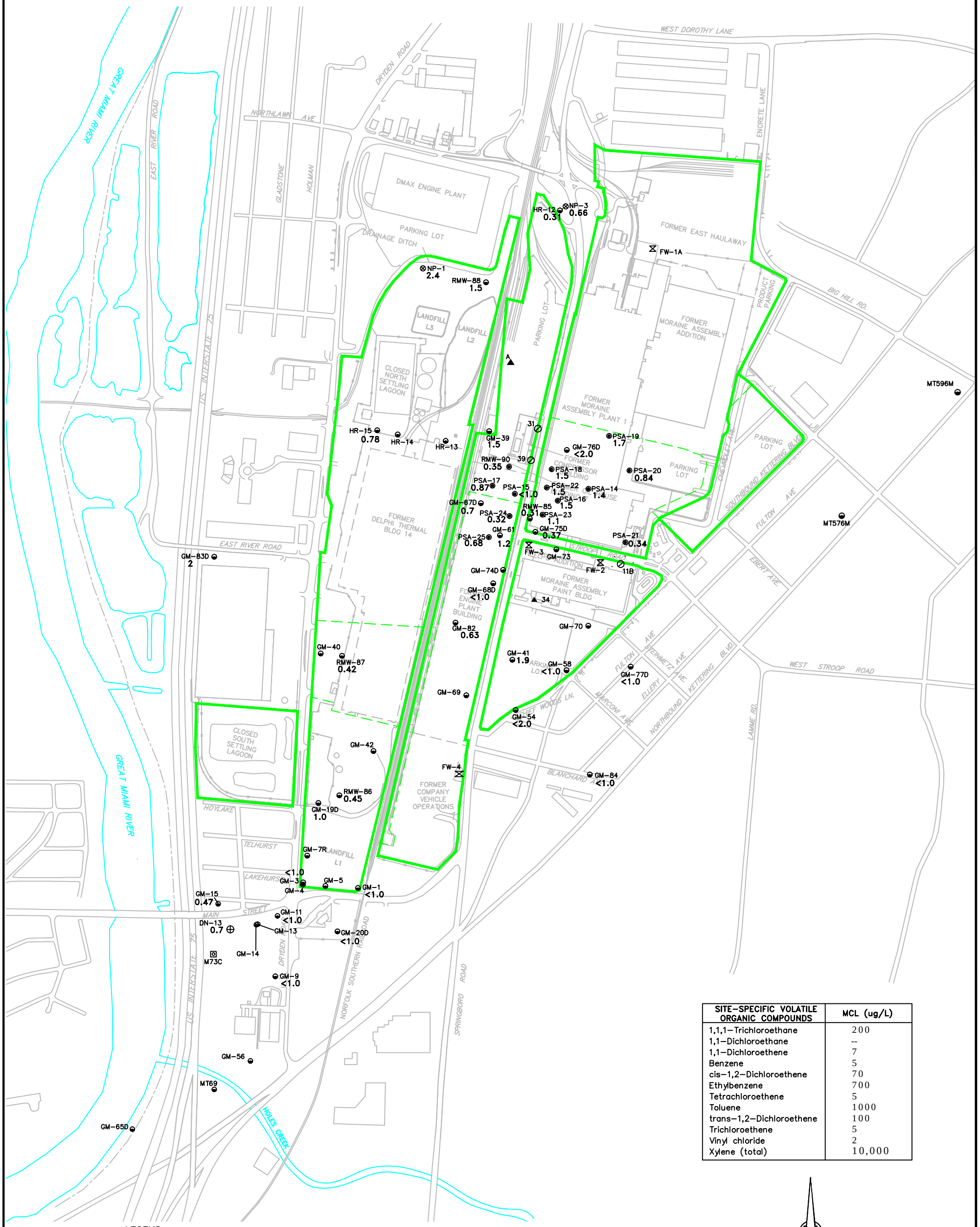
OH000294.2016

# ISOCONCENTRATION MAP (LOWER AQUIFER) cis-1,2-DICHLOROETHENE -2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-9

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: VINYL CHLORIDE SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:37 AM BY: SMITH, BOB




| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

N

0 100 850ft

LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN
- ug/L MICROGRAMS PER LITER
- MCL MAXIMUM CONTAMINANT LEVEL

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

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MORAINE, OHIO

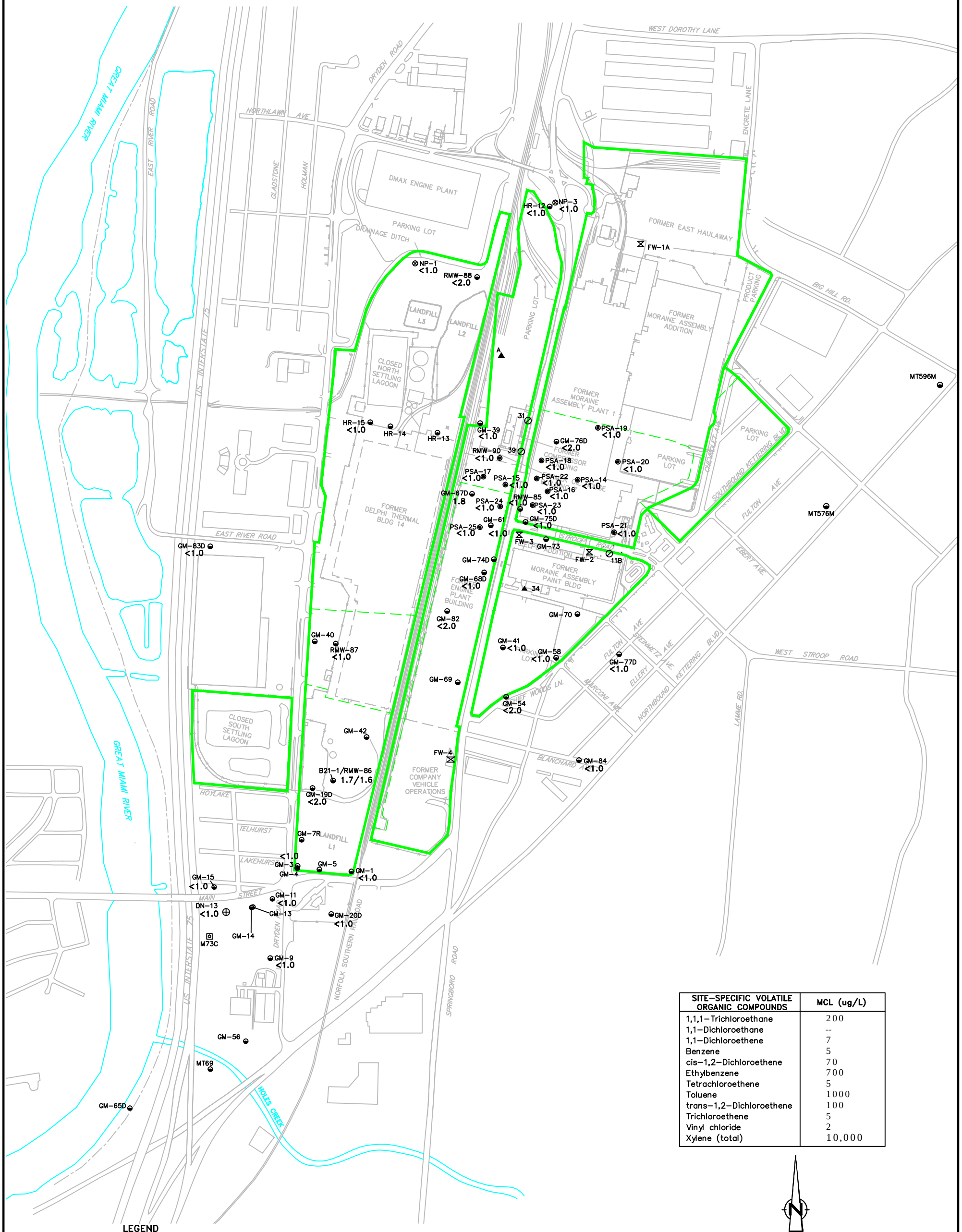
OH000294.2016

# ISOCONCENTRATION MAP (LOWER AQUIFER) VINYL CHLORIDE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-10

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: 1-1-DICHLOROETHENE SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:41 AM BY: SMITH, BOB




| SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS | MCL (ug/L) |
|---|---|
| 1,1,1-Trichloroethane | 200 |
| 1,1-Dichloroethane | -- |
| 1,1-Dichloroethene | 7 |
| Benzene | 5 |
| cis-1,2-Dichloroethene | 70 |
| Ethylbenzene | 700 |
| Tetrachloroethene | 5 |
| Toluene | 1000 |
| trans-1,2-Dichloroethene | 100 |
| Trichloroethene | 5 |
| Vinyl chloride | 2 |
| Xylene (total) | 10,000 |

N

0 200 700ft

LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- <1.0 ug/L MCL — CONSTITUENT NOT DETECTED ABOVE LABORATORY LIMIT SHOWN; MICROGRAMS PER LITER; MAXIMUM CONTAMINANT LEVEL

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

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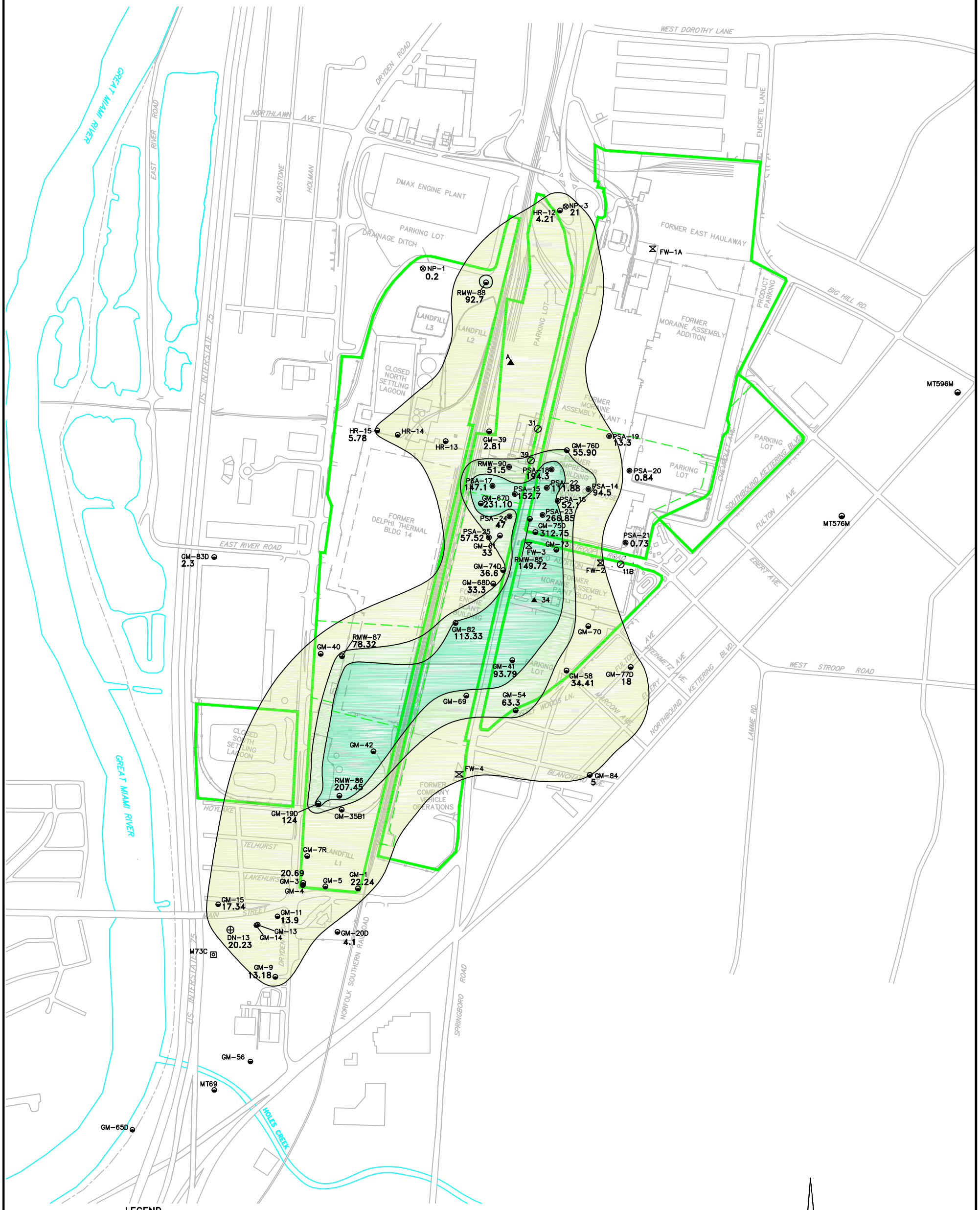
OH000294.2016

# ISOCONCENTRATION MAP (LOWER AQUIFER) 1,1-DICHLOROETHENE - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-11

CITY:DUBLIN DIV/GROUP:SER2 DB:R. SMITH LD:(Opt) PIC:(Opt) PM:N. GILLOTTI TM:T. FORTNER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Columbus-OH\ACT\OH000294 - RACER\294-2015-04B-ANNUAL\ANN294-2016-05-B.dwg LAYOUT: TOTAL VOCS 2015 SAVED: 2/24/2016 3:03 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED: 2/25/2016 11:42 AM BY: SMITH, BOB




## LEGEND

- MONITORING WELL (LOWER AQUIFER)
- PIEZOMETER
- FIRE WELL
- PRODUCTION WELL CONVERTED TO MONITORING WELL (A, 34)
- INACTIVE PRODUCTION WELL
- MONTGOMERY COUNTY WELL (USED BY RACER TRUST AS A LOWER AQUIFER RECOVERY WELL)
- RIVER LEVEE
- FORMER BUILDING FOOTPRINT
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY
- PARCEL BOUNDARY
- ug/L MICROGRAMS PER LITER
- VOCs VOLATILE ORGANIC COMPOUNDS
- >100 ug/L
- 50–100 ug/L
- 5–50 ug/L

NOTE:
CONCENTRATIONS POSTED REFLECT 2015 GROUNDWATER SAMPLING, 2013 ANNUAL GROUNDWATER SAMPLING (WHERE APPLICABLE FOR 5-YEAR EVENT MONITORING WELLS) AND MAXIMUM CONCENTRATION FROM VERTICAL AQUIFER PROFILING. ISOCONCENTRATION CONTOUR INTERPRETATION INCLUDES CONCEPTUAL SITE MODEL UNDERSTANDING (I.E. GROUNDWATER FLOW AND INTERIM MEASURES OPERATION). ISOCONCENTRATION MAPS FOR PCE, TCE AND TCVOC WERE GENERATED BY THREE-DIMENSIONAL MODEL EXPORT. WHEN SAMPLE RESULT IS NON-DETECT, HALF THE REPORTING LIMIT IS HONORED WITH THE CONTOURING.

