

RACER Trust

RACER Buick City Building 44 Tracer Test

February 3, 2026

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Prepared By:

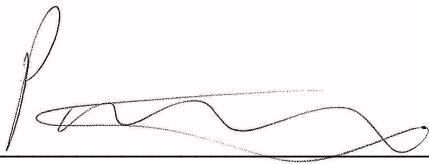
Arcadis of Michigan, LLC
28550 Cabot Drive, Suite 500
Novi
Michigan 48377
Phone: 248 994 2240

Prepared For:

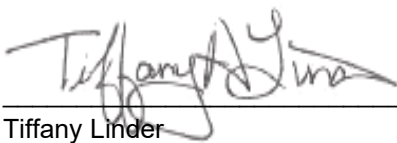
Michigan Department of Environment, Great
Lakes and Energy

Our Ref:

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Patrick Curry
Technical Expert



Tiffany Linder
Certified Project Manager

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1 Background

On behalf of Revitalizing Auto Communities Environmental Response (RACER) Trust, Arcadis of Michigan, LLC (Arcadis) has prepared this memorandum of the Building 44 area (previously referred to as Building 04 area) tracer injection test conducted at the Buick City Site (Site) in Flint, Michigan (**Figure 1**). The tracer injection test was conducted in accordance with the Building 04 Tracer Injection Test Work Plan (Work Plan) dated March 16, 2022. An update on the tracer study was shared with the Michigan Department of Environment, Great Lakes and Energy (EGLE) in a memorandum dated February 3, 2023, with a presentation and updated results and analysis provided on July 3, 2025. An updated version of this presentation is included as **Appendix A** and referred to throughout this report. The overall goal of the tracer injection test was to evaluate groundwater flow in the vicinity of Building 44 area to support better understanding of the PFAS groundwater plume and mobility in this area. In addition, the tracer injection test was completed to evaluate hydraulic parameters and transport pathways that contribute to the observed plume variability in the Building 44 area. The data generated as part of the tracer injection test will be used to help inform the potential remedy for soil and groundwater in this area of the Site.

Soil and groundwater sampling conducted in the Building 44 area has identified elevated concentrations of per- and polyfluoroalkyl substances (PFAS) in soil and groundwater. The primary constituent of concern in this area is perfluorooctane sulfonate (PFOS). PFOS concentrations in groundwater exceed 1,000 ng/L over approximately 5 acres, with concentrations in the immediate vicinity of the former Building 44 varying greatly over short distances, up to 2 to 3 orders of magnitude within 50 feet. The reasons for the variability in plume conditions are understood to include heterogenous placement of fill material, location of former building foundations and other subsurface structures, as well as sewers that act as preferential pathways for groundwater flow. Natural soil heterogeneities also play a role.

As discussed later in this memorandum, groundwater from the Building 44 area flows southward across Hamilton Ave and eastward across the abandoned rail line. The southerly component of groundwater flow may be driven in a large part due to groundwater interception by the storm and sanitary sewer infrastructure along Hamilton Ave. The core of the PFOS plume appears to migrate southeast across Hamilton Ave, with concentrations decreasing rapidly due to interception by the sewer infrastructure, attenuation and/or other natural heterogeneities. In November 2025, PFOS in groundwater was measured at 130,000 ng/L along the north edge of Hamilton Ave (MW-09-93(14-19)) and decreases to less than Michigan's Groundwater-Surface Water Interface (GSI) Criteria of 12 ng/L within approximately 280 feet to the southeast across Hamilton Ave (e.g., RFI-09-24 and RFI-09-55DR).

Based on observations from drill cores and geophysical surveys, building foundations and/or subsurface structures in portions of the area may extend to between 10 and 16 feet below ground surface (bgs), with concrete observed in some locations at over 20 feet bgs. Following building demolition, the floor cavities were filled with demolition debris and soil. This backfill creates local areas of higher permeability, while the potential for concrete walls and foundations can be barriers to groundwater flow.

Storm sewers and sanitary sewers are below the water table in the Building 44 area. Groundwater leaks into the sewers through seams and breaks in the pipes, and through gaps in the manhole structures. To mitigate leakage, laterals have been plugged and disconnected from the storm and sanitary sewer mains within Hamilton Ave, and sewer manholes have been bulkheaded by filling with concrete. These actions have been effective at reducing groundwater transport through the on-site sewer systems, which in turn resulted in rising of the groundwater table due to reduced groundwater flow away from the area. Storm sewer bulkheading completed in the Building 44 area also had the unintended effect of raising the water table within Hamilton Ave, increasing the infiltration of impacted water to remaining public sewer structures. Additional plugging of sanitary sewers in 2025 within

Hamilton Ave have mitigated the sanitary sewer impact associated with the Building 44 area; however, impacted groundwater continues to infiltrate into the Hamilton Ave storm sewer and eventually discharges to the Flint River at Outfall 11.

Native materials include alternating glaciofluvial and glacial till deposits, with glaciofluvial and anthropogenic fill dominant to approximately 10-15 ft bgs and glacial till with lenses of alluvium and occasional deep foundations and fill material to a depth of 20 feet. Below 20 feet glacial till is predominant. The shallower sand zones are typically medium grained sand or medium to coarse grained sand containing very little fines. Glaciofluvial deposits interbedded with the shallower till include a combination of thin sand zones and zones of silty sand and/or clay dominant soils. The glacial till is typically described as a stiff clay/silt containing varying amounts of coarse-grained materials.

2 Scope of Work

The tracer injection test was completed in two areas (**Figure 2**). The two different areas were selected based on the apparent differences in groundwater flow direction. The groundwater flow direction of Area 1 is more easterly than the groundwater flow of Area 2, which is more southerly.

Arcadis implemented three distinct phases of work for the tracer injection tests:

- Phase 1 - Installation of injection wells and dose response wells, baseline groundwater sampling, tracer injection test equipment set-up, and baseline tracer sampling.
- Phase 2 - Injection and tracer injection monitoring. Four injection wells were installed prior to beginning the tracer injection test in 2022. Two shallow/deep injection well pairs were installed in separate boreholes in the two areas shown on **Figure 3**. Phase 1 boring logs with well construction details are provided in **Appendix B**.
- Phase 3 - Post-injection, or drift phase monitoring of wells near the injection wells for the presence of the dye tracer. Drift wells were selected from existing temporary and permanent monitoring wells in approximately the same depth intervals and the similar lithology (permeable soil) as the injection wells. Downgradient and side gradient monitoring was conducted at existing site monitoring wells. The drift phase monitoring is described in more detail below.

In addition, during the tracer study various hydraulic testing, including slug testing, low-flow steady state pump tests (from sampling data) and single well tracer tests, were completed.

2.1 Phase 1 - Well Installation

The injection wells were installed using a combination of rotary sonic and mud rotary. IW-04-01 and IW-04-02 were drilled using mud rotary to between 12 and 16 ft bgs, switching to sonic below this depth due to borehole collapse. IW-04-03 and IW-04-04 were installed using sonic methods. The wells were constructed in an 8-inch diameter borehole using 4-inch diameter Schedule 80 polyvinyl chloride (PVC) casing with 5-foot wire-wrapped 0.010-inch slotted stainless-steel screens. The filter sand pack extended 2 feet above the top of the screen, with a minimum of 1-foot of 00 “choker” sand above the filter sand pack. Neat cement grout was placed above the choker sand to ground surface when conditions allowed. Boring and well construction logs are included in **Appendix B**.

A combination of dose response and drift wells were used to measure tracer magnitude and extent in the subsurface. Dose response wells were installed upgradient and downgradient of the injection wells in a radial pattern at a range of 5 to 15 feet from the injection well. These wells were constructed of 2-inch diameter Schedule 40 PVC casing with 5-foot long 0.010-inch slotted PVC screens. Two previously existing 1-inch diameter wells were also used as dose response wells. Previously existing wells consisting of primarily 1-inch wells, were used for drift wells. Locations of the injection, dose response, and drift wells are shown on **Figure 3** and listed in **Exhibit 1** below. Relevant boring logs are included in **Appendix B**.

Exhibit 1: Injection, Dose Response, and Drift Wells

Area	Injection Well	Dose Response Wells	Drift Wells
1	IW-04-01(7-12)	MW-04-150(8-13) MW-04-151(4-9) MW-04-152(4-9)	SB-04-59(4-9) SB-04-60(4-9) SB-04-25(4-9) SB-04-26(5-10) SB-04-28(5-10) SB-04-81(5-10)
1	IW-04-02(15-20)	MW-04-150(19-24) MW-04-151(15-20) MW-04-152(15-20)	SB-04-59(12-17) SB-04-60(15-20) SB-04-25(12-17) SB-04-61(11-16) SB-04-28(15-20) 04-160(15-22) SB-04-81(19-24) SB-04-49(6.5-11.5)
2	IW-04-03(4-9)	MW-04-156(9-14) MW-04-157(5-10) SB-04-51(8-13)	SB-04-17(5-10) SB-04-34(4-9) SB-04-48(7-12) SB-04-50(4-9) SB-04-19(8-13) SB-04-47(4-9) SB-04-18(5-10) 04-04(2.5-12.5) SB-04-20(10-15) SB-04-46(4-9)
2	IW-04-04(20-25)	MW-04-156(20-25) MW-04-157(20-25) SB-04-51(17-22)	SB-04-17(19-24) SB-04-34(18-23) SB-04-48(20-25) SB-04-50(15-20) SB-04-47(14-19) SB-04-49(20-25) SB-04-18(16-21) SB-04-64(19-24)

Note: Screen intervals are included in parentheses with the well names and are listed in feet below ground surface.

2.1.1 Baseline Groundwater Sampling and Monitoring

Baseline groundwater monitoring was conducted at all newly installed dose response wells, injection wells, and the existing monitoring wells selected for drift observation. Each baseline groundwater sample was analyzed for PFAS and for each tracer used in the area. Low-flow pumping tests were conducted in a subset of existing drift wells in 2021, and the results were used to estimate hydraulic conductivity.

2.1.2 Injection Rate Test

The injection rate test was completed in June 2022. Each injection received approximately 60 gallons of clean water from the City of Flint. Each well was injected under pressure, to a maximum injection pressure of 5 pounds per square inch (PSI). Flow totalizer readings were used to verify the gallons injected. Water level data was collected from the three dose response wells associated with each injection area. At each dose response well, water levels were taken before, midway, and after injection. The data was used to calculate the optimal injection pressures to be used at each injection well during the tracer study. Measured injection rates, injection pressures, and groundwater elevations in surrounding wells are provided in **Appendix C**.

2.2 Phase 2

2.2.1 Dye Injection

For both areas fluorescein dye was used for the shallow tracer injection and rhodamine dye was used at the deep wells. Injection in the deep wells (IW-04-02 and IW-04-04) started on September 21, 2022. On September 29th the rhodamine dye was observed in the shallow injection wells. At the time it was first observed in the shallow injection wells, it had not yet been observed in any of the deep dose-response wells. On October 5 the dyed water was observed daylighting near both deep injection wells, and the injection was stopped. Approximately 1,500 gallons had been injected into both wells under approximately 5 psi pressure. Given the daylighting in the vicinity of the deep injection wells, the most likely reason for the short circuiting was well injection pressures that exceeded the resistance capacity of the well seals. Alternately, given the variable nature of the fill material and debris in the area, the dye may have followed a vertical path through the sediments into the more permeable shallow sands (i.e., path of least resistance). It was determined the best path forward was to abandon both deep injection wells prior to beginning the injection at the shallow wells. This was communicated to EGLE on October 17, 2022. Both deep injection wells were abandoned by over-drilling and were tremie-grouted to the ground surface.

Injections at the two shallow injection wells (IW-04-01 and IW-04-03) began on October 31 and continued until November 23. Approximately 4,000 gallons were injected into IW-04-01 and 3,000 gallons were injected into IW-04-03. Injection pressures were kept at 2 psi or lower.

The well column within a dose response well was mixed prior to collecting grab groundwater samples using a bailer and compared visually in the field to a set of serial dilutions to bias which samples were sent to Ozark Underground Laboratory for analysis of tracer concentration. In addition to composite grab groundwater samples for tracer evaluation, field parameters (specifically pH, specific conductivity, oxidation reduction potential, dissolved oxygen, and temperature) and manual depths to water were measured during the injection.

On November 2, 2022, the City of Flint excavated an area near sanitary sewer manhole MH H-1A in Hamilton Ave, adjacent to the tracer test injection site. They were observed placing an unknown quantity of fluorescein dye into the excavation. Based on the downgradient location of MH H-1A, this addition of dye is not thought to have interfered with the drift response evaluation, but dye analysis from the storm and sanitary sewer mains could not be completed as planned.

2.3 Phase 3

2.3.1 Drift Phase Monitoring

Drift phase monitoring began in December 2022. Carbon samplers were placed at Outfall 010 and 011 storm sewers, and sanitary sewer manhole MH H to capture any potential breakthrough of dye into the sewers. These were changed every two weeks and sent to Ozark Underground Laboratory for analysis of tracer concentration. However, the addition of the same dye type by the city adjacent to the sanitary sewer means that it will not be possible to attribute any detections of fluorescein dye in the sewers to the tracer test.

Groundwater samples were collected from the drift wells and submitted to Ozark Underground Laboratory for analysis of tracer concentration. Sampling intervals and locations were modified as needed based on previous sample results and observations. Drift phase monitoring was continued until January 2024 and results are summarized on **Tables 2B and 3B**.

2.4 Hydraulic Testing

Hydraulic testing was performed during each phase of the tracer test. Prior to the injections, slug tests and low-flow drawdown tests were conducted to quantify hydraulic conductivities across Areas 1 and 2 and to assist with designing the tracer test monitoring plan. During injection performance and monitoring, tracer concentrations measured at dose response wells (**Table 2A and Table 3A**) were used to estimate mobile porosity. During drift phase monitoring, single well tracer tests were conducted to estimate the range of groundwater velocities across Areas 1 and 2.

2.4.1 Slug Tests

Slug testing was performed at 16 wells in October 2021 utilizing rising head recovery methodology (slides 9 and 10; **Appendix A**). The tests were performed in accordance with the Buick City Slug Testing Plan included in **Appendix D**. A summary of the slug testing results is included in **Table 4A** and analytical solution reports are included in **Appendix D-1**.

The slug testing data were processed into displacement-time data and analyzed using AQTESOLV™ for Windows Pro 4.5 (Duffield, 2007). Appropriate and applicable analytical solutions and corrections were applied following guidelines presented in The Design, Performance, and Analysis of Slug Tests (Butler, 2019). The solution utilized to match the observed slug test data was Bouwer and Rice (Bouwer and Rice, 1976; Bower, 1989).

2.4.2 Low-Flow Pumping Tests

Low-flow groundwater purging and sampling methods were used for groundwater sampling at monitoring wells in November 2021 and January 2022. The low-flow purging procedures were conducted to support evaluation of hydraulic conductivity estimation in accordance with the Buick City Low-Flow Pumping Test Plan included in **Appendix E**. The November 2021 and January 2022 tests were performed using both water level meters and pressure transducers to measure water levels. Purging data was used to estimate hydraulic conductivity where drawdown and flow rate, and steady state conditions for the analysis were met. Specifically, hydraulic conductivity values were estimated at wells with flow rates less than 1,000 milliliters per minute that exhibited at least 0.1 feet of steady state drawdown. Steady state drawdown was defined as less than 0.1 feet every 5 minutes. A summary of the low flow pumping test results is included in **Table 4B**.

Data collected during the low-flow steady state drawdown testing were analyzed using the following equation, rearranged to calculate the hydraulic conductivity as presented in Robbins, et al. (2009).

$$K = (Q / (2\pi \times L \times \Delta h)) \times \ln(r_2 / r_1)$$

Where:

K = hydraulic conductivity

Q = pumping rate

L = length of the well screen

Δh = drawdown (difference in water level)

r_1, r_2 = inner and outer radii (well and influence zone)

2.4.3 Mobile Porosity Analysis

Mobile porosity (n_m), as compared to aquifer porosity (n), describes the portion of the aquifer porosity that participates in solute transport. Typical values for mobile porosity range from 0.02 to 0.10 (2-10%). During tracer injections in Areas 1 and 2, tracer arrival was monitored at three dose response wells located within 15 feet of each injection well. Based on these observations, mobile porosity at a given dose response well can be calculated using the following equation:

$$n_m = V / \pi r^2 h$$

Where:

n_m = mobile porosity

V = volume of tracer solution injected to observe half the maximum tracer concentration

r = dose response well distance from injection well

h = injection well screen interval

The above equation assumes that the tracer solution is injected uniformly along the entire length of the injection well screen, and that the surrounding aquifer is homogeneous (i.e., injection solution is injected equally in all directions). During the dose response phase of the tracer test, only three dose response wells received tracer at a concentration to allow for mobile porosity estimates: MW-04-150 and MW-04-151 near injection well IW-04-01, and MW-04-157 near injection well IW-04-03. The other dose response wells exhibited only trace or no detection of the tracer solution, and therefore mobile porosity could not be calculated at those wells.

2.4.4 Single Well Tracer Testing

One objective of the tracer test was to quantify groundwater velocity within Areas 1 and 2. Typically, groundwater velocity is calculated based on tracer arrival times at downgradient monitoring wells during drift phase monitoring. However, dye tracer was only observed at a few wells at low concentrations in both Areas 1 and 2 and reliable groundwater velocity estimates could not be calculated. Therefore, single well tracer tests were performed at multiple wells to estimate groundwater velocity values.

Single well tracer testing was performed at 16 wells across Hamilton Avenue from the Building 04 area in July and August of 2023, though only 10 had sufficient data quality to calculate groundwater velocities (Slide 7 and 8 – **Appendix A**). Single-well tracer test methods generally consist of replacing the water column in a well with a tracer solution (i.e. sodium chloride solution) without imposing an artificial head in the aquifer and then measuring the subsequent decline of tracer concentration in the well (Drost et al. 1968, Gaspar and Oncescu 1972, Grisak et al. 1977, and Hall 1993). The single well tracer test results were used to estimate groundwater velocity. A summary of the single well tracer testing results is included in **Table 4C** and test reports are included in **Appendix F**.

Based on the solution for a well-mixed reservoir, the observed groundwater flux in a monitoring well (q_w) can be calculated from the observed tracer washout rate using the following equation (Freeze and Cherry 1979):

$$q_w = (V * \ln(C-1)) / (A * t)$$

Where:

r = well radius (i.e., effective well diameter)

V = volume of water in the well

C = observed normalized tracer concentration (observed concentration divided by the initial concentration)

A = area of the vertical well segment exposed to groundwater flow

t = time since tracer injection

Based on the q_w value and the well construction, the groundwater flux in the aquifer (q_a) can be calculated using the following two equations:

$$q_a = q_w / \alpha$$

$$\alpha = \frac{8}{\left(1 + \frac{K_3}{K_2}\right) \left[1 + \left(\frac{r_1}{r_2}\right)^2\right] + \frac{K_2}{K_1} \left[1 - \left(\frac{r_1}{r_2}\right)^2\right] + \left(1 - \frac{K_3}{K_2}\right) \left[\left(\frac{r_1}{r_3}\right)^2 + \left(\frac{r_2}{r_3}\right)^2\right] + \frac{K_2}{K_1} \left[\left(\frac{r_1}{r_3}\right)^2 - \left(\frac{r_2}{r_3}\right)^2\right]}$$

Where:

α = flow-focusing effect of the well and borehole, dependent on well-specific construction (see bottom equation).

The equation for α uses hydraulic conductivities of the well, well filter pack, and water-bearing unit, (K_1 , K_2 , and K_3 , respectively) and the inner well radius, outer well radius, and borehole radius (r_1 , r_2 , and r_3 , respectively) to estimate the flow-focusing effect of the well and borehole (Drost et al. 1968). Typical values for α range between 2 and 3 (Drost et al. 1968, Kumar and Nachiappan 2000). The flow-focusing factor is calculated in the Single-Well Tracer Test Analysis Tool, the outputs of which are included as **Appendix F**. An initial estimate of aquifer

hydraulic conductivity is required to estimate the flow-focusing factor, which was provided by slug tests and low-flow drawdown tests. However, α is relatively insensitive to the initial aquifer hydraulic conductivity estimate under most conditions (Drost et al. 1968, Kumar and Nachiappan 2000).

3 Results and Analysis

This section discusses the results of the fluorescein dye injection into shallow wells and other data collected from the area. The data utilized includes groundwater elevations, PFOS analysis, geophysical data, and aquifer testing (slug testing, low flow pumping tests, and single well tracer tests). The data was analyzed to determine the mobile porosity, the vertical and horizontal gradients, and groundwater velocity at Area 1 and Area 2 (**Figure 3**).

For the purposes of this evaluation, any monitoring well with the top of screen 10 feet or more below ground surface (ft bgs) is included in the “deep” category. Any monitoring well with the top of screen above 10 ft bgs is included in the “shallow” category.

3.1 Mobile Porosity

During the injection phase, monitoring for the presence of fluorescein dye was conducted in 3 shallow dose response wells in each area to verify the radius of influence and estimate the mobile porosity. In Area 1 the presence of fluorescein dye was observed at 2 of 3 dose response wells (**Appendix A** – slide 15). At Area 2 fluorescein dye was observed at 1 of 3 dose response wells (**Appendix A** – slide 15). The mobile porosity (nm) was calculated using the distance between the dose response well and the known volume of dye injected (as described section 12.3 of Remediation Hydraulics; Payne et. al., 2008). The calculated mobile porosity at Area 1 was 12.4% and 15% from two locations and the calculated mobile porosity at Area 2 was 19.5%. The average across the areas was 16%, which was used in subsequent groundwater velocity calculations.

3.2 Drift Well Sampling Results

The locations where dye was detected in the drift well network throughout the drift phase are shown in the summary presentation included as **Appendix A** (Slides 14 – 23). In general, dye detections were orders of magnitude lower than anticipated.

In Area 1, fluorescein dye was detected at only two drift response wells during the drift phase monitoring. The wells were located approximately 25 and 45 feet from the injection well. The flow direction in Area 1 appears to be to the south based on the dye detections.

In Area 2 the highest concentrations of dye were detected in deep well SB-04-51 (17-22), which is located to the south and west of the injection well. Six drift wells detected the dye at low concentrations. Due to the dye being detected in monitoring wells thought to be upgradient (north and west), additional wells were added to the drift well sampling to delineate the area of dye detections throughout the drift phase sampling (**Appendix A**, Slide 21). The trace detections of dye to the west-southwest of Area 2 suggest a component of groundwater flow may be in this direction. This could be due to local gradient created by subsurface infrastructure or groundwater sinks associated with buried infrastructure such as storm and sanitary sewers.

3.3 Hydraulic Gradients

Using groundwater elevation data collected from August 2023 to March 2024, horizontal groundwater gradients were calculated for shallow monitoring wells at Area 1 and Area 2. In accordance with USEPA guidance, hydraulic gradient directions were calculated for a series of monitoring well triplets located within Areas 1 and 2 by applying the multiple-point solution method (Devlin 2003) to the time-series gauging data for each well set. Groundwater was gauged multiple times between August and December 2023. The groundwater elevations and resulting horizontal hydraulic gradient calculations are provided on **Table 4E**. The well triplets and calculated flow vectors are shown on **Appendix A**, slide 25. Overall hydraulic gradients are generally to the south and east in both areas, consistent with the site groundwater contours.

3.4 Groundwater Velocity

Groundwater velocity was calculated at multiple wells in Area 1 and Area 2 using two methods. Direct measurements of groundwater velocity were obtained from single well tracer tests. A summary of the single well tracer testing results is included in **Table 4C**.

Indirect estimations of groundwater velocity were obtained using Darcy's Law as shown below:

$$v = Ki / n_m$$

Where v is the groundwater velocity, K is the hydraulic conductivity, i is the hydraulic gradient, and n_m is the mobile porosity. For these Darcy's Law calculations, hydraulic conductivity estimates were derived from either slug tests or low-flow pumping tests, mobile porosity estimates were derived from dose response monitoring (used instead of effective porosity to provide a more accurate estimate of solute transport). Hydraulic gradient estimates were derived from multi-point analysis of nearby well triplets as discussed in the section above. A summary of Darcy's Law groundwater velocity estimates is included in **Table 4D**.

The shallow groundwater velocity calculated across all methods was between 0.1 and 3.7 ft/day. The deep groundwater velocity calculated across all methods was between less than 0.1 and 3.9 ft/day. To assess potential biases related to calculation methods, geometric mean velocities were determined for each method. Geometric mean groundwater velocities derived from slug tests were 0.3 ft/day in shallow wells and 0.2 ft/day in deep wells. Mean groundwater velocities derived from low flow pumping tests were 0.6 ft/day in shallow wells and 0.1 ft/day in deep wells. Mean groundwater velocities derived from single well tracer tests were 0.4 ft/day in shallow wells and 1.3 ft/day in deep wells. All three calculations exhibited similar range of groundwater velocity values.

4 Summary

The results of the tracer injection test and related analyses have found that the localized movement of groundwater is likely complicated by the presence of concrete slabs, foundation walls, and footers, as well as utilities and heterogeneous fill and geologic material present in the subsurface. This results in groundwater flow regimes in the two areas tested that are localized and unpredictable.

The results of the tracer injection test are summarized as follows:

- Hydraulic conductivity across the area varied. Geometric mean ranged from 1.4 to 4.8 ft/day for the shallow zone and 1.1 to 1.2 ft/day for the deeper zone. These results are generally consistent with site observations in that the shallow zone is dominated by sandy fill material and the deeper zone is interbedded clay and till with intermittent silty sand and gravel.
- Tracer observations in the shallow zone are limited primarily to the ROI area with only low-level detections downgradient. Based on this result, subsurface obstructions (such as concrete) and other infrastructure may be influencing local flow, causing localized unpredictable flow paths and directions.
- Groundwater velocity calculations for the shallow groundwater ranges from 0.1 to 3.7 ft/day with geometric mean velocity ranging from 0.3 to 0.6 ft/day depending on the hydraulic testing method. Deep groundwater velocity ranges from <0.1 to 3.9 ft/day with geometric mean velocity ranging from 0.1 to 1.3 ft/day.
- For the shallow zone, the calculated mobile porosity at Area 1 was 12.4% and 15% and the calculated mobile porosity at Area 2 was 19.5%. The average across the areas was 16%.
- Based on well triplets, the overall hydraulic gradients in the shallow zone are to the east-southeast in the eastern portion of Building 44 area and south-southeast in the western portion of the area. Low-level dye detections in Area 2 suggest local flow vectors may be to the southwest, potentially related to buried infrastructure or groundwater sinks.

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Tables

Table 1 - Well Types
RACER Buick City
Flint, Michigan



Area	Injection Well	Dose Response Wells	Drift Wells
1	IW-04-01 (7-12)	MW-04-150 (8-13) MW-04-151 (4-9) MW-04-152 (4-9)	SB-04-59(4-9) SB-04-60(4-9) SB-04-25(4-9) SB-04-26(5-10) SB-04-28(5-10) SB-04-81(5-10)
	IW-04-02 (15-20)	MW-04-150(19-24) MW-04-151(15-20) MW-04-152(15-20)	SB-04-59(12-17) SB-04-60(15-20) SB-04-25(12-17) SB-04-61(11-16) SB-04-28(15-20) 04-160(15-22) SB-04-81(19-24) SB-04-49(6.5-11.5)
2	IW-04-03(4-9)	MW-04-156(9-14) MW-04-157(5-10) SB-04-5(8-13)	SB-04-17(5-10) SB-04-34(4-9) SB-04-48(7-12) SB-04-50(4-9) SB-04-19(8-13) SB-04-47(4-9) SB-04-18(5-10) 04-04(2.5-12.5) SB-04-20(10-15) SB-04-46(4-9)
	IW-04-04(20-25)	MW-04-156(20-25) MW-04-157(20-25) SB-04-51(17-22)	SB-04-17(19-24) SB-04-34(18-23) SB-04-48(20-25) SB-04-50(15-20) SB-04-47(14-19) SB-04-49(20-25) SB-04-18(16-21) SB-04-64(19-24)

IW-04-01			Fluorescein (ppb)					Rhodamine (ppb)				
Distance to IW-04-01			12	15.5	16	12	12	15.5	15.5	16	16	NM
Date	Sample Type	Elapsed Days	MW-04-150 (8-13)	MW-04-151 (4-9)	MW-04-152 (4-9)	MW-04-150(8-13)	MW-04-150(19-24)	MW-04-151(4-9)	MW-04-151(15-20)	MW-04-152(4-9)	MW-04-152(15-20)	MW-04-157(5-10)
11/11/2022	End of Injection	0	1,020	3,170	323	3.60		36.5		ND		-
11/18/2022	1 week event	5	-	7,530	561	-	-	45.9	ND	ND	354	-
12/2/2022	3 week event	21	465	12,400	55	1.65	ND	72.9	ND	ND	291	-
12/14/2022	5 week event	28	-	-	-	-	-	-	-	-	-	-
12/21/2022	6 week event	42	191	9,940	12.0	1.2	ND	74	ND	ND	18.4	-
1/4/2023	8 week event	55	-	-	-	-	-	-	-	-	-	-
1/17/2023	10 week event	69	91.4	5,880	0.657	0.563	ND	52.9	ND	ND	0.199	-
1/31/2023	12 week event	82	52.8	3,540	2.93	0.804	ND	40.6	ND	ND	ND	-
2/13/2023	14 week event	98	-	-	-	-	-	-	-	-	-	-
3/1/2023	16 week event	118	-	1,730	-	ND	ND	30.7	ND	ND	ND	-
3/21/2023	19 week event	140	-	-	-	-	-	-	-	-	-	-
4/12/2023	22 week event	170	-	785	-	-	-	25.2	ND	-	-	-
5/12/2023	26 week event	210	-	447	-	-	-	54.0	ND	-	-	11.9
6/21/2023	32 week event	259	-	391	-	-	-	46.4	ND	-	-	9.82
8/9/2023	39 week event	294	-	-	-	-	-	-	-	-	-	6.92
9/13/2023	45 week event	372	-	-	-	-	-	-	-	-	-	3.66
11/30/2023	56 week event	390	-	-	-	-	-	-	-	-	-	5.01

Notes:

- ND No Dye
- Not Collected/Not Analyzed

Table 2B - Area 1 Drift Response Well Results
 RACER Buick City
 Flint, Michigan



IW-04-01			Fluorescein (ppb)												
Distance to IW-04-01 (ft)			25	25	27	27	27	41	41	50	50	62	62	63	63
Date	Sample Type	Elapsed Days	SB-04-59 (4-9)	SB-04-59 (12-17)	SB-04-60 (4-9)	SB-04-60 (15-20)	MW-04-158	SB-04-25 (4-9)	SB-04-25 (12-17)	MW-04-159 (4-9)	MW-04-159 (18-23)	SB-04-75 (12-17)	SB-04-75 (20-25)	SB-04-74 (7-12)	SB-04-74 (15-20)
11/11/2022	End of Injection	0	-	-	-	-	-	-	-	-	-	-	-	-	-
11/18/2022	1 week event	5	ND	-	ND	ND	-	-	-	-	-	-	-	-	-
12/2/2022	3 week event	21	1.10	0.454	ND	ND	-	ND	ND	-	-	-	-	-	-
12/14/2022	5 week event	28	-	-	-	-	-	-	-	-	-	-	-	-	-
12/21/2022	6 week event	42	3.03	1.24	-	-	-	-	-	-	-	-	-	-	-
1/4/2023	8 week event	55	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2023	10 week event	69	3.57	1.25	ND	ND	-	ND	0.063	-	-	-	-	-	-
1/31/2023	12 week event	82	3.48	1.00	ND	ND	-	ND	ND	-	-	-	-	-	-
2/13/2023	14 week event	98	-	-	-	-	-	-	-	-	-	-	-	-	-
3/1/2023	16 week event	118	2.15	1.32	-	-	ND	ND	ND	-	-	-	-	-	-
3/21/2023	19 week event	140	4.03	0.43	-	-	ND	ND	ND	-	-	-	-	-	-
4/12/2023	22 week event	170	3.79	ND	-	-	ND	ND	ND	-	-	-	-	ND	ND
5/12/2023	26 week event	210	2.28	0.41	ND	ND	ND	ND	ND	-	-	ND	ND	ND	ND
6/21/2023	32 week event	259	1.79	0.744	-	-	ND	ND	ND	ND	ND	-	-	-	-
8/9/2023	39 week event	294	1.94	0.900	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
9/13/2023	45 week event	372	0.888	0.314	ND	ND	ND	ND	ND	ND	ND	-	-	-	-
11/30/2023	56 week event	390	2.01	0.408	ND	ND	ND	ND	ND	ND	ND	-	-	-	-

Notes:

Italics : A fluorescence peak is present that does not meet all the criteria for this dye. However, it has been calculated as a positive dye result.

- ND: No Dye
- Not Collected/Not Analyzed
- Deep drift well interval
- Shallow drift well interval

IW-04-01			Fluorescein (ppb)					Rhodamine (ppb)					
Distance to IW-04-01 (ft)			78	78	87	103	103	25	25	27	27	41	41
Date	Sample Type	Elapsed Days	SB-04-26 (4-9)	SB-04-61 (11-16)	04-160 (15-22)	SB-04-58R (2-4)	SB-04-58R (11-16)	SB-04-59(4-9)	SB-04-59(12-17)	SB-04-60(4-9)	SB-04-60(15-20)	SB-04-25(4-9)	SB-04-25(12-17)
11/11/2022	End of Injection	0	-	-	-	-	-	-	-	-	-	-	-
11/18/2022	1 week event	5	-	-	-	-	-	ND	-	ND	ND	-	-
12/2/2022	3 week event	21	-	-	-	-	-	1.10	0.454	ND	ND	ND	ND
12/14/2022	5 week event	28	-	-	-	-	-	-	-	-	-	-	-
12/21/2022	6 week event	42	-	-	-	-	-	-	-	-	-	-	-
1/4/2023	8 week event	55	-	-	-	-	-	-	-	-	-	-	-
1/17/2023	10 week event	69	-	-	-	-	-	-	-	-	-	-	-
1/31/2023	12 week event	82	-	-	ND	-	-	-	-	-	-	-	-
2/13/2023	14 week event	98	-	-	-	-	-	-	-	-	-	-	-
3/1/2023	16 week event	118	ND	-	-	-	-	-	-	-	-	-	-
3/21/2023	19 week event	140	ND	-	-	-	-	-	-	-	-	-	-
4/12/2023	22 week event	170	ND	-	-	ND	ND	-	-	-	-	-	-
5/12/2023	26 week event	210	ND	-	-	ND	ND	-	-	-	-	-	-
6/21/2023	32 week event	259	ND	-	-	-	-	-	-	-	-	-	-
8/9/2023	39 week event	294	ND	ND	ND	-	-	-	-	-	-	-	-
9/13/2023	45 week event	372	ND	ND	ND	-	-	-	-	-	-	-	-
11/30/2023	56 week event	390	ND	ND	ND	ND	ND	-	-	-	-	-	-

Notes:

Italics : A fluorescence peak is present that d

ND: No Dye

- Not Collected/Not Analyzed

Deep drift well interval

Shallow drift well interval

Table 3A - Area 2 Dose Response Well Results
RACER Buick City
Flint, Michigan



IW-04-03			Fluorescein (ppb)	
Distance to IW-04-03			10.92	17.67
Date	Sample Type	Elapsed Days	MW-04-157 (5-10)	MW-04-156 (9-14)
11/23/2022	End of Injection	0	16,000	-
11/28/2022	1 week event	5	16,600	1.24
12/14/2022	3 week event	21	-	-
12/21/2022	4 week event	28	11,700	1.56
1/4/2023	6 week event	42	-	-
1/17/2023	8 week event	55	7,890	1.89
12/14/2022	10 week event	69	5,680	2.21
12/21/2022	12 week event	82	-	-
1/4/2023	14 week event	98	1,940	2.58
1/17/2023	17 week event	118	-	-
1/31/2023	20 week event	140	3,240	-
2/13/2023	21 week event	170	2,130	-
3/1/2023	27 week event	210	2,560	-
3/21/2023	34 week event	259	1,790	-
4/12/2023	39 week event	294	521	-
5/12/2023	50 week event	372	123	-
12/18/2023	53 week event	390	-	-

Notes:

- Not Collected/Not Analyzed

Table 3B - Area 2 Drift Response Well Results
 RACER Buick City
 Flint, Michigan



IW-04-03			Fluorescein (ppb)								
Distance to IW-04-03			15	15	29	29	30	30	49	49	57
Date	Sample Type	Elapsed Days	SB-04-51 (7-12)	SB-04-51 (17-22)	SB-04-52 (5-10)	SB-04-52 (15-20)	SB-04-17 (5-10)	SB-04-17 (19-24)	SB-04-15 (5-10)	SB-04-15 (17-25)	SB-04-34 (4-9)
11/23/2022	End of Injection	0	-	-	-	-	-	-	-	-	-
11/28/2022	1 week event	5	-	-	-	-	-	-	-	-	-
12/14/2022	3 week event	21	-	-	-	-	-	-	-	-	-
12/21/2022	4 week event	28	-	-	-	-	-	-	-	-	-
1/4/2023	6 week event	42	-	-	-	-	-	-	-	-	-
1/17/2023	8 week event	55	-	-	-	-	0.081	0.010	-	-	-
12/14/2022	10 week event	69	ND	4.22	-	-	0.104	ND	-	-	ND
12/21/2022	12 week event	82	-	-	-	-	-	-	-	-	-
1/4/2023	14 week event	98	0.258	65.7	-	-	0.056	ND	-	-	ND
1/17/2023	17 week event	118	0.153	123	-	-	0.047	ND	-	-	ND
1/31/2023	20 week event	140	0.138	150	-	-	0.058	ND	ND	0.618	ND
2/13/2023	21 week event	170	0.095	93.9	2.52	0.338	ND	ND	ND	0.161	ND
3/1/2023	27 week event	210	0.072	178	7.03	0.483	0.090	ND	-	0.220	ND
3/21/2023	34 week event	259	2.04	191	6.92	6.26	0.085	ND	ND	ND	ND
4/12/2023	39 week event	294	0.666	235	8.70	0.514	ND	ND	ND	0.260	ND
5/12/2023	50 week event	372	7.36	274	3.44	0.985	ND	ND	ND	0.235	ND
12/18/2023	53 week event	390	-	-	-	-	-	-	-	-	-

Notes:

- ND No Dye
- Not Collected/Not Analyzed
- Deep drift well interval
- Shallow drift well interval

IW-04-03			Fluorescein (ppb)								
Distance to IW-04-03			57	60	64	64	71	73	73	77	93
Date	Sample Type	Elapsed Days	SB-04-34 (18-23)	SB-04-33 (19-24)	SB-04-48 (7-12)	SB-04-48 (20-25)	SB-04-19 (8-13)	SB-04-50 (4-9)	SB-04-50 (15-20)	RFI-44-05	SB-04-64 (19-24)
11/23/2022	End of Injection	0	-	-	-	-	-	-	-	-	-
11/28/2022	1 week event	5	-	-	-	-	-	-	-	-	-
12/14/2022	3 week event	21	-	-	-	-	-	-	-	-	-
12/21/2022	4 week event	28	-	-	-	-	-	-	-	-	-
1/4/2023	6 week event	42	-	-	-	-	-	-	-	-	-
1/17/2023	8 week event	55	-	-	-	-	-	-	-	-	-
12/14/2022	10 week event	69	ND	-	ND	ND	ND	ND	ND	-	-
12/21/2022	12 week event	82	-	-	-	-	-	-	-	-	-
1/4/2023	14 week event	98	0.202	-	-	-	-	ND	ND	-	-
1/17/2023	17 week event	118	0.215	-	ND	ND	ND	ND	ND	-	-
1/31/2023	20 week event	140	0.192	-	ND	ND	-	-	-	ND	-
2/13/2023	21 week event	170	0.107	ND	ND	ND	ND	ND	ND	ND	-
3/1/2023	27 week event	210	0.188	-	ND	0.024	ND	-	-	-	-
3/21/2023	34 week event	259	0.190	ND	ND	ND	ND	ND	ND	-	-
4/12/2023	39 week event	294	0.208	ND	ND	ND	ND	ND	ND	-	ND
5/12/2023	50 week event	372	0.137	ND	ND	ND	ND	ND	ND	0.044	ND
12/18/2023	53 week event	390	-	-	-	-	-	-	-	-	-

Notes:

- ND No Dye
- Not Collected/Not Analyzed
- Deep drift well interval
- Shallow drift well interval

IW-04-03			Fluorescein (ppb)							
Distance to IW-04-03			96	96	97	97	97	102	102	291
Date	Sample Type	Elapsed Days	SB-04-11 (10-15)	SB-04-11 (19-24)	SB-04-12 (20-25)	SB-04-47 (4-9)	SB-04-47 (14-19)	SB-04-49 (6.5-11.5)	SB-04-49 (20-25)	MW-09-81 (14-19)
11/23/2022	End of Injection	0	-	-	-	-	-	-	-	-
11/28/2022	1 week event	5	-	-	-	-	-	-	-	-
12/14/2022	3 week event	21	-	-	-	-	-	-	-	-
12/21/2022	4 week event	28	-	-	-	-	-	-	-	-
1/4/2023	6 week event	42	-	-	-	-	-	-	-	-
1/17/2023	8 week event	55	-	-	-	-	-	-	-	-
12/14/2022	10 week event	69	-	-	-	-	-	-	-	-
12/21/2022	12 week event	82	-	-	-	-	-	-	-	-
1/4/2023	14 week event	98	-	-	-	-	-	-	-	-
1/17/2023	17 week event	118	-	-	-	-	-	-	-	-
1/31/2023	20 week event	140	-	-	-	-	-	-	-	-
2/13/2023	21 week event	170	-	-	-	-	-	-	-	ND
3/1/2023	27 week event	210	-	-	-	-	-	-	-	ND
3/21/2023	34 week event	259	-	-	-	-	-	-	-	ND
4/12/2023	39 week event	294	-	-	-	ND	ND	ND	ND	-
5/12/2023	50 week event	372	-	-	-	ND	ND	ND	ND	-
12/18/2023	53 week event	390	0.128	ND	ND	-	-	-	-	-

Notes:

- ND No Dye
- Not Collected/Not Analyzed
- Deep drift well interval
- Shallow drift well interval

Table 4A - Summary of Slug Test Results
RACER Buick City
Flint, Michigan



Well ID	Screen Interval (ft bgs)	Effective Thickness (ft) ¹	Hydraulic Test Type	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)	Test Analytical Solution
RFI-81-09	11-21	11.23	Rising Head	12	4.2E-03	Bower-Rice
				11	3.9E-03	Bower-Rice
20-103S	14.3-19.3	13.74	Rising Head	1.1	3.9E-04	Bower-Rice
				1.2	4.2E-04	Bower-Rice
RFI-36-14	6-16	13.86	Rising Head	3.8	1.3E-03	Bower-Rice
				5.0	1.8E-03	Bower-Rice
RFI-10-33	7-17	8.67	Rising Head	11.0	3.9E-03	Bower-Rice
				12.0	4.2E-03	Bower-Rice
RFI-81-12R	8-18	10.46	Rising Head	2.8	9.9E-04	Bower-Rice
				2.8	9.9E-04	Bower-Rice
RFI-81-33	3-13*	10.34	Rising Head	0.81	2.9E-04	Bower-Rice
				0.81	2.9E-04	Bower-Rice
MW-84-48	7-12	10.21	Rising Head	0.46	1.6E-04	Bower-Rice
				0.47	1.7E-04	Bower-Rice
MW-84-50	10-15	11.2	Rising Head	0.23	8.1E-05	Bower-Rice
				0.32	1.1E-04	Bower-Rice
MW-84-49	14-19	15.06	Rising Head	0.079	2.8E-05	Bower-Rice
				0.080	2.8E-05	Bower-Rice
MW-09-82	9-19	13.14	Rising Head	1.0	3.5E-04	Bower-Rice
				0.91	3.2E-04	Bower-Rice
MW-09-81(5-10)	5-10	4.47	Rising Head	3.3	1.2E-03	Bower-Rice
				3.1	1.1E-03	Bower-Rice
RFI-09-46	5-15	6.33	Rising Head	1.1	3.9E-04	Bower-Rice
				0.89	3.1E-04	Bower-Rice
MW-09-81(14-19)	14-19	14.52	Rising Head	0.70	2.5E-04	Bower-Rice
				0.71	2.5E-04	Bower-Rice
MW-04-79	11-16	7.47	Rising Head	2.9	1.0E-03	Bower-Rice
				3.3	1.2E-03	Bower-Rice
MW-09-80	12-17	11.41	Rising Head	0.71	2.5E-04	Bower-Rice
				0.78	2.8E-04	Bower-Rice
MW-04-80	12-17	11.75	Rising Head	0.82	2.9E-04	Bower-Rice
				0.84	3.0E-04	Bower-Rice

Notes:

¹ Radial flow assumed with saturated thickness equal to water column height

bgs = below ground surface

cm/sec = centimeters per second

ft = feet

* well construction data not available

References:

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

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

Butler, J.J., 2019. The design, performance, and analysis of slug tests. CRC press.

