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Subject:

Plant 3 PFAS Investigation Summary Report Addendum
RACER Trust, Plant 3, Lansing, Michigan

The following report addendum provides a summary of the additional monitoring well installation and sampling completed at the Revitalizing Auto Communities Environmental Response (RACER) Trust Plant 3 (Site) located in Lansing Township and the City of Lansing, Michigan. The area of interest also extends east of Plant 3 into the City of Lansing's Dunnebacke and West Side Parks (City Parks). The location of the Site and City Parks are included on **Figure 1**. Monitoring wells were installed to provide delineation of poly- and perfluoroalkyl substances (PFAS) associated with the plating operations formerly conducted at Plant 3. Details regarding the plating operations and initial PFAS characterization was provided in the Plant 3 PFAS Investigation Summary Report (Arcadis 2018). All work outlined in this addendum was completed between December 4, 2018 and May 10, 2019. The primary objectives of the PFAS sampling were as follows:

- Install additional monitoring wells at the Site for stability and sentinel monitoring for PFAS.
- Collect additional data (i.e. fraction organic carbon [f_{oc}], geotechnical data) to evaluate horizontal and vertical migration potential for PFAS impacts.

- Collect a sample from a source area monitoring well (CH-14-RO) for total oxidizable precursor (TOP) assay to evaluate the potential for precursors that may represent an ongoing PFAS source.

MONITORING WELL INSTALLTION

As outlined in the 2018 Plant 3 PFAS Summary Report (Arcadis 2018), a total of 21 monitoring wells (MW-18-88 through MW-19-108) were installed using rotary drilling methods at the Site for stability and sentinel monitoring for PFAS:

- Five wells (MW-18-88 through 92) were installed within the source area and plume core in 2018 to evaluate hydraulic conductivity of the fill material and sand seams and provide for source area monitoring (Arcadis 2018).
- Six perched monitoring wells installed around the impacts at Plant 3 to serve as perimeter sentinel wells.
- Four deep overburden monitoring wells installed at Plant 3 as sentinels for vertical migration of PFAS. Deep overburden wells were screened just above the bedrock surface (~ 60-100 ft bgs).
- One perched monitoring well to monitor concentrations and plume stability within the southern extent of PFOS exceedances along the eastern property boundary.
- Two off-site perched monitoring wells installed in Dunnebacke Park as sentinels for migration.
- Two off-site perched monitoring wells installed in Dunnebacke Park to monitor concentration trends and plume stability where PFOS was identified at concentrations exceeding Part 201 Groundwater-Surface Water Interface (GSI) Criteria.
- One off-site perched monitoring well installed in Westside Park as a sentinel for migration.
- Note that MW-18-96, an on-site sentinel well in the southwest corner of the PFAS impacts has been dry during both sampling attempts

Continuous soil cores were obtained from the ground surface at the target well depth at each boring location. Arcadis logged and described the soils in accordance with the Arcadis Soil Description Standard Operating Procedures included with the EGLE-approved FSP (Arcadis 2011). Boring logs and wells installation logs for the 16 new monitoring wells are included as **Attachment 1**.

All monitoring wells were constructed with 5-foot stainless-steel wire-wrapped 0.010-slot screens and 2-inch PVC riser. An appropriate sand pack was placed around the screen interval to a depth of 1 foot above the well screen, followed by 1 to 2 feet of choker sand, and then bentonite grout to grade. Following installation, monitoring wells were developed by cycling a surge block and pumping until the well was reasonably free of fine-grained material.

During installation, Shelby tube sampling was attempted at five well locations within the clay till underlying the perched zone to verify the confining unit vertical hydraulic conductivity. However, due to the density and presence of cobbles, Shelby tube recovery of the till was not possible.

Fourteen (14) soil samples were collected during the wells installation and submitted for the following:

- Fraction organic carbon (f_{oc}) via the Walkley Black Method at Merit Laboratories located in East Lansing, Michigan
- In lieu of the Shelby Tube samples, two of the soil samples (MW-18-102 and MW-18-103) were submitted to GeoTesting Express (subcontracted by Merit) for particle size analysis (via Method ASTM D422).

The Soil f_{oc} data is summarized on **Table 1** and can be found in **Attachment 2**. The sieve data was evaluated using the HydrogeoSieveXL (V 2.3; Devlin, 2015) program to estimate permeability. The sieve laboratory reports and HydrogeoSieveXL output is included as **Attachment 3**.

Groundwater Sampling

Groundwater samples were collected from the Site for PFAS analysis during two events; the 2019 first quarter sampling from March 4, 2019 to March 6, 2019 and the second quarter 2019 sampling from June 9, 2019 to June 10, 2019. Samples were submitted to SGS Accutest Laboratory located in Orlando, Florida and analyzed for the 24 PFAS contained in the draft Michigan Department of Environment, Great Lakes, and Energy (EGLE) PFAS Minimum Laboratory Analyte List (EGLE, 2018) using modified USEPA Method 537 with isotope dilution (DoD QSM 5.1). Sample locations and results compared to Part 201 Drinking Water (DW) and GSI Criteria are shown on **Figures 1** and **2**, respectively. The results for the 21 monitoring wells are summarized on **Table 2**.

At each groundwater sampling location, a sample was collected using low-flow groundwater sampling techniques. Fifteen (15) samples were collected during the 2019 first quarter and six (6) samples were collected during the 2019 second quarter groundwater sampling events. To avoid cross contamination, all sampling was conducted in accordance with the Arcadis PFAS Sampling Technical Guidance Instruction. QA/QC samples were collected at a rate of one duplicate for every 10 groundwater samples, one matrix spike/matrix spike duplicate (MS/MSD) per 20 samples, one equipment blank per pump and per water level meter. All analytical data is summarized on **Table 2**. Laboratory analytical reports are included as **Attachment 2**.

RESULTS

Groundwater Sampling

The current GSI Criteria for perfluorooctanesulfonic acid (PFOS) is 12 nanograms per liter (ng/L), a value based on a non-drinking water surface water receptor. The DW criterion is 70 ng/L for combined concentrations of PFOS and Perfluorooctanoic acid (PFOA). All analytical data is summarized on **Table 2**. Analytical results for combined PFOS and PFOA are shown on **Figure 1** with a comparison to DW criteria, and analytical results for PFOS compared to GSI criteria are shown on **Figure 2**. Notable results include:

- MW-18-98: Located on the north perimeter and intended as a sentinel well. The well was sampled twice. PFOS concentrations of 132 and 137 ng/L exceed GSI Criteria. The combined concentrations of PFOS and PFOA of 171.3 and 172 ng/L exceed DW Criteria.
- MW-18-99: Located on the northeast perimeter and intended as a sentinel well. The well was sampled twice. PFOS concentrations of 74.2 and 57.3 ng/L exceed GSI criteria and a combined concentration of PFOS and PFOA of 82.7 ng/L, exceeds DW criteria.
- No exceedances were detected along the west property boundary.
- MW-18-106: Located in the southeast corner of the City Parks and intended as a sentinel well. The well was sampled twice. PFOS concentrations of 51.6 and 14.5 ng/L exceed GSI criteria.
- Perfluorobutanoic acid (PFBA) is considered a mobile PFAS constituent and a possible indicator of the leading edge of PFAS migration. PFBA has been detected in several wells at the Site at concentrations ranging from < 1.9 ng/L to 20.3 ng/L (MW-18-98). PFBA detections do not extend beyond the range of PFOS detections. The PFBA analytical data is included on **Table 2**.
- In addition to PFOS and PFOA, additional PFAS have been detected at the Site. **Figure 3** illustrates a total concentration for eight additional compounds that were consistently reported by the various laboratories since the start of PFAS investigation activities in December 2016. (perfluorobutanesulfonic acid [PFBS], perfluorobutanoic acid [PFBA], perfluorodecanoic acid [PFDA], perfluoroheptanesulfonic acid [PFHpS], perfluoroheptanoic acid [PFHpA], perfluorohexanesulfonic acid [PFHxS], perfluorohexanoic acid [PFHxA], and perfluoropentanoic acid [PFPeA]). The results of the summary show that, in general, only relatively low-level concentrations of other PFAS have been associated with the former plating line. For example, other PFAS detected in source area monitoring well CH-14-RO is one to three orders of magnitude lower than PFOS detected at that location.
- Of the eight PFAS illustrated on **Figure 3**, three are proposed for future regulation, including PFBS, PFHxA, and PFHxS.
 - The maximum concentration of PFBS detected on the Site was 250 ng/L in monitoring well CH-14-RO, below the Michigan PFAS Action Response Team (MPART) Science Advisory Workgroup (SAWG) recommended health-based value of 420 ng/L.
 - The highest concentration of PFHxA detected on Site is 75 ng/L in monitoring well CH-14-RO, below the SAWG health-based value of 400,000 ng/L.
 - The highest observed concentration of PFHxS was 3,000 ng/L in monitoring well CH-14-RO, which is above the SAWG health-based value of 51 ng/L. Although other detections of PFHxS on-site are lower concentration, there are six groundwater samples that exceed the health-based value, primarily located in close proximity to the former plating line (Arcadis 2018, Appendix F).
 - PFHxS was detected in VAP samples collected from SB-OS-CK230 and SB-OS-CS226 located along the northwest boundary of Dunneback Park, at concentrations of 236 ng/L

and 421 ng/L respectively. Upgradient VAP samples located in the PFOS plume at the eastern property boundary of Plant 3 were all non-detect for PFHxS suggesting that the concentrations observed in the park may be related to a separate source of PFAS.

- The quality control samples, including equipment blanks, field duplicates, MS/MSDs, and laboratory method blanks, are included in the laboratory analytical reports (**Attachment 2**). Equipment blanks were collected from the bladder pump, water level meter, and clean peristaltic pump tubing and contained no detections of any PFAS analytes. Field duplicates demonstrated acceptable repeatability with less than 10% difference from the parent sample concentrations for the majority of the results. No analytes were detected within the laboratory method blanks and recoveries for MS/MSD analysis were within laboratory acceptance limits.

Top Assay Results

A groundwater sample was collected from monitoring well CH-14-RO on May 20, 2019. This sample was shipped to Eurofins-TestAmerica Sacramento, where they were analyzed for PFAS and by the total oxidizable precursor (TOP) Assay. The TOP Assay is an oxidation-based technique that converts polyfluorinated compounds, also known as perfluoroalkyl acid (PFAA) precursors, to measurable perfluoroalkyl carboxylates (PFCAs) as an indirect means of detection. The samples are measured after oxidation ("post-treatment"), in addition to their initial analysis for PFAS ("pre-treatment"). The results of the analysis are included as

Attachment 4

Well CH-14-RO contained measurable PFAS in the pre-treatment analysis. Notably, none of the precursors that were directly measured (4:2 FtS, 6:2 FtS, 8:2 FtS, FOSA, MeFOSAA, or EtFOSAA) were detected. In the post-treatment TOP Assay analysis, concentrations of the short chain perfluoroalkyl carboxylates PFHxA rose by 65%, suggesting the presence of a modest amount of short chain (i.e., C6) PFAA precursors. Concentrations of PFOA did not increase in the post-treatment sample, suggesting a lack of C8 precursors that could form either PFOS or PFOA.

A 7% PFOA decline was measured in the post-treatment sample, which may be the result of normal analytical variability between measurements or may be the result of a quality control issue at the laboratory. Generally, losses of up to 10% do not indicate a significant analytical problem. Complete conversion of the M2-4:2FtS compounds, as indicated by a recovery of 0% in the post-treatment sample, suggested that complete oxidation of precursors occurred in this sample; a portion of the increases of PFBA observed in post-treatment sample relative to pre-treatment sample is attributable to the oxidation of M2-4:2FtS.

Overall, the CH-14-RO sample suggested the potential to form up to ~65% more short chain PFAAs, consisting primarily of PFHxA, from the conversion of short chain precursors over time. The maximum PFHxA concentration is currently two orders of magnitude below the SAWG health-based value. There is the potential to form short chain perfluoroalkyl sulfonates (PFSAs) such as PFHxS, however, it is difficult to quantify as TOP Assay does not generate PFSAs. The results suggest that there are no precursors present to form additional PFOS or PFOA.

Groundwater Elevation

Groundwater elevations were measured at new and existing monitoring wells during a gauging event completed on June 3, 2019. Groundwater elevation data is summarized on **Table 3** and a groundwater elevation contour map is provided as **Figure 4**.

On-site, the contour map indicates radial flow moving outwards from the center of Plant 3 driven by infiltration through the former press pit area. Within the City Parks, the groundwater elevation data suggests the groundwater flow is influenced by the presence of the 60-inch sanitary main. The groundwater elevation at MW-18-106 is higher relative to the other wells located in the City Parks and suggests groundwater flow coming into the City Parks from the southeast.

Horizontal Migration

The hydraulic conductivity (K) data obtained from the slug testing the initial 5 monitoring wells (Arcadis 2018), the horizontal gradient, and the f_{oc} data can be used to estimate the migration of PFOS and other PFAS within the perched zone. An average K of 5 to 20 feet per day (ft/day) was determined for the fill material and thicker sand seams (located within the source and east of the source area, respectively), and an average K of 0.1 to 3 ft/day was determined for the silty sediments and thin sand seams (i.e. north, south and west of the source area).

Groundwater seepage velocity (v) is given by

$$v = K i / n_e$$

where

K = Hydraulic Conductivity

i = Horizontal Hydraulic Gradient

n_e = Effective Porosity

A summary of the groundwater seepage velocity is provided in the table below. By incorporating the Site specific f_{oc} data (**Table 1**), estimated bulk density of the soils and the organic carbon distribution coefficient (K_{oc}) for PFOS (**Attachment 5**), the contaminant retardation factor (R_d) can be calculated as follows:

$$R_d = (P_b * (K_{oc} * f_{oc}) / n_e) + 1$$

Where

P_b = Bulk Density

n_e = Effective Porosity

K_{oc} = Organic Carbon Distribution Coefficient

f_{oc} = Organic Carbon Content of Soil

The retardation factor is equivalent to the seepage velocity divided by the contaminant velocity ($R_d = v / v_c$).

For advective soils at Plant 3 the average f_{oc} is 0.0014 grams/gram (g/g). The K_{oc} for PFOS is 631 (Guelfo and Higgins 2013). The bulk density for the silt-fine sand is assumed to be 1.72 grams per cubic centimeter (g/cm³) (Wiedemeier 1999). The calculated groundwater seepage velocity and the estimated migration rate of PFOS at Plant 3 are provided in the following table.

Direction	Gradient	K (Avg/Max) (ft/day)	Seepage Velocity (ft/year)	PFOS Migration (ft/year)
East (Higher Permeability)	0.004	17 (Avg)	165	15
West	0.003	1.1 to 3	8 to 20	1 to 2
North	0.017	1.1 to 3	45 to 125	4 to 11
South West	0.008	1.1 to 3	20 to 60	2 to 5

The estimates of seepage velocity and PFOS migration provided above are over simplified and do not consider the variable nature of the transport zones or the available source mass. PFOS detections are observed approximately 900 feet to the east of the former plating area and approximately 400 to 600 ft from the former plating area in all other directions. The duration of PFOS migration is not known with certainty. It is likely some migration occurred before the demolition of the plating line in 1988 and infiltration increased at the Site after the demolition of the building was completed in 2010. As an example, if migration started upon demolition of the plating line in 1988 the extent of the PFAS migration velocity may range between 10 and 30 feet per year (ft/year).

Vertical Migration

For a simplistic estimate of vertical migration, the ratio of vertical to horizontal hydraulic conductivity can be used to estimate the amount of recharge that may migrate vertically. If the area of the press pits (source area) is approximately 30,000 ft² and recharge is approximately 10 inches per year, the amount of water recharging to the fill material in the press pit area is approximately 25,000 cubic feet annually, or 187,000 gallons per year. Based on slug testing, the mean horizontal K of the fill material is 5 ft/day or 10⁻³ centimeters per second (cm/s). Shelby Tube samples from the deeper till (Arcadis 2012) and the sieve analysis collected from the shallow till (**Attachment 3**) suggest the vertical K ranges from 0.1 to 0.003 ft/day (10⁻⁵ to 10⁻⁶ cm/sec), the ratio of horizontal to vertical flow would be 100/1 to 1000/1, or between 187 to 1,870 gallons per year vertically, with the remainder flowing away from the area horizontally.

When this vertical groundwater flux reaches the deep overburden saturated zone below the press pits it will mix with groundwater migrating horizontally within the saturated deep overburden. Groundwater flux (Q) through the deep overburden is given by

$$Q = K i A$$

Where

K	=	hydraulic conductivity
i	=	horizontal gradient
A	=	cross-sectional area of aquifer

As an example, the width of the PFAS source area beneath the press pits is approximately 250 feet, the deep overburden thickness near well CH-14-RO is approximately 10 feet. Assuming a deep overburden hydraulic conductivity of 3 ft/day (i.e. 10^{-3} cm/s) (consistent with silt-sand deep overburden), and the measured gradient of 0.014, the horizontal groundwater flux within the deep overburden is approximately 785 gallons per day, or 287,000 gallons per year. Therefore, a vertical discharge of 187 gallons per year from the source area would mix with three orders of magnitude more groundwater. If vertical migration of PFAS (primarily PFOS) near CH-14-RO occurs at concentrations between 1,000 and 10,000 ng/L, the PFAS concentration in the discharge would be diluted by three orders of magnitude to a concentration of 1 to 10 ng/L in the deep overburden. The concentration of PFOS in MW-91-2, the deep overburden well adjacent to CH-14-RO, has ranged between 2 and 42 ng/L, although it is noted that PFOS detected at MW-91-2 may be associated with leakage around the aging well casing.

The vertical K used in the example is likely an overestimate considering the Shelby tubes were collected from the deep overburden (primarily silt/sand as opposed to clay), and K estimates from sieve analysis tend to be bias high in poorly sorted clay-rich soils. In addition, the above does not consider the retardation associated with the f_{oc} , which is relatively high for the glacial till underlying the perched zone (average 0.0037 g/g, **Table 1**). Therefore, the estimate of vertical contribution is considered conservative.

In summary, it is unlikely that PFOS would migrate vertically at detectable concentrations in this area. PFAS has not been detected in any of the other 13 deep overburden wells installed around and beneath the former plating area. To evaluate this detection further, RACER proposes to replace MW-91-2 with a properly constructed double-cased, deep overburden monitoring well.

PROPOSED ACTIVITIES

Based on observed detections of PFOS above GSI criteria, and combined PFOA and PFOS detections exceeding DW criteria, installation of additional monitoring wells is proposed near the perimeter of the perched PFOS plume. The proposed monitoring wells are shown on **Figure 5**. The monitoring well installation scope of work includes the following:

- A total of 5 additional monitoring wells will be installed using rotary drilling methods:
 - Two perched monitoring wells installed north-northwest of the Plant 3 perched PFOS plume to provide delineation and act as perimeter sentinel wells

- One additional perched monitoring well along the western property boundary of Plant 3 as a perimeter sentinel well.
 - One off-site perched monitoring well installed in Westside Park to the east of MW-18-96 as a sentinel for migration.
 - The replacement and abandonment of monitoring well MW-91-2 to confirm the deep overburden PFAS detections
- Continuous soil cores will be obtained from the ground surface to the target well depth at each boring location. Arcadis will log and describe the soils in accordance with the Arcadis Soil Description Standard Operating Procedures included with the MDEQ-approved FSP (Arcadis 2011). Boring logs will be generated based on the field descriptions.
 - Perched monitoring wells will be constructed with a 5-foot stainless-steel wire-wrapped 0.010-slot screens and 2-inch PVC riser. An appropriate sand pack will be placed around the screen interval to a depth of 1 foot above the well screen followed by 1 to 2 feet of choker sand and then bentonite grout to grade.
 - The deep overburden monitoring well will be double cased to the underlying till and then be constructed with a 5-foot stainless-steel wire-wrapped 0.010-slot screens and 2-inch PVC riser. An appropriate sand pack will be placed around the screen interval to a depth of 1 foot above the well screen followed by 1 to 2 feet of choker sand and then bentonite grout to grade. Following installation, monitoring wells will be developed by cycling a surge block and pumping until the well is reasonably free of fine-grained material.

The monitoring wells installed as part of the above described work and the additional wells proposed will be integrated into the revised Interim Groundwater Monitoring Plan currently in draft and anticipated to be submitted to EGLE in 3rd quarter 2019. As part of the interim monitoring plan, PFAS concentrations at existing and new wells, including the well MW-18-106 located near the eastern park boundary, will be evaluated for plume stability and seasonal variation and included as part of the semi-annual groundwater monitoring report.

Please direct any questions to Dave Favero at 734-879-9525 or Patrick Curry at Arcadis at 810-225-1926.

REFERENCES

- Arcadis 2011. Field Sampling Plan. RACER Trust, Lansing Plants 2, 3, and 6 Industrial Land, Lansing, Michigan. August 26.
- Arcadis. 2018. Plant 3 PFAS Investigation Summary Report. RACER Trust, Lansing, Michigan, Plant 3. November 2.
- Devlin, J.F. 2015. HydrogeoSieveXL: an Excel-based tool to estimate hydraulic conductivity from grain-size analysis. Hydrogeology Journal.
- Guelfo, J.L., and C.P. Higgins. 2013. Subsurface Transport Potential of Perfluoroalkyl Acids at Aqueous Film-Forming Foam (AFFF)-Impacted Sites. Environmental Science & Technology
- Wiedemeier, T.H., H.S. Rifai, C.J.J. Newell, and J.T. Wilson. 1999. Natural attenuation of fuels and chlorinated solvents in the subsurface. Hoboken, NJ: John Wiley & Sons.

ENCLOSURES

TABLES

Table 1 – Soil FOC Results

Table 2 – Groundwater PFAS Results

FIGURES

Figure1 – PFOS & PFOA in Groundwater – Plant 3

Figure 2 – PFOS in Groundwater – Plant 3

Figure 3 – Other PFAS in Groundwater – Plant 3

Figure 4 – Perched Groundwater Elevation Contour Map – June 2019

Figure 5 – Proposed Additional Monitoring Wells

ATTACHMENTS

Attachment 1 – Soil Boring and Well Construction Logs (PDF page 23)

Attachment 2 – Laboratory Analytical Reports (PDF page 56)

Attachment 3 – Sieve Results and Hydraulic Conductivity Analysis (PDF page 266)

Attachment 4 – TOP Assay Laboratory Analytical Report (PDF page 273)

Attachment 5 – PFAS K_{oc} and Retardation Factors (PDF page 314)

TABLES



Table 1
Soil FOC Results
RACER Trust Plant 3
Lansing, Michigan

Location ID:	MW-18-93	MW-18-93	MW-18-94	MW-18-94	MW-18-97	MW-18-97	MW-18-99
Date Collected:	12/04/18	12/06/18	12/04/18	12/10/18	12/12/18	12/12/18	12/13/18
Depth (feet):	9.5-10.0	54.0-54.5	10.5-11.0	54.5-55.0	9.2-9.6	12.5-13.0	11.0-12.0

Inorganics

Total Solids (%)	89	90	85	91	90	89	90
Fractional Organic Carbon (foc) (%)	0.23	0.38	0.13	0.32	0.08	0.39	0.09
Fractional Organic Carbon (foc) (g/g)	0.0023	0.0038	0.0013	0.0032	0.0008	0.0039	0.0009
FOC 'Zone'	High permeability	Very low permeability (till)	Lower permeability	Very low permeability (till)	Lower permeability	Very low permeability	High permeability

Location ID:	MW-18-100	MW-18-101	MW-18-102	MW-18-102	MW-18-102	MW-18-103	MW-18-105
Date Collected:	12/13/18	12/14/18	12/17/18	12/17/18	12/18/18	12/18/18	12/18/18
Depth (feet):	10.0-11.0	22.0-22.5	12.5-13.0	14.5-15.0	14.5-15.0	14.0-15.0	8.0-9.0

Inorganics

Total Solids (%)	88	87	91	92	--	--	83
Fractional Organic Carbon (FOC) (%)	0.13	0.47	<0.05	0.30	--	--	0.18
Fractional Organic Carbon (foc) (g/g)	0.0013	0.0047	<0.0005	0.0030			0.0018
FOC 'Zone'	High permeability	Very low permeability	High permeability	Very low permeability (till)	Very low permeability (till)	Very low permeability	Lower permeability
Average for lower and higher permeability zones:	0.0014	g/g					
Average for very low permeability:	0.0037	g/g					

Notes:

Soils analyzed for Total Solids via Method SM2540B 2011
 Soils analyzed for FOC via Walkley Black Method
 Samples analyzed by Merit Laboratories
 g/g = grams per gram

FOC 'zones'

High permeability (sand/gravel) - well-sorted sands
 Lower permeability (silt, sandy silt)
 Very low permeability (clay, glacial till)

Table 2
Groundwater PFAS Analytical Results
RACER Trust Plant 3
Lansing, Michigan

Location ID: Plant: Date Collected: Sample Name:		MDEQ Residential Drinking Water Criteria (2017)	EGLE Groundwater Surface Water Interface (GSI) Criteria (2017)	MW-18-88 Plant 3 12/5/2018 MW-18-88_120518	MW-18-89 Plant 3 12/5/2018 MW-18-89_120518	MW-18-90 Plant 3 12/6/2018 MW-18-90_120618	MW-18-91 Plant 3 12/6/2018 MW-18-91_120618	MW-18-92 Plant 3 12/5/2018 MW-18-92_120518	MW-18-93 Plant 3 3/6/2019 MW-18-93_030619	MW-18-94 Plant 3 3/6/2019 MW-18-94_030619	MW-18-95 Plant 3 3/5/2019 MW-18-95_030519	MW-18-97 Plant 3 3/6/2019 MW-18-97_030619	MW-18-98 Plant 3 3/5/2019 MW-18-98_030519
Poly- and Perfluorinated Alkyl Substances (USEPA Method 537 Modified with Isotope Dilution)													
4:2 Flourotelemer Sulfonate (4:2 FTS)	ng/L	--	--	<7.7	<8	<8	<7.7	<7.7	<1.9	<1.9	<1.9 [<1.9]	<1.9	<1.9
6:2 Flourotelemer Sulfonate (6:2 FTS)	ng/L	--	--	<7.7	<8	<8	<7.7	<7.7	<1.9	<1.9	<1.9 [<1.9]	<1.9	<1.9
8:2 Flourotelemer Sulfonate (8:2 FTS)	ng/L	--	--	<7.7	<8	<8	<7.7	<7.7	<1.9	<1.9	<1.9 [<1.9]	<1.9	<1.9
MeFOSAA	ng/L	--	--	<19	<20	<20	<19	<19	<3.8	<3.8	<3.8 [<3.8]	<3.8	<3.8
EtFOSAA	ng/L	--	--	<19	<20	<20	<19	<19	<3.8	<3.8	<3.8 [<3.8]	<3.8	<3.8
Perfluorobutanesulfonic acid (PFBS)	ng/L	--	--	1.79 J	2.23 J	2.73 J	1.82 J	<3.8	<0.96	<0.96	2.84 J [2.72 J]	<0.96	2.27 J
Perfluorobutanoic acid (PFBA)	ng/L	--	--	5.96 J	12.6	<8	10.5	2.67 J	<1.9	<1.9	17.2 [16.2]	2.28 J	20.3
Perfluorodecanesulfonic acid (PFDS)	ng/L	--	--	<3.8	2.48 J	<4	5.29	<3.8	<0.96	<0.96	6.27 [5.35]	<0.96	<0.96
Perfluorodecanoic acid (PFDA)	ng/L	--	--	<3.8	2.97 J	1.11 J	1.76 J	<3.8	<0.96	<0.96	5.53 [5.25]	<0.96	<0.96
Perfluorododecanoic acid (PFDoA)	ng/L	--	--	<3.8	<4	<4	<3.8	<3.8	<1.4	<1.4	<1.4 [<1.4]	<1.4	<1.4
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	--	--	<3.8	7.05	54.9	<3.8	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	4.58
Perfluoroheptanoic acid (PFHpA)	ng/L	--	--	<3.8	7.78	5.16	4.01	<3.8	<0.96	<0.96	7.03 [6.53]	<0.96	12.3
Perfluorohexanesulfonic acid (PFHxS)	ng/L	--	--	1.35 J	8.48	36	1.77 J	<3.8	<0.96	<0.96	1.83 J [<0.96]	<0.96	4.15
Perfluorohexanoic acid (PFHxA)	ng/L	--	--	<3.8	10.2	6.14	4.35	<3.8	<0.96	<0.96	8.11 [7.92]	<0.96	15.3
Perfluorononanesulfonic acid (PFNS)	ng/L	--	--	<3.8	<4	<4	<3.8	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	<0.96
Perfluorononanoic acid (PFNA)	ng/L	--	--	<3.8	2.29 J	1.55 J	1.33 J	<3.8	<0.96	<0.96	4.43 [4.17]	<0.96	<0.96
Perfluorooctane Sulfonamide (FOSA)	ng/L	--	--	<3.8	<4	<4	2.12 J	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	<0.96
Perfluorooctanesulfonic acid (PFOS)	ng/L	--	12	106	289	940	76	<3.8	<1.4	<1.4	115 [100]	<1.4	132
Perfluorooctanoic acid (PFOA)	ng/L	--	12,000	3.22 J	21.4	19.1	8.99	1.05 J	<0.96	<0.96	16.6 [15]	<0.96	39.3
Combined PFOS and PFOA	ng/L	70.0	--	109	300	959	85.0	1.05 J	<2.36	<2.36	132 [115]	<2.36	171
Perfluoropentanesulfonic acid (PFPeS)	ng/L	--	--	<3.8	1.28 J	5.12	<3.8	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	<0.96
Perfluoropentanoic acid (PFPeA)	ng/L	--	--	<3.8	14.5	6.18	6.49	1.56 J	<1.4	<1.4	16.6 [13.8]	<1.4	11.1
Perfluorotetradecanoic acid (PFTeA)	ng/L	--	--	<3.8	<4	<4	<3.8	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	<0.96
Perfluorotridecanoic Acid (PFTriA)	ng/L	--	--	<3.8	<4	<4	<3.8	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	<0.96
Perfluoroundecanoic acid (PFUnA)	ng/L	--	--	<3.8	<4	<4	<3.8	<3.8	<0.96	<0.96	<0.96 [<0.96]	<0.96	<0.96

Table 2
Groundwater PFAS Analytical Results
RACER Trust Plant 3
Lansing, Michigan

Location ID: Plant: Date Collected: Sample Name:		MDEQ Residential Drinking Water Criteria (2017)	EGLE Groundwater Surface Water Interface (GSI) Criteria (2017)	MW-18-98 Plant 3 5/9/2019 MW-18-98_050919	MW-18-99 Plant 3 3/5/2019 MW-18-99_030519	MW-18-99 Plant 3 5/9/2019 MW-18-99_050919	MW-18-100 Plant 3 3/5/2019 MW-18-100_030519	MW-18-101 Plant 3 3/6/2019 MW-18-101_030619	MW-18-102 Plant 3 3/4/2019 MW-18-102_030419	MW-18-103 Plant 3 3/4/2019 MW-18-103_030419	MW-18-104 Plant 3 3/4/2019 MW-18-104_030419	MW-18-105 Plant 3 3/4/2019 MW-18-105_030419	MW-18-105 Plant 3 5/9/2019 MW-18-105_050919
Poly- and Perfluorinated Alkyl Substances (USEPA Method 537 Modified with Isotope Dilution)													
4:2 Flourotelemer Sulfonate (4:2 FTS)	ng/L	--	--	< 2.0	< 1.9	< 2.0	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9 [< 1.9]	< 2.0
6:2 Flourotelemer Sulfonate (6:2 FTS)	ng/L	--	--	< 2.0	< 1.9	< 2.0	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9 [< 1.9]	< 2.0
8:2 Flourotelemer Sulfonate (8:2 FTS)	ng/L	--	--	< 2.0	< 1.9	< 2.0	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9 [< 1.9]	< 2.0
MeFOSAA	ng/L	--	--	< 4.0	< 3.8	< 4.0	< 3.8	< 3.8	< 3.8	< 3.8	< 3.8	< 3.8 [< 3.8]	< 4.0
EtFOSAA	ng/L	--	--	< 4.0	< 3.8	< 4.0	< 3.8	< 3.8	< 3.8	< 3.8	< 3.8	< 3.8 [< 3.8]	< 4.0
Perfluorobutanesulfonic acid (PFBS)	ng/L	--	--	2.69 J	< 0.96	< 1.0	1.47 J	< 0.96	< 0.96	5.34	1.85 J	4.44 [4.67]	4.63
Perfluorobutanoic acid (PFBA)	ng/L	--	--	12	15.6	14.6	6.46 J	< 1.9	< 1.9	< 1.9	7.85	8.56 [8.96]	5.62 J
Perfluorodecanesulfonic acid (PFDS)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluorodecanoic acid (PFDA)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluorododecanoic acid (PFDoA)	ng/L	--	--	< 1.5	< 1.4	< 1.5	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4 [< 1.4]	< 1.5
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	--	--	3.99 J	2.00 J	1.26 J	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluoroheptanoic acid (PFHpA)	ng/L	--	--	10.8	3.77 J	3.97 J	1.68 J	< 0.96	< 0.96	< 0.96	< 0.96	1.61 J [1.68 J]	< 1.0
Perfluorohexanesulfonic acid (PFHxS)	ng/L	--	--	4.5	1.85 J	1.48 J	2.86 J	< 0.96	< 0.96	26.1	< 0.96	2.48 J [2.44 J]	2.17 J
Perfluorohexanoic acid (PFHxA)	ng/L	--	--	13.9	3.53 J	5.54	3.13 J	< 0.96	< 0.96	< 0.96	1.97 J	2.17 J [2.13 J]	1.15 J
Perfluorononanesulfonic acid (PFNS)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluorononanoic acid (PFNA)	ng/L	--	--	< 1.0	< 0.96	1.80 J	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluorooctane Sulfonamide (FOSA)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluorooctanesulfonic acid (PFOS)	ng/L	--	12	137	74.2	57.3	< 1.4	< 1.4	< 1.4	< 1.4	2.50 J	3.28 J [3.72 J]	9.78
Perfluorooctanoic acid (PFOA)	ng/L	--	12,000	35	8.46	7.73	2.32 J	< 0.96	< 0.96	< 0.96	3.85	4.16 [4.14]	2.32 J
Combined PFOS and PFOA	ng/L	70.0	--	172	82.7	65	2.32	< 2.36	< 2.36	< 2.36	6.35	7.44 [7.86]	12.1
Perfluoropentanesulfonic acid (PFPeS)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	3.50 J	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluoropentanoic acid (PFPeA)	ng/L	--	--	10.2	3.61 J	4.83	2.33 J	< 1.4	< 1.4	< 1.4	1.73 J	1.82 J [1.84 J]	< 1.5
Perfluorotetradecanoic acid (PFTeA)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluorotridecanoic Acid (PFTriA)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0
Perfluoroundecanoic acid (PFUnA)	ng/L	--	--	< 1.0	< 0.96	< 1.0	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96 [< 0.96]	< 1.0

Table 2
Groundwater PFAS Analytical Results
RACER Trust Plant 3
Lansing, Michigan

Location ID: Plant: Date Collected: Sample Name:		MDEQ Residential Drinking Water Criteria (2017)	EGLE Groundwater Surface Water Interface (GSI) Criteria (2017)	MW-18-106 Plant 3 3/4/2019 MW-18-106_030419	MW-18-106 Plant 3 5/10/2019 MW-18-106_051019	MW-19-107 Plant 3 5/9/2019 MW-19-107_050919	MW-19-108 Plant 3 5/9/2019 MW-19-108_050919
Poly- and Perfluorinated Alkyl Substances (USEPA Method 537 Modified with Isotope Dilution)							
4:2 Flourotelemer Sulfonate (4:2 FTS)	ng/L	--	--	< 1.9	< 2.0 [< 2.0]	< 2.0	< 2.0
6:2 Flourotelemer Sulfonate (6:2 FTS)	ng/L	--	--	< 1.9	< 2.0 [< 2.0]	< 2.0	< 2.0
8:2 Flourotelemer Sulfonate (8:2 FTS)	ng/L	--	--	< 1.9	< 2.0 [< 2.0]	< 2.0	< 2.0
MeFOSAA	ng/L	--	--	< 3.8	< 4.0 [< 4.0]	< 4.0	< 4.0
EtFOSAA	ng/L	--	--	< 3.8	< 4.0 [< 4.0]	< 4.0	< 4.0
Perfluorobutanesulfonic acid (PFBS)	ng/L	--	--	2.32 J	2.77 J [2.96 J]	2.07 J	1.15 J
Perfluorobutanoic acid (PFBA)	ng/L	--	--	19.2	9.61 [8.77]	4.02 J	3.09 J
Perfluorodecanesulfonic acid (PFDS)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluorodecanoic acid (PFDA)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluorododecanoic acid (PFDoA)	ng/L	--	--	< 1.4	< 1.5 [< 1.5]	< 1.5	< 1.5
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluoroheptanoic acid (PFHpA)	ng/L	--	--	6.5	2.09 J [2.04 J]	< 1.0	< 1.0
Perfluorohexanesulfonic acid (PFHxS)	ng/L	--	--	16.4	10.9 [12]	4.34	< 1.0
Perfluorohexanoic acid (PFHxA)	ng/L	--	--	6.52	2.41 J [2.51 J]	1.59 J	1.86 J
Perfluorononanesulfonic acid (PFNS)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluorononanoic acid (PFNA)	ng/L	--	--	2.46 J	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluorooctane Sulfonamide (FOSA)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluorooctanesulfonic acid (PFOS)	ng/L	--	12	51.6	14.5 [15.8]	3.12 J	6.14
Perfluorooctanoic acid (PFOA)	ng/L	--	12,000	10.7	3.01 J [3.28 J]	6.15	7.58
Combined PFOS and PFOA	ng/L	70.0	--	62.3	17.5 [19.1]	9.27	13.7
Perfluoropentanesulfonic acid (PFPeS)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluoropentanoic acid (PFPeA)	ng/L	--	--	18.3	4.09 [4.27]	4.75	< 1.5
Perfluorotetradecanoic acid (PFTeA)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluorotridecanoic Acid (PFTriA)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0
Perfluoroundecanoic acid (PFUnA)	ng/L	--	--	< 0.96	< 1.0 [< 1.0]	< 1.0	< 1.0

Notes:

Bold result denotes detection is above the laboratory reporting limit but below EGLE Part 201 Generic Cleanup Criteria.

Red text result denotes detection is above the proposed MDEQ Residential Drinking Water Criteria (2017)

Shaded text denotes detection is above EGLE Criteria

GSI Criteria based on a non-drinking water receptor

Data shown in brackets [] represent duplicate sample analytical results.

- - = Not listed in the EGLE Criteria Tables.

< = Not Detected, less than reference level

Acronyms and Abbreviations:

ng/L - nanograms per liter

NA - Not Analyzed

EGLE - Michigan Department of Environment, Great Lakes, and Energy

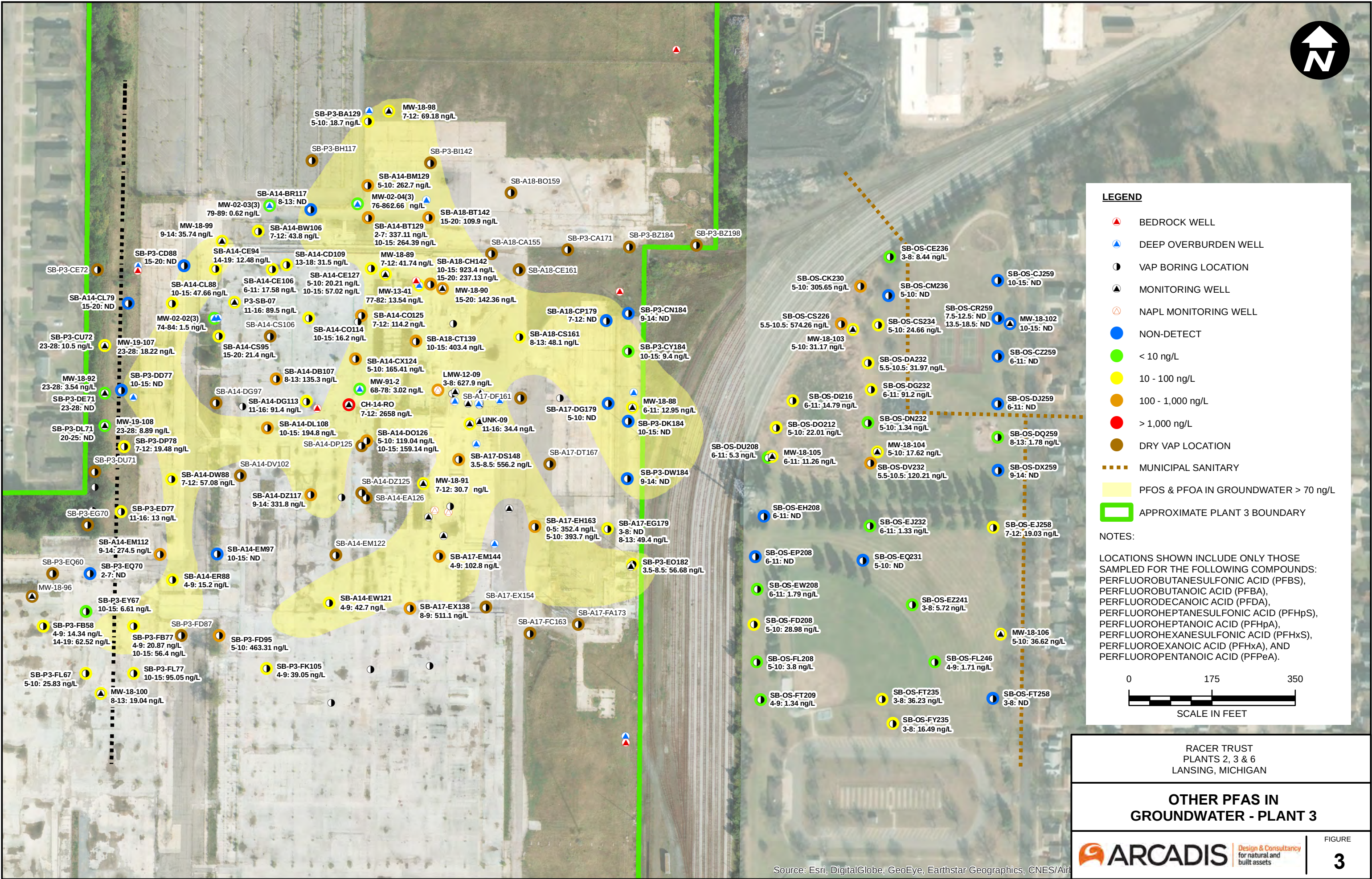
USEPA - United States Environmental Protection Agency

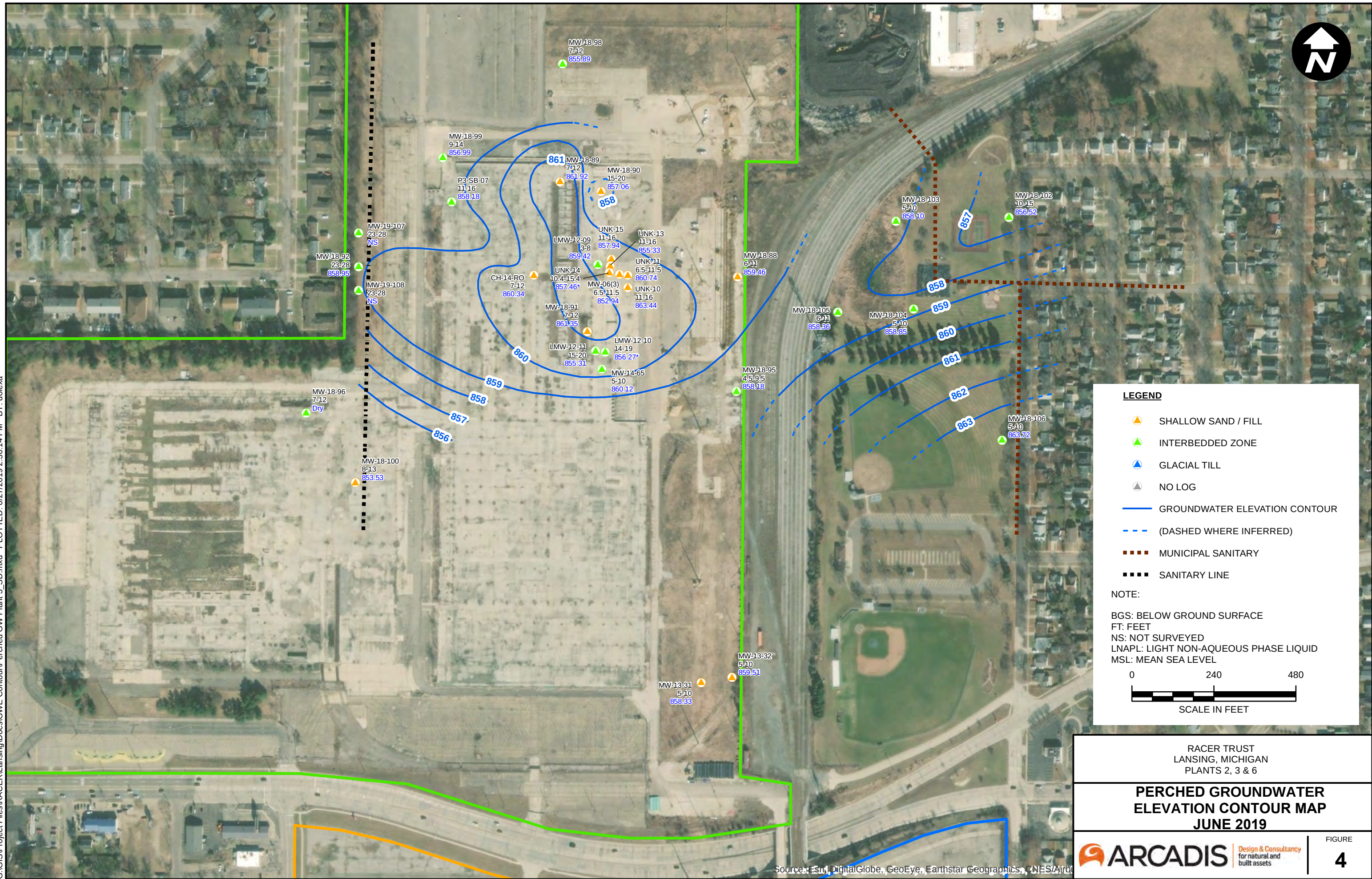
Qualifiers:

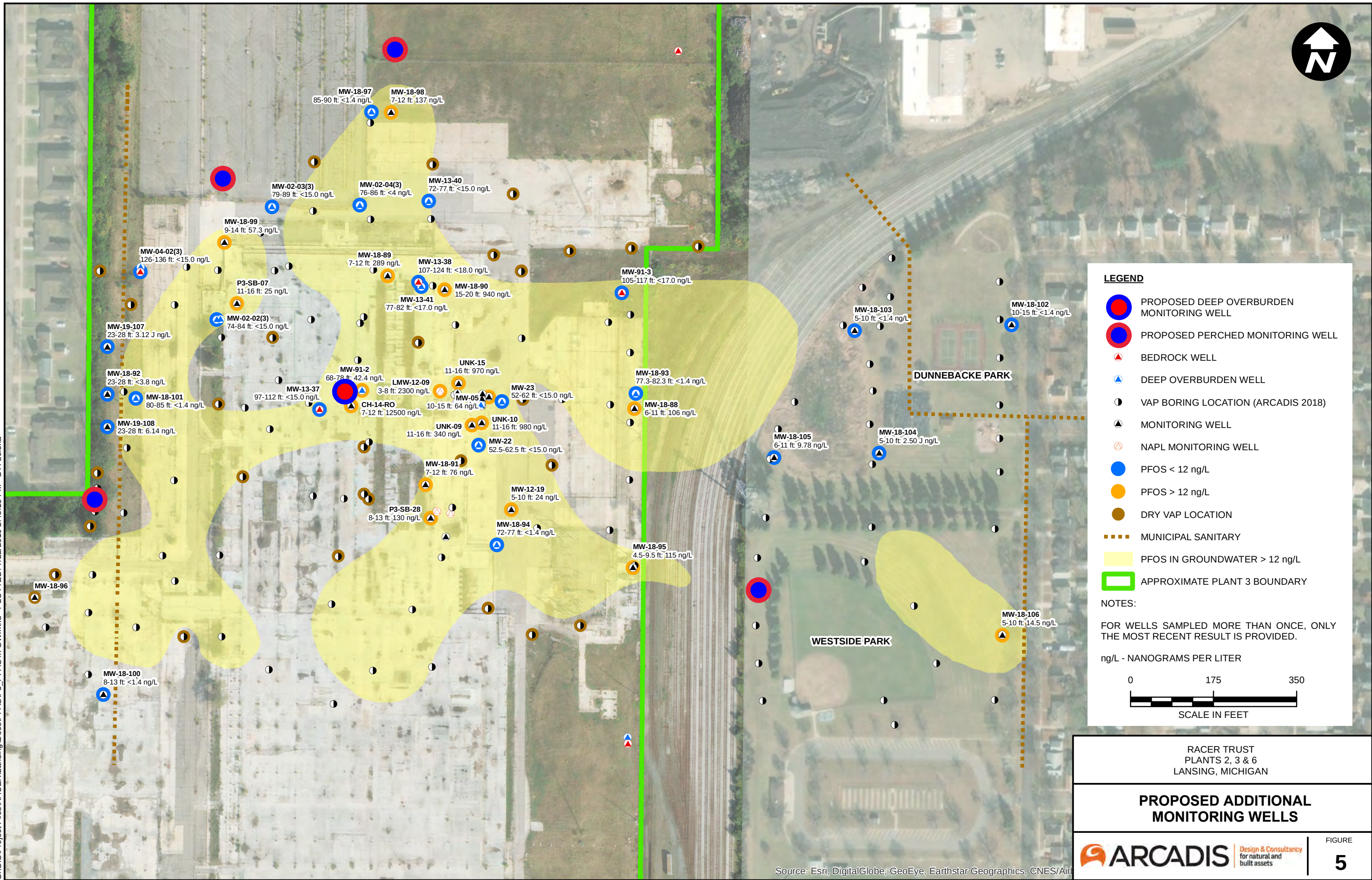
* = Isotope dilution analyte is outside acceptance limits.