N

0 100 850ft

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MORAINE, OHIO

OH000294.2016

# ISOCONCENTRATION MAP (LOWER AQUIFER) TOTAL CHLORINATED VOCs - 2015

ARCADIS Design & Consultancy for natural and built assets

FIGURE
H-12

# APPENDIX I

## DN-13 Pumping Well Operation and Maintenance

## DN-13 Operations and Maintenance

### Background

Extraction well DN-13 is a lower aquifer extraction well that is owned by Montgomery County and operated by Montgomery County and RACER Trust. Well DN-13 was part of the former Greater Moraine Water System located in the former North Dryden Road well field. The well has been used in a Pump-to-Waste Program since March 1990 in cooperation with former GM Corporation/MLC until March 31, 2011 and has continued operation since that time in cooperation with the RACER Trust.

The interim measure for the lower aquifer at the site consists of continued pumping of DN-13 to capture impacted groundwater. The outfall for DN-13 discharges to the Great Miami River and, as required by the National Pollution Discharge Elimination System (NPDES) permit regulated by the Ohio EPA, monthly sampling is performed at well head to monitor water quality along with the discharge flow rate.

Additional information regarding DN-13 capture is located in Section 3.2 of the main report.

An operation and maintenance plan has been defined in the Extraction Well DN-13 Operation and Maintenance Memorandum (ARCADIS, In. 2015a) and the RACER Trust Moraine Facilities: Extraction Well DN-13 Operation and Maintenance Status (ARCADIS, Inc. 2015b). Data has been collected monthly since April 2015 and is used to plan and maintain the performance of extraction well DN-13 by the following:

1. Date and time of measurements;
2. Electric motor power consumption;
3. Flow meter readings (totalizer);
4. Flow control valve setting;
5. Wellhead pressure; and
6. Water-level measurements including both manual depth-to-water measurements during pumping and high frequency water-level data from the pressure transducers deployed in well DN-13 and monitoring wells M73C (down-gradient), GM-14 (up-gradient), GM-15(cross-gradient), GM-9 (cross-gradient), and GM-19D (up-gradient, manual readings only).

The objective of the data collection and subsequent analysis is to recognize, in a timely manner, indications of deteriorating pump/motor and/or fouling/encrustation of the well screen through evaluation of specific performance criteria that will prompt appropriate action.

Data is analyzed and summarized in a quarterly evaluations reported in the Third and Fourth Quarter 2015 Quarterly Progress Reports submitted to the US EPA and Ohio EPA (RACER Trust 2015a and RACER Trust 2015b). As outlined in the RACER Trust Moraine Facilities: Extraction Well DN-13 Operation and Maintenance Status (ARCADIS, Inc. 2015b). Arcadis indicated the following items would be reported in the Annual Site-Wide Groundwater Monitoring Report:

- An annual data summary
- Corresponding figures and tables
- An evaluation and recommendations regarding future data collection and/or corrective actions, and
- Documentation of O&M activities/actions performed during the reporting year

As part of this annual performance summary, DN-13 groundwater elevation is shown graphically on Figure I-1; and specific capacity (SC) and average monthly flow rate are shown on Figure I-2. Data is shown for the third and fourth quarter 2015 as these were the first periods to be included in the new data collection as part of the new operation and maintenance program. Annual average flow rate data for the year is summarized in Section 3.2.1 of the main report.

As part of the quarterly evaluations, correction actions were prompted and summarized below:

**Third Quarter 2015**

Due to the decrease in specific capacity and the anticipated continued decrease in drawdown elevation as shown in figures, re-development of the well DN-13 was recommended to improve performance.

**Fourth Quarter 2015**

Due to recognition of the declining well performance observed in third quarter 2015, DN-13 was shut down for 15 days in November to conduct re-development activities. The Layne Christenson Company (Layne) removed biofouling and mineral scaling on the screen and within the surrounding formation by jetting and application of glycolic acid. In addition, the motor and pump were removed and inspected, and video logging of the well to assess screen conditions was completed prior to and after re-development. A step test was completed by Arcadis to determine the success of the re-development process and obtain new baseline parameters. Testing results

demonstrated improvements in well performance by increasing specific capacity, allowing for higher flow rate operation. The instantaneous flow rate after re-development was approximately 1,030 gpm. The re-development activities were successful in improving flow rate and specific capacity, and additional modifications with regard to these two parameters are not recommended. On December 23, 2015, the DN-13's pump motor failed and was not repaired until after the end of the year.

No additional data is recommended to be collected beyond the original operation and maintenance program in 2016.

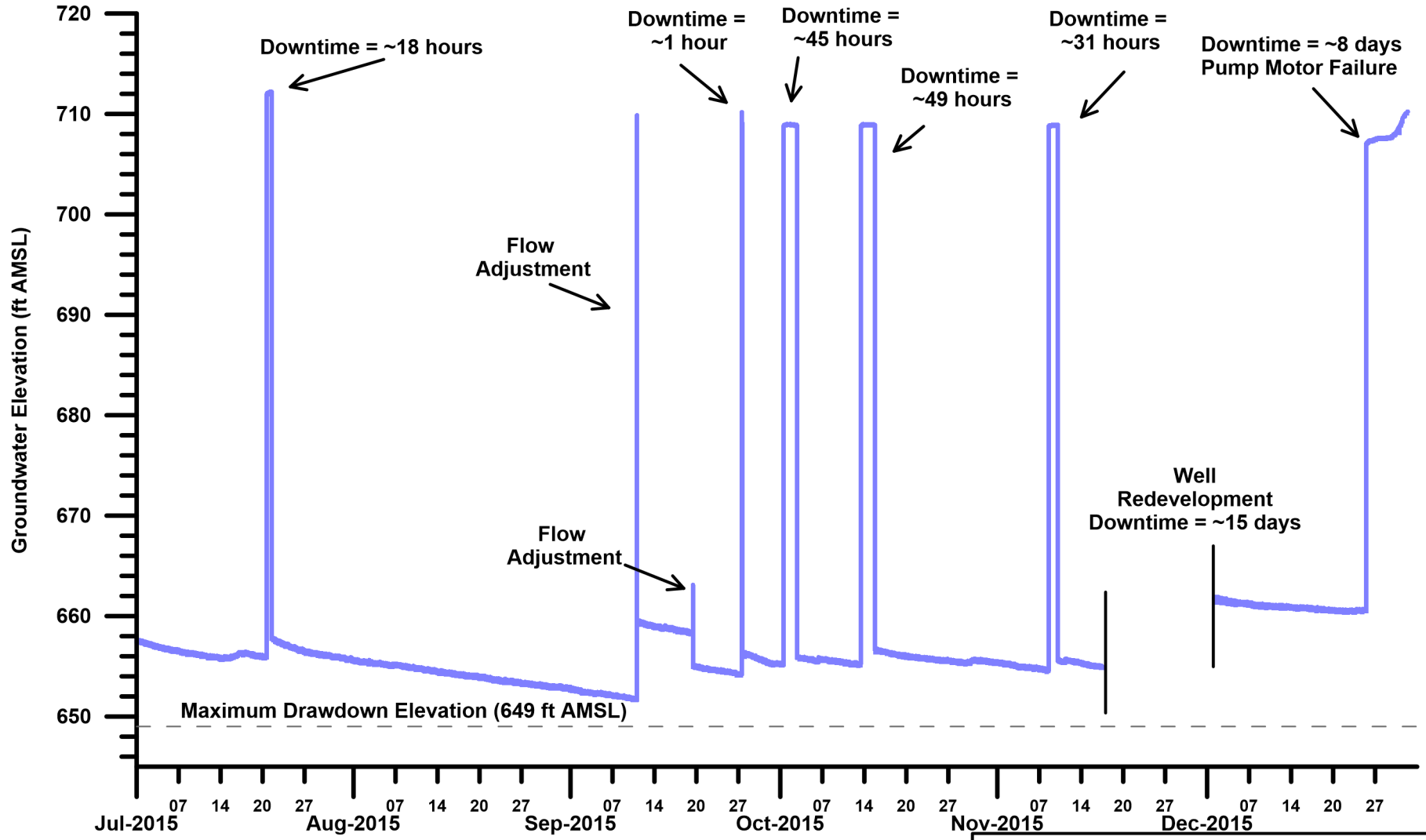
**References:**

ARCADIS, Inc. 2015a. Extraction Well DN-13 Operation and Maintenance Memorandum, RACER Trust, Moraine, Ohio. April 8, 2015.

ARCADIS, Inc. 2015b. RACER Trust Moraine Facilities: Extraction Well DN-13 Operation and Maintenance Status, RACER Trust, Moraine, Ohio. September 24, 2015.

RACER Trust. 2015a. Third Quarter 2015 Progress Report, RACER Trust Moraine Facilities, Moraine, Ohio. October 12, 2015.

RACER Trust. 2015b. Fourth Quarter 2015 Progress Report, RACER Trust Moraine Facilities, Moraine, Ohio. January 11, 2016.




Note: DN-13 Screen Elevation from 619 to 559 feet AMSL

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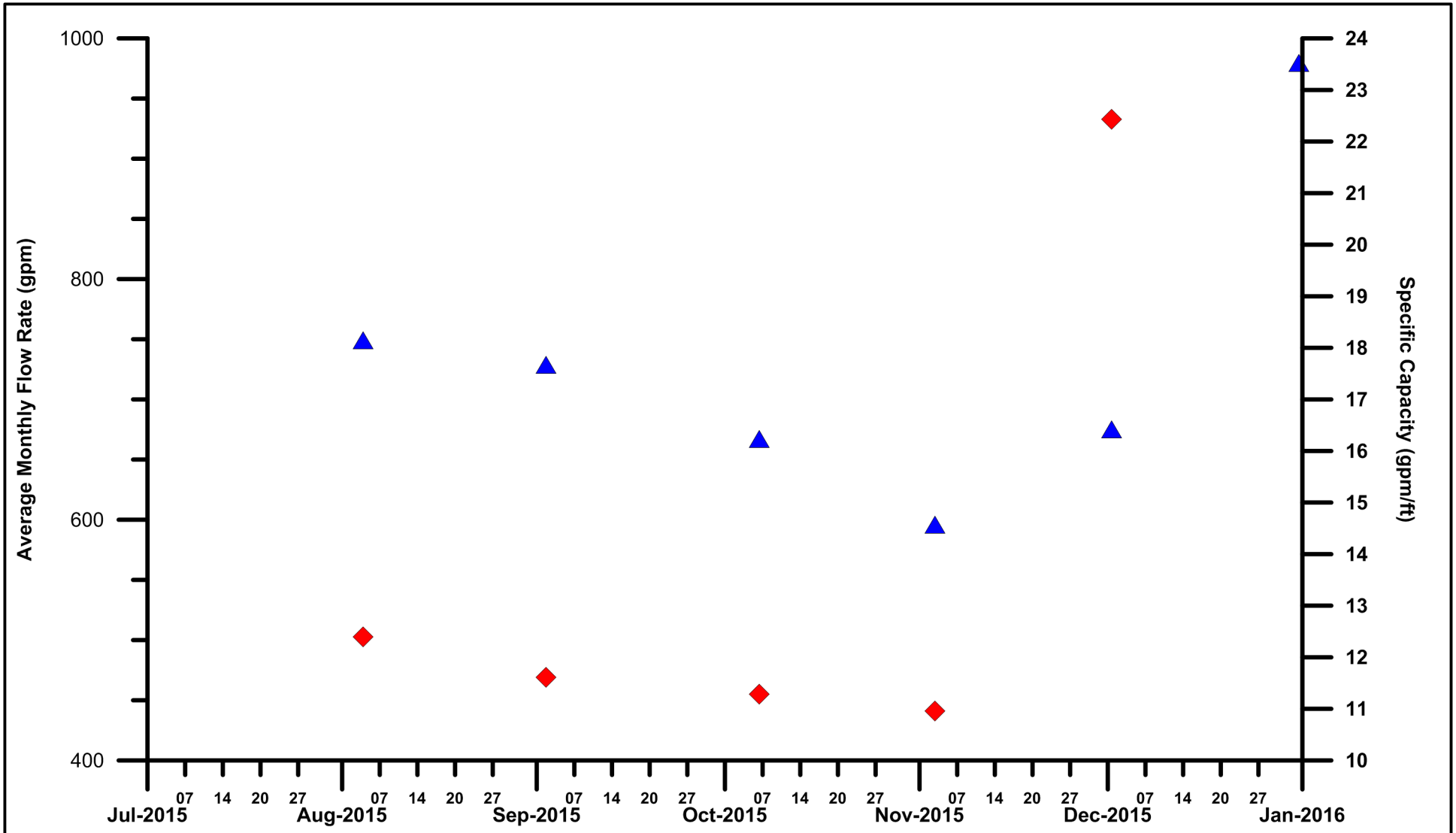
Moraine, Ohio
OH000294.2015