Table 4B - Summary of Low-Flow Pump Test Results
RACER Buick City
Flint, Michigan



Well ID	Aquifer Zone	Test Date	Well Diameter, D (inches)	Screen Length (ft)	Well Depth (ft btoc)	Top of Screen (ft btoc)	Static DTW (ft btoc)	Eff. Length, L (ft)	SS Drawdown (ft)	Flow Rate (mL/min)	Estimated K (ft/day)
SB-04-59(4-9)	Shallow	11/11/2021	1	5	9.96	4.96	2.24	5	0.09	570	54.5
		11/11/2021	1	5	9.96	4.96	2.24	5	0.16	880	47.3
SB-04-70(8-13)	Shallow	11/11/2021	1	5	14.98	9.98	4.07	5	0.5	600	10.3
SB-04-49(6.5-11.5)	Shallow	11/12/2021	1	5	15.01	10.01	8.47	5	0.4	540	11.6
SB-86-18	Shallow	11/10/2021	1	5	15.15	10.15	7.41	5	0.17	100	5.1
SB-20-01	Shallow	11/10/2021	1	5	14.56	9.56	8.45	5	0.63	380	5.2
SB-20-03	Shallow	11/10/2021	1	5	14.8	9.8	8.07	5	0.76	370	4.2
SB-84-26(3-8)	Shallow	11/15/2021	1	5	14.93	9.93	8.63	5	0.003	720	NA
SB-84-30(5-15)	Shallow	11/15/2021	1	10	14.9	4.9	8.61	6.29	0.03	710	169.3
SB-84-37(8-13)	Shallow	11/16/2021	1	5	14.8	9.8	7.65	5	1.8	110	0.5
Minimum:											0.5
Maximum:											169.3
Geometric Mean:											11.3
SB-04-59(12-17)	Deep	11/11/2021	1	5	17.81	12.81	4.21	5	1.01	380	3.2
SB-04-70(16-21)	Deep	11/11/2021	1	5	23.43	18.43	4.95	5	1.27	280	1.9
SB-04-49(20-25)	Deep	11/12/2021	1	5	26.98	21.98	6.25	5	3.32	250	0.6
SB-84-26(18-23)	Deep	11/15/2021	1	5	25.04	20.04	6.7	5	1.14	200	1.5
SB-84-37(20-25)	Deep	11/16/2021	1	5	26.2	21.2	10.62	5	0.25	465	16.0
SB-84-44(27-32)	Deep	11/12/2021	1	5	34.02	29.02	12.12	5	NA	NA	NA
		11/16/2021	1	5	34.02	29.02	12.57	5	0.03	680	194.9
Minimum:											0.6
Maximum:											194.9
Geometric Mean:											5.1
SB-04-17(5-10)	Shallow	1/24/2022	1	5	12.81	7.81	9.01	3.8	1.02	110	1.2
SB-04-18(5-10)	Shallow	1/20/2022	1	5	12.7	7.7	6.42	5	0.8	180	1.9
SB-04-25(4-9)	Shallow	1/25/2022	1	5	8.68	3.68	2.18	5	0.36	280	6.7
SB-04-26(5-10)	Shallow	1/24/2022	1	5	9.19	4.19	1.8	5	0.21	950	38.9
SB-04-28(5-10)	Shallow	1/25/2022	1	5	8.4	3.4	1.9	5	1.46	130	0.8
SB-04-34(4-9)	Shallow	1/24/2022	1	5	10.03	5.03	7.08	2.95	0.69	110	2.1
SB-04-47(4-9)	Shallow	1/21/2022	1	5	9.96	4.96	5.31	4.65	0.1	300	27.3
SB-04-48(7-12)	Shallow	1/21/2022	1	5	14.76	9.76	8.61	5	1.37	100	0.6
SB-04-50(4-9)	Shallow	1/20/2022	1	5	11.69	6.69	6.86	4.83	1.51	90	0.5
SB-04-60(4-9)	Shallow	1/25/2022	1	5	9.85	4.85	3.72	5	0.3	190	5.4
SB-04-81(5-10)	Shallow	1/25/2022	1	5	9.92	4.92	3.51	5	0.91	150	1.4
SB-LAG-30(3-8)	Shallow	1/27/2022	1	5	7.78	2.78	1.62	5	0.58	120	1.8
SB-LAG-44(4-9)	Shallow	1/27/2022	1	5	8.68	3.68	5.11	3.57	0.25	860	38.6
Minimum:											0.5
Maximum:											38.9
Geometric Mean:											3.2

Table 4B - Summary of Low-Flow Pump Test Results
 RACER Buick City
 Flint, Michigan



Well ID	Aquifer Zone	Test Date	Well Diameter, D (inches)	Screen Length (ft)	Well Depth (ft btoc)	Top of Screen (ft btoc)	Static DTW (ft btoc)	Eff. Length, L (ft)	SS Drawdown (ft)	Flow Rate (mL/min)	Estimated K (ft/day)
SB-04-18(16-21)	Deep	1/20/2022	1	5	21.34	16.34	5.9	5	0.92	180	1.7
SB-04-20(10-15)	Deep	1/19/2022	1	5	17.69	12.69	6.28	5	3.06	110	0.3
SB-04-25(12-17)	Deep	1/25/2022	1	5	16.73	11.73	4.56	5	2.3	200	0.7
SB-04-28(15-20)	Deep	1/25/2022	1	5	19.65	14.65	2.72	5	1.04	140	1.2
SB-04-34(18-23)	Deep	1/24/2022	1	5	24.46	19.46	9.4	5	0.51	140	2.4
SB-04-47(14-19)	Deep	1/21/2022	1	5	19.04	14.04	5.91	5	1.01	120	1.0
SB-04-48(20-25)	Deep	1/21/2022	1	5	27.56	22.56	10.7	5	1.23	130	0.9
SB-04-50(15-20)	Deep	1/20/2022	1	5	22.18	17.18	6.82	5	6.93	100	0.1
SB-04-60(15-20)	Deep	1/26/2022	1	5	21.95	16.95	9.01	5	0.46	140	2.6
SB-04-61(11-16)	Deep	1/25/2022	1	5	15.55	10.55	3.85	5	1.26	150	1.0
SB-04-64(19-24)	Deep	1/21/2022	1	5	25.06	20.06	7.65	5	0.79	250	2.7
SB-04-81(19-24)	Deep	1/26/2022	1	5	23.82	18.82	9.87	5	0.25	150	5.2
SB-LAG-30(18-23)	Deep	1/27/2022	1	5	23.44	18.44	5.66	5	7.02	110	0.1
SB-LAG-33(19-24)	Deep	1/27/2022	1	5	26.28	21.28	6.49	5	1.39	100	0.6

Minimum: 0.1
 Maximum: 5.2
 Geometric Mean: 0.9

Table 4C - Summary of Single Well Tracer Test Results
RACER Buick City
Flint, Michigan



Well ID	Aquifer Zone	SWTT Estimated GW Velocity (ft/day)
04-4(2.5-12.5)	Shallow	0.1
SB-04-57(4-9)	Shallow	1.1
SB-04-18(5-10)	Shallow	0.4
SB-04-56(5-10)	Shallow	0.2
RFI-09-52(5-15)	Shallow	0.8
	Minimum:	0.1
	Maximum:	1.1
	Geometric Mean:	0.4
SB-04-20(10-15)	Deep	2.4
MW-09-80(12-17)	Deep	3.9
MW-09-81(14-19)	Deep	2.2
SB-04-56(14-19)	Deep	0.3
SB-04-71(15-20)	Deep	0.7
	Minimum:	0.3
	Maximum:	3.9
	Geometric Mean:	1.3

Table 4D - Summary of Slug Test and Low-Flow Groundwater Velocity Results
RACER Buick City
Flint, MI



Well ID	Aquifer Zone	K Estimation Method	Effective Porosity [n_e] (Dimensionless)	Hydraulic Conductivity [K] (ft/day)	Hydraulic Gradient (dimensionless)	Calculated GW Velocity (ft/day)
MW-09-81(5-10)	Shallow	Rising head slug test	0.16	3.3	0.026	0.54
			0.16	3.1	0.026	0.51
MW-09-82(9-19)	Shallow		0.16	1.0	0.030	0.19
			0.16	0.91	0.028	0.16
			Minimum:	0.9	Minimum:	0.2
			Maximum:	3.3	Maximum:	0.5
			Geometric Mean:	1.7	Geometric Mean:	0.3
SB-04-59(4-9)	Shallow	Low-flow pumping test (Robbins)	0.16	54.5	0.010	3.56
SB-04-25(4-9)	Shallow		0.16	47.3	0.010	3.09
SB-04-60(4-9)	Shallow		0.16	5.4	0.010	0.35
SB-04-18(5-10)	Shallow		0.16	1.9	0.011	0.13
SB-04-26(5-10)	Shallow		0.16	38.9	0.015	3.66
SB-04-28(5-10)	Shallow		0.16	0.8	0.015	0.08
SB-04-81(5-10)	Shallow		0.16	1.4	0.011	0.09
SB-04-49(6.5-11.5)	Shallow		0.16	11.6	0.011	0.81
SB-04-70(8-13)	Shallow		0.16	10.3	0.025	1.62
			Minimum:	0.8	Minimum:	0.1
			Maximum:	54.5	Maximum:	3.7
			Geometric Mean:	7.9	Geometric Mean:	0.6
MW-04-80(12-17)	Deep	Rising head slug test	0.16	0.82	0.038	0.19
			0.16	0.84	0.038	0.20
MW-09-80(12-17)	Deep		0.16	0.71	0.058	0.26
			0.16	0.78	0.058	0.28
MW-09-81(14-19)	Deep		0.16	0.70	0.026	0.11
			0.16	0.71	0.026	0.11
			Minimum:	0.7	Minimum:	0.1
			Maximum:	0.8	Maximum:	0.3
			Geometric Mean:	0.8	Geometric Mean:	0.2
SB-04-20(10-15)	Deep	Low-flow pumping test (Robbins)	0.16	0.3	0.059	0.11
SB-04-61(11-16)	Deep		0.16	1.0	0.053	0.33
SB-04-59(12-17)	Deep		0.16	3.2	0.056	1.11
SB-04-25(12-17)	Deep		0.16	0.7	0.056	0.24
SB-04-47(14-19)	Deep		0.16	1.0	0.004	0.03
SB-04-28(15-20)	Deep		0.16	1.2	0.015	0.11
SB-04-50(15-20)	Deep		0.16	0.1	0.003	0.00
SB-04-60(15-20)	Deep		0.16	2.6	0.056	0.91
SB-04-70(16-21)	Deep		0.16	1.9	0.022	0.26
SB-04-18(16-21)	Deep		0.16	1.7	0.003	0.04
SB-04-34(18-23)	Deep		0.16	2.4	0.003	0.05
SB-04-64(19-24)	Deep		0.16	2.7	0.004	0.07
SB-04-81(19-24)	Deep		0.16	5.2	0.056	1.81
SB-04-49(20-25)	Deep		0.16	0.6	0.003	0.01
SB-04-48(20-25)	Deep		0.16	0.9	0.004	0.02
			Minimum:	0.1	Minimum:	0.0
			Maximum:	5.2	Maximum:	1.8
			Geometric Mean:	1.2	Geometric Mean:	0.1

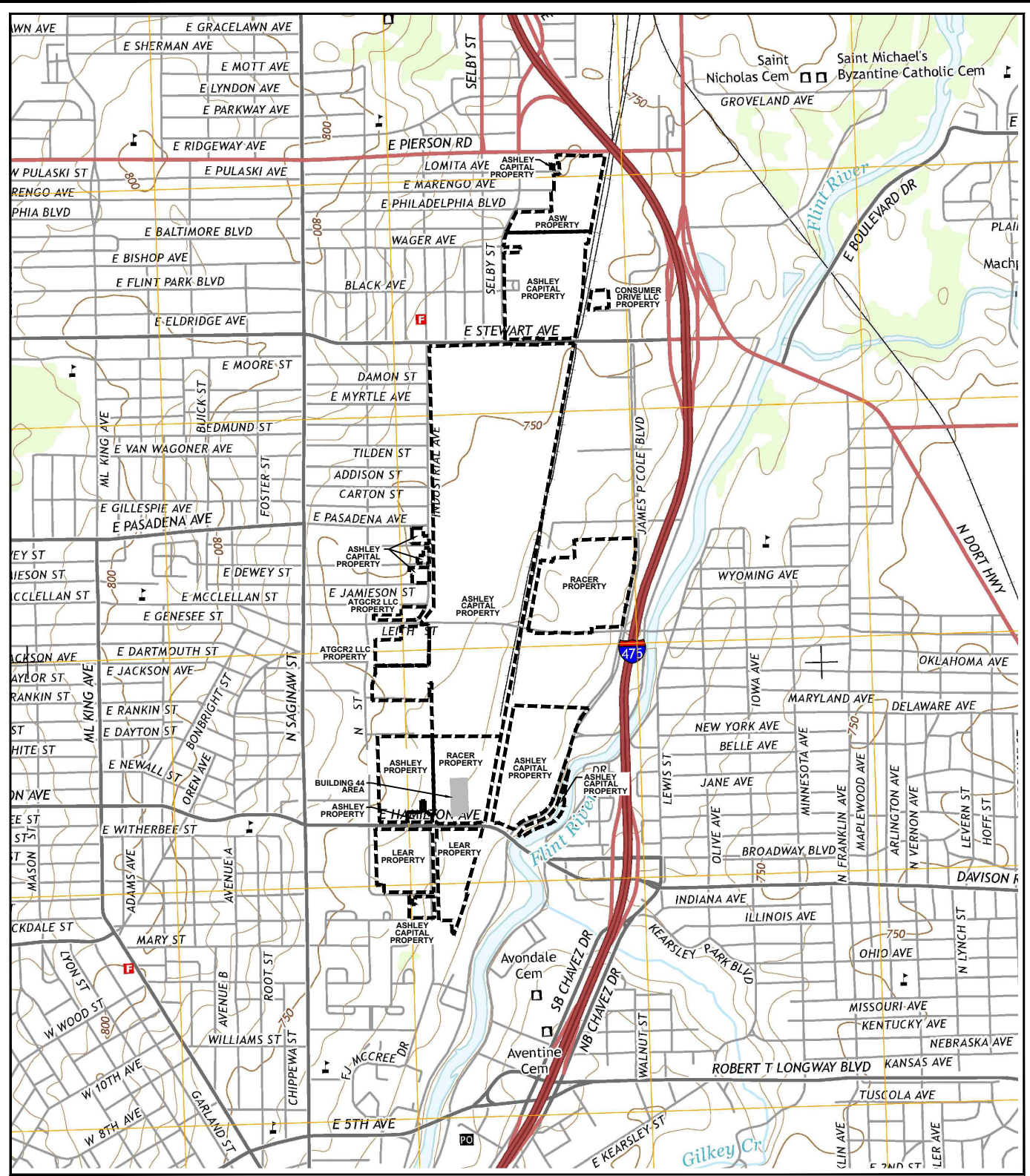
Table 4E - Horizontal Hydraulic Gradients
RACER Buick City
Flint, MI



Well ID	Well Reference Point Elevation (ft amsl)	08/31/23		09/14/23		09/25/23		10/09/23		11/14/23		11/29/23		12/12/23	
		Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)	Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)	Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)	Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)	Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)	Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)	Depth to Water (ft bmp)	Water-Table Elevation (ft amsl)
MW-40-03(5-15)	735.49	4.59	730.90	4.95	730.54	5.56	729.93	5.43	730.06	4.83	730.66	5.10	730.39	5.05	730.44
SB-04-83(6-11)	732.73	1.84	730.89	2.51	730.22	3.14	729.59	3.07	729.66	2.24	730.49	2.52	730.21	2.59	730.14
SB-04-81(5-10)	730.44	1.34	729.10	1.69	728.75	2.38	728.06	2.09	728.35	1.44	729.00	1.59	728.85	1.81	728.63
Hydraulic Gradient Direction:		312.59		302.64		302.43		298.66		307.47		306.62		303.52	
Hydraulic Gradient Magnitude:		0.013		0.010		0.011		0.009		0.010		0.010		0.011	
SB-04-72(5-10)	729.47	0.45	729.02	0.92	728.55	1.47	728.00	1.36	728.11	0.75	728.72	0.89	728.58	0.91	728.56
SB-04-83(6-11)	732.73	1.84	730.89	2.51	730.22	3.14	729.59	3.07	729.66	2.24	730.49	2.52	730.21	2.59	730.14
SB-04-81(5-10)	730.44	1.34	729.10	1.69	728.75	2.38	728.06	2.09	728.35	1.44	729.00	1.59	728.85	1.81	728.63
Hydraulic Gradient Direction:		316.09		312.95		316.28		311.32		311.16		310.79		316.03	
Hydraulic Gradient Magnitude:		0.013		0.010		0.011		0.009		0.010		0.009		0.011	
SB-04-72(5-10)	729.47	0.45	729.02	0.92	728.55	1.47	728.00	1.36	728.11	0.75	728.72	0.89	728.58	0.91	728.56
SB-04-56(5-10)	728.24	0.75	727.49	1.46	726.78	1.86	726.38	1.69	726.55	1.11	727.13	1.22	727.02	1.16	727.08
SB-04-81(5-10)	730.44	1.34	729.10	1.69	728.75	2.38	728.06	2.09	728.35	1.44	729.00	1.59	728.85	1.81	728.63
Hydraulic Gradient Direction:		316.29		314.77		316.68		313.76		313.22		313.29		316.42	
Hydraulic Gradient Magnitude:		0.014		0.017		0.015		0.015		0.015		0.015		0.014	
SB-04-81(5-10)	730.44	1.34	729.10	1.69	728.75	2.38	728.06	2.09	728.35	1.44	729.00	1.59	728.85	1.81	728.63
SB-04-56(5-10)	728.24	0.75	727.49	1.46	726.78	1.86	726.38	1.69	726.55	1.11	727.13	1.22	727.02	1.16	727.08
MW-84-15	727.38	1.30	726.08	1.78	725.60	2.35	725.03	1.92	725.46	1.38	726.00	1.54	725.84	1.70	725.68
Hydraulic Gradient Direction:		322.05		315.06		320.54		315.27		315.23		316.47		322.58	
Hydraulic Gradient Magnitude:		0.018		0.017		0.017		0.016		0.016		0.016		0.017	
SB-04-72(5-10)	729.47	0.45	729.02	0.92	728.55	1.47	728.00	1.36	728.11	0.75	728.72	0.89	728.58	0.91	728.56
SB-04-56(5-10)	728.24	0.75	727.49	1.46	726.78	1.86	726.38	1.69	726.55	1.11	727.13	1.22	727.02	1.16	727.08
MW-09-82(9-19)	728.51	5.40	723.11	5.52	722.99	5.56	722.95	5.49	723.02	5.38	723.13	5.39	723.12	5.40	723.11
Hydraulic Gradient Direction:		268.46		275.55		275.85		274.10		271.45		271.60		269.93	
Hydraulic Gradient Magnitude:		0.034		0.031		0.028		0.028		0.031		0.031		0.031	
SB-04-72(5-10)	729.47	0.45	729.02	0.92	728.55	1.47	728.00	1.36	728.11	0.75	728.72	0.89	728.58	0.91	728.56
MW-09-81(5-10)	728.86	4.61	724.25	4.81	724.05	5.91	722.95	4.77	724.09	4.73	724.13	4.66	724.20	4.68	724.18
MW-09-82(9-19)	728.51	5.40	723.11	5.52	722.99	5.56	722.95	5.49	723.02	5.38	723.13	5.39	723.12	5.40	723.11
Hydraulic Gradient Direction:		291.12		290.85		268.96		293.13		289.47		291.69		291.51	
Hydraulic Gradient Magnitude:		0.032		0.030		0.029		0.028		0.030		0.030		0.030	
SB-04-72(5-10)	729.47	0.45	729.02	0.92	728.55	1.47	728.00	1.36	728.11	0.75	728.72	0.89	728.58	0.91	728.56
MW-09-81(5-10)	728.86	4.61	724.25	4.81	724.05	5.91	722.95	4.77	724.09	4.73	724.13	4.66	724.20	4.68	724.18
SB-04-70(8-13)	730.41	1.23	729.18	1.97	728.44	2.42	727.99	2.31	728.10	1.67	728.74	1.86	728.55	1.82	728.59
Hydraulic Gradient Direction:		258.27		249.97		253.17		253.10		254.08		252.48		254.44	
Hydraulic Gradient Magnitude:		0.026		0.025		0.028		0.022		0.026		0.024		0.024	
RFI-09-11	728.85	4.17	724.68	4.58	724.27	4.80	724.05	4.59	724.26	4.26	724.59	4.13	724.72	4.20	724.65
MW-09-81(5-10)	728.86	4.61	724.25	4.81	724.05	5.91	722.95	4.77	724.09	4.73	724.13	4.66	724.20	4.68	724.18
SB-04-70(8-13)	730.41	1.23	729.18	1.97	728.44	2.42	727.99	2.31	728.10	1.67	728.74	1.86	728.55	1.82	728.59
Hydraulic Gradient Direction:		305.87		302.44		315.67		301.74		306.73		308.35		307.29	
Hydraulic Gradient Magnitude:		0.028		0.024		0.032		0.022		0.027		0.025		0.026	
MW-09-79(9-14)	730.78	4.03	726.75	4.76	726.02	5.09	725.69	4.91	725.87	4.33	726.45	4.51	726.27	4.44	726.34
RFI-09-11	728.85	4.17	724.68	4.58	724.27	4.80	724.05	4.59	724.26	4.26	724.59	4.13	724.72	4.20	724.65
SB-04-70(8-13)	730.41	1.23	729.18	1.97	728.44	2.42	727.99	2.31	728.10	1.67	728.74	1.86	728.55	1.82	728.59
Hydraulic Gradient Direction:		294.52		291.63		291.37		291.60		293.70		290.50		292.31	
Hydraulic Gradient Magnitude:		0.023		0.020		0.019		0.019		0.021		0.018		0.019	
MW-09-79(9-14)	730.78	4.03	726.75	4.76	726.02	5.09	725.69	4.91	725.87	4.33	726.45	4.51	726.27	4.44	726.34
SB-04-40(5-10)	731.16	3.12	728.04	3.70	727.46	4.11	727.05	3.95	727.21	3.44	727.72	3.56	727.60	3.53	727.63
SB-04-70(8-13)	730.41	1.23	729.18	1.97	728.44	2.42	727.99	2.31	728.10	1.67	728.74	1.86	728.55	1.82	728.59
Hydraulic Gradient Direction:		263.60		270.41		270.04		270.95		266.27		269.26		268.25	
Hydraulic Gradient Magnitude:		0.011		0.012		0.011		0.011		0.011		0.011		0.011	

Figures

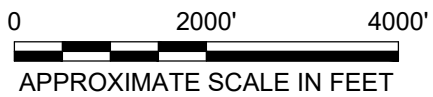
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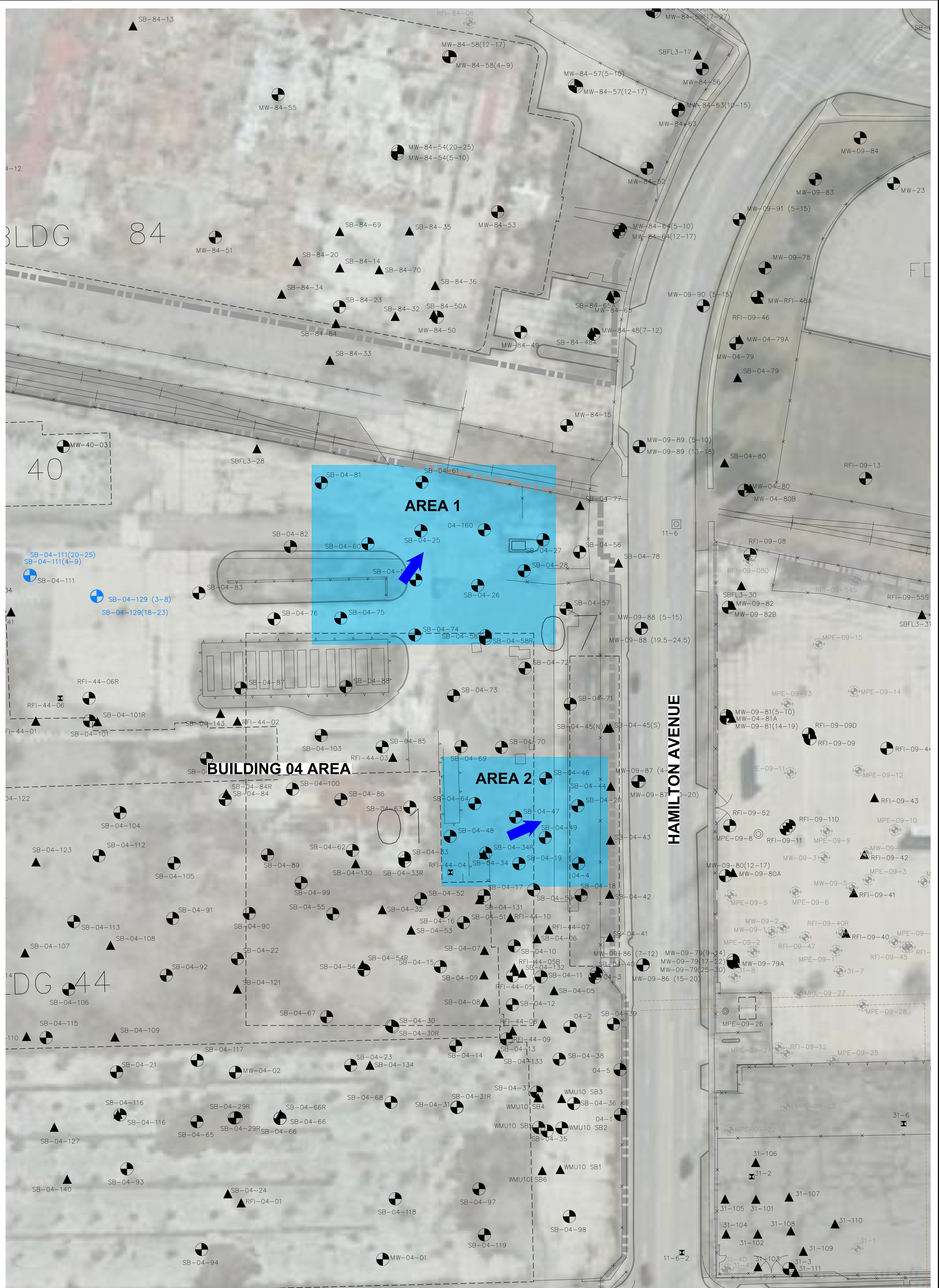
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AREA LOCATION
 MICHIGAN

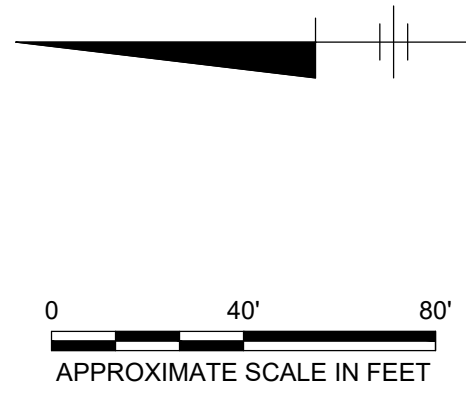


RACER TRUST BUICK CITY FLINT, MICHIGAN	
SITE LOCATION MAP	
	FIGURE 1



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- LEGEND:**
- ▲ SOIL BORING
 - ⊕ MONITORING WELL (ACTIVE)
 - RACER TRUST PROPERTY
 - - - FORMER RACER TRUST PROPERTY
 - ➡ APPROXIMATE GROUNDWATER FLOW DIRECTION
 - TRACER TEST STUDY AREA



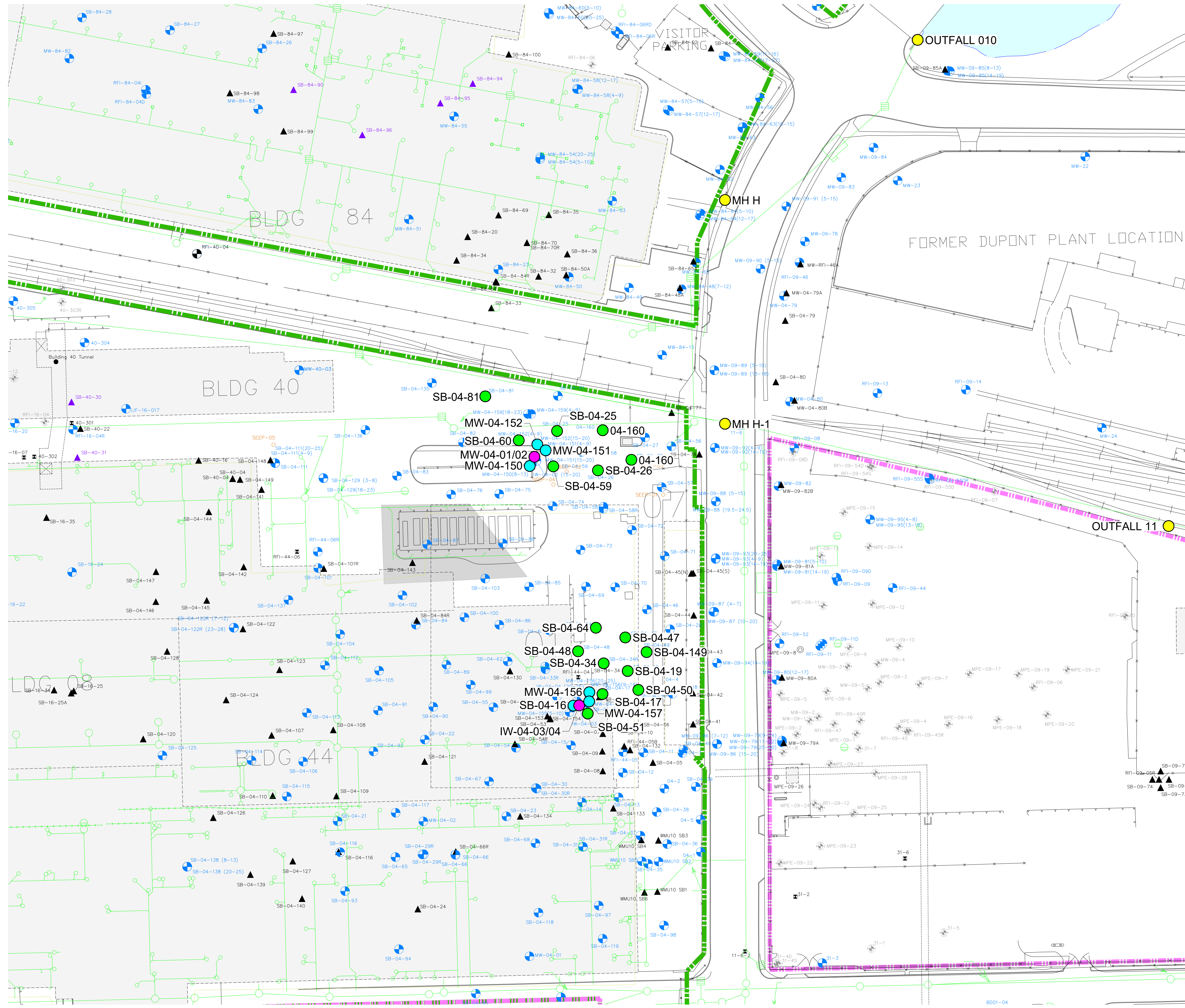
RACER TRUST
BUICK CITY
FLINT, MICHIGAN

TRACER TESTING AREAS

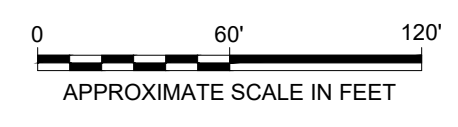
ARCADIS

FIGURE
2

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- LEGEND:**
- ▲ SOIL BORING
 - ⊕ ABANDONED MONITORING WELL
 - ⊕ MONITORING WELL (ACTIVE)
 - ⊕ PIEZOMETER
 - ⊕ RECOVERY WELL
 - ⊕ OBSERVATION WELL
 - ⊕ SOIL GAS POINT
 - ⊕ SUB-SLAB MONITORING POINT
 - ⊕ TRANSECT POINT
 - ⊕ SURFACE WATER
 - ⊕ RIVER GAUGE
 - ⊕ TEST PIT
 - ⊕ UNABLE TO LOCATE
 - STORM SEWER
 - INJECTION WELL
 - DOSE RESPONSE WELL
 - DRIFT WELL
 - SEWER MONITORING PIT



RACER TRUST
BUICK CITY
FLINT, MICHIGAN

MONITORING LOCATIONS

ARCADIS

FIGURE
3

Appendix A

Hamilton Avenue Tracer and Hydraulic Testing Results Presentation

Objectives



Two areas were selected to conduct tracer testing near the highest PFAS concentrations with slightly different estimated flow directions to:

- Evaluate influence of subsurface infrastructure on groundwater movement
- Evaluate horizontal and vertical gradients
- Estimate groundwater velocity using different means
- Measure aquifer properties

The tracer injections were initiated Fall 2022

Preparation Phase

Injection Well Installation

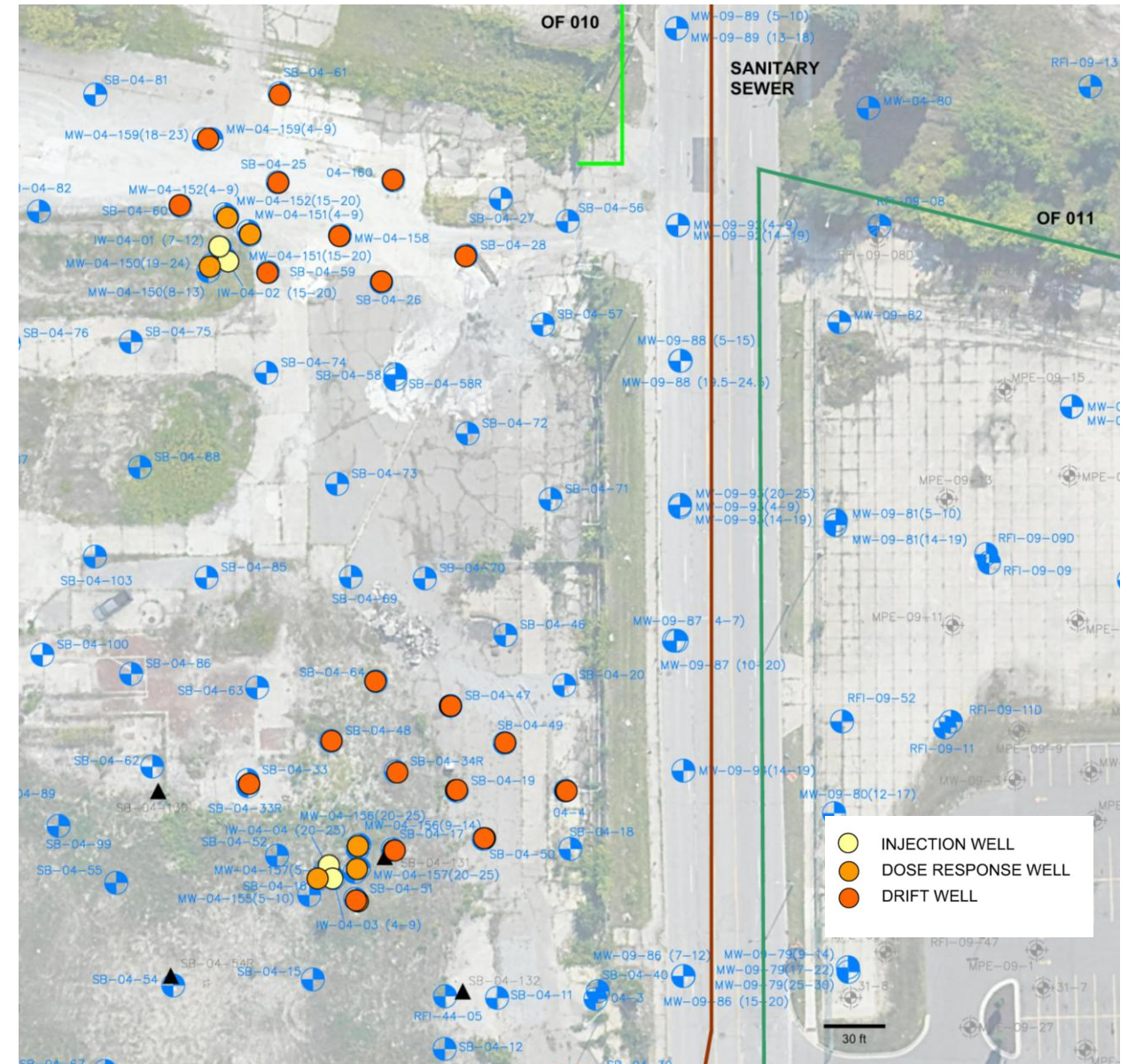
- One shallow, one “deep” injection well were installed in each area
- One pilot borehole was completed in each area to select specific intervals, then shallow and deep injection wells spaced ~4 feet apart.

Hydraulic Testing

- Slug tests and low-flow pump tests completed at select wells to estimate hydraulic conductivity
- Single well tracer tests completed at select wells to estimate groundwater velocity

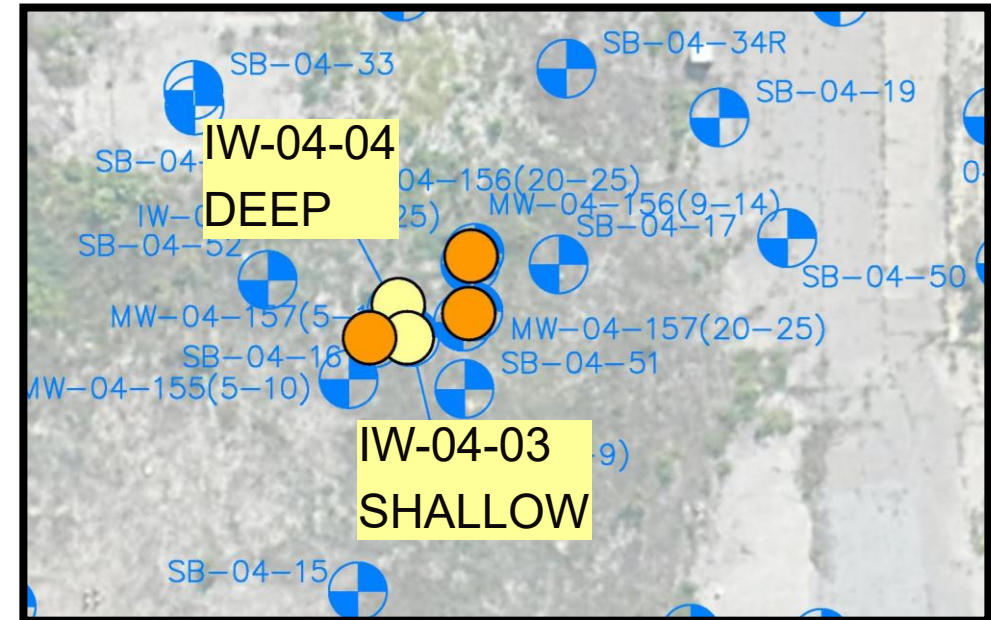
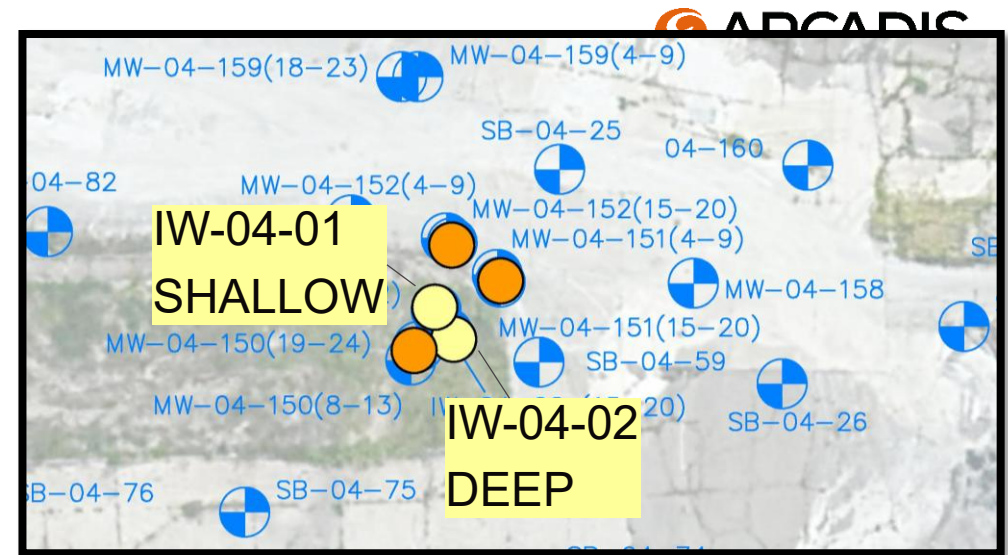
Potable Water Injection Rate Test

- Data used to calculate a target injection pressure for the tracer test



Injection Phase – Deep Wells

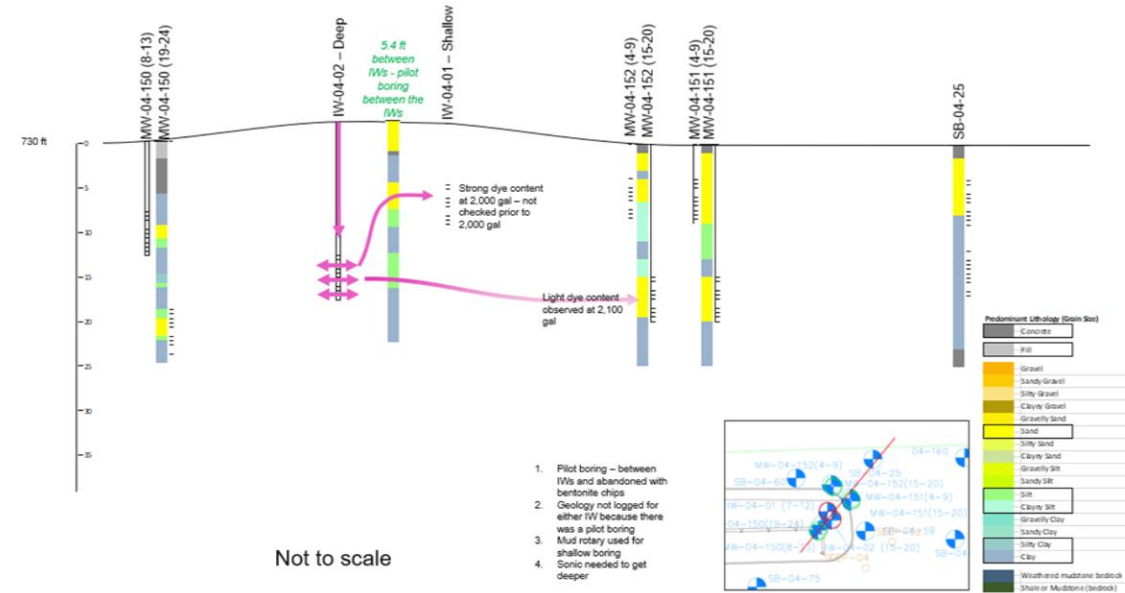
- Injection of rhodamine WT dye was started in the deep wells (IW-04-02 and IW-04-04) on September 21, 2022
- Injection pressures <5 psi
- As of September 29 (Day 9), no dye observed in the deep dose-response wells
- Shallow injection wells (IW-04-01 and IW-04-03) checked, and dye was present
- On October 5 (Day 15), dyed water was observed surfacing to the ground surface
- Injection halted to determine next steps



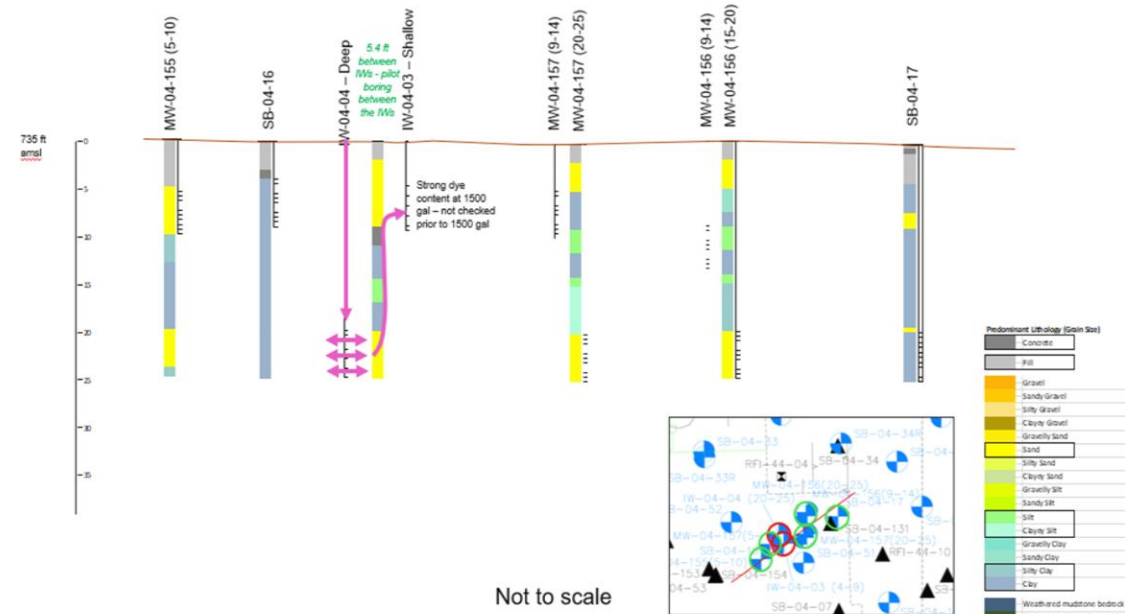
Deep Injection Problem Analysis

- The appearance of rhodamine dye in the shallow wells indicated communication between deeper and shallower zones
- Cross sections were prepared to evaluate the lithology and potential pathways
- Possible causes of communication between shallow and deep:
 - Inadequate seal in the pilot borehole
 - Foundations/concrete present
 - Low hydraulic conductivity in the deeper formation
 - Injection pressure was too high for the formation
 - Other preferential pathway between shallow and deep units
- The decision was made to permanently halt the deep well injection and abandon the wells before beginning the injection into the shallow wells

Area 1



Area 2



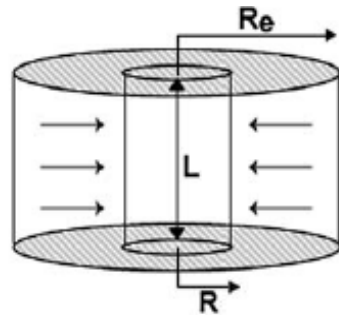
Hydraulic Testing Methods

Slug Tests

- Rising head tests

Low Flow Pumping Tests

- Analytical solution to estimate hydraulic conductivity using low pumping rates (i.e., <1 L/min) and amount of steady-state drawdown



