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GROUNDWATER-SURFACE WATER INTERFACE INVESTIGATION SUMMARY AND WORK PLAN

North Kent Study Area

April 26, 2021; Revised December 03, 2021
File No. 16.0062961.51

PREPARED FOR:
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ACRONYMS

BGT	Below Groundwater Table
CD	Consent Decree
CSM	Conceptual Site Model
DoD	United States Department of Defense
EDD	Electronic Data Deliverable
EGLE	Michigan Department of Environment, Great Lakes and Energy
FCV	Final Chronic Values
GIS	Geographic Information Systems
GSI	Groundwater-Surface Water Interface
HNDV	Human Health Non-Drinking Water Values
HSP	House Street Property
ID	Identification
MDEQ	Michigan Department of Environmental Quality
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NE	Northeast
ng/L	Nanogram per Liter
NKSA	North Kent Study Area
ORP	Oxidation-Reduction Potential
PDF	Portable Document Format
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane Sulfonic Acid
PFHxA	Perfluorohexanoic Acid
PFHxS	Perfluorohexane Sulfonic Acid
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan [*Former Wolverine Tannery, House Street Disposal Area, and Wolven/Jewell Area, Per- and Polyfluoroalkyl Substances Investigation Program*]
QA/QC	Quality Assurance/Quality Control
QSM	Quality Systems Manual
R&W/GZA	Rose & Westra, a Division of GZA GeoEnvironmental, Inc.
RAP	Response Activity Plan
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
USGS	United States Geological Survey
VAP	Vertical Aquifer Profiling
Wolverine	Wolverine World Wide, Inc.
WP	Work Plan
WV	Wildlife Values

1.0 INTRODUCTION

On behalf of Wolverine, R&W/GZA prepared this revised Investigation Summary and WP for the GSI RAP in the NKSA. The GSI RAP was prepared pursuant to Sections 7.4, 7.10 (a) and Appendix S of CD No. 1:18-cv-00039-JTN-SJB, effective February 19, 2020. Specifically, this Investigation Summary and WP is established in Section 7.10(b) of the CD and the approved GSI RAP dated September 23, 2020. This revised Investigation Summary and WP is submitted in response to EGLE's Notice of Approval with Conditions of the Groundwater-Surface Water Interface Investigation Summary and Work Plan dated October 7, 2021.

The objective of the GSI RAP was to investigate potential environmental risks related to surface water quality resulting from the GSI pathway in the Rogue River. The GSI investigations are specific to regulated PFAS in groundwater, originating from the HSP and the Wolven/Jewell area. As established in Paragraph 7.10(a) and Appendix S of the CD, Wolverine will study the potential for groundwater contamination to discharge to surface water at the following three areas: "(i) southeast of the House Street plume(s); (ii) from the Wolven/Jewell plume(s) and the House Street plume(s) to the northwest; and (iii) from the Wolven/Jewell plume(s) toward the Rogue River to the northeast and southeast."

As set forth in the approved GSI RAP, the three broader areas in the CD were further refined based on conceptual understanding of groundwater flow and potential surface water discharge areas in the HSP and Wolven/Jewell study areas at the following six locations:

1. Downgradient of the HSP to the southeast;
2. Downgradient of the HSP to the south,
3. Wolven northwest;
4. Downgradient of the HSP to the northwest;
5. Wolven northeast; and
6. North Childsdale.

2.0 CONCEPTUAL SITE MODEL

Based on interpretation of regional geology and hydrogeology, residential water well sampling data in the NKSA, and groundwater investigations performed associated with the HSP and Wolven/Jewell areas, a CSM was provided in the 2020 GSI RAP (R&W/GZA, 2020). Data collected during the implementation of GSI RAP activities supports the CSM. An updated interpretation of groundwater flow has been included based upon GSI investigation to date.

2.1. GROUNDWATER FLOW

Based on the last monitoring well network gauging and sampling event (November 2019 data set), groundwater elevation contours were interpolated from the static water level data. See **Figure 1** for the groundwater elevation contours in the shallow zone and **Figure 2** for the deep zone. Groundwater contours in Cross-sections A-A' (downgradient of the HSP), B-B' (Wolven Northwest) and C-C' (Area 19) were interpreted and plotted in **Figures 3A**, **3B** and **3C**. Groundwater flowlines to the approximate centerline of the Rogue River were interpreted. Considering groundwater flow on the other side of the Rogue River also discharges to the Rogue River and the

flow pattern on either side of the river is generally symmetrical, the groundwater flowline to the Rogue River centerline approximately represents the lower envelope of the vertical groundwater flow discharge zone. The interpreted groundwater table, also a groundwater flowline, represents the upper envelope of the vertical groundwater flow discharge zone.