**DN-13**
**OPERATION DATA**
**WATER-LEVEL ELEVATION**

ARCADIS

FIGURE
I-1




**DN-13 Flow Rate and Specific Capacity**

- Specific Capacity (gpm/ft)
- Average Monthly Flow Rate (gpm)

Notes:
1. Specific Capacity in gallons per minute per foot (gpm/ft)
2. Flow Rate in gallons per minute (gpm)
3. Measurements are taken near the end or beginning of each reporting month

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Moraine, Ohio
OH000294.2015

# DN-13 OPERATION DATA FLOW RATE AND SPECIFIC CAPACITY

ARCADIS

FIGURE
I-2

# APPENDIX J

## Capture Zone Trends

**Table J-1**
**Volatile Organic Constituent Sums Used in the Statistical Evaluation**
**RACER Trust**
**Moraine, Ohio**

| Date | GM-9 µg/L | Date | GM-15 µg/L | Date | GM-20D µg/L |
|---|---|---|---|---|---|
| 9/24/1999 | 15.8 | 9/24/1999 | 10.8 | 9/24/1999 | 0 |
| 10/3/2000 | 18.4 | 10/2/2000 | 9.6 | 10/2/2000 | 20.1 |
| 11/14/2001 | 11.14 | 11/14/2001 | 6.1 | 11/14/2001 | 8.54 |
| 9/30/2002 | 18.13 | 9/27/2002 | 6.5 | 9/27/2002 | 5.1 |
| 9/24/2003 | 22.31 | 9/22/2003 | 7.5 | 9/22/2003 | 16.49 |
| 9/21/2004 | 18.67 | 9/20/2004 | 7.2 | 9/20/2004 | 14.86 |
| 10/26/2005 | 17.43 | 10/26/2005 | 7.6 | 10/26/2005 | 14.43 |
| 9/25/2006 | 8.37 | 9/18/2006 | 7.5 | 9/18/2006 | 13.61 |
| 9/19/2007 | 20.39 | 9/25/2007 | 7.7 | 9/25/2007 | 11.8 |
| 9/24/2008 | 19.2 | 9/30/2008 | 6.99 | 9/30/2008 | 9.65 |
| 11/13/2009 | NS | 11/13/2009 | 8.7 | 11/13/2009 | 10 |
| 9/22/2010 | 18.81 | 9/23/2010 | 8.7 | 9/23/2010 | 9.02 |
| 9/28/2011 | 14.5 | 9/29/2011 | 6.9 | 9/29/2011 | 7.2 |
| 9/26/2012 | 17.34 | 9/5/2012 | 10.47 | 9/5/2012 | 3.7 |
| 9/25/2013 | 20.84 | 9/25/2013 | 7.79 | 9/25/2013 | 6.92 |
| 10/6/2014 | 19.13 | 10/7/2014 | 8.8 | 10/6/2014 | 5.12 |
| 12/11/2015 | 13.18 | 11/4/2015 | 17.34 | 11/3/2015 | 4.1 |

**Notes:**
µg/L: Micrograms per liter.
NS: Not sampled.
All concentrations represent summations; see text.

**Table J-2**
**Volatile Organic Constituent Sums Used in the Statistical Evaluation**
**RACER Trust**
**Moraine, Ohio**

| Location | Sample Size | Detection Rate | Arithmetic Mean µg/L | Standard Deviation µg/L | Coefficient of Variation | Confidence | Mann - Kendall Result | S Value |
|---|---|---|---|---|---|---|---|---|
| **Full Data Set** | | | | | | | | |
| GM-9 | 16 | 100.0% | 17.10 | 3.69 | 0.216 | 95% | Stable | 8 |
| GM-15 | 17 | 100.0% | 8.60 | 2.61 | 0.303 | 95% | Stable | 40 |
| GM-20D | 17 | 94.1% | 9.45 | 5.25 | 0.556 | 95% | Decreasing | -58 |
| **Most Recent 8 Analyses** | | | | | | | | |
| GM-9 | 8 | 100.0% | 17.92 | 2.75 | 0.154 | 90% | Stable | -10 |
| GM-15 | 8 | 100.0% | 9.46 | 3.38 | 0.358 | 90% | Stable | 13 |
| GM-20D | 8 | 100.0% | 6.96 | 2.48 | 0.356 | 90% | Decreasing | -20 |

**Notes:**
µg/L: Micrograms per liter.
S value: The Mann-Kendall S-statistic.

## Mann-Kendall Trend Analysis

### Parameter: VOC

### Location: GM-9

**Original Data (Not Transformed)**

**Non-Detects Replaced with Detection Limit**

97.5% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 18.4 | 15.8 | 2.6 | 1 | 0 |
| 11.14 | 15.8 | -4.66 | 1 | 1 |
| 18.13 | 15.8 | 2.33 | 2 | 1 |
| 22.31 | 15.8 | 6.51 | 3 | 1 |
| 18.67 | 15.8 | 2.87 | 4 | 1 |
| 17.43 | 15.8 | 1.63 | 5 | 1 |
| 8.37 | 15.8 | -7.43 | 5 | 2 |
| 20.39 | 15.8 | 4.59 | 6 | 2 |
| 19.2 | 15.8 | 3.4 | 7 | 2 |
| 18.81 | 15.8 | 3.01 | 8 | 2 |
| 14.5 | 15.8 | -1.3 | 8 | 3 |
| 17.34 | 15.8 | 1.54 | 9 | 3 |
| 20.84 | 15.8 | 5.04 | 10 | 3 |
| 19.13 | 15.8 | 3.33 | 11 | 3 |
| 13.18 | 15.8 | -2.62 | 11 | 4 |
| | | | | |
| 11.14 | 18.4 | -7.26 | 11 | 5 |
| 18.13 | 18.4 | -0.27 | 11 | 6 |
| 22.31 | 18.4 | 3.91 | 12 | 6 |
| 18.67 | 18.4 | 0.27 | 13 | 6 |
| 17.43 | 18.4 | -0.97 | 13 | 7 |
| 8.37 | 18.4 | -10.03 | 13 | 8 |
| 20.39 | 18.4 | 1.99 | 14 | 8 |
| 19.2 | 18.4 | 0.8 | 15 | 8 |
| 18.81 | 18.4 | 0.41 | 16 | 8 |
| 14.5 | 18.4 | -3.9 | 16 | 9 |
| 17.34 | 18.4 | -1.06 | 16 | 10 |
| 20.84 | 18.4 | 2.44 | 17 | 10 |
| 19.13 | 18.4 | 0.73 | 18 | 10 |
| 13.18 | 18.4 | -5.22 | 18 | 11 |
| | | | | |
| 18.13 | 11.14 | 6.99 | 19 | 11 |
| 22.31 | 11.14 | 11.17 | 20 | 11 |
| 18.67 | 11.14 | 7.53 | 21 | 11 |
| 17.43 | 11.14 | 6.29 | 22 | 11 |
| 8.37 | 11.14 | -2.77 | 22 | 12 |
| 20.39 | 11.14 | 9.25 | 23 | 12 |
| 19.2 | 11.14 | 8.06 | 24 | 12 |
| 18.81 | 11.14 | 7.67 | 25 | 12 |
| 14.5 | 11.14 | 3.36 | 26 | 12 |
| 17.34 | 11.14 | 6.2 | 27 | 12 |
| 20.84 | 11.14 | 9.7 | 28 | 12 |
| 19.13 | 11.14 | 7.99 | 29 | 12 |
| 13.18 | 11.14 | 2.04 | 30 | 12 |
| | | | | |
| 22.31 | 18.13 | 4.18 | 31 | 12 |
| 18.67 | 18.13 | 0.54 | 32 | 12 |

| | | | | |
|---|---|---|---|---|
| 17.43 | 18.13 | -0.7 | 32 | 13 |
| 8.37 | 18.13 | -9.76 | 32 | 14 |
| 20.39 | 18.13 | 2.26 | 33 | 14 |
| 19.2 | 18.13 | 1.07 | 34 | 14 |
| 18.81 | 18.13 | 0.68 | 35 | 14 |
| 14.5 | 18.13 | -3.63 | 35 | 15 |
| 17.34 | 18.13 | -0.79 | 35 | 16 |
| 20.84 | 18.13 | 2.71 | 36 | 16 |
| 19.13 | 18.13 | 1 | 37 | 16 |
| 13.18 | 18.13 | -4.95 | 37 | 17 |
| | | | | |
| 18.67 | 22.31 | -3.64 | 37 | 18 |
| 17.43 | 22.31 | -4.88 | 37 | 19 |
| 8.37 | 22.31 | -13.94 | 37 | 20 |
| 20.39 | 22.31 | -1.92 | 37 | 21 |
| 19.2 | 22.31 | -3.11 | 37 | 22 |
| 18.81 | 22.31 | -3.5 | 37 | 23 |
| 14.5 | 22.31 | -7.81 | 37 | 24 |
| 17.34 | 22.31 | -4.97 | 37 | 25 |
| 20.84 | 22.31 | -1.47 | 37 | 26 |
| 19.13 | 22.31 | -3.18 | 37 | 27 |
| 13.18 | 22.31 | -9.13 | 37 | 28 |
| | | | | |
| 17.43 | 18.67 | -1.24 | 37 | 29 |
| 8.37 | 18.67 | -10.3 | 37 | 30 |
| 20.39 | 18.67 | 1.72 | 38 | 30 |
| 19.2 | 18.67 | 0.53 | 39 | 30 |
| 18.81 | 18.67 | 0.14 | 40 | 30 |
| 14.5 | 18.67 | -4.17 | 40 | 31 |
| 17.34 | 18.67 | -1.33 | 40 | 32 |
| 20.84 | 18.67 | 2.17 | 41 | 32 |
| 19.13 | 18.67 | 0.46 | 42 | 32 |
| 13.18 | 18.67 | -5.49 | 42 | 33 |
| | | | | |
| 8.37 | 17.43 | -9.06 | 42 | 34 |
| 20.39 | 17.43 | 2.96 | 43 | 34 |
| 19.2 | 17.43 | 1.77 | 44 | 34 |
| 18.81 | 17.43 | 1.38 | 45 | 34 |
| 14.5 | 17.43 | -2.93 | 45 | 35 |
| 17.34 | 17.43 | -0.09 | 45 | 36 |
| 20.84 | 17.43 | 3.41 | 46 | 36 |
| 19.13 | 17.43 | 1.7 | 47 | 36 |
| 13.18 | 17.43 | -4.25 | 47 | 37 |
| | | | | |
| 20.39 | 8.37 | 12.02 | 48 | 37 |
| 19.2 | 8.37 | 10.83 | 49 | 37 |
| 18.81 | 8.37 | 10.44 | 50 | 37 |
| 14.5 | 8.37 | 6.13 | 51 | 37 |
| 17.34 | 8.37 | 8.97 | 52 | 37 |
| 20.84 | 8.37 | 12.47 | 53 | 37 |
| 19.13 | 8.37 | 10.76 | 54 | 37 |
| 13.18 | 8.37 | 4.81 | 55 | 37 |
| | | | | |
| 19.2 | 20.39 | -1.19 | 55 | 38 |
| 18.81 | 20.39 | -1.58 | 55 | 39 |
| 14.5 | 20.39 | -5.89 | 55 | 40 |
| 17.34 | 20.39 | -3.05 | 55 | 41 |

| | | | | |
|---|---|---|---|---|
| 20.84 | 20.39 | 0.45 | 56 | 41 |
| 19.13 | 20.39 | -1.26 | 56 | 42 |
| 13.18 | 20.39 | -7.21 | 56 | 43 |
| | | | | |
| 18.81 | 19.2 | -0.39 | 56 | 44 |
| 14.5 | 19.2 | -4.7 | 56 | 45 |
| 17.34 | 19.2 | -1.86 | 56 | 46 |
| 20.84 | 19.2 | 1.64 | 57 | 46 |
| 19.13 | 19.2 | -0.07 | 57 | 47 |
| 13.18 | 19.2 | -6.02 | 57 | 48 |
| | | | | |
| 14.5 | 18.81 | -4.31 | 57 | 49 |
| 17.34 | 18.81 | -1.47 | 57 | 50 |
| 20.84 | 18.81 | 2.03 | 58 | 50 |
| 19.13 | 18.81 | 0.32 | 59 | 50 |
| 13.18 | 18.81 | -5.63 | 59 | 51 |
| | | | | |
| 17.34 | 14.5 | 2.84 | 60 | 51 |
| 20.84 | 14.5 | 6.34 | 61 | 51 |
| 19.13 | 14.5 | 4.63 | 62 | 51 |
| 13.18 | 14.5 | -1.32 | 62 | 52 |
| | | | | |
| 20.84 | 17.34 | 3.5 | 63 | 52 |
| 19.13 | 17.34 | 1.79 | 64 | 52 |
| 13.18 | 17.34 | -4.16 | 64 | 53 |
| | | | | |
| 19.13 | 20.84 | -1.71 | 64 | 54 |
| 13.18 | 20.84 | -7.66 | 64 | 55 |
| | | | | |
| 13.18 | 19.13 | -5.95 | 64 | 56 |