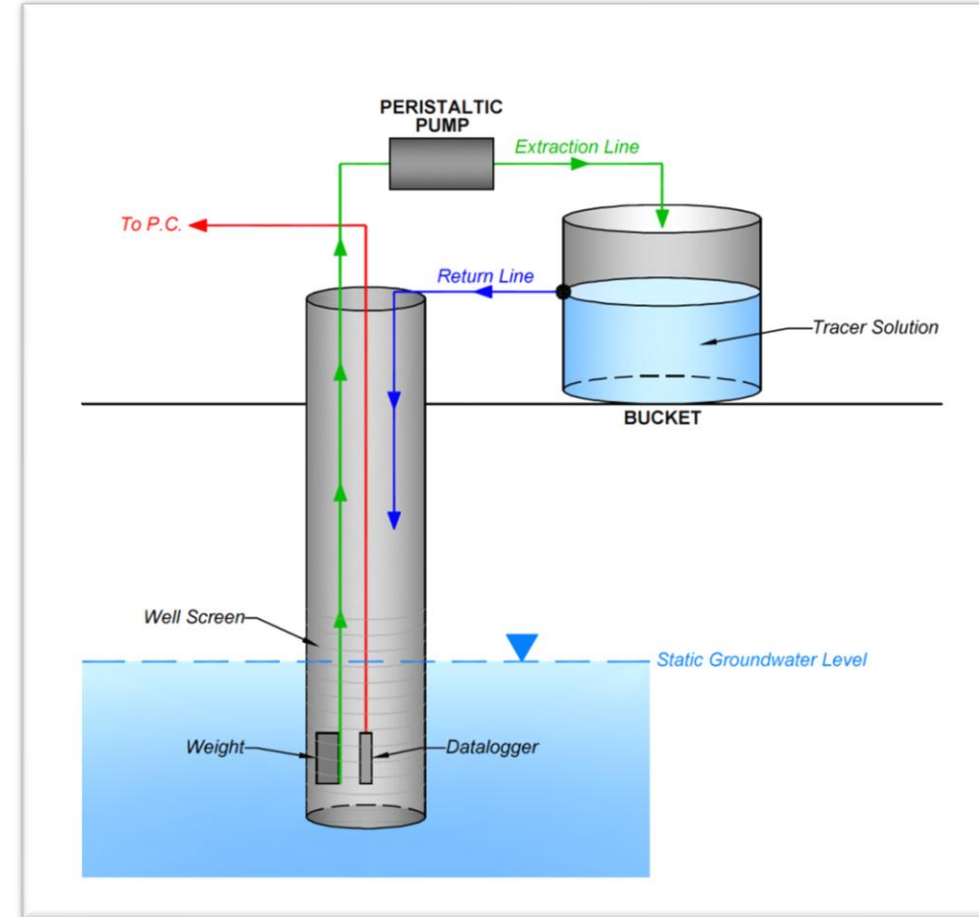
$$Q = \frac{2\pi LKH}{2.303 \log[R_e/R]}$$

Where:

- Q = steady state flow rate
- L = intake length
- K = hydraulic Conductivity
- H = steady state drawdown
- R = intake radius
- D = intake diameter
- R_e = radius of influence

Single Well Tracer Tests

- Conducted by replacing the water column in a well with a tracer solution (salt) without imposing an artificial head in the aquifer, and then measuring the subsequent washout of the tracer (i.e. specific conductivity) to estimate groundwater velocity
- Wells adjacent to Hamilton Ave were selected to supplement data collected within the tracer test areas



Shallow Well Results for Low-Flow Pump Tests and Single Well Tracer Tests

Well ID

Low-flow Pump
Estimated Hydraulic
Conductivity (ft/day)

Well ID

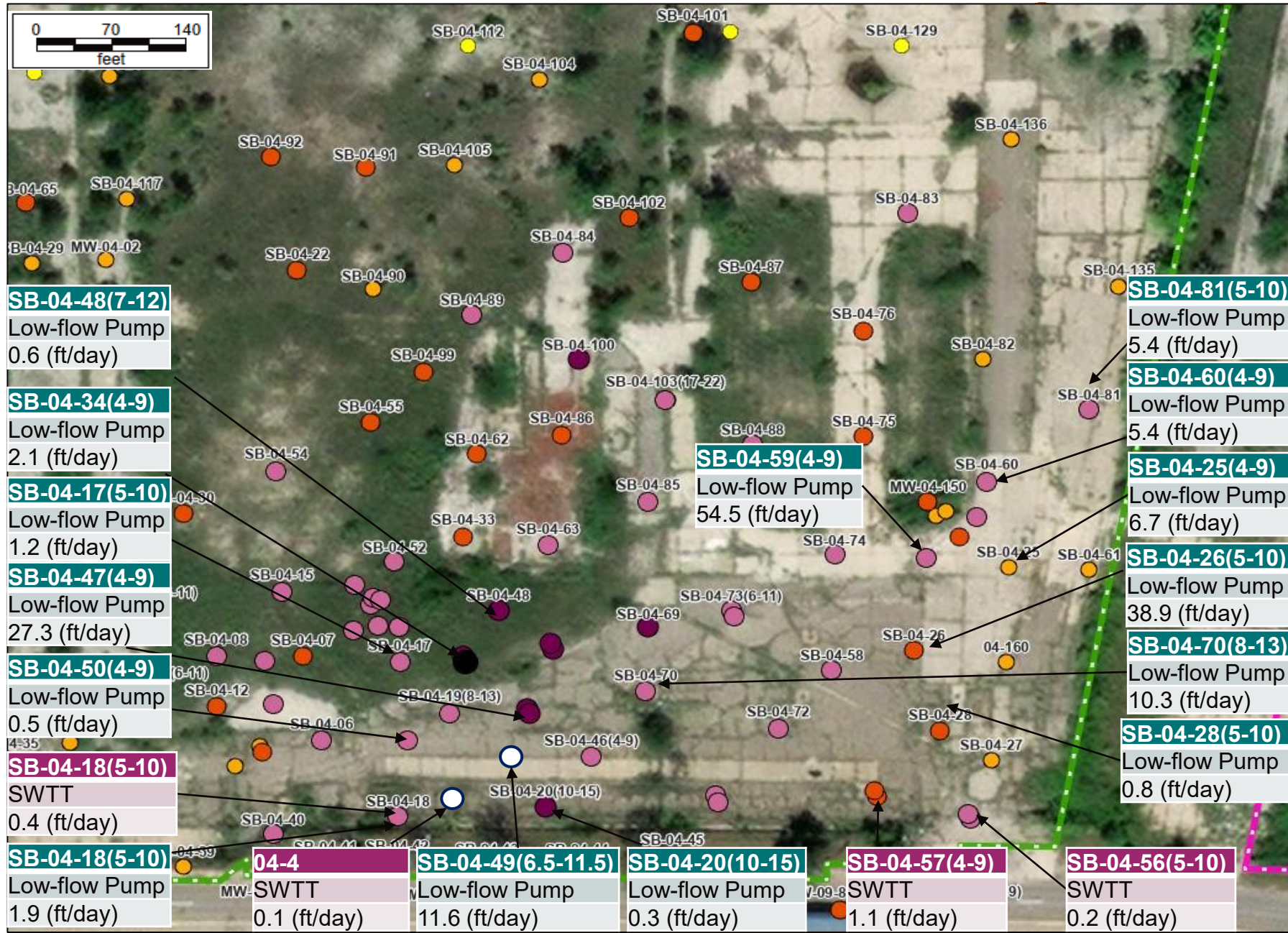
Single Well Tracer Test
Estimated Avg. Linear
GW Velocity (ft/day)

PFAS in Groundwater

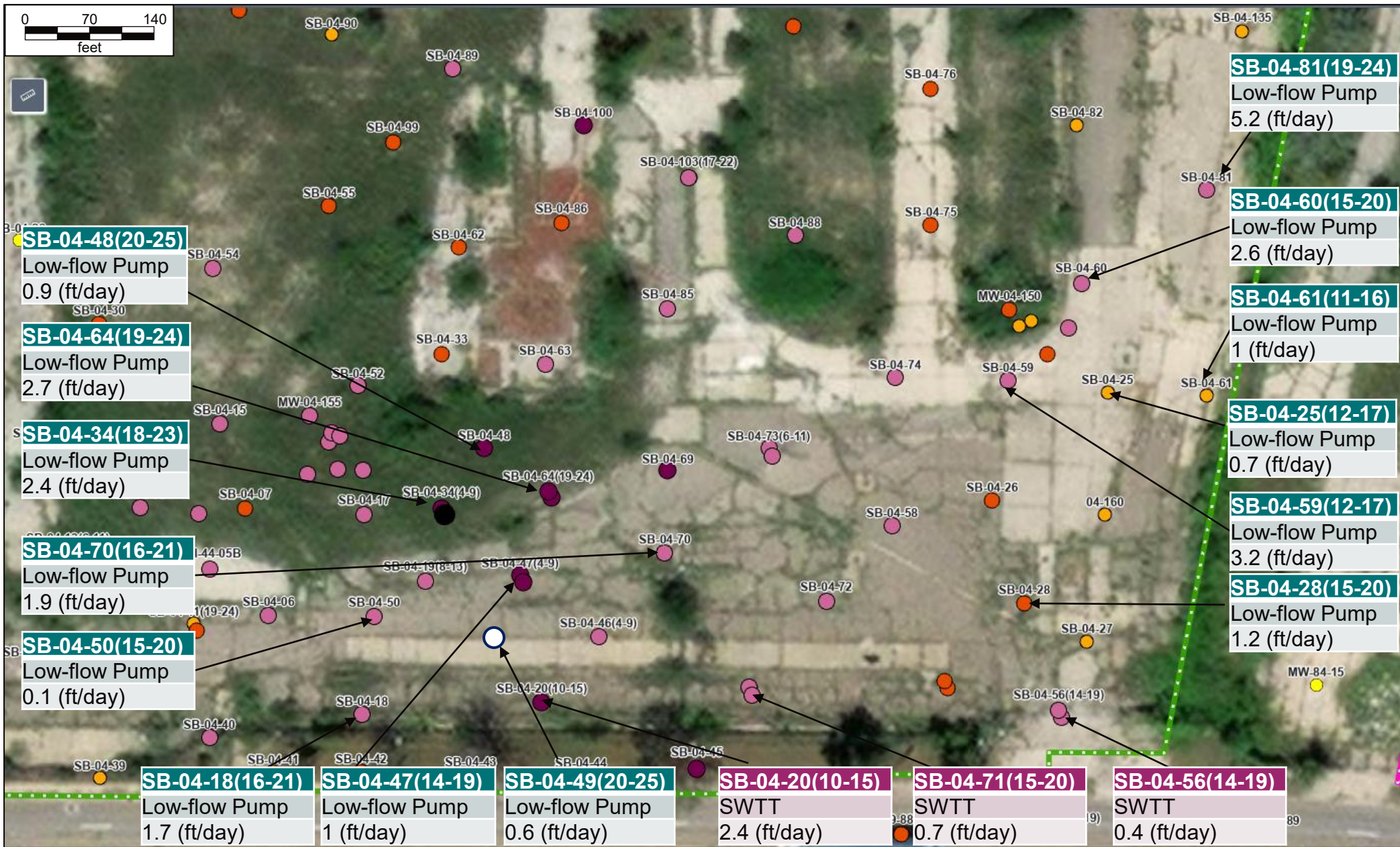
Compared to Michigan GSI
Criteria (SL):

- PFOS 12 ng/L
- PFOA 170 ng/L
- PFHxS 210 ng/L
- PFNA 30 ng/L
- PFBS 670,000 ng/L

- Greater than 100000x SL
- Between 10000x SL and 100000x SL
- Between 1000x SL and 10000x SL
- Between 100x SL and 1000x SL
- Between 10x SL and 100x SL
- Between SL and 10x SL
- Detection less than SL
- Non-detect (RL > SL)
- Non-detect (RL <= SL)



Deep Well Results for Low-Flow Pump Tests and Single Well Tracer Tests



Well ID

Low-flow Pump
Estimated Hydraulic Conductivity (ft/day)

Well ID

Single Well Tracer Test
Estimated Avg. Linear GW Velocity (ft/day)

PFAS in Groundwater

Compared to Michigan GSI Criteria (SL):

- PFOS 12 ng/L
- PFOA 170 ng/L
- PFHxS 210 ng/L
- PFNA 30 ng/L
- PFBS 670,000 ng/L

Legend for PFAS concentrations:

- Greater than 100000x SL
- Between 10000x SL and 100000x SL
- Between 1000x SL and 10000x SL
- Between 100x SL and 1000x SL
- Between 10x SL and 100x SL
- Between SL and 10x SL
- Detection less than SL
- Non-detect (RL > SL)
- Non-detect (RL <= SL)

Slug Test Results – North End

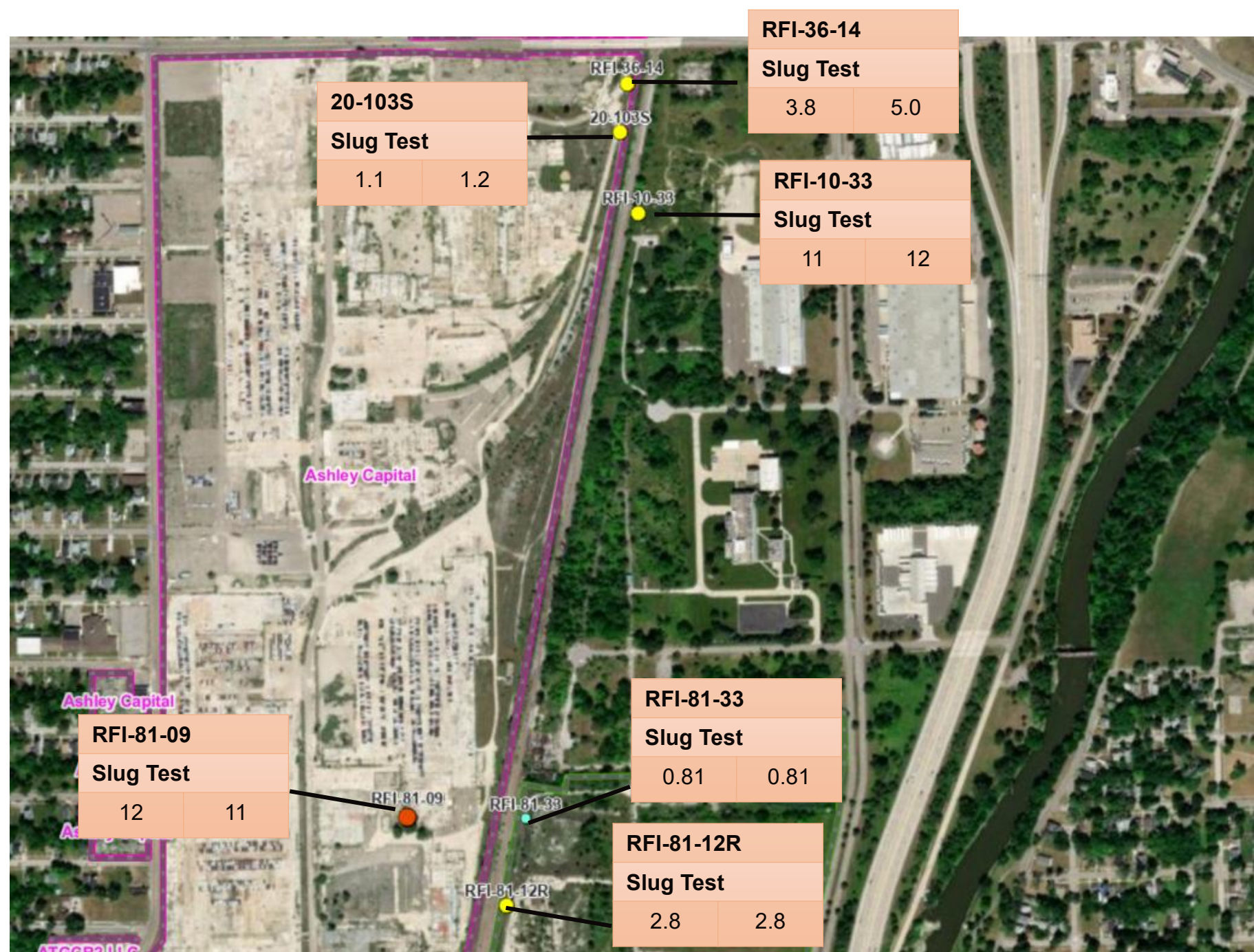
Well ID	
Slug Test	
Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (ft/day)

PFAS in Groundwater

Compared to Michigan GSI Criteria (SL):

- PFOS 12 ng/L
- PFOA 170 ng/L
- PFHxS 210 ng/L
- PFNA 30 ng/L
- PFBS 670,000 ng/L

●	Greater than 100000x SL
●	Between 10000x SL and 100000x SL
●	Between 1000x SL and 10000x SL
●	Between 100x SL and 1000x SL
●	Between 10x SL and 100x SL
●	Between SL and 10x SL
●	Detection less than SL
●	Non-detect (RL > SL)
●	Non-detect (RL <= SL)



Slug Test Results – South End

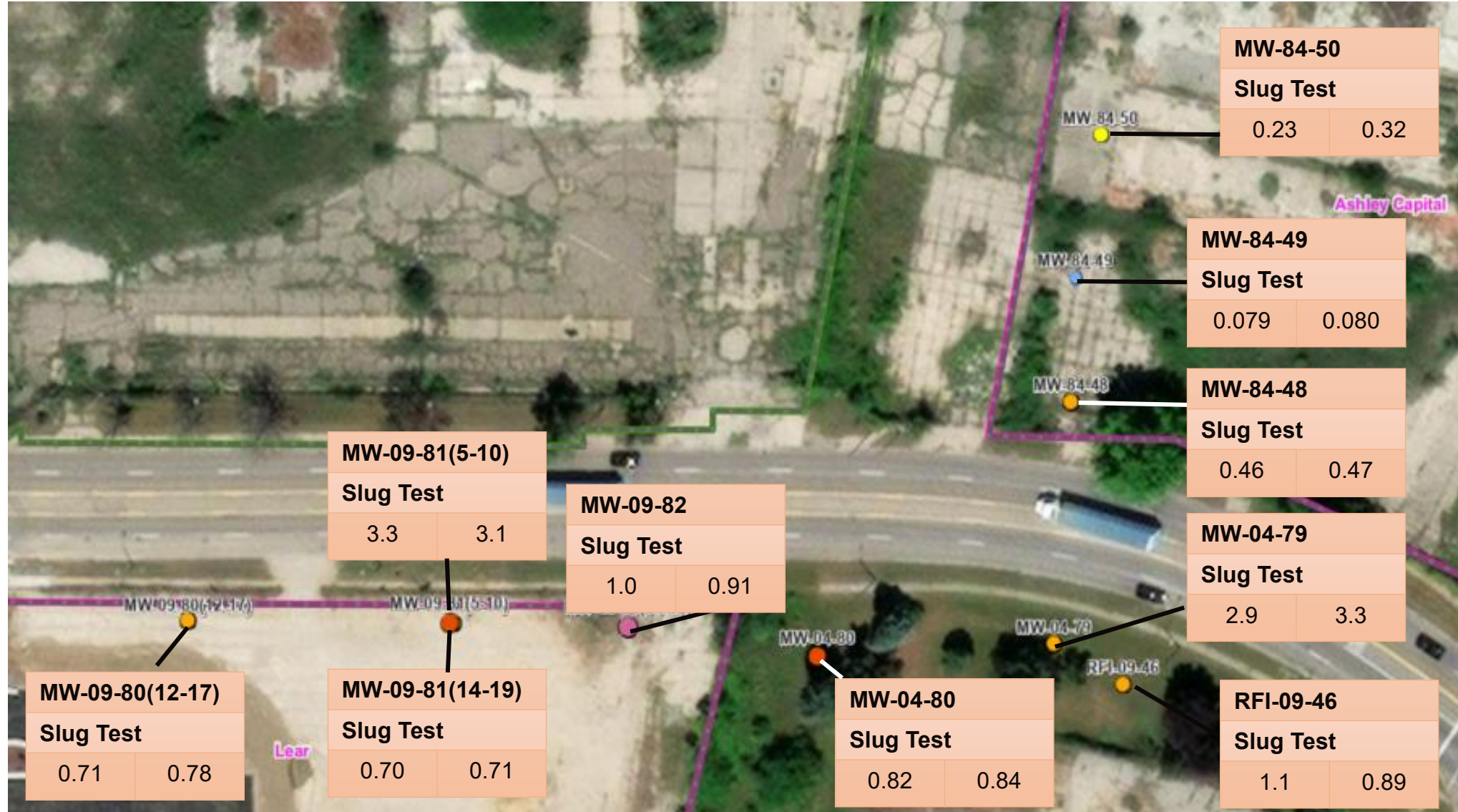
Well ID	
Slug Test	
Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (ft/day)

PFAS in Groundwater

Compared to Michigan GSI Criteria (SL):

- PFOS 12 ng/L
- PFOA 170 ng/L
- PFHxS 210 ng/L
- PFNA 30 ng/L
- PFBS 670,000 ng/L

●	Greater than 100000x SL
●	Between 10000x SL and 100000x SL
●	Between 1000x SL and 10000x SL
●	Between 100x SL and 1000x SL
●	Between 10x SL and 100x SL
●	Between SL and 10x SL
●	Detection less than SL
●	Non-detect (RL > SL)
●	Non-detect (RL <= SL)



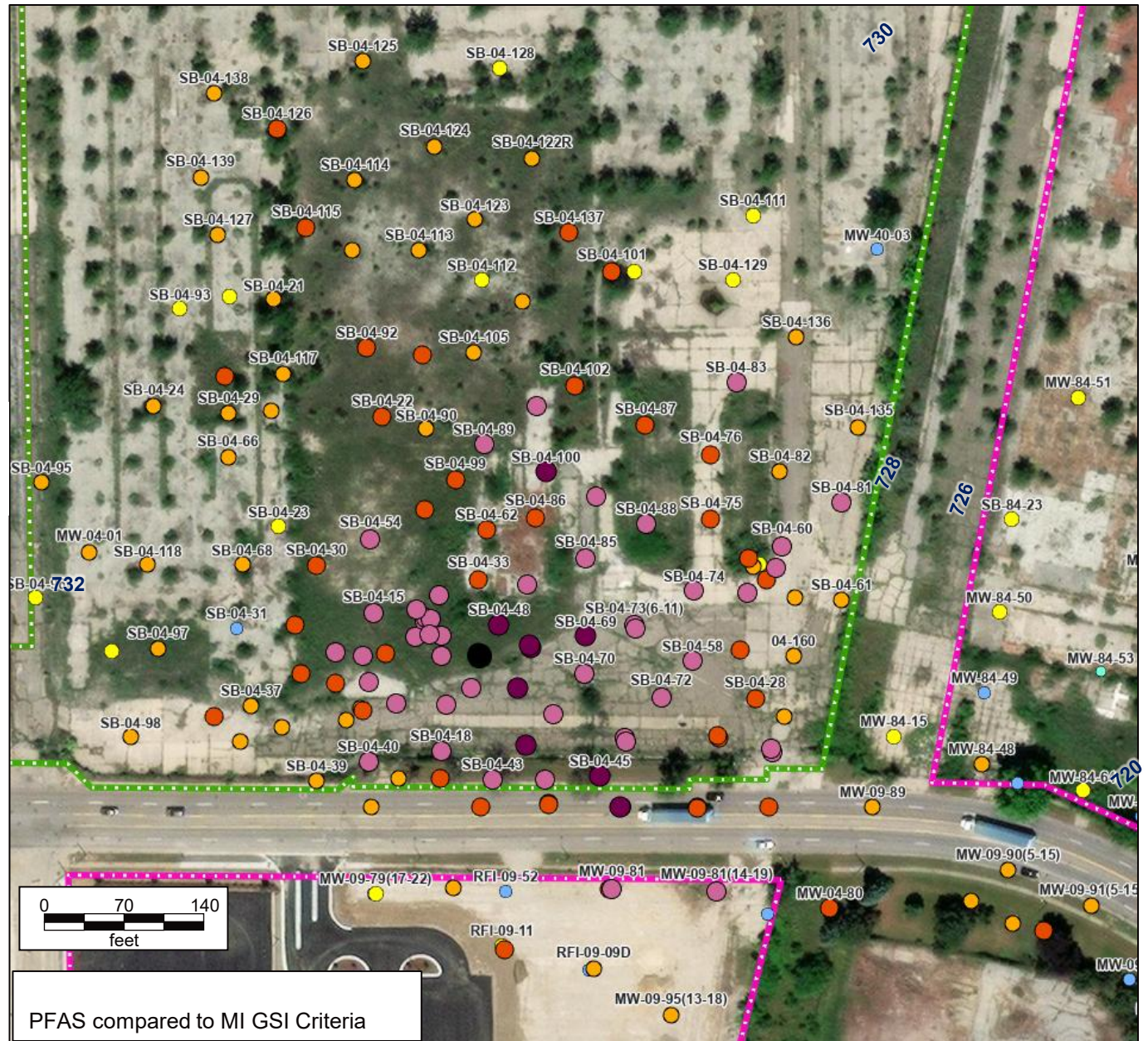
Hydraulic Testing Results

Hamilton Ave Source Area Results

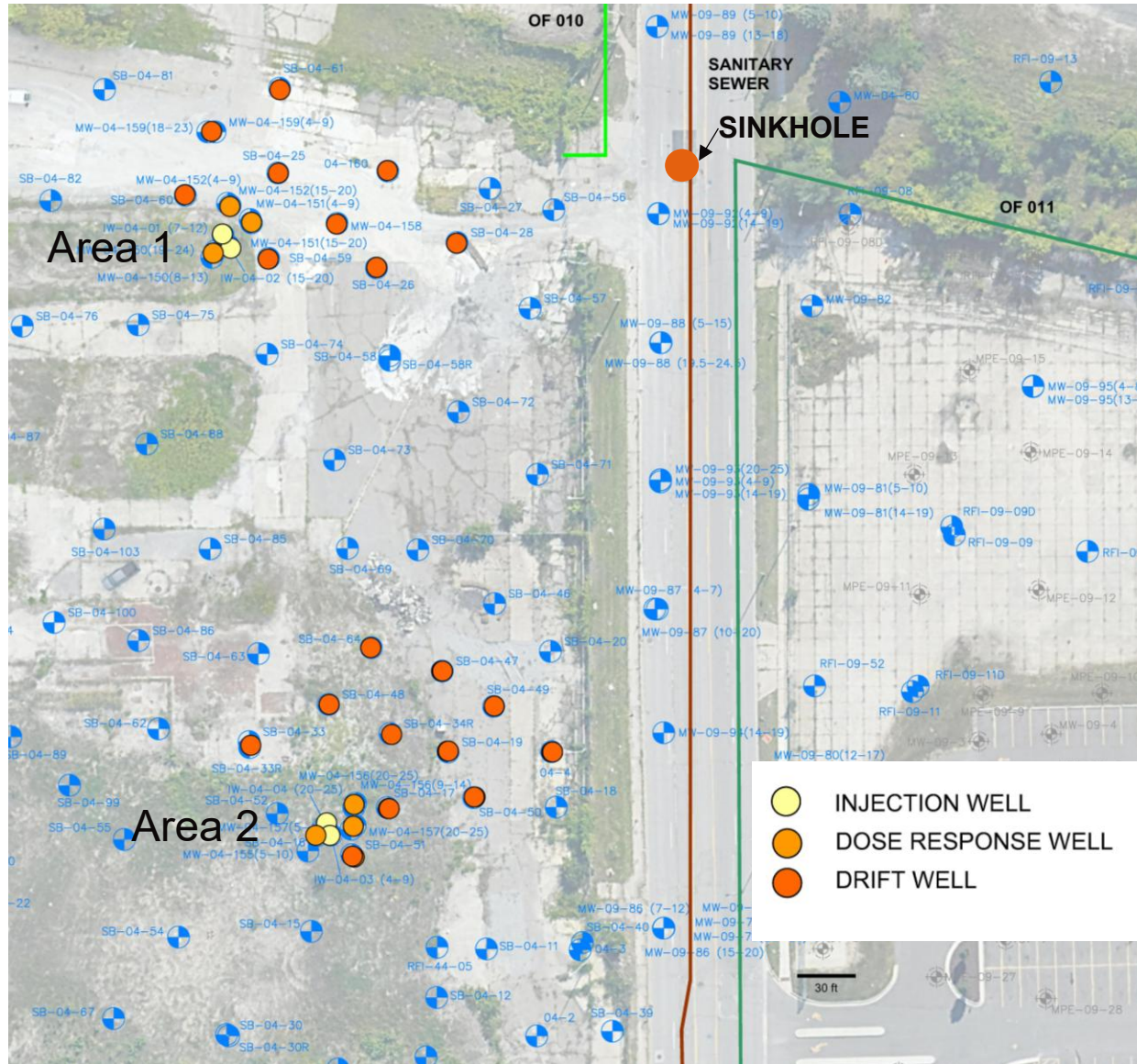
PFAS in Groundwater

Compared to Michigan GSI Criteria

PFOS	12 ng/L
PFOA	170 ng/L
PFHxS	210 ng/L
PFNA	30 ng/L
PFBS	670,000 ng/L



Injection Phase – Shallow Wells



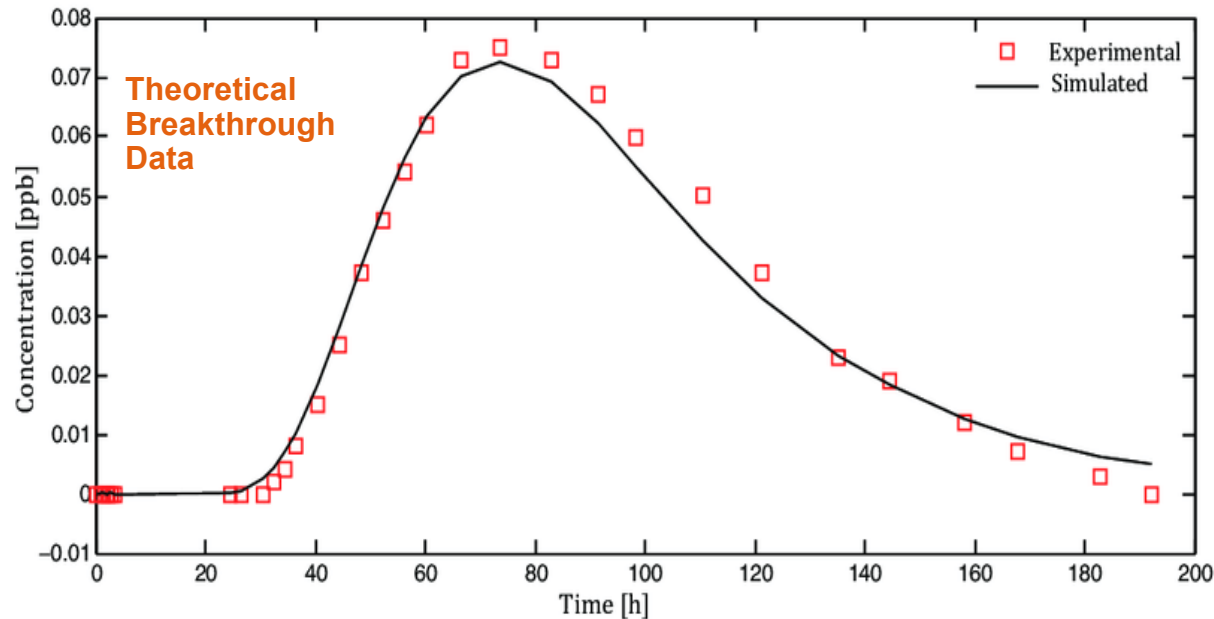
Fluorescein dye was used for shallow injections:

- Shallow injections started on October 31 and continued through November 23, 2022
 - Injection concentration of 20 mg/L (ppm)
 - Area 1 – 4,000 gallons injected
 - Area 2 – 3,000 gallons injected



Drift Phase

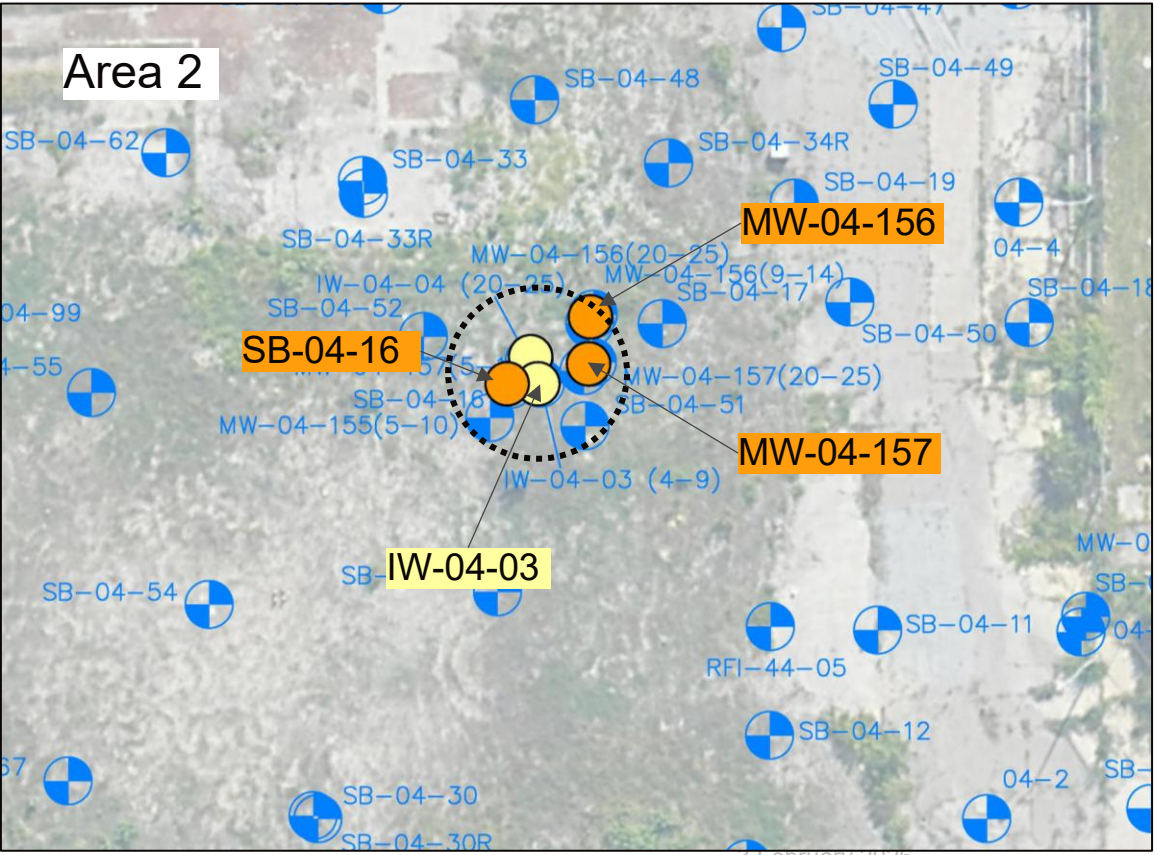
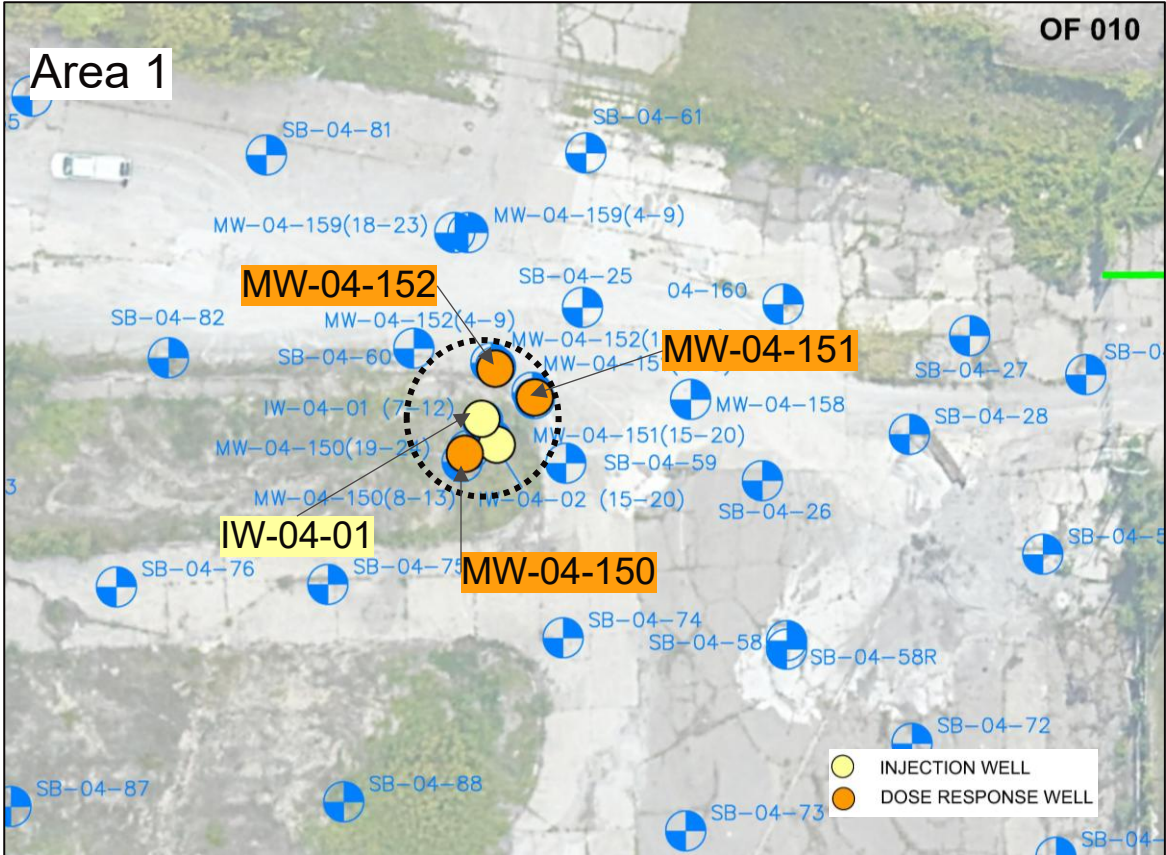
- Drift phase sampling conducted every 4-6 weeks at select wells
- Locations and timeframe between samples are adjusted based on expected travel time estimates and previous results
- The goal is to collect enough data at a drift well to generate a breakthrough curve and estimate groundwater velocity



Dose Response Monitoring in Shallow Zone



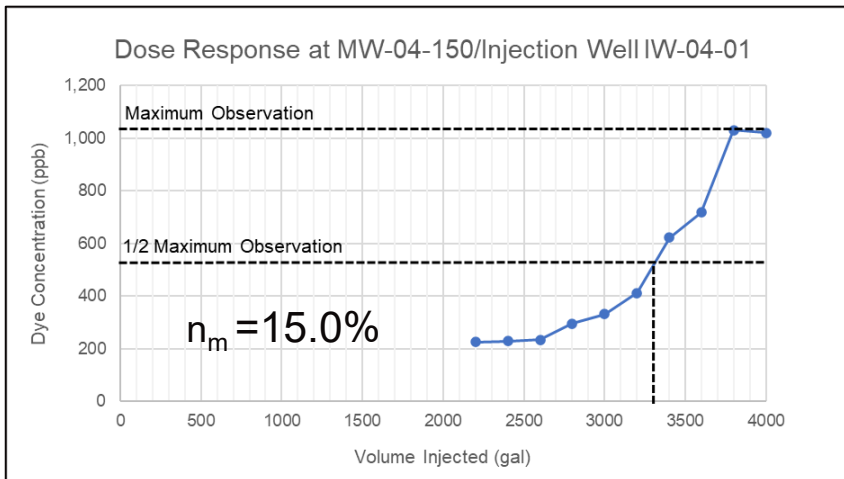
- Monitoring was conducted at 6 shallow wells during injection phase
- Wells were located within the target radius of influence (ROI), located between approximately 11 and 16 feet from the injection wells
- Data was collected to verify ROI and estimate mobile porosity (nm)



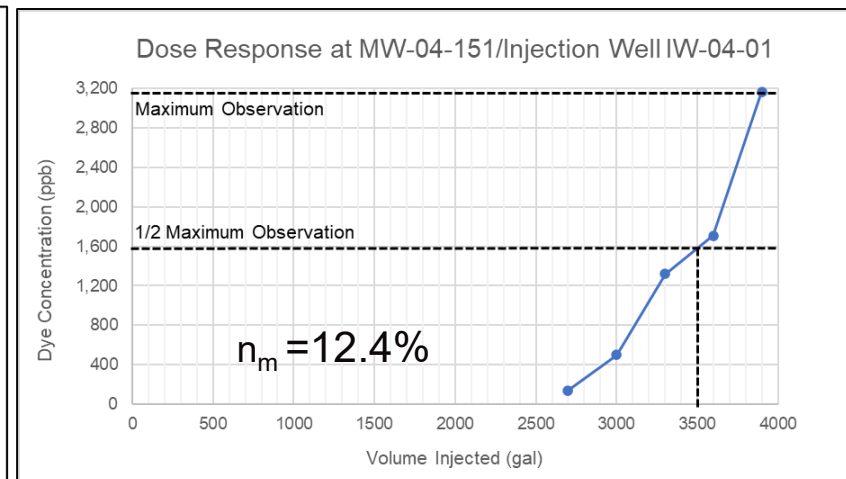
Dose Response Results

- Area 1 - tracer breakthrough observed at 2 of 3 dose response wells
- Area 2 - tracer breakthrough observed at 1 of 3 dose response wells
- Variable breakthrough concentrations observed
- Absence of tracer breakthrough at some dose response wells may be due to the presence of concrete in the subsurface
- Average mobile porosity (n_m) is ~16%

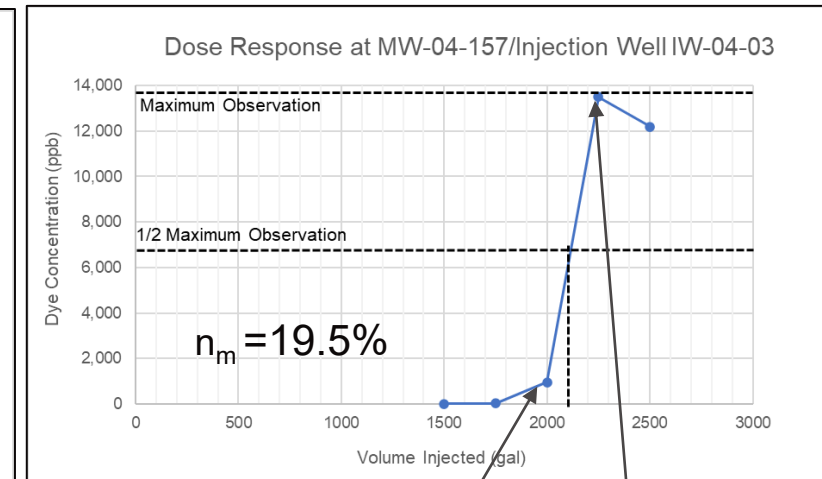
Area 1 – MW is 12 feet from IW-04-01



Area 1 – MW is 15.5 feet from IW-04-01



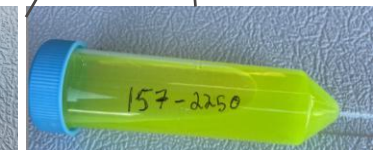
Area 2 – MW is 10.9 feet from IW-04-03



Tracer concentrations did not level off during injection, instead, tracer peaked at Day 21 after injections stopped (21,400 ppb). Mobile porosity may be slightly underestimated.