FIGURES









ATTACHMENT 1

Soil Boring and Well Construction Logs



DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
-5	-5	1	0.0-10.0	10.0	NA		•	(0.0 - 0.8') CONCRETE (0.8 - 1.5') SAND, very fine to very coarse, round to angular; little granules to large pebbles, round to angular; littl silt; trace concrete fragments; trace rebar fragments; poorly sorted; wet; brown (10YR 4/3). NOTE: Fill material. (1.5 - 9.5') CLAY, medium to low plasticity, slow dilatancy; little silt; trace sand, very fine, trace granules to medium pebbles, angular to round; poorly sorted; moist to dry; medium stiff to stiff; olive brown (2.5Y 4/3).		
-10	-10						•	(9.5 - 10.3') SAND, very fine to very coarse, round to angular and granules to medium PEBBLES, round to angular; trace silt; poorly sorted; wet; brown (10YR 4/3). (10.3 - 16.5') CLAY, low plasticity, rapid dilatancy; little silt; trace sand, very fine; trace granules to medium pebbles, angular to subrounded; well sorted; moist to dry; stiff to medium stiff; dark grayish brown (2.5Y 4/2). NOTE: Clay lenses, low plasticity, rapid dilatancy; some sand, very fine to fine; little silt; moist; medium stiff; dark grayish brown (2.5Y 4/2) from 12.5 to 13.3' bgs.		2" PVC well casing (0-77.3' bgs) Bentonite (0-74.3' bgs)
-15	-15	2	10.0-20.0	10.0	NA		•	(16.5 - 17.8') SAND, very fine to medium; little silt; well sorted; dry; light yellowish brown (10YR 6/4). (17.8 - 28.0') SILT, non-plastic, rapid dilatancy; little clay; trace sand; trace small to large pebbles, angular to subrounded; well sorted; dry; medium stiff to stiff; light yellowish brown (2.5Y 6/4). NOTE: Till.		
-20	-20									

Remarks: bgs = below ground surface



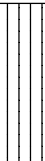
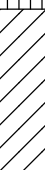
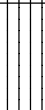
 Design & Consultancy
for natural and built assets

Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 82.3 Surface Elevation: NA Descriptions By: K. VandenBerge	Well/Boring ID: MW-18-93 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: NA

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	-25	3	20.0-30.0	10.0	NA			(28.0 - 28.3') SAND, very fine to very coarse, subrounded to subangular; trace silt; well sorted; dry to moist; dark gray (10YR 4/1). (28.3 - 29.0') SAND, very fine to fine; little silt; trace granules, subrounded to subangular; well sorted; dry; light gray (10YR 7/1). (29.0 - 32.0') SILT, some clay, non-plastic, rapid dilatancy; little sand, very fine to fine; trace granules to small pebbles, subangular to rounded; well sorted; dry to moist; medium stiff; gray (10YR 5/1). (32.0 - 35.8') CLAY, some silt; low plasticity, slow dilatancy; little sand, very fine; trace granules to medium pebbles; subangular to rounded; well sorted; moist; medium stiff; gray (10YR 5/1).		
35	-35	4	30.0-40.0	10.0	NA			(35.8 - 37.3') SAND, very fine to fine and SILT, non-plastic, rapid dilatancy; trace granules to small pebbles, subangular to rounded; well sorted; dry to moist; gray (10YR 5/1). (37.3 - 38.5') SAND, very fine and SILT, non-plastic, rapid dilatancy; little clay; trace granules, subangular to subrounded; well sorted; dry; light gray (10YR 7/1). (38.5 - 38.9') SAND, very fine to medium; little silt; little clay; trace granules to large pebbles, subrounded to subangular; poorly sorted; dry to moist; grayish brown (10YR 5/2). (38.9 - 39.7') SAND, very fine to fine and SILT, non-plastic, rapid dilatancy; some granules to cobbles, angular to rounded; poorly sorted; dry; light brownish gray (10YR 6/2). (39.7 - 42.0') SAND, very fine to medium; some clay, low plasticity, rapid dilatancy; little silt; little granules to pebbles, subangular to subrounded; poorly sorted; moist; soft; grayish brown (10YR 5/2).		2" PVC well casing (0-77.3' bgs) Bentonite (0-74.3' bgs)
40	-40									

	Remarks: bgs = below ground surface

Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 82.3 Surface Elevation: NA Descriptions By: K. VandenBerge	Well/Boring ID: MW-18-93 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: NA

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
45	-45	5	40.0-50.0	10.0	NA			(42.0 - 44.0') SAND, very fine to medium; some silt; little clay; little granules to large pebbles, subangular to surrounded; poorly sorted; dry to moist; dark grayish brown (10YR 4/2).		
								(44.0 - 47.0') SILT, non-plastic, rapid dilatancy and SAND, very fine to fine; little clay; little granules to large pebbles, rounded to subangular; poorly sorted; dry to moist; medium stiff; grayish brown (10YR 5/2).		
								(47.0 - 50.0') CLAY, low plasticity, rapid dilatancy and SAND, vry fine to fine; little silt; little granules to large pebbles, subangular to rounded; poorly sorted; moist; medium stiff to stiff; dark grayish brown (10YR 4/2).		
50	-50	6	50.0-60.0	7.0	NA			(50.0 - 53.0') NO RECOVERY, shelby tube.		
55	-55							(53.0 - 58.9') CLAY, low plasticity, rapid dilatancy and SAND, very fine to fine; little silt; little granules to large pebbles, subangular to rounded; poorly sorted; moist; mediu stiff; dark grayish brown (10YR 4/2).		
							NOTE: Sand seams, very fine to medium; little silt; little granules, subangular to subrounded; well sorted; moist to wet; dark grayish brown (10YR 4/2) from 53.5 to 53.7', 56.2 to 56.4', 56.9 to 57.1' and 57.5 to 57.6' bgs.			
								(58.9 - 59.0') SAND, very fine to medium; little silt; little granules, subangular to subrounded; well sorted; moist to wet; dark grayish brown (10YR 4/2).		
								(59.0 - 62.0') SILT, non-plastic, rapid dilatancy; some sand, very fine to fine; some clay; trace granules to large pebbles, subangular to rounded; poorly sorted; dry to moist; dark grayish brown (10YR 4/2).		
60	-60			(62.0 - 65.0') SILT, some clay, non-plastic, rapid dilatancy; some sand, very fine to fine; little granules to large cobbles, subangular to rounded; poorly sorted; dry; hard; dark grayish brown (10YR 4/2).						

Bentonite (0-74.3' bgs)
2" PVC well casing (0-77.3' bgs)

	Remarks: bgs = below ground surface

Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 82.3 Surface Elevation: NA Descriptions By: K. VandenBerge	Well/Boring ID: MW-18-93 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: NA

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
65	-65	7	60.0-70.0	10.0	NA			(65.0 - 70.4') CLAY and SILT, non-plastic, rapid dilatancy; little granules to large pebbles, subangular to rounded; trae sand, very fine to fine; poorly sorted; dry; hard; very dark gray (10YR 3/1).		
70	-70							(70.4 - 70.8') PEBBLES, small to large cobbles, subangular to subrounded; some clay; some silt; little sand, very fine to fine; poorly sorted; moist; very dark gray (10YR 3/1).		Bentonite (0-74.3' bgs)
								(70.8 - 75.5') CLAY and SILT, low plasticity, rapid dilatancy; little pebbles, small to large, subangular to subrounded; little sand, very fine to fine; poorly sorted; moist; medium stiff; very dark gray (10YR 3/1).		2" PVC well casing (0-77.3' bgs)
								NOTE: Change to soft at 73' bgs; change to stiff at 74' bgs.		
75	-75	8	70.0-80.0	10.0	NA			(75.5 - 76.5') SAND, very fine to medium; some silt; some clay; trace granules to large pebbles, subangular to subrounded; poorly sorted; moist; very dark gray (10YR 3/1).		
								(76.5 - 79.0') SAND, very fine to fine and PEBBLES, small to large cobbles; some silt; little clay; poorly sorted; dry; gray (10YR 5/1).		
80	-80	9	80.0-82.3	2.3	NA			(79.0 - 82.3') CLAY, low plasticity, rapid dilatancy; some silt; some small pebbles to cobbles; little sand, very fine to fine; poorly sorted; moist to wet; medium stiff; very dark gray (10YR 7/1). NOTE: Shale fragments.		Sand Pack (74.3-82.5' bgs)
								End of boring at 82.3' bgs. Boring completed to 82.3 bgs; well settled to 82.5' bgs.		2" stainless steel, 10 slot well screen (77.5-82.5' bgs)
85	-85									

	Remarks: bgs = below ground surface

Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 80.0 Surface Elevation: NA Descriptions By: VandenBerge, Villhauer	Well/Boring ID: MW-18-94 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 28 F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
								(0.0 - 0.8') CONCRETE		
								(0.8 - 4.0') SAND, very fine to very coarse, subrounded to subangular; little silt; little granules to medium pebbles, rounded to angular; poorly sorted; dry; brown (10YR 4/3). NOTE: Fill.		
								(4.0 - 4.3') CONCRETE		
5	-5	1	0.0-10.0	9.5	NA			(4.3 - 5.0') CLAY, some silt, low plasticity, slow dilatancy; some sand, very fine to fine; little granules to small pebbles, rounded to angular; poorly sorted; dry; medium stiff; brown (10YR 4/3).		
								(5.0 - 9.5') NO RECOVERY		
10	-10							(9.5 - 10.5') CLAY, some silt, medium plasticity, slow dilatancy; little sand, very fine to fine; little granules to large pebbles, angular to rounded; poorly sorted; moist; medium stiff; light olive brown (2.5Y 5/3).		
								(10.5 - 11.0') SAND, very fine to coarse, subrounded to subangular and SILT, non-plastic, rapid dilatancy; some granules to medium pebbles, angular to rounded; little clay; poorly sorted; wet; light olive brown (2.5Y 5/3).		
								(11.0 - 22.5') CLAY, low plasticity, slow dilatancy; little silt; trace sand, very fine to fine; trace granules to medium pebbles, angular to rounded; poorly sorted; dry to moist; medium stiff to stiff; dark grayish brown (2.5Y 4/2)		
15	-15	2	10.0-20.0	10.5	NA					
								NOTE: Sand seam, <1 cm, very fine to medium; moist at 16' bgs..		
								NOTE: Sand seam <1 cm, very fine to medium; moist at 17' bgs.		
20	-20									

	Remarks: bgs = below ground surface

Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 80.0 Surface Elevation: NA Descriptions By: VandenBerge, Villhauer	Well/Boring ID: MW-18-94 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 28 F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	-25	3	20.0-30.0	10.0	NA			(22.5 - 23.0') SAND, very fine to medium and SILT; some clay, low plasticity, rapid dilatancy; trace granules to small pebbles, subrounded to subangular; poorly sorte; moist; soft; olive brown (2.5Y 4/3). (23.0 - 25.0') SAND, very fine to fine and SILT, non-plastic, rapid dilatancy; well sorted; dry to moist; light olive brown (2.5Y 5/6). (25.0 - 30.0') CLAY, medium plasticity, slow dilatancy; little silt; trace sand, very fine; trace granules to large pebbles, rounded to subangular; poorly sorted; moist; medium stiff; grayish brown (2.5Y 5/2). NOTE: Till.		2" PVC well casing (0-72' bgs) Bentonite (0-70' bgs)
30	-30							(30.0 - 40.0') SAND, fine; well sorted; loose; dry; light brown (10YR 6/3). NOTE: Poor recovery.		
35	-35	4	30.0-40.0	5.5	NA					
40	-40							(40.0 - 40.9') SILT, some clay, low plasticity; little sand, fine; trace medium pebble, subrounded; moist; dense; dark grayish brown (10YR 4/2). (40.9 - 42.5') SILT, non-plastic; little sand, fine; trace small pebbles, subangular; moist; dense; dark grayish brown (10YR 4/2).		

Remarks: bgs = below ground surface



Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 80.0 Surface Elevation: NA Descriptions By: VandenBerge, Villhauer	Well/Boring ID: MW-18-94 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 28 F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
45	-45	5	40.0-50.0	10.0	NA			(42.5 - 44.5') SAND, fine; well sorted; loose; dry; light brown (10YR 6/3). (44.5 - 48.0') SILT, non-plastic, moserate dilatancy; some sand, fine; dry; medium dense; dark gray (10YR 4/1). (48.0 - 50.0') SAND, fine; well sorted; loose; dry; light brown (10YR 6/3).		
50	-50							(50.0 - 68.0') SILT, low plasticity; little sand, fine; little caly; trace granules to large pebbles, angular to subrounded; dry; dense; dark grayish brown (10YR 4/2).		
55	-55	6	50.0-60.0	7.3	NA			NOTE: Shelby tube collected from 55 to 57.5', not logged.		Bentonite (0-70' bgs) 2" PVC well casing (0-72' bgs)
60	-60									

	Remarks: bgs = below ground surface

Date Start: 12/04/2018 Date Finish: 12/06/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 80.0 Surface Elevation: NA Descriptions By: VandenBerge, Villhauer	Well/Boring ID: MW-18-94 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 28 F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
65	-65	7	60.0-70.0	10.0	NA					
								(68.0 - 70.0') CLAY, some silt, medium plasticity; trace sand, fine; trace granules to small pebbles, subangular; moist; stiff; dark gray (10YR 4/1).		
70	-70							(70.0 - 77.0') SILT, low to high plasticity; some sand, fine; little clay; trace small pebbles to cobbles; subrounded; wet; dark gray (10YR 4/1).		
75	-75	8	70.0-80.0	10.0	NA					
								(77.0 - 80.0') SAND STONE, weathered; shale interbedded.		
80	-80									
								End of boring at 80' bgs.		
85	-85									

	Remarks: bgs = below ground surface

Date Start: 06/15/2016 Date Finish: 06/16/2016 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 20.0 Surface Elevation: NA Descriptions By: K. VandenBerge	Well/Boring ID: MW-18-95 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 70 F, Rain

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
							X X X X X	(0.0 - 2.0') FILL material, brick, concrete chunks, metal fragments, miscellaneous fill material; some sand, very fine to very coarse, angular to subrounded; some granules to large pebbles, angular to round; poorly sorted; dry; grayish brown (10YR 5/2).		Backfill (0-1' bgs)
								(2.0 - 10.0') CLAY, some silt, low plasticity, reapid dilatancy; little sand, very fine to fine; little granules to large pebbles, angular to rounded; poorly sorted; dry to moist; stiff to medium stiff; yellowish brown (10YR 5/4).		Bentonite Pellets (1-3' bgs) 2" PVC well casing (0-70' bgs)
-5	-5	1	0.0-10.0	10.0	NA					Sand Pack (3-10.5' bgs) 2" stainless steel, 10 slot well screen (4.5-9.5' bgs)
-10	-10							(10.0 - 11.5') CLAY, some silt, low plasticity, rapid dilatancy; some sand, very fine to very coarse, angular to round; some granules to mediu pebbles; subangular to rounded; poorly sorted; wet; soft; grayish brown (10YR 5/2).		
								(11.5 - 17.5') CLAY, medium to high plasticity, slow dilatancy; little silt; little sand, very fine; trace granules to medium pebbles, angular to subrounded; poorly sorted; moist to dry; medium stiff; gray (10YR 5/1).		

	Remarks: bgs = below ground surface

Date Start: 12/07/2018 Date Finish: 12/07/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 30.0 Surface Elevation: NA Descriptions By: K. VandenBerge	Well/Boring ID: MW-18-96 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30 F, Cloudy

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
5	-5	1	0.0-10.0	10.0	NA			(0.0 - 0.5') CONCRETE (0.5 - 1.0') SAND, very fine to very coarse, subangular to subrounded; some silt; little clay; little granules to large pebbles, rounded to subangular; poorly sorted; dry; brown (10YR 4/3). NOTE: Fill. (1.0 - 8.3') CLAY, some silt, low plasticity, rapid dilatancy; some sand, very fine to fine; little granules to very large pebbles, rounded to subangular; poorly sorted; dry to moist; medium stiff; yellowish brown (10YR 4/5).		Backfill (0-1' bgs) Bentonite Pellets (1-5' bgs) 2" PVC well casing (0-7' bgs)
10	-10							(8.3 - 8.8') SAND, very fine to very coarse, subrounded to subangular; some silt; little granules to large pebbles, subangular to rounded; poorly sorted; moist; yellowish brown (10YR 5/4). (8.8 - 9.2') SILT, some clay, non-plastic, rapid dilatancy; some sand, very fine to fine; little granules to medium pebbles, subangular to rounded; poorly sorted; dry; medium stiff; yellowish brown (10YR 5/4). (9.2 - 9.6') SAND, very fine to very coarse, subrounded to subangular; some silt; little granules to medium pebbles, subangular to rounded; poorly sorted; dry; yellowish brown (10YR 5/4). (9.6 - 10.3') SILT, some clay, non-plastic, rapid dilatancy; some sand, very fine to fine; little granules to large pebbles, subangular to rounded; poorly sorted; dry; stiff; yellowish brown (10YR 5/4). (10.3 - 14.7') CLAY, some silt, low plasticity, rapid dilatancy; little sand, very fine to fine; little granules to large pebbles, angular to rounded; poorly sorted; dry; stiff; gray (10YR 5/1).		Sand Pack (5-14' bgs) 2" stainless steel, 10 slot well screen (7-12' bgs)
15	-15	2	10.0-20.0	10.0	NA			(14.7 - 15.0') SAND, very fine to fine and SILT, non-plastic, rapid dilatancy; some clay; well sorted; dry; light gray (10YR 7/1). (15.0 - 20.0') CLAY, some silt, low plasticity, rapid dilatancy; little sand, very fine to fine; little granules to very large pebbles, angular to rounded; poorly sorted; dry; stiff; gray (10YR 5/1).		

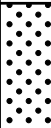
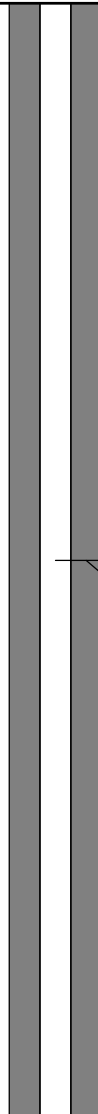
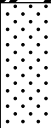
 Design & Consultancy for natural and built assets	Remarks: bgs = below ground surface

Date Start: 12/07/2018 Date Finish: 12/07/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 30.0 Surface Elevation: NA Descriptions By: K. VandenBerge	Well/Boring ID: MW-18-96 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30 F, Cloudy

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	3		10.0	NA					Bentonite Pellets (14-30' bgs)
25	-25							(20.0 - 25.0') SAND, very fine to medium, trace silt; well sorted; moist to dry; brown (10YR 5/3).		
30	-30							(25.0 - 28.5') SILT, non-plastic, rapid dilatancy and SAND, very fine to fine; moist to dry; brownish yellow (10YR 4/6).		
								(28.5 - 30.0') CLAY, some silt, low plasticity, rapid dilatancy; little sand, very fine to fine; trace granules to medium pebbles, subangular to rounded; well sorted; dry to moist; medium stiff; gray (10YR 5/1).		
								End of boring at 30' bgs.		

	Remarks: bgs = below ground surface

Date Start: 12/11/2018 Date Finish: 12/12/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-97 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30 F, overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
5	-5	1	0.0-10.0	9.7	NA			(0.0 - 2.5') SAND, fine to medium; little small to large pebbles, subrounded; poorly sorted; moist; loose; dark yellowish brown (10YR 4/6). NOTE: Roots and debris at 0-1' bgs.		 2" PVC well casing (0-85' bgs) Bentonite (0-83' bgs)
								(2.5 - 5.5') CLAY, low plasticity; some sand, fine; trace small pebbles, subrounded; dry; medium stiff; brown (10YR 5/3).		
								(5.5 - 9.0') SILT, some clay, low plasticity, slow dilatancy; some sand, fine to medium; trace granules to large pebbles, subrounded; wet; midium dense; dark yellowish brown (10YR 4/6).		
								(9.0 - 9.7') SAND, fine to medium; some silt, non dilatancy; wet; dark yellowish brown (10YR 4/6).		
10	-10							(9.7 - 13.0') CLAY, low plasticity and SAND, fine; little silt; trace granules to small pebbles, subrounded to subangular; moist; medium stiff; brown (10YR 5/3).		
								(13.0 - 17.5') CLAY, some silt, high plasticity; tace small pebbles, subangular; trace cobbles, subangular; dry; stiff; dark grayish brown (10YR 4/2).		
15	-15	2	10.0-20.0	9.5	NA			(17.5 - 20.0') SAND, fine; well sorted; dry; light brown (10YR 6/3).		
20	-20							(20.0 - 27.5') CLAY, some silt, low plasticity, non dilatancy; little sand, fine; trace granules to medium p ebbles, subangular; dry; medium stiff; brown (10YR 5/3). NOTE: Boulder at 23.5' bgs.		

	Remarks: bgs = below ground surface

Date Start: 12/11/2018 Date Finish: 12/12/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-97 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30 F, overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
25	-25	3	20.0-30.0	7.0	NA					
30	-30							(27.5 - 34.0') SAND, fine; well sorted; dry; loose; light brown (10YR 6/3).		
35	-35	4	30.0-40.0	7.9	NA			(34.0 - 35.5') SILT, non-plastic, rapid dilatancy; dry; dense; dark grayish brown (10YR 4/2).		
								(35.5 - 38.5') SAND, fine; well sorted; dry; loose; light brown (10YR 6/3).		
								(38.5 - 38.8') SAND, fine to coarse; little granules, subrounded; poorly sorted; dry; loose; brown (10YR 5/3).		
40	-40							(38.8 - 42.0') SAND, fine; well sorted; dry; loose; light brown (10YR 6/3).		
45	-45	5	40.0-50.0	8.1	NA			(42.0 - 47.0') SILT, , slow dilatancy and SAND, fine; trace small to large pebbles, subrounded to subangular; moist; dense; brown (10YR 5/3).		

	Remarks: bgs = below ground surface

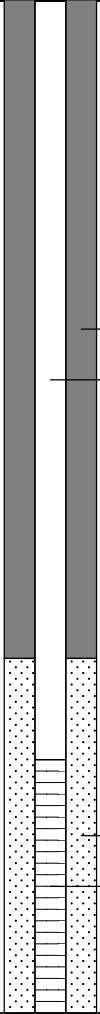
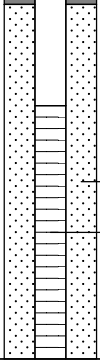
Date Start: 12/11/2018 Date Finish: 12/12/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-97 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30 F, overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
50	-50							(47.0 - 57.0') SILT, some clay, low plasticity, slow dilatancy; trace granules to large pebbles, subrounded to subangular; trace cobbles, subrounded; dry; dense; dark grayish brown (10YR 4/2).		
55	-55	6	50.0-60.0	9.0	NA			(57.0 - 70.0') SILT, non plastic, slow dilatancy; moist; dense; dark grayish brown (10YR 4/2).		
60	-60							NOTE: Wet at 60' bgs.		
								NOTE: Vertical fractor infilled with fine sand from 62 to 64' bgs.		
65	-65	7	60.0-70.0	7.9	NA					
70	-70									

Bentonite (0-70' bgs)
 2" PVC well casing (0-85' bgs)

	Remarks: bgs = below ground surface

Date Start: 12/11/2018 Date Finish: 12/12/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-97 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30 F, overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
75	-75	8	70.0-80.0	7.0	NA			(70.0 - 78.0') SILT, non-plastic, rapid dilatancy; little sand, fine; wet; dense; brown (10YR 5/3). NOTE: SAnd gradually increasing to "and" by 78' bgs and fining upward.		 Bentonite (0-70' bgs) 2" PVC well casing (0-85' bgs)
80	-80							(78.0 - 83.0') SAND, fine; little silt; wet; dense; brown (10YR 5/3).		
85	-85	9	80.0-90.0	7.5	NA			(83.0 - 90.0') SAND, fine; well sorted; wet; brown (10YR 5/3).		 Sand Pack (83-90' bgs) 2" stainless steel, 10 slot well screen (85-90' bgs)
90	-90							End of boring at 90' bgs.		

	Remarks: bgs = below ground surface

Date Start: 12/12/2018 Date Finish: 12/12/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 15.5 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-98 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 30 F, Partly Cloudy

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
5	-5	1	0.0-10.0	8.3	NA			(0.0 - 1.5') SAND, fine to medium; little small pebbles to cobbles, subrounded to subangular; poorly sorted; moist; loose; dark yellowish brown (10YR 4/6). (1.5 - 6.0') CLAY, low plasticity; some sand, fine; trace small pebbles, subrounded; dry; medium stiff; brown (10YR 5/3). (6.0 - 9.2') SILT, some clay, low plasticity, slow dilatancy; some sand, vine to medium; wet medium dense; dark yellowish brown (10YR 4/6). NOTE: Sand seams, fine at 7.0' and 8.1' bgs. (9.2 - 9.6') SAND, fine; some silt; wet; dark yellowish brown (10YR 4/6). (9.6 - 12.5') CLAY, low plasticity and SAND, fine; little silt; trace granules to small pebbles; moist to wet; medium stiff; brown (10YR 5/3). (12.5 - 13.0') CLAY, some silt, high plasticity; trgranules to medium pebbles, subangular; dry; stiff; dark grayish brown (10YR 4/2). (13.0 - 15.5') No logging - advanced shelby tube.		

	Remarks: bgs = below ground surface

Date Start: 12/13/2018 Date Finish: 12/13/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 20.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-99 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 30 F, Overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
								(0.0 - 1.0') CONCRETE		
								(1.0 - 3.0') SAND, fine to coarse, subangular to subrounded; trace granules to small pebbles, subrounded; poorly sorted; moist; brown (10YR 5/3). NOTE: Fill.		
								(3.0 - 6.0') CLAY, low plasticity; some sand, fine to coarse, subrounded; trace granules to medium pebbles, subrounded to subangular; moist; medium stiff; brown (10YR 5/3).		
5	-5	1	0.0-10.0	7.0	NA			(6.0 - 10.0') CLAY, medium plasticity; some organics; little silt, no dilatancy; moist; soft; very dark gray (10YR 2/2).		
								(10.0 - 12.5') SAND, fine to coarse, subangular to subrounded; little silt; trace granules to small pebbles, subrounded; poorly sorted; wet; dark yellowish brown (10YR 4/6).		
								(12.5 - 20.0') CLAY, high plasticity; no dilatancy; little silt; trace granules to large pebbles, subangular; dry; stiff; brown (10YR 4/3).		
15	-15	2	10.0-20.0	8.8	NA			NOTE: Gradial change to dark gray (10YR 4/1) at 15' bgs.		
20	-20							End of boring at 20' bgs.		

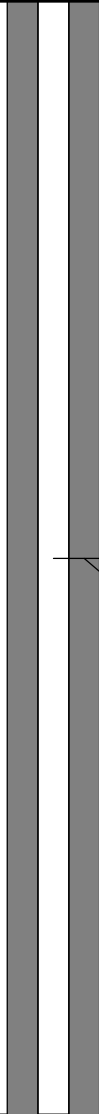
	Remarks: bgs = below ground surface

Date Start: 12/13/2018 Date Finish: 12/13/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 17.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-100 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 30 F, Overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
								(0.0 - 0.9') CONCRETE		
								(0.9 - 9.0') SAND, fine; some silt; trace small to large pebbles, subrounded; poorly sorted; dry to moist; loose; dark yellowish brown (10yR 4/6).		
-5	-5	1	0.0-10.0	6.8	NA					Bentonite (0-7' bgs) 2" PVC well casing (0-8' bgs)
								(9.0 - 12.5') SAND, fine; some silt; trace sand, coarse to small pebbles, subangular to subrounded; poorly sorted; wet; dense; dark yellowish brown (10YR 4/6).		
-10	-10									Sand Pack (7-17' bgs) 2" stainless steel, 10 slot well screen (8-13' bgs)
		2	10.0-17.0	NA	NA			(12.5 - 15.0') CLAY, some silt, low plasticity; little sand, fine; trace cobbles, subrounded to subangular; trace granules to small pebbles; subangular; dry; very stiff; dark grayish brown (10YR 4/2).		
-15	-15							(15.0 - 17.0') CLAY, some silt, high plasticity; trace small pebbles, subangular to angular; dry; stiff; gray (10YR 4/1).		
								End of boring at 17' bgs.		
-20	-20									

	Remarks: bgs = below ground surface

Date Start: 12/14/2018 Date Finish: 12/17/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-101 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30s F, light rain

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
5	-5	1	0.0-10.0	6.0	NA			(0.0 - 6.0') SAND, fine; some clay; some silt; trace small to large pebbles, rounded to subrounded; moist; medium dense; brown (10YR 5/3). NOTE: Fill.		 2" PVC well casing (0-80' bgs) Bentonite (0-78' bgs)
								(6.0 - 7.5') SILT, non-plastic, slow dilatancy; some sand, fine; little clay; trace cobbles, subrounded; trace organics; brown (10YR 4/3).		
10	-10							(7.5 - 14.0') SILT, some clay, low plasticity to no plasticity, non-dilatancy; little sand, fine; little granules to large pebbles, subangular; dry; dense; brown (10YR 4/3). NOTE: Till. NOTE: Color change to dark grayish brown (10YR 4/2) at 10' bgs.		
15	-15	2	10.0-20.0	7.6	NA			(14.0 - 14.2') SAND, fine to coarse, subrounded to subangular; poorly sorted; wet; loose; dark grayish brown (10YR 4/2).		
20	-20							(14.2 - 24.0') CLAY, high plasticity; little silt; little sand, fine; trace small to large pebbles, subangular; moist to dry; stiff; gray (10YR 5/1).		

	Remarks: bgs = below ground surface

Date Start: 12/14/2018 Date Finish: 12/17/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-101 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30s F, light rain

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
50	-50									
55	-55	6	50.0-60.0	6.8	NA					
60	-60							(60.0 - 63.5') SILT, non-plastic; little sand, fine; little clay; trace granules to large pebbles, subangular; dry; very dense; dark grayish brown (10YR 4/2).		
65	-65	7	60.0-70.0	8.8	NA			(63.5 - 68.5') SILT, rapid dilatancy; some sand, fine; moist; dense; dark grayish brown (10YR 4/2).		
70	-70							(68.5 - 70.0') SAND, fine; some silt, rapid dilatancy; moist; medium dense; dark grayish brown (10YR 4/2).		

	Remarks: bgs = below ground surface

Date Start: 12/14/2018 Date Finish: 12/17/2018 Drilling Company: Cascade Driller's Name: Dustin Harris Drilling Method: Rotosonic Sampling Method: Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 90.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-101 Client: RACER Location: RACER Lansing Plant 2 Weather Conditions: 30s F, light rain

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
70	-70							(70.0 - 82.8') SILT, rapid dilatancy; some sand, fine; wet; dense; dark grayish brown (10YR 4/2).		
75	-75	8	70.0-80.0	7.0	NA					Bentonite (0-78' bgs) 2" PVC well casing (0-80' bgs)
80	-80									
								(82.8 - 83.6') SAND, fine to medium; little silt; poorly sorted; wet; light brown (10YR 6/3).		Sand Pack (78-90' bgs) 2" stainless steel, 10 slot well screen (80-85' bgs)
85	-85	9	80.0-90.0	7.2	NA			(83.6 - 90.0') SILT, little to some clay, low to no plasticity, slow dilatancy; wet; dense; dark grayish brown (10YR 4/2).		
90	-90							End of boring at 90' bgs.		

	Remarks: bgs = below ground surface

Date Start: 12/17/2018 Date Finish: 12/17/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Hand auger/Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 15.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-102 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 30s F, Sun

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-5.0	NA	NA			(0.0 - 0.6') SILT, non-plastic, some sand, vine; some organics; loose; moist; very dark brown (10YR 3/3). NOTE: Topsoil. (0.6 - 6.0') CLAY, high plasticity; little sand, fine; trace granules to small pebbles, subangular; dry; medium stiff, brown (10YR 5/3).		
5	-5	2	5.0-10.0	5.0	NA			(6.0 - 9.0') CLAY, low plasticity; some sand, fine; trace granules to medium pebbles, subangular; dry; stiff; brown (10YR 5/3).		
10	-10							(9.0 - 10.0') SILT, non-plastic; some sand, fine; moist; dense; brown (10yR 5/3).		
		3	10.0-15.0	5.0	NA			(10.0 - 12.0') CLAY, low plasticity; some sand, fine; trace granules to medium pebbles, subangular; dry; stiff; brown (10YR 5/3). (12.0 - 14.5') SAND, fine to coarse, subrounded; poorly sorted; wet; loose; dark grayish brown (10YR 4/2). (14.5 - 15.0') CLAY, some silt, low plasticity; little sand, fine; trace granules to large pebbles, angular to subrounded; dry; very stiff; dark grayish brown (10YR 4/2). NOTE: Till.		
15	-15							End of boring at 15' bgs.		
20	-20									

Remarks: bgs = below ground surface



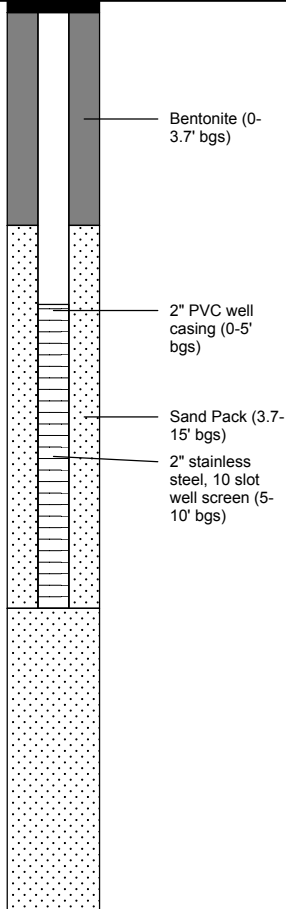
Date Start: 12/17/2018 Date Finish: 12/17/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Hand auger/Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 15.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-103 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 30s F, Sun

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-5.0	NA	NA		(0.0 - 0.5') SAND; some organics; some silt; moist; loose; dark brown (10YR 3/3). NOTE: Topsoil. (0.5 - 1.5') CLAY, high plasticity; little sand, fine; moist; medium stiff; dark gray (10YR 4/1). (1.5 - 3.0') SILT, non-plastic; some organics; moist; very dark brown (10YR 2/2).			Bentonite (0-4' bgs)
-5	-5						(3.0 - 5.5') CLAY, some silt, low plasticity; little sand, fine; trace granules to large pebbles, subangular; dry; very stiff; brown (10YR 5/3). NOTE: Till.			2" PVC well casing (0-5' bgs)
		2	5.0-10.0	5.0	NA		(5.5 - 6.0') SILT, slow dilatancy; some sand, fine; wet; brown (10YR 5/3).			Sand Pack (4-15' bgs)
-10	-10						(6.0 - 15.0') CLAY, some silt, low plasticity; little sand, fine; trace granules to large pebbles, subangular; dry; very stiff; brown (10YR 5/3). NOTE: Till.			2" stainless steel, 10 slot well screen (5-10' bgs)
		3	10.0-15.0	5.0	NA		NOTE: Color change to dark grayish brown (10YR 4/2) at 9.0' bgs.			
-15	-15							End of boring at 15' bgs.		

Remarks: bgs = below ground surface

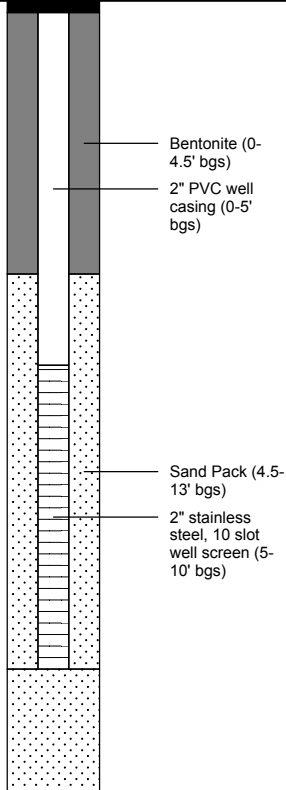


Date Start: 12/18/2018 Date Finish: 12/18/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Hand auger/Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 15.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-104 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 27 F, Overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-5.0	NA	NA			(0.0 - 0.5') CLAY, some silt, low plasticity; some sand, fine; little organics; moist; soft; very dark brown (10YR 2/2). (0.5 - 7.0') CLAY, some silt, low plasticity; little sand, fine; trace granules to large pebbles, subrounded to subangular; dry; medium stiff; brown (10yR 5/3).		 Bentonite (0-3.7' bgs) 2" PVC well casing (0-5' bgs) Sand Pack (3.7-15' bgs) 2" stainless steel, 10 slot well screen (5-10' bgs)
-5	-5							NOTE: Sand seam, fine; wet at 4.8' bgs.		
		2	5.0-10.0	5.0	NA			(7.0 - 15.0') CLAY, some silt, low plasticity, very slow dilatancy; little sand, fine; trace granules to small pebbles, subangular; trace cobbles, subrounded; moist; stiff; dark grayish brown (10YR 4/2). NOTE: Silt and sand seam, fine; wet at 8' bgs.		
-10	-10									
		3	10.0-15.0	5.0	NA					
-15	-15							End of boring at 15' bgs.		

	Remarks: bgs = below ground surface

Date Start: 12/18/2018 Date Finish: 12/18/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Hand auger/Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 13.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-105 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 27 F, Overcast

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-5.0	NA	NA			(0.0 - 1.0') CLAY, medium plasticity; some organics; little sand, fine; moist; soft; very dark brown (10YR 2/2). (1.0 - 3.5') CLAY, high plasticity; little sand, fine; trace small to large pebbles, subangular to subrounded; moist; medium stiff; brown (10YR 5/3). (3.5 - 8.0') CLAY, some silt, low plasticity; little sand, fine; trace granules to large pebbles, subangular; dry; stiff; brown (10YR 5/3). NOTE: Sand seams, fine at 5.5 and 6.5' bgs.		 Bentonite (0-4.5' bgs) 2" PVC well casing (0-5' bgs) Sand Pack (4.5-13' bgs) 2" stainless steel, 10 slot well screen (5-10' bgs)
-5	-5	2	5.0-10.0	5.0	NA			(8.0 - 10.0') SILT and SAND, fine; some clay; wet; loose; dark yellowish brown (10YR 4/6). (10.0 - 13.0') CLAY, some silt, medium plasticity; little sand, fine; trace granules to large pebbles, subangular; dry; very stiff; dark grayish brown (10YR 4/2).		
-10	-10	3	10.0-13.0	3.0	NA			End of boring at 13' bgs.		
-15	-15									

	Remarks: bgs = below ground surface

Date Start: 12/18/2018 Date Finish: 12/18/2018 Drilling Company: Cascade Driller's Name: Arlen Little Drilling Method: Hand auger/Rotosonic Sampling Method: Rotary Sonic Rig Type: Rotosonic Water Level Start (ft. bgs.): NA Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 10.0 Surface Elevation: NA Descriptions By: A. Villhauer	Well/Boring ID: MW-18-106 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 36 F, Sun

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0									
		1	0.0-5.0	NA	NA		(0.0 - 0.4') CLAY, low plasticity; some sand, fine; some organics; trace small pebbles; subrounded; moist; loose; dark brown (10YR 3/7). (0.4 - 3.0') CLAY, high plasticity; little sand, fine; trace granules to small pebbles, subangular; trace organics; moist; soft; brown (10YR 5/3).			Bentonite (0-4' bgs) 2" PVC well casing (0-5' bgs)
5	-5						(3.0 - 7.0') CLAY, some silt, low plasticity; little sand, fine; trace small to large pebbles, subangular; dry; stiff; brown (10YR 5/3).			
		2	5.0-10.0	5.0	NA		(7.0 - 8.1') SAND, fine; some silt; wet; yellowish brown (10YR 5/6). (8.1 - 10.0') CLAY, high plasticity and SAND, fine; wet; soft; dark yellowish brown (10YR 4/6).			Sand Pack (4-10' bgs) 2" stainless steel, 10 slot well screen (5-10' bgs)
10	-10							End of boring at 10' bgs.		
15	-15									

	Remarks: bgs = below ground surface

Date Start: 04/11/2019 Date Finish: 04/11/2019 Drilling Company: Fibertec Driller's Name: Justin McCrimmon Drilling Method: Direct push Sampling Method: Macrocore Rig Type: NA Water Level Start (ft. bgs.): 13.74 Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 28.0 Surface Elevation: NA Descriptions By: B. Pertunen	Well/Boring ID: MW-19-107 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 60F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0							(0.0-0.2') GRASS and TOPSOIL.		
		1	0.0-5.0'	4.3	NA			(0.2-8.0') SILT, nonplastic, rapid dilatancy; little small to medium pebbles, angular to subrounded; trace fine sand; brown (10YR 5/3).		6.25" Diameter Drilled Hole
5	-5	2	5.0-10.0'	4.7	NA			(8.0-10.0') SILT, little clay, nonplastic, rapid dilatancy; little small to medium pebbles, angular to subrounded; trace fine sand; very dark gray (10YR 3/1).		
10	-10	3	10.0-15.0'	4.8	NA			(10.0-13.0') SILT, and CLAY, low plasticity, slow dilatancy; trace small pebbles, subangular to subrounded; very dark gray (10YR 3/1).		Bentonite Chips (0.0 to 22.0' bgs)
								(13.0-13.5') CLAY, high plasticity, no dilatancy; dry to moist; very soft; very dark gray (10YR 3/1).		2' PVC Well Casing (0.0 to 23.0' bgs)
								(13.5-15.0') SILT, trace clay, nonplastic, rapid dilatancy; little small pebbles, angular to subrounded; dry; hard; very dark gray (10YR 3/1).		
15	-15							(15.0-16.0') CLAY, medium plasticity, slow dilatancy; dry to moist; soft; very dark gray (10YR 3/1).		
								(16.0-19.0') SILT, trace clay, nonplastic, rapid dilatancy; moist; soft; dark gray (10YR 4/1).		

	Remarks: bgs = below ground surface NA = not applicable Groundwater encountered at 13.74' bgs. No odor or staining observed.

Date Start: 04/11/2019 Date Finish: 04/11/2019 Drilling Company: Fibertec Driller's Name: Justin McCrimmon Drilling Method: Direct push Sampling Method: Macrocore Rig Type: NA Water Level Start (ft. bgs.): 13.74 Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 28.0 Surface Elevation: NA Descriptions By: B. Pertunen	Well/Boring ID: MW-19-107 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 60F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	4	15.0-20.0'	2.8	NA					
								(19.0-20.0') CLAY, medium plasticity, slow dilatancy; medium stiff; dark gray (10YR 4/1).		
								(20.0-21.0') SILT, trace clay, nonplastic, rapid dilatancy; moist; soft; black (10YR 2/1).		
								(21.0-24.0') CLAY, medium plasticity, slow dilatancy; moist; medium stiff; black (10YR 2/1).		
25	-25	5	20.0-25.0'	2.6	NA			(24.0-25.0') SILT, trace clay, nonplastic, rapid dilatancy; moist; medium stiff; dark gray (10YR 4/1).		
								(25.0-28.0') SAND, very fine to fine; trace silt; well sorted; wet; brown (10YR 4/3).		
		6	25.0-28.0'	3.0	NA					
30	-30							End of boring at 28.0' bgs.		
35	-35									

	Remarks: bgs = below ground surface NA = not applicable Groundwater encountered at 13.74' bgs. No odor or staining observed.

Date Start: 04/11/19 Date Finish: 04/11/19 Drilling Company: Fibertec Driller's Name: Justin McCrimmon Drilling Method: Hollow Stem Auger Sampling Method: Macrocore Rig Type: NA Water Level Start (ft. bgs.): 16.11 Water Level Finish (ft. btoc.): NA	Northings: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 28.0 Surface Elevation: NA Descriptions By: B. Pertunen	Well/Boring ID: MW-19-108 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 60F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
0	0							(0.0-0.2') GRASS and TOPSOIL.		
		1	0.0-5.0'	4.0	NA			(0.2-4.7') SILT, trace clay, nonplastic, rapid dilatancy; little small to medium pebbles, angular to subrounded; dry to moist; soft; brown (10YR 4/3).		6.25" Diameter Drilled Hole
5	-5							(4.7-5.0') SAND, very fine to fine; well sorted; dry; pale brown (10YR 6/3).		
		2	5.0-10.0'	4.0	NA			(5.0-10.0') SILT, nonplastic, rapid dilatancy; trace fine sand; trace small pebbles, subrounded; dry; hard; brown (10YR 5/3).		
								NOTE: Color transition to dark gray (10YR 4/1) at 9.0' bgs.		
10	-10							(10.0-10.3') CLAY, medium plasticity, slow dilatancy; trace granules; moist; medium stiff.		
		3	10.0-15.0'	4.2	NA			(10.3-13.0') SILT, little clay, nonplastic, slow dilatancy; trace small pebbles, subrounded; dry to moist; medium stiff; brown (10YR 4/3).		Bentonite Chips (0.0 to 22.0' bgs)
								(13.0-15.0') CLAY, low plasticity, no dilatancy; trace fine sand; trace granules; soft; brown (10YR 4/3).		2' PVC Well Casing (0.0 to 23.0' bgs)
15	-15							(15.0-21.0') SILT, nonplastic, rapid dilatancy; little fine sand; trace small to medium pebbles, subangular to subrounded; moist to wet; brown (10YR 5/3).		

	Remarks: bgs = below ground surface NA = not applicable Groundwater encountered at 21.0' bgs. No odor or staining observed. Temporary Monitoring Well screened from 20.0 to 25.0' bgs.

Date Start: 04/11/19 Date Finish: 04/11/19 Drilling Company: Fibertec Driller's Name: Justin McCrimmon Drilling Method: Hollow Stem Auger Sampling Method: Macrocore Rig Type: NA Water Level Start (ft. bgs.): 16.11 Water Level Finish (ft. btoc.): NA	Northing: NA Easting: NA Casing Elevation: NA Borehole Depth (ft. bgs.): 28.0 Surface Elevation: NA Descriptions By: B. Pertunen	Well/Boring ID: MW-19-108 Client: RACER Location: RACER Lansing Plant 3 Weather Conditions: 60F, Sunny

DEPTH (feet bgl.)	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Analytical Sample	Geologic Column	Stratigraphic Description	Water Level (ft. bgs.)	Well/Boring Construction
20	-20	4	15.0-20.0'	2.7	NA			NOTE: Color transition to dark gray (10YR 4/1) at 20.0' bgs.		
								NOTE: Wet at 21.0' bgs.		
		5	20.0-25.0'	2.8	NA		(21.0-25.0') SAND, medium to coarse, subangular to subrounded; trace silt; trace small to medium pebbles, subangular to subrounded; poorly sorted; wet; brown (10YR 5/3).			
25	-25	6	25.0-28.0'	3.0	NA		(25.0-28.0') CLAY, medium plasticity, slow dilatancy; trace small pebbles; moist; soft; dark gray (10YR 4/1).			Sand Pack (22.0 to 28.0' bgs) 2' PVC 10 Slot Screen (23.0 to 28.0' bgs)
30	-30							End of boring at 28.0' bgs.		
25	-25									

	Remarks: bgs = below ground surface NA = not applicable Groundwater encountered at 21.0' bgs. No odor or staining observed. Temporary Monitoring Well screened from 20.0 to 25.0' bgs.