3.0 GSI RAP OBJECTIVES

The purpose of the GSI RAP investigation was to further evaluate PFAS at the GSI. The data collected under the GSI RAP and summarized in this Investigation Summary include samples collected in the vicinity of identified potential surface water discharge areas for the PFAS-containing groundwater in the HSP and Wolven/Jewell study areas.

The investigation of GSI is necessarily iterative. To fulfil the obligation under the CD to study the potential for groundwater contamination from the HSP to discharge to surface water, additional investigation is needed as set forth in this WP. In particular, in evaluating the potential risks to the Rogue River, this GSI WP builds on the work done to date and is intended to continue in the understanding of the following areas:

- Groundwater elevation at the GSI,
- Gradient and flux at the GSI, and,
- PFAS compound concentrations in the groundwater discharging to the Rogue River.

The following sections provide an investigation summary of activities completed to satisfy the project objectives required by Paragraph 7.10(a) and Appendix S of the CD as well as the GSI RAP. Furthermore, as established in Section 7.10(b) of the CD, **Section 11** of this report provides location recommendations for permanent GSI monitoring wells and sets forth the monitoring program.

4.0 INVESTIGATION METHODOLOGY

4.1. PIEZOMETER INSTALLATION

In accordance with general procedures outlined in the GSI RAP, stainless steel, 1.25-inch temporary piezometers were hand-driven via fence post driver into the groundwater on the riverbank. The 4-foot stainless steel screens were threaded to galvanized riser pipe as they were driven below grade. The top of the well screen was driven to an approximate depth of 3 feet below the bottom of the river sediment, where possible.

The top of the piezometer was installed above the estimated flood elevation based on observations of vegetation and deposition in each of the locations. An approximate 6- to 12-inch bentonite seal was placed within the borehole over the screen. A 2-inch thick concrete pad was constructed at the surface of the piezometer to prevent infiltration and subsidence of the piezometer casings. An elevational survey collected by a Licensed Professional Surveyor[1] was conducted upon completion of the piezometer installations. Survey data as well as construction information including screen depths and approximate distance to surface water are provided on **Table 1.** A general construction schematic of installed piezometers is depicted in **Appendix A.**

[1] Survey completed by State of Michigan licensed professional surveyor, Exxel Engineering Inc., on November 6, 2020.

The following GSI piezometers were installed in each study area:

- **HSP Study Area** (Nine locations)
  - Southeast downgradient of the HSP along the Rogue River
    i. HS-GSI-1 through HS-GSI-5
  - Downgradient of the HSP near the Grand River
    i. HS-GSI-6 through HS-GSI-8
  - Northwest of the HSP
    i. HS-GSI-9
- **Wolven/Jewell Study Area** (Five locations)
  - Downgradient of Wolven Northeast plume within the Rogue River
    i. Area19-GSI-1 through Area19-GSI-3
  - Downgradient of the northwest portion of the Wolven/Jewell plume along the Rogue River
    i. WVNW-GSI-1 and WVNW-GSI-2
- **Wolven/Childsdale Study Area** (Two locations)
  - North Childsdale area, downgradient of the Wolven study area
    i. WV/CH-GSI-1 and WV/CH-GSI-2

5.0 GROUNDWATER AND SURFACE WATER GAUGING

Prior to pore-water sampling, water levels were collected from the newly installed piezometers and network of staff gauges. As established in the GSI RAP, a minimum of two weeks of piezometer and staff-gauge measurements were made to establish groundwater flows to the surface water. An additional week of groundwater gauging levels were completed based upon weather conditions and schedule prior to pore-water sampling; data was collected three times/week for three weeks. Nine groundwater gauging events were completed starting November 9 through November 27, 2020.

Existing staff gauges of the Rogue River were utilized for water level comparison and groundwater flow evaluation in the following locations in the Rogue River:

- Rockford Dam Seawall;
- East Bridge Street Bridge;
- Rogue River Road Bridge; and
- Jericho Avenue Bridge

The water levels measured from these locations were used in combination with USGS gauging station, USGS04118500, to evaluate surface water levels in the Rogue River.

Additional staff gauge locations (11 Mile Bridge, Algoma Avenue Bridge, and 12 Mile Bridge) were added to pair with piezometer locations where existing staff gauges were not present. The gauging measurements were

determined to demonstrate general groundwater flow toward the Rogue River. Groundwater and surface water gauging data and associated elevations are provided on **Table 2**.

GSI piezometers and staff gauge locations are provided on **Figure 4.** The locations in each study area are further detailed on **Figures 4A** through **4C**.