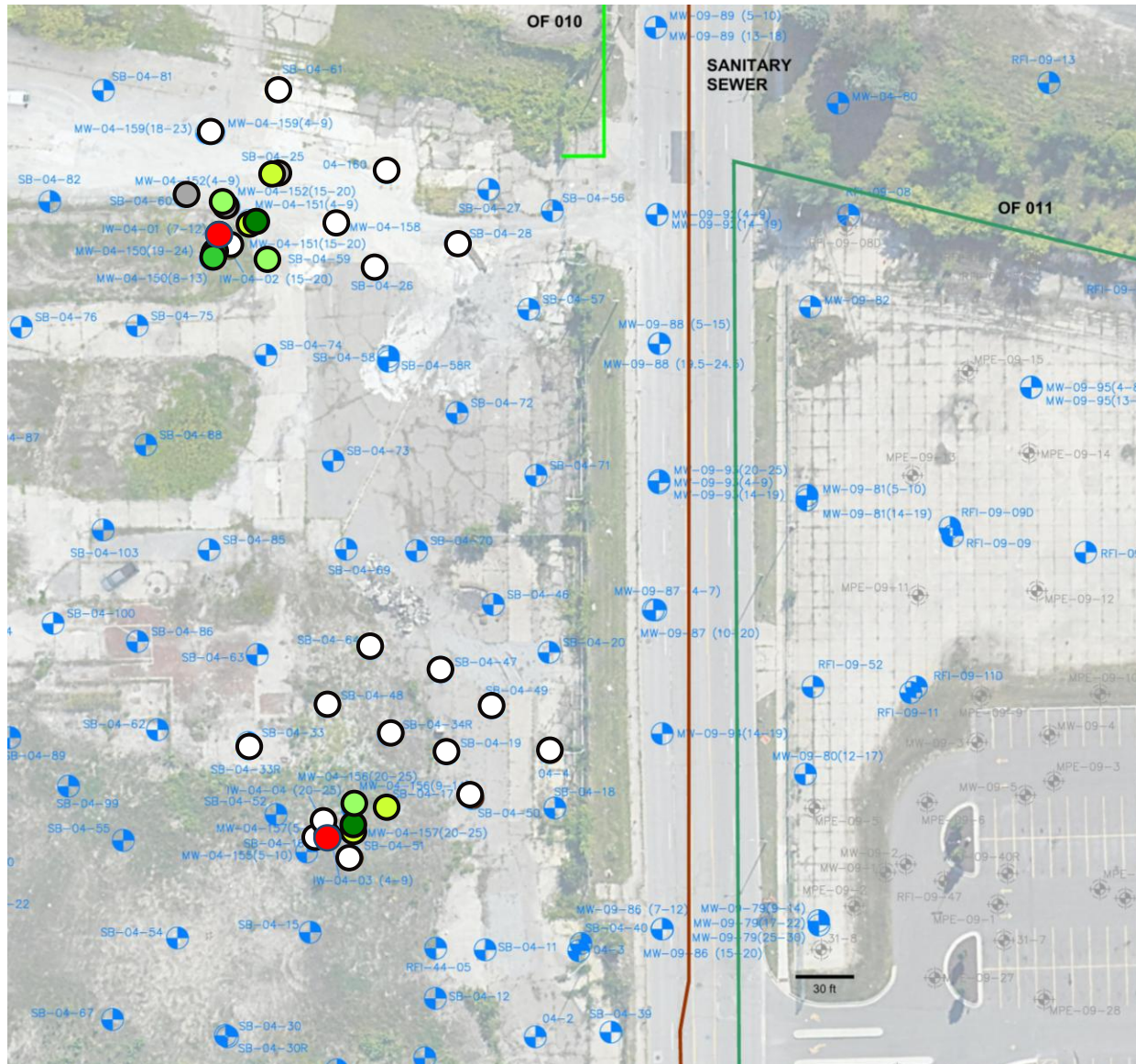


MW-04-157 (5-10) – 2,000 gal



MW-04-157 (5-10) – 2,250 gal

Drift Well Sampling Results

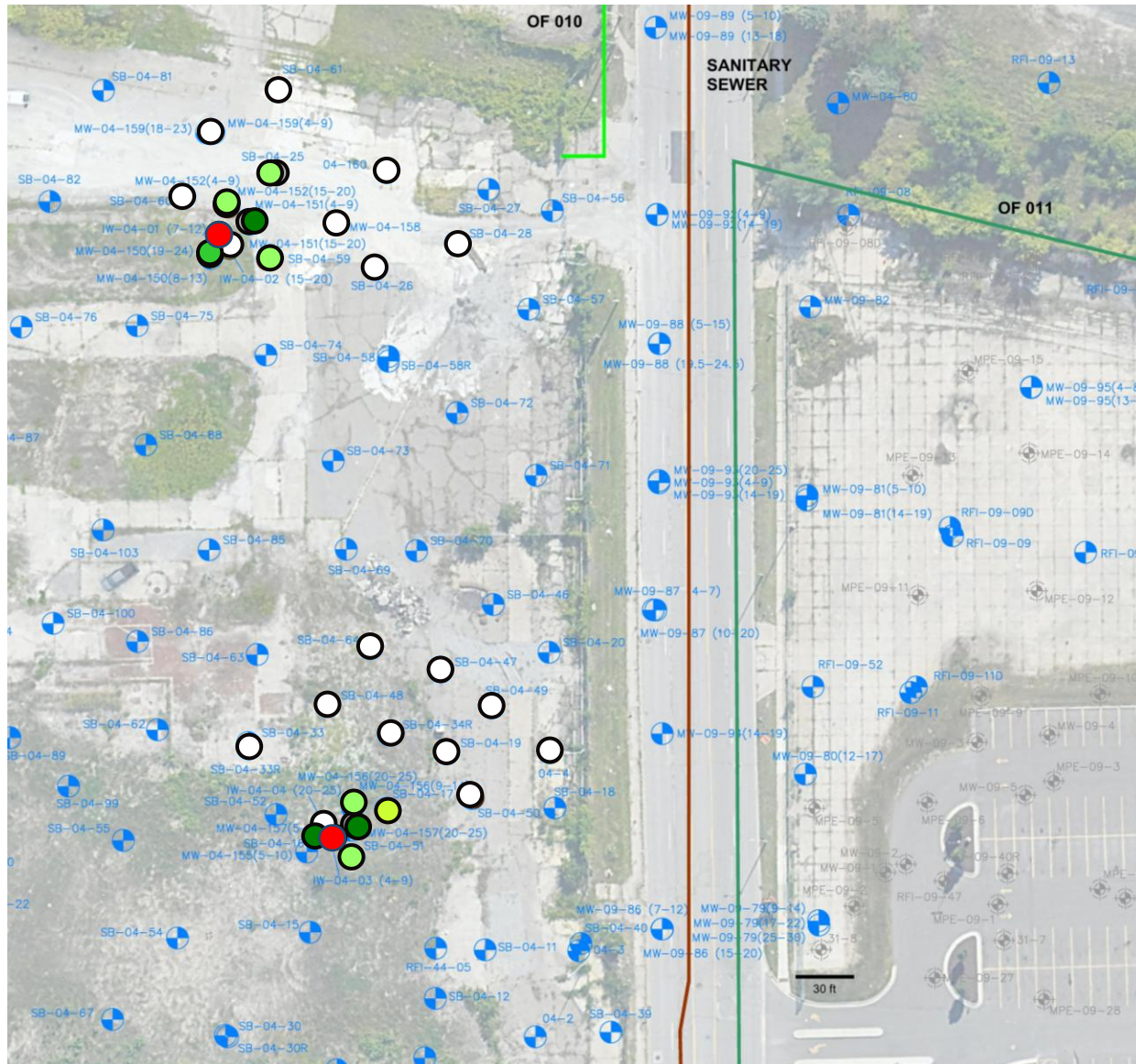


DYE RESULTS 12/21/2022

(ppb)

- Injection Well Location
- Not sampled
- ND
- < 1 ppb
- >1-10 ppb
- >10-100 ppb
- >100 ppb

Drift Well Sampling Results

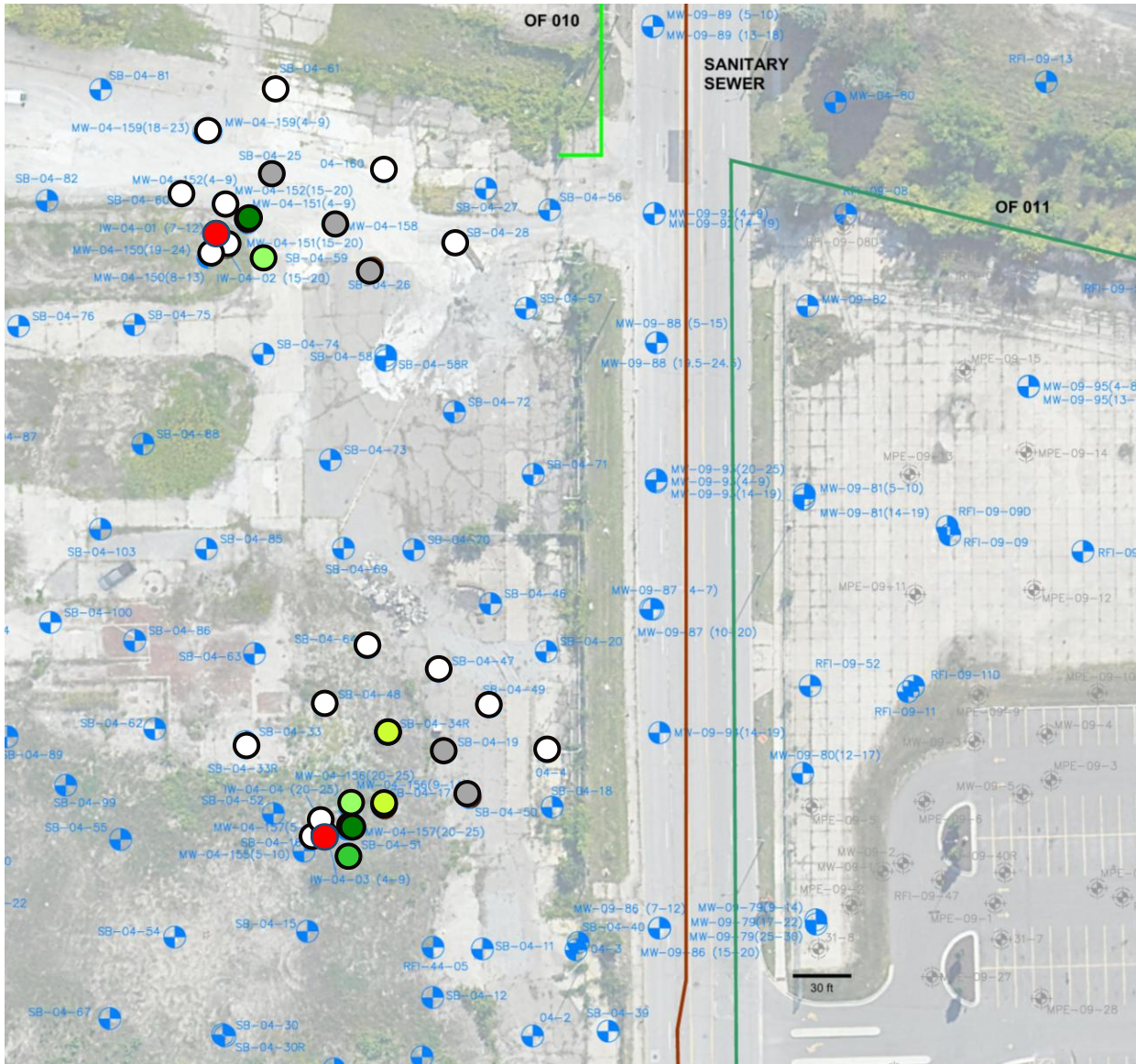


DYE RESULTS 01/31/2023

(ppb)

- Injection Well Location
- Not sampled
- ND
- < 1 ppb
- >1-10 ppb
- >10-100 ppb
- >100 ppb

Drift Well Sampling Results

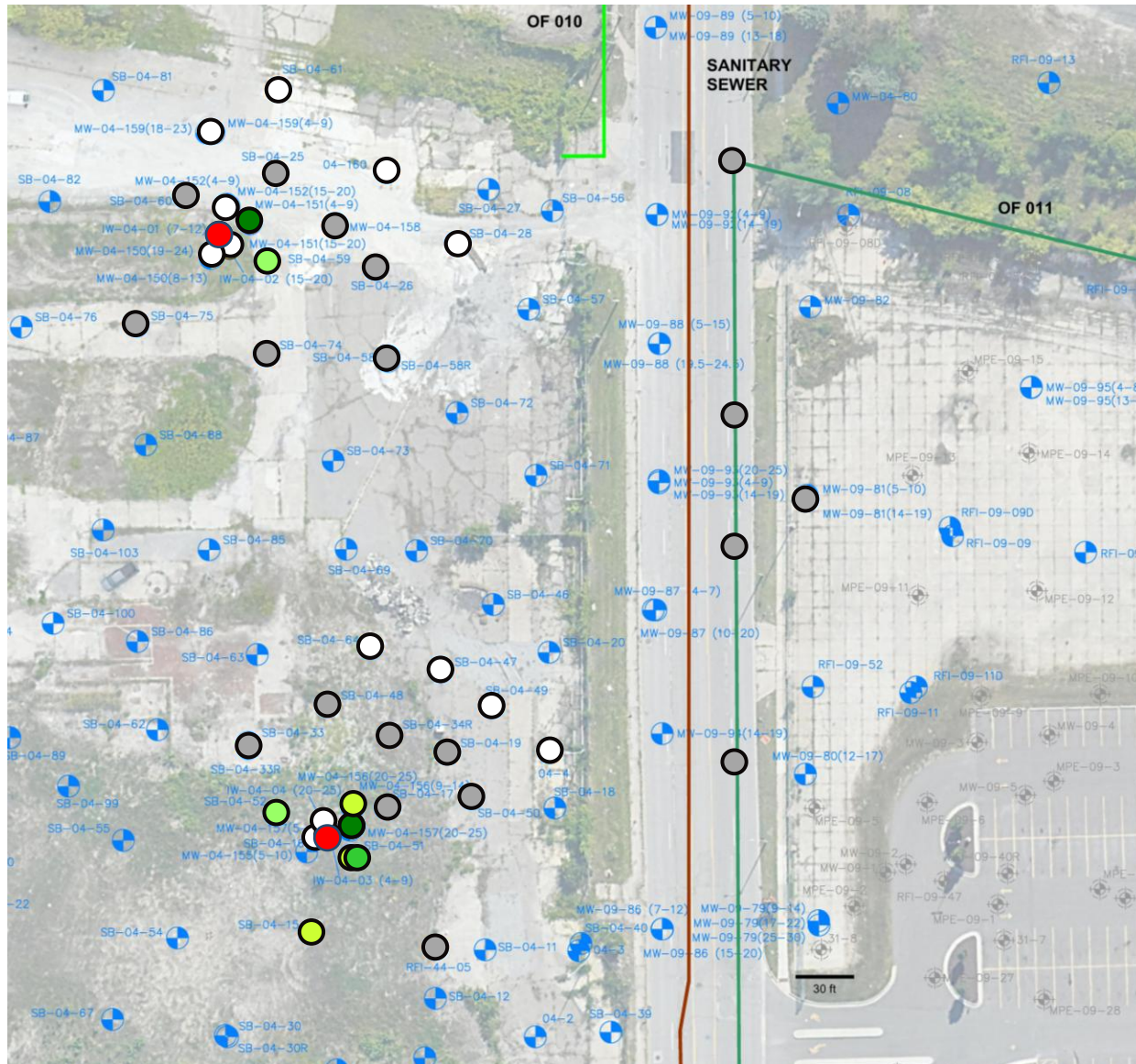


DYE RESULTS 03/01/2023

(ppb)

- Injection Well Location
- Not sampled
- ND
- < 1 ppb
- >1-10 ppb
- >10-100 ppb
- >100 ppb

Drift Well Sampling Results

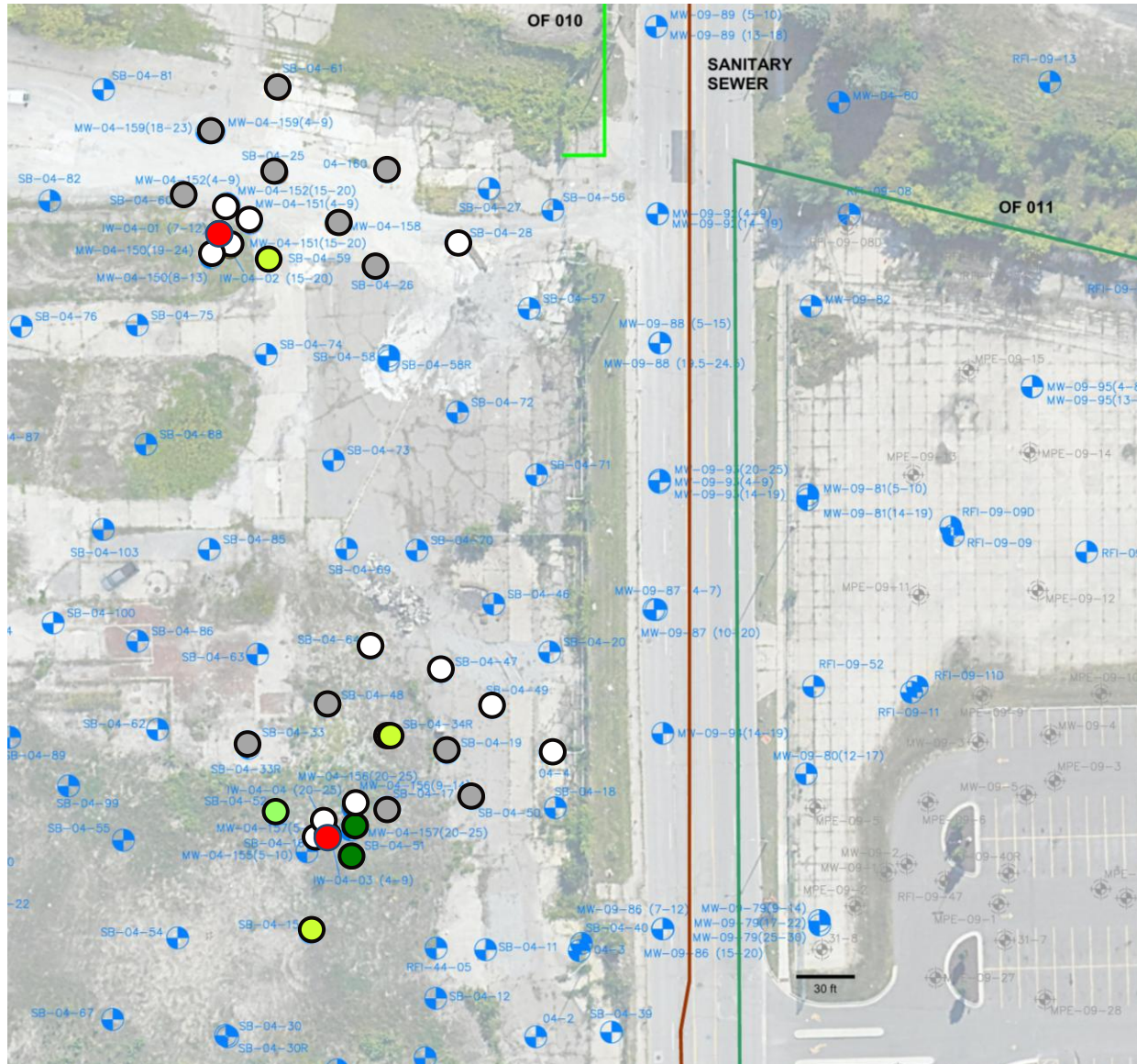


DYE RESULTS 05/12/2023

(ppb)

- Injection Well Location
- Not sampled
- ND
- < 1 ppb
- >1-10 ppb
- >10-100 ppb
- >100 ppb

Drift Well Sampling Results

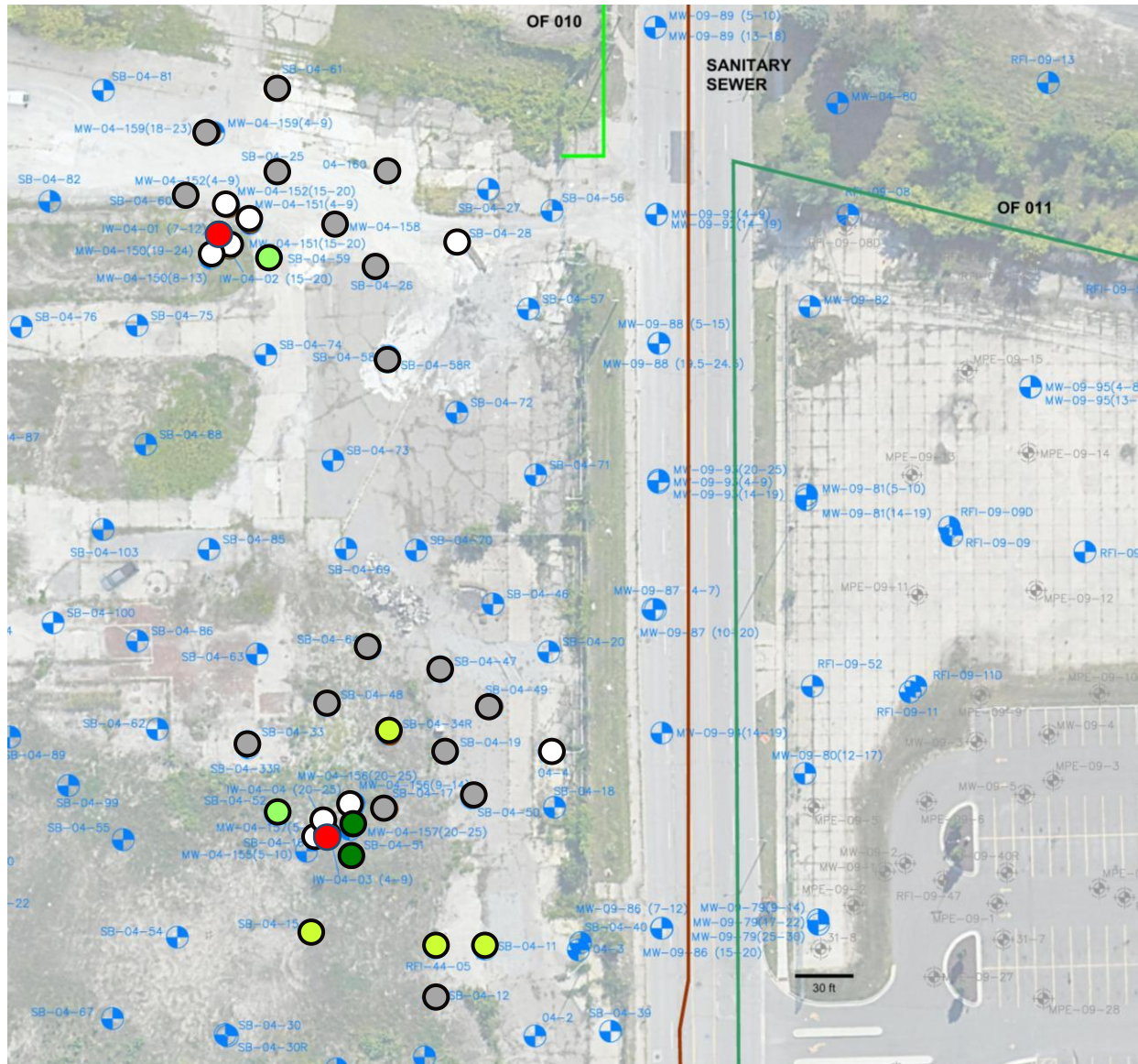


DYE RESULTS 09/13/2023

(ppb)

- Injection Well Location
- Not sampled
- ND
- < 1 ppb
- >1-10 ppb
- >10-100 ppb
- >100 ppb

Drift Well Sampling Results



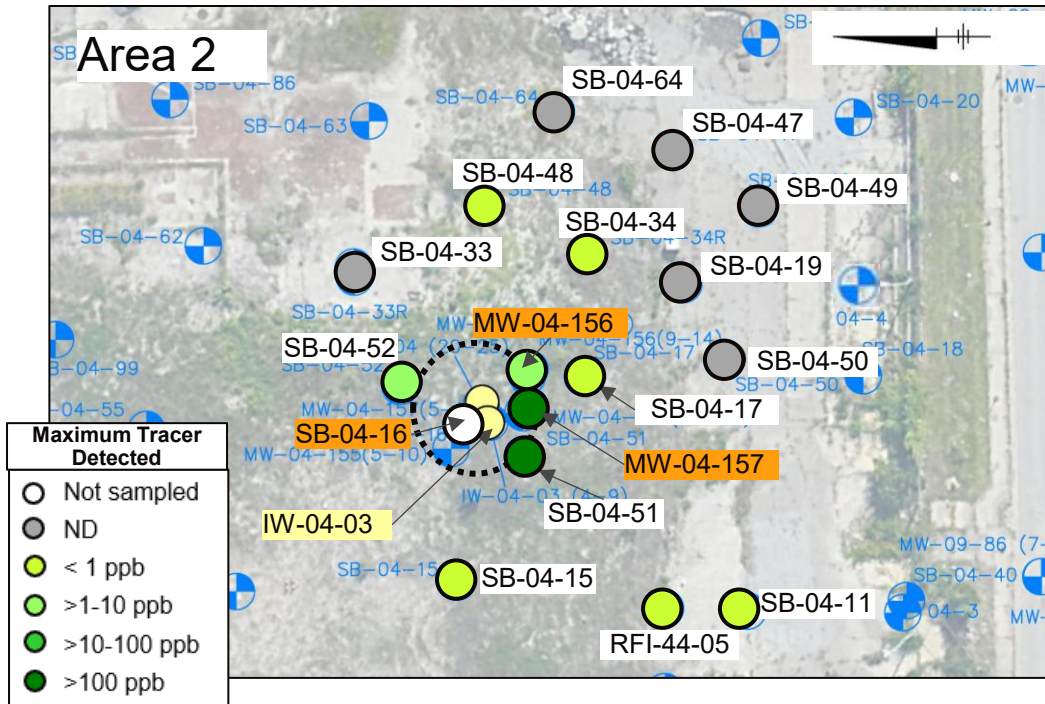
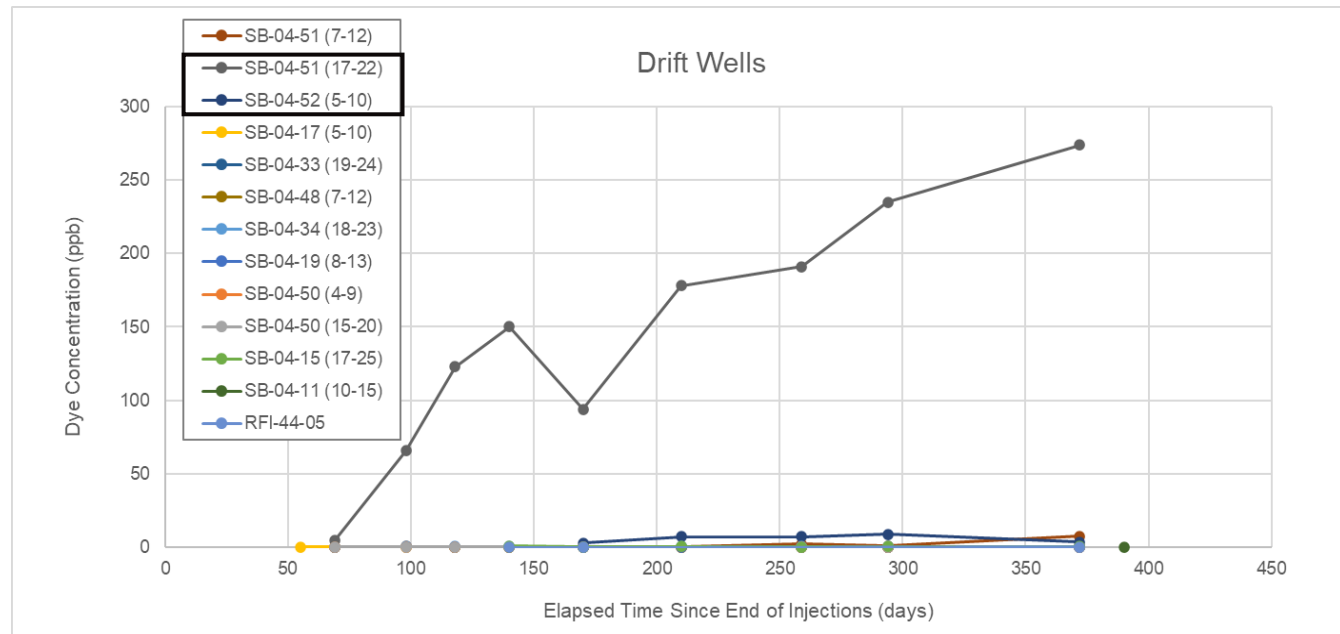
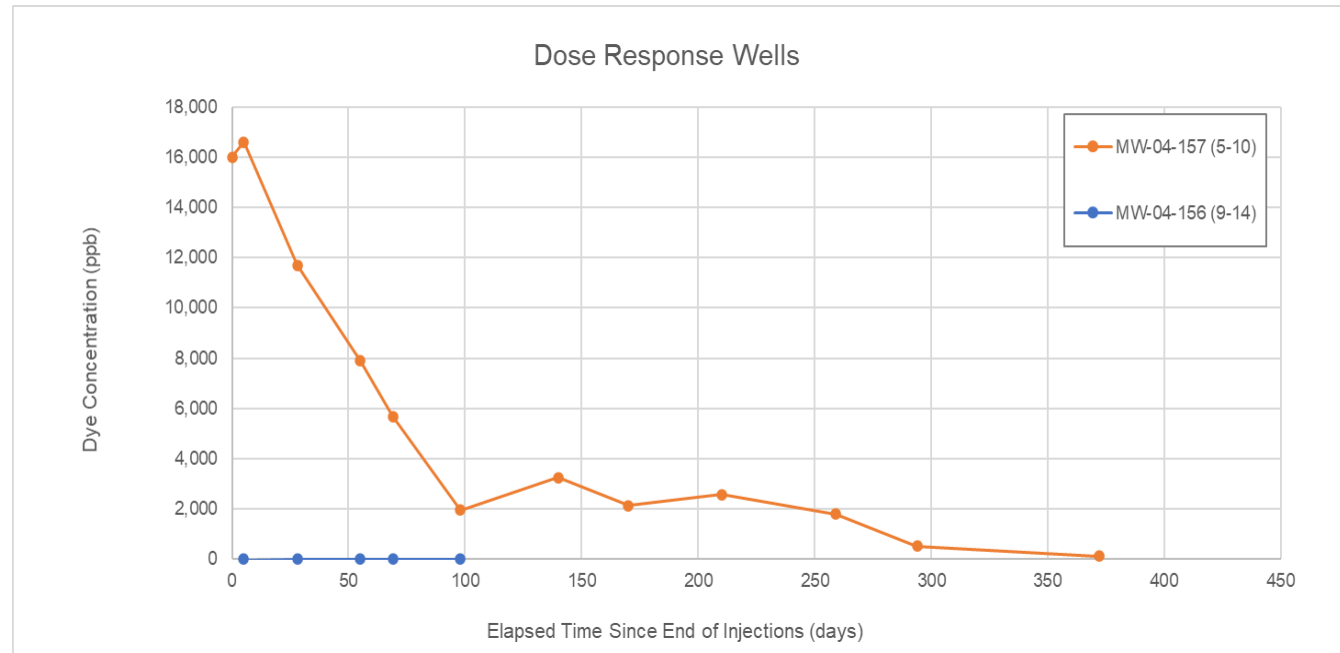
DYE RESULTS 11/30/2023

(ppb)

- Injection Well Location
- Not sampled
- ND
- < 1 ppb
- >1-10 ppb
- >10-100 ppb
- >100 ppb

Area 2 – Tracer Observations

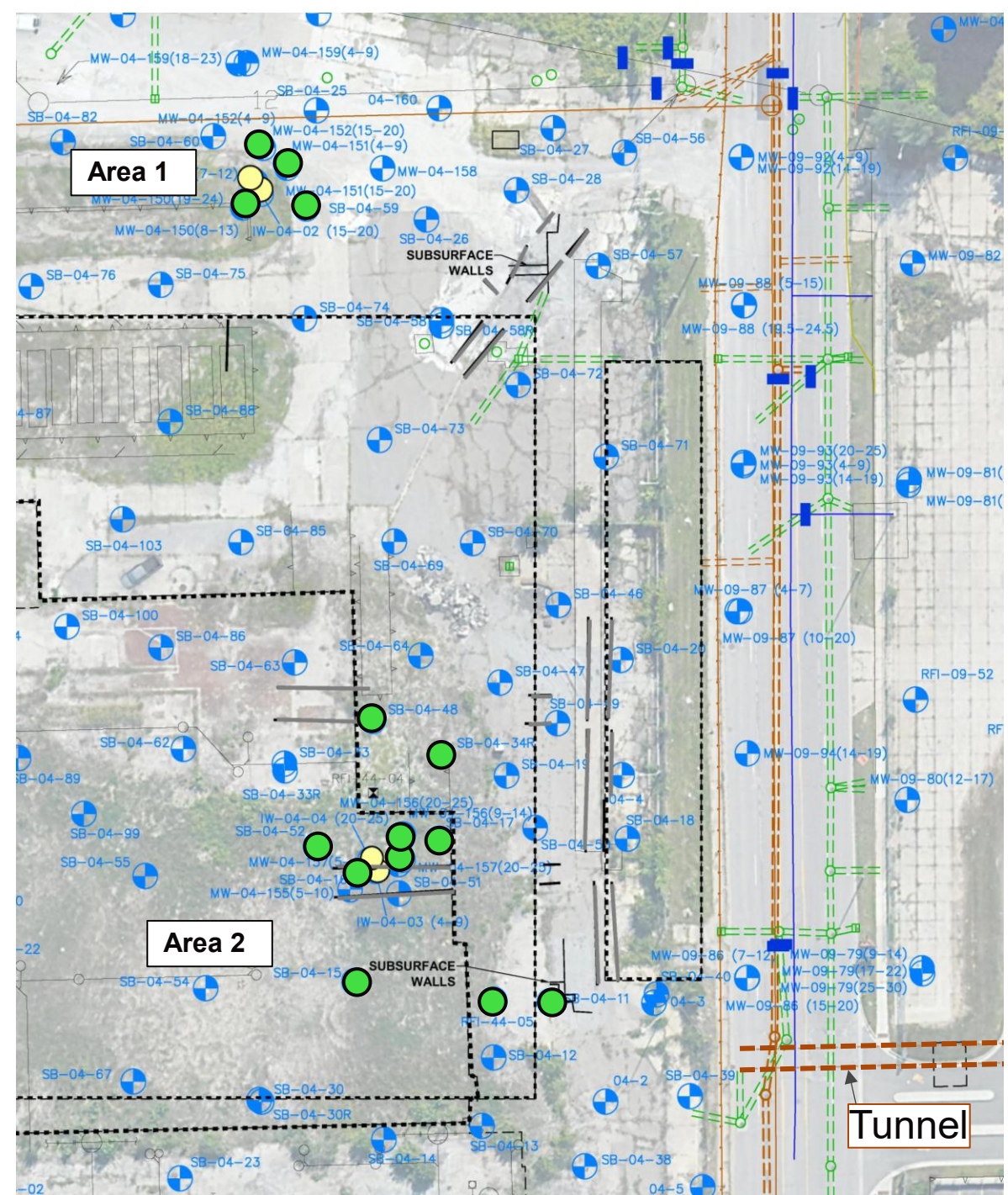
- Concentrations at dose response well MW-04-157 (5-10) declined after injection, confirming groundwater flow through the area
- At drift wells the highest tracer concentrations were detected in deep well SB-04-51 (17-22)
- Low concentrations to ND at all other locations
- Groundwater flow appears to be east and west/southwest (potentially related to subsurface structures)



Subsurface and Dye Detections

- Concrete has been identified in numerous borings in the tracer test area, up to a depth of 20 feet below ground surface
- Subsurface foundations, slabs and other obstructions appear to influence local flow and migration of dye, especially in Area 2
- A subsurface utility tunnel may influence groundwater flow near Area 2

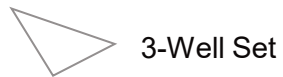
- ▭ Former Building Outline
- Subsurface Slab Identified with MASW
- Dye Detection



Flow Directions for Shallow Wells

(top of screen above 10 ft bgs)

- Localized horizontal hydraulic gradient calculations
 - Water level data from August to December 2023
 - Gradients calculated for multiple 3-well sets to provide high spatial resolution
 - Gradients generally towards south and east



3-Well Set



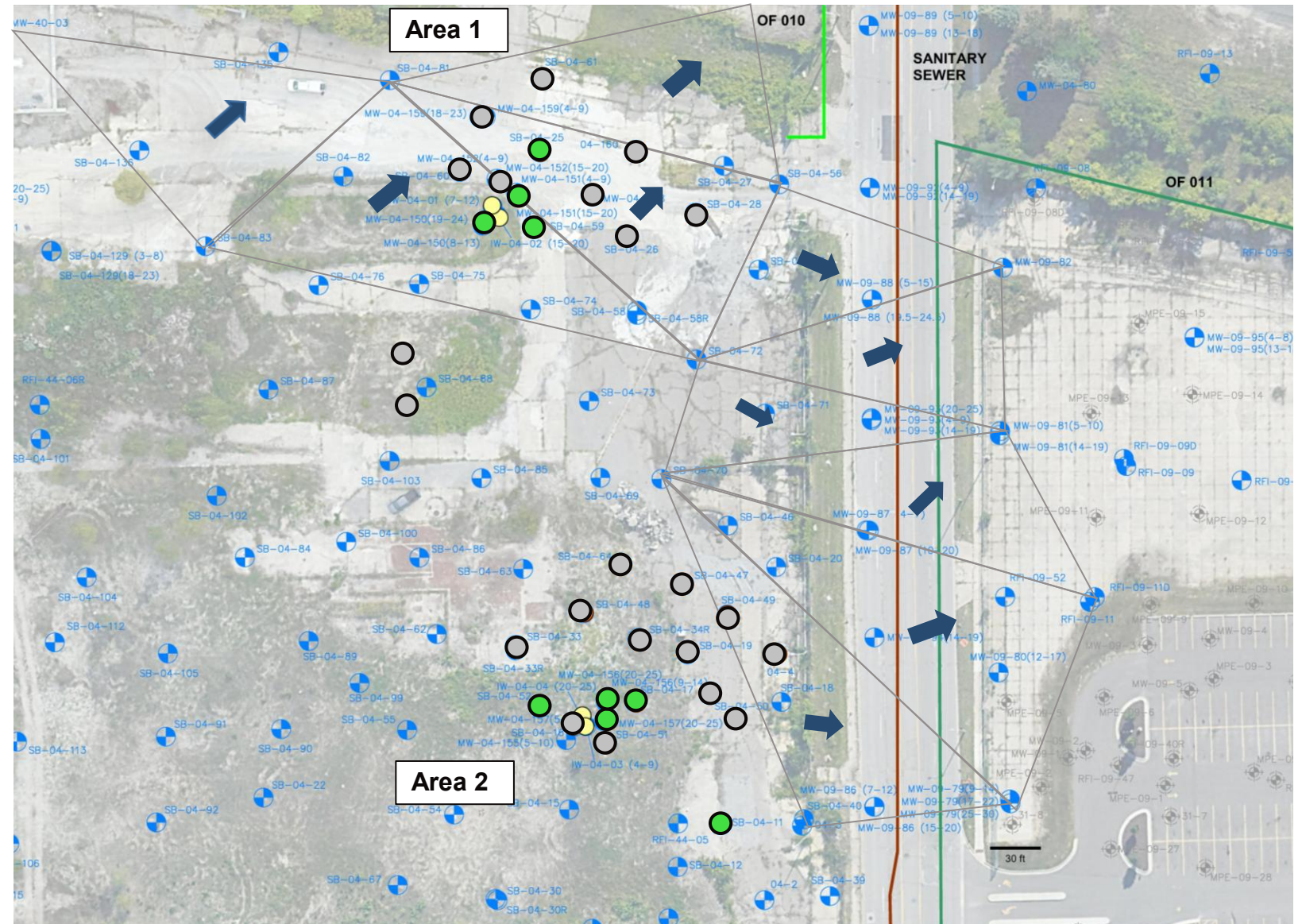
Approximate groundwater flow direction based on localized hydraulic gradient calculations



Well where dye has been detected



Well where dye has not been detected








Groundwater Velocity Summary – Tracer Injection Areas 1 and 2

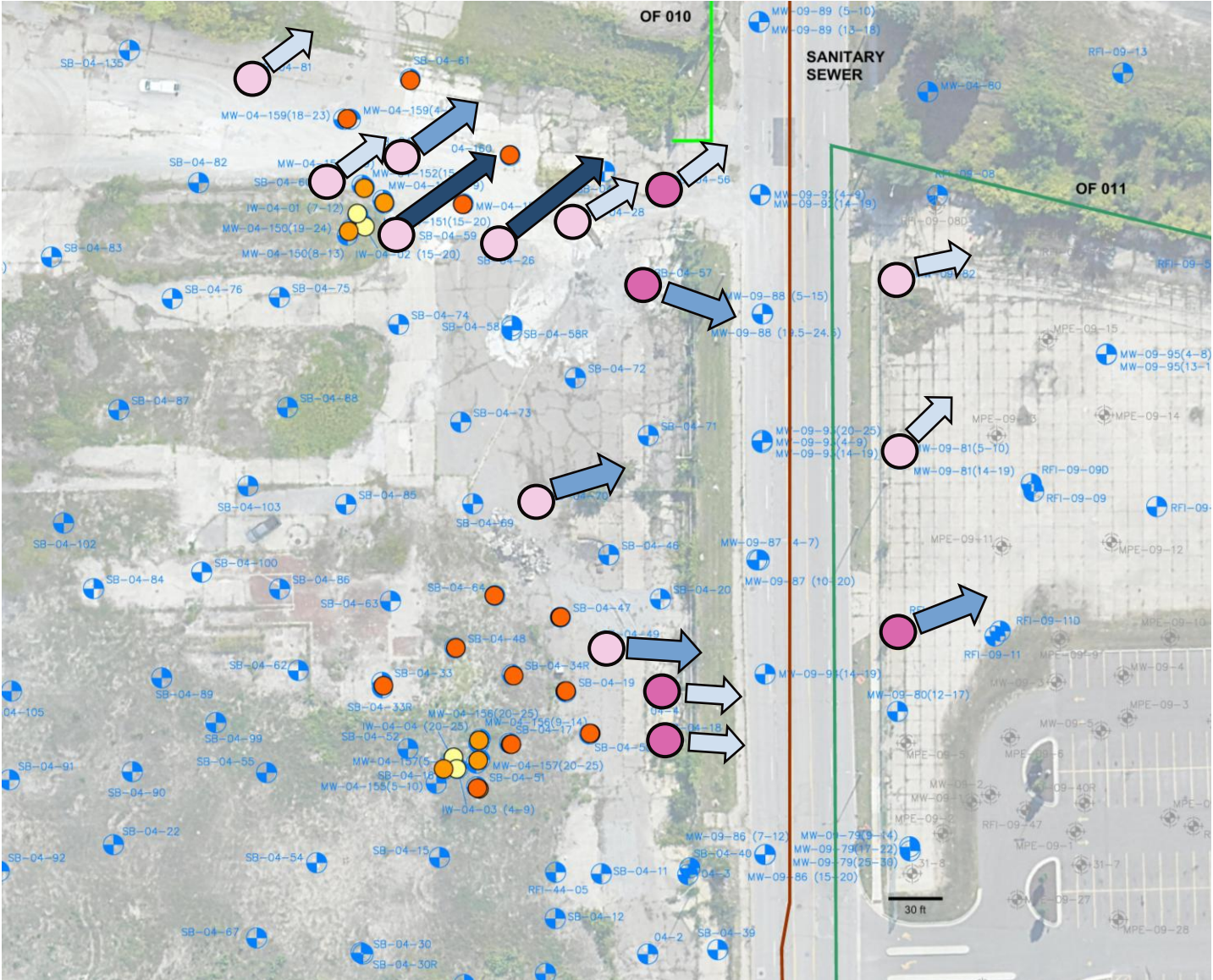
	Hydraulic Conductivity (ft/day)			Groundwater Velocity (ft/day)		
	Minimum	Maximum	Geometric Mean	Minimum	Maximum	Geometric Mean
Shallow Zone						
Slug Test	0.9	3.3	1.4	0.2	0.5	0.3
Low Flow Pumping Test	0.5	54.5	4.8	0.1	3.7	0.6
Single Well Tracer Test	--	--	--	0.1	1.1	0.4
Deep Zone						
Slug Test	0.7	3.3	1.1	0.1	0.3	0.2
Low Flow Pumping Test	0.1	5.2	1.2	0.0	1.8	0.1
Single Well Tracer Test	--	--	--	0.3	3.9	1.3

- Groundwater velocity calculated two ways:
 - Slug tests & low-flow pumping tests – Darcy’s Law
 - Single well tracer tests
 - Mobile porosity of 0.16 assumed for all calculations
- Shallow groundwater velocity ranges from 0.1 to 3.7 ft/day (0.3 to 0.6 ft/day average)
- Deep groundwater velocity ranges from <0.1 to 3.9 ft/day (0.1 to 1.3 ft/day average)

Calculated Groundwater Velocity in Shallow Wells

- Arrows indicate approximate direction and relative velocity of groundwater
 - Assume mobile porosity of 0.16
- Flow in both Area 1 and Area 2 generally to south and southwest at 0.1 to 1.6 ft/day
- Highest velocities (~3.5 ft/day) calculated at SB-04-26(5-10) and SB-04-59(4-9)

-  Slug Test or Low Flow Pumping Test Location
-  Single Well Tracer Test Location
-  Groundwater velocity < 0.5 ft/day
-  Groundwater velocity > 0.5 to < 2 ft/day
-  Groundwater velocity > 2 ft/day



Appendix B

Boring Logs

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/05/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/05/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 48°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					0.0	(0.0-0.2')	GRASS/TOPSOIL.		
2			60		0.0	(0.2-3.5')	SAND, fine to medium; some coarse sand, subangular to subrounded; little very coarse sand to medium pebbles, subangular to subrounded; little clay (as nodules); poorly sorted; brown (10YR 5/3). FILL.	(0.0-4.0' bgs) Concrete	
3					0.0				
4					0.0	(3.5-4.0')	CONCRETE. Note: Red brick.	(4.0-5.0' bgs) Bentonite	
5					0.0	(4.0-7.0')	CLAY; little silt, medium plasticity, no dilatancy to slow dilatancy; and SAND, very fine to medium; little coarse sand to small pebbles, subangular to subrounded; poorly sorted; moist; medium stiff; very dark brown (10YR 2/2).	(5.0-6.0' bgs) Fine Sand	
6					0.0			(0.0-7.0' bgs) 4" Sch 40 PVC Well Casing (6.0-12.0' bgs) Filter Pack Sand	
7			60		0.0	(7.0-10.0')	SAND, medium to coarse, subangular to subrounded; some very coarse sand to granules, subangular to subrounded; little small to large pebbles, angular to subrounded; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 7.0-12.0' bgs.		
8					0.0				
9					0.0				
10					0.0				
11					0.0	(10.0-11.5')	SILT; some clay, low to medium plasticity, slow dilatancy; little very fine to medium sand; poorly sorted; wet; medium stiff to stiff; gray (10YR 5/1).	(7.0-12.0' bgs) 4" PVC 10-Slot Well Screen	
12			60		0.0	(11.5-12.0')	SILT, low plasticity, rapid dilatancy; wet; medium stiff to stiff; gray (10YR 5/1).		
13					0.0	(12.0-15.0')	CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff to very stiff; gray (10YR 5/1).		
14					0.0				
15					0.0				
16					0.0	(15.0-19.0')	SILT, low plasticity, slow to rapid dilatancy; some very fine to medium sand; trace granules to small pebbles, subangular to subrounded; poorly sorted; moist to wet; medium stiff; gray (10YR 5/1). Note: Wet from 15.0-17.0' bgs.	(12.0-25.0' bgs) Bentonite	
17					0.0				
18			60		0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Mud Rotary & Sonic Drilling Water Level Start (ft. bgs.): 7.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Pilot Test location. Mud Rotary was used Surface Elev.: 732.31
 North Coord.: 560503.21
 East Coord.: 13305645.46

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/05/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/05/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 48°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60		0.0		(19.0-25.0') CLAY; little silt, medium to high plasticity, no dilatancy; little very fine to medium sand to small pebbles, subangular to subrounded; poorly sorted; dry to moist; very stiff; gray (10YR 5/1).	(12.0-25.0' bgs) Bentonite	
22					0.0				
23					0.0				
24					0.0				
25					0.0				
26							End of this boring location was 12.0' bgs. Lithology presented from 12.0-25.0' bgs is from pilot boring IW-04-02.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/05/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/05/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 48°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
0							(0.0-0.2') GRASS/TOPSOIL.		
1							(0.2-3.5') SAND, fine to medium; some coarse sand, subangular to subrounded; little very coarse sand to medium pebbles, subangular to subrounded; little clay (as nodules); poorly sorted; brown (10YR 5/3). FILL.		
2									
3									
4							(3.5-4.0') CONCRETE. Note: Red brick.	(0.0-4.0' bgs) Concrete	
5							(4.0-7.0') CLAY; little silt, medium plasticity, no dilatancy to slow dilatancy; and SAND, very fine to medium; little coarse sand to small pebbles, subangular to subrounded; poorly sorted; moist; medium stiff; very dark brown (10YR 2/2).		
6									
7									
8							(7.0-10.0') SAND, medium to coarse, subangular to subrounded; some very coarse sand to granules, subangular to subrounded; little small to large pebbles, angular to subrounded; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 7.0-12.0' bgs.		
9									
10									
11							(10.0-11.5') SILT; some clay, low to medium plasticity, slow dilatancy; little very fine to medium sand; poorly sorted; wet; medium stiff to stiff; gray (10YR 5/1).	(11.0-12.0' bgs) Bentonite	
12							(11.5-12.0') SILT, low plasticity, rapid dilatancy; wet; medium stiff to stiff; gray (10YR 5/1).	(12.0-13.0' bgs) Fine Sand	
13							(12.0-15.0') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff to very stiff; gray (10YR 5/1).	(0.0-15.0' bgs) 4" Sch 40 PVC Well Casing (13.0-20.0' bgs) Filter Pack Sand (15.0-20.0' bgs) 4" PVC 10-Slot Well Screen	
14									
15									
16							(15.0-19.0') SILT, low plasticity, slow to rapid dilatancy; some very fine to medium sand; trace granules to small pebbles, subangular to subrounded; poorly sorted; moist to wet; medium stiff; gray (10YR 5/1). Note: Wet from 15.0-17.0' bgs.		
17									
18									
19									
20							(19.0-20.0') CLAY; little silt, medium to high plasticity, no dilatancy; little very fine to medium sand to small pebbles, subangular to subrounded; poorly sorted; dry to moist;		

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Mud Rotary & Sonic Drilling Water Level Start (ft. bgs.): 7.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Pilot Test location. Mud Rotary drilling used to 16.0' bgs. Sonic used from 16.0-20.0' bgs. Surface Elev.: 732.43
 North Coord.: 560500.67
 East Coord.: 13305640.28

Mud Rotary kept collapsing.