ATTACHMENT 2

Laboratory Analytical Reports





Analytical Laboratory Report

Report ID: S98025.01(01)
Generated on 01/10/2019

Report to

Attention: Christine Gregg
Arcadis
28550 Cabot Drive
Suite 500
Novi, MI 48377

Phone: 734-585-7817 FAX: 248-994-2241
Email: christine.gregg@arcadis.com

Additional Contacts: Alex Villhauer, Kristen Padron, Randy Christensen

Report produced by

Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Contacts for report questions:
John Lavery (johnlavery@meritlabs.com)
Barbara Ball (bball@meritlabs.com)

Report Summary

Lab Sample ID(s): S98025.01-S98025.14
Project: B0064479.2018.03100
Collected Date: 12/04/2018 - 12/18/2018
Submitted Date/Time: 12/20/2018 14:05
Sampled by: Kristen VanDenBerge
P.O. #: B0064479.2018.03100

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Sample Summary (Page 5)

Maya Murshak
Technical Director



Analytical Laboratory Report

General Report Notes

Analytical results relate only to the samples tested, in the condition received by the laboratory.
Methods may be modified for improved performance.
Results reported on a dry weight basis where applicable.
'Not detected' indicates that parameter was not found at a level equal to or greater than the reporting limit (RL).
40 CFR Part 136 Table II Required Containers, Preservation Techniques and Holding Times for the Clean Water Act specify that samples for acrolein and acrylonitrile need to be preserved at a pH in the range of 4 to 5 or if not preserved, analyzed within 3 days of sampling.
QA/QC corresponding to this analytical report is a separate document with the same Merit ID reference and is available upon request.
Full accreditation certificates are available upon request. Starred (*) analytes are not NELAP accredited.
Samples are held by the lab for 30 days from the final report date unless a written request to hold longer is provided by the client.
Report shall not be reproduced except in full, without the written approval of Merit Laboratories, Inc.
Limits for drinking water samples, are listed as the MCL Limits (Maximum Contaminant Level Concentrations)

Report Narrative

There is no additional narrative for this analytical report

Laboratory Certifications

Authority	Certification ID
Michigan DEQ	#9956
DOD ELAP/ISO 17025	#69699
WBENC	#2005110032
Ohio VAP	#CL0002
Indiana DOH	#C-MI-07
New York NELAC	#11814
North Carolina DENR	#680
North Carolina DOH	#26702
Alaska CSLAP	#17-001

Qualifier Descriptions

Qualifier	Description
!	Result is outside of stated limit criteria
B	Compound also found in associated method blank
E	Concentration exceeds calibration range
F	Analysis run outside of holding time
G	Estimated result due to extraction run outside of holding time
H	Sample submitted and run outside of holding time
I	Matrix interference with internal standard
J	Estimated value less than reporting limit, but greater than MDL
L	Elevated reporting limit due to low sample amount
M	Result reported to MDL not RDL
O	Analysis performed by outside laboratory. See attached report.
R	Preliminary result
S	Surrogate recovery outside of control limits
T	No correction for total solids
X	Elevated reporting limit due to matrix interference
Y	Elevated reporting limit due to high target concentration
b	Value detected less than reporting limit, but greater than MDL
e	Reported value estimated due to interference
j	Analyte also found in associated method blank
p	Benzo(b)Fluoranthene and Benzo(k)Fluoranthene integrated as one peak.
x	Preserved from bulk sample

Glossary of Abbreviations

Abbreviation	Description
RL/RDL	Reporting Limit
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
SW	EPA SW 846 (Soil and Wastewater) Methods
E	EPA Methods
SM	Standard Methods
LN	Linear
BR	Branched



Analytical Laboratory Report

Method Summary

Method	Version
SM2540B	Standard Method 2540 B 2011
Walkley Black	Walkley Black



Analytical Laboratory Report

Sample Summary (14 samples)

Sample ID	Sample Tag	Matrix	Collected Date/Time
S98025.01	MW-18-93(9.5-10)_12042018	Soil	12/04/18 12:45
S98025.02	MW-18-94(10.5-11)_12042018	Soil	12/04/18 17:10
S98025.03	MW-18-93(54-54.5)_12062018	Soil	12/06/18 14:05
S98025.04	MW-18-94(54.5-55)_12102018	Soil	12/10/18 14:45
S98025.05	MW-18-97(9.2-9.6)_12122018	Soil	12/12/18 15:30
S98025.06	MW-18-97(12.5-13)_12122018	Soil	12/12/18 15:50
S98025.07	MW-18-99(11-12)_12132018	Soil	12/13/18 12:50
S98025.08	MW-18-100(10-11)_12132018	Soil	12/13/18 14:40
S98025.09	MW-18-101(22-22.5)_12142018	Soil	12/14/18 12:00
S98025.10	MW-18-102(14.5-15)_12172018	Soil	12/17/18 14:45
S98025.11	MW-18-102(12.5-13)_12172018	Soil	12/17/18 14:50
S98025.12	MW-18-105(8-9)_12182018	Soil	12/18/18 11:30
S98025.13	MW-18-102(14.5-15)_12182018	Soil	12/18/18 15:30
S98025.14	MW-18-103(14-15)_12182018	Soil	12/18/18 16:45



Analytical Laboratory Report

Lab Sample ID: S98025.01
Sample Tag: MW-18-93(9.5-10)_12042018
Collected Date/Time: 12/04/2018 12:45
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	89	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 14:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.23	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.02
Sample Tag: MW-18-94(10.5-11)_12042018
Collected Date/Time: 12/04/2018 17:10
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	85	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 14:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.13	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.03
Sample Tag: MW-18-93(54-54.5)_12062018
Collected Date/Time: 12/06/2018 14:05
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	90	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 14:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.38	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.04
Sample Tag: MW-18-94(54.5-55)_12102018
Collected Date/Time: 12/10/2018 14:45
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	91	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 15:00, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.32	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.05
Sample Tag: MW-18-97(9.2-9.6)_12122018
Collected Date/Time: 12/12/2018 15:30
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	90	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 15:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.08	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.06
Sample Tag: MW-18-97(12.5-13)_12122018
Collected Date/Time: 12/12/2018 15:50
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	89	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 15:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.39	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.07
Sample Tag: MW-18-99(11-12)_12132018
Collected Date/Time: 12/13/2018 12:50
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	90	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 15:30, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.09	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.08
Sample Tag: MW-18-100(10-11)_12132018
Collected Date/Time: 12/13/2018 14:40
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	88	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 15:40, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.13	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.09
Sample Tag: MW-18-101(22-22.5)_12142018
Collected Date/Time: 12/14/2018 12:00
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	87	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 15:50, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.47	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.10
Sample Tag: MW-18-102(14.5-15)_12172018
Collected Date/Time: 12/17/2018 14:45
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	92	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 16:00, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.30	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.11
Sample Tag: MW-18-102(12.5-13)_12172018
Collected Date/Time: 12/17/2018 14:50
Matrix: Soil
COC Reference: 120361

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	91	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 16:10, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	Not detected	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.12
Sample Tag: MW-18-105(8-9)_12182018
Collected Date/Time: 12/18/2018 11:30
Matrix: Soil
COC Reference: 120360

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	4oz Glass	None	Yes	6.0	IR

Inorganics

Method: SM2540B, Run Date: 12/20/18 17:05, Analyst: JBL

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Total Solids*	83	1	1	%	1		

Method: Walkley Black, Run Date: 12/27/18 16:20, Analyst: JKB

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Fractional Organic Carbon*	0.18	0.05		%	1		



Analytical Laboratory Report

Lab Sample ID: S98025.13
Sample Tag: MW-18-102(14.5-15)_12182018
Collected Date/Time: 12/18/2018 15:30
Matrix: Soil
COC Reference: 120360

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	Plastic Bag	None	Yes	6.0	IR

Other / Misc.

Method: , Run Date: 01/09/19 12:00, Analyst: GT

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.



Analytical Laboratory Report

Lab Sample ID: S98025.14
Sample Tag: MW-18-103(14-15)_12182018
Collected Date/Time: 12/18/2018 16:45
Matrix: Soil
COC Reference: 120360

Sample Containers

#	Type	Preservative(s)	Refrigerated?	Arrival Temp. (C)	Thermometer #
1	Plastic Bag	None	Yes	6.0	IR

Other / Misc.

Method: , Run Date: 01/09/19 12:00, Analyst: GT

Parameter	Result	RL	MDL	Units	Dilution	CAS#	Flags
Misc. Special Project*	Completed				1		O

O-Analysis performed by outside laboratory. See attached report.

Merit Laboratories Login Checklist

Lab Set ID:S98025

Client:ARCADIS_NOVI (ARCADIS U.S., Inc.)

Project: B0064479.2018.03100

Submitted: 12/20/2018 14:05 Login User: MMC

Attention: Christine Gregg

Address: Arcadis
28550 Cabot Drive
Suite 500
Novi, MI 48377

Phone: 734-585-7817 FAX: 248-994-2241

Email: christine.gregg@arcadis.com

Selection	Description	Note
Sample Receiving		
01.	☒ Yes ☐ No ☐ N/A	Samples are received at 4C +/- 2C Thermometer # IR 6.0
02.	☒ Yes ☐ No ☐ N/A	Received on ice/ cooling process begun
03.	☐ Yes ☒ No ☐ N/A	Samples shipped
04.	☐ Yes ☒ No ☐ N/A	Samples left in 24 hr. drop box
05.	☐ Yes ☐ No ☒ N/A	Are there custody seals/tape or is the drop box locked
Chain of Custody		
06.	☒ Yes ☐ No ☐ N/A	COC adequately filled out
07.	☒ Yes ☐ No ☐ N/A	COC signed and relinquished to the lab
08.	☒ Yes ☐ No ☐ N/A	Sample tag on bottles match COC
09.	☒ Yes ☐ No ☐ N/A	Subcontracting needed? Subcontacted to:
Preservation		
10.	☒ Yes ☐ No ☐ N/A	Do sample have correct chemical preservation
11.	☐ Yes ☐ No ☒ N/A	Completed pH checks on preserved samples? (no VOAs)
12.	☐ Yes ☒ No ☐ N/A	Did any samples need to be preserved in the lab?
Bottle Conditions		
13.	☒ Yes ☐ No ☐ N/A	All bottles intact
14.	☒ Yes ☐ No ☐ N/A	Appropriate analytical bottles are used
15.	☒ Yes ☐ No ☐ N/A	Merit bottles used
16.	☒ Yes ☐ No ☐ N/A	Sufficient sample volume received
17.	☐ Yes ☒ No ☐ N/A	Samples require laboratory filtration
18.	☒ Yes ☐ No ☐ N/A	Samples submitted within holding time
19.	☐ Yes ☐ No ☒ N/A	Do water VOC or TOX bottles contain headspace

Corrective action for all exceptions is to call the client and to notify the project manager.

Client Review By: _____ Date: _____



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Phone (517) 332-0167 Fax (517) 332-4034
www.meritlabs.com

C.O.C. PAGE # 1 OF 2

120361

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME Alex Villhaver			CONTACT NAME ☒ SAME		
COMPANY Arcadis			COMPANY		
ADDRESS 28550 Cabot Dr. Suite 500			ADDRESS		
CITY Novi		STATE MI	ZIP CODE 48377	CITY	
PHONE NO. 248 994 2240		FAX NO. 248 994 2241	PO. NO. 00064479.2018.03100	E-MAIL ADDRESS	
E-MAIL ADDRESS Alex.Villhaver@arcadis.com			QUOTE NO.		

PROJECT NO./NAME B0004479.2018.03100		SAMPLER(S) - PLEASE PRINT/SIGN NAME Kristen Van Den Berge	
TURNAROUND TIME REQUIRED ☐ 1 DAY ☐ 2 DAYS ☐ 3 DAYS ☒ STANDARD ☐ OTHER			
DELIVERABLES REQUIRED ☐ STD ☒ LEVEL II ☐ LEVEL III ☐ LEVEL IV ☐ EDD ☐ OTHER			
MATRIX CODE: GW=GROUNDWATER SL=SLUDGE WW=WASTEWATER DW=DRINKING WATER S=SOIL O=OIL L=LIQUID WP=WIFE SD=SOLID A=AIR W=WASTE		# Containers & Preservatives	

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Certifications ☐ OHIO VAP ☐ Drinking Water ☐ DoD ☐ NPDES Project Locations ☐ Detroit ☐ New York ☐ Other Special Instructions
	DATE	TIME											
18025.01	12/4/18	1245	MW-18-93(9.5-10)-12042018	S	1	1							
02	12/4/18	1710	~~MW-18-94(10.5-11)-12042018~~	~~S~~	~~1~~	~~1~~							
02.03	12/4/18	1710	MW-18-94(10.5-11)-12042018	S	1	1							
03.04	12/4/18	1405	MW-18-93(54.5-55)-12042018	S	1	1							
04.05	12/10/18	1445	MW-18-94(54.5-55)-121018	S	1	1							
05.06	12/12/18	1530	MW-18-98(9.2-9.6)-121218	S	1	1							
06.07	12/12/18	1550	MW-18-98(12.5-13)-121218	S	1	1							
07.08	12/13/18	1250	MW-18-99(11-12)-121318	S	1	1							
08.09	12/13/18	1440	MW-18-100(10-11)-121318	S	1	1							
09.10	12/14/18	1200	MW-18-101(22-22.5)-121418	S	1	1							
10.11	12/17/18	1445	MW-18-102(14.5-15)-121718	S	1	1							
11.12	12/17/18	1450	MW-18-102(12.5-13)-121718	S	1	1							

RELINQUISHED BY: Kristen Van Den Berge (Sampler)	DATE: 12/7/18	TIME: 11025	RELINQUISHED BY:	DATE:	TIME:
SIGNATURE/ORGANIZATION: Arcadis			SIGNATURE/ORGANIZATION:		
RECEIVED BY: Arcadis	DATE: 12/7/18	TIME: 1625	RECEIVED BY:	DATE:	TIME:
SIGNATURE/ORGANIZATION: Arcadis			SIGNATURE/ORGANIZATION:		
RELINQUISHED BY: Arcadis	DATE: 12/20/18	TIME: 1405	SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
SIGNATURE/ORGANIZATION: Arcadis			SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
RECEIVED BY: M. Chilcote	DATE: 12/20/18	TIME: 1405	NOTES: TEMP. ON ARRIVAL 6.0		
SIGNATURE/ORGANIZATION:					

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



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C.O.C. PAGE # 2 OF 2

120360

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME Alex Villhauer			
COMPANY Arcadis			
ADDRESS 28550 Cabot Dr., Suite 500			
CITY Novi	STATE MI	ZIP CODE 48377	
PHONE NO. 248-994-2240	FAX NO. 248-994-2241	P.O. NO. B0064479.2018.03100	
E-MAIL ADDRESS Alex.Villhauer@arcadis.com		QUOTE NO.	

CONTACT NAME SAME	
COMPANY	
ADDRESS	
CITY	STATE ZIP CODE
PHONE NO.	E-MAIL ADDRESS

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME RACER Lansing / B0064479.2018.03100	SAMPLER(S) - PLEASE PRINT/SIGN NAME Kristen Vandon Borge / Alex Villhauer
TURNAROUND TIME REQUIRED ☐ 1 DAY ☐ 2 DAYS ☐ 3 DAYS ☒ STANDARD ☐ OTHER	
DELIVERABLES REQUIRED ☐ STD ☒ LEVEL II ☐ LEVEL III ☐ LEVEL IV ☐ EDD ☐ OTHER	

MATRIX CODE:	GW=GROUNDWATER SL=SLUDGE	WW=WASTEWATER DW=DRINKING WATER	S=SOIL O=OIL	L=LIQUID WP=WIPE	SD=SOLID A=AIR	W=WASTE

Containers & Preservatives

MERIT LAB NO. FOR LAB USE ONLY	YEAR 2018		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER
	DATE	TIME										
98025	12/18/18	1130	MW-18-105(8-9)-121818	S	1	1						
13	12/17/18	1530	MW-18-102(14-15)-121818	S	1	1						
14	12/17/18	1545	MW-18-103(14-15)-121818	S	1	1						

FOC (walkley block)
Grain size analysis

Certifications

☐ OHIO VAP ☐ Drinking Water

☐ DoD ☐ NPDES

Project Locations

☐ Detroit ☐ New York

☐ Other

Special Instructions

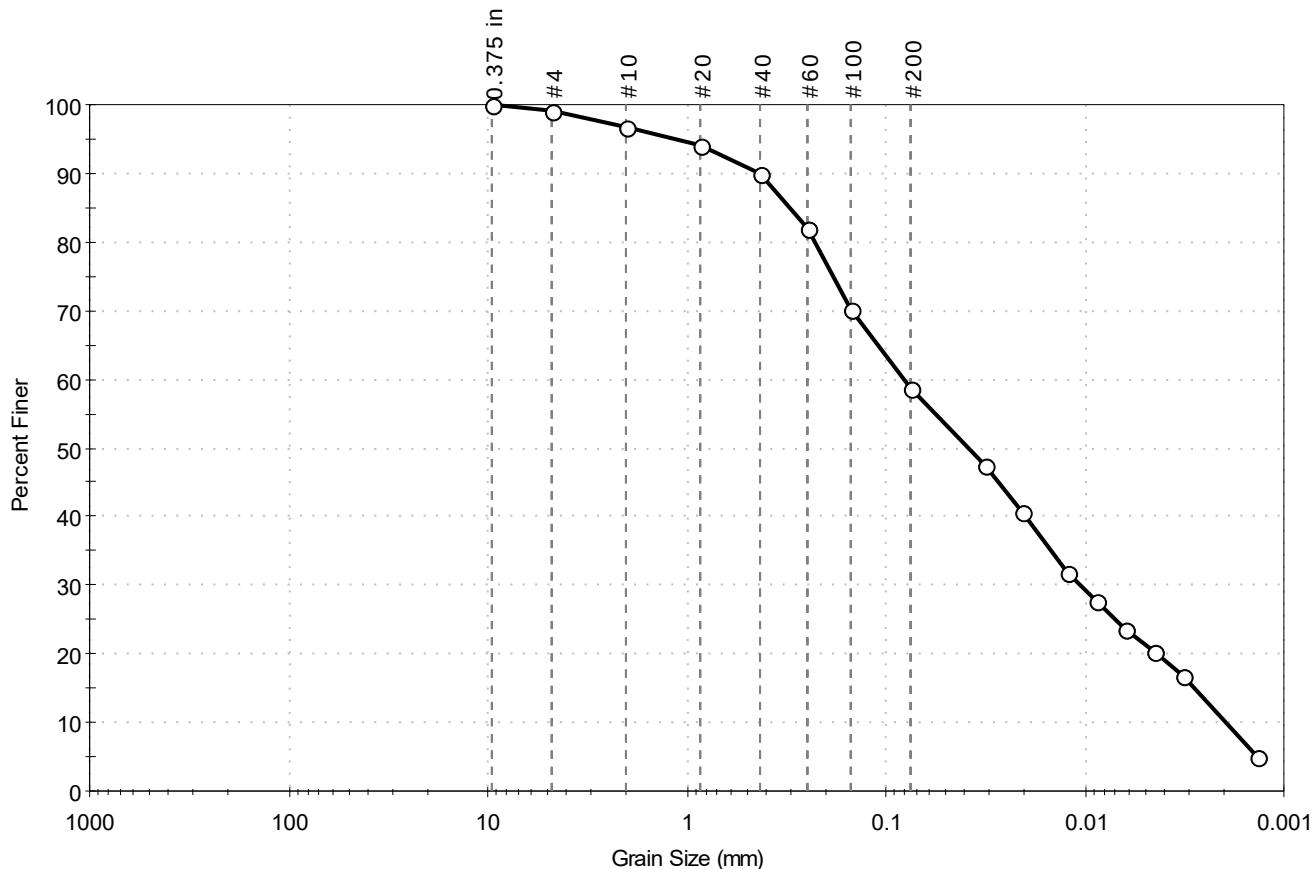
RELINQUISHED BY: SIGNATURE/ORGANIZATION [Signature] / Arcadis	DATE 12/20/18	TIME 1405
RECEIVED BY: SIGNATURE/ORGANIZATION [Signature] / Arcadis	DATE 12/20/18	TIME 1405
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
NOTES:		TEMP. ON ARRIVAL 6.0

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

Client: Merit Laboratories, Inc.	Project No: GTX-309371
Project: S98025	
Location:	
Boring ID: ---	Sample Type: bag
Sample ID: 98025.13	Test Date: 01/09/19
Depth: ---	Test Id: 488540
Test Comment: ---	Tested By: ckg
Visual Description: Moist, dark grayish brown sandy clay	Checked By: emm
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.8	40.4	58.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	97		
#20	0.85	94		
#40	0.42	90		
#60	0.25	82		
#100	0.15	70		
#200	0.075	59		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0316	47		
---	0.0207	41		
---	0.0123	32		
---	0.0088	28		
---	0.0063	24		
---	0.0045	20		
---	0.0032	17		
---	0.0014	5		

Coefficients

$D_{85} = 0.3040$ mm $D_{30} = 0.0106$ mm
 $D_{60} = 0.0807$ mm $D_{15} = 0.0028$ mm
 $D_{50} = 0.0385$ mm $D_{10} = 0.0020$ mm
 $C_u = 40.350$ $C_c = 0.696$

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
 Sand/Gravel Hardness : ---
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #200 Sieve

The results set forth herein are provided by SGS North America Inc.

e-Hardcopy 2.0
Automated Report

Technical Report for

Arcadis

Racer Lansing PFAS Delineation; Lansing, MI

B0064479.2018.03700

SGS Job Number: FA60008

Sampling Dates: 12/04/18 - 12/07/18

Report to:

Arcadis
300 S Washington Sq Suite 315
Lansing, MI 48933
alex.villhauer@arcadis.com; christine.gregg@arcadis.com
ATTN: Alex Villhauer

Total number of pages in report: **68**



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.



Caitlin Brice, M.S.
General Manager

Client Service contact: Andrea Colby 407-425-6700

Certifications: FL(E83510), LA(03051), KS(E-10327), IL(200063), NC(573), NJ(FL002), NY(12022), SC(96038001)
DoD ELAP(ANAB L2229), AZ(AZ0806), CA(2937), TX(T104704404), PA(68-03573), VA(460177),
AK, AR, IA, KY, MA, MS, ND, NH, NV, OK, OR, UT, WA, WV

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Test results relate only to samples analyzed.

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Sample Summary

Arcadis

Job No: FA60008

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064479.2018.03700

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
FA60008-1	12/04/18	14:35	AWDA12/08/18	AQ	Ground Water	MW-91-2_120418
FA60008-2	12/05/18	10:45	AWDA12/08/18	AQ	Ground Water	MW-02-04(3)_120518
FA60008-3	12/05/18	12:20	AWDA12/08/18	AQ	Ground Water	MW-18-92_120518
FA60008-4	12/05/18	13:40	AWDA12/08/18	AQ	Ground Water	MW-18-88_120518
FA60008-5	12/05/18	15:15	AWDA12/08/18	AQ	Ground Water	MW-18-89_120518
FA60008-6	12/06/18	10:45	AWDA12/08/18	AQ	Ground Water	MW-18-90_120618
FA60008-7	12/06/18	12:15	AWDA12/08/18	AQ	Ground Water	MW-18-91_120618
FA60008-8	12/06/18	14:40	AWDA12/08/18	AQ	Ground Water	CH-14-RO_120618
FA60008-9	12/06/18	00:00	AWDA12/08/18	AQ	Ground Water	DUP-04
FA60008-10	12/07/18	11:40	AWDA12/08/18	AQ	Ground Water	AS-17-05_120718
FA60008-11	12/07/18	12:50	AWDA12/08/18	AQ	Ground Water	AS-17-04_120718
FA60008-12	12/07/18	14:20	AWDA12/08/18	AQ	Ground Water	P6-MH2-SW_120718
FA60008-13	12/07/18	15:10	AWDA12/08/18	AQ	Ground Water	P3-MH-NE_120718



Sample Summary
(continued)

Arcadis

Job No: FA60008

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064479.2018.03700

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
FA60008-14	12/07/18	15:40	AWDA12/08/18	AQ	Ground Water	P2-MH-NW_120718
FA60008-15	12/07/18	00:00	AWDA12/08/18	AQ	Ground Water	DUP-08_120718

Summary of Hits

Job Number: FA60008
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 12/04/18 thru 12/07/18

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

FA60008-1 MW-91-2_120418

Perfluoropentanoic acid	0.00157 J	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid	0.00156 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00145 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.00582	0.0040	0.0015	ug/l	EPA 537M BY ID

FA60008-2 MW-02-04(3)_120518

Perfluorobutanoic acid	0.00266 J	0.0077	0.0019	ug/l	EPA 537M BY ID

FA60008-3 MW-18-92_120518

Perfluorobutanoic acid	0.00267 J	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00156 J	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00105 J	0.0038	0.00096	ug/l	EPA 537M BY ID

FA60008-4 MW-18-88_120518

Perfluorobutanoic acid	0.00596 J	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00322 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00179 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00135 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.106	0.0038	0.0014	ug/l	EPA 537M BY ID

FA60008-5 MW-18-89_120518

Perfluorobutanoic acid	0.0126	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0145	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.0102	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00778	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0214	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00229 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00297 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00223 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid	0.00128 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00848	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.00705	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.289	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorodecanesulfonic acid ^a	0.00248 J	0.0040	0.0010	ug/l	EPA 537M BY ID

FA60008-6 MW-18-90_120618

Perfluoropentanoic acid ^b	0.00618	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid ^c	0.00614	0.0040	0.0010	ug/l	EPA 537M BY ID

Summary of Hits

Job Number: FA60008
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 12/04/18 thru 12/07/18

Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
Perfluoroheptanoic acid ^c		0.00516	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid ^c		0.0191	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorononanoic acid ^d		0.00155 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorodecanoic acid ^c		0.00111 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid ^c		0.00273 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid ^c		0.00512	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid ^c		0.0360	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid ^c		0.0549	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid ^c		0.940	0.040	0.015	ug/l	EPA 537M BY ID

FA60008-7 MW-18-91_120618

Perfluorobutanoic acid	0.0105	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00649	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00435	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00401	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00899	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00133 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00176 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00182 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00177 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0760	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorodecanesulfonic acid ^a	0.00529	0.0038	0.00096	ug/l	EPA 537M BY ID
PFOSA	0.00212 J	0.0038	0.00096	ug/l	EPA 537M BY ID

FA60008-8 CH-14-RO_120618

Perfluorooctanoic acid	0.126 J	0.38	0.096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.102 J	0.38	0.096	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid	0.290 J	0.38	0.096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	1.54	0.38	0.096	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.651	0.38	0.096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	10.1	0.38	0.14	ug/l	EPA 537M BY ID

FA60008-9 DUP-04

Perfluorooctanoic acid	0.108 J	0.38	0.096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.120 J	0.38	0.096	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid	0.336 J	0.38	0.096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	1.78	0.38	0.096	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.758	0.38	0.096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	11.0	0.38	0.14	ug/l	EPA 537M BY ID

Summary of Hits

Job Number: FA60008
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 12/04/18 thru 12/07/18

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

FA60008-10 AS-17-05_120718

Perfluorobutanoic acid	0.00549 J	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00256 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00473	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.00114 J	0.0040	0.0010	ug/l	EPA 537M BY ID

FA60008-11 AS-17-04_120718

Perfluorobutanoic acid	0.00655 J	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00640	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00113 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00103 J	0.0040	0.0010	ug/l	EPA 537M BY ID

FA60008-12 P6-MH2-SW_120718

Perfluorobutanoic acid	0.0167	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0253	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.0232	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.0207	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0394	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00303 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00217 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00186 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00126 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0730	0.0040	0.0015	ug/l	EPA 537M BY ID
PFOA	0.0141	0.0040	0.0010	ug/l	EPA 537M BY ID

FA60008-13 P3-MH-NE_120718

Perfluorobutanoic acid ^c	0.00289 J	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluorooctanoic acid ^c	0.00163 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid ^c	0.00148 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid ^c	0.00161 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid ^c	0.0219 B	0.0040	0.0015	ug/l	EPA 537M BY ID

FA60008-14 P2-MH-NW_120718

Perfluorobutanoic acid	0.0136	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0182	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.0177	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.0161	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0312	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00360 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00453	0.0038	0.00096	ug/l	EPA 537M BY ID

Summary of Hits

Job Number: FA60008
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 12/04/18 thru 12/07/18

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
Analyte						
Perfluorobutanesulfonic acid		0.00807	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid		0.00331 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid		0.0220	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid		0.00196 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid		0.176	0.0038	0.0014	ug/l	EPA 537M BY ID
6:2 Fluorotelomer sulfonate		0.00221 J	0.0077	0.0019	ug/l	EPA 537M BY ID

FA60008-15 DUP-08_120718

Perfluorobutanoic acid	0.0162	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0243	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.0216	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.0193	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0374	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00304 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00205 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00200 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00103 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0620	0.0040	0.0015	ug/l	EPA 537M BY ID
PFOSA	0.0133	0.0040	0.0010	ug/l	EPA 537M BY ID

- (a) Associated BS recovery outside control limits.
(b) Insufficient sample for re-extraction. Associated ID Standard outside control limits.
(c) Insufficient sample for re-extraction.
(d) Insufficient sample for re-extraction. Associated BS recovery outside control limits.



Orlando, FL

Section 3



Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	MW-91-2_120418	
Lab Sample ID:	FA60008-1	Date Sampled: 12/04/18
Matrix:	AQ - Ground Water	Date Received: 12/08/18
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25389.D	1	12/21/18 14:01	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2							

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00157	0.0040	0.0015	ug/l	J
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid ^a	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	0.00156	0.0040	0.0010	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	0.00145	0.0040	0.0010	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00582	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-91-2_120418	Date Sampled:	12/04/18
Lab Sample ID:	FA60008-1	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	94%		30-140%
	13C5-PFPeA	99%		40-140%
	13C5-PFHxA	103%		50-150%
	13C4-PFHpA	107%		50-150%
	13C8-PFOA	126%		50-150%
	13C9-PFNA	111%		50-150%
	13C6-PFDA	103%		50-150%
	13C7-PFUnDA	102%		50-150%
	13C2-PFDoDA	77%		50-150%
	13C2-PFTeDA	84%		40-150%
	13C3-PFBS	95%		50-150%
	13C3-PFHxS	100%		50-150%
	13C8-PFOS	83%		50-150%
	13C8-FOSA	95%		30-140%
	d3-MeFOSAA	84%		50-150%
	13C2-4:2FTS	110%		50-150%
	13C2-6:2FTS	119%		50-150%
	13C2-8:2FTS	94%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-02-04(3)_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-2	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25514.D	1	12/24/18 18:41	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00266	0.0077	0.0019	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-02-04(3)_120518**Lab Sample ID:** FA60008-2**Date Sampled:** 12/05/18**Matrix:** AQ - Ground Water**Date Received:** 12/08/18**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	100%		30-140%
	13C5-PFPeA	107%		40-140%
	13C5-PFHxA	115%		50-150%
	13C4-PFHpA	115%		50-150%
	13C8-PFOA	121%		50-150%
	13C9-PFNA	107%		50-150%
	13C6-PFDA	106%		50-150%
	13C7-PFUnDA	103%		50-150%
	13C2-PFDoDA	94%		50-150%
	13C2-PFTeDA	91%		40-150%
	13C3-PFBS	105%		50-150%
	13C3-PFHxS	105%		50-150%
	13C8-PFOS	90%		50-150%
	13C8-FOSA	100%		30-140%
	d3-MeFOSAA	92%		50-150%
	13C2-4:2FTS	109%		50-150%
	13C2-6:2FTS	112%		50-150%
	13C2-8:2FTS	90%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-92_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-3	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25391.D	1	12/21/18 14:33	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00267	0.0077	0.0019	ug/l	J
2706-90-3	Perfluoropentanoic acid	0.00156	0.0038	0.0014	ug/l	J
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.00105	0.0038	0.00096	ug/l	J
375-95-1	Perfluorononanoic acid ^a	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-92_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-3	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	76%		30-140%
	13C5-PFPeA	83%		40-140%
	13C5-PFHxA	91%		50-150%
	13C4-PFHpA	92%		50-150%
	13C8-PFOA	105%		50-150%
	13C9-PFNA	98%		50-150%
	13C6-PFDA	88%		50-150%
	13C7-PFUnDA	95%		50-150%
	13C2-PFDoDA	68%		50-150%
	13C2-PFTeDA	74%		40-150%
	13C3-PFBS	79%		50-150%
	13C3-PFHxS	84%		50-150%
	13C8-PFOS	78%		50-150%
	13C8-FOSA	94%		30-140%
	d3-MeFOSAA	79%		50-150%
	13C2-4:2FTS	90%		50-150%
	13C2-6:2FTS	102%		50-150%
	13C2-8:2FTS	84%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-88_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-4	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25392.D	1	12/21/18 14:50	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2							

Run #	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00596	0.0077	0.0019	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.00322	0.0038	0.00096	ug/l	J
375-95-1	Perfluorononanoic acid ^a	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00179	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00135	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.106	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-88_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-4	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	98%		30-140%
	13C5-PFPeA	101%		40-140%
	13C5-PFHxA	104%		50-150%
	13C4-PFHpA	109%		50-150%
	13C8-PFOA	125%		50-150%
	13C9-PFNA	109%		50-150%
	13C6-PFDA	97%		50-150%
	13C7-PFUnDA	97%		50-150%
	13C2-PFDoDA	71%		50-150%
	13C2-PFTeDA	74%		40-150%
	13C3-PFBS	98%		50-150%
	13C3-PFHxS	101%		50-150%
	13C8-PFOS	86%		50-150%
	13C8-FOSA	94%		30-140%
	d3-MeFOSAA	77%		50-150%
	13C2-4:2FTS	103%		50-150%
	13C2-6:2FTS	119%		50-150%
	13C2-8:2FTS	94%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-89_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-5	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25515.D	1	12/24/18 18:57	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0126	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0145	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.0102	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00778	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.0214	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	0.00229	0.0040	0.0010	ug/l	J
335-76-2	Perfluorodecanoic acid	0.00297	0.0040	0.0010	ug/l	J
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00223	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	0.00128	0.0040	0.0010	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	0.00848	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.00705	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.289	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	0.00248	0.0040	0.0010	ug/l	J

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-89_120518	Date Sampled:	12/05/18
Lab Sample ID:	FA60008-5	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	86%		30-140%
	13C5-PFPeA	94%		40-140%
	13C5-PFHxA	98%		50-150%
	13C4-PFHpA	103%		50-150%
	13C8-PFOA	114%		50-150%
	13C9-PFNA	114%		50-150%
	13C6-PFDA	109%		50-150%
	13C7-PFUnDA	113%		50-150%
	13C2-PFDoDA	102%		50-150%
	13C2-PFTeDA	93%		40-150%
	13C3-PFBS	94%		50-150%
	13C3-PFHxS	95%		50-150%
	13C8-PFOS	98%		50-150%
	13C8-FOSA	64%		30-140%
	d3-MeFOSAA	105%		50-150%
	13C2-4:2FTS	102%		50-150%
	13C2-6:2FTS	115%		50-150%
	13C2-8:2FTS	112%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-90_120618

Lab Sample ID: FA60008-6

Date Sampled: 12/06/18

Matrix: AQ - Ground Water

Date Received: 12/08/18

Method: EPA 537M BY ID EPA 537 MOD

Percent Solids: n/a

Project: Racer Lansing PFAS Delineation; Lansing, MI

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 ^a	2Q25394.D	1	12/21/18 15:21	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2 ^a	2Q25517.D	10	12/24/18 19:28	NAF	12/19/18 09:00	OP73096	S2Q395
Run #3 ^b	2Q25516.D	1	12/24/18 19:12	NAF	12/19/18 09:00	OP73096	S2Q395

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2	250 ml	1.0 ml
Run #3	250 ml	1.0 ml

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid ^c	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid ^c	0.00618	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00614	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00516	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.0191	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid ^d	0.00155	0.0040	0.0010	ug/l	J
335-76-2	Perfluorodecanoic acid	0.00111	0.0040	0.0010	ug/l	J
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00273	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	0.00512	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.0360	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.0549	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.940 ^e	0.040	0.015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-90_120618	Date Sampled:	12/06/18
Lab Sample ID:	FA60008-6	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Run# 3	Limits
	13C4-PFBA	3% ^f	3% ^f	3% ^f	30-140%
	13C5-PFPeA	35% ^f	37% ^f	36% ^f	40-140%
	13C5-PFHxA	91%	104%	97%	50-150%
	13C4-PFHpA	93%	109%	102%	50-150%
	13C8-PFOA	94%	107%	102%	50-150%
	13C9-PFNA	86%	107%	92%	50-150%
	13C6-PFDA	73%	94%	77%	50-150%
	13C7-PFUnDA	63%	91%	63%	50-150%
	13C2-PFDoDA	70%	85%	77%	50-150%
	13C2-PFTeDA	81%	78%	80%	40-150%
	13C3-PFBS	91%	102%	98%	50-150%
	13C3-PFHxS	85%	102%	92%	50-150%
	13C8-PFOS	72%	89%	78%	50-150%
	13C8-FOSA	62%	113%	52%	30-140%
	d3-MeFOSAA	68%	82%	74%	50-150%
	13C2-4:2FTS	91%	97%	96%	50-150%
	13C2-6:2FTS	98%	103%	100%	50-150%
	13C2-8:2FTS	72%	93%	76%	50-150%

- (a) Insufficient sample for re-extraction.
 (b) Confirmation run for internal standard areas.
 (c) Associated ID Standard outside control limits.
 (d) Associated BS recovery outside control limits.
 (e) Result is from Run# 2
 (f) Outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-91_120618		
Lab Sample ID:	FA60008-7	Date Sampled:	12/06/18
Matrix:	AQ - Ground Water	Date Received:	12/08/18
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids:	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25518.D	1	12/24/18 19:44	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0105	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00649	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	0.00435	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00401	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.00899	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	0.00133	0.0038	0.00096	ug/l	J
335-76-2	Perfluorodecanoic acid	0.00176	0.0038	0.00096	ug/l	J
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00182	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00177	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0760	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	0.00529	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	0.00212	0.0038	0.00096	ug/l	J

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-91_120618	Date Sampled:	12/06/18
Lab Sample ID:	FA60008-7	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	81%		30-140%
	13C5-PFPeA	86%		40-140%
	13C5-PFHxA	90%		50-150%
	13C4-PFHpA	93%		50-150%
	13C8-PFOA	106%		50-150%
	13C9-PFNA	107%		50-150%
	13C6-PFDA	101%		50-150%
	13C7-PFUnDA	83%		50-150%
	13C2-PFDoDA	73%		50-150%
	13C2-PFTeDA	78%		40-150%
	13C3-PFBS	85%		50-150%
	13C3-PFHxS	87%		50-150%
	13C8-PFOS	90%		50-150%
	13C8-FOSA	56%		30-140%
	d3-MeFOSAA	101%		50-150%
	13C2-4:2FTS	93%		50-150%
	13C2-6:2FTS	108%		50-150%
	13C2-8:2FTS	103%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CH-14-RO_120618	Date Sampled:	12/06/18
Lab Sample ID:	FA60008-8	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25519.D	100	12/24/18 20:00	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	ND	0.77	0.19	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.38	0.14	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.38	0.096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.38	0.096	ug/l	
335-67-1	Perfluorooctanoic acid	0.126	0.38	0.096	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.38	0.096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.38	0.096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.38	0.096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.38	0.14	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.38	0.096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.38	0.096	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	0.102	0.38	0.096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	0.290	0.38	0.096	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	1.54	0.38	0.096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.651	0.38	0.096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	10.1	0.38	0.14	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.38	0.096	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	ND	0.38	0.096	ug/l	
PERFLUOROOCCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.38	0.096	ug/l	
PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	1.9	0.38	ug/l	
2991-50-6	EtFOSAA	ND	1.9	0.38	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.77	0.19	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.77	0.19	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CH-14-RO_120618	Date Sampled:	12/06/18
Lab Sample ID:	FA60008-8	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.77	0.19	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	98%		30-140%
	13C5-PFPeA	104%		40-140%
	13C5-PFHxA	108%		50-150%
	13C4-PFHpA	105%		50-150%
	13C8-PFOA	107%		50-150%
	13C9-PFNA	110%		50-150%
	13C6-PFDA	117%		50-150%
	13C7-PFUnDA	110%		50-150%
	13C2-PFDoDA	110%		50-150%
	13C2-PFTeDA	107%		40-150%
	13C3-PFBS	102%		50-150%
	13C3-PFHxS	103%		50-150%
	13C8-PFOS	106%		50-150%
	13C8-FOSA	117%		30-140%
	d3-MeFOSAA	104%		50-150%
	13C2-4:2FTS	99%		50-150%
	13C2-6:2FTS	100%		50-150%
	13C2-8:2FTS	102%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-04	Date Sampled:	12/06/18
Lab Sample ID:	FA60008-9	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25520.D	100	12/24/18 20:15	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.77	0.19	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.38	0.14	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.38	0.096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.38	0.096	ug/l	
335-67-1	Perfluorooctanoic acid	0.108	0.38	0.096	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.38	0.096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.38	0.096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.38	0.096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.38	0.14	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.38	0.096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.38	0.096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.120	0.38	0.096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	0.336	0.38	0.096	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	1.78	0.38	0.096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.758	0.38	0.096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	11.0	0.38	0.14	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.38	0.096	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	ND	0.38	0.096	ug/l	

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.38	0.096	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	1.9	0.38	ug/l	
2991-50-6	EtFOSAA	ND	1.9	0.38	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.77	0.19	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.77	0.19	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-04	Date Sampled:	12/06/18
Lab Sample ID:	FA60008-9	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.77	0.19	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	95%		30-140%
	13C5-PFPeA	99%		40-140%
	13C5-PFHxA	103%		50-150%
	13C4-PFHpA	102%		50-150%
	13C8-PFOA	103%		50-150%
	13C9-PFNA	105%		50-150%
	13C6-PFDA	112%		50-150%
	13C7-PFUnDA	109%		50-150%
	13C2-PFDoDA	107%		50-150%
	13C2-PFTeDA	100%		40-150%
	13C3-PFBS	98%		50-150%
	13C3-PFHxS	98%		50-150%
	13C8-PFOS	101%		50-150%
	13C8-FOSA	112%		30-140%
	d3-MeFOSAA	97%		50-150%
	13C2-4:2FTS	95%		50-150%
	13C2-6:2FTS	95%		50-150%
	13C2-8:2FTS	99%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AS-17-05_120718		
Lab Sample ID:	FA60008-10	Date Sampled:	12/07/18
Matrix:	AQ - Ground Water	Date Received:	12/08/18
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids:	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25523.D	1	12/24/18 21:02	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00549	0.0080	0.0020	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.00256	0.0040	0.0010	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00473	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.00114	0.0040	0.0010	ug/l	J
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AS-17-05_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-10	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	71%		30-140%
	13C5-PFPeA	80%		40-140%
	13C5-PFHxA	91%		50-150%
	13C4-PFHpA	89%		50-150%
	13C8-PFOA	98%		50-150%
	13C9-PFNA	97%		50-150%
	13C6-PFDA	91%		50-150%
	13C7-PFUnDA	86%		50-150%
	13C2-PFDoDA	59%		50-150%
	13C2-PFTeDA	56%		40-150%
	13C3-PFBS	86%		50-150%
	13C3-PFHxS	94%		50-150%
	13C8-PFOS	90%		50-150%
	13C8-FOSA	41%		30-140%
	d3-MeFOSAA	74%		50-150%
	13C2-4:2FTS	93%		50-150%
	13C2-6:2FTS	99%		50-150%
	13C2-8:2FTS	97%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AS-17-04_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-11	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25525.D	1	12/24/18 21:34	NAF	12/19/18 09:00	OP73096	S2Q395
Run #2							

Run #	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00655	0.0080	0.0020	ug/l	J
2706-90-3	Perfluoropentanoic acid	0.00640	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.00113	0.0040	0.0010	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00103	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^a	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	AS-17-04_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-11	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	77%		30-140%
	13C5-PFPeA	83%		40-140%
	13C5-PFHxA	94%		50-150%
	13C4-PFHpA	98%		50-150%
	13C8-PFOA	104%		50-150%
	13C9-PFNA	108%		50-150%
	13C6-PFDA	101%		50-150%
	13C7-PFUnDA	88%		50-150%
	13C2-PFDoDA	67%		50-150%
	13C2-PFTeDA	57%		40-150%
	13C3-PFBS	85%		50-150%
	13C3-PFHxS	93%		50-150%
	13C8-PFOS	89%		50-150%
	13C8-FOSA	49%		30-140%
	d3-MeFOSAA	75%		50-150%
	13C2-4:2FTS	91%		50-150%
	13C2-6:2FTS	105%		50-150%
	13C2-8:2FTS	120%		50-150%

(a) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	P6-MH2-SW_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-12	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25403.D	1	12/21/18 17:43	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2	2Q25526.D	1	12/24/18 21:50	NAF	12/19/18 09:00	OP73096	S2Q395

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2	250 ml	1.0 ml

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0167	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0253	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.0232	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	0.0207	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.0394	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	0.00303 ^a	0.0040	0.0010	ug/l	J
335-76-2	Perfluorodecanoic acid	0.00217	0.0040	0.0010	ug/l	J
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00186	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00126	0.0040	0.0010	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0730	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	0.0141	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	P6-MH2-SW_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-12	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	86%	92%	30-140%
	13C5-PFPeA	89%	96%	40-140%
	13C5-PFHxA	93%	102%	50-150%
	13C4-PFHpA	96%	107%	50-150%
	13C8-PFOA	110%	116%	50-150%
	13C9-PFNA	105%	115%	50-150%
	13C6-PFDA	91%	94%	50-150%
	13C7-PFUnDA	90%	92%	50-150%
	13C2-PFDoDA	65%	78%	50-150%
	13C2-PFTeDA	73%	74%	40-150%
	13C3-PFBS	86%	94%	50-150%
	13C3-PFHxS	91%	97%	50-150%
	13C8-PFOS	82%	88%	50-150%
	13C8-FOSA	96%	100%	30-140%
	d3-MeFOSAA	73%	79%	50-150%
	13C2-4:2FTS	95%	97%	50-150%
	13C2-6:2FTS	113%	114%	50-150%
	13C2-8:2FTS	91%	94%	50-150%

(a) Result is from Run# 2

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	P3-MH-NE_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-13	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 ^a	2Q25693.D	1	12/27/18 18:03	NAF	12/26/18 12:00	OP73191	S2Q397
Run #2							

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00289	0.0080	0.0020	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.00163	0.0040	0.0010	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00148	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00161	0.0040	0.0010	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0219	0.0040	0.0015	ug/l	B
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid ^b	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: P3-MH-NE_120718**Lab Sample ID:** FA60008-13**Date Sampled:** 12/07/18**Matrix:** AQ - Ground Water**Date Received:** 12/08/18**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	90%		30-140%
	13C5-PFPeA	91%		40-140%
	13C5-PFHxA	98%		50-150%
	13C4-PFHpA	101%		50-150%
	13C8-PFOA	112%		50-150%
	13C9-PFNA	105%		50-150%
	13C6-PFDA	90%		50-150%
	13C7-PFUnDA	80%		50-150%
	13C2-PFDoDA	75%		50-150%
	13C2-PFTeDA	81%		40-150%
	13C3-PFBS	90%		50-150%
	13C3-PFHxS	90%		50-150%
	13C8-PFOS	72%		50-150%
	13C8-FOSA	91%		30-140%
	d3-MeFOSAA	68%		50-150%
	13C2-4:2FTS	90%		50-150%
	13C2-6:2FTS	99%		50-150%
	13C2-8:2FTS	83%		50-150%

(a) Insufficient sample for re-extraction.

(b) Associated BS recovery outside control limits.