S Statistic = 64 - 56 = 8

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 9/24/1999 | 1 |
| 10/3/2000 | 1 |
| 11/14/2001 | 1 |
| 9/30/2002 | 1 |
| 9/24/2003 | 1 |
| 9/21/2004 | 1 |
| 10/26/2005 | 1 |
| 9/25/2006 | 1 |
| 9/19/2007 | 1 |
| 9/24/2008 | 1 |
| 9/22/2010 | 1 |
| 9/28/2011 | 1 |
| 9/26/2012 | 1 |
| 9/25/2013 | 1 |
| 10/6/2014 | 1 |
| 12/11/2015 | 1 |

There are 0 time periods with multiple data

A = 0
B = 0

C = 0
D = 0
E = 0
F = 0
a = 8880
b = 30240
c = 480
Group Variance = 493.333
Z-Score = 0.315158
Comparison Level at 97.5% confidence level = 1.95996 (upward trend)
0.315158 <= 1.95996 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: VOC

### Location: GM-9

**Original Data (Not Transformed)**

**Non-Detects Replaced with Detection Limit**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 19.2 | 20.39 | -1.19 | 0 | 1 |
| 18.81 | 20.39 | -1.58 | 0 | 2 |
| 14.5 | 20.39 | -5.89 | 0 | 3 |
| 17.34 | 20.39 | -3.05 | 0 | 4 |
| 20.84 | 20.39 | 0.45 | 1 | 4 |
| 19.13 | 20.39 | -1.26 | 1 | 5 |
| 13.18 | 20.39 | -7.21 | 1 | 6 |
| | | | | |
| 18.81 | 19.2 | -0.39 | 1 | 7 |
| 14.5 | 19.2 | -4.7 | 1 | 8 |
| 17.34 | 19.2 | -1.86 | 1 | 9 |
| 20.84 | 19.2 | 1.64 | 2 | 9 |
| 19.13 | 19.2 | -0.07 | 2 | 10 |
| 13.18 | 19.2 | -6.02 | 2 | 11 |
| | | | | |
| 14.5 | 18.81 | -4.31 | 2 | 12 |
| 17.34 | 18.81 | -1.47 | 2 | 13 |
| 20.84 | 18.81 | 2.03 | 3 | 13 |
| 19.13 | 18.81 | 0.32 | 4 | 13 |
| 13.18 | 18.81 | -5.63 | 4 | 14 |
| | | | | |
| 17.34 | 14.5 | 2.84 | 5 | 14 |
| 20.84 | 14.5 | 6.34 | 6 | 14 |
| 19.13 | 14.5 | 4.63 | 7 | 14 |
| 13.18 | 14.5 | -1.32 | 7 | 15 |
| | | | | |
| 20.84 | 17.34 | 3.5 | 8 | 15 |
| 19.13 | 17.34 | 1.79 | 9 | 15 |
| 13.18 | 17.34 | -4.16 | 9 | 16 |
| | | | | |
| 19.13 | 20.84 | -1.71 | 9 | 17 |
| 13.18 | 20.84 | -7.66 | 9 | 18 |
| | | | | |
| 13.18 | 19.13 | -5.95 | 9 | 19 |

S Statistic = 9 - 19 = -10

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 10 is 0.138

S > 0 or 0.138 > 0.05 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: VOC

### Location: GM-15

**Original Data (Not Transformed)**

**Non-Detects Replaced with Detection Limit**

97.5% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 9.6 | 10.8 | -1.2 | 0 | 1 |
| 6.1 | 10.8 | -4.7 | 0 | 2 |
| 6.5 | 10.8 | -4.3 | 0 | 3 |
| 7.5 | 10.8 | -3.3 | 0 | 4 |
| 7.2 | 10.8 | -3.6 | 0 | 5 |
| 7.6 | 10.8 | -3.2 | 0 | 6 |
| 7.5 | 10.8 | -3.3 | 0 | 7 |
| 7.7 | 10.8 | -3.1 | 0 | 8 |
| 6.99 | 10.8 | -3.81 | 0 | 9 |
| 8.7 | 10.8 | -2.1 | 0 | 10 |
| 8.7 | 10.8 | -2.1 | 0 | 11 |
| 6.9 | 10.8 | -3.9 | 0 | 12 |
| 10.47 | 10.8 | -0.33 | 0 | 13 |
| 7.79 | 10.8 | -3.01 | 0 | 14 |
| 8.8 | 10.8 | -2 | 0 | 15 |
| 17.34 | 10.8 | 6.54 | 1 | 15 |
| | | | | |
| 6.1 | 9.6 | -3.5 | 1 | 16 |
| 6.5 | 9.6 | -3.1 | 1 | 17 |
| 7.5 | 9.6 | -2.1 | 1 | 18 |
| 7.2 | 9.6 | -2.4 | 1 | 19 |
| 7.6 | 9.6 | -2 | 1 | 20 |
| 7.5 | 9.6 | -2.1 | 1 | 21 |
| 7.7 | 9.6 | -1.9 | 1 | 22 |
| 6.99 | 9.6 | -2.61 | 1 | 23 |
| 8.7 | 9.6 | -0.9 | 1 | 24 |
| 8.7 | 9.6 | -0.9 | 1 | 25 |
| 6.9 | 9.6 | -2.7 | 1 | 26 |
| 10.47 | 9.6 | 0.87 | 2 | 26 |
| 7.79 | 9.6 | -1.81 | 2 | 27 |
| 8.8 | 9.6 | -0.8 | 2 | 28 |
| 17.34 | 9.6 | 7.74 | 3 | 28 |
| | | | | |
| 6.5 | 6.1 | 0.4 | 4 | 28 |
| 7.5 | 6.1 | 1.4 | 5 | 28 |
| 7.2 | 6.1 | 1.1 | 6 | 28 |
| 7.6 | 6.1 | 1.5 | 7 | 28 |
| 7.5 | 6.1 | 1.4 | 8 | 28 |
| 7.7 | 6.1 | 1.6 | 9 | 28 |
| 6.99 | 6.1 | 0.89 | 10 | 28 |
| 8.7 | 6.1 | 2.6 | 11 | 28 |
| 8.7 | 6.1 | 2.6 | 12 | 28 |
| 6.9 | 6.1 | 0.8 | 13 | 28 |
| 10.47 | 6.1 | 4.37 | 14 | 28 |
| 7.79 | 6.1 | 1.69 | 15 | 28 |
| 8.8 | 6.1 | 2.7 | 16 | 28 |
| 17.34 | 6.1 | 11.24 | 17 | 28 |

| | | | | |
|---|---|---|---|---|
| 7.5 | 6.5 | 1 | 18 | 28 |
| 7.2 | 6.5 | 0.7 | 19 | 28 |
| 7.6 | 6.5 | 1.1 | 20 | 28 |
| 7.5 | 6.5 | 1 | 21 | 28 |
| 7.7 | 6.5 | 1.2 | 22 | 28 |
| 6.99 | 6.5 | 0.49 | 23 | 28 |
| 8.7 | 6.5 | 2.2 | 24 | 28 |
| 8.7 | 6.5 | 2.2 | 25 | 28 |
| 6.9 | 6.5 | 0.4 | 26 | 28 |
| 10.47 | 6.5 | 3.97 | 27 | 28 |
| 7.79 | 6.5 | 1.29 | 28 | 28 |
| 8.8 | 6.5 | 2.3 | 29 | 28 |
| 17.34 | 6.5 | 10.84 | 30 | 28 |
| | | | | |
| 7.2 | 7.5 | -0.3 | 30 | 29 |
| 7.6 | 7.5 | 0.1 | 31 | 29 |
| 7.5 | 7.5 | 0 | 31 | 29 |
| 7.7 | 7.5 | 0.2 | 32 | 29 |
| 6.99 | 7.5 | -0.51 | 32 | 30 |
| 8.7 | 7.5 | 1.2 | 33 | 30 |
| 8.7 | 7.5 | 1.2 | 34 | 30 |
| 6.9 | 7.5 | -0.6 | 34 | 31 |
| 10.47 | 7.5 | 2.97 | 35 | 31 |
| 7.79 | 7.5 | 0.29 | 36 | 31 |
| 8.8 | 7.5 | 1.3 | 37 | 31 |
| 17.34 | 7.5 | 9.84 | 38 | 31 |
| | | | | |
| 7.6 | 7.2 | 0.4 | 39 | 31 |
| 7.5 | 7.2 | 0.3 | 40 | 31 |
| 7.7 | 7.2 | 0.5 | 41 | 31 |
| 6.99 | 7.2 | -0.21 | 41 | 32 |
| 8.7 | 7.2 | 1.5 | 42 | 32 |
| 8.7 | 7.2 | 1.5 | 43 | 32 |
| 6.9 | 7.2 | -0.3 | 43 | 33 |
| 10.47 | 7.2 | 3.27 | 44 | 33 |
| 7.79 | 7.2 | 0.59 | 45 | 33 |
| 8.8 | 7.2 | 1.6 | 46 | 33 |
| 17.34 | 7.2 | 10.14 | 47 | 33 |
| | | | | |
| 7.5 | 7.6 | -0.1 | 47 | 34 |
| 7.7 | 7.6 | 0.1 | 48 | 34 |
| 6.99 | 7.6 | -0.61 | 48 | 35 |
| 8.7 | 7.6 | 1.1 | 49 | 35 |
| 8.7 | 7.6 | 1.1 | 50 | 35 |
| 6.9 | 7.6 | -0.7 | 50 | 36 |
| 10.47 | 7.6 | 2.87 | 51 | 36 |
| 7.79 | 7.6 | 0.19 | 52 | 36 |
| 8.8 | 7.6 | 1.2 | 53 | 36 |
| 17.34 | 7.6 | 9.74 | 54 | 36 |
| | | | | |
| 7.7 | 7.5 | 0.2 | 55 | 36 |
| 6.99 | 7.5 | -0.51 | 55 | 37 |
| 8.7 | 7.5 | 1.2 | 56 | 37 |
| 8.7 | 7.5 | 1.2 | 57 | 37 |
| 6.9 | 7.5 | -0.6 | 57 | 38 |
| 10.47 | 7.5 | 2.97 | 58 | 38 |

| | | | | |
|---|---|---|---|---|
| 7.79 | 7.5 | 0.29 | 59 | 38 |
| 8.8 | 7.5 | 1.3 | 60 | 38 |
| 17.34 | 7.5 | 9.84 | 61 | 38 |
| | | | | |
| 6.99 | 7.7 | -0.71 | 61 | 39 |
| 8.7 | 7.7 | 1 | 62 | 39 |
| 8.7 | 7.7 | 1 | 63 | 39 |
| 6.9 | 7.7 | -0.8 | 63 | 40 |
| 10.47 | 7.7 | 2.77 | 64 | 40 |
| 7.79 | 7.7 | 0.09 | 65 | 40 |
| 8.8 | 7.7 | 1.1 | 66 | 40 |
| 17.34 | 7.7 | 9.64 | 67 | 40 |
| | | | | |
| 8.7 | 6.99 | 1.71 | 68 | 40 |
| 8.7 | 6.99 | 1.71 | 69 | 40 |
| 6.9 | 6.99 | -0.09 | 69 | 41 |
| 10.47 | 6.99 | 3.48 | 70 | 41 |
| 7.79 | 6.99 | 0.8 | 71 | 41 |
| 8.8 | 6.99 | 1.81 | 72 | 41 |
| 17.34 | 6.99 | 10.35 | 73 | 41 |
| | | | | |
| 8.7 | 8.7 | 0 | 73 | 41 |
| 6.9 | 8.7 | -1.8 | 73 | 42 |
| 10.47 | 8.7 | 1.77 | 74 | 42 |
| 7.79 | 8.7 | -0.91 | 74 | 43 |
| 8.8 | 8.7 | 0.1 | 75 | 43 |
| 17.34 | 8.7 | 8.64 | 76 | 43 |
| | | | | |
| 6.9 | 8.7 | -1.8 | 76 | 44 |
| 10.47 | 8.7 | 1.77 | 77 | 44 |
| 7.79 | 8.7 | -0.91 | 77 | 45 |
| 8.8 | 8.7 | 0.1 | 78 | 45 |
| 17.34 | 8.7 | 8.64 | 79 | 45 |
| | | | | |
| 10.47 | 6.9 | 3.57 | 80 | 45 |
| 7.79 | 6.9 | 0.89 | 81 | 45 |
| 8.8 | 6.9 | 1.9 | 82 | 45 |
| 17.34 | 6.9 | 10.44 | 83 | 45 |
| | | | | |
| 7.79 | 10.47 | -2.68 | 83 | 46 |
| 8.8 | 10.47 | -1.67 | 83 | 47 |
| 17.34 | 10.47 | 6.87 | 84 | 47 |
| | | | | |
| 8.8 | 7.79 | 1.01 | 85 | 47 |
| 17.34 | 7.79 | 9.55 | 86 | 47 |
| | | | | |
| 17.34 | 8.8 | 8.54 | 87 | 47 |