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY LOGS.GPJ ARCADIS_2013.GDT 1/19/23

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/05/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/05/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 48°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21							very stiff; gray (10YR 5/1). End of boring at 20.0' bgs.	(20.0-25.0' bgs) Bentonite	[REDACTED]
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/12/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/12/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 63°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					NM		(0.0-2.0') COBBLES, small to large, subangular to subrounded; some medium sand to large pebbles, subangular to subrounded; poorly sorted; dry to moist; light gray (10YR 7/1). FILL. Note: Cobbles are concrete pieces.	(0.0-2.0' bgs) Concrete	
2			45		NM			(2.0-3.0' bgs) Bentonite	
3					0.0		(2.0-5.0') SAND, medium; little coarse sand to medium pebbles, subangular to subrounded; trace medium cobbles, subangular to subrounded; poorly sorted; moist; brown (10YR 5/3). FILL.	(3.0-3.5' bgs) Fine Sand	
4					0.0			(0.0-4.0' bgs) 4" Sch 40 PVC Well Casing (3.5-9.0' bgs) Filter Pack Sand (4.0-9.0' bgs) 4" PVC 10-Slot Well Screen	
5					0.0				
6			60		0.0		(5.0-9.0') SAND, medium; little coarse sand to medium pebbles, subangular to subrounded; little clay (as nodules); little silt; poorly sorted; wet; black (10YR 2/1). FILL. Note: Wet from 5.0-9.0' bgs.		
7					0.0				
8					0.0				
9					0.0				
10					NM		(9.0-11.0') CONCRETE.		
11					NM				
12			60		0.0		(11.0-14.5') CLAY; some silt, medium to high plasticity, no dilatancy; some very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; dry to moist; very stiff; grayish brown (10YR 5/2).		
13					0.0				
14					0.0				
15					0.0		(14.5-17.0') SILT; some clay, low plasticity, rapid dilatancy; little very fine to medium sand; trace small to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff to very stiff; gray (10YR 5/1).	(9.0-25.0' bgs) Bentonite	
16					0.0				
17					0.0				
18			60		0.0		(17.0-20.0') CLAY; some silt, medium to high plasticity, no dilatancy; some very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; dry to moist; very stiff; grayish brown (10YR 5/2).		
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Pilot Test location. Unable to hand auger or use mud rotary due to cobbles. Surface Elev.: 734.96
 North Coord.: 560449.22
 East Coord.: 13305345.76

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/12/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/12/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 63°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60		0.0		(20.0-25.0') SAND, very fine to medium; some coarse sand to granules; little silt; little small to medium pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 20.0-25.0' bgs.	(9.0-25.0' bgs) Bentonite	
22					0.0				
23					0.0				
24					0.0				
25					0.0				
26							End of boring location was 9.0' bgs. Lithology presented from 9.0-25.0' bgs is from pilot boring IW-04-04.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/12/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/12/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 63°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1						(0.0-2.0') COBBLES, small to large, subangular to subrounded; some medium sand to large pebbles, subangular to subrounded; poorly sorted; dry to moist; light gray (10YR 7/1). FILL. Note: Cobbles are concrete pieces.			
2						(2.0-5.0') SAND, medium; little coarse sand to medium pebbles, subangular to subrounded; trace medium cobbles, subangular to subrounded; poorly sorted; moist; brown (10YR 5/3). FILL.			
3						(5.0-9.0') SAND, medium; little coarse sand to medium pebbles, subangular to subrounded; little clay (as nodules); little silt; poorly sorted; wet; black (10YR 2/1). FILL. Note: Wet from 5.0-9.0' bgs.			
4									
5									
6									
7									
8								(0.0-16.0' bgs) Concrete	
9						(9.0-11.0') CONCRETE.			
10									
11									
12						(11.0-14.5') CLAY; some silt, medium to high plasticity, no dilatancy; some very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; dry to moist; very stiff; grayish brown (10YR 5/2).			
13									
14									
15						(14.5-17.0') SILT; some clay, low plasticity, rapid dilatancy; little very fine to medium sand; trace small to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff to very stiff; gray (10YR 5/1).		(0.0-20.0' bgs) 4" Sch 40 PVC Well Casing (16.0-17.0' bgs) Bentonite (17.0-18.0' bgs) Fine Sand (18.0-25.0' bgs) Filter Pack Sand	
16									
17									
18						(17.0-20.0') CLAY; some silt, medium to high plasticity, no dilatancy; some very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; dry to moist; very stiff; grayish brown (10YR 5/2).			
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Pilot Test location. Unable to hand Surface Elev.: 734.89
auger or use mud rotary due to cobbles. North Coor.: 560451.74
 East Coor.: 13305350.73

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/12/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/12/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 63°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21							(20.0-25.0') SAND, very fine to medium; some coarse sand to granules; little silt; little small to medium pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 20.0-25.0' bgs.	(20.0-25.0' bgs) 4" PVC 10-Slot Well Screen	
22									
23									
24									
25									
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/05/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/05/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 39°F, Foggy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1						(0.0-0.5') GRASS/ORGANICS.		(0.0-6.0' bgs) Bentonite	
2					(0.5-2.0') GRANULES to large PEBBLES, subangular to subrounded; some small cobbles, subangular to subrounded; little coarse to very coarse sand, subangular to subrounded; poorly sorted; dry to moist; grayish brown (10YR 5/2). FILL.				
3					(2.0-6.0') CONCRETE.				
4								(0.0-8.0' bgs) 2" Sch 40 PVC Well Casing	
5									
6			156					(6.0-13.0' bgs) Filter Pack Sand	
7						(6.0-9.5') CLAY; some silt, medium plasticity, no dilatancy; some very fine to medium sand; little coarse sand to medium pebbles, subangular to subrounded; poorly sorted; moist; medium stiff; dark yellowish brown (10YR 3/6).			
8									
9								(8.0-13.0' bgs) 2" PVC 10-Slot Well Screen	
10						(9.5-11.0') SAND, medium; some coarse sand to granules, subangular to subrounded; little small to large pebbles, subangular to subrounded; poorly sorted; wet; brown (10YR 4/3). Note: Wet from 9.5-12.0' bgs.			
11						(11.0-12.0') SILT; some clay, low to medium plasticity, slow dilatancy; little very fine to medium sand; poorly sorted; wet; medium stiff to stiff; gray (10YR 5/1).			
12						(12.0-13.0') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff; gray (10YR 5/1).			
13									
14							Location was blind drilled to 13.0' bgs to install a well. Lithology presented here is from soil boring MW-04-150 (19-24).		
15									
16									
17									
18									
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 9.5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 733.36
measured. Step out location. Well set from 8-13' bgs. North Coord.: 560508.81
 East Coord.: 13305634.36

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30121887
 Project Location: Flint, MI

Date Started: 04/05/2022 Date Completed: 04/05/2022
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 39°F, Foggy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					0.0	(0.0-0.5') GRASS/ORGANICS.		(0.0-17.0' bgs) Bentonite	
2			60		0.0	(0.5-2.0') GRANULES to large PEBBLES, subangular to subrounded; some small cobbles, subangular to subrounded; little coarse to very coarse sand, subangular to subrounded; poorly sorted; dry to moist; grayish brown (10YR 5/2). FILL.			
3					0.0	(2.0-6.0') CONCRETE.			
4					0.0			(0.0-19.0' bgs) 2" Sch 40 PVC Well Casing	
6			60		0.0	(6.0-9.5') CLAY; some silt, medium plasticity, no dilatancy; some very fine to medium sand; little coarse sand to medium pebbles, subangular to subrounded; poorly sorted; moist; medium stiff; dark yellowish brown (10YR 3/6).			
7					0.0				
8					0.0			(17.0-25.0' bgs) Filter Pack Sand	
9					0.0	(9.5-11.0') SAND, medium; some coarse sand to granules, subangular to subrounded; little small to large pebbles, subangular to subrounded; poorly sorted; wet; brown (10YR 4/3). Note: Wet from 9.5-12.0' bgs.			
10					0.0	(11.0-12.0') SILT; some clay, low to medium plasticity, slow dilatancy; little very fine to medium sand; poorly sorted; wet; medium stiff to stiff; gray (10YR 5/1).			
11			60		0.0	(12.0-15.0') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff; gray (10YR 5/1).			
12					0.0				
13					0.0				
14					0.0	(15.0-16.0') CLAY; and SILT, medium plasticity, no dilatancy; little very fine to medium sand; trace granules to small pebbles, subangular to subrounded; poorly sorted; moist; stiff; gray (10YR 5/1).			
15					0.0	(16.0-16.5') SILT, low plasticity, rapid dilatancy; moist; stiff; gray (10YR 5/1).			
16					0.0	(16.5-19.0') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff; gray (10YR 5/1).			
17			60		0.0	(19.0-20.0') SILT, low plasticity, slow to rapid dilatancy; some very fine to medium sand; trace granules, subangular to subrounded; moist; medium stiff; gray			
18					0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 9.5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 733.36
measured. Well set from 19-24' bgs, additional well North Coord.: 560507.08
set in step out location from 8-13' bgs. East Coord.: 13305637.38

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY ALL 2022_011223 LOGS.GPJ ARCADIS_2013.GDT 11/19/23

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30121887
 Project Location: Flint, MI

Date Started: 04/05/2022 Date Completed: 04/05/2022
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 39°F, Foggy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0	(10YR 5/1)	(20.0-22.0') SAND, medium to very coarse, subangular to subrounded; and GRANULES to medium PEBBLES, subangular to subrounded; some large pebbles, subangular to subrounded; little silt; poorly sorted; wet; brown (10YR 5/3).	(19.0-24.0' bgs) 2" PVC 10-Slot Well Screen	
22				0.0					
23				0.0	(22.0-22.5') SILT, low plasticity, slow to rapid dilatancy; some very fine to medium sand; trace granules, subangular to subrounded; wet; medium stiff; gray (10YR 5/1).				
24				0.0	(22.5-25.0') CLAY; little silt, medium to high plasticity, no dilatancy; little very fine sand to granules, subangular to subrounded; trace small to medium pebbles, poorly sorted; dry to moist; very stiff; gray (10YR 5/1).				
25									
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/06/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/06/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 49°F, Rainy, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1						(0.0-1.0') CONCRETE.		(0.0-2.0' bgs) Bentonite	
2						(1.0-4.0') SAND, very fine to medium; some silt; some clay; little coarse sand to medium pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1).		(0.0-4.0' bgs) 2" Sch 40 PVC Well Casing	
3									
4			108			(4.0-8.0') SAND, medium to very coarse, subangular to subrounded; some granules; little small to large pebbles; little silt; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 4.0-9.0' bgs.		(2.0-9.0' bgs) Filter Pack Sand	
5									
6									
7									
8								(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
9						(8.0-9.0') SAND, fine to medium; little coarse sand to granules, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3).			
10						Location was blind drilled to 9.0' bgs to install a well. Lithology presented here is from soil boring MW-04-151 (15-20).			
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 4.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Step out location. Well set from 4-9' bgs. Converted to Well: Yes No
 Surface Elev.: 730.03
 North Coor.: 560489.65
 East Coor.: 13305653.29

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/06/2022 Logger: M. Olander
 Project Number: 30121887 Date Completed: 04/06/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 49°F, Rainy, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			12		NM	(0.0-1.0') CONCRETE.			
2			48		0.0	(1.0-4.0') SAND, very fine to medium; some silt; some clay; little coarse sand to medium pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1).	(0.0-13.0' bgs) Bentonite		
3		0.0							
4		0.0							
5			60		0.0	(4.0-8.0') SAND, medium to very coarse, subangular to subrounded; some granules; little small to large pebbles; little silt; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 4.0-9.0' bgs.	(0.0-15.0' bgs) Sch 40 PVC Well Casing		
6		0.0							
7		0.0							
8			60		0.0	(8.0-9.0') SAND, fine to medium; little coarse sand to granules, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3).	(13.0-20.0' bgs) Filter Pack Sand		
9		0.0							
10		0.0							
11			60		0.0	(9.0-12.0') SILT; some clay, low plasticity, rapid dilatancy; little very fine to medium sand; poorly sorted; moist; gray (10YR 5/1).	(15.0-20.0' bgs) 2" PVC 10-Slot Well Screen		
12		0.0							
13		0.0							
14			60		0.0	(12.0-13.0') SILT, low plasticity, rapid dilatancy; moist; stiff; gray (10YR 5/1).			
15		0.0							
16		0.0							
17			60		0.0	(13.0-15.0') CLAY; some silt, medium to high plasticity, no dilatancy; some very fine to medium sand; little coarse sand to medium pebbles, subangular to subrounded; moist; stiff; gray (10YR 5/1).			
18		0.0							
19		0.0							
20		0.0							

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 4.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 730.03
measured. Well set from 15-20' bgs, additional well North Coor.: 560489.00
set in step out location from 4-9' bgs. East Coor.: 13305651.60

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/06/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/06/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 49°F, Rainy, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		(20.0-25.0') CLAY; little silt, medium to high plasticity, no dilatancy; little very fine to medium sand to small pebbles; trace medium to large pebbles, subangular to subrounded; moist; very stiff; gray (10YR 5/1).	(20.0-25.0' bgs) Bentonite	
22		0.0							
23		0.0							
24		0.0							
25		0.0							
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30121887
 Project Location: Flint, MI

Date Started: 04/06/2022 Date Completed: 04/06/2022
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 47°F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1						(0.0-1.0') CONCRETE.		(0.0-2.0' bgs) Bentonite	
2						(1.0-3.0') SAND, medium to very coarse, subangular to subrounded; and GRANULES to large PEBBLES, subangular to subrounded; some small to medium cobbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1).		(0.0-4.0' bgs) 2" Sch 40 PVC Well Casing	
3						(3.0-4.0') CLAY; little silt, medium to high plasticity, no dilatancy to slow dilatancy; and SAND, very fine to medium; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 5/3).		(2.0-9.0' bgs) Filter Pack Sand	
4			108			(4.0-6.5') SAND, very fine to coarse, subangular to subrounded; little silt; little very coarse sand to granules, subangular to subrounded; trace small to medium pebbles, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 4.0-8.0' bgs.		(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
5						(6.5-9.0') CLAY; and SILT, low to medium plasticity, no dilatancy to slow dilatancy; little very fine to medium sand; trace small to medium pebbles, angular to subrounded; poorly sorted; moist to wet; stiff; gray (10YR 5/1).			
6									
7									
8									
9									
10							Location was blind drilled to 9.0' bgs to install a well. Lithology presented here is from soil boring MW-04-152 (15-20).		
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 4.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Step out location. Well set from 4-9' bgs. Surface Elev.: 730.06
 North Coord.: 560500.94
 East Coord.: 13305661.42

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/06/2022 Logger: M. Olander
 Project Number: 30121887 Date Completed: 04/06/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 47°F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					NM	(0.0-1.0') CONCRETE.		(0.0-13.0' bgs) Bentonite	
2		60		0.0	(1.0-3.0') SAND, medium to very coarse, subangular to subrounded; and GRANULES to large PEBBLES, subangular to subrounded; some small to medium cobbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1).				
3				0.0	(3.0-4.0') CLAY; little silt, medium to high plasticity, no dilatancy to slow dilatancy; and SAND, very fine to medium; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 5/3).				
4					0.0	(4.0-6.5') SAND, very fine to coarse, subangular to subrounded; little silt; little very coarse sand to granules, subangular to subrounded; trace small to medium pebbles, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 4.0-8.0' bgs.		(0.0-15.0' bgs) 2" Sch 40 PVC Well Casing	
5				0.0	(6.5-11.0') CLAY; and SILT, low to medium plasticity, no dilatancy to slow dilatancy; little very fine to medium sand; trace small to medium pebbles, angular to subrounded; poorly sorted; moist to wet; stiff; gray (10YR 5/1).				
6		60		0.0	(11.0-13.0') CLAY; some silt, medium to high plasticity, no dilatancy; some very fine to medium sand; trace small to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff; gray (10YR 5/1).				
7					0.0	(13.0-15.0') CLAY; and SILT, low to medium plasticity, no dilatancy to slow dilatancy; little very fine to medium sand; trace small to medium pebbles, angular to subrounded; poorly sorted; moist to wet; stiff; gray (10YR 5/1).		(13.0-20.0' bgs) Filter Pack Sand	
8		60		0.0	(15.0-19.5') SAND, very fine to medium; some coarse to very coarse sand; some silt; little granules to large pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 15.0-19.5' bgs.				
9				0.0					
10					0.0			(15.0-20.0' bgs) 2" PVC 10-Slot Well Screen	
11				0.0					
12				0.0					
13		60			0.0				
14					0.0				
15					0.0				
16					0.0				
17		60			0.0				
18					0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 4.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 730.06
measured. Well set from 15-20' bgs, additional well North Coor: 560499.65
set in step out location from 4-9' bgs. East Coor: 13305660.30

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY LOGS.GPJ ARCADIS_2013.GDT 1/19/23

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/06/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/06/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 47°F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60		0.0		(19.5-25.0') CLAY; little silt, medium to high plasticity, no dilatancy; little very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; dry to moist; very stiff to hard; gray (10YR 5/1).	(20.0-25.0' bgs) Bentonite	
22					0.0				
23					0.0				
24					0.0				
25					0.0				
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/07/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/07/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 45°F, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					NM		(0.0-5.0') COBBLES, small to large, subangular to subrounded; some medium to very coarse sand to large pebbles, subangular to subrounded; poorly sorted; moist; grayish brown (10YR 5/2). FILL. Note: Concrete cobbles and pebbles.	(0.0-3.0' bgs) Bentonite	
2				NM					
3		38		NM					
4				NM					
5				NM					
6					NM		(5.0-10.0') SAND, fine to medium; some coarse sand; little silt; little granules to large pebbles, subangular to subrounded; poorly sorted; wet; grayish brown (10YR 5/2). Note: Wet from 5.0-10.0' bgs.	(5.0-10.0' bgs) 2" PVC 10-Slot Well Screen	
7				NM					
8		60		NM					
9				NM					
10				NM					
11					NM		(10.0-13.0') CLAY; and SILT, low to medium plasticity, no dilatancy to slow dilatancy; little very fine to medium sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; dry to moist; stiff; grayish brown (10YR 5/2).	(3.0-12.0' bgs) Filter Pack Sand	
12				NM					
13		60		NM					
14					NM		(13.0-20.0') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; poorly sorted; dry to moist; very stiff; gray (10YR 5/1).	(12.0-25.0' bgs) Bentonite	
15				NM					
16					NM			(12.0-25.0' bgs) Bentonite	
17				NM					
18		60		NM					
19				NM					
20				NM					

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 735.19
measured. Well set from 5-10' bgs. Unable to hand North Coord.: 560460.78
auger due to concrete and cobbles. East Coord.: 13305337.77

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/07/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/07/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 45°F, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond-shaped interval symbol]		60		NM	[Dotted pattern]	(20.0-24.0') SAND, very fine to medium; some coarse sand to granules; little silt; little medium to large pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 20.0-24.0' bgs.	(12.0-25.0' bgs) Bentonite	[Black shaded area]
22				NM					
23				NM					
24				NM					
25				NM	[Diagonal hatched pattern]	(24.0-25.0') CLAY; and SILT, low to medium plasticity, no dilatancy to slow dilatancy; little very fine sand to medium pebbles, subangular to rounded; poorly sorted; moist; stiff; gray (10YR 5/1).			
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/13/2022 Logger: M. Olander
 Project Number: 30121887 Date Completed: 04/13/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 69°F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1						(0.0-2.0')	COBBLES, small to large, subangular to subrounded; some small to large pebbles, subangular to subrounded; poorly sorted; dry; gray (10YR 5/1). FILL. Note: Concrete.	(0.0-7.0' bgs) Bentonite (0.0-9.0' bgs) 2" Sch 40 PVC Well Casing (7.0-14.0' bgs) Filter Pack Sand (9.0-14.0' bgs) 2" PVC 10-Slot Well Screen	
2					(2.0-5.0')	SAND, medium; little coarse sand; trace granules, subangular; poorly sorted; moist; brown (10YR 5/3).			
3					(5.0-7.5')	CLAY, medium to high plasticity, no dilatancy; and SAND, very fine to medium; trace granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff; brown (10YR 5/3).			
4					(7.5-9.0')	CLAY; little silt, high plasticity, no dilatancy; trace very fine sand to small pebbles, subangular to subrounded; poorly sorted; moist; grayish brown (10YR 5/2) to brown (10YR 5/3).			
5					(9.0-10.0')	SILT; some clay, low plasticity, rapid dilatancy; trace very fine sand to granules, subangular to subrounded; wet; medium stiff to stiff; grayish brown (10YR 5/2). Note: Wet from 9.0-11.5' bgs.			
6					(10.0-11.5')	SILT, low plasticity, rapid dilatancy; some very fine to medium sand; little granules to medium pebbles, subangular to subrounded; wet; medium stiff; brown (10YR 5/3).			
7					(11.5-14.0')	CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; moist; stiff to very stiff; brown (10YR 5/3) to gray (10YR 5/1).			
8									
9									
10									
11									
12									
13									
14									
15						Location blind drilled to 14.0' bgs to install a well. Lithology presented here is from MW-04-156 (20-25).			
16									
17									
18									
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 9.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Unable to hand auger due to concrete and cobbles. Converted to Well: Yes No
 Surface Elev.: 734.66
 North Coord.: 560437.78
 East Coord.: 13305359.65

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY LOGS\BUICK CITY ALL 2022_011223 LOGS.GPJ ARCADIS_2013.GDT 11/19/23

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/13/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/13/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 69°F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					NM		(0.0-2.0') COBBLES, small to large, subangular to subrounded; some small to large pebbles, subangular to subrounded; poorly sorted; dry; gray (10YR 5/1). FILL. Note: Concrete.	(0.0-18.0' bgs) Bentonite	
2				NM					
3		40		0.0		(2.0-5.0') SAND, medium; little coarse sand; trace granules, subangular; poorly sorted; moist; brown (10YR 5/3).			
4					0.0			(0.0-20.0' bgs) Sch 40 PVC Well Casing	
5					0.0				
6					0.0		(5.0-7.5') CLAY, medium to high plasticity, no dilatancy; and SAND, very fine to medium; trace granules to medium pebbles, subangular to subrounded; poorly sorted; moist; stiff; brown (10YR 5/3).		
7					0.0				
8		60			0.0		(7.5-9.0') CLAY; little silt, high plasticity, no dilatancy; trace very fine sand to small pebbles, subangular to subrounded; poorly sorted; moist; grayish brown (10YR 5/2) to brown (10YR 5/3).		
9					0.0		(9.0-10.0') SILT; some clay, low plasticity, rapid dilatancy; trace very fine sand to granules, subangular to subrounded; wet; medium stiff to stiff; grayish brown (10YR 5/2). Note: Wet from 9.0-11.5' bgs.		
10					0.0		(10.0-11.5') SILT, low plasticity, rapid dilatancy; some very fine to medium sand; little granules to medium pebbles, subangular to subrounded; wet; medium stiff; brown (10YR 5/3).		
11					0.0			(18.0-25.0' bgs) Filter Pack Sand	
12					0.0		(11.5-14.0') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand; trace granules to medium pebbles, subangular to subrounded; moist; stiff to very stiff; brown (10YR 5/3) to gray (10YR 5/1).		
13		60			0.0				
14					0.0		(14.0-15.0') SILT, low plasticity, rapid dilatancy; dry to moist; medium stiff to soft; gray (10YR 5/1).		
15					0.0		(15.0-20.0') CLAY; and SILT, low to medium plasticity, no dilatancy; little very fine to medium sand to large pebbles, subangular to subrounded; moist; stiff; gray (10YR 5/1).		
16					0.0				
17					0.0				
18		60			0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 9.0
 Drilling Fluid: Water Water Level Finish (ft. bgs.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Unable to hand auger due to concrete and cobbles. Surface Elev.: 734.66
 North Coord.: 560437.02
 East Coord.: 13305361.63

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/13/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/13/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 69°F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60		0.0	[Dotted pattern]	(20.0-25.0') SAND, very fine to medium; some coarse sand to granules, subangular to subrounded; little silt; little small to large pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 20.0-25.0' bgs.	(20.0-25.0' bgs) 2" PVC 10-Slot Well Screen	[Well diagram]
22				0.0					
23				0.0					
24				0.0					
25				0.0					
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/14/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/14/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 39°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well	
1							(0-0-2.0') COBBLES, small to large, subangular to subrounded; some coarse sand to large pebbles, subangular to subrounded; little medium sand; poorly sorted; dry to moist; gray (10YR 5/1). FILL. Note: Concrete and metal chunks.	(0.0-3.0' bgs) Bentonite		
2					(2.0-5.0') SAND, medium; little coarse sand to medium cobbles, angular to subrounded; poorly sorted; moist; brown (10YR 5/3).					(0.0-5.0' bgs) 2" Sch 40 PVC Well Casing
3										
4					(5.0-10.0' bgs) 2" PVC 10-Slot Well Screen					
5						Location was blind drilled to 10.0' bgs to install a well. Lithology presented here is from soil boring MW-04-157 (20-25).				
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Unable to hand auger due to cobbles. Converted to Well: Yes No
 Surface Elev.: 734.93
 North Coor.: 560438.58
 East Coor.: 13305349.17

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY LOGS\BUICK CITY ALL 2022_011223 LOGS.GPJ ARCADIS_2013.GDT 11/19/23

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30121887
 Project Location: Flint, MI

Date Started: 04/14/2022 Date Completed: 04/14/2022
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 39°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well	
1					0.0		(0-0.2.0') COBBLES, small to large, subangular to subrounded; some coarse sand to large pebbles, subangular to subrounded; little medium sand; poorly sorted; dry to moist; gray (10YR 5/1). FILL. Note: Concrete and metal chunks.	(0.0-18.0' bgs) Bentonite		
2				0.0						
3		60			0.0		(2.0-5.0') SAND, medium; little coarse sand to medium cobbles, angular to subrounded; poorly sorted; moist; brown (10YR 5/3).			
4				0.0						
5				0.0						
6					0.0		(5.0-10.0') SAND, fine to medium; little silt; little coarse sand; trace small to large pebbles; poorly sorted; wet; brown (10YR 5/3). Note: Wet from 5.0-10.0' bgs.			(0.0-20.0' bgs) 2" Sch 40 PVC Well Casing
7				0.0						
8		60			0.0					
9				0.0						
10					0.0		(10.0-13.0') CLAY; and SILT, medium plasticity, no dilatancy; little very fine sand to medium pebbles, subangular to subrounded; moist; stiff; brown (10YR 5/3).			
11				0.0						
12				0.0						
13		60			0.0		(13.0-14.5') CLAY; some silt, medium to high plasticity, no dilatancy; little very fine to medium sand to small pebbles, subangular to subrounded; dry to moist; stiff to very stiff; gray (10YR 5/1).			
14				0.0						
15					0.0		(14.5-15.0') SAND, very fine to medium; some silt; dry to moist; well sorted; gray (10YR 5/1).			
16				0.0						
17					0.0		(15.0-17.0') CLAY; and SILT, medium plasticity, no dilatancy; little very fine sand to medium pebbles, subangular to subrounded; moist; stiff; brown (10YR 5/3).	(18.0-25.0' bgs) Filter Pack Sand		
18		60			0.0					
19				0.0						
20					0.0					
					0.0		(17.0-20.5') CLAY; little silt; and SAND, very fine to medium; little granules to small pebbles, subangular to subrounded; poorly sorted; moist; gray (10YR 5/1).			
				0.0						

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Unable to hand auger due to cobbles. Surface Elev.: 734.93
 North Coord.: 560437.19
 East Coord.: 13305350.60

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 04/14/2022 Logger: M. Olender
 Project Number: 30121887 Date Completed: 04/14/2022 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 39°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60		0.0	[Dotted pattern]	(20.5-25.0') SAND, very fine to medium; some silt; some coarse sand; little granules to medium pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 20.5-25.0' bgs.	(20.0-25.0' bgs) 2" PVC 10-Slot Well Screen	[Well diagram]
22					0.0				
23					0.0				
24					0.0				
25					0.0				
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Date Start/Finish: 3/9/00 / 3/9/00 Drilling Company: RAU Drilling Driller's Name: Rick Rau Drilling Method: Hollow Stem Auger Auger Size: 4.25" ID Rig Type: CME 55 Sampling Method: Split Spoon Hammer Weight: 140 lb.	Borehole Depth: 14.0 feet Geologist: Matt Stuk	Well No: 04-4 Client: General Motors Corporation Location: GM NAO Flint Site Building 04 Area
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DEPTH	ELEVATION	Sample Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID (ppm) Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
										GROUND SURFACE	
		(0-2')		3 5 8 10	13	1.67	0.0			Asphalt. Black Sand FILL, dry, no odor.	
		(2-4')		7 11 14 19	25	2.0	0.1				
5		(4-6')		8 13 14 22	27	2.0	7.6				
		(6-8')		6 16 22 28	38	1.67	1.0		Wet.		
		(8-10')		4 6 4 4	10	1.83	0.0		Brown Sandy lean CLAY, some fine to coarse Sand, moist, no odor.		
10		(10-12')		3 2 1 2	3	0.83	0.0		Brown Clayey GRAVEL, wet.		
		(12-14')		8 50 - -	NA	0.33	0.0		Auger refusal at 12.5' bgs.		
5									End of boring at 14.0' bgs.		

	Remarks: bgs - below ground surface. NA - Not Available. Soil sample collected from 4-6' bgs for VOCs, metals, SVOCs, and PCBs.	Water Levels		
		Date / Time	Elevation	Depth

Project Name: GM-NAO FLINT OPERATIONS
 Project Number: 041057F001
 Location: T.7N R.7E 7
 T R SEC QTR QTR
 Northing: _____ Easting: _____
 Ground Surface Elev.: 730.42
 Property Owner/Contact: GENERAL MOTORS

Date(s) Drilled: 10/10/95
 Logged By: DARRYL BARRICKLOW
 Contractor: SOMAT ENGINEERING
 Drill Rig/Method: HOLLOW STEM AUGER
 Sampling Method: SPLIT SPOON
 Borehole Diam.: 8" Drilling Fluid: NONE
 Depth to Water: 14.02 Total Depth: 22.0'
 Application: MONITORING WELL INSTALLATION

Depth (ft)	Lithology	Samples	Color	Org. Vapor (ppm)	Sample ID	Recovery %	USCS Code	Lithologic Description
0.0-0.6'								ASPHALT AND CONCRETE.
0.7-3.3'							SP	SAND AND CINDER, BLACK/BROWN, DRY TO SLIGHTLY MOIST.
3.3-4.9'							CL	CLAY WITH SOME SILT, TRACE SAND AND GRAVEL, OLIVE/BROWN, SLIGHTLY MOIST.
4.9-6.0'								SAND WITH TRACE SILT AND FINE GRAVEL, BROWN/ORANGE, SLIGHTLY MOIST, FINE GRAINED.
6.0-9.3'							SP	S.A.A.: FINE SAND TO FINE GRAVEL. MOIST TO WET.
9.3-10.2'							CL	CLAY AND SILT, BROWN, SLIGHTLY MOIST.
10.2-12.0'							CH	CLAY WITH VARYING SILT AND SAND LENSES, GRAY, MOIST TO WET.
12.0-16.8'							CL	CLAY WITH SILT TO COARSE GRAVEL, GRAY, DRY, HARD.
16.8-17.8'							SP	SAND (FINE GRAINED) TO COARSE GRAVEL, GRAY, WET.
17.8-18.3'							ML	SILT WITH SOME CLAY, GRAY, SLIGHTLY MOIST.
18.3-19.0'							SM	SILT AND FINE SAND WITH SOME GRAVEL, GRAY, MOIST.
19.0-19.8'							CL	CLAY WITH SOME SILT AND GRAVEL, GRAY, SLIGHTLY MOIST.
19.8-20.0'							SM	SILT WITH SOME SAND, GRAY, WET.
20.0-22.0'							CL	CLAY WITH SOME SILT TO GRAVEL, GRAY, STIFF TO HARD. SILT SEAMS.
								TOTAL DEPTH DRILLED = 22.0 FEET
								WELL SET FROM 15.0 TO 22.0'
								GROUNDWATER SAMPLE COLLECTED FROM 15.0 TO 20.0'

Comments: COLOR CODE- GEOLOGICAL SOCIETY OF AMERICA ROCK COLOR CHART

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/29/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/29/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 67°F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1				SB-04-17(1-1.5) _052920 @ 0820	0.0	(0.0-0.2') TOPSOIL, grass.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-3.0' bgs) Bentonite (3.0-12.0' bgs) Filter Pack Sand		
2			0.0		(0.2-1.0') CONCRETE.				
3		72		SB-04-17(4.5-5) _052920 @ 0825	0.0	(1.0-4.0') SAND, fine to medium, subangular to subrounded; trace granules to small pebbles, subangular to subrounded; poorly sorted; loose; moist; brown (10YR 5/3). FILL. Note: Little gravel, angular to subangular at 2.0'bgs. FILL.			
4			0.0						
5			0.0						
6				SB-04-17(8-8.5) _052920 @ 0830	0.0	(4.0-7.0') CLAY, medium to high plasticity; some fine to medium sand, subangular to subrounded; little small pebbles, subangular to subrounded; trace gravel, subangular to subrounded; poorly sorted; stiff to very stiff; moist to wet; brown (10YR 5/3) to dark gray (10YR 4/1). Note: Wet from 6-9' bgs.	(5.0-10.0' bgs) 2" PVC 10-Slot Well Screen		
7			0.0						
8		48		SB-04-17(12.5-13) _052920 @0835	0.0	(7.0-8.5') SAND, very fine to medium, subangular to subrounded; trace granules; trace silt, rapid dilatancy; loose to dense; wet; black (10YR 2/1).			
9			0.0						
10				SB-04-17(16.5-17) _052920 @ 0840	0.0	(8.5-13.0') CLAY, high plasticity, no dilatancy; little fine to medium sand, subangular to subrounded; trace granules to small pebbles, subangular to subrounded; medium stiff to stiff; moist to wet; grayish brown (10YR 5/2) to brown (10YR 5/3).			
11			0.0						
12				SB-04-17(18.5-19) _052920 @ 0845	0.0	(13.0-18.5') CLAY, medium plasticity, no dilatancy to slow dilatancy; little silt to very fine to medium sand, subangular to subrounded; trace small to medium pebbles, subangular to subrounded; poorly sorted; medium stiff to very stiff; moist; gray (10YR 5/1).	(12.0-17.0' bgs) Bentonite		
13		60			0.1				
14				SB-04-17(18.5-19) _052920 @ 0845	0.1				
15			0.0						
16				SB-04-17(18.5-19) _052920 @ 0845	0.0	(18.5-19.0') SAND, fine to very coarse; trace granules; loose to medium dense; moist; gray (10YR 5/1).	(17.0-25.0' bgs) Filter Pack Sand		
17		60			0.0				
18					0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 6.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary wells installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 734.3
 North Coor.: 560421.1
 East Coor.: 13305359.7

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ - ARCADIS - 2019.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/29/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/29/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 67°F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60	SB-04-17(22-22.5)	0.0		(19.0-25.0') CLAY, medium to high plasticity, no to slow dilatancy; little silt; trace fine to medium sand; medium stiff to very stiff; moist to wet; gray (10YR 5/1). Note: Wet from 19.0-24.0' bgs.	(19.0-24.0' bgs) 2" PVC 10-Slot Well Screen	
22				_052920 @ 0850	0.1				
23					0.1				
24					0.1				
25				SB-04-17(24.5-25)	0.0				
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/28/2020 Logger: E. Redner
 Project Number: 30075935 Date Completed: 05/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 72°F, Overcast

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			0				(0.0-1.0') CONCRETE. Note: No recovery.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-3.0' bgs) Bentonite (3.0-10.5' bgs) Filter Pack Sand	
2			60	SB-04-18(1-1.5) _052820 @ 0950	0.0		(1.0-5.0') SAND, fine to medium, subrounded to subangular; trace granules to small pebbles, subrounded to subangular; well sorted; very loose; dry to moist; black (10YR 2/1). FILL.		
3			60		0.0				
4			60	SB-04-18(4.5-5) _052820 @ 0955	0.0		Note: Wet at 5.0' bgs.		
5			60		0.9		(5.0-6.5') SAND, very fine to small PEBBLE, subrounded; some silt; little clay, nonplastic, rapid dilatancy; poorly sorted; moist to wet; black (10YR 2/1). FILL.		
6			60		2.2				
7			60	SB-04-18(8-8.5) _052820 @ 0958	0.3		(6.5-10.0') SAND, very fine to fine; some silt; some clay, low to medium plasticity, slow to rapid dilatancy; trace granules to small pebbles, subrounded; well sorted; moist to dry; medium dense; dark gray (10YR 4/1) to grayish brown (10YR 5/2). FILL.	(5.0-10.0' bgs) 2" PVC 10-Slot Well Screen	
8			60		0.5				
9			60		0.2				
10			60		0.0				
11			0		0.0		(10-16') CONCRETE.		
12			41		0.0			(10.5-14.0' bgs) Bentonite	
13			41		0.0				
14			41		0.0				
15			41		0.0			(14.0-22.0' bgs) Filter Pack Sand	
16			41		0.0				
17			48	SB-04-18(16.5-17) _052820 @ 1020	0.0		(16.0-18.5') SAND, very fine to medium, subrounded to subangular; some silt; little to trace little granules to medium pebble, subrounded; poorly sorted; medium dense; moist to wet; gray (10YR 5/1). Note: Wet at 16.5' bgs.	(16.0-21.0' bgs) 2" PVC 10-Slot Well Screen	
18			48		0.0				
19			48	SB-04-18(18.5-19) _052820 @ 1028	0.0		(18.5-25.0') SAND, very fine to fine; and SILT; trace granules to medium pebbles, subrounded to rounded; well sorted; dry, very dense; gray (10YR 5/1) to gray (10YR 6/1).		
20			48		0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary wells installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 730.2
 North Coord.: 560336.7
 East Coord.: 13305359.6

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/28/2020 Logger: E. Redner
 Project Number: 30075935 Date Completed: 05/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 72°F, Overcast

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		(18.5-25.0') SAND, very fine to fine; and SILT; trace granules to medium pebbles, subrounded to rounded; well sorted; dry, very dense; gray (10YR 5/1) to gray (10YR 6/1).	(22.0-25.0' bgs) Bentonite	
22			SB-04-18(22-22.5)	0.0					
23		60	_052820 @ 1035	0.0					
24				0.0					
25			SB-04-18(24.5-25)	0.0					
				_052820 @ 1040					
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/28/2020 Logger: E. Redner
 Project Number: 30075935 Date Completed: 05/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 78°F, Rainy, overcast

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			0				(0.0-1.0') CONCRETE.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing	
2				SB-04-19(1-1.5) _052820 @1230	0.0		(1.0-2.5') SAND, fine to granules, subangular to subrounded; little small pebbles to medium pebbles, subrounded; dry; loose to medium dense; very dark grayish brown (10YR 3/2) to light brownish gray (10YR 6/2).	(0.3-6.0' bgs) Bentonite	
3			48		0.0		(2.5-7.5') SAND, very fine to coarse, subangular to subrounded; little silt; moist to wet; medium dense; dark grayish brown (10YR 4/2).		
4				SB-04-19(4-4.5) _052820 @1233	0.0				
5					0.0		Note: A little wet at 5.5' bgs		
6					0.0				
7					0.0			(6.0-14.0' bgs) Filter Pack Sand	
8			60	SB-04-19(8-8.5) _052820 @1240	0.0		(7.5-8.5') CLAY, medium plasticity, slow to rapid dilatancy; some silt; little very fine to fine sand; trace granules to small pebbles, subangular to subrounded; moist; stiff; olive brown (2.5YR 4/3). Note: Wet at 8.5' bgs.		
9					0.0		(8.5-10.0') SILT; some very fine to fine sand; little clay; nonplastic to low plasticity, rapid dilatancy; well sorted; wet; medium dense; light olive brown (2.5YR 5/4).	(8.0-13.0' bgs) 2" PVC 10-Slot Well Screen	
10					0.0		(10.0-20.0') SAND, very fine to coarse, subangular; some silt; poorly sorted; moist to wet; loose to dense; gray (10YR 6/1). Note: Wet at 10.5' bgs.		
11					0.0				
12					0.0				
13			60	SB-04-19(12.5-13) _052820 @1255	0.0				
14					0.0				
15					0.0				
16				SB-04-19(16.5-17) _052820 @1258	0.0				
17					0.0				
18			60	SB-04-19(18.5-19) _052820 @1300	0.0			(14.0-25.0' bgs) Bentonite	
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 5.5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary well installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 731.3
 North Coord.: 560390.7
 East Coord.: 13305387.4

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ ARCADIS - 2019.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/28/2020 Logger: E. Redner
 Project Number: 30075935 Date Completed: 05/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 78°F, Rainy, overcast

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60	SB-04-19(22-22.5) _052820 @1310	0.0		(20.0-25.0') SILT; some very fine to fine sand; some clay, nonplastic, rapid dilatancy; trace granules, subangular; well sorted; dry; very dense; dark gray (10YR 5/4) to gray (10YR 5/1)	(14.0-25.0' bgs) Bentonite	[Black box]
22					0.0				
23					0.0				
24					0.0				
25				SB-04-19(24.5-25) _052820 @1315					
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/28/2020 Logger: E. Redner
 Project Number: 30075935 Date Completed: 05/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 72°F

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			0				(0.0-1.0') CONCRETE. Note: No recovery.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing	
2				SB-04-20(1-1.5) _052820 @ 0755	0.0		(1.0-6.5') SAND, fine to medium, subrounded; trace very coarse sand to medium pebble, subrounded; poorly sorted; dry to moist; very loose; black (10YR 2/1).		
3			48		0.0				
4				SB-04-20(4.5-5.0) _052820 @ 0800	0.0			(0.3-8.0' bgs) Bentonite	
5									
6					1.3 0.3				
7					0.1 2.0		(6.5-7.0') SAND, fine to large pebble, subrounded; poorly sorted; dry to moist; loose; very dark gray (10YR 3/1) to white (10YR 8/1).		
8			60	SB-04-20(8-8.5) _052820 @ 0810	0.8		(7.0-7.5') SAND, medium to coarse, subangular, some granules to medium pebbles; wet; black (10YR 2/1). Note: Wet at 7.5' bgs.		
9					0.6 0.2		(7.5-10.0') CLAY, medium to low plasticity, moderate dilatancy; little very fine to very coarse sand, subangular to subrounded; medium stiff; moist; gray (10YR 5/1). Note: Wet at 11.0' bgs.	(8.0-16.0' bgs) Filter Pack Sand	
10									
11					0.0		(10.0-11.0') CLAY, nonplastic to low plasticity, rapid dilatancy; and SAND, very fine to medium, subrounded; poorly sorted; moist to wet; soft to medium stiff; gray (10YR 5/1).		
12					0.0				
13			60	SB-04-20(12.5-13) _052820 @ 0815	0.0		(11.0-16.0') SAND, very fine to coarse, subangular to subrounded; little to some silt, rapid dilatancy; little clay, low plasticity; poorly sorted; moist to wet; loose to medium dense; gray (10YR 6/1).	(10.0-15.0' bgs) 2" PVC 10-Slot Well Screen	
14					0.0				
15					0.0				
16					0.0				
17				SB-04-20(16.5-17.0) _052820 @ 0830	0.0		(16.0-20.0') SAND, very fine to fine; some silt; some clay, nonplastic, rapid dilatancy; trace granules to small pebbles, subrounded to rounded; poorly sorted; dry; dense; gray (10YR 5/1).		
18			60		0.0				
19				SB-04-20(18.5-19) _052820 @ 0835	0.0			(16.0-25.0' bgs) Bentonite	
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 7.5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary well installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 730.0
 North Coord.: 560339.6
 East Coord.: 13305437.7