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	P2-MH-NW_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-14	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25405.D	1	12/21/18 18:14	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2	2Q25527.D	1	12/24/18 22:05	NAF	12/19/18 09:00	OP73096	S2Q395

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2	260 ml	1.0 ml

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0136	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0182	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	0.0177	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	0.0161	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.0312	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	0.00360 ^a	0.0038	0.00096	ug/l	J
335-76-2	Perfluorodecanoic acid	0.00453	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00807	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	0.00331	0.0038	0.00096	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	0.0220	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.00196	0.0038	0.00096	ug/l	J
1763-23-1	Perfluorooctanesulfonic acid	0.176	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	0.00221	0.0077	0.0019	ug/l	J

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: P2-MH-NW_120718**Lab Sample ID:** FA60008-14**Date Sampled:** 12/07/18**Matrix:** AQ - Ground Water**Date Received:** 12/08/18**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	74%	80%	30-140%
	13C5-PFPeA	77%	84%	40-140%
	13C5-PFHxA	78%	87%	50-150%
	13C4-PFHpA	80%	91%	50-150%
	13C8-PFOA	89%	100%	50-150%
	13C9-PFNA	85%	99%	50-150%
	13C6-PFDA	80%	84%	50-150%
	13C7-PFUnDA	71%	75%	50-150%
	13C2-PFDoDA	59%	69%	50-150%
	13C2-PFTeDA	66%	71%	40-150%
	13C3-PFBS	73%	81%	50-150%
	13C3-PFHxS	73%	82%	50-150%
	13C8-PFOS	73%	79%	50-150%
	13C8-FOSA	69%	61%	30-140%
	d3-MeFOSAA	67%	74%	50-150%
	13C2-4:2FTS	81%	87%	50-150%
	13C2-6:2FTS	95%	101%	50-150%
	13C2-8:2FTS	79%	83%	50-150%

(a) Result is from Run# 2

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-08_120718		
Lab Sample ID:	FA60008-15	Date Sampled:	12/07/18
Matrix:	AQ - Ground Water	Date Received:	12/08/18
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids:	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q25407.D	1	12/21/18 18:46	NAF	12/19/18 09:00	OP73096	S2Q394
Run #2	2Q25528.D	1	12/24/18 22:21	NAF	12/19/18 09:00	OP73096	S2Q395

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2	250 ml	1.0 ml

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0162	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0243	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.0216	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	0.0193	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.0374	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	0.00304 ^a	0.0040	0.0010	ug/l	J
335-76-2	Perfluorodecanoic acid	0.00205	0.0040	0.0010	ug/l	J
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00200	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00103	0.0040	0.0010	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0620	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	0.0133	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-08_120718	Date Sampled:	12/07/18
Lab Sample ID:	FA60008-15	Date Received:	12/08/18
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	84%	89%	30-140%
	13C5-PFPeA	87%	93%	40-140%
	13C5-PFHxA	88%	98%	50-150%
	13C4-PFHpA	94%	103%	50-150%
	13C8-PFOA	99%	113%	50-150%
	13C9-PFNA	102%	111%	50-150%
	13C6-PFDA	96%	101%	50-150%
	13C7-PFUnDA	108%	107%	50-150%
	13C2-PFDoDA	81%	91%	50-150%
	13C2-PFTeDA	84%	89%	40-150%
	13C3-PFBS	83%	91%	50-150%
	13C3-PFHxS	88%	94%	50-150%
	13C8-PFOS	95%	100%	50-150%
	13C8-FOSA	82%	89%	30-140%
	d3-MeFOSAA	88%	96%	50-150%
	13C2-4:2FTS	92%	94%	50-150%
	13C2-6:2FTS	105%	111%	50-150%
	13C2-8:2FTS	98%	104%	50-150%

(a) Result is from Run# 2

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound



Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

Chain of Custody

4405 Vineland Road, Suite C-15 Orlando, FL 32811
TEL: 407-425-6700 FAX: 407-425-0707
www.sgs.com

SGS - ORLANDO JOB # :

PAGE 1 OF 2

SGS		4405 Vineland Road, Suite C-15 Orlando, FL 32811 TEL 407-425-6700 FAX: 407-425-0707 www.sgs.com		SGS - ORLANDO Quote #		SKIFF #	
Client / Reporting Information				Project Information			
Company Name: Arcadis of Michigan, LLC		Project Name: RACER Lansing					
Address: 20550 Cabot Drive, Suite 500		Street:					
City: Novi		State: MI		Zip: 48377		City: Lansing State: MI	
Project Contact: Christine Gregg		Email: christine.gregg@arcadis.com		Project # B0064479.2018.03700			
Phone #: 248-483-6634				Fax # 248-994-2241			
Sampler(s) Name(s) (Printed) Sampler 1: Austin Westman Sampler 2: Dan Annett		Client Purchase Order # B0064479.2018.03700					
SGS Orlando Sample #		Field ID / Point of Collection		COLLECTION		CONTAINER INFORMATION	
		DATE	TIME	SAMPLED BY:	MATRIX	TOTAL # OF BOTTLES	OTHER
							NONE OTHER HCl NOHr NO3r NH4r ZnAs Cd Pb Cu Ni Cr Mn
1	MW-91-2-120418	2/17/18	1435	AW	GW	2	2
2	MW-02-04(3)-120518	2/5/18	1045	AW	GW	2	2
3	MW-18-92-120518	2/5/18	1220	AW	GW	2	2
4	MW-18-88-120518	2/5/18	1340	AW	GW	2	2
5	MW-18-89-120518	2/5/18	1515	AW	GW	2	2
6	MW-18-90-120618	2/6/18	1045	AW	GW	2	2
7	MW-18-91-120618	2/6/18	1215	AW	GW	2	2
8	CH-14-R0-120618	2/6/18	1440	AW	GW	2	2
9	Dup-04	2/6/18	---	AW	GW	2	2
10	AS-17-05-130718	13/7/18	1140	DA	bw	2	2
11	AS-17-07-130718	13/7/18	1850	DA	bw	2	2
12	PB-MH2-SW-110718	11/7/18	1420	DA	bw	2	2
Turnaround Time (Business days)				Data Deliverable Information			
10 Day (Business)		Approved By / Date:		☐ COMMERCIAL "A" (RESULTS ONLY) ☐ COMMERCIAL "B" (RESULTS PLUS QC) ☐ REDT1 (EPA LEVEL 3) ☐ FULLT1 (EPA LEVEL 4) ☐ EDD'S			
7 Day				* PFAS method 537 mod. with isotop dilution per QSM 5.1. MDEQ 24-Compound list.			
5 Day							
3 Day RUSH							
2 Day RUSH							
1 Day RUSH							
Other _____							
Rush T/A Data Available VIA Email or Lablink							
Sample Custody must be documented below each time samples change possession, including courier delivery.							
Relinquished by Sampler/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:
1 D. Annett / Arcadis	12/14/17	2 FedEx / FedEx		3 FH		4 K. Pappas / Arcadis	12/18/18
Relinquished by Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:
5		6		7		8	
Lab Use Only: Cooler Temperature (s) Celsius (corrected): 17							

ORLD-SMT-0001-03-FORM-COC (1) Rev 031318

FA60008: Chain of Custody

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FA 60008

SGS - ORLANDO Quote #	SKIFF #																
4405 Vineland Road, Suite C-15 Orlando, FL 32811 TEL: 407-425-6700 FAX: 407-425-0707 www.sgs.com																	
Client / Reporting Information	Project Information	Analytical Information	Matrix Codes														
Company Name: ARCADIS at Michigan LLC Address: 38550 Cabot Dr. SW 500 City: Novi State: MI Zip: 48377 Project Contact: Chris Lee Email: chris.lee@arcadis.com Phone #: 248-433-6634 Sampler(s) Name(s) (Printed): Sampler 1: Ausub Westman Sampler 2: Dale Ainsworth	Project Name: River Lansing Street: City: Lansing State: MI Project # B0064479.0018.03700 Fax # 248-444-3241 Client Purchase Order # B0064479.0018.03700		DW - Drinking Water GW - Ground Water WW - Wastewater SW - Surface Water SO - Soil SL - Sludge LI - Other Liquid AIR - Air SOL - Other Solid														
SGS Orlando Sample #	Field ID / Point of Collection	DATE	TIME	SAMPLER BY:	MATRIX	TOTAL # OF BOTTLES	OTHER	NONE	AC	NH4	NH3	H2S	NH4+ZNA	DI WATER	MEDI	PEAS	LAB USE ONLY
13	P3-MH-NE-120718	12/7/18	1510	DA	6W	2	2									X	
14	P3-MH-NW-120718	12/7/18	1540	DA	6W	2	2									X	
15	Dup-UG-120718	12/7/18	—	DA	6W	2	2									X	
Turnaround Time (Business days)																	
Data Deliverable Information																	
Comments / Remarks																	
10 Day (Business) Approved By / Date: _____ 7 Day _____ 5 Day _____ 3 Day RUSH _____ 2 Day RUSH _____ 1 Day RUSH _____ Other _____ Rush T/A Data Available VIA Email or Lablink																	
☐ COMMERCIAL "A" (RESULTS ONLY) ☐ COMMERCIAL "B" (RESULTS PLUS QC) ☐ REDT1 (EPA LEVEL 3) ☐ FULLT1 (EPA LEVEL 4) ☐ EDD'S																	
* PEAS method 537 mod. w/ isovig Dilution per QSM S.I. MDEQ 24-Comp and 1:5																	
Sample Custody must be documented below each time samples change possession, including courier delivery																	
Relinquished By/Affiliation: Chris Lee / ARCADIS Date Time: 12/7/18 1700 Received By/Affiliation: gedex Date Time: 12/8/18 1000 Relinquished By/Affiliation: _____ Date Time: _____ Received By/Affiliation: _____ Date Time: _____ Relinquished By/Affiliation: _____ Date Time: _____ Received By/Affiliation: _____ Date Time: _____																	
Lab Use Only: Cooler Temperature (s) Celsius (corrected): 10.2																	

ORLD-SMT-0001-03-FORM-COC (1) Rev 031318

FA60008: Chain of Custody

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SGS Sample Receipt Summary

Job Number: FA60008

Client: ARCADIS OF MICHIGAN

Project: RACER LANSING

Date / Time Received: 12/8/2018 10:00:00 AM

Delivery Method: FX

Airbill #s: 1002241571060003281100813921966404

Therm ID: IR 1;

Therm CF: -0.2;

of Coolers: 1

Cooler Temps (Raw Measured) °C: Cooler 1: (1.4);

Cooler Temps (Corrected) °C: Cooler 1: (1.2);

Cooler Information

Y or N

1. Custody Seals Present ☒ ☐
2. Custody Seals Intact ☒ ☐
3. Temp criteria achieved ☒ ☐
4. Cooler temp verification IR Gun
5. Cooler media Ice (Bag)

Trip Blank Information

Y or N N/A

1. Trip Blank present / cooler ☐ ☐ ☒
 2. Trip Blank listed on COC ☐ ☐ ☒
- W or S N/A
3. Type Of TB Received ☐ ☐ ☒

Sample Information

Y or N N/A

1. Sample labels present on bottles ☒ ☐
2. Samples preserved properly ☒ ☐
3. Sufficient volume/containers recvd for analysis: ☒ ☐
4. Condition of sample Intact
5. Sample recvd within HT ☒ ☐
6. Dates/Times/IDs on COC match Sample Label ☒ ☐
7. VOCs have headspace ☐ ☐ ☒
8. Bottles received for unspecified tests ☐ ☒ ☐
9. Compositing instructions clear ☐ ☐ ☒
10. Voa Soil Kits/Jars received past 48hrs? ☐ ☐ ☒
11. % Solids Jar received? ☐ ☐ ☒
12. Residual Chlorine Present? ☐ ☐ ☒

Misc. Information

Number of Encores: 25-Gram _____ 5-Gram _____

Number of 5035 Field Kits: _____

Number of Lab Filtered Metals: _____

Test Strip Lot #s: pH 0-3 230315

pH 10-12 219813A

Other: (Specify) _____

Residual Chlorine Test Strip Lot #: _____

Comments

SM001
Rev. Date 05/24/17

Technician: PETERH

Date: 12/8/2018 10:00:00 A

Reviewer: _____

Date: _____

FA60008: Chain of Custody

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MS Semi-volatiles

5

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

Page 1 of 2

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-MB	2Q25388.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	98% 30-140%
	13C5-PFPeA	97% 40-140%
	13C5-PFHxA	99% 50-150%
	13C4-PFHpA	101% 50-150%
	13C8-PFOA	117% 50-150%
	13C9-PFNA	106% 50-150%
	13C6-PFDA	90% 50-150%
	13C7-PFUnDA	88% 50-150%

Method Blank Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-MB	2Q25388.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	62% 50-150%
	13C2-PFTeDA	66% 40-150%
	13C3-PFBS	95% 50-150%
	13C3-PFHxS	96% 50-150%
	13C8-PFOS	79% 50-150%
	13C8-FOSA	99% 30-140%
	d3-MeFOSAA	72% 50-150%
	13C2-4:2FTS	94% 50-150%
	13C2-6:2FTS	112% 50-150%
	13C2-8:2FTS	81% 50-150%

Method Blank Summary

Page 1 of 2

Job Number: FA60008**Account:** ARCMIL Arcadis**Project:** Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-MB	2Q25692.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples:**Method:** EPA 537M BY ID

FA60008-13

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00546	0.0077	0.0029	ug/l	J
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Limits	
	13C4-PFBA	102%	30-140%
	13C5-PFPeA	107%	40-140%
	13C5-PFHxA	111%	50-150%
	13C4-PFHpA	110%	50-150%
	13C8-PFOA	116%	50-150%
	13C9-PFNA	114%	50-150%
	13C6-PFDA	109%	50-150%
	13C7-PFUnDA	101%	50-150%

Method Blank Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-MB	2Q25692.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA60008-13

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	84% 50-150%
	13C2-PFTeDA	80% 40-150%
	13C3-PFBS	102% 50-150%
	13C3-PFHxS	104% 50-150%
	13C8-PFOS	102% 50-150%
	13C8-FOSA	108% 30-140%
	d3-MeFOSAA	86% 50-150%
	13C2-4:2FTS	103% 50-150%
	13C2-6:2FTS	107% 50-150%
	13C2-8:2FTS	96% 50-150%

Method Blank Summary

Page 1 of 2

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-MB	2Q25757.D	1	12/28/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-13

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00578	0.0077	0.0029	ug/l	J
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	104% 30-140%
	13C5-PFPeA	110% 40-140%
	13C5-PFHxA	114% 50-150%
	13C4-PFHpA	111% 50-150%
	13C8-PFOA	120% 50-150%
	13C9-PFNA	120% 50-150%
	13C6-PFDA	118% 50-150%
	13C7-PFUnDA	101% 50-150%

Method Blank Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-MB	2Q25757.D	1	12/28/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA60008-13

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	86% 50-150%
	13C2-PFTeDA	87% 40-150%
	13C3-PFBS	106% 50-150%
	13C3-PFHxS	107% 50-150%
	13C8-PFOS	104% 50-150%
	13C8-FOSA	113% 30-140%
	d3-MeFOSAA	99% 50-150%
	13C2-4:2FTS	108% 50-150%
	13C2-6:2FTS	115% 50-150%
	13C2-8:2FTS	103% 50-150%

Instrument Blank

Page 1 of 2

Job Number: FA60008

Account: ARCMIL Arcadis

Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q394-IBLK	2Q25384.D	1	12/21/18	NAF	n/a	n/a	S2Q394

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA60008-1, FA60008-3, FA60008-4, FA60008-6, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.015	0.0038	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	97% 50-150%
	13C5-PFPeA	98% 50-150%
	13C5-PFHxA	100% 50-150%
	13C4-PFHpA	100% 50-150%
	13C8-PFOA	101% 50-150%
	13C9-PFNA	105% 50-150%
	13C6-PFDA	110% 50-150%
	13C7-PFUnDA	107% 50-150%

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Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q394-IBLK	2Q25384.D	1	12/21/18	NAF	n/a	n/a	S2Q394

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15

FA60008-1, FA60008-3, FA60008-4, FA60008-6, FA60008-12, FA60008-14, FA60008-15

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	105% 50-150%
	13C2-PFTeDA	105% 50-150%
	13C3-PFBS	97% 50-150%
	13C3-PFHxS	97% 50-150%
	13C8-PFOS	101% 50-150%
	13C8-FOSA	109% 50-150%
	d3-MeFOSAA	105% 50-150%
	13C2-4:2FTS	93% 50-150%
	13C2-6:2FTS	95% 50-150%
	13C2-8:2FTS	99% 50-150%

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Job Number: FA60008

Account: ARCMIL Arcadis

Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q395-IBLK	2Q25509.D	1	12/24/18	NAF	n/a	n/a	S2Q395

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA60008-2, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.015	0.0038	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	98% 50-150%
	13C5-PFPeA	99% 50-150%
	13C5-PFHxA	102% 50-150%
	13C4-PFHpA	102% 50-150%
	13C8-PFOA	102% 50-150%
	13C9-PFNA	100% 50-150%
	13C6-PFDA	109% 50-150%
	13C7-PFUnDA	105% 50-150%

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Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q395-IBLK	2Q25509.D	1	12/24/18	NAF	n/a	n/a	S2Q395

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15

FA60008-2, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	102% 50-150%
	13C2-PFTeDA	100% 50-150%
	13C3-PFBS	99% 50-150%
	13C3-PFHxS	100% 50-150%
	13C8-PFOS	99% 50-150%
	13C8-FOSA	108% 50-150%
	d3-MeFOSAA	99% 50-150%
	13C2-4:2FTS	93% 50-150%
	13C2-6:2FTS	95% 50-150%
	13C2-8:2FTS	97% 50-150%

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Job Number: FA60008

Account: ARCMIL Arcadis

Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q397-IBLK	2Q25674.D	1	12/27/18	NAF	n/a	n/a	S2Q397

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA60008-13

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.015	0.0038	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	105% 50-150%
	13C5-PFPeA	104% 50-150%
	13C5-PFHxA	107% 50-150%
	13C4-PFHpA	105% 50-150%
	13C8-PFOA	108% 50-150%
	13C9-PFNA	107% 50-150%
	13C6-PFDA	113% 50-150%
	13C7-PFUnDA	114% 50-150%

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Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q397-IBLK	2Q25674.D	1	12/27/18	NAF	n/a	n/a	S2Q397

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15

FA60008-13

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	111% 50-150%
	13C2-PFTeDA	103% 50-150%
	13C3-PFBS	104% 50-150%
	13C3-PFHxS	104% 50-150%
	13C8-PFOS	106% 50-150%
	13C8-FOSA	112% 50-150%
	d3-MeFOSAA	109% 50-150%
	13C2-4:2FTS	99% 50-150%
	13C2-6:2FTS	102% 50-150%
	13C2-8:2FTS	101% 50-150%

Blank Spike Summary

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Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-BS	2Q25387.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.08	0.0692	87	70-130
2706-90-3	Perfluoropentanoic acid	0.08	0.0689	86	70-130
307-24-4	Perfluorohexanoic acid	0.08	0.0609	76	70-130
375-85-9	Perfluoroheptanoic acid	0.08	0.0682	85	71-130
335-67-1	Perfluorooctanoic acid	0.08	0.0661	83	74-130
375-95-1	Perfluorononanoic acid	0.08	0.0571	71* a	76-130
335-76-2	Perfluorodecanoic acid	0.08	0.0601	75	70-130
2058-94-8	Perfluoroundecanoic acid	0.08	0.0653	82	70-130
307-55-1	Perfluorododecanoic acid	0.08	0.0722	90	70-130
72629-94-8	Perfluorotridecanoic acid	0.08	0.0787	98	70-139
376-06-7	Perfluorotetradecanoic acid	0.08	0.0654	82	70-130
375-73-5	Perfluorobutanesulfonic acid	0.0708	0.0593	84	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.0752	0.0630	84	70-130
355-46-4	Perfluorohexanesulfonic acid	0.0728	0.0587	81	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.076	0.0657	86	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.074	0.0669	90	70-130
68259-12-1	Perfluorononanesulfonic acid	0.0768	0.0594	77	70-130
335-77-3	Perfluorodecanesulfonic acid	0.0772	0.0568	74	70-130
754-91-6	PFOSA	0.08	0.0699	87	70-131
2355-31-9	MeFOSAA	0.08	0.0681	85	70-130
2991-50-6	EtFOSAA	0.08	0.0686	86	70-130
757124-72-44:2	Fluorotelomer sulfonate	0.0748	0.0659	88	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.076	0.0682	90	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.0768	0.0658	86	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	114%	30-140%
	13C5-PFPeA	113%	40-140%
	13C5-PFHxA	115%	50-150%
	13C4-PFHpA	113%	50-150%
	13C8-PFOA	126%	50-150%
	13C9-PFNA	114%	50-150%
	13C6-PFDA	106%	50-150%
	13C7-PFUnDA	117%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-BS	2Q25387.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	85%	50-150%
	13C2-PFTeDA	90%	40-150%
	13C3-PFBS	110%	50-150%
	13C3-PFHxS	106%	50-150%
	13C8-PFOS	94%	50-150%
	13C8-FOSA	107%	30-140%
	d3-MeFOSAA	94%	50-150%
	13C2-4:2FTS	114%	50-150%
	13C2-6:2FTS	126%	50-150%
	13C2-8:2FTS	102%	50-150%

(a) Sporadic marginal failure.

* = Outside of Control Limits.

Blank Spike Summary

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Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-BS	2Q25512.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.08	0.0666	83	70-130
2706-90-3	Perfluoropentanoic acid	0.08	0.0665	83	70-130
307-24-4	Perfluorohexanoic acid	0.08	0.0605	76	70-130
375-85-9	Perfluoroheptanoic acid	0.08	0.0659	82	71-130
335-67-1	Perfluorooctanoic acid	0.08	0.0694	87	74-130
375-95-1	Perfluorononanoic acid	0.08	0.0618	77	76-130
335-76-2	Perfluorodecanoic acid	0.08	0.0612	77	70-130
2058-94-8	Perfluoroundecanoic acid	0.08	0.0697	87	70-130
307-55-1	Perfluorododecanoic acid	0.08	0.0650	81	70-130
72629-94-8	Perfluorotridecanoic acid	0.08	0.0724	91	70-139
376-06-7	Perfluorotetradecanoic acid	0.08	0.0662	83	70-130
375-73-5	Perfluorobutanesulfonic acid	0.0708	0.0580	82	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.0752	0.0628	84	70-130
355-46-4	Perfluorohexanesulfonic acid	0.0728	0.0567	78	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.076	0.0642	84	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.074	0.0660	89	70-130
68259-12-1	Perfluorononanesulfonic acid	0.0768	0.0577	75	70-130
335-77-3	Perfluorodecanesulfonic acid	0.0772	0.0520	67* a	70-130
754-91-6	PFOSA	0.08	0.0681	85	70-131
2355-31-9	MeFOSAA	0.08	0.0661	83	70-130
2991-50-6	EtFOSAA	0.08	0.0673	84	70-130
757124-72-44:2	Fluorotelomer sulfonate	0.0748	0.0638	85	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.076	0.0651	86	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.0768	0.0617	80	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	113%	30-140%
	13C5-PFPeA	116%	40-140%
	13C5-PFHxA	118%	50-150%
	13C4-PFHpA	118%	50-150%
	13C8-PFOA	123%	50-150%
	13C9-PFNA	116%	50-150%
	13C6-PFDA	101%	50-150%
	13C7-PFUnDA	99%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-BS	2Q25512.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	91%	50-150%
	13C2-PFTeDA	89%	40-150%
	13C3-PFBS	115%	50-150%
	13C3-PFHxS	111%	50-150%
	13C8-PFOS	96%	50-150%
	13C8-FOSA	108%	30-140%
	d3-MeFOSAA	92%	50-150%
	13C2-4:2FTS	118%	50-150%
	13C2-6:2FTS	121%	50-150%
	13C2-8:2FTS	99%	50-150%

(a) Sporadic marginal failure.

* = Outside of Control Limits.

Blank Spike Summary

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Job Number: FA60008**Account:** ARCMIL Arcadis**Project:** Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-BS	2Q25691.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples:**Method:** EPA 537M BY ID

FA60008-13

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.154	0.134	87	70-130
2706-90-3	Perfluoropentanoic acid	0.154	0.126	82	70-130
307-24-4	Perfluorohexanoic acid	0.154	0.117	76	70-130
375-85-9	Perfluoroheptanoic acid	0.154	0.127	83	71-130
335-67-1	Perfluorooctanoic acid	0.154	0.137	89	74-130
375-95-1	Perfluorononanoic acid	0.154	0.118	77	76-130
335-76-2	Perfluorodecanoic acid	0.154	0.122	79	70-130
2058-94-8	Perfluoroundecanoic acid	0.154	0.131	85	70-130
307-55-1	Perfluorododecanoic acid	0.154	0.140	91	70-130
72629-94-8	Perfluorotridecanoic acid	0.154	0.142	92	70-139
376-06-7	Perfluorotetradecanoic acid	0.154	0.123	80	70-130
375-73-5	Perfluorobutanesulfonic acid	0.136	0.113	83	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.145	0.122	84	70-130
355-46-4	Perfluorohexanesulfonic acid	0.14	0.114	81	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.146	0.126	86	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.142	0.141	99	70-130
68259-12-1	Perfluorononanesulfonic acid	0.148	0.116	79	70-130
335-77-3	Perfluorodecanesulfonic acid	0.148	0.103	69* a	70-130
754-91-6	PFOSA	0.154	0.135	88	70-131
2355-31-9	MeFOSAA	0.154	0.133	86	70-130
2991-50-6	EtFOSAA	0.154	0.136	88	70-130
757124-72-44:2	Fluorotelomer sulfonate	0.144	0.125	87	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.146	0.128	88	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.148	0.122	83	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	94%	30-140%
	13C5-PFPeA	98%	40-140%
	13C5-PFHxA	102%	50-150%
	13C4-PFHpA	102%	50-150%
	13C8-PFOA	100%	50-150%
	13C9-PFNA	104%	50-150%
	13C6-PFDA	102%	50-150%
	13C7-PFUnDA	99%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-BS	2Q25691.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-13

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	88%	50-150%
	13C2-PFTeDA	91%	40-150%
	13C3-PFBS	96%	50-150%
	13C3-PFHxS	98%	50-150%
	13C8-PFOS	95%	50-150%
	13C8-FOSA	80%	30-140%
	d3-MeFOSAA	88%	50-150%
	13C2-4:2FTS	101%	50-150%
	13C2-6:2FTS	101%	50-150%
	13C2-8:2FTS	95%	50-150%

(a) Sporadic marginal failure.

* = Outside of Control Limits.

Matrix Spike Summary

Page 1 of 2

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-MS	2Q25524.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395
FA60008-10	2Q25523.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	FA60008-10 ug/l	Spike Q	ug/l	MS ug/l	MS %	Limits
375-22-4	Perfluorobutanoic acid	0.00549	J	0.08	0.0791	92	70-130
2706-90-3	Perfluoropentanoic acid	ND		0.08	0.0773	97	70-130
307-24-4	Perfluorohexanoic acid	ND		0.08	0.0672	84	70-130
375-85-9	Perfluoroheptanoic acid	ND		0.08	0.0742	93	71-130
335-67-1	Perfluorooctanoic acid	0.00256	J	0.08	0.0767	93	74-130
375-95-1	Perfluorononanoic acid	ND		0.08	0.0662	83	76-130
335-76-2	Perfluorodecanoic acid	ND		0.08	0.0728	91	70-130
2058-94-8	Perfluoroundecanoic acid	ND		0.08	0.0810	101	70-130
307-55-1	Perfluorododecanoic acid	ND		0.08	0.0830	104	70-130
72629-94-8	Perfluorotridecanoic acid	ND		0.08	0.0736	92	70-139
376-06-7	Perfluorotetradecanoic acid	ND		0.08	0.0757	95	70-130
375-73-5	Perfluorobutanesulfonic acid	0.00473		0.0708	0.0677	89	73-130
2706-91-4	Perfluoropentanesulfonic acid	ND		0.0752	0.0739	98	70-130
355-46-4	Perfluorohexanesulfonic acid	ND		0.0728	0.0635	87	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.00114	J	0.076	0.0766	99	74-130
1763-23-1	Perfluorooctanesulfonic acid	ND		0.074	0.0728	98	70-130
68259-12-1	Perfluorononanesulfonic acid	ND		0.0768	0.0564	73	70-130
335-77-3	Perfluorodecanesulfonic acid	ND		0.0772	0.0420	54*	70-130
754-91-6	PFOSA	ND		0.08	0.0797	100	70-131
2355-31-9	MeFOSAA	ND		0.08	0.0772	97	70-130
2991-50-6	EtFOSAA	ND		0.08	0.0796	100	70-130
757124-72-44:2	Fluorotelomer sulfonate	ND		0.0748	0.0700	94	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	ND		0.076	0.0709	93	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	ND		0.0768	0.0692	90	70-130

CAS No.	ID Standard Recoveries	MS	FA60008-10	Limits
	13C4-PFBA	75%	71%	30-140%
	13C5-PFPeA	83%	80%	40-140%
	13C5-PFHxA	94%	91%	50-150%
	13C4-PFHpA	93%	89%	50-150%
	13C8-PFOA	98%	98%	50-150%
	13C9-PFNA	103%	97%	50-150%
	13C6-PFDA	93%	91%	50-150%
	13C7-PFUnDA	82%	86%	50-150%

* = Outside of Control Limits.

Matrix Spike Summary

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-MS	2Q25524.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395
FA60008-10	2Q25523.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	ID Standard Recoveries	MS	FA60008-10	Limits
	13C2-PFDoDA	52%	59%	50-150%
	13C2-PFTeDA	38%* a	56%	40-150%
	13C3-PFBS	89%	86%	50-150%
	13C3-PFHxS	97%	94%	50-150%
	13C8-PFOS	92%	90%	50-150%
	13C8-FOSA	51%	41%	30-140%
	d3-MeFOSAA	74%	74%	50-150%
	13C2-4:2FTS	99%	93%	50-150%
	13C2-6:2FTS	105%	99%	50-150%
	13C2-8:2FTS	120%	97%	50-150%

(a) Outside control limits.

* = Outside of Control Limits.

Matrix Spike Summary

Page 1 of 2

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-MS	2Q25695.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397
JC80150-21 ^a	2Q25694.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-13

CAS No.	Compound	JC80150-21 ug/l	Spike Q	ug/l	MS ug/l	MS %	Limits
375-22-4	Perfluorobutanoic acid	ND		0.16	0.132	83	70-130
2706-90-3	Perfluoropentanoic acid	0.00339 J		0.16	0.129	79	70-130
307-24-4	Perfluorohexanoic acid	0.00585 J		0.16	0.119	71	70-130
375-85-9	Perfluoroheptanoic acid	0.0450		0.16	0.173	80	71-130
335-67-1	Perfluorooctanoic acid	0.0630		0.16	0.194	82	74-130
375-95-1	Perfluorononanoic acid	0.614		0.16	0.723	68* ^b	76-130
335-76-2	Perfluorodecanoic acid	ND		0.16	0.125	78	70-130
2058-94-8	Perfluoroundecanoic acid	ND		0.16	0.130	81	70-130
307-55-1	Perfluorododecanoic acid	ND		0.16	0.134	84	70-130
72629-94-8	Perfluorotridecanoic acid	ND		0.16	0.152	95	70-139
376-06-7	Perfluorotetradecanoic acid	ND		0.16	0.128	80	70-130
375-73-5	Perfluorobutanesulfonic acid	ND		0.142	0.112	79	73-130
2706-91-4	Perfluoropentanesulfonic acid	ND		0.15	0.119	79	70-130
355-46-4	Perfluorohexanesulfonic acid	0.00210 J		0.146	0.112	75	74-130
375-92-8	Perfluoroheptanesulfonic acid	ND		0.152	0.128	84	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.00966 B		0.148	0.134	84	70-130
68259-12-1	Perfluorononanesulfonic acid	ND		0.154	0.116	76	70-130
335-77-3	Perfluorodecanesulfonic acid	ND		0.154	0.0989	64*	70-130
754-91-6	PFOSA	ND		0.16	0.131	82	70-131
2355-31-9	MeFOSAA	ND		0.16	0.133	83	70-130
2991-50-6	EtFOSAA	ND		0.16	0.129	81	70-130
757124-72-44:2	Fluorotelomer sulfonate	ND		0.15	0.123	82	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	ND		0.152	0.127	84	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	ND		0.154	0.121	79	70-130

CAS No.	ID Standard Recoveries	MS	JC80150-21	Limits
	13C4-PFBA	38%		30-140%
	13C5-PFPeA	112%		40-140%
	13C5-PFHxA	120%	107%	50-150%
	13C4-PFHpA	116%	106%	50-150%
	13C8-PFOA	121%	113%	50-150%
	13C9-PFNA	114%	105%	50-150%
	13C6-PFDA	111%	112%	50-150%
	13C7-PFUnDA	113%	103%	50-150%

* = Outside of Control Limits.

Matrix Spike Summary

Page 2 of 2

Job Number: FA60008

Account: ARCMIL Arcadis

Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73191-MS	2Q25695.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397
JC80150-21 ^a	2Q25694.D	1	12/27/18	NAF	12/26/18	OP73191	S2Q397

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-13

CAS No.	ID Standard Recoveries	MS	JC80150-21	Limits
	13C2-PFDoDA	100%	95%	50-150%
	13C2-PFTeDA	97%	90%	40-150%
	13C3-PFBS	112%	100%	50-150%
	13C3-PFHxS	109%	101%	50-150%
	13C8-PFOS	107%	99%	50-150%
	13C8-FOSA	120%		30-140%
	d3-MeFOSAA	102%		50-150%
	13C2-4:2FTS	115%		50-150%
	13C2-6:2FTS	118%		50-150%
	13C2-8:2FTS	109%		50-150%

(a) Insufficient sample for re-extraction.

(b) Outside control limits due to high level in sample relative to spike amount.

* = Outside of Control Limits.

Duplicate Summary

Page 1 of 2

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-DUP	2Q25406.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394
FA60008-14	2Q25405.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394
FA60008-14	2Q25527.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

CAS No.	Compound	FA60008-14 DUP		Q	RPD	Limits
		ug/l	Q ug/l			
375-22-4	Perfluorobutanoic acid	0.0136	0.0143	5	30	
2706-90-3	Perfluoropentanoic acid	0.0182	0.0207	13	30	
307-24-4	Perfluorohexanoic acid	0.0177	0.0185	4	30	
375-85-9	Perfluoroheptanoic acid	0.0161	0.0176	9	30	
335-67-1	Perfluorooctanoic acid	0.0312	0.0341	9	30	
375-95-1	Perfluorononanoic acid	0.00360 aj	0.00437	19	30	
335-76-2	Perfluorodecanoic acid	0.00453	0.00444	2	30	
2058-94-8	Perfluoroundecanoic acid	ND	ND	nc	30	
307-55-1	Perfluorododecanoic acid	ND	ND	nc	30	
72629-94-8	Perfluorotridecanoic acid	ND	ND	nc	30	
376-06-7	Perfluorotetradecanoic acid	ND	ND	nc	30	
375-73-5	Perfluorobutanesulfonic acid	0.00807	0.0128	45*	30	
2706-91-4	Perfluoropentanesulfonic acid	0.00331 J	0.00337 J	2	30	
355-46-4	Perfluorohexanesulfonic acid	0.0220	0.0233	6	30	
375-92-8	Perfluoroheptanesulfonic acid	0.00196 J	0.00199 J	2	30	
1763-23-1	Perfluorooctanesulfonic acid	0.176	0.192	9	30	
68259-12-1	Perfluorononanesulfonic acid	ND	ND	nc	30	
335-77-3	Perfluorodecanesulfonic acid	ND	ND	nc	30	
754-91-6	PFOSA	ND	ND	nc	30	
2355-31-9	MeFOSAA	ND	ND	nc	30	
2991-50-6	EtFOSAA	ND	ND	nc	30	
757124-72-44:2	Fluorotelomer sulfonate	ND	ND	nc	30	
27619-97-2	6:2 Fluorotelomer sulfonate	0.00221 J	0.00233 J	5	30	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	ND	nc	30	

CAS No.	ID Standard Recoveries	DUP	FA60008-14	FA60008-14	Limits
	13C4-PFBA	83%	74%	80%	30-140%
	13C5-PFPeA	86%	77%	84%	40-140%
	13C5-PFHxA	88%	78%	87%	50-150%
	13C4-PFHpA	89%	80%	91%	50-150%
	13C8-PFOA	99%	89%	100%	50-150%
	13C9-PFNA	99%	85%	99%	50-150%
	13C6-PFDA	87%	80%	84%	50-150%
	13C7-PFUnDA	82%	71%	75%	50-150%

* = Outside of Control Limits.

Duplicate Summary

Page 2 of 2

Job Number: FA60008
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP73096-DUP	2Q25406.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394
FA60008-14	2Q25405.D	1	12/21/18	NAF	12/19/18	OP73096	S2Q394
FA60008-14	2Q25527.D	1	12/24/18	NAF	12/19/18	OP73096	S2Q395

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA60008-1, FA60008-2, FA60008-3, FA60008-4, FA60008-5, FA60008-6, FA60008-7, FA60008-8, FA60008-9, FA60008-10, FA60008-11, FA60008-12, FA60008-14, FA60008-15

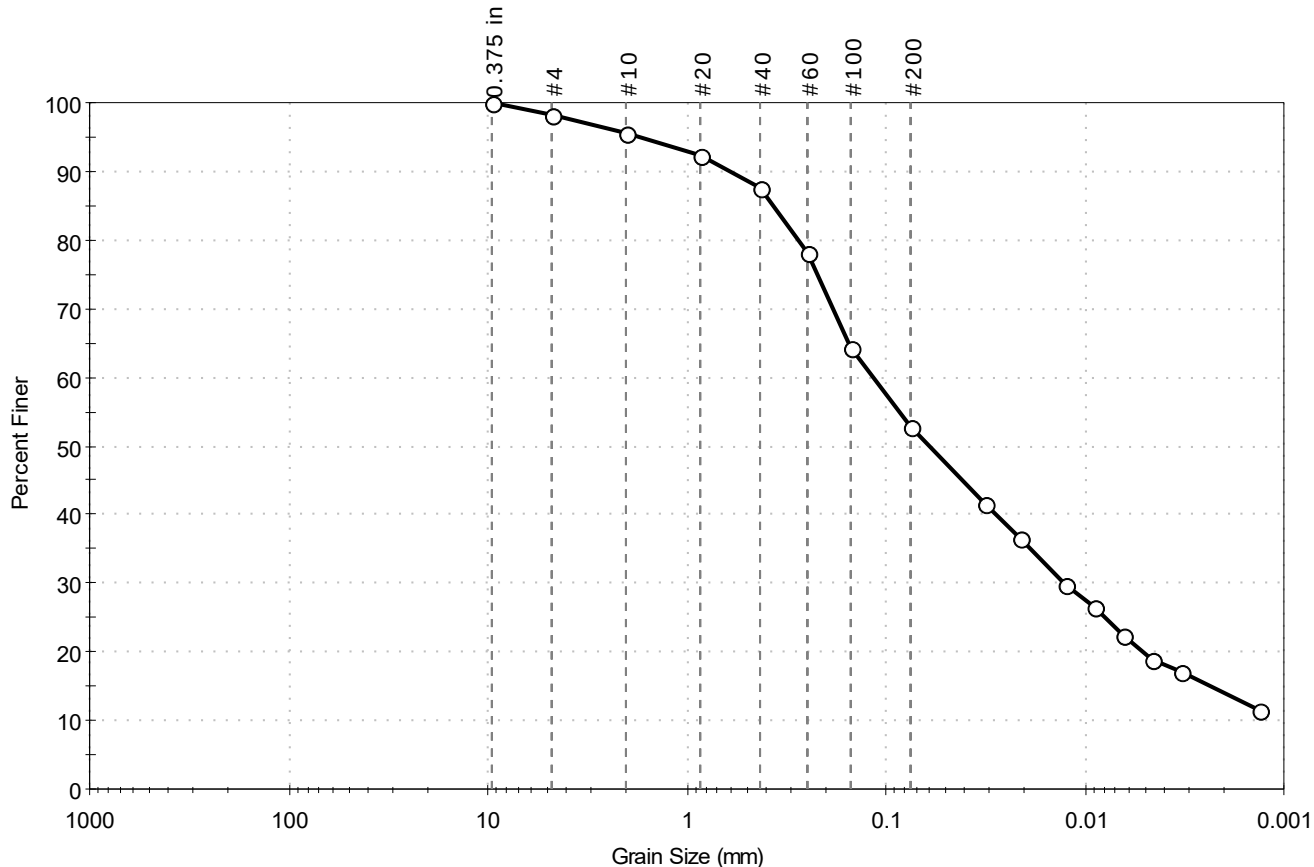
CAS No.	ID Standard Recoveries	DUP	FA60008-14	FA60008-14	Limits
	13C2-PFDoDA	72%	59%	69%	50-150%
	13C2-PFTeDA	79%	66%	71%	40-150%
	13C3-PFBS	83%	73%	81%	50-150%
	13C3-PFHxS	83%	73%	82%	50-150%
	13C8-PFOS	81%	73%	79%	50-150%
	13C8-FOSA	77%	69%	61%	30-140%
	d3-MeFOSAA	79%	67%	74%	50-150%
	13C2-4:2FTS	93%	81%	87%	50-150%
	13C2-6:2FTS	109%	95%	101%	50-150%
	13C2-8:2FTS	90%	79%	83%	50-150%

(a) Result is from Run #2.

* = Outside of Control Limits.

Client: Merit Laboratories, Inc.	Project No: GTX-309371
Project: S98025	
Location:	
Boring ID: ---	Sample Type: bag
Sample ID: 98025.14	Test Date: 01/09/19
Depth: ---	Test Id: 488541
Test Comment: ---	
Visual Description: Moist, dark grayish brown sandy clay	
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.9	45.4	52.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	96		
#20	0.85	92		
#40	0.42	88		
#60	0.25	78		
#100	0.15	64		
#200	0.075	53		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0319	42		
---	0.0211	37		
---	0.0125	30		
---	0.0089	27		
---	0.0065	22		
---	0.0046	19		
---	0.0033	17		
---	0.0013	12		

Coefficients

$D_{85} = 0.3654 \text{ mm}$ $D_{30} = 0.0125 \text{ mm}$
 $D_{60} = 0.1162 \text{ mm}$ $D_{15} = 0.0023 \text{ mm}$
 $D_{50} = 0.0611 \text{ mm}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
 Sand/Gravel Hardness : ---
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #200 Sieve

The results set forth herein are provided by SGS North America Inc.

e-Hardcopy 2.0
Automated Report

Technical Report for

Arcadis

Racer Lansing PFAS Delineation; Lansing, MI

B0064479.2019.03700

SGS Job Number: FA62151

Sampling Dates: 03/04/19 - 03/06/19

Report to:

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Total number of pages in report: **60**



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.



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General Manager

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Certifications: FL(E83510), LA(03051), KS(E-10327), IL(200063), NC(573), NJ(FL002), NY(12022), SC(96038001)
DoD ELAP(ANAB L2229), AZ(AZ0806), CA(2937), TX(T104704404), PA(68-03573), VA(460177),
AK, AR, IA, KY, MA, MS, ND, NH, NV, OK, OR, UT, WA, WV

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Test results relate only to samples analyzed.

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Sample Summary

Arcadis

Job No: FA62151

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064479.2019.03700

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
FA62151-1	03/04/19	10:50 WC	03/08/19	AQ	Ground Water	MW-18-106_030419
FA62151-2	03/04/19	12:15 WC	03/08/19	AQ	Ground Water	MW-18-102_030419
FA62151-3	03/04/19	13:30 WC	03/08/19	AQ	Ground Water	MW-18-104_030419
FA62151-3D	03/04/19	13:30 WC	03/08/19	AQ	Water Dup/MSD	MW-18-104_030419
FA62151-3S	03/04/19	13:30 WC	03/08/19	AQ	Water Matrix Spike	MW-18-104_030419
FA62151-4	03/04/19	15:10 WC	03/08/19	AQ	Ground Water	MW-18-103_030419
FA62151-5	03/04/19	16:05 WC	03/08/19	AQ	Ground Water	MW-18-105_030419
FA62151-6	03/04/19	00:00 WC	03/08/19	AQ	Ground Water	DUP-03_030419
FA62151-7	03/04/19	10:30 WC	03/08/19	AQ	Equipment Blank	EB-01_030419
FA62151-8	03/05/19	10:05 WC	03/08/19	AQ	Ground Water	MW-18-100_030519
FA62151-9	03/05/19	11:30 WC	03/08/19	AQ	Ground Water	MW-18-99_030519
FA62151-10	03/05/19	12:50 WC	03/08/19	AQ	Ground Water	MW-18-98_030519
FA62151-11	03/05/19	13:45 WC	03/08/19	AQ	Ground Water	MW-18-95_030519



Sample Summary
(continued)

Arcadis

Job No: FA62151

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064479.2019.03700

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
FA62151-12	03/05/19	00:00	WC	03/08/19	AQ Ground Water	DUP-02_030519
FA62151-13	03/06/19	09:05	WC	03/08/19	AQ Ground Water	EB-02_030619
FA62151-14	03/06/19	10:05	WC	03/08/19	AQ Ground Water	MW-18-97_030619
FA62151-15	03/06/19	11:40	WC	03/08/19	AQ Ground Water	MW-18-93_030619
FA62151-16	03/06/19	13:10	WC	03/08/19	AQ Ground Water	MW-18-94_030619
FA62151-17	03/06/19	14:40	WC	03/08/19	AQ Ground Water	MW-18-101_030619

Summary of Hits

Page 1 of 4

Job Number: FA62151
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 03/04/19 thru 03/06/19

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

FA62151-1 MW-18-106_030419

Perfluorobutanoic acid	0.0192	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0183	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00652	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00650	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0107	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00246 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00232 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.0164	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0516	0.0038	0.0014	ug/l	EPA 537M BY ID

FA62151-2 MW-18-102_030419

No hits reported in this sample.

FA62151-3 MW-18-104_030419

Perfluorobutanoic acid	0.00785	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00173 J	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00197 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00385	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00185 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.00250 J	0.0038	0.0014	ug/l	EPA 537M BY ID

FA62151-4 MW-18-103_030419

Perfluorobutanesulfonic acid	0.00534	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoropentanesulfonic acid	0.00350 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.0261	0.0038	0.00096	ug/l	EPA 537M BY ID

FA62151-5 MW-18-105_030419

Perfluorobutanoic acid	0.00856	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00182 J	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00217 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00161 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00416	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00444	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00248 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.00328 J	0.0038	0.0014	ug/l	EPA 537M BY ID

FA62151-6 DUP-03_030419

Perfluorobutanoic acid	0.00896	0.0077	0.0019	ug/l	EPA 537M BY ID

Summary of Hits

Job Number: FA62151
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 03/04/19 thru 03/06/19

Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
Perfluoropentanoic acid		0.00184 J	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid		0.00213 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid		0.00168 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid		0.00414	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid		0.00467	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid		0.00244 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid		0.00372 J	0.0038	0.0014	ug/l	EPA 537M BY ID

FA62151-7 EB-01_030419

No hits reported in this sample.

FA62151-8 MW-18-100_030519

Perfluorobutanoic acid	0.00646 J	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00233 J	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00313 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00168 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00232 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00147 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00286 J	0.0038	0.00096	ug/l	EPA 537M BY ID

FA62151-9 MW-18-99_030519

Perfluorobutanoic acid	0.0156	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00361 J	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00353 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00377 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00846	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00185 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.00200 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0742	0.0038	0.0014	ug/l	EPA 537M BY ID

FA62151-10 MW-18-98_030519

Perfluorobutanoic acid ^a	0.0203	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0111	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.0153	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.0123	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0393	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00227 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00415	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.00458	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.132	0.0038	0.0014	ug/l	EPA 537M BY ID

Summary of Hits

Job Number: FA62151
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 03/04/19 thru 03/06/19

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

FA62151-11 MW-18-95_030519

Perfluorobutanoic acid	0.0172	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0166	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00811	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00703	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0166	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00443	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00553	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00284 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00183 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.115	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorodecanesulfonic acid	0.00627	0.0038	0.00096	ug/l	EPA 537M BY ID

FA62151-12 DUP-02_030519

Perfluorobutanoic acid	0.0162	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0138	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00792	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00653	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0150	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00417	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorodecanoic acid	0.00525	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00272 J	0.0038	0.00096	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.100	0.0038	0.0014	ug/l	EPA 537M BY ID
Perfluorodecanesulfonic acid	0.00535	0.0038	0.00096	ug/l	EPA 537M BY ID

FA62151-13 EB-02_030619

No hits reported in this sample.