S Statistic = 87 - 47 = 40

| Tied Group | Value | Members |
|---|---|---|
| 1 | 7.5 | 2 |
| 2 | 8.7 | 2 |

| Time Period | Observations |
|---|---|
| 9/24/1999 | 1 |

| | |
|---|---|
| 10/2/2000 | 1 |
| 11/14/2001 | 1 |
| 9/27/2002 | 1 |
| 9/22/2003 | 1 |
| 9/20/2004 | 1 |
| 10/26/2005 | 1 |
| 9/18/2006 | 1 |
| 9/25/2007 | 1 |
| 9/30/2008 | 1 |
| 11/13/2009 | 1 |
| 9/23/2010 | 1 |
| 9/29/2011 | 1 |
| 9/5/2012 | 1 |
| 9/25/2013 | 1 |
| 10/7/2014 | 1 |
| 11/4/2015 | 1 |

There are 0 time periods with multiple data

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A = 36
B = 0
C = 0
D = 0
E = 4
F = 0
a = 10608
b = 36720
c = 544
Group Variance = 587.333
Z-Score = 1.60925
Comparison Level at 97.5% confidence level = 1.95996 (upward trend)
1.60925 <= 1.95996 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: VOC

### Location: GM-15

**Original Data (Not Transformed)**

**Non-Detects Replaced with Detection Limit**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8.7 | 6.99 | 1.71 | 1 | 0 |
| 8.7 | 6.99 | 1.71 | 2 | 0 |
| 6.9 | 6.99 | -0.09 | 2 | 1 |
| 10.47 | 6.99 | 3.48 | 3 | 1 |
| 7.79 | 6.99 | 0.8 | 4 | 1 |
| 8.8 | 6.99 | 1.81 | 5 | 1 |
| 17.34 | 6.99 | 10.35 | 6 | 1 |
| | | | | |
| 8.7 | 8.7 | 0 | 6 | 1 |
| 6.9 | 8.7 | -1.8 | 6 | 2 |
| 10.47 | 8.7 | 1.77 | 7 | 2 |
| 7.79 | 8.7 | -0.91 | 7 | 3 |
| 8.8 | 8.7 | 0.1 | 8 | 3 |
| 17.34 | 8.7 | 8.64 | 9 | 3 |
| | | | | |
| 6.9 | 8.7 | -1.8 | 9 | 4 |
| 10.47 | 8.7 | 1.77 | 10 | 4 |
| 7.79 | 8.7 | -0.91 | 10 | 5 |
| 8.8 | 8.7 | 0.1 | 11 | 5 |
| 17.34 | 8.7 | 8.64 | 12 | 5 |
| | | | | |
| 10.47 | 6.9 | 3.57 | 13 | 5 |
| 7.79 | 6.9 | 0.89 | 14 | 5 |
| 8.8 | 6.9 | 1.9 | 15 | 5 |
| 17.34 | 6.9 | 10.44 | 16 | 5 |
| | | | | |
| 7.79 | 10.47 | -2.68 | 16 | 6 |
| 8.8 | 10.47 | -1.67 | 16 | 7 |
| 17.34 | 10.47 | 6.87 | 17 | 7 |
| | | | | |
| 8.8 | 7.79 | 1.01 | 18 | 7 |
| 17.34 | 7.79 | 9.55 | 19 | 7 |
| | | | | |
| 17.34 | 8.8 | 8.54 | 20 | 7 |

S Statistic = 20 - 7 = 13
Comparing at 95% confidence level (upward trend)
Probability of obtaining S >= 13 is 0.0715
S < 0 or 0.0715 >= 0.05 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: VOC

### Location: GM-20D

**Original Data (Not Transformed)**

**Non-Detects Replaced with Detection Limit**

97.5% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 20.1 | ND<0 | 20.1 | 1 | 0 |
| 8.54 | ND<0 | 8.54 | 2 | 0 |
| 5.1 | ND<0 | 5.1 | 3 | 0 |
| 16.49 | ND<0 | 16.49 | 4 | 0 |
| 14.86 | ND<0 | 14.86 | 5 | 0 |
| 14.43 | ND<0 | 14.43 | 6 | 0 |
| 13.61 | ND<0 | 13.61 | 7 | 0 |
| 11.8 | ND<0 | 11.8 | 8 | 0 |
| 9.65 | ND<0 | 9.65 | 9 | 0 |
| 10 | ND<0 | 10 | 10 | 0 |
| 9.02 | ND<0 | 9.02 | 11 | 0 |
| 7.2 | ND<0 | 7.2 | 12 | 0 |
| 3.7 | ND<0 | 3.7 | 13 | 0 |
| 6.92 | ND<0 | 6.92 | 14 | 0 |
| 5.12 | ND<0 | 5.12 | 15 | 0 |
| 4.1 | ND<0 | 4.1 | 16 | 0 |
| | | | | |
| 8.54 | 20.1 | -11.56 | 16 | 1 |
| 5.1 | 20.1 | -15 | 16 | 2 |
| 16.49 | 20.1 | -3.61 | 16 | 3 |
| 14.86 | 20.1 | -5.24 | 16 | 4 |
| 14.43 | 20.1 | -5.67 | 16 | 5 |
| 13.61 | 20.1 | -6.49 | 16 | 6 |
| 11.8 | 20.1 | -8.3 | 16 | 7 |
| 9.65 | 20.1 | -10.45 | 16 | 8 |
| 10 | 20.1 | -10.1 | 16 | 9 |
| 9.02 | 20.1 | -11.08 | 16 | 10 |
| 7.2 | 20.1 | -12.9 | 16 | 11 |
| 3.7 | 20.1 | -16.4 | 16 | 12 |
| 6.92 | 20.1 | -13.18 | 16 | 13 |
| 5.12 | 20.1 | -14.98 | 16 | 14 |
| 4.1 | 20.1 | -16 | 16 | 15 |
| | | | | |
| 5.1 | 8.54 | -3.44 | 16 | 16 |
| 16.49 | 8.54 | 7.95 | 17 | 16 |
| 14.86 | 8.54 | 6.32 | 18 | 16 |
| 14.43 | 8.54 | 5.89 | 19 | 16 |
| 13.61 | 8.54 | 5.07 | 20 | 16 |
| 11.8 | 8.54 | 3.26 | 21 | 16 |
| 9.65 | 8.54 | 1.11 | 22 | 16 |
| 10 | 8.54 | 1.46 | 23 | 16 |
| 9.02 | 8.54 | 0.48 | 24 | 16 |
| 7.2 | 8.54 | -1.34 | 24 | 17 |
| 3.7 | 8.54 | -4.84 | 24 | 18 |
| 6.92 | 8.54 | -1.62 | 24 | 19 |
| 5.12 | 8.54 | -3.42 | 24 | 20 |
| 4.1 | 8.54 | -4.44 | 24 | 21 |

| | | | | |
|---|---|---|---|---|
| 16.49 | 5.1 | 11.39 | 25 | 21 |
| 14.86 | 5.1 | 9.76 | 26 | 21 |
| 14.43 | 5.1 | 9.33 | 27 | 21 |
| 13.61 | 5.1 | 8.51 | 28 | 21 |
| 11.8 | 5.1 | 6.7 | 29 | 21 |
| 9.65 | 5.1 | 4.55 | 30 | 21 |
| 10 | 5.1 | 4.9 | 31 | 21 |
| 9.02 | 5.1 | 3.92 | 32 | 21 |
| 7.2 | 5.1 | 2.1 | 33 | 21 |
| 3.7 | 5.1 | -1.4 | 33 | 22 |
| 6.92 | 5.1 | 1.82 | 34 | 22 |
| 5.12 | 5.1 | 0.02 | 35 | 22 |
| 4.1 | 5.1 | -1 | 35 | 23 |
| | | | | |
| 14.86 | 16.49 | -1.63 | 35 | 24 |
| 14.43 | 16.49 | -2.06 | 35 | 25 |
| 13.61 | 16.49 | -2.88 | 35 | 26 |
| 11.8 | 16.49 | -4.69 | 35 | 27 |
| 9.65 | 16.49 | -6.84 | 35 | 28 |
| 10 | 16.49 | -6.49 | 35 | 29 |
| 9.02 | 16.49 | -7.47 | 35 | 30 |
| 7.2 | 16.49 | -9.29 | 35 | 31 |
| 3.7 | 16.49 | -12.79 | 35 | 32 |
| 6.92 | 16.49 | -9.57 | 35 | 33 |
| 5.12 | 16.49 | -11.37 | 35 | 34 |
| 4.1 | 16.49 | -12.39 | 35 | 35 |
| | | | | |
| 14.43 | 14.86 | -0.43 | 35 | 36 |
| 13.61 | 14.86 | -1.25 | 35 | 37 |
| 11.8 | 14.86 | -3.06 | 35 | 38 |
| 9.65 | 14.86 | -5.21 | 35 | 39 |
| 10 | 14.86 | -4.86 | 35 | 40 |
| 9.02 | 14.86 | -5.84 | 35 | 41 |
| 7.2 | 14.86 | -7.66 | 35 | 42 |
| 3.7 | 14.86 | -11.16 | 35 | 43 |
| 6.92 | 14.86 | -7.94 | 35 | 44 |
| 5.12 | 14.86 | -9.74 | 35 | 45 |
| 4.1 | 14.86 | -10.76 | 35 | 46 |
| | | | | |
| 13.61 | 14.43 | -0.82 | 35 | 47 |
| 11.8 | 14.43 | -2.63 | 35 | 48 |
| 9.65 | 14.43 | -4.78 | 35 | 49 |
| 10 | 14.43 | -4.43 | 35 | 50 |
| 9.02 | 14.43 | -5.41 | 35 | 51 |
| 7.2 | 14.43 | -7.23 | 35 | 52 |
| 3.7 | 14.43 | -10.73 | 35 | 53 |
| 6.92 | 14.43 | -7.51 | 35 | 54 |
| 5.12 | 14.43 | -9.31 | 35 | 55 |
| 4.1 | 14.43 | -10.33 | 35 | 56 |
| | | | | |
| 11.8 | 13.61 | -1.81 | 35 | 57 |
| 9.65 | 13.61 | -3.96 | 35 | 58 |
| 10 | 13.61 | -3.61 | 35 | 59 |
| 9.02 | 13.61 | -4.59 | 35 | 60 |
| 7.2 | 13.61 | -6.41 | 35 | 61 |
| 3.7 | 13.61 | -9.91 | 35 | 62 |

| | | | | |
|---|---|---|---|---|
| 6.92 | 13.61 | -6.69 | 35 | 63 |
| 5.12 | 13.61 | -8.49 | 35 | 64 |
| 4.1 | 13.61 | -9.51 | 35 | 65 |
| | | | | |
| 9.65 | 11.8 | -2.15 | 35 | 66 |
| 10 | 11.8 | -1.8 | 35 | 67 |
| 9.02 | 11.8 | -2.78 | 35 | 68 |
| 7.2 | 11.8 | -4.6 | 35 | 69 |
| 3.7 | 11.8 | -8.1 | 35 | 70 |
| 6.92 | 11.8 | -4.88 | 35 | 71 |
| 5.12 | 11.8 | -6.68 | 35 | 72 |
| 4.1 | 11.8 | -7.7 | 35 | 73 |
| | | | | |
| 10 | 9.65 | 0.35 | 36 | 73 |
| 9.02 | 9.65 | -0.63 | 36 | 74 |
| 7.2 | 9.65 | -2.45 | 36 | 75 |
| 3.7 | 9.65 | -5.95 | 36 | 76 |
| 6.92 | 9.65 | -2.73 | 36 | 77 |
| 5.12 | 9.65 | -4.53 | 36 | 78 |
| 4.1 | 9.65 | -5.55 | 36 | 79 |
| | | | | |
| 9.02 | 10 | -0.98 | 36 | 80 |
| 7.2 | 10 | -2.8 | 36 | 81 |
| 3.7 | 10 | -6.3 | 36 | 82 |
| 6.92 | 10 | -3.08 | 36 | 83 |
| 5.12 | 10 | -4.88 | 36 | 84 |
| 4.1 | 10 | -5.9 | 36 | 85 |
| | | | | |
| 7.2 | 9.02 | -1.82 | 36 | 86 |
| 3.7 | 9.02 | -5.32 | 36 | 87 |
| 6.92 | 9.02 | -2.1 | 36 | 88 |
| 5.12 | 9.02 | -3.9 | 36 | 89 |
| 4.1 | 9.02 | -4.92 | 36 | 90 |
| | | | | |
| 3.7 | 7.2 | -3.5 | 36 | 91 |
| 6.92 | 7.2 | -0.28 | 36 | 92 |
| 5.12 | 7.2 | -2.08 | 36 | 93 |
| 4.1 | 7.2 | -3.1 | 36 | 94 |
| | | | | |
| 6.92 | 3.7 | 3.22 | 37 | 94 |
| 5.12 | 3.7 | 1.42 | 38 | 94 |
| 4.1 | 3.7 | 0.4 | 39 | 94 |
| | | | | |
| 5.12 | 6.92 | -1.8 | 39 | 95 |
| 4.1 | 6.92 | -2.82 | 39 | 96 |
| | | | | |
| 4.1 | 5.12 | -1.02 | 39 | 97 |