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/28/2020 Logger: E. Redner
 Project Number: 30075935 Date Completed: 05/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 72°F

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	-		60	SB-04-20(22-22.5) _052820 @ 0840	0.3	SP	(20.0-21.5') SAND, very fine to fine; and SILT; well sorted; very dense; dry; gray (10YR 6/1).	(16.0-25.0' bgs) Bentonite	█
22					0.7				
23					0.3	SM	(21.5-25.0') SAND, very fine to fine; some silt; little to some clay, nonplastic, rapid dilatancy; trace granule to small pebble, subrounded; well sorted; very dense; dry; gray (10YR 5/1).		
24	0.3								
25				SB-04-20(24.5-25) _052820 @ 0845	0.2				
26					0.0		End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/27/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/27/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 84°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			18		0.0		(0.0-1.5') CONCRETE.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing	
2				SB-04-25(1.5-2.5) _052720 @1505	0.0		(1.5-2.5') SAND, fine to coarse, subangular to subrounded; and GRANULES to medium PEBBLES, subangular to subrounded; some gravel, subangular to subrounded; little large pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1) to gray (10YR 5/1). FILL.	(0.3-3.0' bgs) Bentonite	
3					0.0				
4			54		0.0		(2.5-8.0') SAND, fine to very coarse, subangular to subrounded; and GRANULES to medium PEBBLES, subangular to subrounded; some small to medium cobbles, subangular to subrounded; trace gravel, subangular to subrounded; trace silt; poorly sorted; moist to wet; very dark grayish brown (10YR 3/2) to brown (10YR 5/3). FILL.	(3.0-10.0' bgs) Filter Pack Sand	
5				SB-04-25(4.5-6.5) _052720 @1515	0.0				
6					0.0			(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
7					0.0		(8.0-23.0') CLAY, low to medium plasticity; and SILT, slow to medium dilatancy; trace granules to medium pebbles, subangular to subrounded; trace fine to medium sand, subangular to subrounded; stiff to very stiff; moist to wet. FILL. Note: Wet from 6-8' bgs and 10-17' bgs.		
8			48		0.0				
9					0.0				
10					0.0				
11					0.0			(10.0-11.0' bgs) Bentonite	
12					0.0			(11.0-19.0' bgs) Filter Pack Sand	
13			60		0.0				
14					0.0			(12.0-17.0' bgs) 2" PVC 10-Slot Well Screen	
15					0.0				
16				SB-04-25(15-17) _052720 @1530	0.0				
17					0.0				
18			60		0.0				
19					0.0				
20					0.0			(19.0-25.0' bgs) Bentonite	

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 6.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary wells installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 729.8
 North Coord.: 560476.1
 East Coord.: 13305677.0

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/27/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/27/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 84°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60		0.0	[Diagonal hatching]	(8.0-23.0') CLAY, low to medium plasticity; and SILT, slow to medium dilatancy; trace granules to medium pebbles, subangular to subrounded; trace fine to medium sand, subangular to subrounded; stiff to very stiff; moist to wet. FILL. Note: Wet from 6-8' bgs and 10-17' bgs.	(19.0-25.0' bgs) Bentonite	[Black bar]
22					0.0				
23					0.0				
24					0.0	[Dotted pattern]	(23.0-25.0') CONCRETE; and GRAVEL, subangular; gray (10YR 5/1).		
25					0.0				
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/27/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/27/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 74°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			12				(0.0-1.0') CONCRETE.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-3.0' bgs)	
2			60	SB-04-26(1-2.5) _052720 @0830	0.0		(1.0-4.0') SAND, medium to fine, subangular to subrounded; little granules to small pebbles, subangular to subrounded; trace medium pebbles, subangular; poorly sorted; moist; black (10YR 2/1). Note: Little medium pebbles to small cobbles, subangular to subrounded at 3.0' bgs.	Bentonite (3.0-11.0' bgs) Filter Pack Sand	
3					0.0				
4					0.0				
5				SB-04-26(4.5-6.5) _052720 @1005	0.0		(4.0-6.5') SAND, medium to fine, subangular to subrounded; and GRANULES to medium PEBBLES, subangular to subrounded; some large pebbles, subangular to subrounded; little small cobbles, subangular to subrounded. Note: Wet at 6.0' bgs.		
6					0.0				
7					0.7		(6.5-7.0') SILT, slow dilatancy; some clay, low to medium plasticity; stiff; wet; grayish brown (10YR 5/2).	(5.0-10.0' bgs) 2" PVC 10-Slot Well Screen	
8			45		0.1		(7.0-8.0') SAND, fine to medium, subangular to subrounded; little granules to medium pebbles, subangular to subrounded; trace silt; poorly sorted; wet; black (10YR 2/1) to brown (10YR 5/3). Note: Brick fragments from 8.0-8.2' bgs.		
9					0.1				
10					0.1		(8.0-25.0') CLAY, high plasticity, no dilatancy; some fine to medium sand, subangular; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist to wet; gray (10YR 5/1). Note: Moist at 15.0' bgs.		
11					0.2				
12					0.1				
13			60		0.1				
14					0.1				
15					0.1				
16				SB-04-26(15-17) _052720 @1020	0.1			(11.0-25.0' bgs) Bentonite	
17					0.1				
18			60		0.1				
19					0.1				
20					0.1				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 6.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary well installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 729.5
 North Coord.: 560426.6
 East Coord.: 13305629.2

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/27/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/27/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 74°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60		0.1		(8.0-25.0') CLAY, high plasticity, no dilatancy; some fine to medium sand, subangular; little granules to medium pebbles, subangular to subrounded; poorly sorted; moist to wet; gray (10YR 5/1). Note: Moist at 15.0' bgs.	(11.0-25.0' bgs) Bentonite	
22					0.1				
23					0.1				
24					0.1				
25					0.8				
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/27/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/27/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 81°F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			18		0.0	(0.0-1.5') CONCRETE.		(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing	
2				SB-04-28(1.5-2.5) _052720 @1130	0.0	(1.5-3.0') SAND, fine to very coarse, subrounded to subangular; and large PEBBLES to medium COBBLES, subangular to subrounded; little granules to small pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1) to brown (10YR 5/3).		(0.3-3.0' bgs) Bentonite	
3			10		0.0	(3.0-6.0') SAND, fine to coarse, subangular to subrounded; trace granules to small pebbles, subangular to subrounded; trace small cobbles, subangular to subrounded; poorly sorted; moist; brown (10YR 5/3). Note: Wet from 5.0 - 17.0' bgs		(3.0-12.0' bgs) Filter Pack Sand	
4			12		0.0				
5				SB-04-28(4.5-6.5) _052720 @1135	0.0				
6					0.0	(6.0-25.0') CLAY, medium to high plasticity, no dilatancy; little fine to coarse sand, subangular to subrounded; trace granules to medium pebbles, subangular to subrounded; medium stiff to very stiff; wet to moist; gray (10YR 5/1).		(5.0-10.0' bgs) 2" PVC 10-Slot Well Screen	
7					0.0				
8			48		0.0				
9					0.0				
10					0.0				
11					0.0				
12					0.0				
13			57		0.0			(12.0-13.0' bgs) Bentonite	
14					0.0			(13.0-22.0' bgs) Filter Pack Sand	
15					0.0				
16				SB-04-27(15-17) _052720 @1140	0.0				
17					0.0				
18			60		0.0			(15.0-20.0' bgs) 2" PVC 10-Slot Well Screen	
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Dave Gordon Sampling Interval: Continuous
 Drilling Method: Hand Auger / Sonic Drilling Water Level Start (ft. bgs.): 5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: Temporary wells installed. bgs = below ground surface; NA = not applicable; btoc = below top of casing; ft = feet; NM= not measured. Converted to Well: Yes No
 Surface Elev.: 729.1
 North Coord.: 560386.3
 East Coord.: 13305641.9

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ / ARCADIS - 2013.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 05/27/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 05/27/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 81°F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60		0.0	[Diagonal lines]	(6.0-25.0') CLAY, medium to high plasticity, no dilatancy; little fine to coarse sand, subangular to subrounded; trace granules to medium pebbles, subangular to subrounded; medium stiff to very stiff; wet to moist; gray (10YR 5/1). Note: Moisture change to dry to moist at 20.0' bgs.	(22.0-25.0' bgs) Bentonite	[Stippled pattern]
22					0.0				[Stippled pattern]
23					0.0				[Stippled pattern]
24					0.0				[Stippled pattern]
25					0.0				[Stippled pattern]
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/28/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 81°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1				SB-04-34(1.5-2.5) _072820 @ 1405	0.0	(0.0-0.2') TOPSOIL/GRASS.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-2.0' bgs) Bentonite (2.0-10.0' bgs) Filter Pack Sand (4.0-9.0' bgs) 2" PVC 10-Slot Well Screen (10.0-16.0' bgs) Bentonite (16.0-25.0' bgs) Filter Pack Sand (18.0-23.0' bgs) 2" PVC 10-Slot Well Screen		
2		60	0.0		(0.2-2.5') SAND, fine to medium; and GRAVEL, subangular to subrounded; some small to medium pebbles, subangular to subrounded; little small to medium cobbles, subangular to subrounded; poorly sorted; dry; grayish brown (10YR 5/2). FILL. Note: Plastic/PVC and metal peices observed at 1.0' bgs.				
3			0.0		(2.5-3.0') CONCRETE.				
4			0.0		(3.0-5.0') NO RECOVERY.				
5									
6				SB-04-34(9.5-10) _072820 @ 1410	0.0	(5.0-6.0') SAND, fine to medium; and GRAVEL, subangular to subrounded; some small to medium pebbles, subangular to subrounded; little small to medium cobbles, subangular to subrounded; poorly sorted; wet; grayish brown (10YR 5/2). FILL.			
7		60	0.0		(6.0-7.5') SAND, fine to medium; some clay; poorly sorted; wet; medium stiff; brown (10YR 5/2) to black (10YR 2/1).				
8			0.0		(7.5-9.0') SAND, fine to medium; wet; black (10YR 2/1).				
9			0.0						
10					0.0	(9.0-18.5') CLAY, high plasticity; little silt; little pebbles, subangular to subrounded; trace fine to medium sand; poorly sorted; moist; stiff to very stiff; brown (10YR 5/3) to gray (10YR 5/1). Note: Wet from 10.0' to 23.0' bgs.			
11			0.0						
12			0.0						
13		60	0.0						
14			0.0						
15					0.0				
16			0.0						
17		60	0.0						
18			0.0						
19					0.0	(18.5-23.0') SAND, fine to very coarse, subangular to subrounded; little granules to small pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1).			
20			0.0						

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary wells screened from 4-9' and 18-23' bgs. Surface Elev.: 734.0
 North Coord: 560421.5
 East Coord: 13305394.3

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ ARCADIS - 2019.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/28/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 81°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60	SB-04-34(24.5-25) _072820 @ 1415	0.0	[Dotted pattern]	(18.5-23.0') SAND, fine to very coarse, subangular to subrounded; little granules to small pebbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1).	(18.0-23.0' bgs) 2" PVC 10-Slot Well Screen	[Well diagram]
22					0.0	[Dotted pattern]			
23					0.0	[Dotted pattern]			
24					0.0	[Diagonal lines]	(23.0-25.0') CLAY, high plasticity; little silt; little pebbles, subangular to subrounded; trace fine to medium sand; poorly sorted; dry; stiff to very stiff; brown (10YR 5/3) to gray (10YR 5/1).		
25					0.0	[Diagonal lines]			
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 01/14/2021 Logger: E. Redner
 Project Number: 30075935 Date Completed: 01/14/2021 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 36°F, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1	[Diamond symbol]	36	36	SB-04-34R(0-2)	0.0	[Organics symbol]	(0.0-0.2') ORGANICS.	(0.0-3.0' bgs) Backfilled with bentonite.	[Black box]
2				011421 @ 1110 and	0.0	[Sand symbol]	(0.2-2.2') SAND, very fine to small cobbles, subangular to rounded; poorly sorted; dry to moist; grayish brown (10YR 5/2). FILL. Note: Backfill, construction material observed from 0.2-3.0' bgs.		
3				1120	0.0	[Concrete symbol]	(2.2-2.5') CONCRETE.		
4							End of boring at 3.0' bgs.		
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Chris Barden Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): NA
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 734.2
measured. Hand augering the first 5.0' bgs could not North Coord: 560419.7
be completed due to concrete cobbles. Shelby tube East Coord: 13305396.5

sample collected from 0-2' bgs.

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30043300
 Project Location: Flint, MI

Date Started: 07/30/2020 Date Completed: 07/30/2020
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 67°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
0.0			6				(0.0-0.5') CONCRETE.	(0.0-2.0' bgs) 2" Sch 40 PVC Well Casing (2.0-10.0' bgs) Filter Pack Sand	
1				SB-04-46(1-1.5) _073020 @ 0825	0.0		(0.5-6.0') SAND, fine to medium; little coarse to very coarse sand, subangular to subrounded; trace granules, subangular to subrounded; poorly sorted; moist; brown (10YR 5/3) to black (10YR 2/1). FILL.		
2			54		0.0				
3					0.0				
4				SB-04-46(4-4.5) _073020 @ 0830	0.0				
5					0.6		Note: Wet at 5.5' bgs.	(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
6					3.6		(6.0-9.0') SAND, fine to very coarse, subangular to subrounded; and small to large COBBLES, subangular to subrounded; some granules to large pebbles, subangular to subrounded; little clay; poorly sorted; wet; gray (10YR 5/1). FILL. Note: Concrete chunks observed throughout.		
7			60		1.0				
8					4.0				
9					NA		(9.0-10.0') CONCRETE.		
10					0.0		(10.0-11.0') SAND, fine to very coarse, subangular to subrounded; and small to large COBBLES, subangular to subrounded; some granules to large pebbles, subangular to subrounded; little clay; poorly sorted; wet; gray (10YR 5/1). FILL.		
11					NA		(11.0-14.0') CONCRETE.		
12			60		0.0				
13					0.0				
14				SB-04-46(14-14.5) _072020 @ 0915	0.0				
15					0.0		(14.0-25.0') CLAY, low to medium plasticity; and SAND, fine to medium; little silt; little granules to small pebbles, subangular to subrounded; medium stiff; gray (10YR 5/1).	(10.0-25.0' bgs) Bentonite	
16				SB-04-46(16.5-17) _073020 @ 0920	0.0				
17			60		0.0				
18				SB-04-46(18.5-19) _073020 @ 0925	0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 5.5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary well screened from 4-9' bgs. Surface Elev.: 730.7
 North Coord.: 560367.5
 East Coord.: 13305461.6

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30043300
 Project Location: Flint, MI

Date Started: 07/30/2020 Date Completed: 07/30/2020
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 67°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60	SB-04-46(22-22.5)	0.0		(14.0-25.0') CLAY, low to medium plasticity; and SAND, fine to medium; little silt; little granules to small pebbles, subangular to subrounded; medium stiff; gray (10YR 5/1).	(10.0-25.0' bgs) Bentonite	
22				_073020 @ 0930	0.0				
23					0.0				
24				SB-04-46(24.5-25)	0.0				
25				_073030 @ 0935	0.0				
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/30/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/30/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 77°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			6		0.0		(0.0-0.5') CONCRETE.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing	
2				SB-04-47(1-1.5) _073020 @ 1310	0.0		(0.5-3.0') SAND, fine to very coarse, subangular to subrounded; and GRAVEL, subangular to subrounded; poorly sorted; dry to moist; grayish brown (10YR 5/2).	(0.3-205' bgs) Bentonite (2.0-10.0' bgs) Filter Pack Sand	
3			54		0.0		(3.0-5.0') SAND, fine to medium; trace silt; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist; black (10YR 2/1) to brown (10YR 5/3).		
4				SB-04-47(4-4.5) _073030 @ 1315	0.0				
5					0.0		(5.0-6.0') SAND, fine to very coarse, subangular to subrounded; and GRAVEL, subangular to subrounded; poorly sorted; dry to moist; grayish brown (10YR 5/2).	(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
6					0.0		(6.0-7.0') SAND, fine to medium; trace silt; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist; black (10YR 2/1) to brown (10YR 5/3). Note: Wood fragments observed. Note: Wet from 6.0-9.0' bgs.		
7			60		0.0		(7.0-9.0') SAND, fine to very coarse, subangular to subrounded; and GRAVEL, subangular to subrounded; some small pebbles to medium cobbles, subangular to subrounded; poorly sorted; wet; grayish brown (10YR 5/2).		
8				SB-04-47(9-9.5) _073020 @ 1320	0.0				
9					0.0		(9.0-15.0') CLAY, low to medium plasticity; and SILT, slow dilatancy; little fine to medium sand; trace granules to small pebbles, subangular to subrounded; poorly sorted; moist; medium stiff to stiff; grayish brown (10YR 5/2).	(10.0-12.0' bgs) Bentonite	
10					0.0				
11			60		0.0			(12.0-25.0' bgs) Filter Pack Sand	
12					0.0				
13					0.0				
14					0.0				
15					0.0				
16					0.0		(15.0-19.0') SAND, fine to coarse, subangular to subrounded; some very coarse sand, subangular to subrounded; trace granules, subangular to subrounded; little silt; poorly sorted.	(14.0-19.0' bgs) 2" PVC 10-Slot Well Screen	
17			60		0.0				
18					0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 6.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary wells screened from 4-9' and 14-19' bgs. Surface Elev.: 731.4
 North Coord.: 560393.4
 East Coord.: 13305428.1

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ ARCADIS - 2013.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30075935
 Project Location: Flint, MI

Date Started: 07/30/2020 Date Completed: 07/30/2020
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 77°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60		0.0		(19.0-25.0') CLAY, low to medium plasticity; and SILT, slow dilatancy; little fine to medium sand; trace granules to small pebbles, subangular to subrounded; poorly sorted; moist; medium stiff to stiff; grayish brown (10YR 5/2).		
22				SB-04-47(22-22.5)	0.0				
23				_073020 @ 1335	0.0				
24				SB-04-47(24.5-25)	0.0				
25				_073020 @ 1350	0.0				
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 08/03/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 08/03/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 75°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1				SB-04-48(1.5-2) _080320 @ 1450	0.0	(0.0-0.5') TOPSOIL; grass.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-5.0' bgs) Bentonite		
2		60	0.0		(0.5-1.0') SAND, fine to coarse, subangular to subrounded; and GRAVEL, angular to subangular; poorly sorted; moist; dark brown (10YR 3/3). FILL.				
3			0.0		(1.0-1.5') CONCRETE.				
4				SB-04-48(4-4.5) _080320 @ 1455	0.0	(1.5-7.5') SAND, fine to medium; little clay; high plasticity; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist to wet; medium stiff; gray (10YR 5/1) to yellowish brown (10YR 5/4).	(5.0-13.0' bgs) Filter Pack Sand		
5			0.0						
6				SB-04-48(8-8.5) _080320 @ 1500	3.6		Note: Wet from 7.0-7.5' bgs.	(7.0-12.0' bgs) 2" PVC 10-Slot Well Screen	
7		60	0.0						
8			0.0		(7.5-10.0') CLAY, high plasticity; trace fine sand to granules, subangular to subrounded; poorly sorted; moist; stiff; yellowish brown (10YR 5/4).				
9				SB-04-48(12.5-13) _080320 @ 1505	0.0	(10.0-12.0') SAND, fine to medium; little clay; high plasticity; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist to wet; medium stiff; gray (10YR 5/1) to yellowish brown (10YR 5/4). Note: Wet from 10.0-12.0' bgs	(13.0-18.0' bgs) Bentonite		
10			0.0						
11			0.0		(12.0-14.0') CLAY, high plasticity; trace fine sand to granules, subangular to subrounded; poorly sorted; moist; stiff; yellowish brown (10YR 5/4).				
12				SB-04-48(16.5-17) _080320 @ 080320 @ 1510	0.0	(14.0-15.0') CLAY, low to medium plasticity; and SILT, no dilatancy to slow dilatancy; little fine to medium sand; stiff to very stiff; dry; gray (10YR 5/1).	(18.0-20.0' bgs) Filter Pack Sand		
13		60	0.0						
14			0.0		(15.0-16.0') SAND, fine to medium; little clay; high plasticity; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist to wet; medium stiff; gray (10YR 5/1) to yellowish brown (10YR 5/4). Note: Reddish brown (5YR 4/3) streak observed from 17.5-18.0' bgs. .				
15				SB-04-48(18.5-19) _080320 @ 1515	0.0				
16			0.0						
17					0.0				
18					0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: J. Greer Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 7
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary wells screened from 7-12' and 20-25' bgs among the boring and step out location. Surface Elev.: 734.1
 North Coord.: 560450.5
 East Coord.: 13305411.0

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ - ARCADIS - 2019.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 08/03/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 08/03/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 75°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60	SB-04-48(22-22.5)	0.0		(20.0-25.0') CLAY, medium to high plasticity; some fine to medium sand; little silt; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist to wet; medium stiff to very stiff; gray (10YR 5/1).	(20.0-25.0' bgs) 2" PVC 10-Slot Well Screen	
22				_080320 @ 1535	0.0				
23					0.0				
24				SB-04-48(24.5-25)	0.0				
25				_080320 @ 1540	0.0				
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/30/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/30/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 70°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
0			6				(0.0-0.5') CONCRETE.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-4.5' bgs) Bentonite	
1				SB-04-49(1-1.5) _073020 @ 1005	0.0		(0.5-7.0') SAND, fine to medium; little coarse sand to very coarse sand, subangular to subrounded; trace granules, subangular; poorly sorted; moist; very dark brown (10YR 2/2) to black (10YR 2/1). FILL.		
2					0.0				
3			54		0.0				
4				SB-04-49(4-4.5) _073020 @ 1010	0.0				
5					0.0				
6				SB-04-49(6-6.5) _073020 @ 1015	0.7			(4.5-13.0' bgs) Filter Pack Sand	
7					0.8				
8			60		14.1		(7.0-8.5') CONCRETE COBBLES, small to medium, subangular to subrounded; some sand, medium to very coarse, subangular to subrounded; some small to medium pebbles, subangular to subrounded; wet; poorly sorted; black (10YR 2/1) to gray (10YR 5/1) to brown (10YR 5/3). FILL.	(6.5-11.5' bgs) 2" PVC 10-Slot Well Screen	
9					432				
10					35.9		(8.5-10.0') CONCRETE.		
11					5.5		(10.0-11.5') CLAY, medium to high plasticity; some medium sand to medium cobbles, subangular to subrounded; poorly sorted; wet; gray (10YR 6/1). FILL. Note: Wood and metal chunks observed from 10-11.5' bgs.		
12					629				
13			60		0.3		(11.5-15.0') CONCRETE.		
14					0.3				
15					0.1				
16					0.0		(15.0-18.0') SAND, fine to medium; some clay; little coarse sand to granules, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1).	(13.0-18.0' bgs) Bentonite	
17					0.2				
18					0.0				
19			60	SB-04-49(18.5-19) _073020 @ 1030	0.0		(18.0-20.0') CLAY, low to medium plasticity; some silt, no dilatancy to slow dilatancy; little fine to medium sand; poorly sorted; dry to moist; very stiff; gray (10YR 5/1).	(18.0-25.0' bgs) Filter Pack Sand	
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 7.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary wells screened from 6.5-11.5', Surface Elev.: 731.1
13-18', and 20-25' bgs among the boring and step North Coord.: 560368.0
out location. East Coord.: 13305410.1

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ - ARCADIS - 2019.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/30/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/30/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 70°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		(20.0-20.5') PEBBLES, small to large, subangular to subrounded; some fine to very coarse sand, subangular to subrounded; wet; poorly sorted; gray (10YR 5/1).	(20.0-25.0' bgs) 2" PVC 10-Slot Well Screen	
22			SB-04-49(22-22.5) _073020 @ 1035	0.0		(20.5-23.0') CLAY, low to medium plasticity; some silt, no dilatancy to slow dilatancy; little fine to medium sand; poorly sorted; dry; very stiff; gray (10YR 5/1).			
23		60		0.0		(23.0-24.0') SAND, fine to coarse, subangular to subrounded; some clay, medium plasticity; poorly sorted; wet; medium stiff; gray (10YR 5/1).			
24			SB-04-49(24.5-25) _073020 @ 1040	0.0		(24.0-25.0') CLAY, low to medium plasticity; some silt, no dilatancy to slow dilatancy; little fine to medium sand; poorly sorted; dry to moist; very stiff; gray (10YR 5/1).			
25					0.0				
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30075935
 Project Location: Flint, MI

Date Started: 08/03/2020 Date Completed: 08/03/2020
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 74°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
0.0 - 0.5			6			(0.0-0.5') CONCRETE.		(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-2.0' bgs)	
1.0 - 2.0				SB-04-50(1-1.5) _080320 @ 1320	0.0	(0.5-3.0') SAND, fine to very coarse, subangular to subrounded; and GRAVEL, angular to subangular; some granules to small pebbles, subangular to subrounded; poorly sorted; dry to moist; brown (10YR 5/3).			
2.0 - 3.0			54		0.0				
3.0 - 4.0				SB-04-50(4-4.5) _080320 @ 1325	1.8	(3.0-10.0') CLAY, high plasticity; little fine to medium sand; trace granules; poorly sorted; moist to wet; medium stiff to stiff; brown (10YR 5/3) to black (10YR 2/1).		Bentonite (2.0-10.0' bgs) Filter Pack Sand	
4.0 - 5.0					9.4				
5.0 - 6.0					1.3			(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
6.0 - 7.0					2.4		Note: Wet from 6.0-9.0' bgs.		
7.0 - 8.0			60		614.3				
8.0 - 9.0					2.9				
9.0 - 10.0					1.7				
10.0 - 11.0				SB-04-50(10.5-11) _080320 @ 1330	1.1	(10.0-14.0') CLAY, low to medium plasticity; and SILT, no dilatancy to slow dilatancy; trace fine to medium sand to granules, subangular to subrounded; moist to wet; medium stiff to stiff; gray (10YR 5/1).		(10.0-13.0' bgs) Bentonite	
11.0 - 12.0					1.6				
12.0 - 13.0			60		36.2				
13.0 - 14.0					10.1			(15.0-21.0' bgs) Filter Pack Sand	
14.0 - 15.0					6.3	(14.0-14.5') SAND, fine to medium, subangular to subrounded; little silt; trace clay; poorly sorted; wet; gray (10YR 5/1) to dark gray (10YR 4/1).			
15.0 - 16.0					578	(14.5-16.0') CLAY, low to medium plasticity; and SILT, no dilatancy to slow dilatancy; trace fine to medium sand to granules, subangular to subrounded; moist to wet; medium stiff to stiff; gray (10YR 5/1).			
16.0 - 17.0					2.1	(16.0-25.0') SAND, fine to medium; some silt; little clay, slow to rapid dilatancy; little granules to medium cobbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1).		(15.0-20.0' bgs) 2" PVC 10-Slot Well Screen	
17.0 - 18.0			60		1.4				
18.0 - 19.0					0.4				
19.0 - 20.0					0.5				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: J. Greer Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 6.0
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary wells screened from 4-9', and Surface Elev.: 731.0
15-20' bgs among the boring and step out location. North Coord.: 560378.1
 East Coord.: 13305364.5

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 4.26.2021.GPJ ARCADIS - 2019.GDT 4/28/21

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 08/03/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 08/03/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 74°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60		1.7		(16.0-25.0') SAND, fine to medium; some silt; little clay, slow to rapid dilatancy; little granules to medium cobbles, subangular to subrounded; poorly sorted; wet; gray (10YR 5/1).	(21.0-25.0' bgs) Bentonite.	
22					0.8				
23					0.4				
24					1.0				
25					0.5				
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/29/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/29/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 80°F, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			9.5			(0.0-0.8') CONCRETE.		(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-2.0' bgs) Bentonite (2.0-10.0' bgs) Filter Pack Sand	
2			50.5	SB-04-59(2-2.5) _072920 @ 1350	0.0	(0.8-3.5') SAND, fine to coarse, subangular to subrounded; some granules to small pebbles, subangular to subrounded; poorly sorted; moist to wet; brown (10YR 5/3). Note: Wet from 0.8-2.0' bgs.			
3					0.0				
4				SB-04-59(4-4.5) _072920 @ 1355	0.0	(3.5-7.0') SAND, fine to medium; trace coarse sand to granules, subangular to subrounded; moist; poorly sorted; black (10YR 2/1).			
5					4.9				
6					0.0			(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
7					0.0		Note: Wet from 6.0-8.0' bgs.		
8			60	SB-04-59(8-8.5) _072920 @ 1400	0.0	(7.0-14.0') CLAY, medium plasticity; some silt, slow dilatancy; little fine to coarse sand to small pebbles, subangular to subrounded; moist to stiff to very stiff; wet; gray (10YR 5/1).			
9					0.0				
10					0.0		Note: Wet from 9.5-18.0' bgs.		
11					0.0			(10.0-11.0' bgs) Bentonite (11.0-18.0' bgs) Filter Pack Sand	
12			60		0.0				
13					0.0				
14					0.0			(12.0-17.0' bgs) 2" PVC 10-Slot Well Screen	
15					0.0	(14.0-18.0') CLAY, medium to high plasticity; some fine to coarse sand, subangular to subrounded; little silt; poorly sorted; medium stiff to stiff; wet; gray (10YR 5/1).			
16					0.0				
17					0.0				
18			60		0.0				
19				SB-04-59(18.5-19) _072920 @ 1405	0.0	(18.0-25.0') CLAY, medium plasticity; some silt, slow dilatancy; little fine to coarse sand to small pebbles, subangular to subrounded; moist to wet; stiff to very stiff; gray (10YR 5/1).		(18.0-25.0' bgs) Bentonite	
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): NA
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary wells screened from 4-9' and 12-17' bgs. Surface Elev.: 730.2
 North Coord.: 560480.6
 East Coord.: 13305634.4

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/29/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/29/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 80°F, Partly Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60	SB-04-59(24.5-25) _072920 @ 1410	0.0		(18.0-25.0') CLAY, medium plasticity; some silt, slow dilatancy; little fine to coarse sand to small pebbles, subangular to subrounded; moist to wet; stiff to very stiff; gray (10YR 5/1).	(18.0-25.0' bgs) Bentonite	
22					0.0				
23					0.0				
24					0.0				
25					0.0				
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/29/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/29/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 84°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			6		0.0	(0.0-0.5') CONCRETE.		(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing (0.3-2.0' bgs)	
2			54	SB-04-60(2-2.5) _072920 @ 1500	0.0	(0.5-1.0') SAND, fine to coarse, subangular to subrounded; and GRAVEL, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3).			
3					0.0	(1.0-2.0') SAND, fine to medium; some coarse sand to granules, subangular to subrounded; trace pebbles, subangular; poorly sorted; moist; brown (10YR 5/3). Note: Wet from 1.0-2.0' bgs.			
4					0.0	(2.0-5.0') CLAY, high plasticity; little sand, fine to medium; trace small pebbles, subangular to subrounded; moist to wet; medium stiff; grayish brown (10YR 5/2). Note: Wet from 4.0-9.0' bgs.			
5					0.0				
6					0.0	(5.0-7.0') SAND, fine to very coarse, subangular to subrounded; some granules, subangular to subrounded; little small pebbles, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3).		(4.0-9.0' bgs) 2" PVC 10-Slot Well Screen	
7					0.0				
8			60	SB-04-60(9.5-10) _072920 @ 1520	0.0	(7.0-16.0') CLAY, medium plasticity; some silt, slow dilatancy; little fine to coarse sand, subangular to subrounded; trace small pebbles, subangular to subrounded; moist to wet; stiff; gray (10YR 5/1).			
9					0.0				
10					0.0		Note: Wet from 10.0-23.0' bgs.		
11					0.0				
12					0.0			(10.0-13.0' bgs) Bentonite	
13			60		0.0				
14					0.0				
15					0.0			(13.0-21.0' bgs) Filter Pack Sand	
16					0.0				
17					0.0	(16.0-19.0') SAND, medium to very coarse, subangular to subrounded; some granules to small pebbles, subangular to subrounded; little clay; poorly sorted; wet; gray (10YR 5/1).		(15.0-20.0' bgs) 2" PVC 10-Slot Well Screen	
18			60		0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): NA
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not Surface Elev.: 730.3
measured. Temporary wells screened from 4-9' and North Coord: 560522.2
15-20' bgs. East Coord: 13305665.1

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/29/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 07/29/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 84°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21	[Diamond symbol]		60	SB-04-60(24.5-25) _072920 @ 1525	0.0	[Diagonal lines symbol]	(19.0-25.0') CLAY, medium plasticity; some silt, slow dilatancy; little fine to coarse sand, subangular to subrounded; trace small pebbles, subangular to subrounded; poorly sorted; dry to wet; stiff; gray (10YR 5/1).	(21.0-25.0' bgs) Bentonite	[Dotted pattern]
22					0.0				[Dotted pattern]
23					0.0				[Dotted pattern]
24					0.0				[Dotted pattern]
25					0.0				[Dotted pattern]
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks: _____

Soil Boring Log

Project Name: RACER Trust - Buick City
 Project Number: 30043300
 Project Location: Flint, MI

Date Started: 07/28/2020 Date Completed: 07/28/2020
 Logger: M. Olender Editor: M. Humphrey
 Weather Conditions: 72°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			6		0.0		(0.0-0.5') CONCRETE.	(0.0-1.4' bgs) 2" Sch 40 PVC Well Casing	
2			SB-04-61(2-2.5) _072820 @ 0930	0.0		(0.5-3.0') SAND, fine to coarse, subangular to subrounded; and GRAVEL, subangular to subrounded; some very coarse sand to small pebbles, subangular to subrounded; little silt; poorly sorted; moist; black (10YR 2/1) to brown (10YR 5/3).			
3		54		0.0					
4				SB-04-61(4-4.5) _072820 @ 0932	0.0		(3.0-5.0') SAND, medium to coarse, subangular to subrounded; some very coarse sand to granules, subangular to subrounded; little small to medium pebbles, angular to subangular; poorly sorted; moist; brown (10YR 5/3).	(0.3-9.0' bgs) Bentonite	
5				0.0					
6				SB-04-61(8-8.5) _072820 @ 0934	0.0		(5.0-9.0') CLAY, medium to high plasticity; little silt, no dilatancy to slow dilatancy; medium stiff; moist; well sorted; gray (10YR 5/1).	(9.0-17.0' bgs) Filter Pack Sand	
7		60		0.0					
8				0.0					
9				SB-04-61(18.5-19) _072820 @ 0936	0.0		(9.0-9.2') SAND, medium to very coarse, subangular to subrounded; and GRANULES to small PEBBLES, subrounded to subangular; little clay; poorly sorted; moist to wet; gray (10YR 5/1).	(11.0-16.0' bgs) 2" PVC 10-Slot Well Screen	
10				0.0					
11					0.0		(9.2-11.0') CLAY, medium to high plasticity; little silt, no dilatancy to slow dilatancy; medium stiff; moist; well sorted; gray (10YR 5/1).	(17.0-25.0' bgs) Bentonite	
12		60		0.0					
13				0.0					
14					0.0		(11.0-25.0') CLAY, medium plasticity; some silt, no dilatancy to slow dilatancy; little small pebbles, subangular to subrounded; trace fine to medium sand; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 11.0-17.5' bgs. Note: Dry from 19.0-25.0' bgs.		
15					0.0				
16					0.0				
17					0.0				
18					0.0				
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: R. Gordon Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): NA
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary well screened from 11-16' Surface Elev.: 729.1
bgs. North Coord.: 560474.9
 East Coord.: 13305719.0

SOIL BORING LOG - 2013 C:\USERS\HUMPHREY\DESKTOP\NEW BUICK CITY LOGS\BUICK CITY MASTER 11.0.2020.GPJ ARCADIS - 2019.GDT 11/10/20

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 07/28/2020 Logger: M. Olender
 Project Number: 30043300 Date Completed: 07/28/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 72°F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21			60	SB-04-61(22-22.5) _072820 @ 0938	0.0		(11.0-25.0') CLAY, medium plasticity; some silt, no dilatancy to slow dilatancy; little small pebbles, subangular to subrounded; trace fine to medium sand; poorly sorted; wet; gray (10YR 5/1). Note: Wet from 11.0-17.5' bgs. Note: Dry from 19.0-25.0' bgs.	(17.0-25.0' bgs) Bentonite	
22									
23									
24				SB-04-61(24.5-25) _072820 @ 0940	0.0				
25									
26						End of boring at 25.0' bgs.			
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 08/06/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 08/06/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1				SB-04-64(0-1) _080620 @ 1400	0.0		(0.0-0.2') TOPSOIL; grass.	(0.0-25' bgs) Filter Pack Sand	Well
2				SB-04-64(1-2) _080620 @ 1405	0.0		(0.0-4.0') SAND, fine to coarse, subangular to subrounded; some small pebbles to small cobbles, subangular to subrounded; poorly sorted; dry to moist; brown (10YR 5/3) to light brownish gray (10YR 6/2). FILL.		
3				SB-04-64(2-3) _080620 @ 1410	0.0				
4				SB-04-64(3-4) _080620 @ 1415	0.0				
5				SB-04-64(4-5) _080620 @ 1420	0.0		(4.0-6.0') SAND, fine to medium, subangular to subrounded; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist; black (10YR 2/1). FILL.		
6				SB-04-64(5-6) _080620 @ 1425	0.0				
7				SB-04-64(6-7) _080620 @ 1430	0.0		(6.0-7.0') CLAY, medium to high plasticity; and SAND, fine to coarse, subangular to subrounded; little small pebbles, subangular to subrounded; poorly sorted; moist to wet; medium stiff; gray (10YR 5/1) to black (10YR 2/1). FILL.		
8				SB-04-64(7-8) _080620 @ 1435	8.6		(7.0-8.5') SAND, fine to medium, subangular to subrounded; trace coarse sand to granules, subangular to subrounded; poorly sorted; moist; black (10YR 2/1). FILL.		
9				SB-04-64(8-9) _080620 @ 1440	0.0		(8.5-9.5') SAND, fine to very coarse, subangular to subrounded; some gravel, subangular to subrounded; poorly sorted; moist; very dark brown (10YR 2/2) to black (10YR 2/1). FILL.		
10					0.0		Note: Glass chunks throughout interval.		
11					0.0		(9.5-11.0') CONCRETE as cobbles, small to medium; subangular to subrounded; trace fine to medium sand.		
12					1.7		(11.0-16.0') SAND, fine to medium, subangular to subrounded; and SILT, slow to rapid dilatancy; some clay, medium to high plasticity; trace coarse sand to granules, subangular to subrounded.		
13				SB-04-64(12.5-13) _080620 @ 1445	0.0				
14					0.0				
15					0.0				
16					0.0				
17				SB-04-64(16.5-17) _080620 @ 1450	0.0		(16.0-17.0') SAND, fine to very coarse, subangular to subrounded; and COBBLES, subangular to subrounded; some clay, medium plasticity; poorly sorted; wet; gray (10YR 5/1).		
18					0.0		(17.0-20.0') SAND, fine to medium, subangular to subrounded; and SILT, slow to rapid dilatancy; some clay, medium to high plasticity; trace coarse sand to granules, subangular to subrounded.		
19				SB-04-64(18.5-19) _080620 @1455	0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: 5.0' Macrocore
 Driller: J. Greer Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 6.5
 Drilling Fluid: None Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Temporary well screened from 19-24' Surface Elev.: 733.5
bgs. North Coord.: 560429.1
 East Coord.: 13305439.7

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 08/06/2020 Logger: M. Olender
 Project Number: 30075935 Date Completed: 08/06/2020 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well				
21				SB-04-64(22-22.5) _080620 @ 1500	0.0		(20.0-24.0') SAND, fine to coarse, subangular to subrounded; some pebbles, subangular to subrounded; small to medium; little silt - clay; poorly sorted; wet; gray (10YR 5/1).	(19.0-24.0' bgs) 2" PVC 10-Slot Well Screen					
22					0.0					SB-04-64(24.5-25) _080620 @ 1505	0.0	(24.0-25.0') SAND, fine to medium, subangular to subrounded; and SILT, slow to rapid dilatancy; some clay, medium to high plasticity; trace coarse sand to granules, subangular to subrounded.	(24.0-25.0' bgs) Bentonite.
23					0.0								
24				0.0									
25				0.0									
26							End of boring at 25.0' bgs.						
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													

Remarks:

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 01/08/2021 Logger: E. Redner
 Project Number: 30075935 Date Completed: 01/08/2021 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 28°F, Overcast

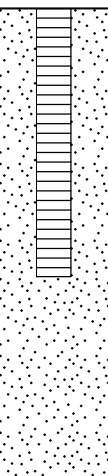
Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			8		0.0	(0.0-1.0') CONCRETE.		(0.3-4.0' bgs) Bentonite	
2			12		0.0	(1.0-2.0') SAND, very fine to medium; little coarse sand to small pebbles, subangular to subrounded; poorly sorted; moist; black (10YR 2/1). FILL.		(0.0-5.0' bgs) 1" Sch 40 PVC Well Casing	
3					0.0	(2.0-2.5') CONCRETE.			
4					0.0	(2.5-4.0') SAND, fine to medium; trace granules, subangular to subrounded; well sorted; moist; black (10YR 2/1).			
5			40	SB-04-81(4-6) _010821 @ 0810	0.0	(4.0-8.0') SAND, fine to coarse, subangular to rounded; some very coarse sand to large pebbles, subangular to rounded; little silt; little clay, nonplastic to low plasticity, rapid dilatancy; poorly sorted; moist to wet; brownish yellow (10YR 6/6). Note: Wet at 6.0' bgs.		(4.0-12.0' bgs) Filter Pack Sand	
6					0.0				
7					0.0				
8					0.0	(8.0-14.5') CLAY; little silt, high plasticity, slow dilatancy; litte very fine sand to granules, subangular to subrounded; moist to wet; medium stiff to stiff; gray (10YR 6/1).		(5.0-10.0' bgs) 1" PVC 10-Slot Well Screen	
9				SB-04-81(9-10) _010821 @ 0820	0.0				
10					0.0				
11					0.0	(14.5-19.5') CLAY; some silt, medium plasticity, rapid dilatancy; little very fine sand to granules, subangular to rounded; dry to moist; medium stiff; gray (10YR 6/1).			
12			120		0.0				
13					0.0				
14					0.0			(12.0-17.0' bgs) Bentonite	
15				SB-04-81(14-15) _010821 @ 0830	0.0				
16					0.0				
17					0.0				
18					0.0			(0.0-19.0' bgs) 1" Sch 40 PVC Well Casing	
19					0.0				
20					0.0				

Drilling Co.: Cascade Sampling Method: Core Barrel
 Driller: Chris Barden Sampling Interval: Continuous
 Drilling Method: Sonic Drilling Water Level Start (ft. bgs.): 6.0
 Drilling Fluid: Water Water Level Finish (ft. btoc.): NA
 Remarks: bgs = below ground surface; NA = not applicable; Converted to Well: Yes No
btoc = below top of casing; ft = feet; NM= not measured. Hand augering the first 5.0' bgs could not be completed due to concrete and lose sands. Surface Elev.: 730.5
 North Coord.: 560562.3
 East Coord.: 13305718.5

Temporary wells screened from 5.0-10.0' and 19-24' bgs.

Soil Boring Log

Project Name: RACER Trust - Buick City Date Started: 01/08/2021 Logger: E. Redner
 Project Number: 30075935 Date Completed: 01/08/2021 Editor: M. Humphrey
 Project Location: Flint, MI Weather Conditions: 28°F, Overcast

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21				SB-04-81(19-21) _010821 @ 0840	0.0		(19.5-23.0') SILT; little clay, nonplastic to low plasticity, rapid dilatancy; some fine sand to small pebbles, subangular to subrounded; wet; soft; gray (10YR 6/1). Note: Wet at 19.5' bgs. Note: A 2" seam was observed 21.0' bgs of medium to very coarse sand; subangular; wet.	(19.0-24.0' bgs) 1" PVC 10-Slot Well Screen	
22		120	0.0						
23			0.0						
24			0.0			(23.0-27.0') CLAY; some silt, medium plasticity, rapid dilatancy; little to trace very fine sand to granules, subangular to subrounded; dry; very stiff to hard; gray (10YR 6/1).			
25			0.0						
26			0.0						
27			0.0						
28						End of boring at 27.0' bgs.			
29									
30									
31									
32									
33									
34									
35									
36									
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39									
40									
41									

Remarks:

Appendix C

Injection Rate Test Field Notes

2 hours and 37 minutes to take 60 gal

Clean Water Injection Test Operational Data
RACER Trust Buick City

Personnel: Donald Richmond

Date: 6/23/22

Injection Well: Iw-04-02

DTW: 7.27

DTB: 20.25

Observation Data

Gravity
Start flow →
Pump start →
2nd after →
Start Grav flow →
Pump Start →

Pump off →

Time	Gallons in Tote	Flow Totalizer	Gallons Injected	Flow (gpm)	Inj. Pressure (psi)	Notes
10:08	300			1.82	0	(No Pump, Just gravity fed)
10:12					10-20	Exceeded 10 immediately. Furnce popped off.
10:17				0.00	Set at 5 PSI	Well not taking any more water
10:27				.2		
10:28	290	Not reading too low flow	10 gal	.4	5 PSI	
11:08	275	↓	25 gal	.4	5 PSI	
11:40	265		35 gal	.4	5 PSI	
12:00	255		45 gal	.4	5 PSI	
12:30	245		55 gal	.4	5 PSI	
12:45	240		60 gal	.4	5 PSI	

Appendix D

Slug Test Plan

SUBJECT

Buick City Slug Testing Plan

DATE

Summary

This Field Implementation Plan (FIP) outlines the methodology for the following activities. Well locations are shown on Figure 1.

Preparation

.