FA62151-14 MW-18-97_030619

Perfluorobutanoic acid	0.00228 J	0.0077	0.0019	ug/l	EPA 537M BY ID

FA62151-15 MW-18-93_030619

No hits reported in this sample.

FA62151-16 MW-18-94_030619

No hits reported in this sample.

Summary of Hits

Job Number: FA62151
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 03/04/19 thru 03/06/19

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

FA62151-17 MW-18-101_030619

No hits reported in this sample.

(a) Associated ID Standard outside control limits due to matrix interference. Confirmed by re-extraction and reanalysis.

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	MW-18-106_030419	
Lab Sample ID:	FA62151-1	Date Sampled: 03/04/19
Matrix:	AQ - Ground Water	Date Received: 03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27629.D	1	03/15/19 09:35	NAF	03/11/19 10:45	OP74116	S2Q441
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	0.0192	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0183	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	0.00652	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00650	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.0107	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	0.00246	0.0038	0.00096	ug/l	J
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	0.00232	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.0164	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0516	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	
PERFLUOROOCOTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	
PERFLUOROOCOTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected

MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-106_030419**Lab Sample ID:** FA62151-1**Date Sampled:** 03/04/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	65%		30-140%
	13C5-PFPeA	69%		40-140%
	13C5-PFHxA	69%		50-150%
	13C4-PFHpA	71%		50-150%
	13C8-PFOA	76%		50-150%
	13C9-PFNA	82%		50-150%
	13C6-PFDA	86%		50-150%
	13C7-PFUnDA	83%		50-150%
	13C2-PFDoDA	59%		50-150%
	13C2-PFTeDA	40%		40-150%
	13C3-PFBS	69%		50-150%
	13C3-PFHxS	68%		50-150%
	13C8-PFOS	76%		50-150%
	13C8-FOSA	61%		30-140%
	d3-MeFOSAA	72%		50-150%
	13C2-4:2FTS	74%		50-150%
	13C2-6:2FTS	79%		50-150%
	13C2-8:2FTS	89%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-102_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-2	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27604.D	1	03/14/19 12:52	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-102_030419**Lab Sample ID:** FA62151-2**Date Sampled:** 03/04/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	72%		30-140%
	13C5-PFPeA	74%		40-140%
	13C5-PFHxA	74%		50-150%
	13C4-PFHpA	75%		50-150%
	13C8-PFOA	82%		50-150%
	13C9-PFNA	76%		50-150%
	13C6-PFDA	70%		50-150%
	13C7-PFUnDA	68%		50-150%
	13C2-PFDoDA	58%		50-150%
	13C2-PFTeDA	60%		40-150%
	13C3-PFBS	73%		50-150%
	13C3-PFHxS	71%		50-150%
	13C8-PFOS	63%		50-150%
	13C8-FOSA	71%		30-140%
	d3-MeFOSAA	59%		50-150%
	13C2-4:2FTS	73%		50-150%
	13C2-6:2FTS	82%		50-150%
	13C2-8:2FTS	63%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-104_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-3	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27605.D	1	03/14/19 13:08	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00785	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00173	0.0038	0.0014	ug/l	J
307-24-4	Perfluorohexanoic acid	0.00197	0.0038	0.00096	ug/l	J
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.00385	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00185	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00250	0.0038	0.0014	ug/l	J
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected

MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-104_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-3	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	59%		30-140%
	13C5-PFPeA	61%		40-140%
	13C5-PFHxA	63%		50-150%
	13C4-PFHpA	61%		50-150%
	13C8-PFOA	66%		50-150%
	13C9-PFNA	70%		50-150%
	13C6-PFDA	68%		50-150%
	13C7-PFUnDA	67%		50-150%
	13C2-PFDoDA	54%		50-150%
	13C2-PFTeDA	48%		40-150%
	13C3-PFBS	61%		50-150%
	13C3-PFHxS	50%		50-150%
	13C8-PFOS	58%		50-150%
	13C8-FOSA	56%		30-140%
	d3-MeFOSAA	60%		50-150%
	13C2-4:2FTS	64%		50-150%
	13C2-6:2FTS	65%		50-150%
	13C2-8:2FTS	64%		50-150%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-103_030419	
Lab Sample ID:	FA62151-4	Date Sampled: 03/04/19
Matrix:	AQ - Ground Water	Date Received: 03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27608.D	1	03/14/19 13:55	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00534	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	0.00350	0.0038	0.00096	ug/l	J
355-46-4	Perfluorohexanesulfonic acid	0.0261	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-103_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-4	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	77%		30-140%
	13C5-PFPeA	79%		40-140%
	13C5-PFHxA	81%		50-150%
	13C4-PFHpA	81%		50-150%
	13C8-PFOA	92%		50-150%
	13C9-PFNA	85%		50-150%
	13C6-PFDA	79%		50-150%
	13C7-PFUnDA	81%		50-150%
	13C2-PFDoDA	68%		50-150%
	13C2-PFTeDA	69%		40-150%
	13C3-PFBS	77%		50-150%
	13C3-PFHxS	75%		50-150%
	13C8-PFOS	65%		50-150%
	13C8-FOSA	77%		30-140%
	d3-MeFOSAA	69%		50-150%
	13C2-4:2FTS	80%		50-150%
	13C2-6:2FTS	97%		50-150%
	13C2-8:2FTS	75%		50-150%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-105_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-5	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27609.D	1	03/14/19 14:10	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00856	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00182	0.0038	0.0014	ug/l	J
307-24-4	Perfluorohexanoic acid	0.00217	0.0038	0.00096	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00161	0.0038	0.00096	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00416	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00444	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00248	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00328	0.0038	0.0014	ug/l	J
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected

MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-105_030419**Lab Sample ID:** FA62151-5**Date Sampled:** 03/04/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	80%		30-140%
	13C5-PFPeA	82%		40-140%
	13C5-PFHxA	84%		50-150%
	13C4-PFHpA	83%		50-150%
	13C8-PFOA	93%		50-150%
	13C9-PFNA	89%		50-150%
	13C6-PFDA	83%		50-150%
	13C7-PFUnDA	86%		50-150%
	13C2-PFDoDA	74%		50-150%
	13C2-PFTeDA	74%		40-150%
	13C3-PFBS	80%		50-150%
	13C3-PFHxS	74%		50-150%
	13C8-PFOS	70%		50-150%
	13C8-FOSA	80%		30-140%
	d3-MeFOSAA	74%		50-150%
	13C2-4:2FTS	85%		50-150%
	13C2-6:2FTS	97%		50-150%
	13C2-8:2FTS	82%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-03_030419	
Lab Sample ID:	FA62151-6	Date Sampled: 03/04/19
Matrix:	AQ - Ground Water	Date Received: 03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27610.D	1	03/14/19 14:26	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00896	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00184	0.0038	0.0014	ug/l	J
307-24-4	Perfluorohexanoic acid	0.00213	0.0038	0.00096	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00168	0.0038	0.00096	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00414	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00467	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00244	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00372	0.0038	0.0014	ug/l	J
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected

MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-03_030419		
Lab Sample ID:	FA62151-6	Date Sampled:	03/04/19
Matrix:	AQ - Ground Water	Date Received:	03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids:	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	76%		30-140%
	13C5-PFPeA	78%		40-140%
	13C5-PFHxA	80%		50-150%
	13C4-PFHpA	79%		50-150%
	13C8-PFOA	88%		50-150%
	13C9-PFNA	83%		50-150%
	13C6-PFDA	76%		50-150%
	13C7-PFUnDA	75%		50-150%
	13C2-PFDoDA	67%		50-150%
	13C2-PFTeDA	70%		40-150%
	13C3-PFBS	76%		50-150%
	13C3-PFHxS	72%		50-150%
	13C8-PFOS	65%		50-150%
	13C8-FOSA	71%		30-140%
	d3-MeFOSAA	67%		50-150%
	13C2-4:2FTS	81%		50-150%
	13C2-6:2FTS	92%		50-150%
	13C2-8:2FTS	74%		50-150%

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EB-01_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-7	Date Received:	03/08/19
Matrix:	AQ - Equipment Blank	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q1806.D	1	03/12/19 19:31	NAF	03/11/19 10:45	OP74116	S3Q49
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EB-01_030419	Date Sampled:	03/04/19
Lab Sample ID:	FA62151-7	Date Received:	03/08/19
Matrix:	AQ - Equipment Blank	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	94%		30-140%
	13C5-PFPeA	92%		40-140%
	13C5-PFHxA	92%		50-150%
	13C4-PFHpA	93%		50-150%
	13C8-PFOA	98%		50-150%
	13C9-PFNA	99%		50-150%
	13C6-PFDA	98%		50-150%
	13C7-PFUnDA	88%		50-150%
	13C2-PFDoDA	78%		50-150%
	13C2-PFTeDA	77%		40-150%
	13C3-PFBS	92%		50-150%
	13C3-PFHxS	91%		50-150%
	13C8-PFOS	89%		50-150%
	13C8-FOSA	88%		30-140%
	d3-MeFOSAA	87%		50-150%
	13C2-4:2FTS	88%		50-150%
	13C2-6:2FTS	94%		50-150%
	13C2-8:2FTS	93%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-100_030519	Date Sampled:	03/05/19
Lab Sample ID:	FA62151-8	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27611.D	1	03/14/19 14:42	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00646	0.0077	0.0019	ug/l	J
2706-90-3	Perfluoropentanoic acid	0.00233	0.0038	0.0014	ug/l	J
307-24-4	Perfluorohexanoic acid	0.00313	0.0038	0.00096	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00168	0.0038	0.00096	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00232	0.0038	0.00096	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00147	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00286	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-100_030519**Lab Sample ID:** FA62151-8**Date Sampled:** 03/05/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	78%		30-140%
	13C5-PFPeA	78%		40-140%
	13C5-PFHxA	78%		50-150%
	13C4-PFHpA	79%		50-150%
	13C8-PFOA	88%		50-150%
	13C9-PFNA	88%		50-150%
	13C6-PFDA	85%		50-150%
	13C7-PFUnDA	86%		50-150%
	13C2-PFDoDA	73%		50-150%
	13C2-PFTeDA	74%		40-150%
	13C3-PFBS	77%		50-150%
	13C3-PFHxS	72%		50-150%
	13C8-PFOS	75%		50-150%
	13C8-FOSA	73%		30-140%
	d3-MeFOSAA	74%		50-150%
	13C2-4:2FTS	78%		50-150%
	13C2-6:2FTS	92%		50-150%
	13C2-8:2FTS	80%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-99_030519	Date Sampled:	03/05/19
Lab Sample ID:	FA62151-9	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27612.D	1	03/14/19 14:58	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0156	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00361	0.0038	0.0014	ug/l	J
307-24-4	Perfluorohexanoic acid	0.00353	0.0038	0.00096	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00377	0.0038	0.00096	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00846	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00185	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	0.00200	0.0038	0.00096	ug/l	J
1763-23-1	Perfluorooctanesulfonic acid	0.0742	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
 RL = Reporting Limit B = Indicates analyte found in associated method blank
 E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-99_030519	Date Sampled:	03/05/19
Lab Sample ID:	FA62151-9	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	75%		30-140%
	13C5-PFPeA	78%		40-140%
	13C5-PFHxA	78%		50-150%
	13C4-PFHpA	78%		50-150%
	13C8-PFOA	88%		50-150%
	13C9-PFNA	89%		50-150%
	13C6-PFDA	91%		50-150%
	13C7-PFUnDA	92%		50-150%
	13C2-PFDoDA	74%		50-150%
	13C2-PFTeDA	82%		40-150%
	13C3-PFBS	75%		50-150%
	13C3-PFHxS	62%		50-150%
	13C8-PFOS	75%		50-150%
	13C8-FOSA	79%		30-140%
	d3-MeFOSAA	76%		50-150%
	13C2-4:2FTS	80%		50-150%
	13C2-6:2FTS	95%		50-150%
	13C2-8:2FTS	101%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-98_030519	Date Sampled:	03/05/19
Lab Sample ID:	FA62151-10	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27615.D	1	03/14/19 15:45	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2 ^a	2Q27731.D	1	03/19/19 12:22	NAF	03/18/19 11:00	OP74197	S2Q443

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2	250 ml	1.0 ml

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid ^b	0.0203	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0111	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	0.0153	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	0.0123	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.0393	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00227	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00415	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.00458	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.132	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-98_030519**Lab Sample ID:** FA62151-10**Date Sampled:** 03/05/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	10% ^c	14% ^c	30-140%
	13C5-PFPeA	72%	80%	40-140%
	13C5-PFHxA	78%	83%	50-150%
	13C4-PFHpA	77%	82%	50-150%
	13C8-PFOA	86%	93%	50-150%
	13C9-PFNA	93%	87%	50-150%
	13C6-PFDA	94%	85%	50-150%
	13C7-PFUnDA	80%	83%	50-150%
	13C2-PFDoDA	54%	69%	50-150%
	13C2-PFTeDA	48%	65%	40-150%
	13C3-PFBS	75%	79%	50-150%
	13C3-PFHxS	63%	67%	50-150%
	13C8-PFOS	75%	75%	50-150%
	13C8-FOSA	85%	83%	30-140%
	d3-MeFOSAA	78%	74%	50-150%
	13C2-4:2FTS	79%	83%	50-150%
	13C2-6:2FTS	91%	95%	50-150%
	13C2-8:2FTS	109%	93%	50-150%

(a) Confirmation run.

(b) Associated ID Standard outside control limits due to matrix interference. Confirmed by re-extraction and reanalysis.

(c) Outside control limits.

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-95_030519	
Lab Sample ID:	FA62151-11	Date Sampled: 03/05/19
Matrix:	AQ - Ground Water	Date Received: 03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27616.D	1	03/14/19 16:01	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0172	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0166	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	0.00811	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00703	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.0166	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	0.00443	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	0.00553	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00284	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00183	0.0038	0.00096	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.115	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	0.00627	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-95_030519**Lab Sample ID:** FA62151-11**Date Sampled:** 03/05/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	68%		30-140%
	13C5-PFPeA	68%		40-140%
	13C5-PFHxA	65%		50-150%
	13C4-PFHpA	64%		50-150%
	13C8-PFOA	72%		50-150%
	13C9-PFNA	77%		50-150%
	13C6-PFDA	76%		50-150%
	13C7-PFUnDA	85%		50-150%
	13C2-PFDoDA	72%		50-150%
	13C2-PFTeDA	77%		40-150%
	13C3-PFBS	66%		50-150%
	13C3-PFHxS	59%		50-150%
	13C8-PFOS	62%		50-150%
	13C8-FOSA	55%		30-140%
	d3-MeFOSAA	72%		50-150%
	13C2-4:2FTS	75%		50-150%
	13C2-6:2FTS	87%		50-150%
	13C2-8:2FTS	96%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-02_030519	
Lab Sample ID:	FA62151-12	Date Sampled: 03/05/19
Matrix:	AQ - Ground Water	Date Received: 03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27617.D	1	03/14/19 16:16	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0162	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0138	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	0.00792	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00653	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	0.0150	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	0.00417	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	0.00525	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00272	0.0038	0.00096	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.100	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	0.00535	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected

MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-02_030519	Date Sampled:	03/05/19
Lab Sample ID:	FA62151-12	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	59%		30-140%
	13C5-PFPeA	59%		40-140%
	13C5-PFHxA	57%		50-150%
	13C4-PFHpA	56%		50-150%
	13C8-PFOA	61%		50-150%
	13C9-PFNA	68%		50-150%
	13C6-PFDA	68%		50-150%
	13C7-PFUnDA	77%		50-150%
	13C2-PFDoDA	63%		50-150%
	13C2-PFTeDA	64%		40-150%
	13C3-PFBS	58%		50-150%
	13C3-PFHxS	52%		50-150%
	13C8-PFOS	57%		50-150%
	13C8-FOSA	50%		30-140%
	d3-MeFOSAA	66%		50-150%
	13C2-4:2FTS	64%		50-150%
	13C2-6:2FTS	73%		50-150%
	13C2-8:2FTS	84%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EB-02_030619	Date Sampled:	03/06/19
Lab Sample ID:	FA62151-13	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q1807.D	1	03/12/19 19:46	NAF	03/11/19 10:45	OP74116	S3Q49
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EB-02_030619	Date Sampled:	03/06/19
Lab Sample ID:	FA62151-13	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	101%		30-140%
	13C5-PFPeA	99%		40-140%
	13C5-PFHxA	99%		50-150%
	13C4-PFHpA	101%		50-150%
	13C8-PFOA	113%		50-150%
	13C9-PFNA	105%		50-150%
	13C6-PFDA	87%		50-150%
	13C7-PFUnDA	79%		50-150%
	13C2-PFDoDA	76%		50-150%
	13C2-PFTeDA	79%		40-150%
	13C3-PFBS	96%		50-150%
	13C3-PFHxS	95%		50-150%
	13C8-PFOS	78%		50-150%
	13C8-FOSA	95%		30-140%
	d3-MeFOSAA	81%		50-150%
	13C2-4:2FTS	94%		50-150%
	13C2-6:2FTS	110%		50-150%
	13C2-8:2FTS	84%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-97_030619	Date Sampled:	03/06/19
Lab Sample ID:	FA62151-14	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27631.D	1	03/15/19 10:06	NAF	03/11/19 10:45	OP74116	S2Q441
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00228	0.0077	0.0019	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-97_030619**Lab Sample ID:** FA62151-14**Date Sampled:** 03/06/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	64%		30-140%
	13C5-PFPeA	64%		40-140%
	13C5-PFHxA	65%		50-150%
	13C4-PFHpA	66%		50-150%
	13C8-PFOA	73%		50-150%
	13C9-PFNA	65%		50-150%
	13C6-PFDA	59%		50-150%
	13C7-PFUnDA	60%		50-150%
	13C2-PFDoDA	50%		50-150%
	13C2-PFTeDA	50%		40-150%
	13C3-PFBS	63%		50-150%
	13C3-PFHxS	62%		50-150%
	13C8-PFOS	54%		50-150%
	13C8-FOSA	61%		30-140%
	d3-MeFOSAA	50%		50-150%
	13C2-4:2FTS	65%		50-150%
	13C2-6:2FTS	73%		50-150%
	13C2-8:2FTS	56%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-93_030619	Date Sampled:	03/06/19
Lab Sample ID:	FA62151-15	Date Received:	03/08/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27619.D	1	03/14/19 16:48	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-93_030619**Lab Sample ID:** FA62151-15**Date Sampled:** 03/06/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	81%		30-140%
	13C5-PFPeA	88%		40-140%
	13C5-PFHxA	87%		50-150%
	13C4-PFHpA	86%		50-150%
	13C8-PFOA	85%		50-150%
	13C9-PFNA	96%		50-150%
	13C6-PFDA	94%		50-150%
	13C7-PFUnDA	90%		50-150%
	13C2-PFDoDA	72%		50-150%
	13C2-PFTeDA	77%		40-150%
	13C3-PFBS	82%		50-150%
	13C3-PFHxS	69%		50-150%
	13C8-PFOS	82%		50-150%
	13C8-FOSA	90%		30-140%
	d3-MeFOSAA	79%		50-150%
	13C2-4:2FTS	91%		50-150%
	13C2-6:2FTS	91%		50-150%
	13C2-8:2FTS	90%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-94_030619		
Lab Sample ID:	FA62151-16	Date Sampled:	03/06/19
Matrix:	AQ - Ground Water	Date Received:	03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids:	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27620.D	1	03/14/19 17:04	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-94_030619**Lab Sample ID:** FA62151-16**Date Sampled:** 03/06/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	68%		30-140%
	13C5-PFPeA	69%		40-140%
	13C5-PFHxA	72%		50-150%
	13C4-PFHpA	72%		50-150%
	13C8-PFOA	80%		50-150%
	13C9-PFNA	80%		50-150%
	13C6-PFDA	77%		50-150%
	13C7-PFUnDA	78%		50-150%
	13C2-PFDoDA	63%		50-150%
	13C2-PFTeDA	62%		40-150%
	13C3-PFBS	68%		50-150%
	13C3-PFHxS	59%		50-150%
	13C8-PFOS	70%		50-150%
	13C8-FOSA	75%		30-140%
	d3-MeFOSAA	68%		50-150%
	13C2-4:2FTS	73%		50-150%
	13C2-6:2FTS	82%		50-150%
	13C2-8:2FTS	73%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-101_030619	
Lab Sample ID:	FA62151-17	Date Sampled: 03/06/19
Matrix:	AQ - Ground Water	Date Received: 03/08/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q27621.D	1	03/14/19 17:19	NAF	03/11/19 10:45	OP74116	S2Q440
Run #2							

	Initial Volume	Final Volume
Run #1	260 ml	1.0 ml
Run #2		

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0077	0.0019	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0038	0.0014	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0038	0.00096	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0038	0.00096	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0038	0.00096	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0038	0.00096	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0038	0.00096	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0038	0.00096	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0038	0.0014	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0038	0.00096	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0038	0.00096	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0038	0.00096	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0038	0.00096	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0038	0.00096	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0038	0.0014	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0038	0.00096	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0038	0.00096	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.019	0.0038	ug/l	
2991-50-6	EtFOSAA	ND	0.019	0.0038	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

ND = Not detected MDL = Method Detection Limit

J = Indicates an estimated value

RL = Reporting Limit

B = Indicates analyte found in associated method blank

E = Indicates value exceeds calibration range

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-101_030619**Lab Sample ID:** FA62151-17**Date Sampled:** 03/06/19**Matrix:** AQ - Ground Water**Date Received:** 03/08/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

PFAS List

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0077	0.0019	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	72%		30-140%
	13C5-PFPeA	73%		40-140%
	13C5-PFHxA	75%		50-150%
	13C4-PFHpA	76%		50-150%
	13C8-PFOA	82%		50-150%
	13C9-PFNA	86%		50-150%
	13C6-PFDA	84%		50-150%
	13C7-PFUnDA	85%		50-150%
	13C2-PFDoDA	66%		50-150%
	13C2-PFTeDA	61%		40-150%
	13C3-PFBS	72%		50-150%
	13C3-PFHxS	70%		50-150%
	13C8-PFOS	71%		50-150%
	13C8-FOSA	78%		30-140%
	d3-MeFOSAA	74%		50-150%
	13C2-4:2FTS	77%		50-150%
	13C2-6:2FTS	87%		50-150%
	13C2-8:2FTS	94%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound



Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody



SGS North America Inc - Orlando
Chain of Custody

4405 Vineland Road, Suite C-15 Orlando, FL 32811
TEL: 407-425-6700 FAX: 407-425-0707
www.sgs.com

SGS - ORLANDO JOB #:

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FA62151

Client / Reporting Information			Project Information			Analytical Information										Matrix Codes
Company Name: ARCADIS			Project Name: RACER LANSING													DW - Drinking Water
Address: 28550 CADET DR. STE 500			Street													GW - Ground Water
City: NOVI State: MI Zip: 48377			City: LANSING State: MI													WW - Water
Project Contact: PAN SICHANO Email: PANIC.SICHANO@ARCADIS.COM			Project # 6064474-2019-03700													SW - Surface Water
Phone #: 248-994-2240			Fax # 248-994-2241													SO - Soil
Sampler(s) Name(s) (Printed)			Client Purchase Order #													SL - Sludge
Sampler 1: Bill C. S. S. Sampler 2:																OI - Oil
			COLLECTION			CONTAINER INFORMATION										LIQ - Other Liquid
SGS Orlando Sample #	Field ID / Point of Collection	DATE	TIME	SAMPLED BY:	MATRIX	TOTAL # OF BOTTLES	OTHER	NONE	IC	NH3	HNOS	AS04	NAOH-ZNA	DI WATER	MECH	LAB USE ONLY
1	MW-18-106-030419	3/4/19	10:50	BJC	GW	2			X							
2	MW-18-102-030419	3/4/19	12:15	BJC	GW	2			X							
3	MW-18-104-030419	3/4/19	13:30	BJC	GW	6			X							
4	MW-18-103-030419	3/4/19	15:10	BJC	GW	2			X							
5	MW-18-105-030419	3/4/19	16:05	BJC	GW	2			X							
6	DUP-03-030419	3/4/19	—	BJC	GW	2			X							
7	ED-01-030419	3/4/19	16:30	BJC	GW	2			X							
8	MW-18-100-030519	3/5/19	10:05	BJC	GW	2			X							
9	MW-18-99-030519	3/5/19	11:30	BJC	GW	2			X							
10	MW-18-98-030519	3/5/19	12:50	BJC	GW	2			X							
11	MW-18-95-030519	3/5/19	13:45	BJC	GW	2			X							
12	DUP-02-030519	3/5/19	—	BJC	GW	2			X							
Turnaround Time (Business days)			Data Deliverable Information										Comments / Remarks			
10 Day (Business) Approved By / Date:			☐ COMMERCIAL "A" (RESULTS ONLY)										MW-18-104 = MSMSO			
7 Day			☐ COMMERCIAL "B" (RESULTS PLUS QC)													
5 Day			☐ REDT1 (EPA LEVEL 3)													
3 Day RUSH			☐ FULLT1 (EPA LEVEL 4)													
2 Day RUSH			☐ EDO'S													
1 Day RUSH																
Other																
Rush T/A Data Available VIA Email or Lablink			Sample Custody must be documented below each time samples change possession, including courier delivery.													
Relinquished by Sampler/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation		
1 ARCADIS	3/4/19 15:40	2 FF	3 FF		4 FF	5 FF		6 FF	7 FF		8 FF	9 FF		10 FF		
Relinquished by/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation		
5		6	7		8	9		10	11		12	13		14		
Lab Use Only: Cooler Temperature (s) Celsius (corrected): 3.4														http://www.sgs.com/en/terms-and-conditions		

ORLD-SMT-0001-03-FORM-COC (4).xls Rev 031318

FA62151: Chain of Custody

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SGS North America Inc - Orlando

Chain of Custody

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TEL: 407-425-6700 FAX: 407-425-0707
www.sgs.com

SGS - ORLANDO JOB #:

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FA62151

Client / Reporting Information		Project Information		Analytical Information		Matrix Codes											
Company Name: ARCADIS		Project Name: RACON LANSING				DW - Drinking Water GW - Ground Water WW - Wastewater SW - Surface Water SO - Soil SL - Sludge LO - Other Liquid AO - Air SOL - Other Solid											
Address: 28550 CABOT DR. STE 500		Street															
City: NOVI State: MI Zip: 48377		City: LANSING State: MI															
Project Contact: DAN STUCHINO Email: DANIEL.STUCHINO@ARCADIS		Project # 60064479-2019-03700															
Phone #: 248-994-2240		Fax #: 248-994-2241															
Sampler(s) Name(s) (Printed)		Client Purchase Order #															
Sampler 1: BILL C. GAN Sampler 2:																	
SGS Orlando Sample #	Field ID / Point of Collection	DATE	TIME	SAMPLED BY:	MATRIX	TOTAL # OF BOTTLES	OTHER	NONE	HCI	NOH	HAUS	EBSD4	NOH+ZINC	DI WATER	MECH	LAB USE ONLY	
12	EB-02-030619	3/6/19	9:05	BSC	MW	2		X									
13	MW-18-97-030619	3/6/19	10:05	BSC	GW	2		X									
15	MW-18-93-030619	3/6/19	11:40	BSC	GW	2		X									
16	MW-18-94-030619	3/6/19	13:10	BSC	GW	2		X									
17	MW-18-101-030619	3/6/19	14:40	BSC	GW	2		X									
Turnaround Time (Business days)		Data Deliverable Information		Comments / Remarks													
10 Day (Business)		Approved By: / Date:		☐ COMMERCIAL "A" (RESULTS ONLY)													
7 Day				☐ COMMERCIAL "B" (RESULTS PLUS QC)													
5 Day				☐ REDT1 (EPA LEVEL 3)													
3 Day RUSH				☐ FULLT1 (EPA LEVEL 4)													
2 Day RUSH				☐ EDD'S													
1 Day RUSH																	
Other																	
Rush T/A Data Available VIA Email or LabLink																	
Relinquished by Sampler/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:
ARCADIS	3-7-19 15:10	EH	2	EH	3	EH	4	EH	5	EH	6	EH	7	EH	8	EH	9
Relinquished by/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:	Received By/Affiliation	Date Time:	Relinquished By/Affiliation	Date Time:
Lab Use Only : Cooler Temperature (s) Celsius (corrected):																	

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<http://www.sgs.com/en/terms-and-conditions>

FA62151: Chain of Custody

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SGS Sample Receipt Summary

Job Number: FA62151

Client: ARCADIS

Project: RACER LANSING

Date / Time Received: 3/8/2019 9:30:00 AM

Delivery Method: FED EX

Airbill #'s: N/A

Therm ID: IR 1;

Therm CF: -0.2;

of Coolers: 1

Cooler Temps (Raw Measured) °C: Cooler 1: (3.6);

Cooler Temps (Corrected) °C: Cooler 1: (3.4);

Cooler Information

Y or N

1. Custody Seals Present	☒	☐
2. Custody Seals Intact	☒	☐
3. Temp criteria achieved	☒	☐
4. Cooler temp verification	<u>IR Gun</u>	
5. Cooler media	<u>Ice (Bag)</u>	

Trip Blank Information

Y or N N/A

1. Trip Blank present / cooler	☐	☐	☒
2. Trip Blank listed on COC	☐	☐	☒
	<u>W or S</u>	<u>N/A</u>	
3. Type Of TB Received	☐	☐	☒

Sample Information

Y or N N/A

1. Sample labels present on bottles	☒	☐	
2. Samples preserved properly	☒	☐	
3. Sufficient volume/containers recvd for analysis:	☒	☐	
4. Condition of sample	<u>Intact</u>		
5. Sample recvd within HT	☒	☐	
6. Dates/Times/IDs on COC match Sample Label	☒	☐	
7. VOCs have headspace	☐	☐	☒
8. Bottles received for unspecified tests	☐	☒	
9. Compositing instructions clear	☐	☐	☒
10. Voa Soil Kits/Jars received past 48hrs?	☐	☐	☒
11. % Solids Jar received?	☐	☐	☒
12. Residual Chlorine Present?	☐	☐	☒

Misc. Information

Number of Encores: 25-Gram _____ 5-Gram _____
 Test Strip Lot #s: pH 0-3 230315
 Residual Chlorine Test Strip Lot #: _____

Number of 5035 Field Kits: _____
 pH 10-12 219813A

Number of Lab Filtered Metals: _____
 Other: (Specify) _____

Comments

SM001
Rev. Date 05/24/17

Technician: SHAYLAP

Date: 3/8/2019 9:30:00 AM

Reviewer: SP

Date: 3/8/2019

FA62151: Chain of Custody

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MS Semi-volatiles

5

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

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Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP74116-MB	3Q1802.D	1	03/12/19	NAF	03/11/19	OP74116	S3Q49

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA62151-1, FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-7, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-13, FA62151-14, FA62151-15, FA62151-16, FA62151-17

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	94% 30-140%
	13C5-PFPeA	92% 40-140%
	13C5-PFHxA	93% 50-150%
	13C4-PFHpA	93% 50-150%
	13C8-PFOA	100% 50-150%
	13C9-PFNA	100% 50-150%
	13C6-PFDA	98% 50-150%
	13C7-PFUnDA	85% 50-150%

Method Blank Summary

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP74116-MB	3Q1802.D	1	03/12/19	NAF	03/11/19	OP74116	S3Q49

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA62151-1, FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-7, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-13, FA62151-14, FA62151-15, FA62151-16, FA62151-17

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	77% 50-150%
	13C2-PFTeDA	77% 40-150%
	13C3-PFBS	93% 50-150%
	13C3-PFHxS	92% 50-150%
	13C8-PFOS	91% 50-150%
	13C8-FOSA	91% 30-140%
	d3-MeFOSAA	87% 50-150%
	13C2-4:2FTS	88% 50-150%
	13C2-6:2FTS	96% 50-150%
	13C2-8:2FTS	90% 50-150%

Instrument Blank

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Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q49-IBLK	3Q1778.D	1	03/12/19	NAF	n/a	n/a	S3Q49

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA62151-7, FA62151-13

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.016	0.0040	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0080	0.0030	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0080	0.0020	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0080	0.0020	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0080	0.0020	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0080	0.0020	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0080	0.0020	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0080	0.0020	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0080	0.0030	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0080	0.0020	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0080	0.0020	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0080	0.0020	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0080	0.0020	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0080	0.0020	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0080	0.0020	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0080	0.0030	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0080	0.0020	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0080	0.0020	ug/l	
754-91-6	PFOSA	ND	0.0080	0.0020	ug/l	
2355-31-9	MeFOSAA	ND	0.040	0.0080	ug/l	
2991-50-6	EtFOSAA	ND	0.040	0.0080	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	96% 50-150%
	13C5-PFPeA	97% 50-150%
	13C5-PFHxA	96% 50-150%
	13C4-PFHpA	97% 50-150%
	13C8-PFOA	99% 50-150%
	13C9-PFNA	101% 50-150%
	13C6-PFDA	104% 50-150%
	13C7-PFUnDA	102% 50-150%

Instrument Blank

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q49-IBLK	3Q1778.D	1	03/12/19	NAF	n/a	n/a	S3Q49

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15
FA62151-7, FA62151-13

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	100% 50-150%
	13C2-PFTeDA	85% 50-150%
	13C3-PFBS	97% 50-150%
	13C3-PFHxS	98% 50-150%
	13C8-PFOS	98% 50-150%
	13C8-FOSA	102% 50-150%
	d3-MeFOSAA	99% 50-150%
	13C2-4:2FTS	90% 50-150%
	13C2-6:2FTS	93% 50-150%
	13C2-8:2FTS	96% 50-150%

Instrument Blank

Page 1 of 2

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q440-IBLK	2Q27600.D	1	03/14/19	NAF	n/a	n/a	S2Q440

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-15, FA62151-16, FA62151-17

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	0.00398	0.0080	0.0020	ug/l	J
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits	
	13C4-PFBA	67%	50-150%
	13C5-PFPeA	67%	50-150%
	13C5-PFHxA	66%	50-150%
	13C4-PFHpA	66%	50-150%
	13C8-PFOA	65%	50-150%
	13C9-PFNA	70%	50-150%
	13C6-PFDA	73%	50-150%
	13C7-PFUnDA	69%	50-150%

Instrument Blank

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q440-IBLK	2Q27600.D	1	03/14/19	NAF	n/a	n/a	S2Q440

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15

FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-15, FA62151-16, FA62151-17

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	64% 50-150%
	13C2-PFTeDA	55% 50-150%
	13C3-PFBS	67% 50-150%
	13C3-PFHxS	65% 50-150%
	13C8-PFOS	67% 50-150%
	13C8-FOSA	67% 50-150%
	d3-MeFOSAA	66% 50-150%
	13C2-4:2FTS	64% 50-150%
	13C2-6:2FTS	65% 50-150%
	13C2-8:2FTS	68% 50-150%

Instrument Blank

Page 1 of 2

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q441-IBLK	2Q27626.D	1	03/15/19	NAF	n/a	n/a	S2Q441

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA62151-1, FA62151-14

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	78% 50-150%
	13C5-PFPeA	79% 50-150%
	13C5-PFHxA	78% 50-150%
	13C4-PFHpA	79% 50-150%
	13C8-PFOA	78% 50-150%
	13C9-PFNA	83% 50-150%
	13C6-PFDA	85% 50-150%
	13C7-PFUnDA	80% 50-150%

Instrument Blank

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q441-IBLK	2Q27626.D	1	03/15/19	NAF	n/a	n/a	S2Q441

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15

FA62151-1, FA62151-14

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	73% 50-150%
	13C2-PFTeDA	66% 50-150%
	13C3-PFBS	81% 50-150%
	13C3-PFHxS	80% 50-150%
	13C8-PFOS	85% 50-150%
	13C8-FOSA	87% 50-150%
	d3-MeFOSAA	81% 50-150%
	13C2-4:2FTS	73% 50-150%
	13C2-6:2FTS	74% 50-150%
	13C2-8:2FTS	75% 50-150%

Blank Spike Summary

Page 1 of 2

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP74116-BS	3Q1801.D	1	03/12/19	NAF	03/11/19	OP74116	S3Q49

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA62151-1, FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-7, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-13, FA62151-14, FA62151-15, FA62151-16, FA62151-17

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.08	0.0771	96	70-130
2706-90-3	Perfluoropentanoic acid	0.08	0.0769	96	70-130
307-24-4	Perfluorohexanoic acid	0.08	0.0767	96	70-130
375-85-9	Perfluoroheptanoic acid	0.08	0.0782	98	71-130
335-67-1	Perfluorooctanoic acid	0.08	0.0786	98	74-130
375-95-1	Perfluorononanoic acid	0.08	0.0771	96	76-130
335-76-2	Perfluorodecanoic acid	0.08	0.0788	99	70-130
2058-94-8	Perfluoroundecanoic acid	0.08	0.0787	98	70-130
307-55-1	Perfluorododecanoic acid	0.08	0.0774	97	70-130
72629-94-8	Perfluorotridecanoic acid	0.08	0.0773	97	70-139
376-06-7	Perfluorotetradecanoic acid	0.08	0.0790	99	70-130
375-73-5	Perfluorobutanesulfonic acid	0.08	0.0772	97	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.08	0.0758	95	70-130
355-46-4	Perfluorohexanesulfonic acid	0.08	0.0784	98	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.08	0.0810	101	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.08	0.0737	92	70-130
68259-12-1	Perfluorononanesulfonic acid	0.08	0.0692	87	70-130
335-77-3	Perfluorodecanesulfonic acid	0.08	0.0596	75	70-130
754-91-6	PFOSA	0.08	0.0796	100	70-131
2355-31-9	MeFOSAA	0.08	0.0820	103	70-130
2991-50-6	EtFOSAA	0.08	0.0761	95	70-130
757124-72-44:2	Fluorotelomer sulfonate	0.08	0.0806	101	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.08	0.0817	102	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.08	0.0825	103	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	87%	30-140%
	13C5-PFPeA	86%	40-140%
	13C5-PFHxA	87%	50-150%
	13C4-PFHpA	87%	50-150%
	13C8-PFOA	91%	50-150%
	13C9-PFNA	93%	50-150%
	13C6-PFDA	89%	50-150%
	13C7-PFUnDA	83%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Page 2 of 2

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP74116-BS	3Q1801.D	1	03/12/19	NAF	03/11/19	OP74116	S3Q49

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA62151-1, FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-7, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-13, FA62151-14, FA62151-15, FA62151-16, FA62151-17

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	78%	50-150%
	13C2-PFTeDA	77%	40-150%
	13C3-PFBS	86%	50-150%
	13C3-PFHxS	86%	50-150%
	13C8-PFOS	86%	50-150%
	13C8-FOSA	79%	30-140%
	d3-MeFOSAA	82%	50-150%
	13C2-4:2FTS	87%	50-150%
	13C2-6:2FTS	93%	50-150%
	13C2-8:2FTS	91%	50-150%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 1 of 2

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP74116-MS	2Q27606.D	1	03/14/19	NAF	03/11/19	OP74116	S2Q440
OP74116-MSD	2Q27607.D	1	03/14/19	NAF	03/11/19	OP74116	S2Q440
FA62151-3	2Q27605.D	1	03/14/19	NAF	03/11/19	OP74116	S2Q440

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA62151-1, FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-7, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-13, FA62151-14, FA62151-15, FA62151-16, FA62151-17

CAS No.	Compound	FA62151-3 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
375-22-4	Perfluorobutanoic acid	0.00785		0.0769	98	0.0769	0.0770	90	8	70-130/30
2706-90-3	Perfluoropentanoic acid	0.00173 J		0.0769	96	0.0769	0.0699	89	7	70-130/30
307-24-4	Perfluorohexanoic acid	0.00197 J		0.0769	95	0.0769	0.0695	88	8	70-130/30
375-85-9	Perfluoroheptanoic acid	ND		0.0769	98	0.0769	0.0694	90	8	71-130/30
335-67-1	Perfluorooctanoic acid	0.00385		0.0769	99	0.0769	0.0738	91	8	74-130/30
375-95-1	Perfluorononanoic acid	ND		0.0769	96	0.0769	0.0674	88	9	76-130/30
335-76-2	Perfluorodecanoic acid	ND		0.0769	95	0.0769	0.0679	88	8	70-130/30
2058-94-8	Perfluoroundecanoic acid	ND		0.0769	98	0.0769	0.0716	93	5	70-130/30
307-55-1	Perfluorododecanoic acid	ND		0.0769	96	0.0769	0.0690	90	7	70-130/30
72629-94-8	Perfluorotridecanoic acid	ND		0.0769	106	0.0769	0.0780	101	5	70-139/30
376-06-7	Perfluorotetradecanoic acid	ND		0.0769	102	0.0769	0.0729	95	7	70-130/30
375-73-5	Perfluorobutanesulfonic acid	0.00185 J		0.0769	96	0.0769	0.0704	89	7	73-130/30
2706-91-4	Perfluoropentanesulfonic acid	ND		0.0769	95	0.0769	0.0670	87	9	70-130/30
355-46-4	Perfluorohexanesulfonic acid	ND		0.0769	100	0.0769	0.0706	92	9	74-130/30
375-92-8	Perfluoroheptanesulfonic acid	ND		0.0769	125	0.0769	0.0874	114	9	74-130/30
1763-23-1	Perfluorooctanesulfonic acid	0.00250 J		0.0769	100	0.0769	0.0729	92	8	70-130/30
68259-12-1	Perfluorononanesulfonic acid	ND		0.0769	83	0.0769	0.0616	80	4	70-130/30
335-77-3	Perfluorodecanesulfonic acid	ND		0.0769	75	0.0769	0.0572	74	1	70-130/30
754-91-6	PFOSA	ND		0.0769	102	0.0769	0.0725	94	8	70-131/30
2355-31-9	MeFOSAA	ND		0.0769	98	0.0769	0.0733	95	2	70-130/30
2991-50-6	EtFOSAA	ND		0.0769	97	0.0769	0.0704	92	6	70-130/30
757124-72-44:2	Fluorotelomer sulfonate	ND		0.0769	100	0.0769	0.0695	90	10	70-130/30
27619-97-2	6:2 Fluorotelomer sulfonate	ND		0.0769	100	0.0769	0.0714	93	7	70-133/30
39108-34-4	8:2 Fluorotelomer sulfonate	ND		0.0769	97	0.0769	0.0695	90	7	70-130/30

CAS No.	ID Standard Recoveries	MS	MSD	FA62151-3	Limits
	13C4-PFBA	62%	76%	59%	30-140%
	13C5-PFPeA	65%	80%	61%	40-140%
	13C5-PFHxA	65%	81%	63%	50-150%
	13C4-PFHpA	65%	81%	61%	50-150%
	13C8-PFOA	68%	85%	66%	50-150%
	13C9-PFNA	74%	91%	70%	50-150%
	13C6-PFDA	74%	91%	68%	50-150%
	13C7-PFUnDA	71%	89%	67%	50-150%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 2 of 2

Job Number: FA62151
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP74116-MS	2Q27606.D	1	03/14/19	NAF	03/11/19	OP74116	S2Q440
OP74116-MSD	2Q27607.D	1	03/14/19	NAF	03/11/19	OP74116	S2Q440
FA62151-3	2Q27605.D	1	03/14/19	NAF	03/11/19	OP74116	S2Q440

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA62151-1, FA62151-2, FA62151-3, FA62151-4, FA62151-5, FA62151-6, FA62151-7, FA62151-8, FA62151-9, FA62151-10, FA62151-11, FA62151-12, FA62151-13, FA62151-14, FA62151-15, FA62151-16, FA62151-17

CAS No.	ID Standard Recoveries	MS	MSD	FA62151-3	Limits
13C2-PFDoDA		59%	75%	54%	50-150%
13C2-PFTeDA		50%	62%	48%	40-150%
13C3-PFBS		64%	79%	61%	50-150%
13C3-PFHxS		51%	64%	50%	50-150%
13C8-PFOS		65%	81%	58%	50-150%
13C8-FOSA		63%	69%	56%	30-140%
d3-MeFOSAA		65%	79%	60%	50-150%
13C2-4:2FTS		69%	88%	64%	50-150%
13C2-6:2FTS		71%	88%	65%	50-150%
13C2-8:2FTS		75%	92%	64%	50-150%

* = Outside of Control Limits.



Quality Control Report

Report ID: QC-S98025-01
Generated on 01/17/2019

Report to

Attention: Christine Gregg
Arcadis
28550 Cabot Drive
Suite 500
Novi, MI 48377

Phone: 734-585-7817 FAX: 248-994-2241

Report Produced by

Merit Laboratories
2680 East Lansing Drive
East Lansing, MI 48823

Phone: (517) 332-0167 FAX: (517) 332-6333

Report Summary

Lab Sample ID(s): S98025.01-S98025.12
Project: B0064479.2018.03100
Submitted Date/Time: 12/20/2018 14:05
Sampled by: Kristen VanDenBerge
P.O. #: B0064479.2018.03100

QC Report Sections

Cover Page (Page 1)
Analysis Summary (Pages 2-13)
Prep Batch Summary (Page 14)
Batch QC Results (Pages 15-16)

Report Flag Descriptions

*: QC result is outside of indicated control limits
W: Surrogate result not applicable due to sample dilution

I certify that this data package is in compliance with the terms and conditions of the program, and project, and contractual requirements both technically and for completeness. Release of the data contained in this hardcopy data package and its computer-readable data submitted has been authorized by the Quality Assurance Manager and his/her designee, as verified by the following signature.