S Statistic = 39 - 97 = -58

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 9/24/1999 | 1 |
| 10/2/2000 | 1 |
| 11/14/2001 | 1 |

| | |
|---|---|
| 9/27/2002 | 1 |
| 9/22/2003 | 1 |
| 9/20/2004 | 1 |
| 10/26/2005 | 1 |
| 9/18/2006 | 1 |
| 9/25/2007 | 1 |
| 9/30/2008 | 1 |
| 11/13/2009 | 1 |
| 9/23/2010 | 1 |
| 9/29/2011 | 1 |
| 9/5/2012 | 1 |
| 9/25/2013 | 1 |
| 10/7/2014 | 1 |
| 11/3/2015 | 1 |

There are 0 time periods with multiple data

---

A = 0
B = 0
C = 0
D = 0
E = 0
F = 0
a = 10608
b = 36720
c = 544
Group Variance = 589.333
Z-Score = -2.34798
Comparison Level at 97.5% confidence level = -1.95996 (downward trend)
**-2.34798 < -1.95996 indicating a downward trend**

## Mann-Kendall Trend Analysis

**Parameter: VOC**

**Location: GM-20D**

**Original Data (Not Transformed)**

**Non-Detects Replaced with Detection Limit**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10 | 9.65 | 0.35 | 1 | 0 |
| 9.02 | 9.65 | -0.63 | 1 | 1 |
| 7.2 | 9.65 | -2.45 | 1 | 2 |
| 3.7 | 9.65 | -5.95 | 1 | 3 |
| 6.92 | 9.65 | -2.73 | 1 | 4 |
| 5.12 | 9.65 | -4.53 | 1 | 5 |
| 4.1 | 9.65 | -5.55 | 1 | 6 |
| | | | | |
| 9.02 | 10 | -0.98 | 1 | 7 |
| 7.2 | 10 | -2.8 | 1 | 8 |
| 3.7 | 10 | -6.3 | 1 | 9 |
| 6.92 | 10 | -3.08 | 1 | 10 |
| 5.12 | 10 | -4.88 | 1 | 11 |
| 4.1 | 10 | -5.9 | 1 | 12 |
| | | | | |
| 7.2 | 9.02 | -1.82 | 1 | 13 |
| 3.7 | 9.02 | -5.32 | 1 | 14 |
| 6.92 | 9.02 | -2.1 | 1 | 15 |
| 5.12 | 9.02 | -3.9 | 1 | 16 |
| 4.1 | 9.02 | -4.92 | 1 | 17 |
| | | | | |
| 3.7 | 7.2 | -3.5 | 1 | 18 |
| 6.92 | 7.2 | -0.28 | 1 | 19 |
| 5.12 | 7.2 | -2.08 | 1 | 20 |
| 4.1 | 7.2 | -3.1 | 1 | 21 |
| | | | | |
| 6.92 | 3.7 | 3.22 | 2 | 21 |
| 5.12 | 3.7 | 1.42 | 3 | 21 |
| 4.1 | 3.7 | 0.4 | 4 | 21 |
| | | | | |
| 5.12 | 6.92 | -1.8 | 4 | 22 |
| 4.1 | 6.92 | -2.82 | 4 | 23 |
| | | | | |
| 4.1 | 5.12 | -1.02 | 4 | 24 |

S Statistic = 4 - 24 = -20

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 20 is 0.0071

**S < 0 and 0.0071 < 0.05 indicating a downward trend**

# APPENDIX K

## Lagoon Statistics

**Table K-1**
**Mann Kendall Trend Test Results North and South Settling Lagoon Groundwater Monitoring**
**RACER Trust**
**Moraine, Ohio**

| Settling Lagoon | Upgradient/ Downgradient | Well | Chemical | n | NDs | Number of Detections | Detection Frequency | S | p-value* | Trend Test Conclusion (at 0.05 level of significance) |
|---|---|---|---|---|---|---|---|---|---|---|
| North | Upgradient | HR-04 | 1,1,1-Trichloroethane | 15 | 10 | 5 | 33% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | 1,1,1-Trichloroethane | 15 | 12 | 3 | 20% | 23 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | 1,1,1-Trichloroethane | 15 | 15 | 0 | 0% | -81 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | 1,1,1-Trichloroethane | 15 | 7 | 8 | 53% | 50 | > 0.05 | **Increasing Trend** |
| North | Upgradient | HR-04 | 1,1-Dichloroethane | 15 | 3 | 12 | 80% | 45 | > 0.05 | Increasing Trend |
| North | Downgradient | W-2-N | 1,1-Dichloroethane | 15 | 9 | 6 | 40% | 35 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | 1,1-Dichloroethane | 15 | 15 | 0 | 0% | -81 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | 1,1-Dichloroethane | 15 | 0 | 15 | 100% | 67 | > 0.05 | **Increasing Trend** |
| North | Upgradient | HR-04 | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | -81 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | Benzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Benzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | Benzene | 15 | 15 | 0 | 0% | -81 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | Benzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | cis-1,2-Dichloroethene | 15 | 9 | 6 | 40% | 4 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | cis-1,2-Dichloroethene | 15 | 0 | 15 | 100% | -16 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | cis-1,2-Dichloroethene | 15 | 0 | 15 | 100% | -89 | > 0.05 | Decreasing Trend |
| North | Downgradient | W-4-N | cis-1,2-Dichloroethene | 15 | 0 | 15 | 100% | 64 | > 0.05 | **Increasing Trend** |
| North | Upgradient | HR-04 | Ethylbenzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Ethylbenzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | Ethylbenzene | 15 | 15 | 0 | 0% | -81 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | Ethylbenzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | Tetrachloroethene | 15 | 3 | 12 | 80% | -24 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Tetrachloroethene | 15 | 14 | 1 | 7% | 8 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | Tetrachloroethene | 15 | 7 | 8 | 53% | -65 | > 0.05 | Decreasing Trend |
| North | Downgradient | W-4-N | Tetrachloroethene | 15 | 1 | 14 | 93% | -35 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | Toluene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Toluene | 15 | 14 | 1 | 7% | 2 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | Toluene | 15 | 15 | 0 | 0% | -81 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | Toluene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |

*Footnotes on Page 4*

**Table K-1**
**Mann Kendall Trend Test Results North and South Settling Lagoon Groundwater Monitoring**
**RACER Trust**
**Moraine, Ohio**

| Settling Lagoon | Upgradient/ Downgradient | Well | Chemical | n | NDs | Number of Detections | Detection Frequency | S | p-value* | Trend Test Conclusion (at 0.05 level of significance) |
|---|---|---|---|---|---|---|---|---|---|---|
| North | Upgradient | HR-04 | trans-1,2-Dichloroethene | 15 | 15 | 0 | 0% | 44 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | trans-1,2-Dichloroethene | 15 | 13 | 2 | 13% | 41 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | trans-1,2-Dichloroethene | 15 | 1 | 14 | 93% | -87 | > 0.05 | Decreasing Trend |
| North | Downgradient | W-4-N | trans-1,2-Dichloroethene | 15 | 3 | 12 | 80% | 33 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | Trichloroethene | 15 | 2 | 13 | 87% | -38 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Trichloroethene | 15 | 5 | 10 | 67% | -50 | > 0.05 | Decreasing Trend |
| North | Downgradient | W-3-N | Trichloroethene | 15 | 13 | 2 | 13% | -56 | > 0.05 | Decreasing Trend |
| North | Downgradient | W-4-N | Trichloroethene | 15 | 0 | 15 | 100% | 18 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | Vinyl Chloride | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Vinyl Chloride | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | Vinyl Chloride | 15 | 0 | 15 | 100% | -79 | > 0.05 | Decreasing Trend |
| North | Downgradient | W-4-N | Vinyl Chloride | 15 | 6 | 9 | 60% | 16 | > 0.05 | No Trend |
| North | Upgradient | HR-04 | Xylene (total) | 15 | 15 | 0 | 0% | 44 | > 0.05 | No Trend |
| North | Downgradient | W-2-N | Xylene (total) | 15 | 15 | 0 | 0% | 44 | > 0.05 | No Trend |
| North | Downgradient | W-3-N | Xylene (total) | 15 | 15 | 0 | 0% | -48 | > 0.05 | No Trend |
| North | Downgradient | W-4-N | Xylene (total) | 15 | 15 | 0 | 0% | 44 | > 0.05 | No Trend |

*Footnotes on Page 4*

**Table K-1**
**Mann Kendall Trend Test Results North and South Settling Lagoon Groundwater Monitoring**
**RACER Trust**
**Moraine, Ohio**

| Settling Lagoon | Upgradient/ Downgradient | Well | Chemical | n | NDs | Number of Detections | Detection Frequency | S | p-value* | Trend Test Conclusion (at 0.05 level of significance) |
|---|---|---|---|---|---|---|---|---|---|---|
| South | Upgradient | HR-17 | 1,1,1-Trichloroethane | 15 | 11 | 4 | 27% | 25 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | 1,1,1-Trichloroethane | 15 | 1 | 14 | 93% | -15 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | 1,1,1-Trichloroethane | 15 | 1 | 14 | 93% | -59 | > 0.05 | Decreasing Trend |
| South | Downgradient | W-4-S | 1,1,1-Trichloroethane | 19 | 0 | 19 | 100% | -94 | > 0.05 | Decreasing Trend |
| South | Upgradient | HR-17 | 1,1-Dichloroethane | 15 | 3 | 12 | 80% | 20 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | 1,1-Dichloroethane | 15 | 0 | 15 | 100% | -20 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | 1,1-Dichloroethane | 15 | 8 | 7 | 47% | -14 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | 1,1-Dichloroethane | 19 | 0 | 19 | 100% | 90 | > 0.05 | **Increasing Trend** |
| South | Upgradient | HR-17 | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | 21 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | 1,1-Dichloroethene | 15 | 15 | 0 | 0% | 6 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | 1,1-Dichloroethene | 19 | 18 | 1 | 5% | 40 | > 0.05 | No Trend |
| South | Upgradient | HR-17 | Benzene | 15 | 15 | 0 | 0% | 21 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | Benzene | 15 | 14 | 1 | 7% | -2 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | Benzene | 15 | 15 | 0 | 0% | 6 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | Benzene | 19 | 19 | 0 | 0% | 47 | > 0.05 | No Trend |
| South | Upgradient | HR-17 | cis-1,2-Dichloroethene | 15 | 2 | 13 | 87% | -23 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | cis-1,2-Dichloroethene | 15 | 1 | 14 | 93% | 51 | > 0.05 | **Increasing Trend** |
| South | Downgradient | W-3-S | cis-1,2-Dichloroethene | 15 | 7 | 8 | 53% | 58 | > 0.05 | **Increasing Trend** |
| South | Downgradient | W-4-S | cis-1,2-Dichloroethene | 19 | 0 | 19 | 100% | 129 | > 0.05 | **Increasing Trend** |
| South | Upgradient | HR-17 | Ethylbenzene | 15 | 15 | 0 | 0% | 21 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | Ethylbenzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | Ethylbenzene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | Ethylbenzene | 19 | 19 | 0 | 0% | 60 | > 0.05 | No Trend |
| South | Upgradient | HR-17 | Tetrachloroethene | 15 | 0 | 15 | 100% | 76 | > 0.05 | Increasing Trend |
| South | Downgradient | W-2-S | Tetrachloroethene | 15 | 6 | 9 | 60% | -55 | > 0.05 | Decreasing Trend |
| South | Downgradient | W-3-S | Tetrachloroethene | 15 | 0 | 15 | 100% | 77 | > 0.05 | **Increasing Trend** |
| South | Downgradient | W-4-S | Tetrachloroethene | 19 | 0 | 19 | 100% | 128 | > 0.05 | **Increasing Trend** |
| South | Upgradient | HR-17 | Toluene | 15 | 15 | 0 | 0% | 21 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | Toluene | 15 | 14 | 1 | 7% | 10 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | Toluene | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | Toluene | 19 | 18 | 1 | 5% | 70 | > 0.05 | **Increasing Trend** |

*Footnotes on Page 4*

**Table K-1**
**Mann Kendall Trend Test Results North and South Settling Lagoon Groundwater Monitoring**
**RACER Trust**
**Moraine, Ohio**

| Settling Lagoon | Upgradient/ Downgradient | Well | Chemical | n | NDs | Number of Detections | Detection Frequency | S | p-value* | Trend Test Conclusion (at 0.05 level of significance) |
|---|---|---|---|---|---|---|---|---|---|---|
| South | Upgradient | HR-17 | trans-1,2-Dichloroethene | 15 | 4 | 11 | 73% | 31 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | trans-1,2-Dichloroethene | 15 | 13 | 2 | 13% | 11 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | trans-1,2-Dichloroethene | 15 | 10 | 5 | 33% | -7 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | trans-1,2-Dichloroethene | 19 | 0 | 19 | 100% | 91 | > 0.05 | **Increasing Trend** |
| South | Upgradient | HR-17 | Trichloroethene | 15 | 0 | 15 | 100% | 79 | > 0.05 | Increasing Trend |
| South | Downgradient | W-2-S | Trichloroethene | 15 | 0 | 15 | 100% | 40 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | Trichloroethene | 15 | 0 | 15 | 100% | 63 | > 0.05 | **Increasing Trend** |
| South | Downgradient | W-4-S | Trichloroethene | 19 | 0 | 19 | 100% | 133 | > 0.05 | **Increasing Trend** |
| South | Upgradient | HR-17 | Vinyl Chloride | 15 | 15 | 0 | 0% | 21 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | Vinyl Chloride | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | Vinyl Chloride | 15 | 15 | 0 | 0% | 0 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | Vinyl Chloride | 19 | 19 | 0 | 0% | 47 | > 0.05 | No Trend |
| South | Upgradient | HR-17 | Xylene (total) | 15 | 15 | 0 | 0% | 39 | > 0.05 | No Trend |
| South | Downgradient | W-2-S | Xylene (total) | 15 | 15 | 0 | 0% | 44 | > 0.05 | No Trend |
| South | Downgradient | W-3-S | Xylene (total) | 15 | 15 | 0 | 0% | 44 | > 0.05 | No Trend |
| South | Downgradient | W-4-S | Xylene (total) | 19 | 19 | 0 | 0% | 95 | > 0.05 | No Trend |