Equipment and Materials List

The following materials will be required to complete the field efforts:

- Laptop computer/smart device and field notebook or electronic field form
- Water Level Meter
- 5 -In Situ brand Level Troll 500 (vented) pressure transducers (15 psig/35 ft pressure rated) with two 25-foot of direct read cable for each.
- Communication package: 1) Wireless Troll Com which can be used with a tablet/phone and VuSitu mobile app
- Download VuSitu mobile app on tablet/phone or download Win-Situ to laptop prior to field work: <https://in-situ.com/us/win-situ-software>
- 4 Slugs
- Pressure transducer communication equipment/software
- Pressure transducer quick start guide
- Additional field forms
- FIP and guidance documents
- Tailgate meeting and TIP forms
- Decontamination supplies
- General tools

a. Everyday On-site Activities

- Review Arcadis HASP Daily
- Conduct safety meetings; document using daily Health and Safety/Tail Gate Meeting forms. In addition, Stop Work authority may be utilized at any time.

- Update TM daily with progress, and in the event of any unexpected developments.

HEALTH & SAFETY

a. General H&S procedures

Constituents of concern are primarily PFAS as addressed in the Health & Safety Plan. As with all projects:

- Review and sign the HASP prior to mobilizing to the site.
- Prior to each workday, complete COVID-19 Self Assessment on Arcadis H&S App
- Each day will begin with a health and safety tailgate meeting; fill out the attached Tailgate Safety Form each day
- Review the task hazards, as well as emergency procedures and directions to the hospital.
- Make sure to document the weather conditions, personnel onsite, objectives, and health and safety at the beginning of each day's field log.
- Make sure that your vehicle emergency supplies are complete and current and use traffic cones whenever working in or near parking lots and roadways.

b. Personal Protective Equipment (PPE) Requirements

The work will be completed in Level D PPE (i.e. hard hat, safety glasses, safety-toe boots, and a high visibility safety vest). Don Nitrile gloves when appropriate.

There is a potential for exposure to contaminated media while performing this task. Wash hands before eating, drinking, smoking, or any other activity that brings your hands to your face.

SLUG TESTING

Well construction details and recent water depths are included in **Table 1**. Pressure transducer will be installed to record background for 15 minutes prior to testing at depth provided in **Table 1**.

Prior to mobilization please become familiar with the Arcadis Technical Guidance Instructions (TGI) for Slug Testing document and field form. A minimum of two rising head slug tests should be completed with the same slug size. Follow the steps listed below to perform the slug tests.

To perform the slug tests, follow the steps listed below.

1. Unlock and open the monitoring well cover while standing upwind from the well.
2. Obtain water level and well depth information.
 - a. Using a water level meter, measure the depth to water and depth to bottom of the well. Record on field form or Fulcrum App.
3. Install/reprogram the pressure transducer.

- a. Program the transducer to fast **linear (not logarithmic) 0.5 second** data collection intervals. Program the correct well location and project ID. Program the pressure units in feet and temperature in Celsius. Do not program in an offset or reference elevation.
 - b. Install the transducer in the well at the deployment depth calculated on the table. Secure transducer cable to ensure that it will not move during testing.
 - c. Record the depth the transducer(s) was set at on the transducer log field form.
 - d. Confirm that the transducer is measuring the appropriate parameters (pressure, depth, temperature). **VERIFY THAT THE PRESSURE TRANSDUCER IS LOGGING DATA**, and not just displaying it.
 - e. Allow the water level to equilibrate and monitor it for at least 15 minutes to establish a baseline water level and confirm that it's not drifting.
4. Place slug and initiate slug-in test.
- a. Tie one end of a piece of rope to the slug and tie the other end to the well completion with enough slack. Measure using the water level meter and mark with black electrical tape the location on the rope where the slug would be completely submerged or the desired submersion plus a couple inches.
 - b. Lower the slug into the well so the entire slug is submerged according to the mark on the rope.
 - c. Wait for the water level to re-equilibrate using the real-time data display on the laptop and monitor it for at least 3 minutes to verify.
 - d. Quickly and smoothly remove the slug from the water column and carefully pull it to the surface.
 - e. If not utilizing entire length of slug (i.e. 2' submersion with a 4' slug) measure calculate the length of the slug that will be submerged and record.
5. Monitor Recovery
- a. Observe the water level response on the laptop computer/tablet in real time and record the approximate maximum displacement (prior test level minus max change level).
 - b. Allow the water level to recover completely and monitor the water level for at least 3 minutes to confirm it has equilibrated. **Use a water level meter periodically to confirm that the recovery is occurring and to the specific depth.** If subsequent tests will not be performed, then 90% recovery is sufficient. **When conducting subsequent tests, the water level must recover at least 95% before initiating the next test.**
- $$\text{Percent Recovery} = ((\text{current displacement})/(\text{maximum displacement})) * 100$$
- c. A photo of the response curve can be sent to support staff for response verification if necessary.
 - d. Once complete, stop and save the test data.

Based on recent low-flow sampling results, the wells are likely to recover fairly quickly (< 1 hour). If recovery is taking an extended period of time to recovery (> 1 hour), then a slug test within a different well can be started while the first well is recovering. Direct read cables will allow for returning and checking on status.

Review the data collected to determine the reasonableness of the preliminary results. If additional tests are required, then consult with support staff on additional testing and the above procedure may be repeated with the appropriate size slug. The water level record for each test will show a baseline water level, displacement, and the

recovery response. Make notes on the field form and notebook concerning any irregularities. Save all data files to the laptop and backup flash drive.

EQUIPMENT DECONTAMINATION

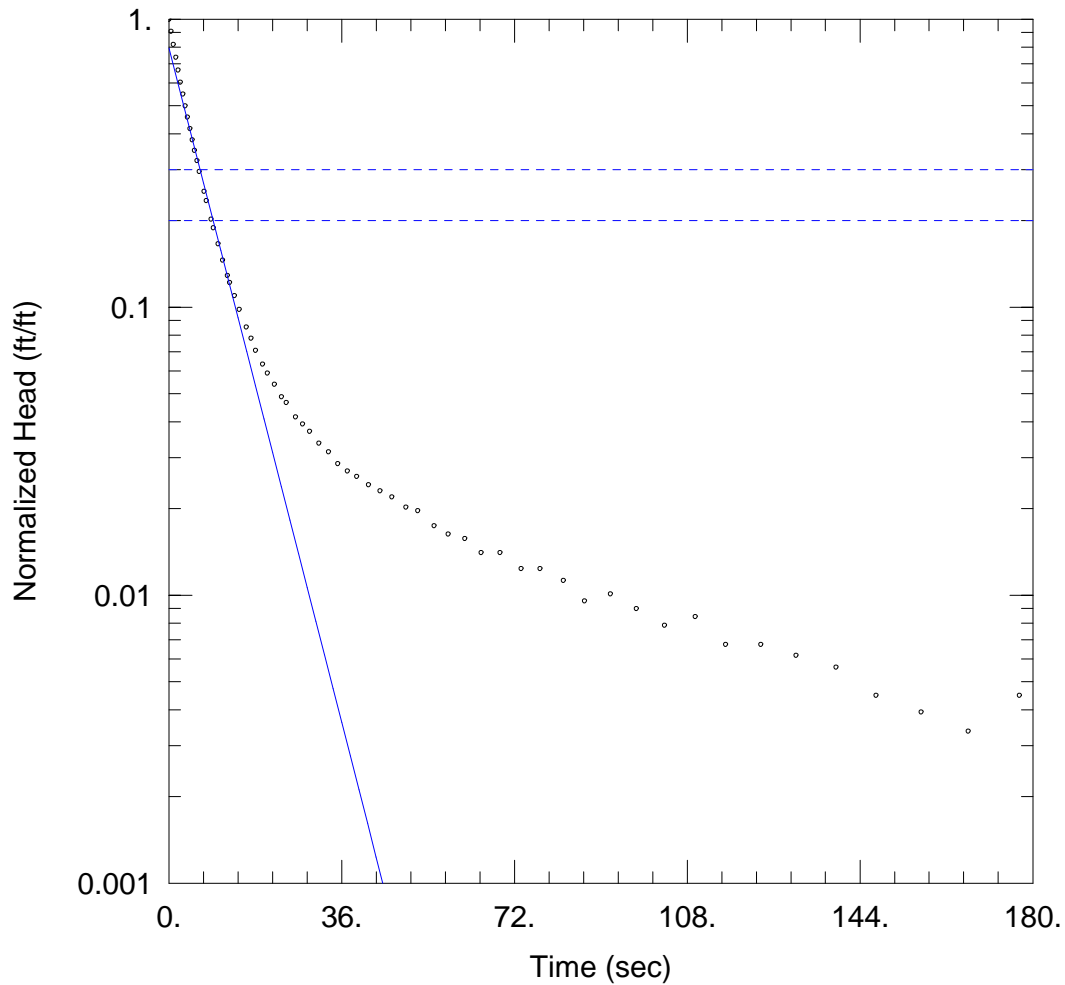
Cleaning and decontamination should be carried out according to the *Field Equipment Decontamination SOP*. This includes the following:

Cleaning Sampling Equipment

1. Wash the equipment with potable water.
2. Wash with detergent solution (Alconox or equivalent).
3. If equipment is very dirty, precleaning with a brush and tap water may be necessary.
4. Rinse with distilled water.
5. Rinse with isopropyl alcohol or acetone.
6. Rinse with distilled/deionized water or Lab provided PFAS-free water.

Appendix D-1

Slug Test Results



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: RFI-81-09
 Test Date: 10/4/2021

AQUIFER DATA

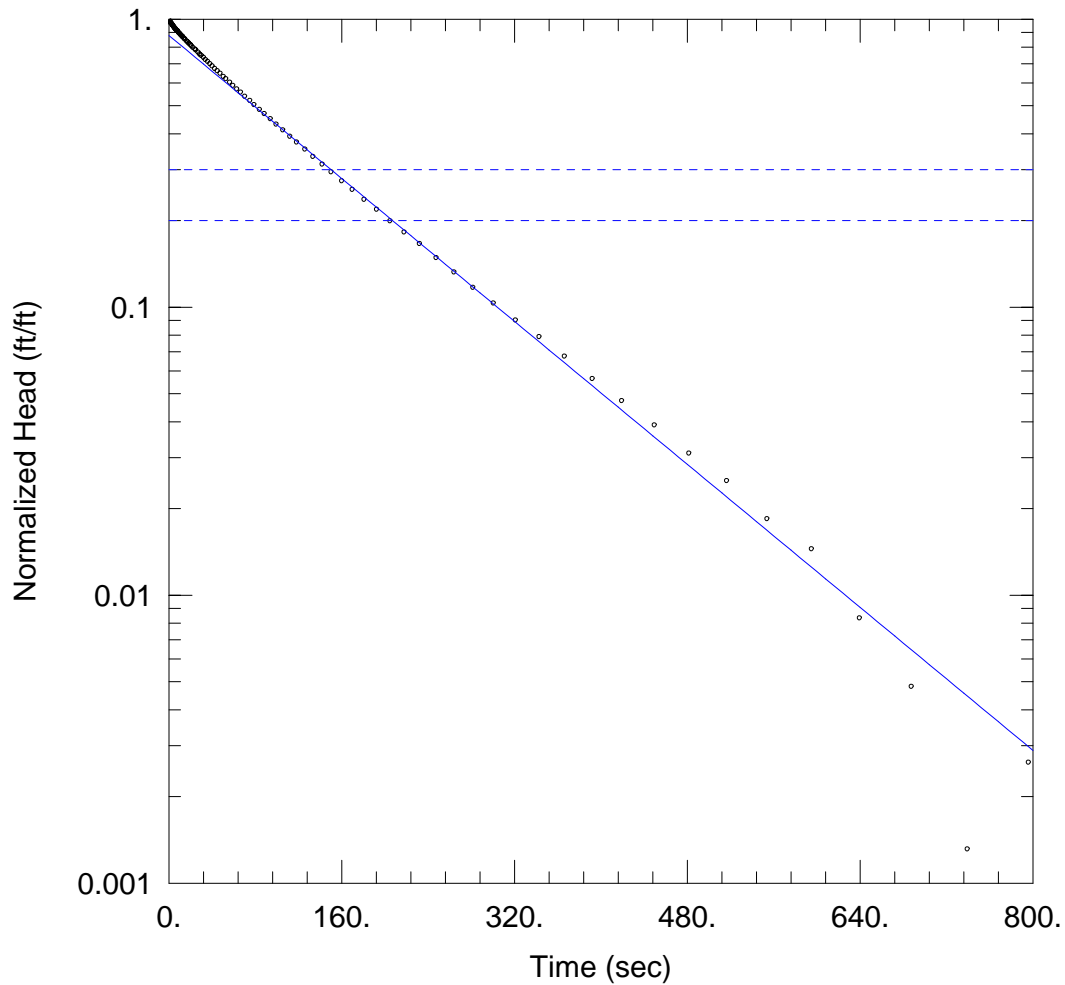
Saturated Thickness: 11.23 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RFI-81-09)

Initial Displacement: 1.782 ft Static Water Column Height: 11.23 ft
 Total Well Penetration Depth: 11.23 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.3 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 12. ft/day $y_0 =$ 1.413 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: 20-103S
 Test Date: 10/4/2021

AQUIFER DATA

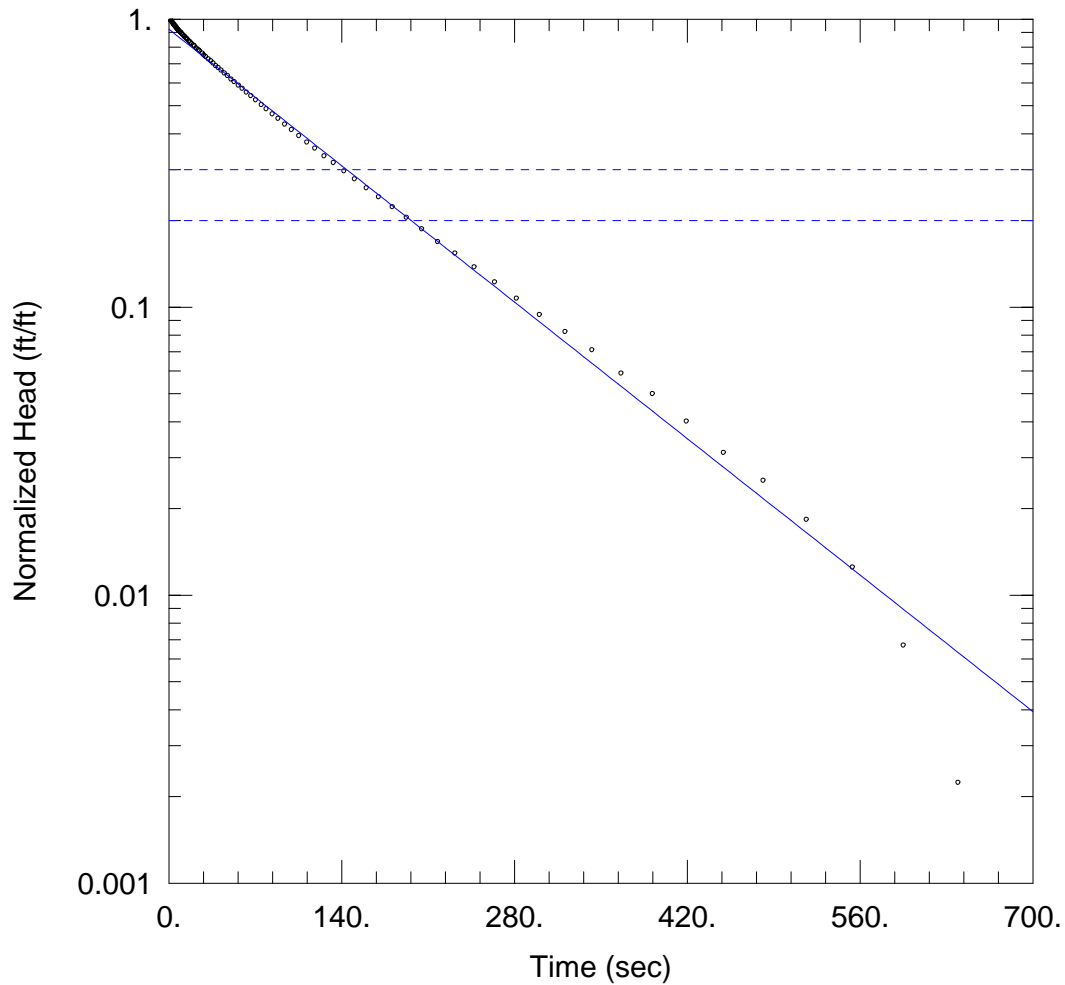
Saturated Thickness: 13.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (20-103S)

Initial Displacement: 2.283 ft Static Water Column Height: 13.74 ft
 Total Well Penetration Depth: 13.74 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.3 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 1.1 ft/day $y_0 =$ 2.002 ft



RISING HEAD 2

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: 20-103S
 Test Date: 10/4/2021

AQUIFER DATA

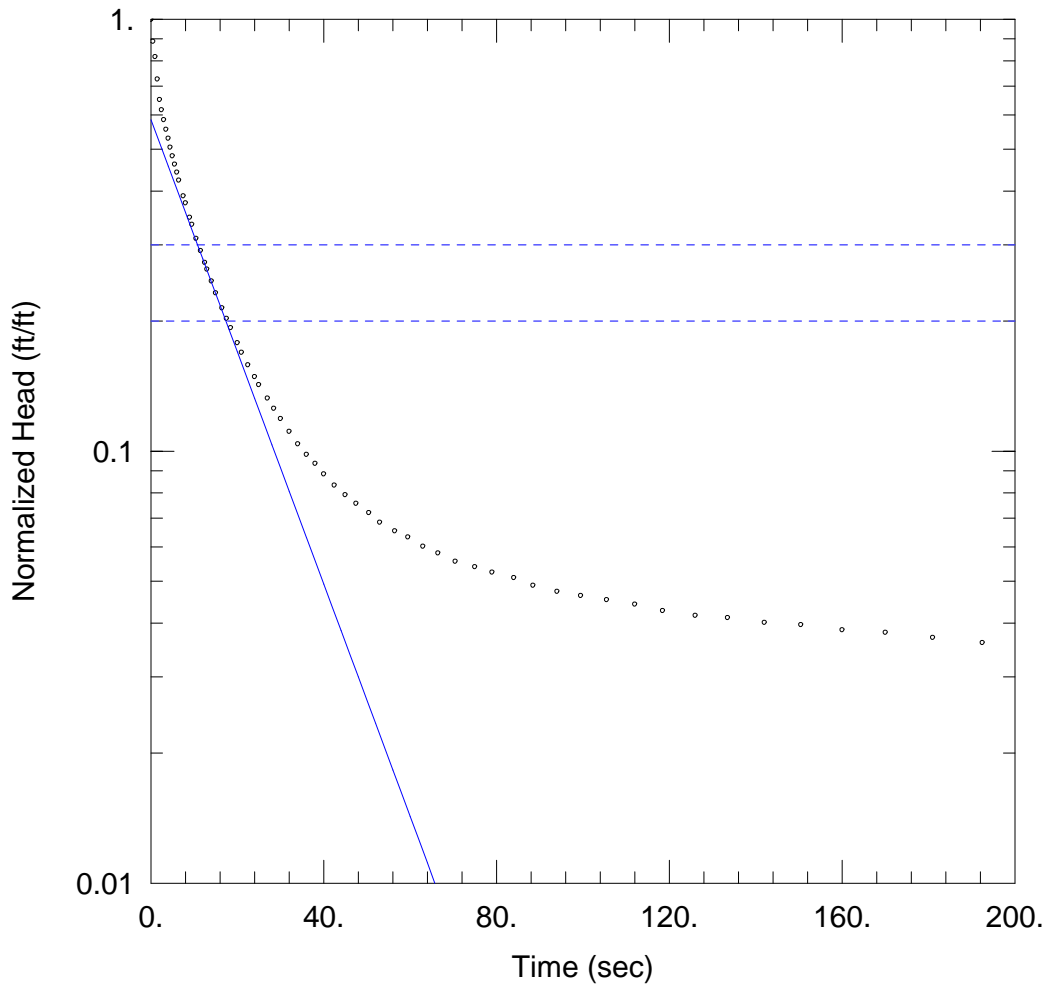
Saturated Thickness: 13.74 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (20-103S)

Initial Displacement: 2.239 ft Static Water Column Height: 13.74 ft
 Total Well Penetration Depth: 13.74 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.3 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 1.2 ft/day $y_0 =$ 2.064 ft



RISING HEAD 2

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: RFI-36-14
 Test Date: 10/5/2021

AQUIFER DATA

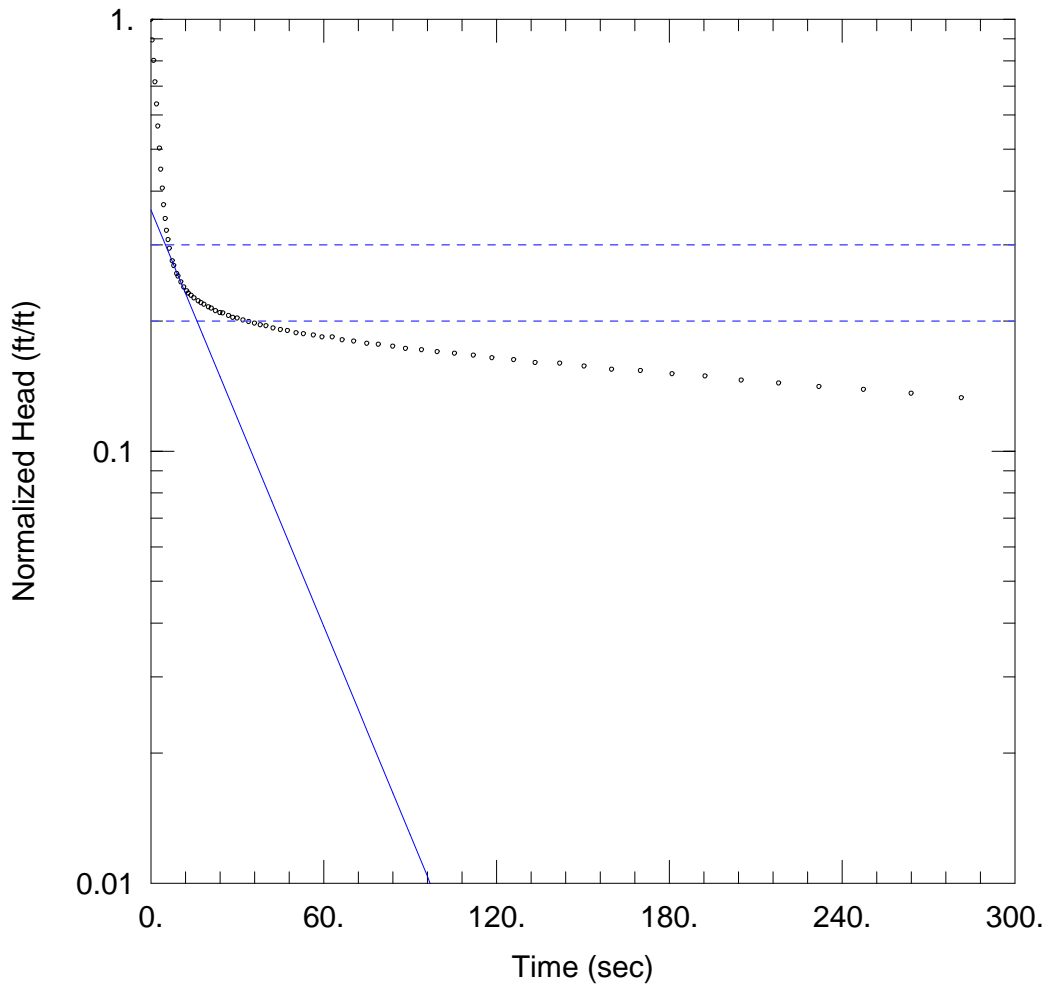
Saturated Thickness: 13.86 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RFI-36-14)

Initial Displacement: 1.944 ft Static Water Column Height: 13.86 ft
 Total Well Penetration Depth: 13.86 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 5. ft/day $y_0 =$ 1.137 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: RFI-81-12R
 Test Date: 10/5/2021

AQUIFER DATA

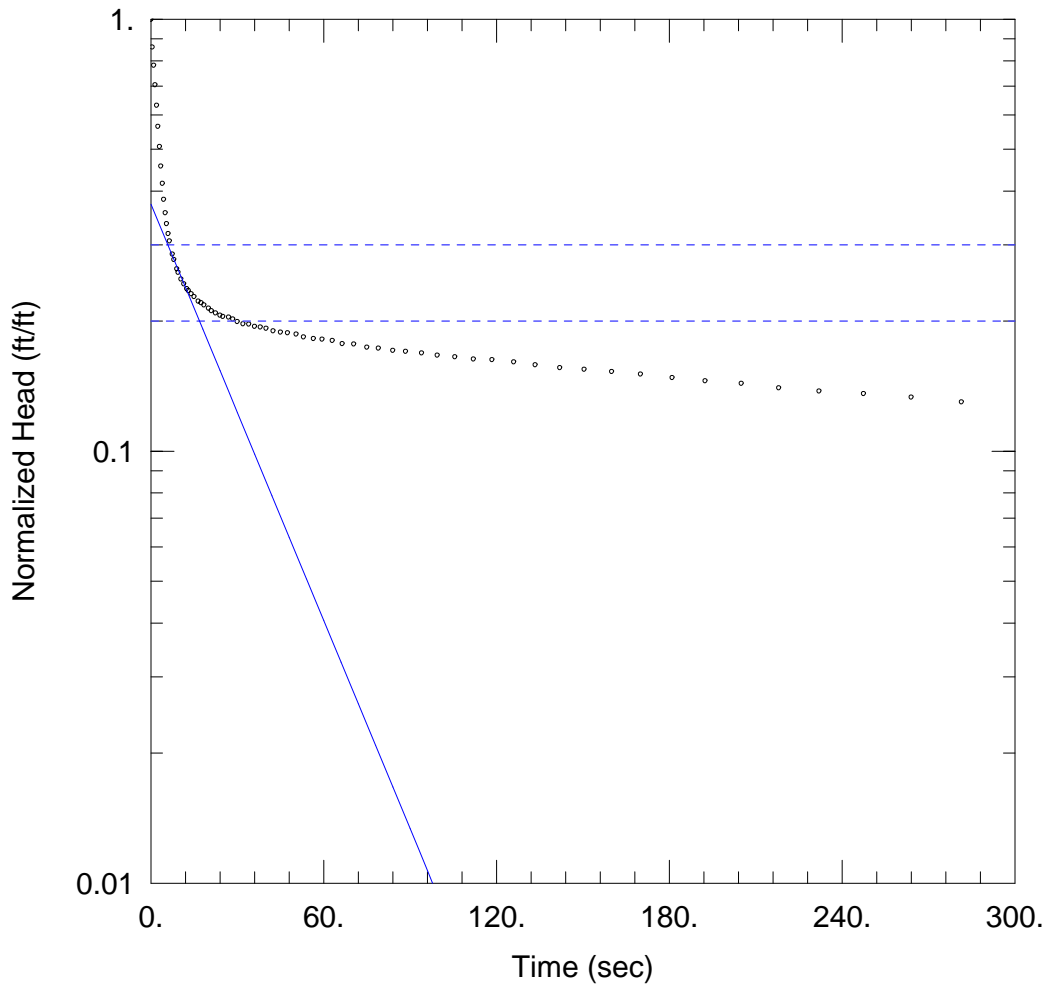
Saturated Thickness: 10.46 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RFI-81-12R)

Initial Displacement: 1.836 ft Static Water Column Height: 10.46 ft
 Total Well Penetration Depth: 10.46 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 2.8 ft/day y0 = 0.6633 ft



RISING HEAD 2

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: RFI-81-12R
 Test Date: 10/5/2021

AQUIFER DATA

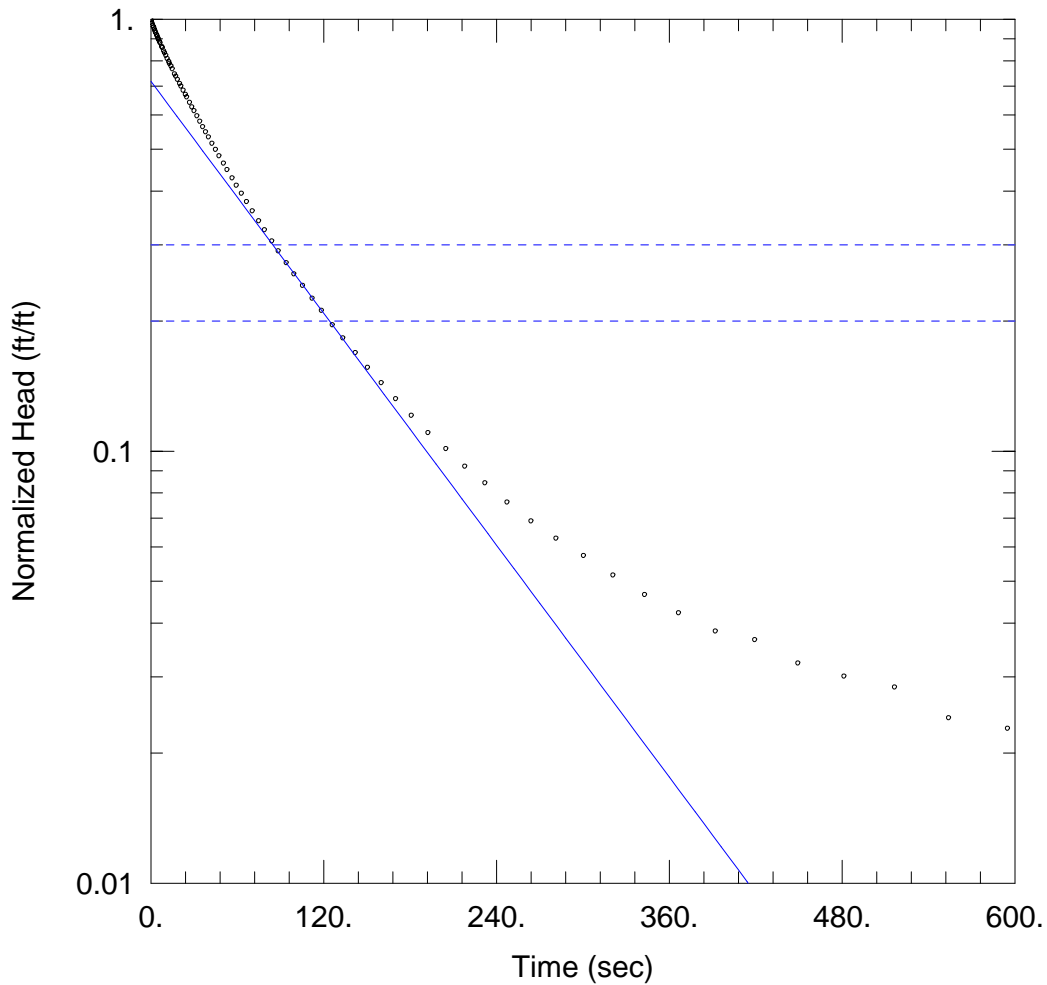
Saturated Thickness: 10.46 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RFI-81-12R)

Initial Displacement: 2.07 ft Static Water Column Height: 10.46 ft
 Total Well Penetration Depth: 10.46 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 2.8 ft/day y0 = 0.7716 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: RFI-81-33
 Test Date: 10/5/2021

AQUIFER DATA

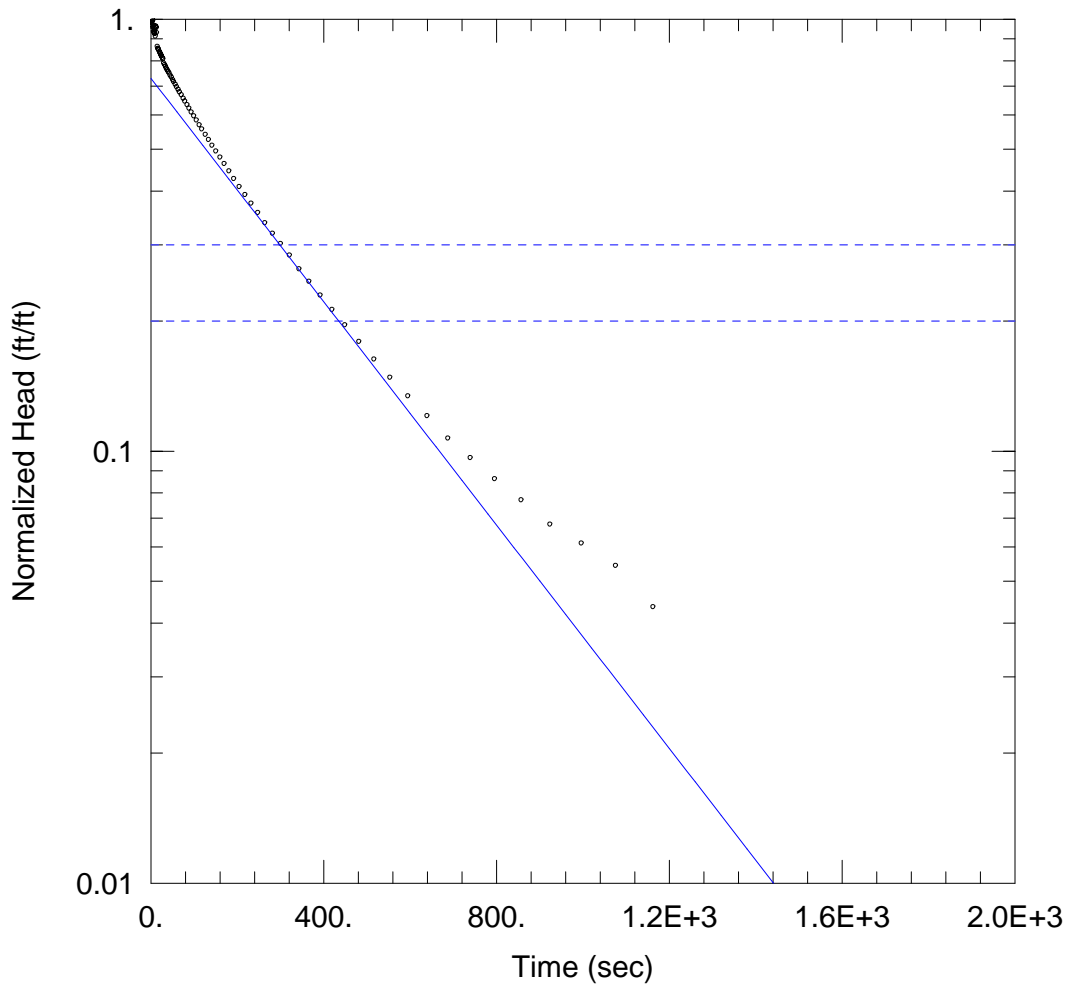
Saturated Thickness: 10.34 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (RFI-81-33)

Initial Displacement: 2.322 ft Static Water Column Height: 10.34 ft
 Total Well Penetration Depth: 10.34 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.3 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.81 ft/day y0 = 1.666 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-84-48
 Test Date: 10/5/2021

AQUIFER DATA

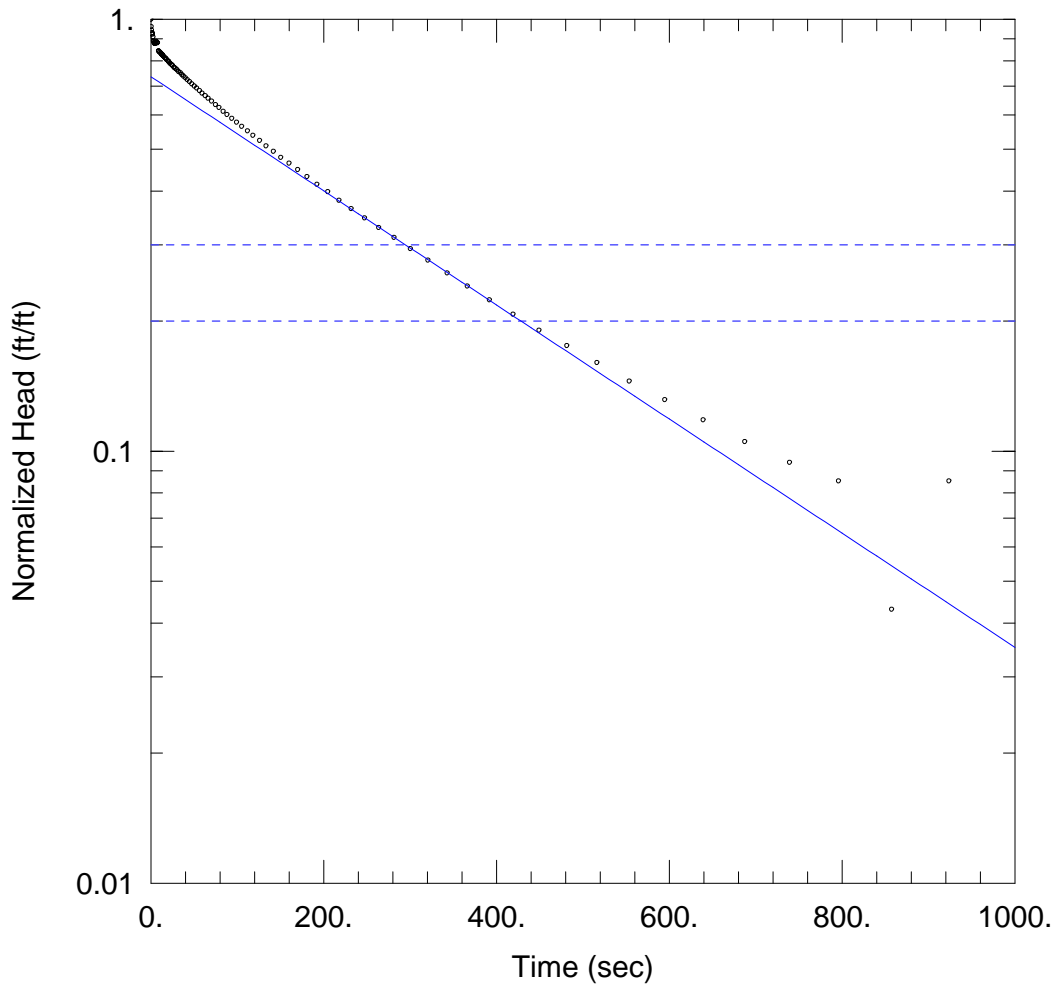
Saturated Thickness: 10.21 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-84-48)

Initial Displacement: 2.154 ft Static Water Column Height: 10.21 ft
 Total Well Penetration Depth: 10.21 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.46 ft/day y0 = 1.571 ft



RISING HEAD 2

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-84-48
 Test Date: 10/5/2021

AQUIFER DATA

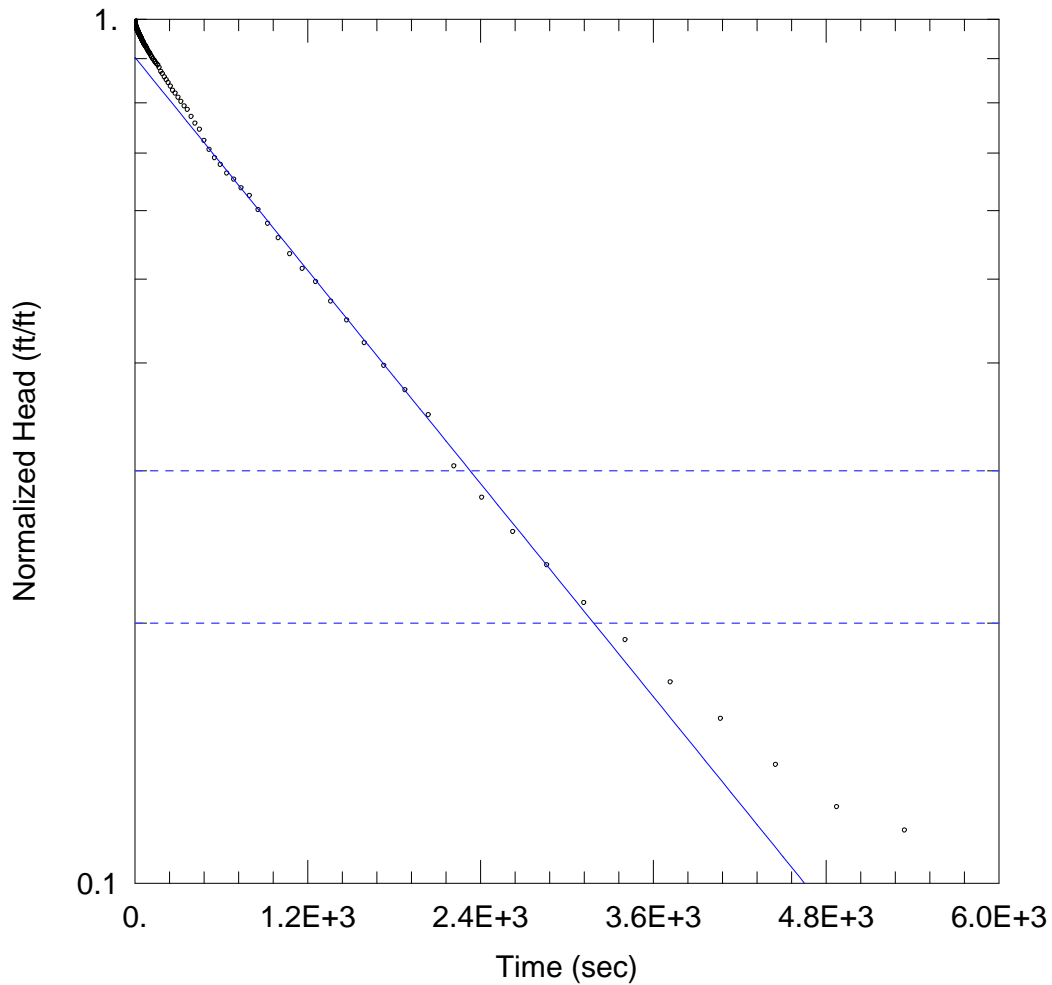
Saturated Thickness: 10.21 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-84-48)

Initial Displacement: 2.253 ft Static Water Column Height: 10.21 ft
 Total Well Penetration Depth: 10.21 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.47 ft/day $y_0 =$ 1.657 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-84-49
 Test Date: 10/6/2021

AQUIFER DATA

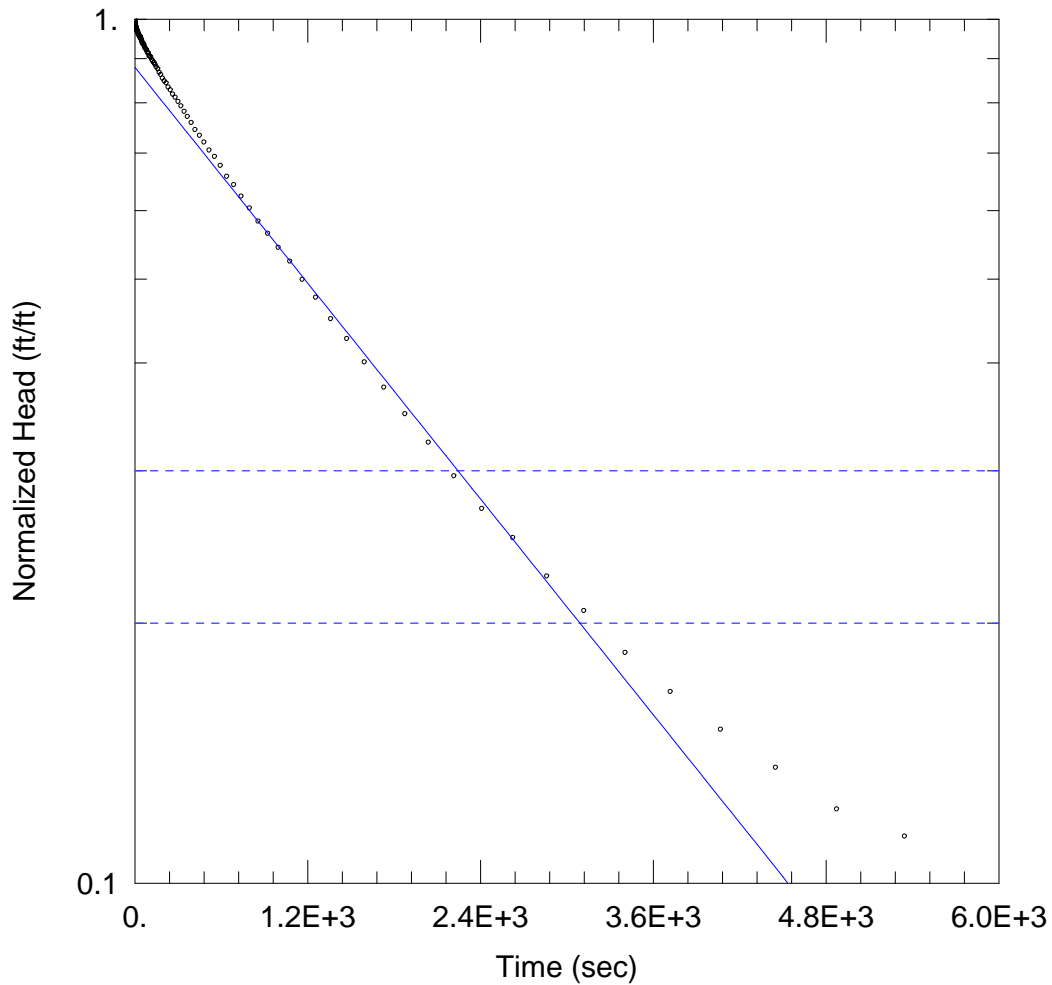
Saturated Thickness: 15.06 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-84-49)

Initial Displacement: 2.457 ft Static Water Column Height: 15.06 ft
 Total Well Penetration Depth: 15.06 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.079 ft/day $y_0 =$ 2.219 ft



RISING HEAD 2

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-84-49
 Test Date: 10/6/2021