6.0 PORE-WATER SAMPLING

Pore-water sampling was conducted in accordance with procedures outlined in SOP A27/GSI RAP. A Henry Tube Sampler (i.e., stainless-steel probe) with 1.5-inch slotted screen was pushed into the sediment at discrete depths within the river bottom. A shallow-sample interval (minimum of 12 inches below the river bottom) and a deep-sample interval (minimum 6 inches below the shallow interval) were attempted at each pore-water sample location. Once the Henry Tube was pushed to depth for the shallow-sample interval, a vacuum gauge device (manometer) was connected to the Henry Tube and a peristaltic pump was used to draw water from the pore space. A second length of tubing was connected to the opposite side of the manometer in which river water was drawn into the tubing. A system of valves were closed to compare the pressure of pore-water to that of the river water. A higher gradient pressure within the pore-water tubing indicated that up-welling was occurring within the pore space and the pore-water was distinguishable from surface water. Upon confirmation, the manometer was removed and a multiparameter meter with a flow-through cell was connected to the Henry Tube sampler.

R&W/GZA collected pH, temperature, conductivity, dissolved oxygen, and ORP from the river water which was then compared to the real-time readings of pore-water. This was an additional confirmation tool indicating pore-water, not surface water, was being drawn through the sample device. Pore-water readings were considered distinguishable from the river readings when the variance was greater than 10% difference for collected parameters from the multiparameter meter, with the exception of temperature. Following the stabilization of parameters, the flow-through cell was disconnected, and pore-water was pumped directly into laboratory-provided sampling containers. The difference between pore-water and surface water geochemistry demonstrates the pore-water samples did not have significant surface water intrusion; refer to Tables 3A and 3B. Monitoring well geochemistry data is provided on Table 3C. **Section 7.3** further details laboratory sample analysis.

As described in the GSI RAP, pore-water samples were collected from the following locations in each study area:

- **HSP Study Area**
  - Nine pore-water sampling locations (HS-PW-1 through HS-PW-9), southeast downgradient of the HSP plume along the Rogue River
  - Two pore-water sampling locations (HS-PW-10 and HS-PW-11), northwest of the HSP
- **Wolven/Jewell Study Area**
  - Four pore-water sampling locations (WVNW-PW-1 through WVNW-PW-4) immediately downgradient of the Wolven northwest plume, along the Rogue River
  - Seven pore-water sampling locations (Area19-PW-1 through Area19-PW-7) downgradient/northeast of the Area 19 plume within the Rogue River
- **Wolven/Childsdale Study Area**
  - Six pore-water sampling locations (WV/CH-PW-1 through WV/CH-PW-6) downgradient to the southeast of the Wolven study area

Figure 5 summarizes pore-water sample locations in the NKSA.

6.1. GROUNDWATER SAMPLING

As identified in the GSI RAP, existing well clusters HS-MW-19S/D and HS-MW-29A (located hydraulically downgradient of the House Street plume) and one existing well installed by EGLE (DEQ-MW-9 well series) were sampled concurrently during the pore-water sampling event. Newly installed piezometers (Area19-GSI-1, Area19-GSI-2, and Area19-GSI-3) were also sampled during the pore-water sampling event. Piezometer sampling was conducted in general accordance with procedures outlined in SOP A29.

6.2. RE-SAMPLE EVENT

While not part of the GSI RAP, additional pore-water samples were collected to better delineate PFAS concentrations detected in HS-PW-3, located at the southeast downgradient portion of the HSP plume. A sample was advanced directly adjacent to the original HS-PW-3 location (HS-PW-3R). HS-PW-2.5 was advanced approximately 130 feet upstream of HS-PW-3. HS-PW-3.5 was advanced 480 feet downstream of HS-PW-3. The re-sample event was completed eight weeks after the initial sample location. Samples were collected following the previously identified procedures.

7.0 SAMPLING AND ANALYTICAL PROCEDURES

7.1. SAMPLING LOCATIONS

As discussed in **Sections 4.0** and **6.0**, the following GSI piezometer, monitoring well, and pore-water samples were collected:

Table 7.1.1 Sampled GSI Piezometers and Monitoring Wells

Area of Investigation	Piezometers	Wells
Southeast downgradient of the HSP plume along Rogue River	Out of scope for current investigation	HS-MW-19S/D and HS-MW-29A
Downgradient of Wolven northeast plume within the Rogue River	Area19-GSI-1 through Area19-GSI-3	One EGLE well (DEQ-MW-9 well series)

Table 7.1.2 Pore-Water Sample Locations

Area of Investigation	Sample I.D.	Pore-Water (ft)[1] Screen Depth	
		Shallow (A)[2]	Deep (B)[3]
Southeast downgradient of the HSP plume along Rogue River	HS-PW-1	2.00 - 2.13	2.50 -2.63
	HS-PW-2	1.00 - 1.13	NS
	HS-PW-2.5	0.50 - 0.63	1.00 - 1.13
	HS-PW-3	1.33 - 1.46	NS
	HS-PW-3R	0.50 - 0.63	NS
	HS-PW-3.5	0.83 - 0.96	NS
	HS-PW-4	0.75 - 0.88	NS