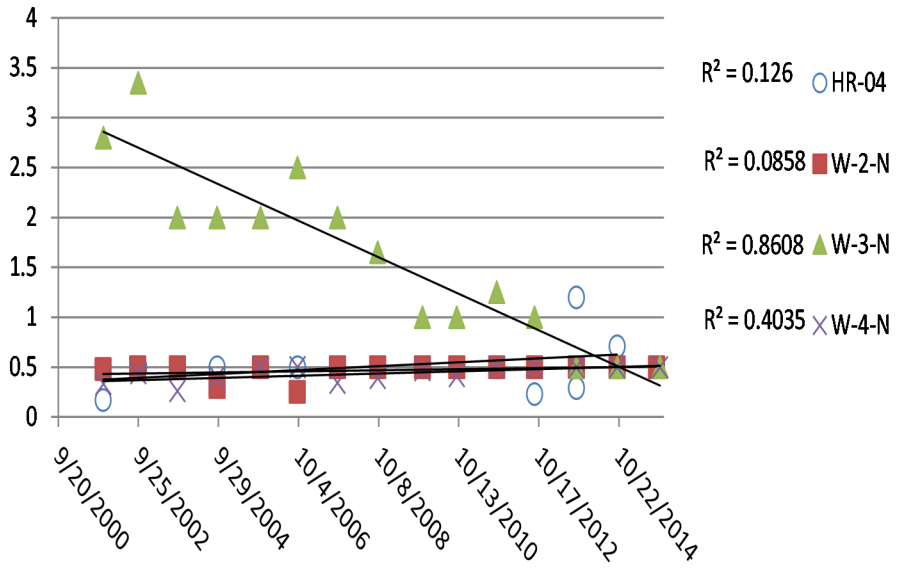
* Indicated p-value represents the significance of both the upper and lower tails combined.

**Bold** - Increasing trends that are statistically significant in downgradient monitoring wells are shown in bold font.

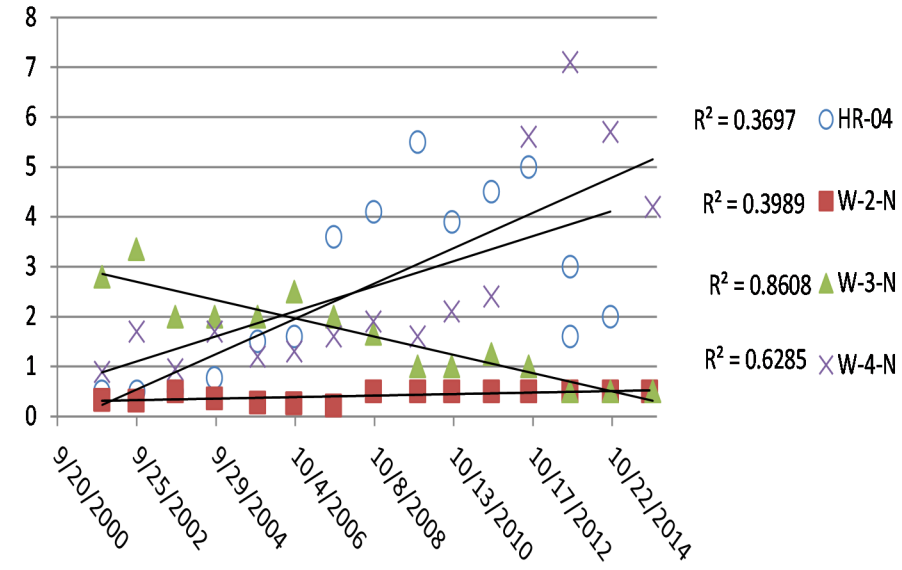
Shaded - An increasing trend is shaded if the detection frequency is 40% or greater, or if the three most recent sampling results were over the analytical detection limit.

Trends identified by the model were not reported if the detection frequency was less than 10%.