Barbara Ball
Quality Assurance Manager

QC Report - Analysis Summary

Lab Sample ID: S98025.01

Sample Tag: MW-18-93(9.5-10)_12042018

Collected Date/Time: 12/04/2018 12:45

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 14:20	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.02

Sample Tag: MW-18-94(10.5-11)_12042018

Collected Date/Time: 12/04/2018 17:10

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 14:40	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.03

Sample Tag: MW-18-93(54-54.5)_12062018

Collected Date/Time: 12/06/2018 14:05

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 14:50	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.04

Sample Tag: MW-18-94(54.5-55)_12102018

Collected Date/Time: 12/10/2018 14:45

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 15:00	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.05

Sample Tag: MW-18-97(9.2-9.6)_12122018

Collected Date/Time: 12/12/2018 15:30

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 15:10	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.06

Sample Tag: MW-18-97(12.5-13)_12122018

Collected Date/Time: 12/12/2018 15:50

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 15:20	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.07

Sample Tag: MW-18-99(11-12)_12132018

Collected Date/Time: 12/13/2018 12:50

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 15:30	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.08

Sample Tag: MW-18-100(10-11)_12132018

Collected Date/Time: 12/13/2018 14:40

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 15:40	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.09

Sample Tag: MW-18-101(22-22.5)_12142018

Collected Date/Time: 12/14/2018 12:00

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 15:50	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.10

Sample Tag: MW-18-102(14.5-15)_12172018

Collected Date/Time: 12/17/2018 14:45

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 16:00	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.11

Sample Tag: MW-18-102(12.5-13)_12172018

Collected Date/Time: 12/17/2018 14:50

Matrix: Soil

COC Reference: 120361

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 16:10	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Analysis Summary

Lab Sample ID: S98025.12

Sample Tag: MW-18-105(8-9)_12182018

Collected Date/Time: 12/18/2018 11:30

Matrix: Soil

COC Reference: 120360

Analysis	Method	Run Date/Time	Batch ID	Prep ID	Surr	QC Types
<i>Inorganics</i>						
Fractional Organic Carbon	Walkley Black	12/27/18 16:20	FOC181226-S1	FOC181226-S1	No	BLK/DUP
Total Solids	SM2540B	12/20/18 17:05	TS181220B	TS181220B	No	BLK/LCS/DUP

QC Report - Prep Batch Summary

Inorganics, Prep Batch ID: FOC181226-S1

Surrogates: No, QC Types: BLK/DUP

Sample ID	Analysis	Method	Run Date/Time	Batch ID
S98025.01	Fractional Organic Carbon	Walkley Black	12/27/18 14:20	FOC181226-S1
S98025.02	Fractional Organic Carbon	Walkley Black	12/27/18 14:40	FOC181226-S1
S98025.03	Fractional Organic Carbon	Walkley Black	12/27/18 14:50	FOC181226-S1
S98025.04	Fractional Organic Carbon	Walkley Black	12/27/18 15:00	FOC181226-S1
S98025.05	Fractional Organic Carbon	Walkley Black	12/27/18 15:10	FOC181226-S1
S98025.06	Fractional Organic Carbon	Walkley Black	12/27/18 15:20	FOC181226-S1
S98025.07	Fractional Organic Carbon	Walkley Black	12/27/18 15:30	FOC181226-S1
S98025.08	Fractional Organic Carbon	Walkley Black	12/27/18 15:40	FOC181226-S1
S98025.09	Fractional Organic Carbon	Walkley Black	12/27/18 15:50	FOC181226-S1
S98025.10	Fractional Organic Carbon	Walkley Black	12/27/18 16:00	FOC181226-S1
S98025.11	Fractional Organic Carbon	Walkley Black	12/27/18 16:10	FOC181226-S1
S98025.12	Fractional Organic Carbon	Walkley Black	12/27/18 16:20	FOC181226-S1

Inorganics, Prep Batch ID: TS181220B

Surrogates: No, QC Types: BLK/LCS/DUP

Sample ID	Analysis	Method	Run Date/Time	Batch ID
S98025.01	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.02	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.03	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.04	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.05	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.06	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.07	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.08	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.09	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.10	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.11	Total Solids	SM2540B	12/20/18 17:05	TS181220B
S98025.12	Total Solids	SM2540B	12/20/18 17:05	TS181220B

QC Report - Batch QC Results

Inorganics, Prep Batch ID: FOC181226-S1

Surrogates: No, QC Types: BLK/DUP

Blank (BLK)

Lab Sample ID: FOC181226-S1.LRB1

Run in Batch: FOC181226-S1, Run Date: 12/26/2018 14:00, Prep Date: 12/26/2018, Matrix: Liquid, Dilution: 1

Analyte	Flags	Conc	RDL	Units
Fractional Organic Carbon		ND	0.05	%

Blank (BLK)

Lab Sample ID: FOC181226-S1.LRB2

Run in Batch: FOC181226-S1, Run Date: 12/26/2018 14:10, Prep Date: 12/26/2018, Matrix: Liquid, Dilution: 1

Analyte	Flags	Conc	RDL	Units
Fractional Organic Carbon		ND	0.05	%

Duplicate (DUP)

Lab Sample ID: FOC181226-S1.DP1, Parent Sample ID: S98025.01

Run in Batch: FOC181226-S1, Run Date: 12/26/2018 14:30, Prep Date: 12/26/2018, Matrix: soil, Dilution: 1

Analyte	Flags	RPD	RPD CL
Fractional Organic Carbon		8	15

QC Report - Batch QC Results

Inorganics, Prep Batch ID: TS181220B

Surrogates: No, QC Types: BLK/LCS/DUP

Blank (BLK)

Lab Sample ID: TS181220B.LRB1

Run in Batch: TS181220B, Run Date: 12/20/2018 17:05, Prep Date: 12/20/2018, Matrix: Liquid, Dilution: 1

Analyte	Flags	Conc	RDL	Units
Total Solids		ND	1	mg/L

Laboratory Control Sample (LCS)

Lab Sample ID: TS181220B.LCS1

Run in Batch: TS181220B, Run Date: 12/20/2018 17:05, Prep Date: 12/20/2018, Matrix: Liquid, Dilution: 1

Analyte	Flags	% Rec	LCL	UCL
Total Solids		100	90	110

Duplicate (DUP)

Lab Sample ID: TS181220B.DP1, Parent Sample ID: S98025.01

Run in Batch: TS181220B, Run Date: 12/20/2018 17:05, Prep Date: 12/20/2018, Matrix: Soil, Dilution: 1

Analyte	Flags	RPD	RPD CL
Total Solids		1	5

Duplicate (DUP)

Lab Sample ID: TS181220B.DP2, Parent Sample ID: S98025.11

Run in Batch: TS181220B, Run Date: 12/20/2018 17:05, Prep Date: 12/20/2018, Matrix: Soil, Dilution: 1

Analyte	Flags	RPD	RPD CL
Total Solids		1	5



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C.O.C. PAGE # 1 OF 2

120361

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME Alex Villhaver			CONTACT NAME ☒ SAME		
COMPANY Arcadis			COMPANY		
ADDRESS 28550 Cabot Dr. Suite 500			ADDRESS		
CITY Novi	STATE MI	ZIP CODE 48377	CITY	STATE	ZIP CODE
PHONE NO. 248 994 2240	FAX NO. 248 994 2241	PO. NO. 00064479.2018.03100	PHONE NO.	E-MAIL ADDRESS	
E-MAIL ADDRESS Alex.Vilhaver@arcadis.com			E-MAIL ADDRESS		
PROJECT NO./NAME B0004479.2018.03100			ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)		
TURNAROUND TIME REQUIRED ☐ 1 DAY ☐ 2 DAYS ☐ 3 DAYS ☒ STANDARD ☐ OTHER					
DELIVERABLES REQUIRED ☐ STD ☒ LEVEL II ☐ LEVEL III ☐ LEVEL IV ☐ EDD ☐ OTHER					
MATRIX CODE: GW=GROUNDWATER WW=WASTEWATER S=SOIL L=LIQUID SD=SOLID SL=SLUDGE DW=DRINKING WATER O=OIL WP=WIFE A=AIR W=WASTE			# Containers & Preservatives		

MERIT LAB NO. FOR LAB USE ONLY	YEAR		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER	Certifications ☐ OHIO VAP ☐ Drinking Water ☐ DoD ☐ NPDES Project Locations ☐ Detroit ☐ New York ☐ Other Special Instructions
	DATE	TIME											
18025.01	12/4/18	1245	MW-18-93(9.5-10)-12042018	S	1	1							FOC (Wetley BK) ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
02	12/4/18	1710	~~MW-18-94(10.5-11)-12042018~~	~~S~~	~~1~~	~~1~~							
02.03	12/4/18	1710	MW-18-94(10.5-11)-12042018	S	1	1							
03.04	12/4/18	1405	MW-18-93(54.5-55)-12042018	S	1	1							
04.05	12/10/18	1445	MW-18-94(54.5-55)-121018	S	1	1							
05.06	12/12/18	1530	MW-18-98(9.2-9.6)-121218	S	1	1							
06.07	12/12/18	1550	MW-18-98(12.5-13)-121218	S	1	1							
07.08	12/13/18	1250	MW-18-99(11-12)-121318	S	1	1							
08.09	12/13/18	1440	MW-18-100(10-11)-121318	S	1	1							
09.10	12/14/18	1200	MW-18-101(22-22.5)-121418	S	1	1							
10.11	12/17/18	1445	MW-18-102(14.5-15)-121718	S	1	1							
11.12	12/17/18	1450	MW-18-102(12.5-13)-121718	S	1	1							

RELINQUISHED BY: Kristen VanDenBerge (Sampler)	DATE: 12/7/18	TIME: 11025	RELINQUISHED BY:	DATE:	TIME:
SIGNATURE/ORGANIZATION: Arcadis			SIGNATURE/ORGANIZATION:		
RECEIVED BY: Arcadis	DATE: 12/7/18	TIME: 1625	RECEIVED BY:	DATE:	TIME:
SIGNATURE/ORGANIZATION: Arcadis			SIGNATURE/ORGANIZATION:		
RELINQUISHED BY: Arcadis	DATE: 12/20/18	TIME: 1405	SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
SIGNATURE/ORGANIZATION: Arcadis			SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
RECEIVED BY: M. Chilcote	DATE: 12/20/18	TIME: 1405	NOTES: TEMP. ON ARRIVAL 6.0		
SIGNATURE/ORGANIZATION:					

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE



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C.O.C. PAGE # 2 OF 2

120360

REPORT TO

CHAIN OF CUSTODY RECORD

INVOICE TO

CONTACT NAME Alex Villhauer			
COMPANY Arcadis			
ADDRESS 28550 Cabot Dr., Suite 500			
CITY Novi	STATE MI	ZIP CODE 48377	
PHONE NO. 248-994-2240	FAX NO. 248-994-2241	P.O. NO. B0064479.2018.03100	
E-MAIL ADDRESS Alex.Vilhauer@arcadis.com		QUOTE NO.	

CONTACT NAME SAME	
COMPANY	
ADDRESS	
CITY	STATE ZIP CODE
PHONE NO.	E-MAIL ADDRESS

ANALYSIS (ATTACH LIST IF MORE SPACE IS REQUIRED)

PROJECT NO./NAME RACER Lansing / B0064479.2018.03100	SAMPLER(S) - PLEASE PRINT/SIGN NAME Kristen Vandon Borge / Alex Villhauer
TURNAROUND TIME REQUIRED ☐ 1 DAY ☐ 2 DAYS ☐ 3 DAYS ☒ STANDARD ☐ OTHER	
DELIVERABLES REQUIRED ☐ STD ☒ LEVEL II ☐ LEVEL III ☐ LEVEL IV ☐ EDD ☐ OTHER	

MATRIX CODE:	GW=GROUNDWATER	WW=WASTEWATER	S=SOIL	L=LIQUID	SD=SOLID
	SL=SLUDGE	DW=DRINKING WATER	O=OIL	WP=WIPE	A=AIR W=WASTE

Containers & Preservatives

MERIT LAB NO. FOR LAB USE ONLY	YEAR 2018		SAMPLE TAG IDENTIFICATION-DESCRIPTION	MATRIX	# OF BOTTLES	NONE	HCl	HNO ₃	H ₂ SO ₄	NaOH	MeOH	OTHER
	DATE	TIME										
9802518	12/18/18	1130	MW-18-105(8-9)-121818	S	1	1						
13	12/17/18	1530	MW-18-102(14-15)-121818	S	1	1						
14	12/17/18	1545	MW-18-103(14-15)-121818	S	1	1						

FOC (walkley block)
Grain size analysis

Certifications

☐ OHIO VAP ☐ Drinking Water

☐ DoD ☐ NPDES

Project Locations

☐ Detroit ☐ New York

☐ Other

Special Instructions

RELINQUISHED BY: SIGNATURE/ORGANIZATION [Signature] / Arcadis	DATE 12/20/18	TIME 1405
RECEIVED BY: SIGNATURE/ORGANIZATION [Signature] m. Alcala	DATE 12/20/18	TIME 1405
RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME

RELINQUISHED BY: SIGNATURE/ORGANIZATION	DATE	TIME
RECEIVED BY: SIGNATURE/ORGANIZATION	DATE	TIME
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
SEAL NO.	SEAL INTACT YES ☐ NO ☐	INITIALS
NOTES:		TEMP. ON ARRIVAL 6.0

PLEASE NOTE: SIGNING ACKNOWLEDGES ADHERENCE TO MERIT'S SAMPLE ACCEPTANCE POLICY ON REVERSE SIDE

The results set forth herein are provided by SGS North America Inc.

e-Hardcopy 2.0
Automated Report

Technical Report for

Arcadis

Racer Lansing PFAS Delineation; Lansing, MI

B0064479.201.03100

SGS Job Number: FA64076

Sampling Dates: 05/09/19 - 05/10/19

Report to:

Arcadis
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Total number of pages in report: 39



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.



Caitlin Brice, M.S.
General Manager

Client Service contact: Andrea Colby 407-425-6700

Certifications: FL(E83510), LA(03051), KS(E-10327), IL(200063), NC(573), NJ(FL002), NY(12022), SC(96038001)
DoD ELAP(ANAB L2229), AZ(AZ0806), CA(2937), TX(T104704404), PA(68-03573), VA(460177),
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Test results relate only to samples analyzed.

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Sample Summary

Arcadis

Job No: FA64076

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064479.201.03100

Sample Number	Collected Date	Time By	Received	Matrix Code	Type	Client Sample ID
FA64076-1	05/09/19	10:00 BP	05/11/19	AQ	Equipment Blank	EB01-050919
FA64076-2	05/09/19	11:30 BP	05/11/19	AQ	Ground Water	MW-18-105_050919
FA64076-2D	05/09/19	11:30 BP	05/11/19	AQ	Water Dup/MSD	MW-18-105_050919
FA64076-2S	05/09/19	11:30 BP	05/11/19	AQ	Water Matrix Spike	MW-18-105_050919
FA64076-3	05/09/19	13:30 BP	05/11/19	AQ	Ground Water	MW-18-98_050919
FA64076-4	05/09/19	15:20 BP	05/11/19	AQ	Ground Water	MW-18-99_050919
FA64076-5	05/09/19	17:15 BP	05/11/19	AQ	Ground Water	MW-19-107_050919
FA64076-6	05/10/19	09:50 BP	05/11/19	AQ	Ground Water	MW-18-106_051019
FA64076-7	05/09/19	11:30 BP	05/11/19	AQ	Ground Water	MW-19-108_050919
FA64076-8	05/10/19	00:00 BP	05/11/19	AQ	Ground Water	DUP-01_051019

Summary of Hits

Job Number: FA64076
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 05/09/19 thru 05/10/19

Lab Sample ID	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

FA64076-1 EB01-050919

No hits reported in this sample.

FA64076-2 MW-18-105_050919

Perfluorobutanoic acid	0.00562 J	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00115 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00232 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00463	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00217 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.00978	0.0040	0.0015	ug/l	EPA 537M BY ID

FA64076-3 MW-18-98_050919

Perfluorobutanoic acid	0.0120	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.0102	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.0139	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.0108	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.0350	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00269 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00450	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.00399 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.137	0.0040	0.0015	ug/l	EPA 537M BY ID

FA64076-4 MW-18-99_050919

Perfluorobutanoic acid	0.0146	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00483	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00554	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00397 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00773	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorononanoic acid	0.00180 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00148 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanesulfonic acid	0.00126 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0573	0.0040	0.0015	ug/l	EPA 537M BY ID

FA64076-5 MW-19-107_050919

Perfluorobutanoic acid	0.00402 J	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00475	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00159 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00615	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00207 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.00434	0.0040	0.0010	ug/l	EPA 537M BY ID

Summary of Hits

Job Number: FA64076
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 05/09/19 thru 05/10/19

Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method

Perfluorooctanesulfonic acid		0.00312 J	0.0040	0.0015	ug/l	EPA 537M BY ID

FA64076-6 MW-18-106_051019

Perfluorobutanoic acid	0.00961	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00409	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00241 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00209 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00301 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00277 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.0109	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0145	0.0040	0.0015	ug/l	EPA 537M BY ID

FA64076-7 MW-19-108_050919

Perfluorobutanoic acid	0.00309 J	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00186 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00758	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00115 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.00614	0.0040	0.0015	ug/l	EPA 537M BY ID

FA64076-8 DUP-01_051019

Perfluorobutanoic acid	0.00877	0.0080	0.0020	ug/l	EPA 537M BY ID
Perfluoropentanoic acid	0.00427	0.0040	0.0015	ug/l	EPA 537M BY ID
Perfluorohexanoic acid	0.00251 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid	0.00204 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanoic acid	0.00328 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorobutanesulfonic acid	0.00296 J	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorohexanesulfonic acid	0.0120	0.0040	0.0010	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid	0.0158	0.0040	0.0015	ug/l	EPA 537M BY ID

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	EB01-050919	
Lab Sample ID:	FA64076-1	Date Sampled: 05/09/19
Matrix:	AQ - Equipment Blank	Date Received: 05/11/19
Method:	EPA 537M BY ID EPA 537 MOD	Percent Solids: n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI	

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3893.D	1	05/16/19 21:55	NG	05/14/19 09:00	OP75020	S3Q98
Run #2							

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: EB01-050919

Lab Sample ID: FA64076-1

Date Sampled: 05/09/19

Matrix: AQ - Equipment Blank

Date Received: 05/11/19

Method: EPA 537M BY ID EPA 537 MOD

Percent Solids: n/a

Project: Racer Lansing PFAS Delineation; Lansing, MI

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	99%		30-140%
	13C5-PFPeA	96%		40-140%
	13C5-PFHxA	96%		50-150%
	13C4-PFHpA	93%		50-150%
	13C8-PFOA	106%		50-150%
	13C9-PFNA	110%		50-150%
	13C6-PFDA	99%		50-150%
	13C7-PFUnDA	84%		50-150%
	13C2-PFDoDA	69%		50-150%
	13C2-PFTeDA	69%		40-150%
	13C3-PFBS	94%		50-150%
	13C3-PFHxS	89%		50-150%
	13C8-PFOS	86%		50-150%
	13C8-FOSA	89%		30-140%
	d3-MeFOSAA	83%		50-150%
	13C2-4:2FTS	97%		50-150%
	13C2-6:2FTS	107%		50-150%
	13C2-8:2FTS	94%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-105_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-2	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3894.D	1	05/16/19 22:10	NG	05/14/19 09:00	OP75020	S3Q98
Run #2							

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00562	0.0080	0.0020	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00115	0.0040	0.0010	ug/l	J
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.00232	0.0040	0.0010	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid ^a	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid ^a	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid ^a	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00463	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00217	0.0040	0.0010	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00978	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-105_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-2	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	94%		30-140%
	13C5-PFPeA	94%		40-140%
	13C5-PFHxA	96%		50-150%
	13C4-PFHpA	99%		50-150%
	13C8-PFOA	104%		50-150%
	13C9-PFNA	107%		50-150%
	13C6-PFDA	78%		50-150%
	13C7-PFUnDA	59%		50-150%
	13C2-PFDoDA	33% ^b		50-150%
	13C2-PFTeDA	33% ^b		40-150%
	13C3-PFBS	94%		50-150%
	13C3-PFHxS	93%		50-150%
	13C8-PFOS	66%		50-150%
	13C8-FOSA	74%		30-140%
	d3-MeFOSAA	58%		50-150%
	13C2-4:2FTS	97%		50-150%
	13C2-6:2FTS	107%		50-150%
	13C2-8:2FTS	88%		50-150%

(a) Associated ID Standard outside control limits due to matrix interference.

(b) Outside control limits due to matrix interference. Confirmed by MS/MSD.

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-98_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-3	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3897.D	1	05/16/19 22:55	NG	05/14/19 09:00	OP75020	S3Q98
Run #2 ^a	2Q30019.D	1	05/22/19 21:31	NAF	05/20/19 09:30	OP75125	S2Q480

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2	250 ml	1.0 ml

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0120	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.0102	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.0139	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	0.0108	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.0350	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid ^b	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid ^b	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid ^b	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid ^b	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00269	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00450	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	0.00399	0.0040	0.0010	ug/l	J
1763-23-1	Perfluorooctanesulfonic acid	0.137	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA ^b	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-98_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-3	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	86%	92%	30-140%
	13C5-PFPeA	91%	98%	40-140%
	13C5-PFHxA	95%	97%	50-150%
	13C4-PFHpA	96%	106%	50-150%
	13C8-PFOA	103%	106%	50-150%
	13C9-PFNA	103%	86%	50-150%
	13C6-PFDA	62%	39%	50-150%
	13C7-PFUnDA	19% ^c	22%	50-150%
	13C2-PFDoDA	15% ^c	37%	50-150%
	13C2-PFTeDA	27% ^c	44%	40-150%
	13C3-PFBS	91%	98%	50-150%
	13C3-PFHxS	92%	97%	50-150%
	13C8-PFOS	60%	46%	50-150%
	13C8-FOSA	77%	67%	30-140%
	d3-MeFOSAA	32% ^c	23%	50-150%
	13C2-4:2FTS	92%	103%	50-150%
	13C2-6:2FTS	107%	109%	50-150%
	13C2-8:2FTS	71%	41%	50-150%

(a) Confirmation run.

(b) Associated ID Standard outside control limits due to matrix interference.

(c) Outside control limits due to matrix interference. Confirmed by re-extraction and reanalysis.

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-99_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-4	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3898.D	1	05/16/19 23:10	NG	05/14/19 09:00	OP75020	S3Q98
Run #2							

Run #	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.0146	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00483	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00554	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	0.00397	0.0040	0.0010	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00773	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	0.00180	0.0040	0.0010	ug/l	J
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00148	0.0040	0.0010	ug/l	J
375-92-8	Perfluoroheptanesulfonic acid	0.00126	0.0040	0.0010	ug/l	J
1763-23-1	Perfluorooctanesulfonic acid	0.0573	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-18-99_050919**Lab Sample ID:** FA64076-4**Date Sampled:** 05/09/19**Matrix:** AQ - Ground Water**Date Received:** 05/11/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	99%		30-140%
	13C5-PFPeA	98%		40-140%
	13C5-PFHxA	99%		50-150%
	13C4-PFHpA	100%		50-150%
	13C8-PFOA	106%		50-150%
	13C9-PFNA	111%		50-150%
	13C6-PFDA	100%		50-150%
	13C7-PFUnDA	90%		50-150%
	13C2-PFDoDA	74%		50-150%
	13C2-PFTeDA	77%		40-150%
	13C3-PFBS	96%		50-150%
	13C3-PFHxS	95%		50-150%
	13C8-PFOS	87%		50-150%
	13C8-FOSA	96%		30-140%
	d3-MeFOSAA	86%		50-150%
	13C2-4:2FTS	99%		50-150%
	13C2-6:2FTS	113%		50-150%
	13C2-8:2FTS	104%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-107_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-5	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3899.D	1	05/16/19 23:25	NG	05/14/19 09:00	OP75020	S3Q98
Run #2							

Run #	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00402	0.0080	0.0020	ug/l	J
2706-90-3	Perfluoropentanoic acid	0.00475	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00159	0.0040	0.0010	ug/l	J
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.00615	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00207	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.00434	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00312	0.0040	0.0015	ug/l	J
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-107_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-5	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	73%		30-140%
	13C5-PFPeA	82%		40-140%
	13C5-PFHxA	84%		50-150%
	13C4-PFHpA	87%		50-150%
	13C8-PFOA	98%		50-150%
	13C9-PFNA	109%		50-150%
	13C6-PFDA	99%		50-150%
	13C7-PFUnDA	86%		50-150%
	13C2-PFDoDA	71%		50-150%
	13C2-PFTeDA	79%		40-150%
	13C3-PFBS	78%		50-150%
	13C3-PFHxS	79%		50-150%
	13C8-PFOS	74%		50-150%
	13C8-FOSA	82%		30-140%
	d3-MeFOSAA	82%		50-150%
	13C2-4:2FTS	87%		50-150%
	13C2-6:2FTS	108%		50-150%
	13C2-8:2FTS	104%		50-150%

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-106_051019	Date Sampled:	05/10/19
Lab Sample ID:	FA64076-6	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2Q30020.D	1	05/22/19 21:46	NAF	05/20/19 09:30	OP75125	S2Q480
Run #2 ^a	3Q3900.D	1	05/16/19 23:40	NG	05/14/19 09:00	OP75020	S3Q98

	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2	250 ml	1.0 ml

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00961	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00409	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00241	0.0040	0.0010	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00209	0.0040	0.0010	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00301	0.0040	0.0010	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid ^b	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid ^b	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid ^b	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid ^b	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00277	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.0109	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0145	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCCTANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA ^b	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-18-106_051019	Date Sampled:	05/10/19
Lab Sample ID:	FA64076-6	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	91%	95%	30-140%
	13C5-PFPeA	90%	99%	40-140%
	13C5-PFHxA	95%	100%	50-150%
	13C4-PFHpA	98%	0%	50-150%
	13C8-PFOA	105%	112%	50-150%
	13C9-PFNA	101%	110%	50-150%
	13C6-PFDA	56%	53%	50-150%
	13C7-PFUnDA	19% ^c	24%	50-150%
	13C2-PFDoDA	25% ^c	22%	50-150%
	13C2-PFTeDA	32% ^c	38%	40-150%
	13C3-PFBS	89%	96%	50-150%
	13C3-PFHxS	96%	95%	50-150%
	13C8-PFOS	63%	44%	50-150%
	13C8-FOSA	67%	61%	30-140%
	d3-MeFOSAA	29% ^c	29%	50-150%
	13C2-4:2FTS	100%	100%	50-150%
	13C2-6:2FTS	111%	123%	50-150%
	13C2-8:2FTS	58%	56%	50-150%

(a) Confirmation run.

(b) Associated ID Standard outside control limits due to matrix interference.

(c) Outside control limits due to matrix interference. Confirmed by re-extraction and reanalysis.

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-108_050919	Date Sampled:	05/09/19
Lab Sample ID:	FA64076-7	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3903.D	1	05/17/19 00:26	NG	05/14/19 09:00	OP75020	S3Q98
Run #2							

Run #	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00309	0.0080	0.0020	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00186	0.0040	0.0010	ug/l	J
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	0.00758	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00115	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.00614	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID: MW-19-108_050919**Lab Sample ID:** FA64076-7**Date Sampled:** 05/09/19**Matrix:** AQ - Ground Water**Date Received:** 05/11/19**Method:** EPA 537M BY ID EPA 537 MOD**Percent Solids:** n/a**Project:** Racer Lansing PFAS Delineation; Lansing, MI

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	78%		30-140%
	13C5-PFPeA	85%		40-140%
	13C5-PFHxA	89%		50-150%
	13C4-PFHpA	94%		50-150%
	13C8-PFOA	103%		50-150%
	13C9-PFNA	113%		50-150%
	13C6-PFDA	102%		50-150%
	13C7-PFUnDA	76%		50-150%
	13C2-PFDoDA	61%		50-150%
	13C2-PFTeDA	67%		40-150%
	13C3-PFBS	83%		50-150%
	13C3-PFHxS	89%		50-150%
	13C8-PFOS	85%		50-150%
	13C8-FOSA	89%		30-140%
	d3-MeFOSAA	79%		50-150%
	13C2-4:2FTS	92%		50-150%
	13C2-6:2FTS	107%		50-150%
	13C2-8:2FTS	95%		50-150%

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-01_051019	Date Sampled:	05/10/19
Lab Sample ID:	FA64076-8	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q3904.D	1	05/17/19 00:41	NG	05/14/19 09:00	OP75020	S3Q98
Run #2							

Run #	Initial Volume	Final Volume
Run #1	250 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q

PERFLUOROALKYLCARBOXYLIC ACIDS

375-22-4	Perfluorobutanoic acid	0.00877	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	0.00427	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	0.00251	0.0040	0.0010	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00204	0.0040	0.0010	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00328	0.0040	0.0010	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROALKYLSULFONATES

375-73-5	Perfluorobutanesulfonic acid	0.00296	0.0040	0.0010	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	0.0120	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0158	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDES

754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	

PERFLUOROOCETANESULFONAMIDOACETIC ACIDS

2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	

FLUOROTELOMER SULFONATES

757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

ND = Not detected MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	DUP-01_051019	Date Sampled:	05/10/19
Lab Sample ID:	FA64076-8	Date Received:	05/11/19
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	EPA 537M BY ID EPA 537 MOD		
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	92%		30-140%
	13C5-PFPeA	94%		40-140%
	13C5-PFHxA	95%		50-150%
	13C4-PFHpA	97%		50-150%
	13C8-PFOA	107%		50-150%
	13C9-PFNA	119%		50-150%
	13C6-PFDA	115%		50-150%
	13C7-PFUnDA	97%		50-150%
	13C2-PFDoDA	77%		50-150%
	13C2-PFTeDA	73%		40-150%
	13C3-PFBS	94%		50-150%
	13C3-PFHxS	94%		50-150%
	13C8-PFOS	92%		50-150%
	13C8-FOSA	87%		30-140%
	d3-MeFOSAA	102%		50-150%
	13C2-4:2FTS	97%		50-150%
	13C2-6:2FTS	118%		50-150%
	13C2-8:2FTS	133%		50-150%

ND = Not detected MDL = Method Detection Limit
 RL = Reporting Limit
 E = Indicates value exceeds calibration range

J = Indicates an estimated value
 B = Indicates analyte found in associated method blank
 N = Indicates presumptive evidence of a compound



Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

Chain of Custody

4405 Vineland Road, Suite C-15 Orlando, FL 32811
TEL: 407-425-6700 FAX: 407-425-0707
www.sgs.com

SGS - ORLANDO JOB # :

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FA64076

Client / Reporting Information						Project Information							SGS - ORLANDO Quote #								Analytical Information									Matrix Codes										
Company Name: Arcadis						Project Name: RACER Lensing																							DW - Drinking Water GW - Ground Water WW - Wastewater SW - Surface Water SL- Sludge OI - Oil LIQ - Other Liquid AIR - Air SOL - Other Solid											
Address: 300 S. Washington Square, Suite 315						Street:																																		
City: Lansing State: MI Zip: 48933						City: Lansing State: MI																																		
Email: Alex.Villaverde@arcadis.com						Project #: B0064474.2019.03100																																		
Phone #: 517-324-5076						Fax #: 517-337-0417																																		
Sampler(s) Name(s) (Printed)						Client Purchase Order #: B0064474.2019.03100																																		
Sampler 1: Borehole Sampler						Sampler 2:																																		
SGS Orlando Sample #		Field ID / Point of Collection				DATE		TIME		COLOR	MATRIX	TOTAL # OF SAMPLES	OTHER	NONE	HCl	HNO ₃	H ₂ O ₂	NaOH/ZnSO ₄	DILUTION WATER	MEPHI									LAB USE ONLY											
1	EBO1-050919	5/9/19 1000 BP GW				2	L														X	M1 24 PFA's (mod 537)																		
2	MW-18-105-050919	5/9/19 1130 BP GW				6	L														X										MS/MSSD									
3	MW-18-98-050919	5/9/19 1330 BP GW				V	L														X																			
4	MW-18-99-050919	5/9/19 1520 BP GW				V	L														X																			
5	MW-19-107-050919	5/9/19 1715 BP GW				V	L														X																			
6	MW-18-106-051019	5/10/19 950 BP GW				BV															X																			
7	MW-19-108-051019	5/9/19 1130 BP GW				BV															X																			
8	PWP-01-051019	5/10/19 - BP GW				L															X																			
9	TEMP Blank																																							
Turnaround Time (Business days)						Data Deliverable Information						Comments / Remarks																												
10 Day (Business) _____ Approved By: / Date: 7 Day _____ 5 Day _____ 3 Day RUSH _____ 2 Day RUSH _____ 1 Day RUSH _____ Other _____						☐ COMMERCIAL "A" (RESULTS ONLY) ☐ COMMERCIAL "B" (RESULTS PLUS QC) ☐ REDT1 (EPA LEVEL 3) ☐ FULLT1 (EPA LEVEL 4) ☒ EDD'S																																		
Rush T/A Data Available VIA Email or Lablink																																								
Sample Custody must be documented below each time samples change possession, including courier delivery.																																								
Relinquished by Sampler/Affiliation						Date Time: 5/10/19						Received By/Affiliation FX						Relinquished By/Affiliation FY						Date Time:						Received By/Affiliation KCC/H 5/11/19										
Relinquished by Affiliation						Date Time:						Received By/Affiliation						Relinquished By/Affiliation						Date Time:						Received By/Affiliation										
5						6						7						8																						
Lab Use Only : Cooler Temperature (s) Celsius (corrected): 33°																																								

http://www.sgs.com/en/terms-and-conditions

4.4.1

FA64076: Chain of Custody

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SGS Sample Receipt Summary

Job Number: FA64076

Client: ARCADIS

Project: RACER LENSING

Date / Time Received: 5/11/2019 9:15:00 AM

Delivery Method: FX

Airbill #'s:

Therm ID: IR 1;

Therm CF: 0.4;

of Coolers: 1

Cooler Temps (Raw Measured) °C: Cooler 1: (2.8);

Cooler Temps (Corrected) °C: Cooler 1: (3.2);

Cooler Information

Y or N

1. Custody Seals Present	☒	☐
2. Custody Seals Intact	☒	☐
3. Temp criteria achieved	☒	☐
4. Cooler temp verification	<u>IR Gun</u>	
5. Cooler media	<u>Ice (Bag)</u>	

Trip Blank Information

Y or N N/A

1. Trip Blank present / cooler	☐	☐	☒
2. Trip Blank listed on COC	☐	☐	☒
	<u>W</u>	<u>or</u>	<u>S</u>
3. Type Of TB Received	☐	☐	☒

Sample Information

Y or N N/A

1. Sample labels present on bottles	☒	☐	
2. Samples preserved properly	☒	☐	
3. Sufficient volume/containers recvd for analysis:	☒	☐	
4. Condition of sample	<u>Intact</u>		
5. Sample recvd within HT	☒	☐	
6. Dates/Times/IDs on COC match Sample Label	☒	☐	
7. VOCs have headspace	☐	☐	☒
8. Bottles received for unspecified tests	☐	☒	
9. Compositing instructions clear	☐	☐	☒
10. Voa Soil Kits/Jars received past 48hrs?	☐	☐	☒
11. % Solids Jar received?	☐	☐	☒
12. Residual Chlorine Present?	☐	☐	☒

Misc. Information

Number of Encores: 25-Gram _____ 5-Gram _____
 Test Strip Lot #s: pH 0-3 230315
 Residual Chlorine Test Strip Lot #: _____

Number of 5035 Field Kits: _____
 pH 10-12 219813A

Number of Lab Filtered Metals: _____
 Other: (Specify) _____

Comments

SM001
Rev. Date 05/24/17

Technician: PETERH

Date: 5/11/2019 9:15:00 AM

Reviewer: _____

Date: _____

FA64076: Chain of Custody

Page 2 of 2



MS Semi-volatiles

5

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

Page 1 of 2

Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75020-MB	3Q3892.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	100% 30-140%
	13C5-PFPeA	97% 40-140%
	13C5-PFHxA	100% 50-150%
	13C4-PFHpA	97% 50-150%
	13C8-PFOA	103% 50-150%
	13C9-PFNA	105% 50-150%
	13C6-PFDA	103% 50-150%
	13C7-PFUnDA	88% 50-150%

Method Blank Summary

Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75020-MB	3Q3892.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	76% 50-150%
	13C2-PFTeDA	76% 40-150%
	13C3-PFBS	96% 50-150%
	13C3-PFHxS	97% 50-150%
	13C8-PFOS	93% 50-150%
	13C8-FOSA	95% 30-140%
	d3-MeFOSAA	88% 50-150%
	13C2-4:2FTS	100% 50-150%
	13C2-6:2FTS	99% 50-150%
	13C2-8:2FTS	94% 50-150%

Method Blank Summary

Page 1 of 2

Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75125-MB	2Q30018.D	1	05/22/19	NAF	05/20/19	OP75125	S2Q480

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-6

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C4-PFBA	111% 30-140%
	13C5-PFPeA	106% 40-140%
	13C5-PFHxA	108% 50-150%
	13C4-PFHpA	108% 50-150%
	13C8-PFOA	111% 50-150%
	13C9-PFNA	112% 50-150%
	13C6-PFDA	108% 50-150%
	13C7-PFUnDA	93% 50-150%

Method Blank Summary

Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75125-MB	2Q30018.D	1	05/22/19	NAF	05/20/19	OP75125	S2Q480

The QC reported here applies to the following samples: Method: EPA 537M BY ID

FA64076-6

CAS No.	ID Standard Recoveries	Limits
	13C2-PFDoDA	109% 50-150%
	13C2-PFTeDA	83% 40-150%
	13C3-PFBS	105% 50-150%
	13C3-PFHxS	107% 50-150%
	13C8-PFOS	106% 50-150%
	13C8-FOSA	110% 30-140%
	d3-MeFOSAA	94% 50-150%
	13C2-4:2FTS	106% 50-150%
	13C2-6:2FTS	105% 50-150%
	13C2-8:2FTS	107% 50-150%

Instrument Blank

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Job Number: FA64076

Account: ARCMIL Arcadis

Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q98-IBLK	3Q3843.D	1	05/16/19	NG	n/a	n/a	S3Q98

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits	
	13C5-PFHxA	98%	50-150%
	13C4-PFHpA	99%	50-150%
	13C8-PFOA	100%	50-150%
	13C9-PFNA	102%	50-150%
	13C6-PFDA	104%	50-150%
	13C7-PFUnDA	104%	50-150%
	13C2-PFDoDA	103%	50-150%
	13C2-PFTeDA	110%	50-150%

Instrument Blank

Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q98-IBLK	3Q3843.D	1	05/16/19	NG	n/a	n/a	S3Q98

The QC reported here applies to the following samples: Method: EPA 537M QSM5.1 B-15

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	ID Standard Recoveries	Limits
13C3-PFBS	99%	50-150%
13C3-PFHxS	100%	50-150%
13C8-PFOS	102%	50-150%
d3-MeFOSAA	99%	50-150%

Instrument Blank

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Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S2Q480-IBLK	2Q29988.D	1	05/22/19	NAF	n/a	n/a	S2Q480

The QC reported here applies to the following samples:

Method: EPA 537M QSM5.1 B-15

FA64076-6

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-44:2	Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	0.00227	0.0080	0.0020	ug/l	J
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries	Limits
	13C8-PFOA	104%
	13C8-PFOS	101%

Blank Spike Summary

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Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75020-BS	3Q3891.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.08	0.0764	96	70-130
2706-90-3	Perfluoropentanoic acid	0.08	0.0764	96	70-130
307-24-4	Perfluorohexanoic acid	0.08	0.0746	93	70-130
375-85-9	Perfluoroheptanoic acid	0.08	0.0756	95	71-130
335-67-1	Perfluorooctanoic acid	0.08	0.0759	95	74-130
375-95-1	Perfluorononanoic acid	0.08	0.0764	96	76-130
335-76-2	Perfluorodecanoic acid	0.08	0.0782	98	70-130
2058-94-8	Perfluoroundecanoic acid	0.08	0.0798	100	70-130
307-55-1	Perfluorododecanoic acid	0.08	0.0763	95	70-130
72629-94-8	Perfluorotridecanoic acid	0.08	0.0693	87	70-139
376-06-7	Perfluorotetradecanoic acid	0.08	0.0759	95	70-130
375-73-5	Perfluorobutanesulfonic acid	0.08	0.0806	101	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.08	0.0756	95	70-130
355-46-4	Perfluorohexanesulfonic acid	0.08	0.0767	96	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.08	0.0773	97	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.08	0.0715	89	70-130
68259-12-1	Perfluorononanesulfonic acid	0.08	0.0669	84	70-130
335-77-3	Perfluorodecanesulfonic acid	0.08	0.0562	70	70-130
754-91-6	PFOSA	0.08	0.0746	93	70-131
2355-31-9	MeFOSAA	0.08	0.0785	98	70-130
2991-50-6	EtFOSAA	0.08	0.0605	76	70-130
757124-72-44:2	Fluorotelomer sulfonate	0.08	0.0729	91	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.08	0.0748	94	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.08	0.0756	95	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	98%	30-140%
	13C5-PFPeA	95%	40-140%
	13C5-PFHxA	97%	50-150%
	13C4-PFHpA	95%	50-150%
	13C8-PFOA	98%	50-150%
	13C9-PFNA	102%	50-150%
	13C6-PFDA	96%	50-150%
	13C7-PFUnDA	85%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

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Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75020-BS	3Q3891.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	71%	50-150%
	13C2-PFTeDA	72%	40-150%
	13C3-PFBS	94%	50-150%
	13C3-PFHxS	94%	50-150%
	13C8-PFOS	93%	50-150%
	13C8-FOSA	91%	30-140%
	d3-MeFOSAA	86%	50-150%
	13C2-4:2FTS	102%	50-150%
	13C2-6:2FTS	99%	50-150%
	13C2-8:2FTS	100%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

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Job Number: FA64076**Account:** ARCMIL Arcadis**Project:** Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75125-BS ^a	2Q30017.D	1	05/22/19	NAF	05/20/19	OP75125	S2Q480

The QC reported here applies to the following samples:**Method:** EPA 537M BY ID

FA64076-6

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.08	0.0783	98	70-130
2706-90-3	Perfluoropentanoic acid	0.08	0.0806	101	70-130
307-24-4	Perfluorohexanoic acid	0.08	0.0775	97	70-130
375-85-9	Perfluoroheptanoic acid	0.08	0.0758	95	71-130
335-67-1	Perfluorooctanoic acid	0.08	0.0796	100	74-130
375-95-1	Perfluorononanoic acid	0.08	0.0803	100	76-130
335-76-2	Perfluorodecanoic acid	0.08	0.0795	99	70-130
2058-94-8	Perfluoroundecanoic acid	0.08	0.0808	101	70-130
307-55-1	Perfluorododecanoic acid	0.08	0.0780	98	70-130
72629-94-8	Perfluorotridecanoic acid	0.08	0.0942	118	70-139
376-06-7	Perfluorotetradecanoic acid	0.08	0.0795	99	70-130
375-73-5	Perfluorobutanesulfonic acid	0.08	0.0815	102	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.08	0.0765	96	70-130
355-46-4	Perfluorohexanesulfonic acid	0.08	0.0776	97	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.08	0.0791	99	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.08	0.0730	91	70-130
68259-12-1	Perfluorononanesulfonic acid	0.08	0.0698	87	70-130
335-77-3	Perfluorodecanesulfonic acid	0.08	0.0660	83	70-130
754-91-6	PFOSA	0.08	0.0803	100	70-131
2355-31-9	MeFOSAA	0.08	0.0832	104	70-130
2991-50-6	EtFOSAA	0.08	0.0770	96	70-130
757124-72-44:2	Fluorotelomer sulfonate	0.08	0.0882	110	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.08	0.0813	102	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.08	0.0776	97	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	102%	30-140%
	13C5-PFPeA	99%	40-140%
	13C5-PFHxA	98%	50-150%
	13C4-PFHpA	100%	50-150%
	13C8-PFOA	99%	50-150%
	13C9-PFNA	99%	50-150%
	13C6-PFDA	98%	50-150%
	13C7-PFUnDA	93%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

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Job Number: FA64076

Account: ARCMIL Arcadis

Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75125-BS ^a	2Q30017.D	1	05/22/19	NAF	05/20/19	OP75125	S2Q480

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-6

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	119%	50-150%
	13C2-PFTeDA	79%	40-150%
	13C3-PFBS	100%	50-150%
	13C3-PFHxS	99%	50-150%
	13C8-PFOS	99%	50-150%
	13C8-FOSA	94%	30-140%
	d3-MeFOSAA	93%	50-150%
	13C2-4:2FTS	103%	50-150%
	13C2-6:2FTS	101%	50-150%
	13C2-8:2FTS	104%	50-150%

(a) Insufficient sample for MS/MSD.

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

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Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75020-MS	3Q3895.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98
OP75020-MSD	3Q3896.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98
FA64076-2	3Q3894.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	Compound	FA64076-2 ug/l	Spike Q	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD	
375-22-4	Perfluorobutanoic acid	0.00562	J	0.08	0.0808	94	0.08	0.0784	91	3	70-130/30
2706-90-3	Perfluoropentanoic acid	ND		0.08	0.0789	99	0.08	0.0757	95	4	70-130/30
307-24-4	Perfluorohexanoic acid	0.00115	J	0.08	0.0766	94	0.08	0.0749	92	2	70-130/30
375-85-9	Perfluoroheptanoic acid	ND		0.08	0.0755	94	0.08	0.0745	93	1	71-130/30
335-67-1	Perfluorooctanoic acid	0.00232	J	0.08	0.0788	96	0.08	0.0749	91	5	74-130/30
375-95-1	Perfluorononanoic acid	ND		0.08	0.0764	96	0.08	0.0739	92	3	76-130/30
335-76-2	Perfluorodecanoic acid	ND		0.08	0.0769	96	0.08	0.0757	95	2	70-130/30
2058-94-8	Perfluoroundecanoic acid	ND		0.08	0.0746	93	0.08	0.0785	98	5	70-130/30
307-55-1	Perfluorododecanoic acid	ND		0.08	0.0735	92	0.08	0.0762	95	4	70-130/30
72629-94-8	Perfluorotridecanoic acid	ND		0.08	0.0643	80	0.08	0.0979	122	41*	70-139/30
376-06-7	Perfluorotetradecanoic acid	ND		0.08	0.0709	89	0.08	0.0698	87	2	70-130/30
375-73-5	Perfluorobutanesulfonic acid	0.00463		0.08	0.0856	101	0.08	0.0824	97	4	73-130/30
2706-91-4	Perfluoropentanesulfonic acid	ND		0.08	0.0777	97	0.08	0.0760	95	2	70-130/30
355-46-4	Perfluorohexanesulfonic acid	0.00217	J	0.08	0.0787	96	0.08	0.0772	94	2	74-130/30
375-92-8	Perfluoroheptanesulfonic acid	ND		0.08	0.0752	94	0.08	0.0678	85	10	74-130/30
1763-23-1	Perfluorooctanesulfonic acid	0.00978		0.08	0.0829	91	0.08	0.0879	98	6	70-130/30
68259-12-1	Perfluorononanesulfonic acid	ND		0.08	0.0423	53*	0.08	0.0194	24*	74*	70-130/30
335-77-3	Perfluorodecanesulfonic acid	ND		0.08	0.0287	36*	0.08	0.0260	33*	10	70-130/30
754-91-6	PFOSA	ND		0.08	0.0725	91	0.08	0.0717	90	1	70-131/30
2355-31-9	MeFOSAA	ND		0.08	0.0751	94	0.08	0.0701	88	7	70-130/30
2991-50-6	EtFOSAA	ND		0.08	0.0635	79	0.08	0.0475	59*	29	70-130/30
757124-72-44:2	Fluorotelomer sulfonate	ND		0.08	0.0741	93	0.08	0.0758	95	2	70-130/30
27619-97-2	6:2 Fluorotelomer sulfonate	ND		0.08	0.0758	95	0.08	0.0736	92	3	70-133/30
39108-34-4	8:2 Fluorotelomer sulfonate	ND		0.08	0.0735	92	0.08	0.0784	98	6	70-130/30

CAS No.	ID Standard Recoveries	MS	MSD	FA64076-2	Limits
	13C4-PFBA	84%	89%	94%	30-140%
	13C5-PFPeA	86%	91%	94%	40-140%
	13C5-PFHxA	87%	94%	96%	50-150%
	13C4-PFHpA	87%	94%	99%	50-150%
	13C8-PFOA	94%	99%	104%	50-150%
	13C9-PFNA	93%	93%	107%	50-150%
	13C6-PFDA	71%	46%* a	78%	50-150%
	13C7-PFUnDA	51%	20%* a	59%	50-150%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Page 2 of 2

Job Number: FA64076
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP75020-MS	3Q3895.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98
OP75020-MSD	3Q3896.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98
FA64076-2	3Q3894.D	1	05/16/19	NG	05/14/19	OP75020	S3Q98

The QC reported here applies to the following samples:

Method: EPA 537M BY ID

FA64076-1, FA64076-2, FA64076-3, FA64076-4, FA64076-5, FA64076-7, FA64076-8

CAS No.	ID Standard Recoveries	MS	MSD	FA64076-2	Limits
13C2-PFDoDA		25%* ^a	16%* ^a	33%* ^b	50-150%
13C2-PFTeDA		30%* ^a	11%* ^a	33%* ^b	40-150%
13C3-PFBS		84%	90%	94%	50-150%
13C3-PFHxS		82%	90%	93%	50-150%
13C8-PFOS		58%	45%* ^a	66%	50-150%
13C8-FOSA		69%	48%	74%	30-140%
d3-MeFOSAA		51%	26%* ^a	58%	50-150%
13C2-4:2FTS		91%	98%	97%	50-150%
13C2-6:2FTS		101%	102%	107%	50-150%
13C2-8:2FTS		79%	49%* ^a	88%	50-150%

(a) Outside control limits.

(b) Outside control limits due to matrix interference. Confirmed by MS/MSD.

* = Outside of Control Limits.