AQUIFER DATA

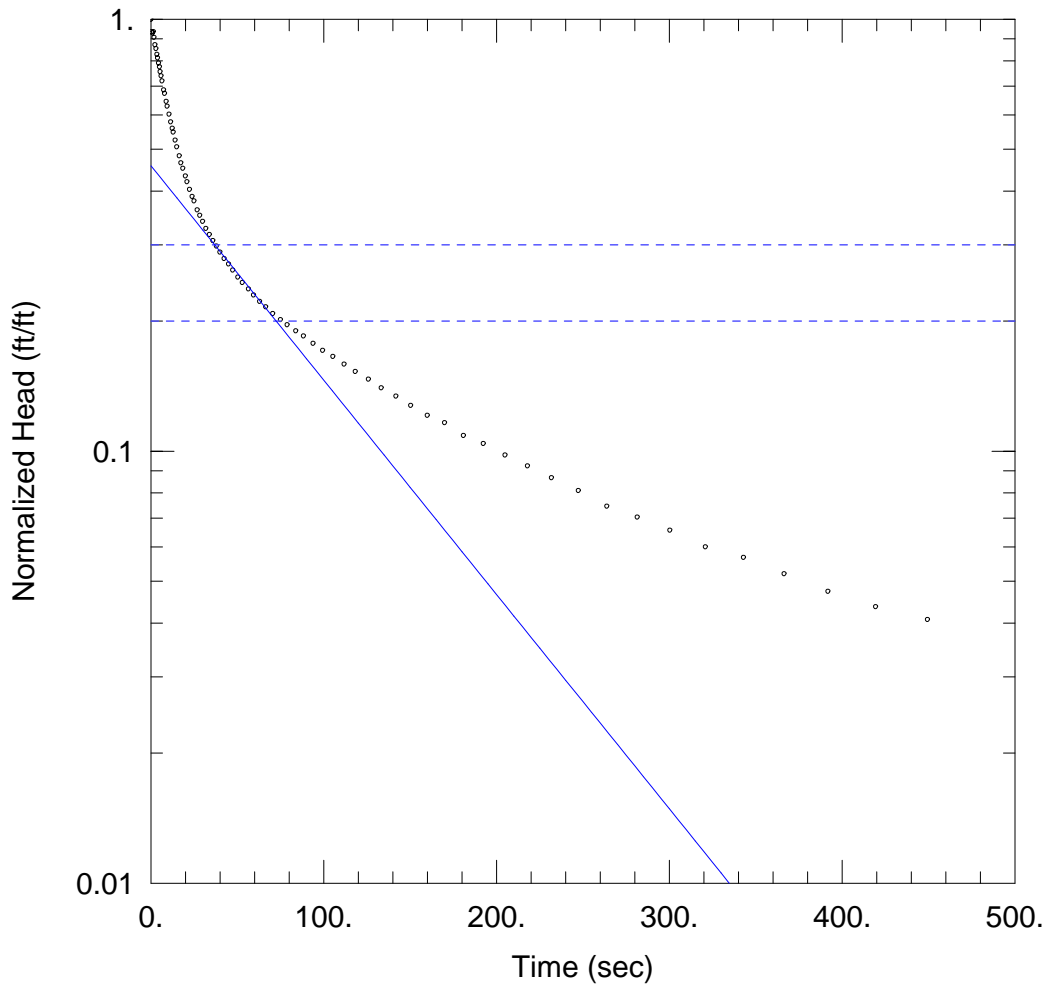
Saturated Thickness: 15.06 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-84-49)

Initial Displacement: 2.462 ft Static Water Column Height: 15.06 ft
 Total Well Penetration Depth: 15.06 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
 K = 0.08 ft/day y0 = 2.165 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-09-82
 Test Date: 10/6/2021

AQUIFER DATA

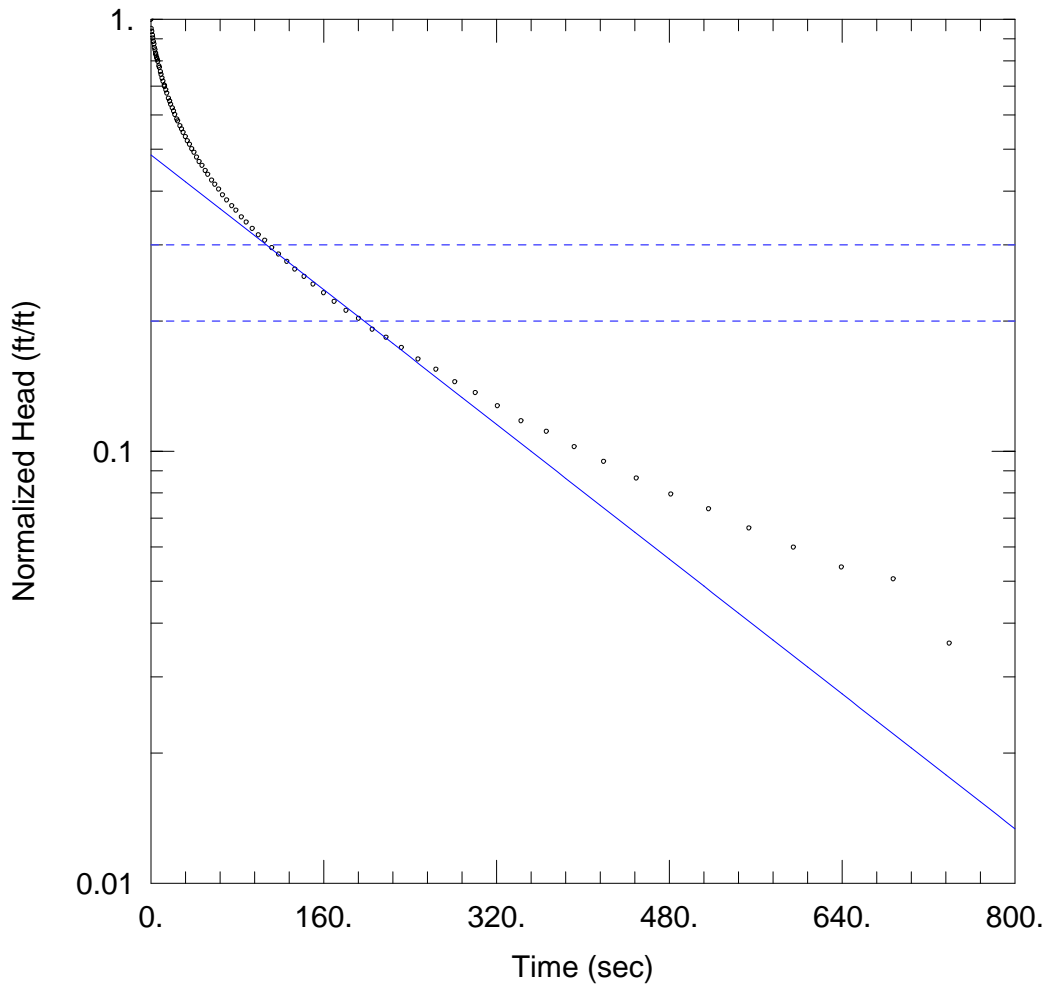
Saturated Thickness: 13.14 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-09-82)

Initial Displacement: 2.134 ft Static Water Column Height: 13.14 ft
 Total Well Penetration Depth: 13.14 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 1. ft/day y0 = 0.9763 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-09-80
 Test Date: 10/7/2021

AQUIFER DATA

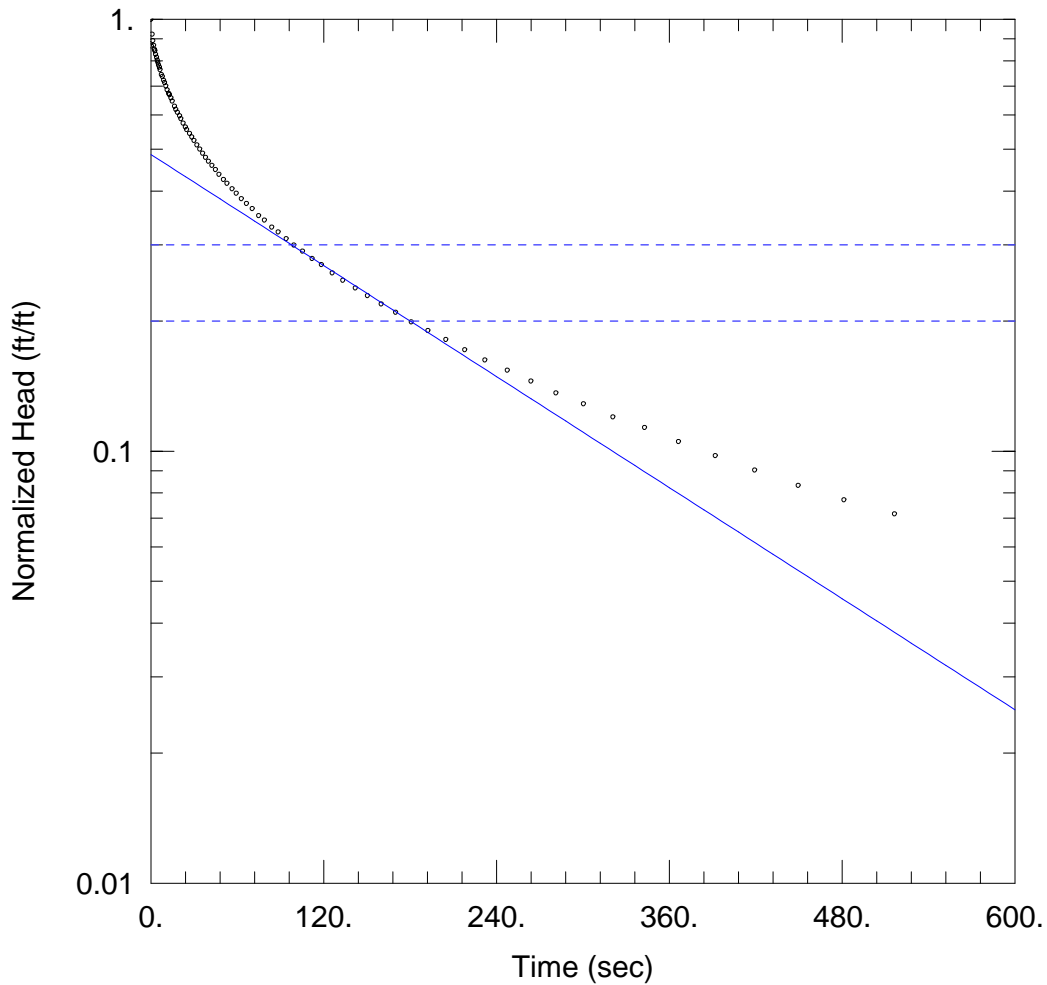
Saturated Thickness: 11.41 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-09-80)

Initial Displacement: 1.838 ft Static Water Column Height: 11.41 ft
 Total Well Penetration Depth: 11.41 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.71 ft/day y0 = 0.8915 ft



RISING HEAD 2

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-09-80
 Test Date: 10/7/2021

AQUIFER DATA

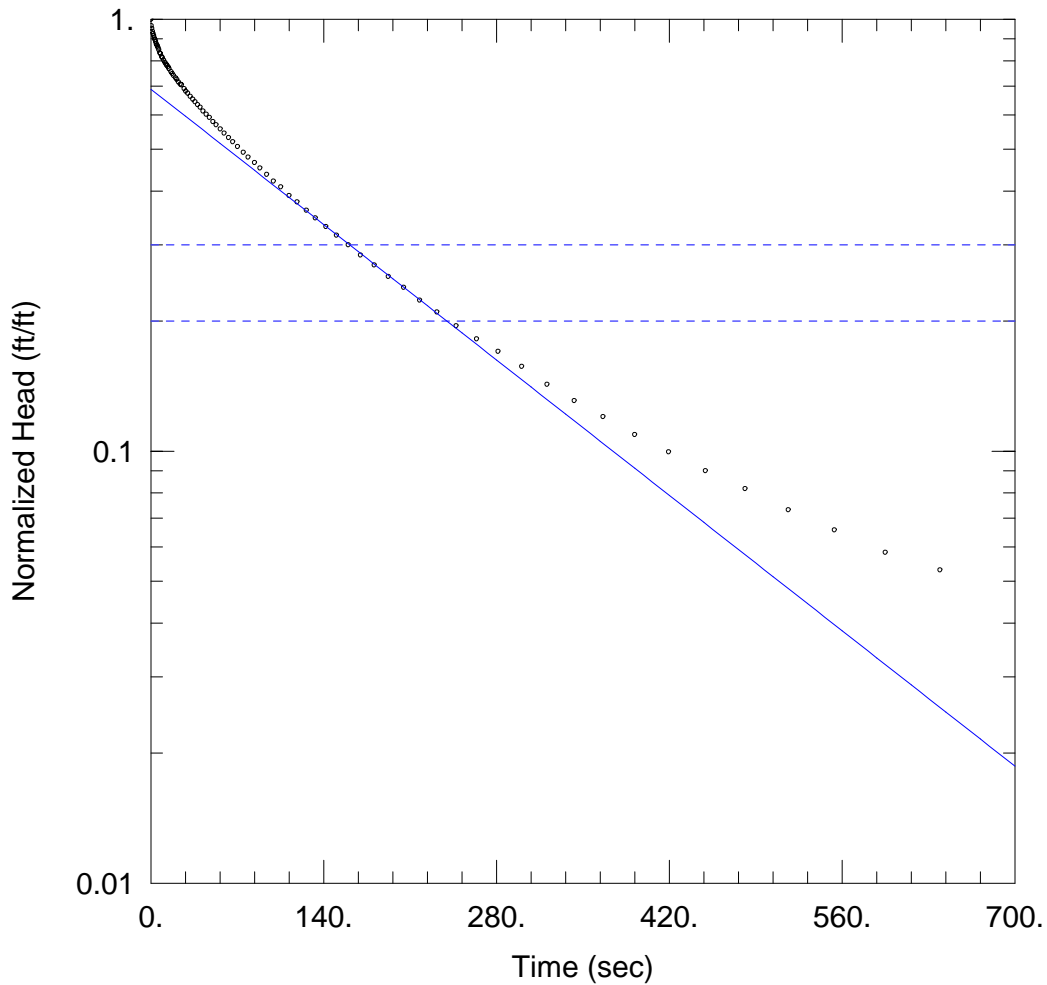
Saturated Thickness: 11.41 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-09-80)

Initial Displacement: 1.958 ft Static Water Column Height: 11.41 ft
 Total Well Penetration Depth: 11.41 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.78 ft/day y0 = 0.9515 ft



RISING HEAD 1

PROJECT INFORMATION

Company: Arcadis
 Client: RACER Trust
 Location: Flint, MI
 Test Well: MW-04-80
 Test Date: 10/7/2021

AQUIFER DATA

Saturated Thickness: 11.75 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-04-80)

Initial Displacement: 2.299 ft Static Water Column Height: 11.75 ft
 Total Well Penetration Depth: 11.75 ft Screen Length: 5. ft
 Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.82 ft/day y0 = 1.582 ft

Appendix E

Low-Flow Pumping Test Plan

SUBJECT

Buick City Low-Flow Pumping Test Plan

DATE

Summary

This Field Implementation Plan (FIP) outlines the methodology for the following activities. Well locations are shown on Figure 1.

Preparation

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Field Forms

The following field forms can be used. Either hard copy or Fulcrum logs are acceptable:

- Pressure Transducer Log (hard copy)
 - For manually recording transducer start/stop times, recording interval, and deployment depth
- FieldNow – Pressure Transducer Log (Tier 1)
 - For electronically recording transducer start/stop times, recording interval, and deployment depth
- Pumping/Recovery Test Log (hard copy)
 - For manually recording pumping test data including DTW, pumping rates and other details
- FieldNow – Pumping/Recovery Test Log (draft)
 - For electronically recording pumping test data including DTW, pumping rates and other details

Equipment and Materials List

The following materials will be required to complete the field efforts:

- “Skinny” Water Level Meter, **maximum 3/8” probe diameter**
- Peristaltic pump and battery pack/charger
- 2-3 graduated 5-gal buckets with lids
- Graduated cylinder, 100 mL, 250 mL, or 500 mL
 - Alternative: graduated measuring cup or beaker
- 0.17” x 0.25” polyethylene tubing; 350 ft total
- Silicon tubing for peristaltic pump head; 8-10 ft total
- Laptop computer/smart device and field notebook or electronic field form
- 2 x In Situ brand Level Troll 500 (vented) pressure transducers (15 psig/35 ft pressure rated) with two 25-foot of direct read cable for each.

- Communication package: 1) Wireless Troll Com which can be used with a tablet/phone and VuSitu mobile app
- Download VuSitu mobile app on tablet/phone or download Win-Situ to laptop prior to field work: <https://in-situ.com/us/win-situ-software>
- Pressure transducer communication equipment/software
- Pressure transducer quick start guide
- Additional field forms
- FIP and guidance documents
- Tailgate meeting and TIP forms
- Decontamination supplies
- General tools

a. Everyday On-site Activities

- Review Arcadis HASP Daily
- Conduct safety meetings; document using daily Health and Safety/Tail Gate Meeting forms. In addition, Stop Work authority may be utilized at any time.
- Update TM daily with progress, and in the event of any unexpected developments.

HEALTH & SAFETY

a. General H&S procedures

Constituents of concern are primarily PFAS as addressed in the Health & Safety Plan. As with all projects:

- Review and sign the HASP prior to mobilizing to the site.
- Prior to each workday, complete COVID-19 Self Assessment on Arcadis H&S App
- Each day will begin with a health and safety tailgate meeting; fill out the attached Tailgate Safety Form each day
- Review the task hazards, as well as emergency procedures and directions to the hospital.
- Make sure to document the weather conditions, personnel onsite, objectives, and health and safety at the beginning of each day's field log.
- Make sure that your vehicle emergency supplies are complete and current and use traffic cones whenever working in or near parking lots and roadways.

b. Personal Protective Equipment (PPE) Requirements

The work will be completed in Level D PPE (i.e. hard hat, safety glasses, safety-toe boots, and a high visibility safety vest). Don Nitrile gloves when appropriate.

There is a potential for exposure to contaminated media while performing this task. Wash hands before eating, drinking, smoking, or any other activity that brings your hands to your face.

LOW-FLOW PUMPING TESTS

Well construction details and planned depths for placement of transducers and pump tubing are included in **Table 1**. Pressure transducer will be installed to record background for 15 minutes prior to testing at depth provided in **Table 1**.

Prior to mobilization please become familiar with the Arcadis Technical Guidance Instructions (TGI) for Constant Rate Pumping Test document and field form. The low-flow pumping test is a simplified version of a full-scale pumping test, and not all sections of the full-scale TGI are relevant. For example, we will not monitor drawdowns in nearby observation wells, and we will not monitor water level recovery after turning off the pump. However, the general concepts are the same and are important to understand.

One low-flow pumping test will be completed at each well. To perform the pumping tests, follow the steps listed below.

1. Unlock and open the monitoring well cover while standing upwind from the well.
2. Obtain water level and well depth information.
 - a. Using a water level meter, measure the depth to water and depth to bottom of the well. Record on Pumping/Recovery Test Log (hard copy) or FieldNow – Pumping/Recovery Test Log (draft).
3. Install/reprogram the pressure transducer and pump tubing.
 - a. Program the transducer to fast **linear (not logarithmic) 0.5 second** data collection intervals. Program the correct well location and project ID. Program the pressure units in feet and temperature in Celsius. Do not program in an offset or reference elevation.
 - b. Install the transducer in the well at the deployment depth calculated on the table. In general, transducers will be deployed about 6 inches from the well bottom. Secure transducer cable to ensure that it will not move during testing.
 - c. Record the depth the transducer(s) was set at on the Pressure Transducer Log (hard copy) or FieldNow – Pressure Transducer Log (Tier 1).
 - d. Confirm that the transducer is measuring the appropriate parameters (pressure, depth, temperature). VERIFY THAT THE PRESSURE TRANSDUCER IS LOGGING DATA, and not just displaying it.
 - e. Insert the pump tubing at the deployment depth calculated on the table. If there is enough water column height, the tubing intake will be deployed about 1 foot above the transducer.
 - i. Note: exercise field judgement based on static DTW measurement and the water column height. The pump tubing should be set deep enough so that the pump does not go dry during the test (i.e., at least 1 or 2 feet below the static DTW, if possible). However, the pump tubing should not be deeper than the transducer.

- f. Record the depth the tubing was set at on the Pumping/Recovery Test Log (hard copy) or FieldNow – Pumping/Recovery Test Log (draft).
 - g. Allow the water level to equilibrate and monitor it for at least 15 minutes to establish a baseline water level and confirm that it's not drifting.
4. Initiate the low-flow pumping test.
- a. Ensure that the pump tubing is directed into a 5-gallon bucket, and that you have 1 or 2 extra buckets in case the first bucket becomes full.
 - b. Ensure that you have access to a stopwatch/timer and a graduated cylinder (or graduated measuring cup/beaker) to **accurately measure flow rates**.
 - c. After baseline water level has been confirmed and at least 15 minutes of background data have been collected, turn the peristaltic pump on at a flow rate of about 200 mL/min. Make sure to record the time you started the pump on the
 - i. It is critical that the flow rate be held steady. Set the flow rate as soon as possible after starting the pump. If possible, use a second person to help adjust and/or measure flow rates until it is set.
 - d. Record the manual DTW and flow rate on the Pumping/Recovery Test Log (hard copy) or FieldNow – Pumping/Recovery Test Log (draft). Collect measurements on the following schedule:
 - i. Every 30 seconds for the first 5 minutes (0-5 minutes)
 - ii. Every minute for the next 5 minutes (5-10 minutes)
 - iii. Every 5 minutes for the duration (10 minutes and beyond)
 - e. If flow rate adjustments are necessary, record the time and magnitude of each change. In general, we're aiming for at least 0.1 ft of drawdown, but preferably 0.5 to 1.0 ft of drawdown. Do not exceed a flow rate of 1,000 mL/min.
 - f. Continue the pumping test until the drawdown has reached steady state, **defined as less than 0.1 ft of drawdown every 5 minutes**.
 - i. The target duration is approximately 1 hour, so select a flow rate that will likely stabilize within that amount of time.
 - ii. Use the direct read cables, along with manual water level measurements, to evaluate the drawdown data in real time.
 - g. After steady state drawdown is achieved, turn the pump off and remove the equipment in this order:
 - i. Water level meter
 - ii. Pump tubing
 - iii. Pressure transducer
 - h. Stop the transducer and save the test data. Ensure the data file is stored on a device (laptop or tablet) before re-programming the transducer for the next test.

Review the data collected to determine the reasonableness of the preliminary results. If additional tests are required, then consult with support staff on additional testing and the above procedure may be repeated with another flow rate or configuration. Make notes on the field form and notebook concerning any irregularities. Save all data files to the laptop and backup flash drive.

EQUIPMENT DECONTAMINATION

Cleaning and decontamination should be carried out according to the *Field Equipment Decontamination SOP*. This includes the following:

Cleaning Sampling Equipment

1. Wash the equipment with potable water.
2. Wash with detergent solution (Alconox or equivalent).
3. If equipment is very dirty, precleaning with a brush and tap water may be necessary.
4. Rinse with distilled water.
5. Rinse with isopropyl alcohol or acetone.
6. Rinse with distilled/deionized water or Lab provided PFAS-free water.

Appendix F

Single Well Tracer Test Results

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

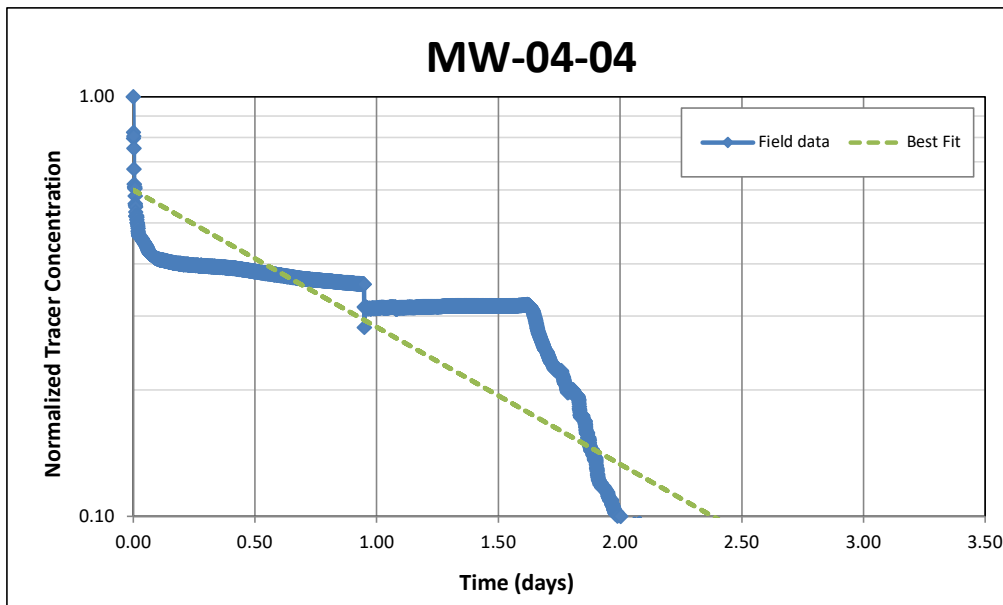


Site/Project #: Buick City 30174223
Well ID: MW-04-04
Analysis by/date: Steph P. 10/13/23
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	764	uS/cm
Starting Tracer Concentration in Well	1,317	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.1
Darcy Velocity in Aquifer	v	ft/day	0.0

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.16	--
	0.1	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

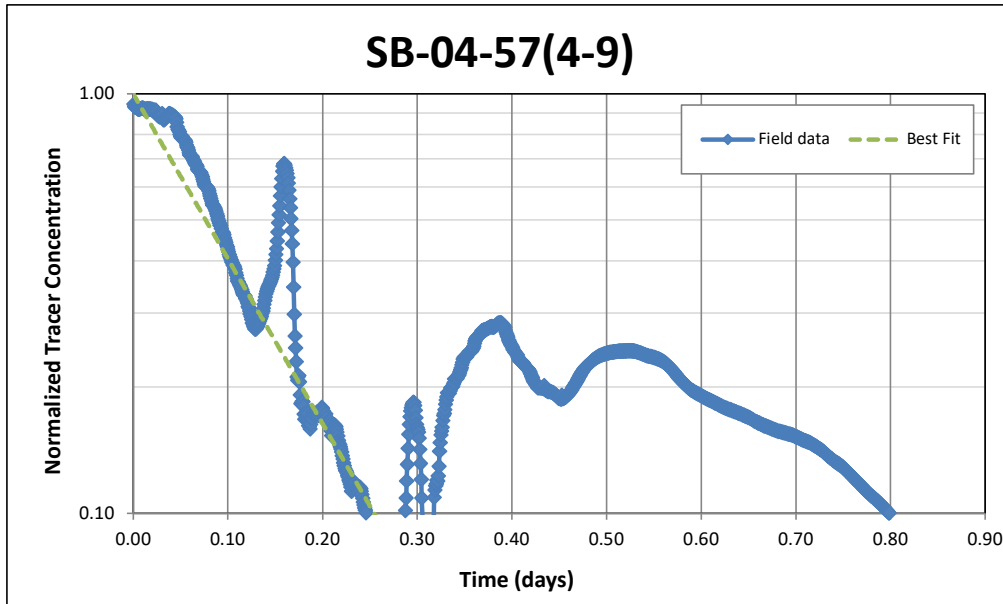


Site/Project #: Buick City 30174223
Well ID: SB-04-57(4-9)
Analysis by/date: G. Link 10/19/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	789	uS/cm
Starting Tracer Concentration in Well	1,396	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.6
Darcy Velocity in Aquifer	v	ft/day	0.2

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	1.1	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

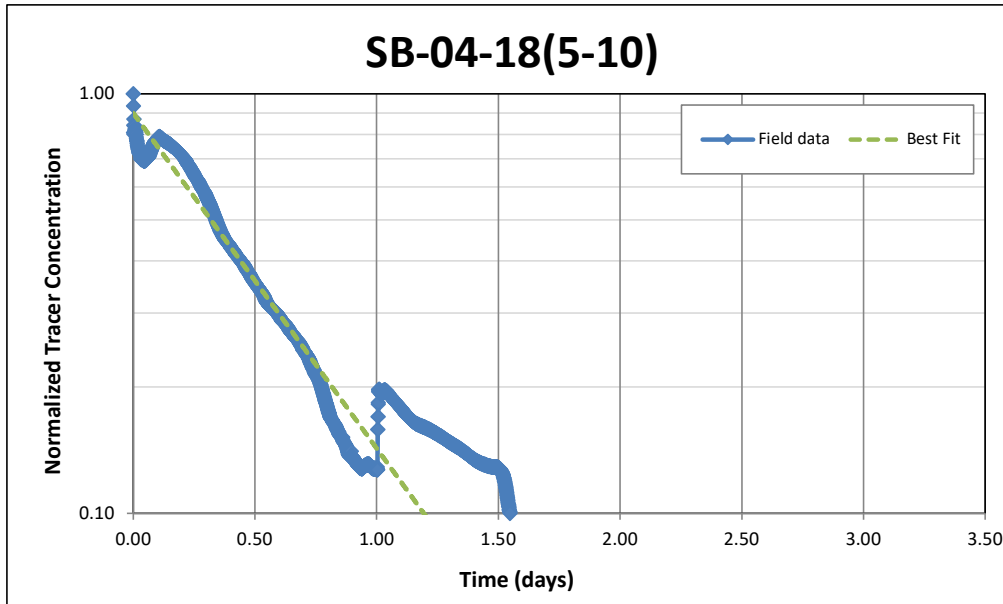


Site/Project #: Buick City 30174223
Well ID: SB-04-18(5-10)
Analysis by/date: G. Link 12/13/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	504	uS/cm
Starting Tracer Concentration in Well	1,370	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.2
Darcy Velocity in Aquifer	v	ft/day	0.1

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.4	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

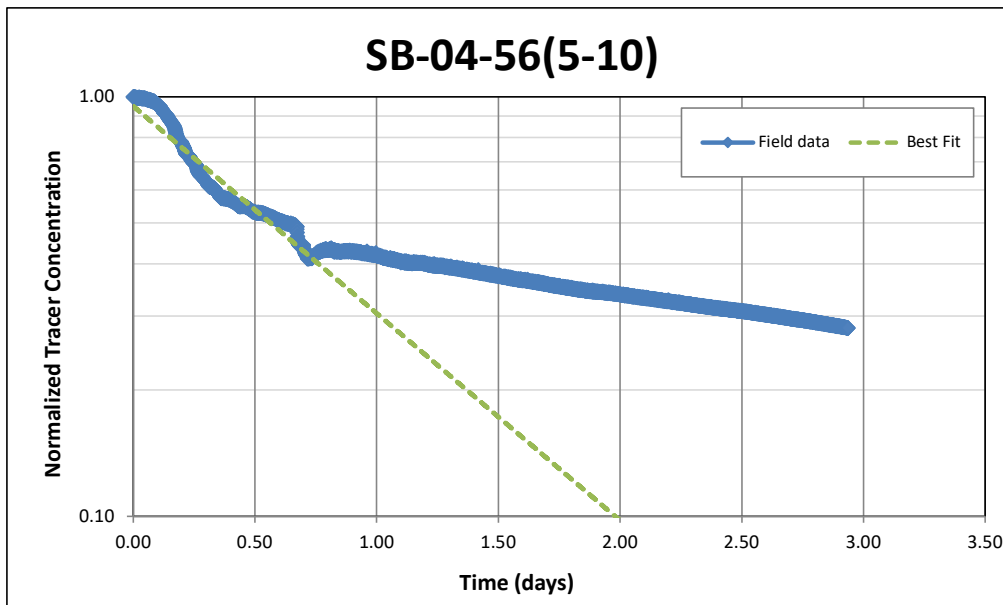


Site/Project #: Buick City 30174223
Well ID: SB-04-56(5-10)
Analysis by/date: Steph P. 10/13/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	881	uS/cm
Starting Tracer Concentration in Well	1,202	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.1
Darcy Velocity in Aquifer	v	ft/day	0.0

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.2	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

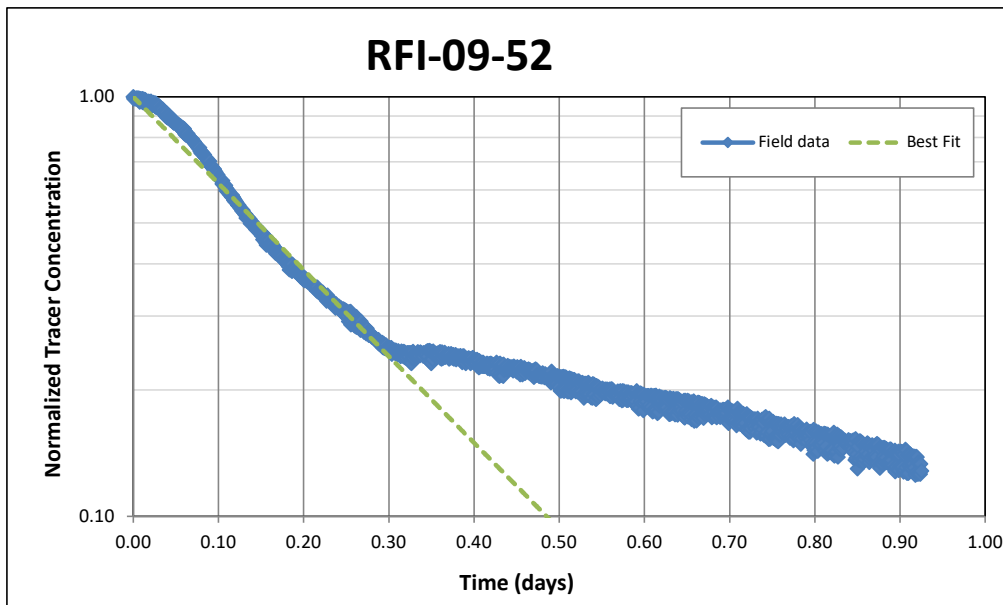


Site/Project #: Buick City 30174223
Well ID: RFI-09-52
Analysis by/date: G. Link 12/13/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	2,157	uS/cm
Starting Tracer Concentration in Well	3,007	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.4
Darcy Velocity in Aquifer	v	ft/day	0.1

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.8	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

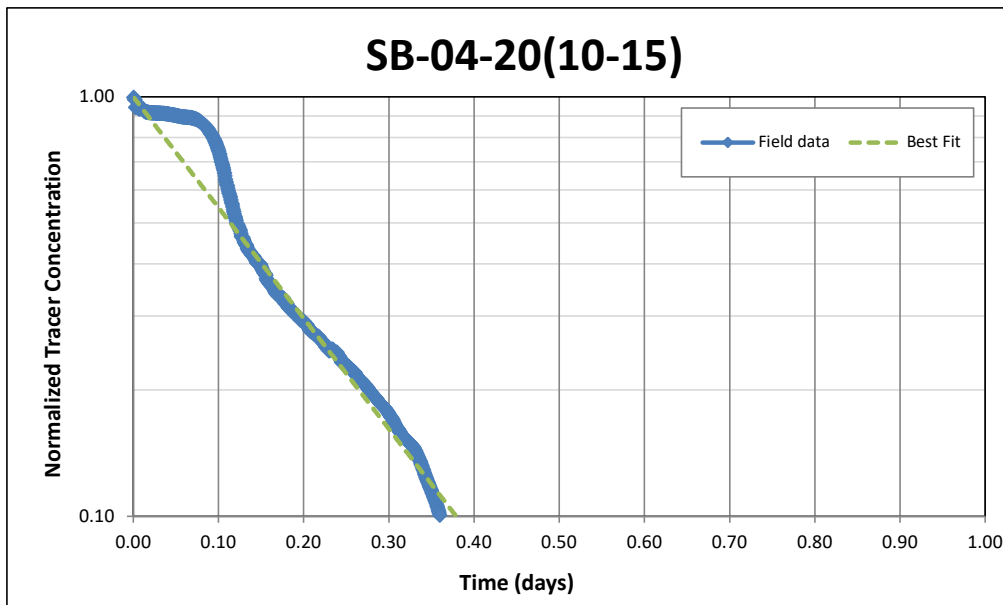


Site/Project #: Buick City 30174223
Well ID: SB-04-20(10-15)
Analysis by/date: Steph P. 10/13/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	785	uS/cm
Starting Tracer Concentration in Well	1,350	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	1.3
Darcy Velocity in Aquifer	v	ft/day	0.4

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.16	--
	2.4	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

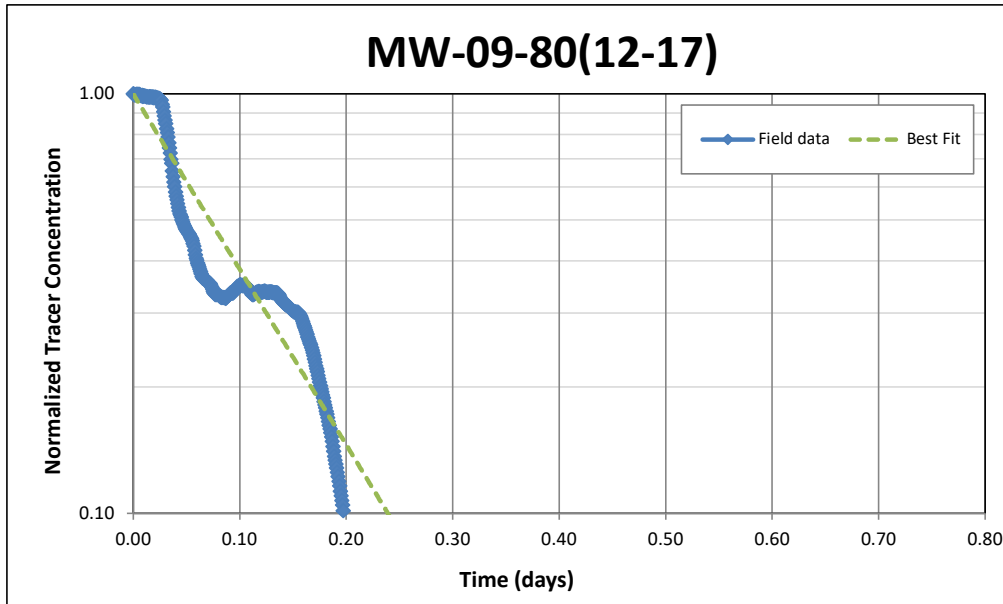


Site/Project #: Buick City 30174223
Well ID: MW-09-80(12-17)
Analysis by/date: Steph P 10/13/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	1,712	uS/cm
Starting Tracer Concentration in Well	2,147	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	2.0
Darcy Velocity in Aquifer	v	ft/day	0.6

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	3.9	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

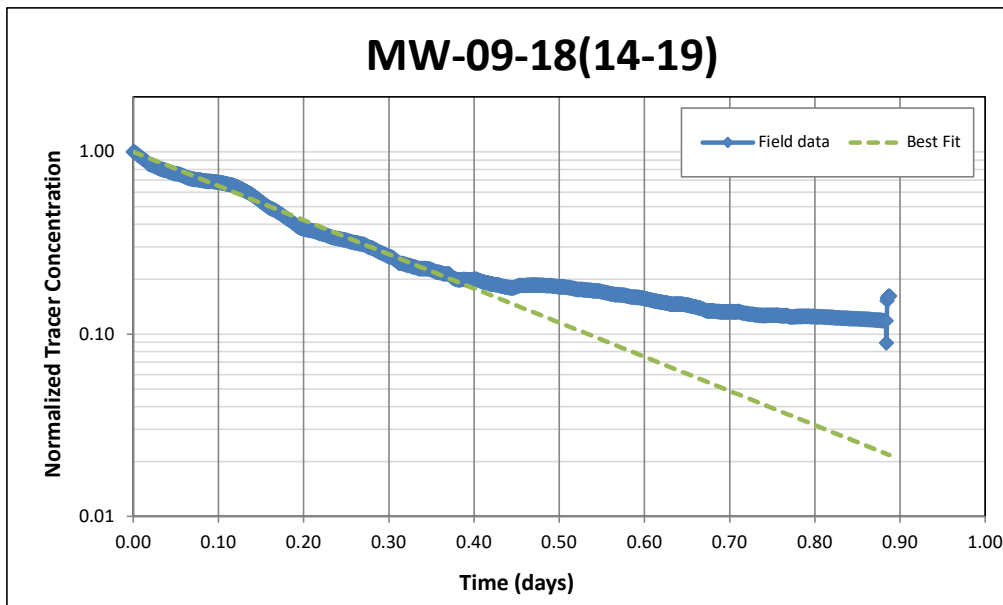


Site/Project #: Buick City 30174223
Well ID: MW-09-81(14-19)
Analysis by/date: Steph P. 10/13/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	1,274	uS/cm
Starting Tracer Concentration in Well	1,718	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	1.1
Darcy Velocity in Aquifer	v	ft/day	0.3

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	2.2	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

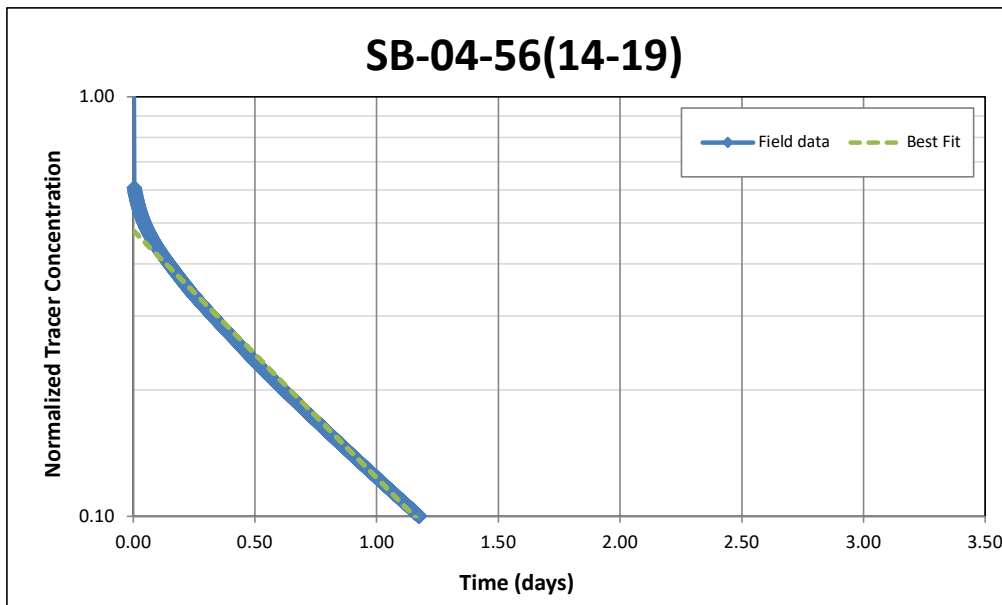


Site/Project #: Buick City 30174223
Well ID: SB-04-56(14-19)
Analysis by/date: Steph P 10/13/2023 G. Link 10/19/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	717	uS/cm
Starting Tracer Concentration in Well	2,104	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.2
Darcy Velocity in Aquifer	v	ft/day	0.1

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.3	ft/day

Single Well Tracer Test Analysis Tool

K. Heinze, A. Kempf, S. Russold, C. Divine; Version 1.0, December 2011

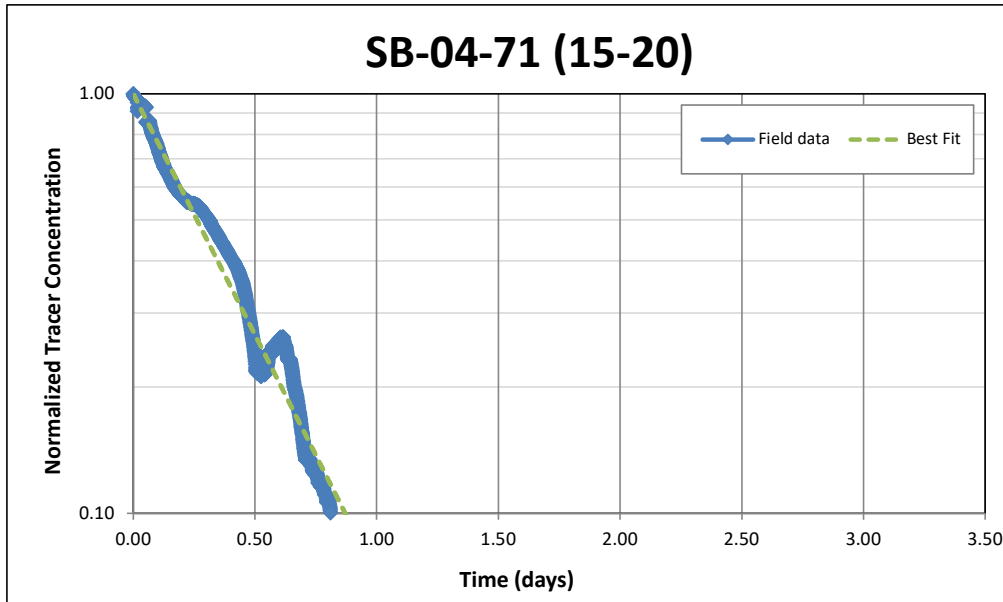


Site/Project #: Buick City 30174223
Well ID: SB-04-71(15-20), Test A
Analysis by/date: G. Link 09/07/2023
Tracer Used: Saline Solution

Directions

Fill in the **BLUE** fields, the tool will compute values in **GREEN** fields.
 A **GREY** fill color indicates value is linked to another location.

Tracer Input	Concentration	Units
Background Tracer Concentration	821	uS/cm
Starting Tracer Concentration in Well	1,462	uS/cm
Tracer Test Start Date and Time	7/28/2023 11:34	



Estimation of Groundwater Movement through Well and Darcy Velocity (q_w and v)

Groundwater Movement through Well	q_w	ft/day	0.4
Darcy Velocity in Aquifer	v	ft/day	0.1

Calculated Groundwater Velocity

	Mobile Porosity (n_m)	Units
	0.16	--
Average Linear Groundwater Velocity Estimate Based on Best Fit (ft/day)	0.7	ft/day

Arcadis of Michigan, LLC
28550 Cabot Drive, Suite 500
Novi
Michigan 48377
Phone: 248 994 2240
www.arcadis.com