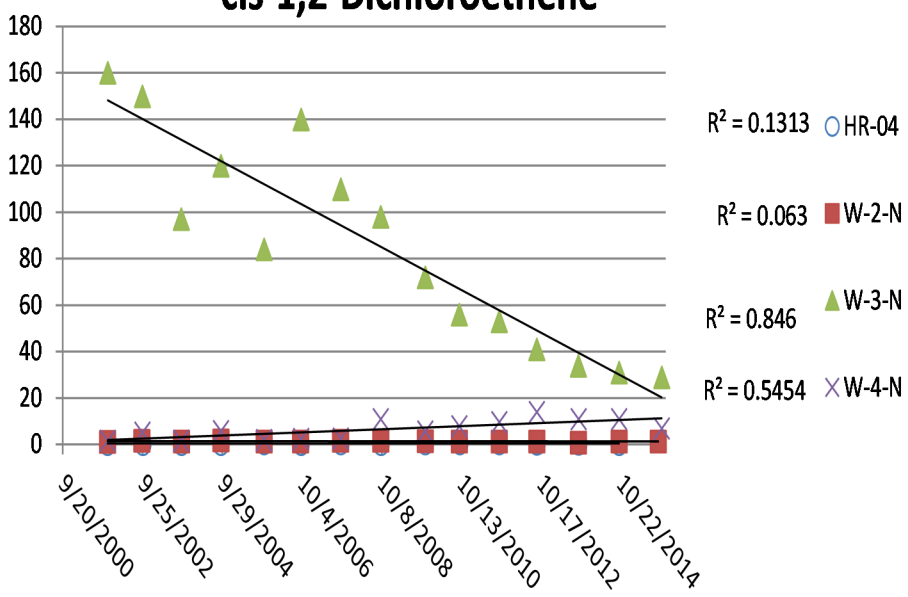
## 1,1,1-Trichloroethane



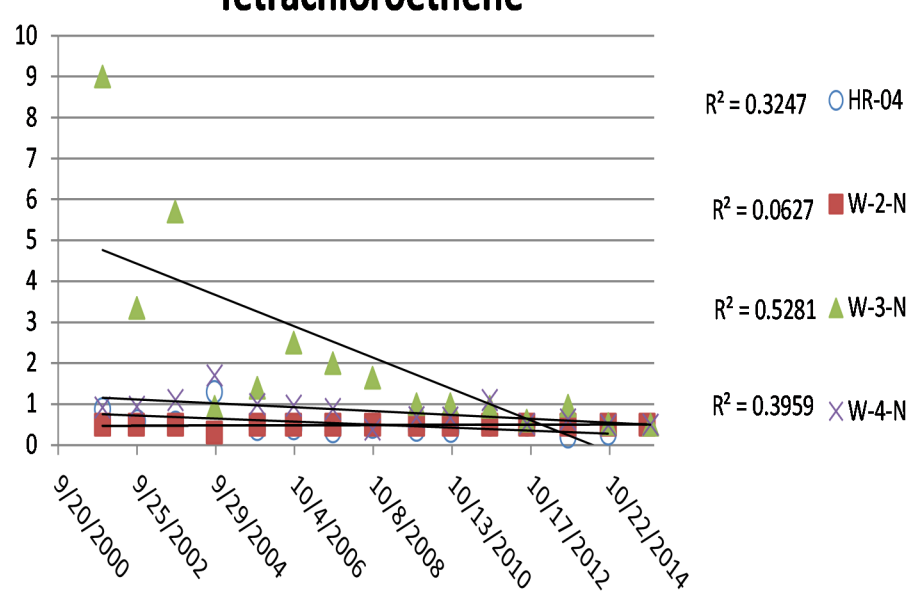

## 1,1-Dichloroethane



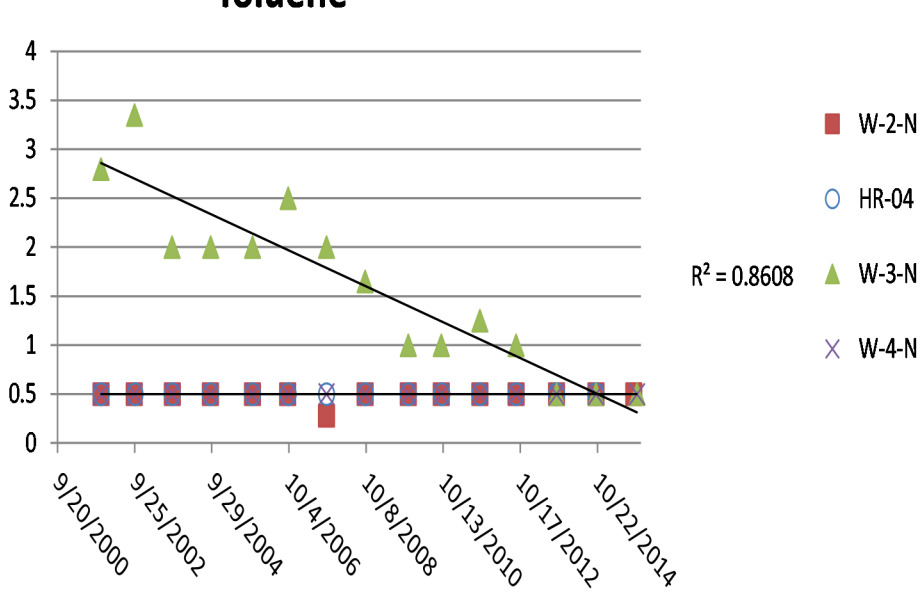

## cis-1,2-Dichloroethene



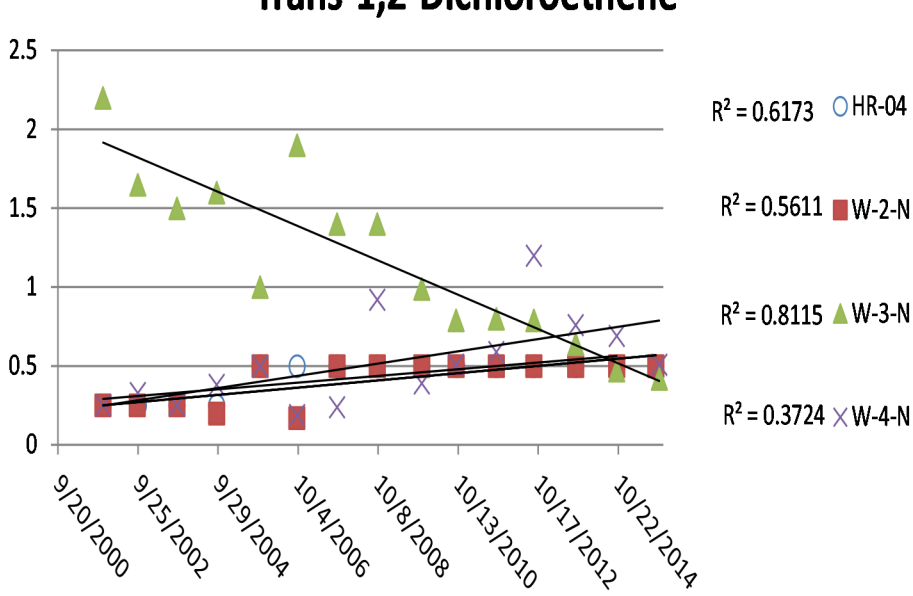

## Tetrachloroethene



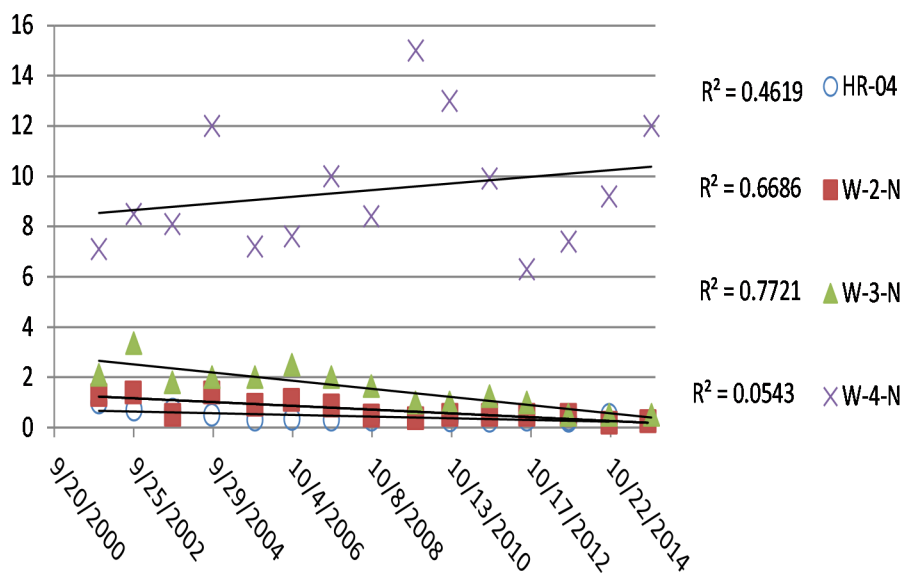

## Toluene



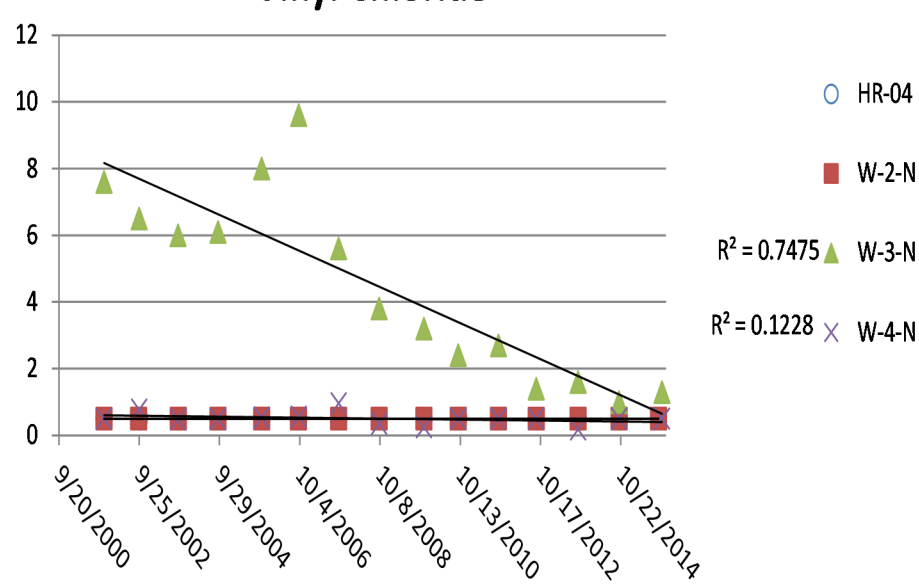

## Trans-1,2-Dichloroethene




## Trichloroethene




## Vinyl Chloride




Note: $R^2$ = #N/A refers to a slope of zero

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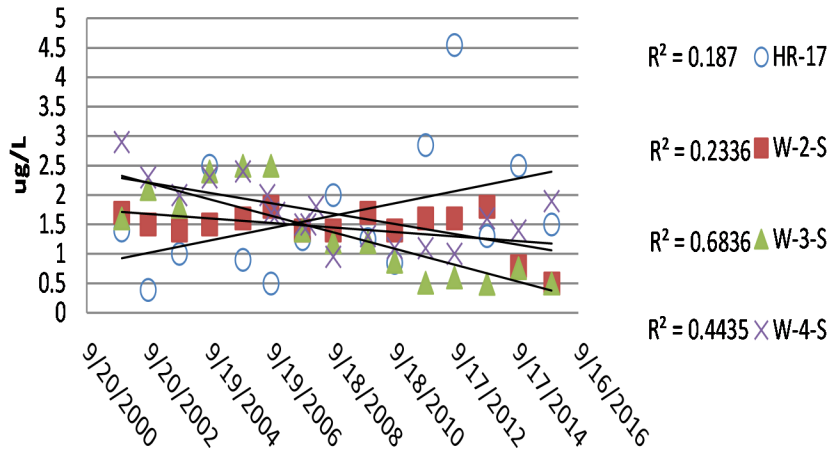
# North Settling Lagoon Linear Regression Graphs

ARCADIS Design & Consultancy for natural and built assets

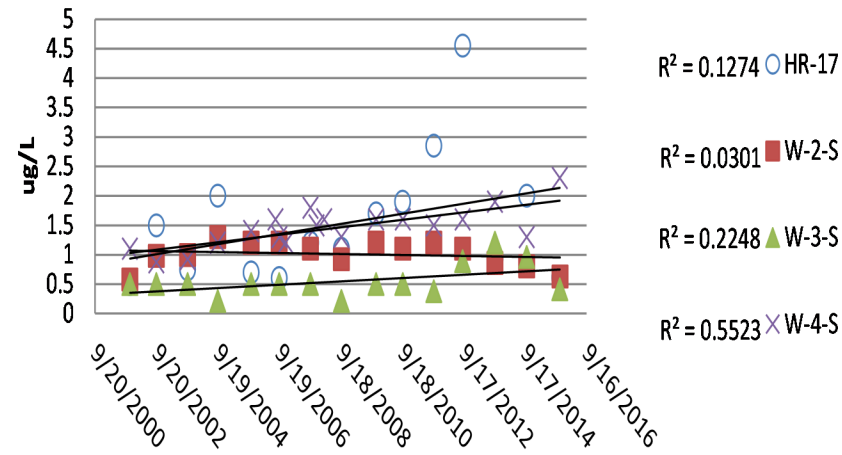
FIGURE
K-1

PROJECT NAME - RACER, Moraine, Ohio

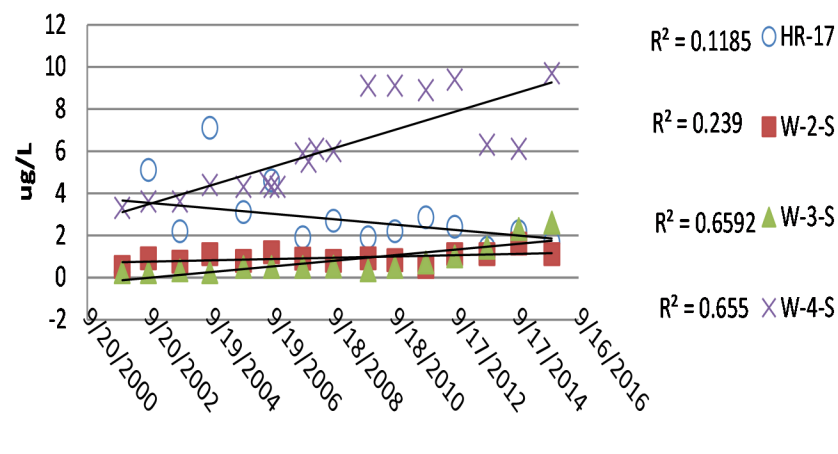
## 1,1,1-Trichloroethane



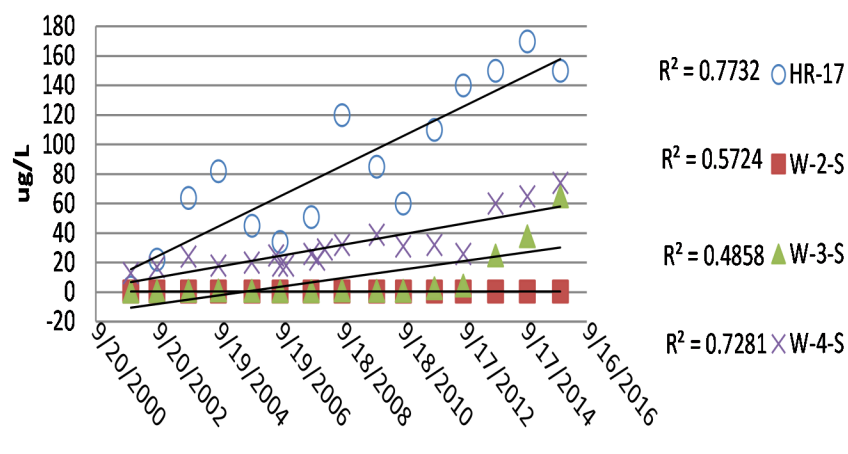

## 1,1-Dichloroethane



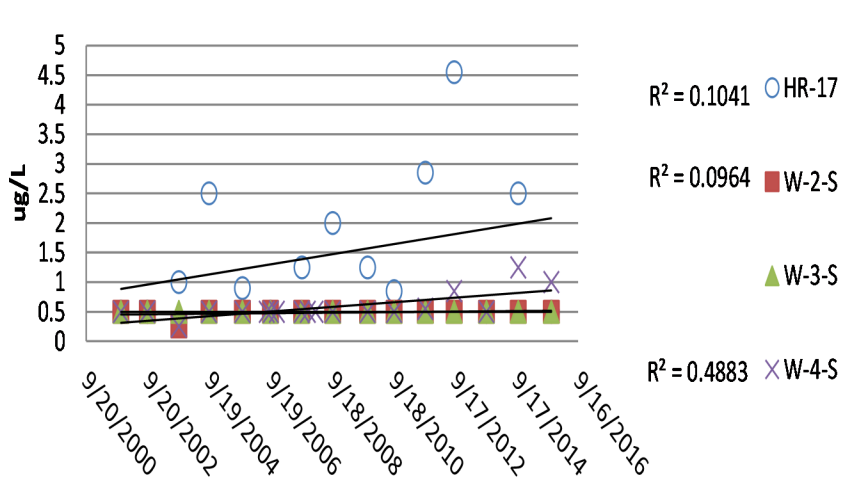

## cis-1,2-Dichloroethene



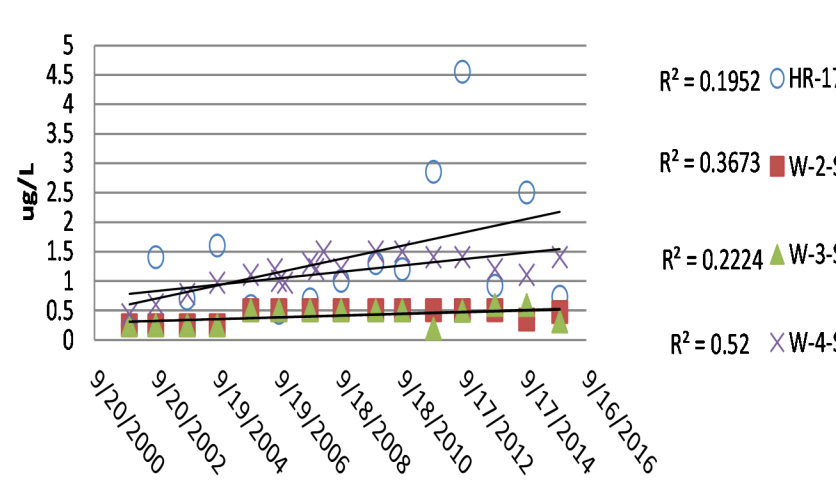

## Tetrachloroethene



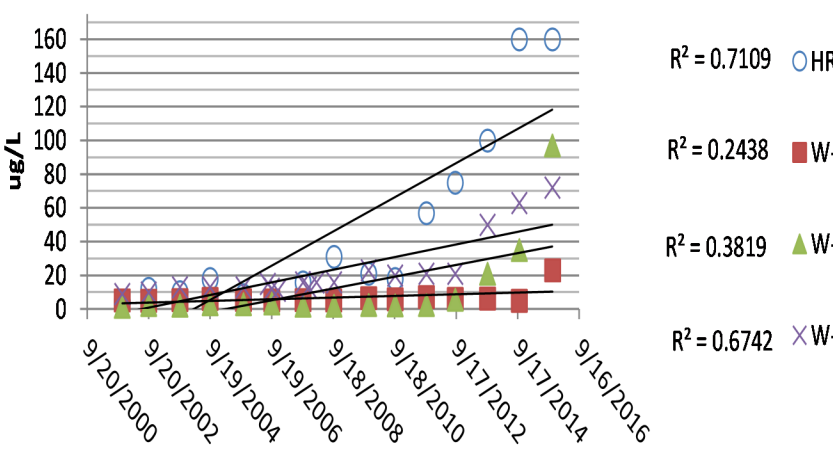

## Toluene



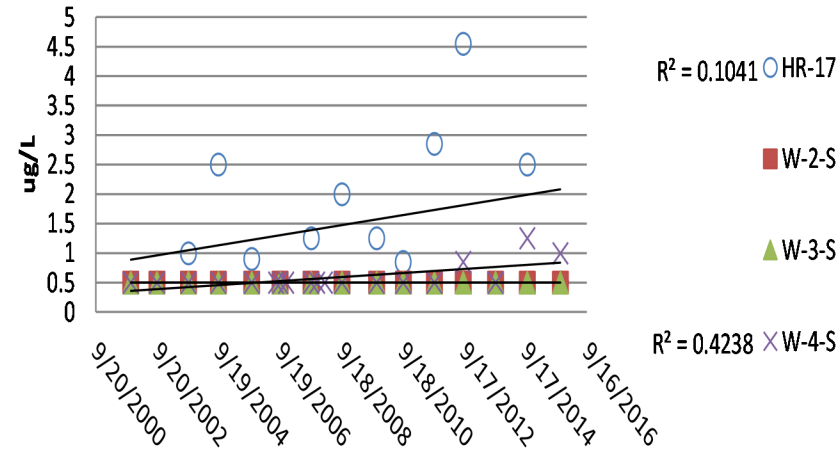

## trans-1,2-Dichloroethene




## Trichloroethene




## Vinyl chloride




Note: $R^2$ = #N/A refers to a slope of zero

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# South Settling Lagoon
# Linear Regression Graphs

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FIGURE
K-2

PROJECT NAME - RACER, Moraine, Ohio