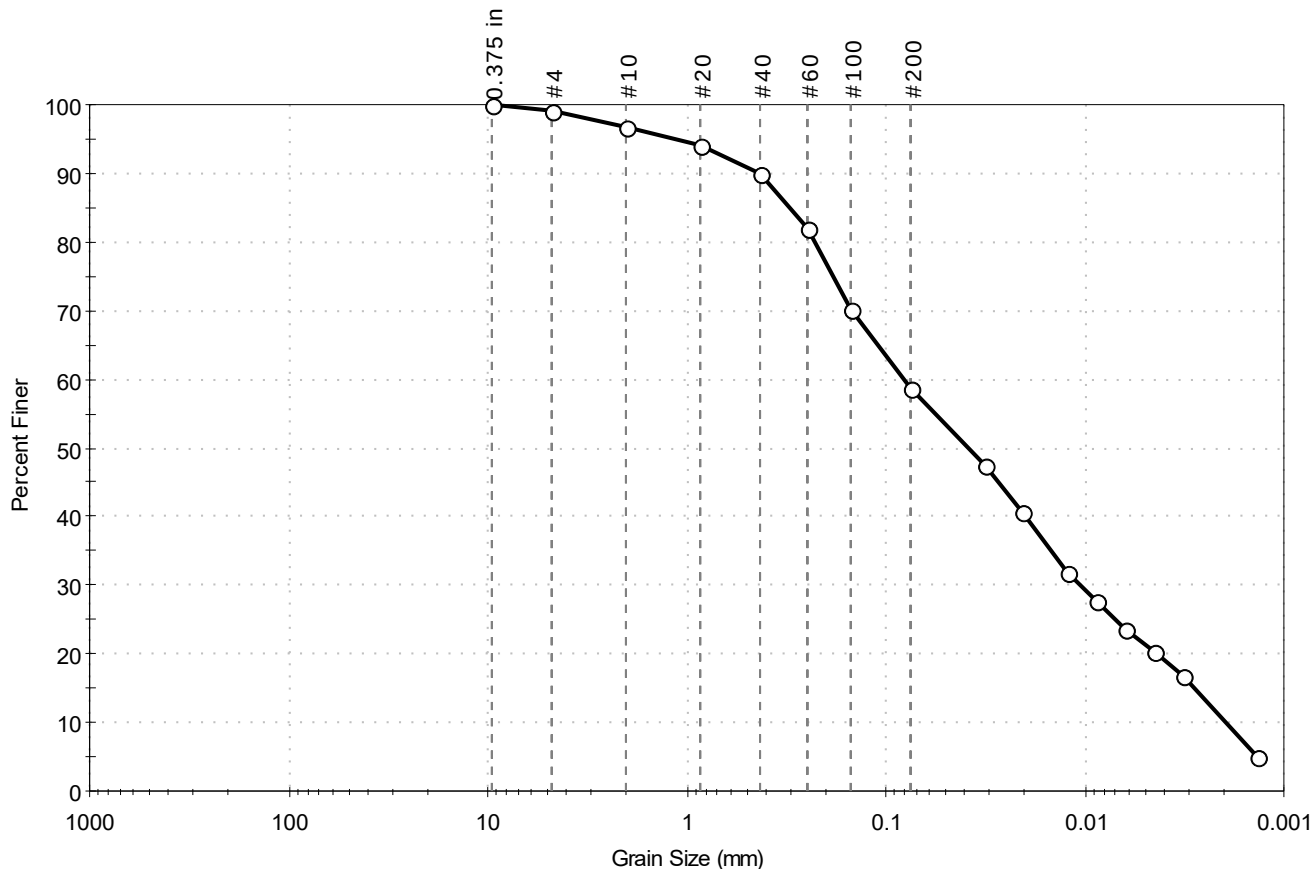
ATTACHMENT 3

Sieve Results and Hydraulic Conductivity Analysis



Client: Merit Laboratories, Inc.	Project No: GTX-309371
Project: S98025	
Location:	
Boring ID: ---	Sample Type: bag
Sample ID: 98025.13	Test Date: 01/09/19
Depth: ---	Test Id: 488540
Test Comment: ---	Tested By: ckg
Visual Description: Moist, dark grayish brown sandy clay	Checked By: emm
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.8	40.4	58.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	97		
#20	0.85	94		
#40	0.42	90		
#60	0.25	82		
#100	0.15	70		
#200	0.075	59		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0316	47		
---	0.0207	41		
---	0.0123	32		
---	0.0088	28		
---	0.0063	24		
---	0.0045	20		
---	0.0032	17		
---	0.0014	5		

Coefficients

$D_{85} = 0.3040$ mm $D_{30} = 0.0106$ mm
 $D_{60} = 0.0807$ mm $D_{15} = 0.0028$ mm
 $D_{50} = 0.0385$ mm $D_{10} = 0.0020$ mm
 $C_u = 40.350$ $C_c = 0.696$

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
 Sand/Gravel Hardness : ---
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #200 Sieve



Grain Size Analysis Report

Date:

12-18-2018

Sample Name: MW-18-102

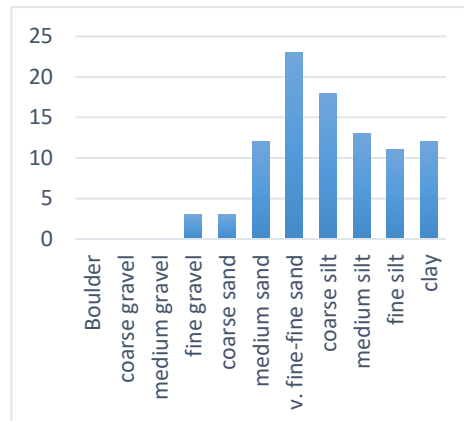
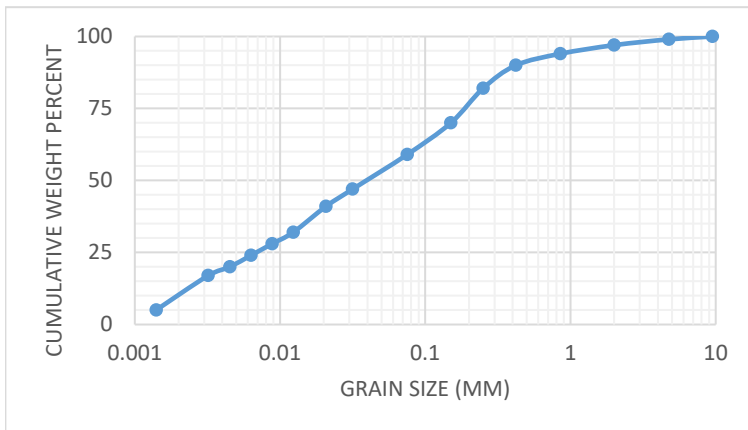
Mass Sample (g):

100

T (oC)

20

Poorly sorted sandy silt with fines



Sieve opening (ps) di (mm)	Mass of retained (mr) (g)	mass fraction (mf)	Percent Passing (pp)
9.5	0	0	100
4.75	1	0.01	99
2	2	0.02	97
0.85	3	0.03	94
0.42	4	0.04	90
0.25	8	0.08	82
0.15	12	0.12	70
0.075	11	0.11	59
0.0316	12	0.12	47
0.0207	6	0.06	41
0.0123	9	0.09	32
0.0088	4	0.04	28
0.0063	4	0.04	24
0.0045	4	0.04	20
0.0032	3	0.03	17
0.0014	12	0.12	5

Effective Grain Diameters (mm)		Other Useful Parameters	
d10	0.002	Uniformity Coef.	38.05
d17	0.003	n computed	0.26
d20	0.005	g (cm/s ²)	980.00
d50	0.042	ρ (g/cm ³)	0.9981
d60	0.082	μ (g/cm s)	0.0098
de (Kruger)	0.011	ρg/μ (1/cm s)	9.9327E+04
de (Kozeny)	0.008	tau (Sauerbrei)	1.053
de (Zunker)	0.008	d _{geometric mean}	0.052
de (Zamarin)	0.008	σ _φ	3.128
lo (Alyameni)	-0.008		
mm		0	% in sample
>64	Boulder		
16 - 64	coarse gravel		
8 - 16	medium gravel		0
2 - 8	fine gravel		3
0.5 - 2	coarse sand		3
0.25 - 0.5	medium sand		12
0.063 - 0.25	v. fine-fine sand		23
0.016 - 0.063	coarse silt		18
0.008 - 0.016	medium silt		13
0.002 - 0.008	fine silt		11
<0.002	clay		12



K from Grain Size Analysis Report

Date: 12-18-2018

Sample Name: MW-18-102

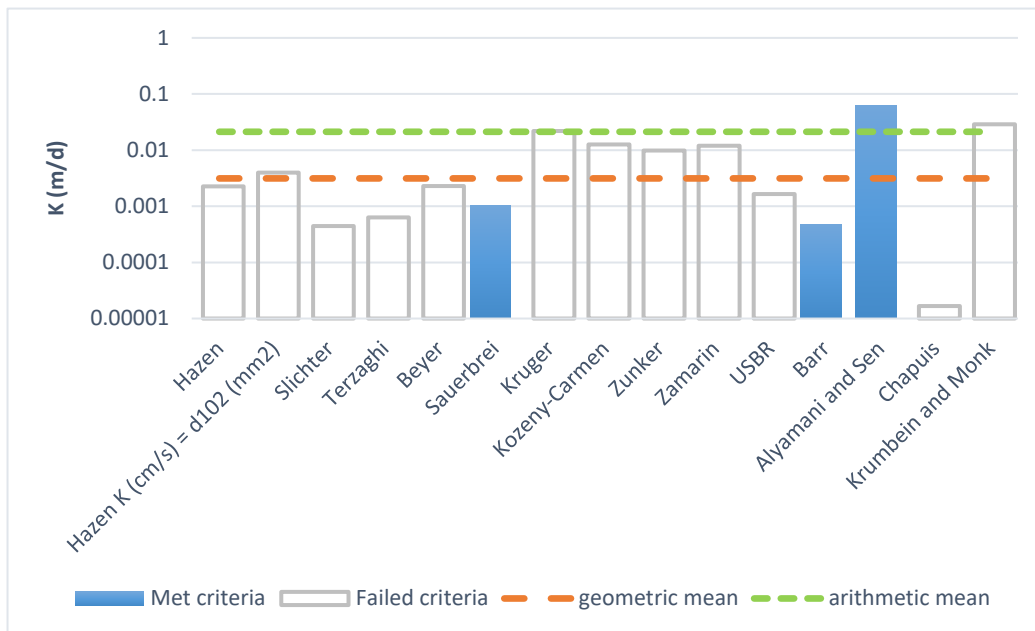
Mass Sample (g):

100

T (oC)

20

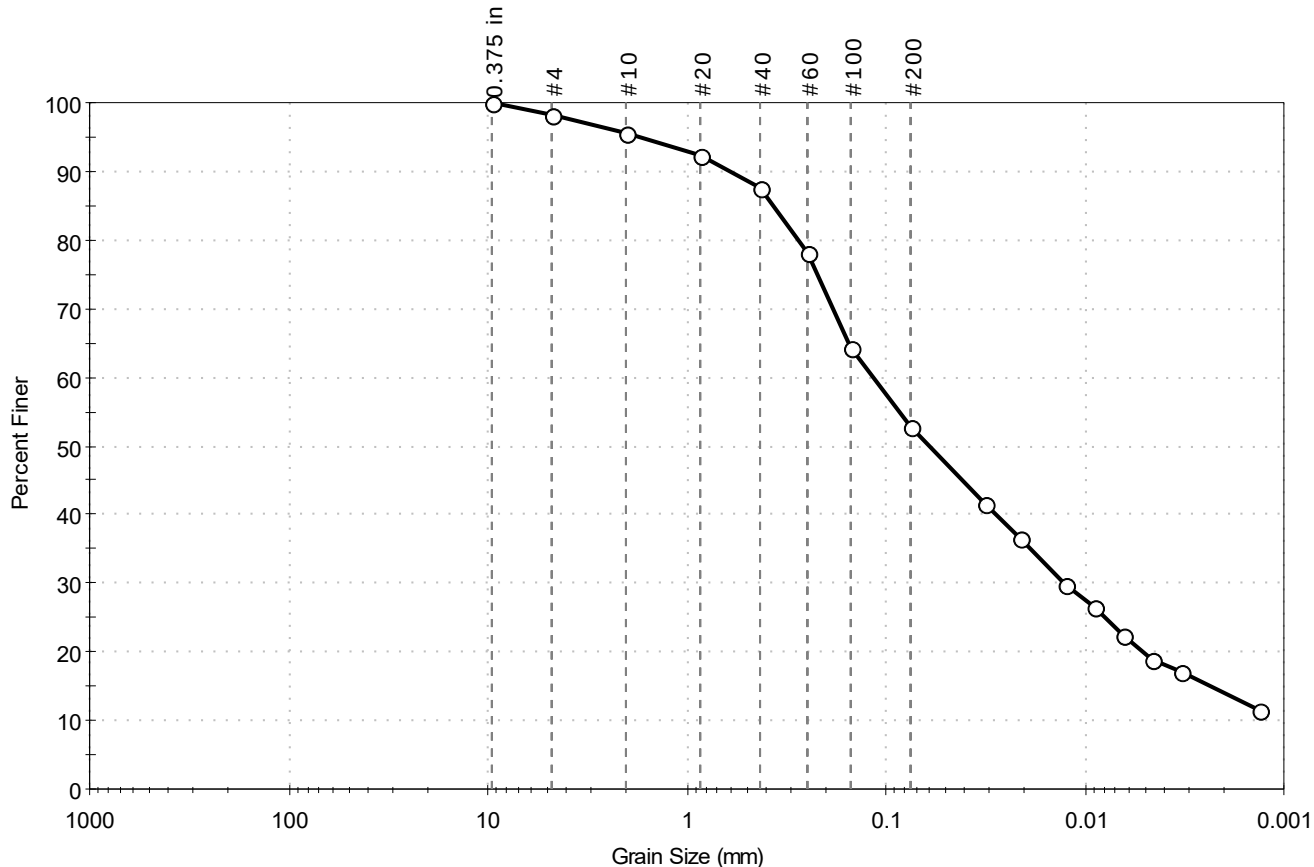
Poorly sorted sandy silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	.262E-05	.262E-07	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	.462E-05	.462E-07	0.00	
Slichter	.516E-06	.516E-08	0.00	
Terzaghi	.736E-06	.736E-08	0.00	
Beyer	.267E-05	.267E-07	0.00	
Sauerbrei	.120E-05	.120E-07	0.00	
Kruger	.255E-04	.255E-06	0.02	
Kozeny-Carmen	.147E-04	.147E-06	0.01	
Zunker	.114E-04	.114E-06	0.01	
Zamarin	.138E-04	.138E-06	0.01	
USBR	.191E-05	.191E-07	0.00	
Barr	.553E-06	.553E-08	0.00	
Alyamani and Sen	.720E-04	.720E-06	0.06	
Chapuis	.193E-07	.193E-09	0.00	
Krumbein and Monk	.336E-04	.336E-06	0.03	
geometric mean	.363E-05	.363E-07	0.00	
arithmetic mean	.246E-04	.246E-06	0.02	

Client: Merit Laboratories, Inc.	Project No: GTX-309371
Project: S98025	
Location:	
Boring ID: ---	Sample Type: bag
Sample ID: 98025.14	Test Date: 01/09/19
Depth: ---	Test Id: 488541
Test Comment: ---	Tested By: ckg
Visual Description: Moist, dark grayish brown sandy clay	Checked By: emm
Sample Comment: ---	

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	1.9	45.4	52.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	96		
#20	0.85	92		
#40	0.42	88		
#60	0.25	78		
#100	0.15	64		
#200	0.075	53		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0319	42		
---	0.0211	37		
---	0.0125	30		
---	0.0089	27		
---	0.0065	22		
---	0.0046	19		
---	0.0033	17		
---	0.0013	12		

Coefficients

$D_{85} = 0.3654 \text{ mm}$ $D_{30} = 0.0125 \text{ mm}$
 $D_{60} = 0.1162 \text{ mm}$ $D_{15} = 0.0023 \text{ mm}$
 $D_{50} = 0.0611 \text{ mm}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
 Sand/Gravel Hardness : ---
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #200 Sieve



Grain Size Analysis Report

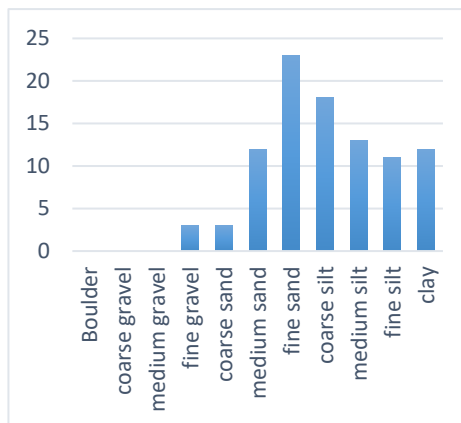
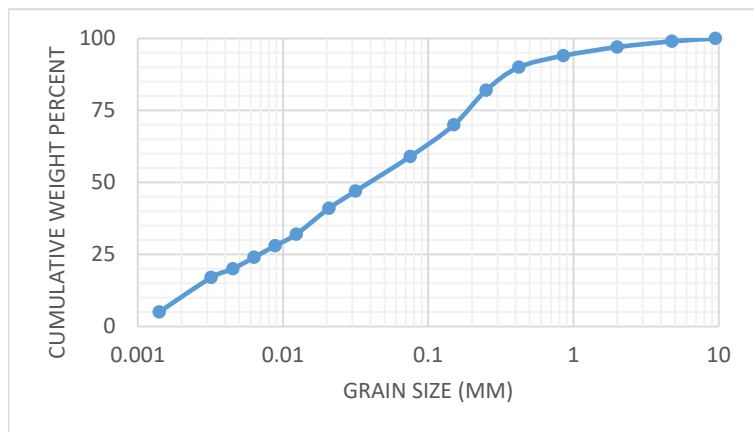
12-18-2018

Sample Name: MW-18-103

Mass Sample (g): 100

T (oC) 20

Poorly sorted sandy silt with fines



Sieve opening (ps) di (mm)	Mass of retained (mr) (g)	mass fraction (mf)	Percent Passing (pp)
9.5	0	0	100
4.75	1	0.01	99
2	2	0.02	97
0.85	3	0.03	94
0.42	4	0.04	90
0.25	8	0.08	82
0.15	12	0.12	70
0.075	11	0.11	59
0.0316	12	0.12	47
0.0207	6	0.06	41
0.0123	9	0.09	32
0.0088	4	0.04	28
0.0063	4	0.04	24
0.0045	4	0.04	20
0.0032	3	0.03	17
0.0014	12	0.12	5

Effective Grain Diameters (mm)		Other Useful Parameters	
d10	0.002	Uniformity Coef.	38.05
d17	0.003	n computed	0.26
d20	0.005	g (cm/s ²)	980.00
d50	0.042	ρ (g/cm ³)	0.9981
d60	0.082	μ (g/cm s)	0.0098
de (Krugger)	0.011	ρg/μ (1/cm s)	9.9327E+04
de (Kozeny)	0.008	tau (Sauerbrei)	1.053
de (Zunker)	0.008	d _{geometric mean}	0.052
de (Zamarin)	0.008	σ _φ	3.128
lo (Alyameni)	-0.008		
mm		0 % in sample	
>64		Boulder	
16 - 64		coarse gravel	
8 - 16		medium gravel	0
2 - 8		fine gravel	3
0.5 - 2		coarse sand	3
0.25 - 0.5		medium sand	12
0.063 - 0.25		fine sand	23
0.016 - 0.063		coarse silt	18
0.008 - 0.016		medium silt	13
0.002 - 0.008		fine silt	11
<0.002		clay	12



K from Grain Size Analysis Report

Date: 12-18-2018

Sample Name: MW-18-103

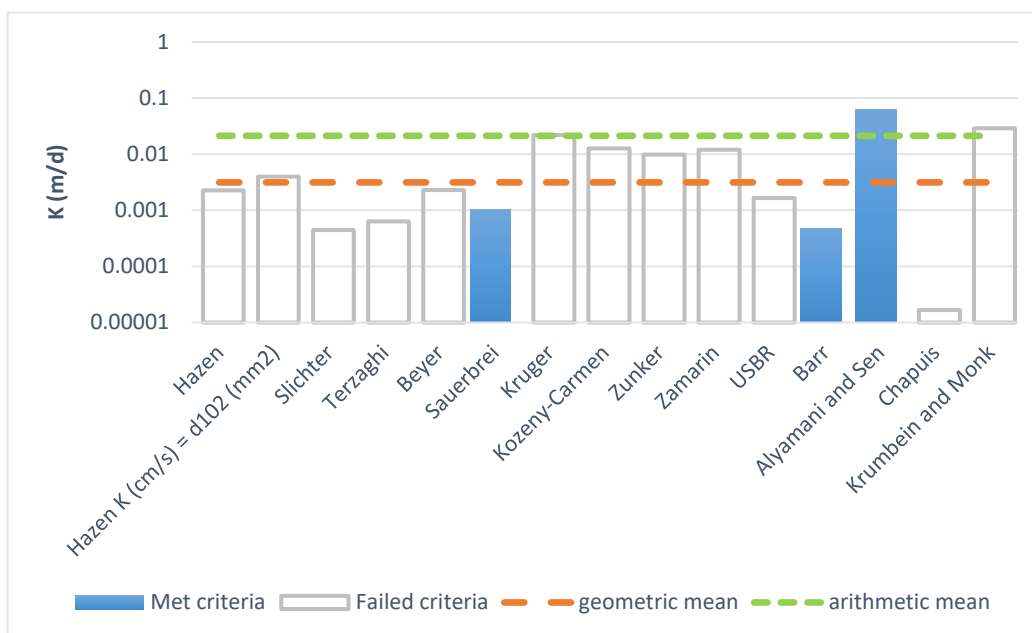
Mass Sample (g):

100

T (oC)

20

Poorly sorted sandy silt with fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	.262E-05	.262E-07	0.00	
Hazen K (cm/s) = d ₁₀ (mm)	.462E-05	.462E-07	0.00	
Slichter	.516E-06	.516E-08	0.00	
Terzaghi	.736E-06	.736E-08	0.00	
Beyer	.267E-05	.267E-07	0.00	
Sauerbrei	.120E-05	.120E-07	0.00	
Kruger	.255E-04	.255E-06	0.02	
Kozeny-Carmen	.147E-04	.147E-06	0.01	
Zunker	.114E-04	.114E-06	0.01	
Zamarin	.138E-04	.138E-06	0.01	
USBR	.191E-05	.191E-07	0.00	
Barr	.553E-06	.553E-08	0.00	
Alyamani and Sen	.720E-04	.720E-06	0.06	
Chapuis	.193E-07	.193E-09	0.00	
Krumbein and Monk	.336E-04	.336E-06	0.03	
geometric mean	.363E-05	.363E-07	0.00	
arithmetic mean	.246E-04	.246E-06	0.02	

ATTACHMENT 4

TOP Assay Laboratory Analytical Report



Attachment 4
TOP Assay Groundwater Analytical Results
RACER Trust Plant 3 - Lansing, Michigan



Sample Location: Sample Date:		CH-14-RO 5/20/2019	
Poly- and Perfluorinated Alkyl Substances	Units	Pre-treatment*	Post-treatment*
4:2 FTS	ng/l	<500	<500
6:2FTS	ng/l	<500	<500
8:2FTS	ng/l	<500	<500
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	ng/l	<500	<500
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	ng/l	<500	<500
Perfluorobutanesulfonic acid (PFBS)	ng/l	250	290
Perfluorobutanoic acid (PFBA)	ng/l	<50	55 B
Perfluorodecanesulfonic acid (PFDS)	ng/l	<50	<50
Perfluorodecanoic acid (PFDA)	ng/l	<50	<50
Perfluorododecanoic acid (PFDoA)	ng/l	<50	<50
Perfluoroheptanesulfonic Acid (PFHpS)	ng/l	530	440
Perfluoroheptanoic acid (PFHpA)	ng/l	<50	<51
Perfluorohexanesulfonic acid (PFHxS)	ng/l	3,000	2,800
Perfluorohexanoic acid (PFHxA)	ng/l	73	120
Perfluorononanesulfonic acid (PFNS)	ng/l	<50	<50
Perfluorononanoic acid (PFNA)	ng/l	<50	<50
Perfluorooctane Sulfonamide (FOSA)	ng/l	<400	<400
Perfluorooctane sulfonic acid (PFOS)	ng/l	16,000	13,000
Perfluorooctanoic acid (PFOA)	ng/l	140	130
Perfluoropentanesulfonic acid (PFPeS)	ng/l	630	650
Perfluoropentanoic acid (PFPeA)	ng/l	<50	<50
Perfluorotetradecanoic acid (PFTeA)	ng/l	<50	<50
Perfluorotridecanoic Acid (PFTriA)	ng/l	<50	<50
Perfluoroundecanoic acid (PFUnA)	ng/l	<50	<50
Total PFAS	ng/l	21,000	17,000

Samples were analyzed by Eurofins TestAmerica, Canton

Notes:

* - samples subjected to total oxidizable precursor (TOP) assay treatment

B = Compounds also found in associated method blank

ng/l = nanograms per liter

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-113072-1
Client Project/Site: Racer Lansing

For:
ARCADIS U.S., Inc.
10559 Citation Drive
Suite 100
Brighton, Michigan 48116

Attn: Amber Dmytro



Authorized for release by:
6/13/2019 5:00:13 PM

Michael DelMonico, Project Manager I
(330)497-9396
michael.delmonico@testamericainc.com

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www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Qualifiers

LCMS

Qualifier	Qualifier Description
*	Isotope Dilution analyte is outside acceptance limits.
B	Compound was found in the blank and sample.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
□	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Job ID: 240-113072-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

CASE NARRATIVE

Client: ARCADIS U.S., Inc.

Project: Racer Lansing

Report Number: 240-113072-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, Canton attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

All analyses in this report were performed at the Eurofins TestAmerica, Sacramento laboratory.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 5/22/2019 9:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.2° C.

EPA 537 MODIFIED

Samples MW-14-62_052019 (240-113072-1), P6-SB-07_052019 (240-113072-2) and CH-14-RO_052019 (240-113072-3) were analyzed for EPA 537 Modified in accordance with EPA 537. The samples were prepared on 06/01/2019 and analyzed on 06/04/2019 and 06/07/2019.

Perfluorobutanoic acid (PFBA) was detected in method blank MB 320-298518/1-A at a level exceeding the reporting limit. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Refer to the QC report for details.

Samples CH-14-RO_052019 (240-113072-3)[10X] and CH-14-RO_052019 (240-113072-3)[20X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

Sample container is non standard, normal volume is 250ml, container is approximately 125ml: MW-14-62_052019 (240-113072-1), P6-SB-07_052019 (240-113072-2) and CH-14-RO_052019 (240-113072-3).

Case Narrative

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Job ID: 240-113072-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

The labeled analyte M2-4:2FTS is employed in this analysis as a "Reverse Surrogate". It is used to monitor the oxidation efficiency of the TOP assay. This analyte is fortified into all sample fractions prior to any processing. The recovery of this analyte should be 0% in Post-Treatment fractions, indicating complete oxidation of the sample.

The labeled analyte M2-4:2FTS is converted to PFBA during the oxidation step of the TOP assay. The PFBA result in the Post-Treatment Method Blank (MB) indicates how much of a field sample's Post-Treatment PFBA result is contributed by the Reverse Surrogate, when adjusted for dilution factors.

Zero percent recovery of precursor analytes (4:2FTS, 6:2FTS, 8:2FTS, FOSA, NMeFOSAA, and NEtFOSAA) and enhanced recoveries of PFCAs is observed in the Post-Treatment Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) associated with these samples, consistent with the expected oxidation of precursor analytes.

The reverse surrogate, M2-4:2FTS, recovery in the following Pre-Treatment sample was above control limits: MW-14-62_052019 (240-113072-1). This sample was re-analyzed with concurring results and the original set of data was reported. As this analyte is used to monitor the oxidation efficiency in the Post-treatment fraction, there is no adverse impact to the data.

Results for pre- and post-treatment sample CH-14-RO_052019 (240-113072-3) were reported from the analysis of a diluted extract due to high concentration of the target analyte and matrix interferences in the analysis of the undiluted extract. The dilution factor was applied to the labeled internal standard area counts and these area counts were within acceptance limits.

Sample and extract are bright yellow: CH-14-RO_052019 (240-113072-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PFCA DIFFERENCE

Samples MW-14-62_052019 (240-113072-1), P6-SB-07_052019 (240-113072-2) and CH-14-RO_052019 (240-113072-3) were analyzed for PFCA Difference in accordance with TALS SOP PFCA. The samples were analyzed on 06/13/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TOTAL PFCA

Samples MW-14-62_052019 (240-113072-1), P6-SB-07_052019 (240-113072-2) and CH-14-RO_052019 (240-113072-3) were analyzed for Total PFCA in accordance with TALS SOP PFCA. The samples were analyzed on 06/13/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SUM OF TOTAL PFCA

Samples MW-14-62_052019 (240-113072-1), P6-SB-07_052019 (240-113072-2) and CH-14-RO_052019 (240-113072-3) were analyzed for Sum of total PFCA in accordance with TAL SOP for Total PFCA. The samples were analyzed on 06/13/2019.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method	Method Description	Protocol	Laboratory
537 (modified)	Fluorinated Alkyl Substances	EPA	TAL SAC
Total PFCA-Dif	Total PFCA (Treatment Difference)	TAL SOP	TAL SAC
Total PFCA-Sum	Total PFCA (Summary)	TAL SOP	TAL SAC
TOP Post Prep	Solid-Phase Extraction (SPE)	SW846	TAL SAC
TOP Pre - Prep	Solid-Phase Extraction (SPE)	SW846	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-113072-1	MW-14-62_052019	Water	05/20/19 11:30	05/22/19 09:45	
240-113072-2	P6-SB-07_052019	Water	05/20/19 14:05	05/22/19 09:45	
240-113072-3	CH-14-RO_052019	Water	05/20/19 16:20	05/22/19 09:45	

Detection Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: MW-14-62_052019

Lab Sample ID: 240-113072-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	14		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluoropentanoic acid (PFPeA)	15		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorohexanoic acid (PFHxA)	21		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluoroheptanoic acid (PFHpA)	22		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorooctanoic acid (PFOA)	67		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorononanoic acid (PFNA)	11		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorohexanesulfonic acid (PFHxS)	8.4		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorooctanesulfonic acid (PFOS)	71		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorobutanoic acid (PFBA)	31	B	5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluoropentanoic acid (PFPeA)	24		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorohexanoic acid (PFHxA)	31		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluoroheptanoic acid (PFHpA)	24		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorooctanoic acid (PFOA)	61		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorononanoic acid (PFNA)	9.0		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorohexanesulfonic acid (PFHxS)	8.4		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorooctanesulfonic acid (PFOS)	49		5.0		ng/L	1		537 (modified)	Post-Treatment
PFBA	16				ng/L	1		Total PFCA-Dif	Total/NA
PFPA	8.1				ng/L	1		Total PFCA-Dif	Total/NA
PFHxA	11				ng/L	1		Total PFCA-Dif	Total/NA
PFHpA	2.5				ng/L	1		Total PFCA-Dif	Total/NA
PFOA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
PFNA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
Total PFCA	30				ng/L	1		Total PFCA-Dif	Total/NA
PFBA	14		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFPA	15		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFHxA	21		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFHpA	22		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFOA	67		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFNA	11		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
Total PFCA	150				ng/L	1		Total PFCA-Sum	Pre-Treatment
PFBA	31	B	5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFPA	24		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Canton

Detection Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: MW-14-62_052019 (Continued)

Lab Sample ID: 240-113072-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
PFHxA	31		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFHpA	24		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFOA	61		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFNA	9.0		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
Total PFCA	180				ng/L	1		Total PFCA-Sum	Post-Treatment

Client Sample ID: P6-SB-07_052019

Lab Sample ID: 240-113072-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	240		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluoropentanoic acid (PFPeA)	790		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorohexanoic acid (PFHxA)	860		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluoroheptanoic acid (PFHpA)	640		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorooctanoic acid (PFOA)	790		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorononanoic acid (PFNA)	110		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorodecanoic acid (PFDA)	31		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorooctanesulfonic acid (PFOS)	49		5.0		ng/L	1		537 (modified)	Pre-Treatment
Perfluorobutanoic acid (PFBA)	340	B	5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluoropentanoic acid (PFPeA)	900		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorohexanoic acid (PFHxA)	900		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluoroheptanoic acid (PFHpA)	670		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorooctanoic acid (PFOA)	760		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorononanoic acid (PFNA)	100		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorodecanoic acid (PFDA)	30		5.0		ng/L	1		537 (modified)	Post-Treatment
Perfluorooctanesulfonic acid (PFOS)	42		5.0		ng/L	1		537 (modified)	Post-Treatment
PFBA	100				ng/L	1		Total PFCA-Dif	Total/NA
PFPA	110				ng/L	1		Total PFCA-Dif	Total/NA
PFHxA	40				ng/L	1		Total PFCA-Dif	Total/NA
PFHpA	29				ng/L	1		Total PFCA-Dif	Total/NA
PFOA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
PFNA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
Total PFCA	240				ng/L	1		Total PFCA-Dif	Total/NA
PFBA	240		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFPA	790		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Canton

Detection Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: P6-SB-07_052019 (Continued)

Lab Sample ID: 240-113072-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
PFHxA	860		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFHpA	640		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFOA	790		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
PFNA	110		5.0		ng/L	1		Total PFCA-Sum	Pre-Treatment
Total PFCA	3400				ng/L	1		Total PFCA-Sum	Pre-Treatment
PFBA	340	B	5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFPA	900		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFHxA	900		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFHpA	670		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFOA	760		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
PFNA	100		5.0		ng/L	1		Total PFCA-Sum	Post-Treatment
Total PFCA	3700				ng/L	1		Total PFCA-Sum	Post-Treatment

Client Sample ID: CH-14-RO_052019

Lab Sample ID: 240-113072-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanoic acid (PFHxA)	73		50		ng/L	10		537 (modified)	Pre-Treatment
Perfluorooctanoic acid (PFOA)	140		50		ng/L	10		537 (modified)	Pre-Treatment
Perfluorobutanesulfonic acid (PFBS)	250		50		ng/L	10		537 (modified)	Pre-Treatment
Perfluoropentanesulfonic acid (PFPeS)	630		50		ng/L	10		537 (modified)	Pre-Treatment
Perfluorohexanesulfonic acid (PFHxS)	3000		50		ng/L	10		537 (modified)	Pre-Treatment
Perfluoroheptanesulfonic Acid (PFHpS)	530		50		ng/L	10		537 (modified)	Pre-Treatment
Perfluorooctanesulfonic acid (PFOS) - DL	16000		250		ng/L	50		537 (modified)	Pre-Treatment
Perfluorobutanoic acid (PFBA)	55	B	50		ng/L	10		537 (modified)	Post-Treatment
Perfluorohexanoic acid (PFHxA)	120		50		ng/L	10		537 (modified)	Post-Treatment
Perfluorooctanoic acid (PFOA)	130		50		ng/L	10		537 (modified)	Post-Treatment
Perfluorobutanesulfonic acid (PFBS)	290		50		ng/L	10		537 (modified)	Post-Treatment
Perfluoropentanesulfonic acid (PFPeS)	650		50		ng/L	10		537 (modified)	Post-Treatment
Perfluorohexanesulfonic acid (PFHxS)	2800		50		ng/L	10		537 (modified)	Post-Treatment
Perfluoroheptanesulfonic Acid (PFHpS)	440		50		ng/L	10		537 (modified)	Post-Treatment
Perfluorooctanesulfonic acid (PFOS) - DL	13000		100		ng/L	20		537 (modified)	Post-Treatment

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Canton

Detection Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: CH-14-RO_052019 (Continued)

Lab Sample ID: 240-113072-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
PFBA	55				ng/L	1		Total PFCA-Dif	Total/NA
PFPA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
PFHxA	44				ng/L	1		Total PFCA-Dif	Total/NA
PFHpA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
PFOA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
PFNA	0.00				ng/L	1		Total PFCA-Dif	Total/NA
Total PFCA	92				ng/L	1		Total PFCA-Dif	Total/NA
PFHxA	73		50		ng/L	1		Total PFCA-Sum	Pre-Treatme nt
PFOA	140		50		ng/L	1		Total PFCA-Sum	Pre-Treatme nt
Total PFCA	210				ng/L	1		Total PFCA-Sum	Pre-Treatme nt
PFBA	55 B		50		ng/L	1		Total PFCA-Sum	Post-Treatme nt
PFHxA	120		50		ng/L	1		Total PFCA-Sum	Post-Treatme nt
PFOA	130		50		ng/L	1		Total PFCA-Sum	Post-Treatme nt
Total PFCA	310				ng/L	1		Total PFCA-Sum	Post-Treatme nt

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: MW-14-62_052019

Lab Sample ID: 240-113072-1

Date Collected: 05/20/19 11:30

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Pre-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	14		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluoropentanoic acid (PFPeA)	15		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorohexanoic acid (PFHxA)	21		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluoroheptanoic acid (PFHpA)	22		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorooctanoic acid (PFOA)	67		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorononanoic acid (PFNA)	11		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorodecanoic acid (PFDA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluoroundecanoic acid (PFUnA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorododecanoic acid (PFDoA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorotridecanoic acid (PFTriA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorotetradecanoic acid (PFTeA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorobutanesulfonic acid (PFBS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluoropentanesulfonic acid (PFPeS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorohexanesulfonic acid (PFHxS)	8.4		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorooctanesulfonic acid (PFOS)	71		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorononanesulfonic acid (PFNS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorodecanesulfonic acid (PFDS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:35	1
Perfluorooctanesulfonamide (FOSA)	ND		40		ng/L		06/01/19 09:52	06/04/19 21:35	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		50		ng/L		06/01/19 09:52	06/04/19 21:35	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		50		ng/L		06/01/19 09:52	06/04/19 21:35	1
4:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:35	1
6:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:35	1
8:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:35	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	47		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C5 PFPeA	92		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C2 PFHxA	99		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C4 PFHpA	94		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C4 PFOA	96		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C5 PFNA	94		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C2 PFDA	103		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C2 PFUnA	110		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C2 PFDoA	99		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C2 PFTeDA	105		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C3 PFBS	97		25 - 150	06/01/19 09:52	06/04/19 21:35	1
18O2 PFHxS	84		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C4 PFOS	88		25 - 150	06/01/19 09:52	06/04/19 21:35	1
13C8 FOSA	82		25 - 150	06/01/19 09:52	06/04/19 21:35	1
d3-NMeFOSAA	101		25 - 150	06/01/19 09:52	06/04/19 21:35	1
d5-NEtFOSAA	100		25 - 150	06/01/19 09:52	06/04/19 21:35	1
M2-6:2 FTS	127		25 - 150	06/01/19 09:52	06/04/19 21:35	1
M2-8:2 FTS	108		25 - 150	06/01/19 09:52	06/04/19 21:35	1
M2-4:2 FTS	177	*	25 - 150	06/01/19 09:52	06/04/19 21:35	1

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: MW-14-62_052019

Lab Sample ID: 240-113072-1

Date Collected: 05/20/19 11:30

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Post-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	31	B	5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluoropentanoic acid (PFPeA)	24		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorohexanoic acid (PFHxA)	31		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluoroheptanoic acid (PFHpA)	24		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorooctanoic acid (PFOA)	61		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorononanoic acid (PFNA)	9.0		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorodecanoic acid (PFDA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluoroundecanoic acid (PFUnA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorododecanoic acid (PFDoA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorotridecanoic acid (PFTriA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorotetradecanoic acid (PFTeA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorobutanesulfonic acid (PFBS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluoropentanesulfonic acid (PFPeS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorohexanesulfonic acid (PFHxS)	8.4		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorooctanesulfonic acid (PFOS)	49		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorononanesulfonic acid (PFNS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorodecanesulfonic acid (PFDS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:47	1
Perfluorooctanesulfonamide (FOSA)	ND		40		ng/L		06/01/19 09:55	06/04/19 22:47	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		50		ng/L		06/01/19 09:55	06/04/19 22:47	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		50		ng/L		06/01/19 09:55	06/04/19 22:47	1
4:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:47	1
6:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:47	1
8:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:47	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	84		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C5 PFPeA	92		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C2 PFHxA	93		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C4 PFHpA	90		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C4 PFOA	96		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C5 PFNA	99		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C2 PFDA	98		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C2 PFUnA	102		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C2 PFDoA	97		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C2 PFTeDA	107		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C3 PFBS	96		25 - 150	06/01/19 09:55	06/04/19 22:47	1
18O2 PFHxS	81		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C4 PFOS	93		25 - 150	06/01/19 09:55	06/04/19 22:47	1
13C8 FOSA	82		25 - 150	06/01/19 09:55	06/04/19 22:47	1
d3-NMeFOSAA	90		25 - 150	06/01/19 09:55	06/04/19 22:47	1
d5-NEtFOSAA	105		25 - 150	06/01/19 09:55	06/04/19 22:47	1
M2-6:2 FTS	112		25 - 150	06/01/19 09:55	06/04/19 22:47	1
M2-8:2 FTS	108		25 - 150	06/01/19 09:55	06/04/19 22:47	1
M2-4:2 FTS	0		0 - 10	06/01/19 09:55	06/04/19 22:47	1

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: MW-14-62_052019

Lab Sample ID: 240-113072-1

Date Collected: 05/20/19 11:30

Matrix: Water

Date Received: 05/22/19 09:45

Method: Total PFCA-Dif - Total PFCA (Treatment Difference)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	16				ng/L			06/13/19 10:22	1
PFPA	8.1				ng/L			06/13/19 10:22	1
PFHxA	11				ng/L			06/13/19 10:22	1
PFHpA	2.5				ng/L			06/13/19 10:22	1
PFOA	0.00				ng/L			06/13/19 10:22	1
PFNA	0.00				ng/L			06/13/19 10:22	1
Total PFCA	30				ng/L			06/13/19 10:22	1

Method: Total PFCA-Sum - Total PFCA (Summary) - Pre-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	14		5.0		ng/L			06/13/19 10:17	1
PFPA	15		5.0		ng/L			06/13/19 10:17	1
PFHxA	21		5.0		ng/L			06/13/19 10:17	1
PFHpA	22		5.0		ng/L			06/13/19 10:17	1
PFOA	67		5.0		ng/L			06/13/19 10:17	1
PFNA	11		5.0		ng/L			06/13/19 10:17	1
Total PFCA	150				ng/L			06/13/19 10:17	1

Method: Total PFCA-Sum - Total PFCA (Summary) - Post-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	31	B	5.0		ng/L			06/13/19 10:19	1
PFPA	24		5.0		ng/L			06/13/19 10:19	1
PFHxA	31		5.0		ng/L			06/13/19 10:19	1
PFHpA	24		5.0		ng/L			06/13/19 10:19	1
PFOA	61		5.0		ng/L			06/13/19 10:19	1
PFNA	9.0		5.0		ng/L			06/13/19 10:19	1
Total PFCA	180				ng/L			06/13/19 10:19	1

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: P6-SB-07_052019

Lab Sample ID: 240-113072-2

Date Collected: 05/20/19 14:05

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Pre-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	240		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluoropentanoic acid (PFPeA)	790		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorohexanoic acid (PFHxA)	860		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluoroheptanoic acid (PFHpA)	640		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorooctanoic acid (PFOA)	790		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorononanoic acid (PFNA)	110		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorodecanoic acid (PFDA)	31		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluoroundecanoic acid (PFUnA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorododecanoic acid (PFDoA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorotridecanoic acid (PFTriA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorotetradecanoic acid (PFTeA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorobutanesulfonic acid (PFBS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluoropentanesulfonic acid (PFPeS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorohexanesulfonic acid (PFHxS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorooctanesulfonic acid (PFOS)	49		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorononanesulfonic acid (PFNS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorodecanesulfonic acid (PFDS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:43	1
Perfluorooctanesulfonamide (FOSA)	ND		40		ng/L		06/01/19 09:52	06/04/19 21:43	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		50		ng/L		06/01/19 09:52	06/04/19 21:43	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		50		ng/L		06/01/19 09:52	06/04/19 21:43	1
4:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:43	1
6:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:43	1
8:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:43	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	76		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C5 PFPeA	84		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C2 PFHxA	90		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C4 PFHpA	92		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C4 PFOA	93		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C5 PFNA	96		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C2 PFDA	99		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C2 PFUnA	105		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C2 PFDoA	103		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C2 PFTeDA	111		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C3 PFBS	91		25 - 150	06/01/19 09:52	06/04/19 21:43	1
18O2 PFHxS	81		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C4 PFOS	94		25 - 150	06/01/19 09:52	06/04/19 21:43	1
13C8 FOSA	76		25 - 150	06/01/19 09:52	06/04/19 21:43	1
d3-NMeFOSAA	90		25 - 150	06/01/19 09:52	06/04/19 21:43	1
d5-NEtFOSAA	103		25 - 150	06/01/19 09:52	06/04/19 21:43	1
M2-6:2 FTS	103		25 - 150	06/01/19 09:52	06/04/19 21:43	1
M2-8:2 FTS	94		25 - 150	06/01/19 09:52	06/04/19 21:43	1
M2-4:2 FTS	124		25 - 150	06/01/19 09:52	06/04/19 21:43	1

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: P6-SB-07_052019

Lab Sample ID: 240-113072-2

Date Collected: 05/20/19 14:05

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Post-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	340	B	5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluoropentanoic acid (PFPeA)	900		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorohexanoic acid (PFHxA)	900		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluoroheptanoic acid (PFHpA)	670		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorooctanoic acid (PFOA)	760		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorononanoic acid (PFNA)	100		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorodecanoic acid (PFDA)	30		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluoroundecanoic acid (PFUnA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorododecanoic acid (PFDoA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorotridecanoic acid (PFTriA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorotetradecanoic acid (PFTeA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorobutanesulfonic acid (PFBS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluoropentanesulfonic acid (PFPeS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorohexanesulfonic acid (PFHxS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorooctanesulfonic acid (PFOS)	42		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorononanesulfonic acid (PFNS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorodecanesulfonic acid (PFDS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:55	1
Perfluorooctanesulfonamide (FOSA)	ND		40		ng/L		06/01/19 09:55	06/04/19 22:55	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		50		ng/L		06/01/19 09:55	06/04/19 22:55	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		50		ng/L		06/01/19 09:55	06/04/19 22:55	1
4:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:55	1
6:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:55	1
8:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:55	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	82		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C5 PFPeA	88		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C2 PFHxA	92		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C4 PFHpA	91		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C4 PFOA	93		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C5 PFNA	104		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C2 PFDA	103		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C2 PFUnA	107		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C2 PFDoA	97		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C2 PFTeDA	108		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C3 PFBS	96		25 - 150	06/01/19 09:55	06/04/19 22:55	1
18O2 PFHxS	87		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C4 PFOS	97		25 - 150	06/01/19 09:55	06/04/19 22:55	1
13C8 FOSA	79		25 - 150	06/01/19 09:55	06/04/19 22:55	1
d3-NMeFOSAA	99		25 - 150	06/01/19 09:55	06/04/19 22:55	1
d5-NEtFOSAA	102		25 - 150	06/01/19 09:55	06/04/19 22:55	1
M2-6:2 FTS	104		25 - 150	06/01/19 09:55	06/04/19 22:55	1
M2-8:2 FTS	109		25 - 150	06/01/19 09:55	06/04/19 22:55	1
M2-4:2 FTS	0		0 - 10	06/01/19 09:55	06/04/19 22:55	1

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: P6-SB-07_052019

Lab Sample ID: 240-113072-2

Date Collected: 05/20/19 14:05

Matrix: Water

Date Received: 05/22/19 09:45

Method: Total PFCA-Dif - Total PFCA (Treatment Difference)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	100				ng/L			06/13/19 10:22	1
PFPA	110				ng/L			06/13/19 10:22	1
PFHxA	40				ng/L			06/13/19 10:22	1
PFHpA	29				ng/L			06/13/19 10:22	1
PFOA	0.00				ng/L			06/13/19 10:22	1
PFNA	0.00				ng/L			06/13/19 10:22	1
Total PFCA	240				ng/L			06/13/19 10:22	1

Method: Total PFCA-Sum - Total PFCA (Summary) - Pre-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	240		5.0		ng/L			06/13/19 10:17	1
PFPA	790		5.0		ng/L			06/13/19 10:17	1
PFHxA	860		5.0		ng/L			06/13/19 10:17	1
PFHpA	640		5.0		ng/L			06/13/19 10:17	1
PFOA	790		5.0		ng/L			06/13/19 10:17	1
PFNA	110		5.0		ng/L			06/13/19 10:17	1
Total PFCA	3400				ng/L			06/13/19 10:17	1

Method: Total PFCA-Sum - Total PFCA (Summary) - Post-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	340	B	5.0		ng/L			06/13/19 10:19	1
PFPA	900		5.0		ng/L			06/13/19 10:19	1
PFHxA	900		5.0		ng/L			06/13/19 10:19	1
PFHpA	670		5.0		ng/L			06/13/19 10:19	1
PFOA	760		5.0		ng/L			06/13/19 10:19	1
PFNA	100		5.0		ng/L			06/13/19 10:19	1
Total PFCA	3700				ng/L			06/13/19 10:19	1

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: CH-14-RO_052019

Lab Sample ID: 240-113072-3

Date Collected: 05/20/19 16:20

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Pre-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluoropentanoic acid (PFPeA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorohexanoic acid (PFHxA)	73		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluoroheptanoic acid (PFHpA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorooctanoic acid (PFOA)	140		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorononanoic acid (PFNA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorodecanoic acid (PFDA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluoroundecanoic acid (PFUnA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorododecanoic acid (PFDoA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorotridecanoic acid (PFTriA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorotetradecanoic acid (PFTeA)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorobutanesulfonic acid (PFBS)	250		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluoropentanesulfonic acid (PFPeS)	630		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorohexanesulfonic acid (PFHxS)	3000		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluoroheptanesulfonic Acid (PFHpS)	530		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorononanesulfonic acid (PFNS)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorodecanesulfonic acid (PFDS)	ND		50		ng/L		06/01/19 09:52	06/07/19 02:29	10
Perfluorooctanesulfonamide (FOSA)	ND		400		ng/L		06/01/19 09:52	06/07/19 02:29	10
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		500		ng/L		06/01/19 09:52	06/07/19 02:29	10
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		500		ng/L		06/01/19 09:52	06/07/19 02:29	10
4:2 FTS	ND		500		ng/L		06/01/19 09:52	06/07/19 02:29	10
6:2 FTS	ND		500		ng/L		06/01/19 09:52	06/07/19 02:29	10
8:2 FTS	ND		500		ng/L		06/01/19 09:52	06/07/19 02:29	10

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	125		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C5 PFPeA	133		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C2 PFHxA	133		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C4 PFHpA	118		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C4 PFOA	89		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C5 PFNA	115		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C2 PFDA	120		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C2 PFUnA	124		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C2 PFDoA	116		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C2 PFTeDA	114		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C3 PFBS	137		25 - 150	06/01/19 09:52	06/07/19 02:29	10
18O2 PFHxS	121		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C4 PFOS	116		25 - 150	06/01/19 09:52	06/07/19 02:29	10
13C8 FOSA	111		25 - 150	06/01/19 09:52	06/07/19 02:29	10
d3-NMeFOSAA	127		25 - 150	06/01/19 09:52	06/07/19 02:29	10
d5-NEtFOSAA	127		25 - 150	06/01/19 09:52	06/07/19 02:29	10
M2-6:2 FTS	68		25 - 150	06/01/19 09:52	06/07/19 02:29	10
M2-8:2 FTS	86		25 - 150	06/01/19 09:52	06/07/19 02:29	10
M2-4:2 FTS	100		25 - 150	06/01/19 09:52	06/07/19 02:29	10

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: CH-14-RO_052019

Lab Sample ID: 240-113072-3

Date Collected: 05/20/19 16:20

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Pre-Treatment - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	16000		250		ng/L		06/01/19 09:52	06/07/19 02:21	50
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFOS	98		25 - 150				06/01/19 09:52	06/07/19 02:21	50

Method: 537 (modified) - Fluorinated Alkyl Substances - Post-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	55	B	50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluoropentanoic acid (PFPeA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorohexanoic acid (PFHxA)	120		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluoroheptanoic acid (PFHpA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorooctanoic acid (PFOA)	130		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorononanoic acid (PFNA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorodecanoic acid (PFDA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluoroundecanoic acid (PFUnA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorododecanoic acid (PFDoA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorotridecanoic acid (PFTriA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorotetradecanoic acid (PFTeA)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorobutanesulfonic acid (PFBS)	290		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluoropentanesulfonic acid (PFPeS)	650		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorohexanesulfonic acid (PFHxS)	2800		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluoroheptanesulfonic Acid (PFHpS)	440		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorononanesulfonic acid (PFNS)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorodecanesulfonic acid (PFDS)	ND		50		ng/L		06/01/19 09:55	06/07/19 03:01	10
Perfluorooctanesulfonamide (FOSA)	ND		400		ng/L		06/01/19 09:55	06/07/19 03:01	10
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		500		ng/L		06/01/19 09:55	06/07/19 03:01	10
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		500		ng/L		06/01/19 09:55	06/07/19 03:01	10
4:2 FTS	ND		500		ng/L		06/01/19 09:55	06/07/19 03:01	10
6:2 FTS	ND		500		ng/L		06/01/19 09:55	06/07/19 03:01	10
8:2 FTS	ND		500		ng/L		06/01/19 09:55	06/07/19 03:01	10
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFBA	114		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C5 PFPeA	125		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C2 PFHxA	120		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C4 PFHpA	112		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C4 PFOA	92		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C5 PFNA	125		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C2 PFDA	130		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C2 PFUnA	121		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C2 PFDoA	119		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C2 PFTeDA	109		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C3 PFBS	120		25 - 150				06/01/19 09:55	06/07/19 03:01	10
18O2 PFHxS	115		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C4 PFOS	110		25 - 150				06/01/19 09:55	06/07/19 03:01	10
13C8 FOSA	109		25 - 150				06/01/19 09:55	06/07/19 03:01	10

Eurofins TestAmerica, Canton

Client Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: CH-14-RO_052019

Lab Sample ID: 240-113072-3

Date Collected: 05/20/19 16:20

Matrix: Water

Date Received: 05/22/19 09:45

Method: 537 (modified) - Fluorinated Alkyl Substances - Post-Treatment (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d3-NMeFOSAA	132		25 - 150	06/01/19 09:55	06/07/19 03:01	10
d5-NEtFOSAA	120		25 - 150	06/01/19 09:55	06/07/19 03:01	10
M2-6:2 FTS	88		25 - 150	06/01/19 09:55	06/07/19 03:01	10
M2-8:2 FTS	114		25 - 150	06/01/19 09:55	06/07/19 03:01	10
M2-4:2 FTS	0		0 - 10	06/01/19 09:55	06/07/19 03:01	10

Method: 537 (modified) - Fluorinated Alkyl Substances - Post-Treatment - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanesulfonic acid (PFOS)	13000		100		ng/L	-	06/01/19 09:55	06/07/19 02:53	20
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C4 PFOS	96		25 - 150				06/01/19 09:55	06/07/19 02:53	20

Method: Total PFCA-Dif - Total PFCA (Treatment Difference)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	55				ng/L			06/13/19 10:22	1
PFPA	0.00				ng/L			06/13/19 10:22	1
PFHxA	44				ng/L			06/13/19 10:22	1
PFHpA	0.00				ng/L			06/13/19 10:22	1
PFOA	0.00				ng/L			06/13/19 10:22	1
PFNA	0.00				ng/L			06/13/19 10:22	1
Total PFCA	92				ng/L			06/13/19 10:22	1

Method: Total PFCA-Sum - Total PFCA (Summary) - Pre-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	ND		50		ng/L			06/13/19 10:17	1
PFPA	ND		50		ng/L			06/13/19 10:17	1
PFHxA	73		50		ng/L			06/13/19 10:17	1
PFHpA	ND		50		ng/L			06/13/19 10:17	1
PFOA	140		50		ng/L			06/13/19 10:17	1
PFNA	ND		50		ng/L			06/13/19 10:17	1
Total PFCA	210				ng/L			06/13/19 10:17	1

Method: Total PFCA-Sum - Total PFCA (Summary) - Post-Treatment

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PFBA	55	B	50		ng/L			06/13/19 10:19	1
PFPA	ND		50		ng/L			06/13/19 10:19	1
PFHxA	120		50		ng/L			06/13/19 10:19	1
PFHpA	ND		50		ng/L			06/13/19 10:19	1
PFOA	130		50		ng/L			06/13/19 10:19	1
PFNA	ND		50		ng/L			06/13/19 10:19	1
Total PFCA	310				ng/L			06/13/19 10:19	1

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QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Lab Sample ID: MB 320-298515/1-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Method Blank

Prep Type: Pre-Treatment

Prep Batch: 298515

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluoropentanoic acid (PFPeA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorohexanoic acid (PFHxA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluoroheptanoic acid (PFHpA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorooctanoic acid (PFOA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorononanoic acid (PFNA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorodecanoic acid (PFDA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluoroundecanoic acid (PFUnA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorododecanoic acid (PFDoA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorotridecanoic acid (PFTriA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorotetradecanoic acid (PFTeA)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorobutanesulfonic acid (PFBS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluoropentanesulfonic acid (PFPeS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorohexanesulfonic acid (PFHxS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorooctanesulfonic acid (PFOS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorononanesulfonic acid (PFNS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorodecanesulfonic acid (PFDS)	ND		5.0		ng/L		06/01/19 09:52	06/04/19 21:11	1
Perfluorooctanesulfonamide (FOSA)	ND		40		ng/L		06/01/19 09:52	06/04/19 21:11	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		50		ng/L		06/01/19 09:52	06/04/19 21:11	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		50		ng/L		06/01/19 09:52	06/04/19 21:11	1
4:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:11	1
6:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:11	1
8:2 FTS	ND		50		ng/L		06/01/19 09:52	06/04/19 21:11	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	85		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C5 PFPeA	86		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C2 PFHxA	89		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C4 PFHpA	92		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C4 PFOA	89		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C5 PFNA	94		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C2 PFDA	98		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C2 PFUnA	105		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C2 PFDoA	93		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C2 PFTeA	105		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C3 PFBS	89		25 - 150	06/01/19 09:52	06/04/19 21:11	1
18O2 PFHxS	79		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C4 PFOS	90		25 - 150	06/01/19 09:52	06/04/19 21:11	1
13C8 FOSA	72		25 - 150	06/01/19 09:52	06/04/19 21:11	1
d3-NMeFOSAA	93		25 - 150	06/01/19 09:52	06/04/19 21:11	1
d5-NEtFOSAA	98		25 - 150	06/01/19 09:52	06/04/19 21:11	1
M2-6:2 FTS	97		25 - 150	06/01/19 09:52	06/04/19 21:11	1
M2-8:2 FTS	99		25 - 150	06/01/19 09:52	06/04/19 21:11	1
M2-4:2 FTS	99		25 - 150	06/01/19 09:52	06/04/19 21:11	1

Eurofins TestAmerica, Canton

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCS 320-298515/2-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample

Prep Type: Pre-Treatment

Prep Batch: 298515

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorobutanoic acid (PFBA)	100	103		ng/L		103	78 - 138
Perfluoropentanoic acid (PFPeA)	100	104		ng/L		104	66 - 136
Perfluorohexanoic acid (PFHxA)	100	102		ng/L		102	76 - 136
Perfluoroheptanoic acid (PFHpA)	100	105		ng/L		105	78 - 138
Perfluorooctanoic acid (PFOA)	100	101		ng/L		101	70 - 130
Perfluorononanoic acid (PFNA)	100	109		ng/L		109	77 - 137
Perfluorodecanoic acid (PFDA)	100	101		ng/L		101	74 - 134
Perfluoroundecanoic acid (PFUnA)	100	93.5		ng/L		94	68 - 128
Perfluorododecanoic acid (PFDoA)	100	99.8		ng/L		100	72 - 132
Perfluorotridecanoic acid (PFTriA)	100	104		ng/L		104	56 - 163
Perfluorotetradecanoic acid (PFTeA)	100	76.8		ng/L		77	63 - 123
Perfluorobutanesulfonic acid (PFBS)	88.4	91.3		ng/L		103	79 - 139
Perfluoropentanesulfonic acid (PFPeS)	93.8	91.2		ng/L		97	70 - 130
Perfluorohexanesulfonic acid (PFHxS)	91.0	92.9		ng/L		102	77 - 137
Perfluoroheptanesulfonic Acid (PFHpS)	95.2	93.0		ng/L		98	83 - 143
Perfluorooctanesulfonic acid (PFOS)	92.8	88.1		ng/L		95	74 - 134
Perfluorononanesulfonic acid (PFNS)	96.0	94.2		ng/L		98	70 - 130
Perfluorodecanesulfonic acid (PFDS)	96.4	98.4		ng/L		102	75 - 135
Perfluorooctanesulfonamide (FOSA)	100	111		ng/L		111	82 - 142
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	104		ng/L		104	77 - 137
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	97.7		ng/L		98	79 - 139
4:2 FTS	93.4	99.0		ng/L		106	59 - 149
6:2 FTS	94.8	95.2		ng/L		100	82 - 142
8:2 FTS	95.8	101		ng/L		105	80 - 140

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4 PFBA	88		25 - 150
13C5 PFPeA	91		25 - 150
13C2 PFHxA	92		25 - 150
13C4 PFHpA	96		25 - 150
13C4 PFOA	98		25 - 150
13C5 PFNA	94		25 - 150
13C2 PFDA	97		25 - 150
13C2 PFUnA	102		25 - 150
13C2 PFDoA	96		25 - 150
13C2 PFTeDA	108		25 - 150
13C3 PFBS	94		25 - 150
18O2 PFHxS	81		25 - 150

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QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCS 320-298515/2-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample

Prep Type: Pre-Treatment

Prep Batch: 298515

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4 PFOS	92		25 - 150
13C8 FOSA	75		25 - 150
d3-NMeFOSAA	95		25 - 150
d5-NEtFOSAA	100		25 - 150
M2-6:2 FTS	105		25 - 150
M2-8:2 FTS	101		25 - 150
M2-4:2 FTS	99		25 - 150

Lab Sample ID: LCSD 320-298515/3-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample Dup

Prep Type: Pre-Treatment

Prep Batch: 298515

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	100	112		ng/L		112	78 - 138	8	30
Perfluoropentanoic acid (PFPeA)	100	102		ng/L		102	66 - 136	1	30
Perfluorohexanoic acid (PFHxA)	100	105		ng/L		105	76 - 136	4	30
Perfluoroheptanoic acid (PFHpA)	100	104		ng/L		104	78 - 138	1	30
Perfluorooctanoic acid (PFOA)	100	103		ng/L		103	70 - 130	2	30
Perfluorononanoic acid (PFNA)	100	108		ng/L		108	77 - 137	0	30
Perfluorodecanoic acid (PFDA)	100	104		ng/L		104	74 - 134	3	30
Perfluoroundecanoic acid (PFUnA)	100	96.3		ng/L		96	68 - 128	3	30
Perfluorododecanoic acid (PFDoA)	100	104		ng/L		104	72 - 132	4	30
Perfluorotridecanoic acid (PFTriA)	100	111		ng/L		111	56 - 163	6	30
Perfluorotetradecanoic acid (PFTeA)	100	83.4		ng/L		83	63 - 123	8	30
Perfluorobutanesulfonic acid (PFBS)	88.4	98.5		ng/L		111	79 - 139	8	30
Perfluoropentanesulfonic acid (PFPeS)	93.8	97.7		ng/L		104	70 - 130	7	30
Perfluorohexanesulfonic acid (PFHxS)	91.0	92.2		ng/L		101	77 - 137	1	30
Perfluoroheptanesulfonic Acid (PFHpS)	95.2	90.3		ng/L		95	83 - 143	3	30
Perfluorooctanesulfonic acid (PFOS)	92.8	89.8		ng/L		97	74 - 134	2	30
Perfluorononanesulfonic acid (PFNS)	96.0	98.9		ng/L		103	70 - 130	5	30
Perfluorodecanesulfonic acid (PFDS)	96.4	101		ng/L		105	75 - 135	2	30
Perfluorooctanesulfonamide (FOSA)	100	115		ng/L		115	82 - 142	3	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	99.8		ng/L		100	77 - 137	4	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	99.0		ng/L		99	79 - 139	1	30
4:2 FTS	93.4	116		ng/L		124	59 - 149	16	30
6:2 FTS	94.8	98.2		ng/L		104	82 - 142	3	30
8:2 FTS	95.8	107		ng/L		111	80 - 140	5	30

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QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Isotope Dilution	LCSD		Limits
	%Recovery	Qualifier	
13C4 PFBA	81		25 - 150
13C5 PFPeA	92		25 - 150
13C2 PFHxA	93		25 - 150
13C4 PFHpA	92		25 - 150
13C4 PFOA	92		25 - 150
13C5 PFNA	93		25 - 150
13C2 PFDA	98		25 - 150
13C2 PFUnA	104		25 - 150
13C2 PFDoA	93		25 - 150
13C2 PFTeDA	105		25 - 150
13C3 PFBS	91		25 - 150
18O2 PFHxS	78		25 - 150
13C4 PFOS	92		25 - 150
13C8 FOSA	71		25 - 150
d3-NMeFOSAA	95		25 - 150
d5-NEtFOSAA	94		25 - 150
M2-6:2 FTS	99		25 - 150
M2-8:2 FTS	97		25 - 150
M2-4:2 FTS	106		25 - 150

Lab Sample ID: MB 320-298518/1-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Method Blank

Prep Type: Post-Treatment

Prep Batch: 298518

Analyte	MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Perfluorobutanoic acid (PFBA)	10.1		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluoropentanoic acid (PFPeA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorohexanoic acid (PFHxA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluoroheptanoic acid (PFHpA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorooctanoic acid (PFOA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorononanoic acid (PFNA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorodecanoic acid (PFDA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluoroundecanoic acid (PFUnA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorododecanoic acid (PFDoA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorotridecanoic acid (PFTriA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorotetradecanoic acid (PFTeA)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorobutanesulfonic acid (PFBS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluoropentanesulfonic acid (PFPeS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorohexanesulfonic acid (PFHxS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorooctanesulfonic acid (PFOS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorononanesulfonic acid (PFNS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorodecanesulfonic acid (PFDS)	ND		5.0		ng/L		06/01/19 09:55	06/04/19 22:15	1
Perfluorooctanesulfonamide (FOSA)	ND		40		ng/L		06/01/19 09:55	06/04/19 22:15	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	ND		50		ng/L		06/01/19 09:55	06/04/19 22:15	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	ND		50		ng/L		06/01/19 09:55	06/04/19 22:15	1
4:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:15	1
6:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:15	1
8:2 FTS	ND		50		ng/L		06/01/19 09:55	06/04/19 22:15	1

Eurofins TestAmerica, Canton

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFBA	80		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C5 PFPeA	90		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C2 PFHxA	91		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C4 PFHpA	88		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C4 PFOA	90		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C5 PFNA	92		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C2 PFDA	96		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C2 PFUnA	97		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C2 PFDoA	93		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C2 PFTeDA	97		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C3 PFBS	89		25 - 150	06/01/19 09:55	06/04/19 22:15	1
18O2 PFHxS	80		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C4 PFOS	85		25 - 150	06/01/19 09:55	06/04/19 22:15	1
13C8 FOSA	68		25 - 150	06/01/19 09:55	06/04/19 22:15	1
d3-NMeFOSAA	86		25 - 150	06/01/19 09:55	06/04/19 22:15	1
d5-NEtFOSAA	88		25 - 150	06/01/19 09:55	06/04/19 22:15	1
M2-6:2 FTS	89		25 - 150	06/01/19 09:55	06/04/19 22:15	1
M2-8:2 FTS	92		25 - 150	06/01/19 09:55	06/04/19 22:15	1
M2-4:2 FTS	0		0 - 10	06/01/19 09:55	06/04/19 22:15	1

Lab Sample ID: LCS 320-298518/2-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample

Prep Type: Post-Treatment

Prep Batch: 298518

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorobutanoic acid (PFBA)	100	120		ng/L		120	93 - 153
Perfluoropentanoic acid (PFPeA)	100	116		ng/L		116	85 - 145
Perfluorohexanoic acid (PFHxA)	100	112		ng/L		112	81 - 141
Perfluoroheptanoic acid (PFHpA)	100	128		ng/L		128	104 - 171
Perfluorooctanoic acid (PFOA)	100	219		ng/L		219	158 - 454
Perfluorononanoic acid (PFNA)	100	108		ng/L		108	66 - 126
Perfluorodecanoic acid (PFDA)	100	96.4		ng/L		96	65 - 125
Perfluoroundecanoic acid (PFUnA)	100	90.2		ng/L		90	57 - 117
Perfluorododecanoic acid (PFDoA)	100	90.8		ng/L		91	66 - 126
Perfluorotridecanoic acid (PFTriA)	100	94.6		ng/L		95	65 - 136
Perfluorotetradecanoic acid (PFTeA)	100	65.7		ng/L		66	63 - 123
Perfluorobutanesulfonic acid (PFBS)	88.4	88.8		ng/L		100	75 - 135
Perfluoropentanesulfonic acid (PFPeS)	93.8	85.7		ng/L		91	70 - 130
Perfluorohexanesulfonic acid (PFHxS)	91.0	89.7		ng/L		99	64 - 124
Perfluoroheptanesulfonic Acid (PFHpS)	95.2	91.9		ng/L		97	70 - 131
Perfluorooctanesulfonic acid (PFOS)	92.8	84.0		ng/L		91	68 - 128
Perfluorononanesulfonic acid (PFNS)	96.0	87.0		ng/L		91	70 - 130
Perfluorodecanesulfonic acid (PFDS)	96.4	88.1		ng/L		91	66 - 126

Eurofins TestAmerica, Canton

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCS 320-298518/2-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample

Prep Type: Post-Treatment

Prep Batch: 298518

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorooctanesulfonamide (FOSA)	100	ND		ng/L		0	0 - 10
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	ND		ng/L		0	0 - 10
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	ND		ng/L		0	0 - 10
4:2 FTS	93.4	ND		ng/L		0	0 - 10
6:2 FTS	94.8	ND		ng/L		0	0 - 10
8:2 FTS	95.8	ND		ng/L		0	0 - 10

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C4 PFBA	83		25 - 150
13C5 PFPeA	89		25 - 150
13C2 PFHxA	93		25 - 150
13C4 PFHpA	92		25 - 150
13C4 PFOA	93		25 - 150
13C5 PFNA	99		25 - 150
13C2 PFDA	93		25 - 150
13C2 PFUnA	98		25 - 150
13C2 PFDoA	94		25 - 150
13C2 PFTeDA	108		25 - 150
13C3 PFBS	95		25 - 150
18O2 PFHxS	84		25 - 150
13C4 PFOS	93		25 - 150
13C8 FOSA	73		25 - 150
d3-NMeFOSAA	88		25 - 150
d5-NEtFOSAA	90		25 - 150
M2-6:2 FTS	104		25 - 150
M2-8:2 FTS	100		25 - 150
M2-4:2 FTS	0		0 - 10

Lab Sample ID: LCSD 320-298518/3-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample Dup

Prep Type: Post-Treatment

Prep Batch: 298518

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
Perfluorobutanoic acid (PFBA)	100	122		ng/L		122	93 - 153	1	30
Perfluoropentanoic acid (PFPeA)	100	116		ng/L		116	85 - 145	0	30
Perfluorohexanoic acid (PFHxA)	100	118		ng/L		118	81 - 141	5	30
Perfluoroheptanoic acid (PFHpA)	100	128		ng/L		128	104 - 171	0	30
Perfluorooctanoic acid (PFOA)	100	208		ng/L		208	158 - 454	5	30
Perfluorononanoic acid (PFNA)	100	116		ng/L		116	66 - 126	8	30
Perfluorodecanoic acid (PFDA)	100	102		ng/L		102	65 - 125	5	30
Perfluoroundecanoic acid (PFUnA)	100	85.8		ng/L		86	57 - 117	5	30
Perfluorododecanoic acid (PFDoA)	100	94.4		ng/L		94	66 - 126	4	30
Perfluorotridecanoic acid (PFTriA)	100	102		ng/L		102	65 - 136	8	30
Perfluorotetradecanoic acid (PFTeA)	100	72.1		ng/L		72	63 - 123	9	30

Eurofins TestAmerica, Canton

QC Sample Results

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCSD 320-298518/3-A

Matrix: Water

Analysis Batch: 299147

Client Sample ID: Lab Control Sample Dup

Prep Type: Post-Treatment

Prep Batch: 298518

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorobutanesulfonic acid (PFBS)	88.4	94.7		ng/L		107	75 - 135	6	30
Perfluoropentanesulfonic acid (PFPeS)	93.8	90.2		ng/L		96	70 - 130	5	30
Perfluorohexanesulfonic acid (PFHxS)	91.0	86.5		ng/L		95	64 - 124	4	30
Perfluoroheptanesulfonic Acid (PFHpS)	95.2	84.7		ng/L		89	70 - 131	8	30
Perfluorooctanesulfonic acid (PFOS)	92.8	82.4		ng/L		89	68 - 128	2	30
Perfluorononanesulfonic acid (PFNS)	96.0	89.1		ng/L		93	70 - 130	2	30
Perfluorodecanesulfonic acid (PFDS)	96.4	92.7		ng/L		96	66 - 126	5	30
Perfluorooctanesulfonamide (FOSA)	100	ND		ng/L		0	0 - 10	NC	30
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	100	ND		ng/L		0	0 - 10	NC	30
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	100	ND		ng/L		0	0 - 10	NC	30
4:2 FTS	93.4	ND		ng/L		0	0 - 10	NC	30
6:2 FTS	94.8	ND		ng/L		0	0 - 10	NC	30
8:2 FTS	95.8	ND		ng/L		0	0 - 10	NC	30

Isotope Dilution	LCSD %Recovery	LCSD Qualifier	Limits
13C4 PFBA	88		25 - 150
13C5 PFPeA	98		25 - 150
13C2 PFHxA	101		25 - 150
13C4 PFHpA	95		25 - 150
13C4 PFOA	98		25 - 150
13C5 PFNA	99		25 - 150
13C2 PFDA	96		25 - 150
13C2 PFUnA	101		25 - 150
13C2 PFDoA	97		25 - 150
13C2 PFTeDA	109		25 - 150
13C3 PFBS	100		25 - 150
18O2 PFHxS	87		25 - 150
13C4 PFOS	93		25 - 150
13C8 FOSA	75		25 - 150
d3-NMeFOSAA	98		25 - 150
d5-NEtFOSAA	101		25 - 150
M2-6:2 FTS	105		25 - 150
M2-8:2 FTS	103		25 - 150
M2-4:2 FTS	0		0 - 10

QC Association Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

LCMS

Prep Batch: 298515

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-1	MW-14-62_052019	Pre-Treatment	Water	TOP Pre - Prep	
240-113072-2	P6-SB-07_052019	Pre-Treatment	Water	TOP Pre - Prep	
240-113072-3	CH-14-RO_052019	Pre-Treatment	Water	TOP Pre - Prep	
240-113072-3 - DL	CH-14-RO_052019	Pre-Treatment	Water	TOP Pre - Prep	
MB 320-298515/1-A	Method Blank	Pre-Treatment	Water	TOP Pre - Prep	
LCS 320-298515/2-A	Lab Control Sample	Pre-Treatment	Water	TOP Pre - Prep	
LCSD 320-298515/3-A	Lab Control Sample Dup	Pre-Treatment	Water	TOP Pre - Prep	

Prep Batch: 298518

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-1	MW-14-62_052019	Post-Treatment	Water	TOP Post Prep	
240-113072-2	P6-SB-07_052019	Post-Treatment	Water	TOP Post Prep	
240-113072-3	CH-14-RO_052019	Post-Treatment	Water	TOP Post Prep	
240-113072-3 - DL	CH-14-RO_052019	Post-Treatment	Water	TOP Post Prep	
MB 320-298518/1-A	Method Blank	Post-Treatment	Water	TOP Post Prep	
LCS 320-298518/2-A	Lab Control Sample	Post-Treatment	Water	TOP Post Prep	
LCSD 320-298518/3-A	Lab Control Sample Dup	Post-Treatment	Water	TOP Post Prep	

Analysis Batch: 299147

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-1	MW-14-62_052019	Post-Treatment	Water	537 (modified)	298518
240-113072-1	MW-14-62_052019	Pre-Treatment	Water	537 (modified)	298515
240-113072-2	P6-SB-07_052019	Post-Treatment	Water	537 (modified)	298518
240-113072-2	P6-SB-07_052019	Pre-Treatment	Water	537 (modified)	298515
MB 320-298515/1-A	Method Blank	Pre-Treatment	Water	537 (modified)	298515
MB 320-298518/1-A	Method Blank	Post-Treatment	Water	537 (modified)	298518
LCS 320-298515/2-A	Lab Control Sample	Pre-Treatment	Water	537 (modified)	298515
LCS 320-298518/2-A	Lab Control Sample	Post-Treatment	Water	537 (modified)	298518
LCSD 320-298515/3-A	Lab Control Sample Dup	Pre-Treatment	Water	537 (modified)	298515
LCSD 320-298518/3-A	Lab Control Sample Dup	Post-Treatment	Water	537 (modified)	298518

Analysis Batch: 299696

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-3 - DL	CH-14-RO_052019	Post-Treatment	Water	537 (modified)	298518
240-113072-3	CH-14-RO_052019	Post-Treatment	Water	537 (modified)	298518
240-113072-3 - DL	CH-14-RO_052019	Pre-Treatment	Water	537 (modified)	298515
240-113072-3	CH-14-RO_052019	Pre-Treatment	Water	537 (modified)	298515

Analysis Batch: 301086

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-1	MW-14-62_052019	Pre-Treatment	Water	Total PFCA-Sum	
240-113072-2	P6-SB-07_052019	Pre-Treatment	Water	Total PFCA-Sum	
240-113072-3	CH-14-RO_052019	Pre-Treatment	Water	Total PFCA-Sum	

Analysis Batch: 301087

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-1	MW-14-62_052019	Post-Treatment	Water	Total PFCA-Sum	
240-113072-2	P6-SB-07_052019	Post-Treatment	Water	Total PFCA-Sum	
240-113072-3	CH-14-RO_052019	Post-Treatment	Water	Total PFCA-Sum	

Eurofins TestAmerica, Canton

QC Association Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

LCMS

Analysis Batch: 301088

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-113072-1	MW-14-62_052019	Total/NA	Water	Total PFCA-Dif	
240-113072-2	P6-SB-07_052019	Total/NA	Water	Total PFCA-Dif	
240-113072-3	CH-14-RO_052019	Total/NA	Water	Total PFCA-Dif	

Lab Chronicle

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Client Sample ID: MW-14-62_052019

Lab Sample ID: 240-113072-1

Date Collected: 05/20/19 11:30

Matrix: Water

Date Received: 05/22/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Post-Treatment	Prep	TOP Post Prep			298518	06/01/19 09:55	JER	TAL SAC
Post-Treatment	Analysis	537 (modified)		1	299147	06/04/19 22:47	JRM	TAL SAC
Pre-Treatment	Prep	TOP Pre - Prep			298515	06/01/19 09:52	JER	TAL SAC
Pre-Treatment	Analysis	537 (modified)		1	299147	06/04/19 21:35	JRM	TAL SAC
Total/NA	Analysis	Total PFCA-Dif		1	301088	06/13/19 10:22	MKW	TAL SAC
Post-Treatment	Analysis	Total PFCA-Sum		1	301087	06/13/19 10:19	MKW	TAL SAC
Pre-Treatment	Analysis	Total PFCA-Sum		1	301086	06/13/19 10:17	MKW	TAL SAC

Client Sample ID: P6-SB-07_052019

Lab Sample ID: 240-113072-2

Date Collected: 05/20/19 14:05

Matrix: Water

Date Received: 05/22/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Post-Treatment	Prep	TOP Post Prep			298518	06/01/19 09:55	JER	TAL SAC
Post-Treatment	Analysis	537 (modified)		1	299147	06/04/19 22:55	JRM	TAL SAC
Pre-Treatment	Prep	TOP Pre - Prep			298515	06/01/19 09:52	JER	TAL SAC
Pre-Treatment	Analysis	537 (modified)		1	299147	06/04/19 21:43	JRM	TAL SAC
Total/NA	Analysis	Total PFCA-Dif		1	301088	06/13/19 10:22	MKW	TAL SAC
Post-Treatment	Analysis	Total PFCA-Sum		1	301087	06/13/19 10:19	MKW	TAL SAC
Pre-Treatment	Analysis	Total PFCA-Sum		1	301086	06/13/19 10:17	MKW	TAL SAC

Client Sample ID: CH-14-RO_052019

Lab Sample ID: 240-113072-3

Date Collected: 05/20/19 16:20

Matrix: Water

Date Received: 05/22/19 09:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Post-Treatment	Prep	TOP Post Prep	DL		298518	06/01/19 09:55	JER	TAL SAC
Post-Treatment	Analysis	537 (modified)	DL	20	299696	06/07/19 02:53	AAR	TAL SAC
Post-Treatment	Prep	TOP Post Prep			298518	06/01/19 09:55	JER	TAL SAC
Post-Treatment	Analysis	537 (modified)		10	299696	06/07/19 03:01	AAR	TAL SAC
Pre-Treatment	Prep	TOP Pre - Prep	DL		298515	06/01/19 09:52	JER	TAL SAC
Pre-Treatment	Analysis	537 (modified)	DL	50	299696	06/07/19 02:21	AAR	TAL SAC
Pre-Treatment	Prep	TOP Pre - Prep			298515	06/01/19 09:52	JER	TAL SAC
Pre-Treatment	Analysis	537 (modified)		10	299696	06/07/19 02:29	AAR	TAL SAC
Total/NA	Analysis	Total PFCA-Dif		1	301088	06/13/19 10:22	MKW	TAL SAC
Post-Treatment	Analysis	Total PFCA-Sum		1	301087	06/13/19 10:19	MKW	TAL SAC
Pre-Treatment	Analysis	Total PFCA-Sum		1	301086	06/13/19 10:17	MKW	TAL SAC

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Eurofins TestAmerica, Canton

Accreditation/Certification Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Laboratory: Eurofins TestAmerica, Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	2927	02-23-20
Connecticut	State Program	1	PH-0590	12-31-19
Florida	NELAP	4	E87225	06-30-19 *
Illinois	NELAP	5	200004	07-31-19 *
Iowa	State Program	7	421	06-01-21
Kansas	NELAP	7	E-10336	04-30-20
Kentucky (UST)	State Program	4	58	02-23-20
Kentucky (VW)	State Program	4	98016	12-31-19
Minnesota	NELAP	5	039-999-348	12-31-19 *
Minnesota (Petrofund)	State Program	1	3506	07-31-19 *
Nevada	State Program	9	OH00048	07-31-19
New Jersey	NELAP	2	OH001	06-30-19 *
New York	NELAP	2	10975	03-31-20
Ohio VAP	State Program	5	CL0024	06-05-21
Oregon	NELAP	10	4062	02-23-20
Pennsylvania	NELAP	3	68-00340	08-31-19 *
Texas	NELAP	6	T104704517-18-10	08-31-19 *
USDA	Federal		P330-16-00404	12-28-19
Virginia	NELAP	3	460175	09-14-19 *
Washington	State Program	10	C971	01-12-20 *
West Virginia DEP	State Program	3	210	12-31-19

Laboratory: Eurofins TestAmerica, Sacramento

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-020	01-20-21
ANAB	DoD		L2468	01-20-21
ANAB	DOE		L2468.01	01-20-21
Arizona	State Program	9	AZ0708	08-11-19
Arkansas DEQ	State Program	6	88-0691	06-17-20
California	State Program	9	2897	01-31-20
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-19
Hawaii	State Program	9	N/A	01-29-20
Illinois	NELAP	5	200060	03-17-19 *
Kansas	NELAP	7	E-10375	10-31-19
Louisiana	NELAP	6	30612	06-30-19
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-20-20
New Jersey	NELAP	2	CA005	06-30-19
New York	NELAP	2	11666	04-01-20
Oregon	NELAP	10	4040	01-29-20
Pennsylvania	NELAP	3	68-01272	03-31-20
Texas	NELAP	6	T104704399	05-31-20
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Eurofins TestAmerica, Canton

Accreditation/Certification Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Laboratory: Eurofins TestAmerica, Sacramento (Continued)

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
USEPA UCMR	Federal	1	CA00044	12-31-20
Utah	NELAP	8	CA00044	02-29-20
Vermont	State Program	1	VT-4040	04-16-20
Virginia	NELAP	3	460278	03-14-20
Washington	State Program	10	C581	05-05-20
West Virginia (DW)	State Program	3	9930C	12-31-19
Wyoming	State Program	8	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Eurofins TestAmerica, Canton

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact Company Name: ARCADIS Address: 28550 Cabot Dr, Suite 500 City/State/Zip: Novi, MI 48377 Phone: 248-944-2240 Fax: 248-944-2241 Project Name: RACER Lansing Top Assay Site: RACER Lansing PO# 00064479.2019.03700		Project Manager: Randy Christensen Tel/Fax: 810-225-1940 Analysis Turnaround Time ☐ CALENDAR DAYS ☐ WORKING DAYS TAT if different from Below ☒ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day		Site Contact: Tiffany Under Date: 5/20/19 Carrier:		COC No: _____ of _____ COCs Sampler: For Lab Use Only: Walk-in Client: Lab Sampling: Job / SDG No.: Sample Specific Notes:	
Sample Identification MW-14-62-052019 P6-SB-07-052019 CH-14-RD-052019 unused containers		Sample Type (C=Comp, G=Grab) Date Time Matrix # of Cont.		Filtered Sample (Y/N) Perform MS/MSD (Y/N) Method 557 Modified TOP Assay plus via		elevated levels of PFAS elevated levels of PFAS elevated concn. of hexavalent chromium	
Preservation Used: 1=Ice; 2=HCl; 3=H2SO4; 4=HNO3; 5=NaOH; 6=Other Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample. ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown							
Special Instructions/QC Requirements & Comments:							
Relinquished by: <i>[Signature]</i> Relinquished by: <i>[Signature]</i> Relinquished by: <i>[Signature]</i>		Custody Seal No.: Company: ARCADIS Company: ARCADIS Company: EPA		Received by: Novi Cold Storage Received by: <i>[Signature]</i> Received by: <i>[Signature]</i>		Date/Time: 5/20/19 2000 Date/Time: 5/21/19 1000 Date/Time: 5/22/19 945	
Cooler Temp. (°C): Obs'd: _____ Corr'd: _____		Therm ID No.: _____					



Login # : 113072

Site Name

Cooler unpacked by:

Opened on 5-22-19

FedEx: 1st Grd **Exp** UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Storage Location

TestAmerica Cooler #	72	Foam Box	Client Cooler	Box	Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: ☒ Wet Ice ☐ Blue Ice ☐ Dry Ice ☐ Water ☐ None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
IR GUN# IR-8 (CF -0.2 °C) Observed Cooler Temp. 1.4 °C Corrected Cooler Temp. 1.2 °C
IR GUN #36 (CF +0.7°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
-Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes ~~No~~
-Were tamper/custody seals intact and uncompromised? Yes No NA
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes ~~No~~
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels be reconciled with the COC? Yes No
9. Were correct bottle(s) used for the test(s) indicated? Yes No
10. Sufficient quantity received to perform indicated analyses? Yes No
11. Are these work share samples? Yes ~~No~~
If yes, Questions 12-16 have been checked at the originating laboratory.
12. Were all preserved sample(s) at the correct pH upon receipt? Yes No ~~NA~~ pH
13. Were VOAs on the COC? Yes ~~No~~
14. Were air bubbles >6 mm in any VOA vials?  Larger than this. Yes No ~~NA~~
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____ Yes ~~No~~
16. Was a LL Hg or Me Hg trip blank present? Yes ~~No~~

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other _____

Concerning _____

Samples processed by:

EC

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen:

Login Sample Receipt Checklist

Client: ARCADIS U.S., Inc.

Job Number: 240-113072-1

Login Number: 113072

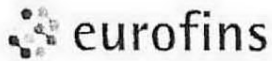
List Number: 3

Creator: Thompson, Sarah W

List Source: Eurofins TestAmerica, Sacramento

List Creation: 05/31/19 12:49 PM

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	491294
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.8c
COC is present.	False	
COC is filled out in ink and legible.	N/A	
COC is filled out with all pertinent information.	N/A	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



Environment Testing
TestAmerica



240-113072 Field Sheet

amento
Notes

Job: _____

Tracking # 1021 3377 6009

SO PO / FO / 2-Day / Ground / UPS / Courier / GSO /
OnTrac / Goldstreak / USPS / Other _____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC.

Notes: no COC, but ^{printed} email from
Michael DelMonico (5/30/19)
was sent 5/31/19

CoC not relinquished 5/31/19

Therm. ID: HACC Corr. Factor: _____

Ice ☒ Wet ☒ Gel _____ Other _____

Cooler Custody Seal: 491294

Sample Custody Seal: _____

Cooler ID: _____

Temp Observed: 6.8 Corrected: 0.8

From: Temp Blank ☒ Sample ☐

NCM Filed: Yes ☒ No ☐

	Yes	No	NA
Perchlorate has headspace?	☐	☐	☒
Alkalinity has no headspace?	☐	☐	☒
CoC is complete w/o discrepancies?	☐	☒	☐
Samples received within holding time?	☒	☐	☐
Sample preservatives verified?	☐	☐	☒
Cooler compromised/tampered with?	☐	☒	☐
Samples compromised/tampered with?	☐	☒	☐
Samples w/o discrepancies?	☒	☐	☐
Sample containers have legible labels?	☒	☐	☐
Containers are not broken or leaking?	☒	☐	☐
Sample date/times are provided.	☒	☐	☐
Appropriate containers are used?	☒	☐	☐
Sample bottles are completely filled?	☒	☐	☐
Zero headspace?*	☐	☐	☒
Multiphasic samples are not present?	☒	☐	☐
Sample temp OK?	☒	☐	☐
Sample out of temp?	☐	☒	☐

Initials: GT Date: 5/31/19

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

W24C

RE: Job 240-113072

DM DelMonico, Michael



Reply all

Today, 16:13

Chirgwin, Brad; Dawicki, Don; Murray, John; Bourdeau, Timothy

Inbox

Yes, please. The other 3 can go to Sacramento. I'll get the login updated now - any chance they can be shipped tonight still?

Mike DelMonico

330-966-9783

From: Chirgwin, Brad**Sent:** Thursday, May 30, 2019 3:56 PM**To:** DelMonico, Michael**Cc:** Dawicki, Don; Murray, John; Bourdeau, Timothy**Subject:** Re: Job 240-113072

I just found out that our prep chemist already prepped these samples today, using one of the four bottles.

Do the rest of the bottles need to go to Sacramento?

Brad

From: DelMonico, Michael**Sent:** Thursday, May 30, 2019 15:33**To:** Chirgwin, Brad**Cc:** Dawicki, Don; Murray, John; Bourdeau, Timothy**Subject:** RE: Job 240-113072

Thanks for the info. I did some digging on this one and found out the samples were meant for Sacramento to run TOPS Assay, which requires four 125mL bottles like what you received.

Mike DelMonico

330-966-9783

From: Chirgwin, Brad**Sent:** Thursday, May 30, 2019 3:02 PM

Received  6/31/19 9:20 0.8°C

Isotope Dilution Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Water

Prep Type: Pre-Treatment

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFBA (25-150)	PFPeA (25-150)	PFHxA (25-150)	PFHpA (25-150)	PFOA (25-150)	PFNA (25-150)	PFDA (25-150)	PFUnA (25-150)
240-113072-1	MW-14-62_052019	47	92	99	94	96	94	103	110
240-113072-2	P6-SB-07_052019	76	84	90	92	93	96	99	105
240-113072-3 - DL	CH-14-RO_052019								
240-113072-3	CH-14-RO_052019	125	133	133	118	89	115	120	124
LCS 320-298515/2-A	Lab Control Sample	88	91	92	96	98	94	97	102
LCSD 320-298515/3-A	Lab Control Sample Dup	81	92	93	92	92	93	98	104
MB 320-298515/1-A	Method Blank	85	86	89	92	89	94	98	105

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFDaA (25-150)	PFTDA (25-150)	3C3-PFB: (25-150)	PFHxS (25-150)	PFOS (25-150)	PFOSA (25-150)	-NMeFOS/ (25-150)	-NEtFOS/ (25-150)
240-113072-1	MW-14-62_052019	99	105	97	84	88	82	101	100
240-113072-2	P6-SB-07_052019	103	111	91	81	94	76	90	103
240-113072-3 - DL	CH-14-RO_052019					98			
240-113072-3	CH-14-RO_052019	116	114	137	121	116	111	127	127
LCS 320-298515/2-A	Lab Control Sample	96	108	94	81	92	75	95	100
LCSD 320-298515/3-A	Lab Control Sample Dup	93	105	91	78	92	71	95	94
MB 320-298515/1-A	Method Blank	93	105	89	79	90	72	93	98

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	M262FTS (25-150)	M282FTS (25-150)	M242FTS (25-150)
240-113072-1	MW-14-62_052019	127	108	177 *
240-113072-2	P6-SB-07_052019	103	94	124
240-113072-3 - DL	CH-14-RO_052019			
240-113072-3	CH-14-RO_052019	68	86	100
LCS 320-298515/2-A	Lab Control Sample	105	101	99
LCSD 320-298515/3-A	Lab Control Sample Dup	99	97	106
MB 320-298515/1-A	Method Blank	97	99	99

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
PFHxA = 13C2 PFHxA
PFHpA = 13C4 PFHpA
PFOA = 13C4 PFOA
PFNA = 13C5 PFNA
PFDA = 13C2 PFDA
PFUnA = 13C2 PFUnA
PFDaA = 13C2 PFDaA
PFTDA = 13C2 PFTeDA
13C3-PFBs = 13C3 PFBs
PFHxS = 18O2 PFHxS
PFOS = 13C4 PFOS
PFOSA = 13C8 FOSA
d3-NMeFOSAA = d3-NMeFOSAA
d5-NEtFOSAA = d5-NEtFOSAA
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS
M242FTS = M2-4:2 FTS

Eurofins TestAmerica, Canton

Isotope Dilution Summary

Client: ARCADIS U.S., Inc.
Project/Site: Racer Lansing

Job ID: 240-113072-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Water

Prep Type: Post-Treatment

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFBA (25-150)	PFPeA (25-150)	PFHxA (25-150)	PFHpA (25-150)	PFOA (25-150)	PFNA (25-150)	PFDA (25-150)	PFUnA (25-150)
240-113072-1	MW-14-62_052019	84	92	93	90	96	99	98	102
240-113072-2	P6-SB-07_052019	82	88	92	91	93	104	103	107
240-113072-3 - DL	CH-14-RO_052019								
240-113072-3	CH-14-RO_052019	114	125	120	112	92	125	130	121
LCS 320-298518/2-A	Lab Control Sample	83	89	93	92	93	99	93	98
LCSD 320-298518/3-A	Lab Control Sample Dup	88	98	101	95	98	99	96	101
MB 320-298518/1-A	Method Blank	80	90	91	88	90	92	96	97

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFDaA (25-150)	PFTDA (25-150)	3C3-PFBs (25-150)	PFHxS (25-150)	PFOS (25-150)	PFOSA (25-150)	NMeFOS (25-150)	NetFOS (25-150)
240-113072-1	MW-14-62_052019	97	107	96	81	93	82	90	105
240-113072-2	P6-SB-07_052019	97	108	96	87	97	79	99	102
240-113072-3 - DL	CH-14-RO_052019					96			
240-113072-3	CH-14-RO_052019	119	109	120	115	110	109	132	120
LCS 320-298518/2-A	Lab Control Sample	94	108	95	84	93	73	88	90
LCSD 320-298518/3-A	Lab Control Sample Dup	97	109	100	87	93	75	98	101
MB 320-298518/1-A	Method Blank	93	97	89	80	85	68	86	88

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	M262FTS (25-150)	M282FTS (25-150)	M242FTS (0-10)
240-113072-1	MW-14-62_052019	112	108	0
240-113072-2	P6-SB-07_052019	104	109	0
240-113072-3 - DL	CH-14-RO_052019			
240-113072-3	CH-14-RO_052019	88	114	0
LCS 320-298518/2-A	Lab Control Sample	104	100	0
LCSD 320-298518/3-A	Lab Control Sample Dup	105	103	0
MB 320-298518/1-A	Method Blank	89	92	0

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
PFHxA = 13C2 PFHxA
PFHpA = 13C4 PFHpA
PFOA = 13C4 PFOA
PFNA = 13C5 PFNA
PFDA = 13C2 PFDA
PFUnA = 13C2 PFUnA
PFDaA = 13C2 PFDaA
PFTDA = 13C2 PFTeDA
13C3-PFBs = 13C3 PFBs
PFHxS = 18O2 PFHxS
PFOS = 13C4 PFOS
PFOSA = 13C8 FOSA
d3-NMeFOSAA = d3-NMeFOSAA
d5-NetFOSAA = d5-NetFOSAA
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS
M242FTS = M2-4:2 FTS

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ATTACHMENT 5

PFAS Koc and Retardation Factors



Adsorption-Based Retardation of Select PFAAs

Compound	Perfluoroalkyl Carbons	Average Log K_{oc} [L/kg]	K_{oc} [L/kg]	R_f Low	R_f Medium	R_f High
				$F_{oc}(0.0004)$	$F_{oc}(0.0026)$	$F_{oc}(0.0210)$
PFBA	3	1.88	76	1	2	11
PFPeA	4	1.37	23	1	1	4
PFHxA	5	1.31	20	1	1	4
PFHpA	6	1.63	43	1	2	6
PFOA	7	1.89	78	1	2	11
PFNA	8	2.36	229	2	5	30
PFDA	9	2.96	912	3	15	116
PFUnA	10	3.56	3631	10	58	458
PFBS	4	1.79	62	1	2	9
PFHxS	6	2.05	112	1	3	15
PFOS	8	2.80	631	3	11	81

Retardation factors calculated using $\log K_{oc}$ values in Guelfo and Higgins 2013