Area of Investigation	Sample I.D.	Pore-Water (ft)[1] Screen Depth	
		Shallow (A)[2]	Deep (B)[3]
	HS-PW-5	1.33 - 1.46	NS
	HS-PW-6	1.00 - 1.13	NS
	HS-PW-7	1.50 - 1.63	NS
	HS-PW-8	1.00 - 1.13	NS
	HS-PW-9	1.00 - 1.13	NS
Northwest of the HSP	HS-PW-10	5.00 - 5.13	NS
	HS-PW-11	4.50 - 4.63	NS
Downgradient of Wolven Northeast plume within the Rogue River	Area19-PW-1	1.00 - 1.13	NS
	Area19-PW-2	1.00 - 1.13	1.42 - 1.54
	Area19-PW-3	1.00 - 1.13	NS
	Area19-PW-4	1.00 - 1.13	1.42 - 1.54
	Area19-PW-5	1.00 - 1.13	NS
	Area19-PW-6	1.50 - 1.63	2.00 - 2.13
	Area19-PW-7	5.00 - 5.13	NS
Downgradient of the northwest portion of the Wolven/Jewell plume along the Rogue River	WVNW-PW-1	3.00 - 3.13	4.00 - 4.13
	WVNW-PW-2	2.33 - 2.46	3.33 - 3.46
	WVNW-PW-3	1.50 - 1.63	NS
	WVNW-PW-4	1.67 - 1.79	NS
North Childsdale area, downgradient of the Wolven study area	WV/CH-PW-1	0.75 - 0.88	NS
	WV/CH-PW-2	0.75 - 0.88	NS
	WV/CH-PW-3	1.00 - 1.13	NS
	WV/CH-PW-4	1.00 - 1.13	NS
	WV/CH-PW-5	0.83 - 0.96	NS
	WV/CH-PW-6	1.00 -1.13	2.00 - 2.13

[1] – Measured in feet below the ground surface of the river bottom
[2] – "A" represents the shallow interval sample collected at each location which was advanced to a minimum of 12-inches below the sediment where conditions allowed.
[3] – "B" represents the deep interval sample collected at each location which was advanced to a minimum of 6-inches below the shallow sample where conditions allowed.
NS – Not Sampled. See **Section 7.2**, Sampling Deviations

7.2. GSI RAP SAMPLING ADJUSTMENTS

The intervals at which samples were collected were based upon the results of the vacuum-gauge device and confirmation of up-welling groundwater gradient at each location. In some sample locations, the shallow intervals were at depths greater than 12 inches due to unconsolidated sediment which did not create an adequate seal between pore and river water. The Henry Tube sample device was pushed deeper into the pore space until the vacuum gauge could confirm that pore-water was being collected through the sampling device and river water was not being short circuited.

Subsurface conditions (rocky substrate, refusal, etc.) did not allow for the collection of the deep interval at every location. Refusal or inadequate groundwater gradient prevented the sampling deeper intervals at 23 pore-water sampling locations. Proposed pore-water sample locations in the study area northwest of the HSP (HS-PW-10 and HS-PW-11) were required to be moved further downstream. Impassable conditions of the Rogue River combined with limited private landowner access made the locations established in the GSI RAP inaccessible. Following discussion with and approval of EGLE, these locations were shifted to be located upstream and downstream of GSI piezometer HS-GSI-9. Pore-water and monitoring well sampling worksheets are provided in **Appendix B**. Sampler Screen Interval provided on pore-water worksheets is the measured depth from the top of the sediment surface to the top of the sampler screen. The approximate screen length of the Henry Tube Sampler (.13 ft or 1.5 inches) is included in the total Pore Water Screen Depth interval of *Table 7.1.2*, measured in feet.

7.3. ANALYTICAL METHOD AND PARAMETERS

The samples were analyzed for PFAS using DoD QSM 5.3 guidelines for PFAS by isotope dilution methodology. The analyte list included the 28 PFAS compounds specified in the CD, and reporting limits are provided in Table A.7.7 of the project-specific QAPP.

8.0 GSI AND APPLICABLE RULE 57 WATER QUALITY STANDARDS

The potential environmental exposure pathways for impacted surface water in the Rogue River and applicable Part 4 Rule 57 Water Quality Values are identified as follows:

- Human exposure via non-drinking water exposure route – Rule 57 HNDV;
- Aquatic life exposure to impacted water in the Rogue River – Rule 57 FCV; and
- Wildlife exposure to impacted water in the Rogue River – Rule 57 WV.

Parameter	Units	HNDV	FCV	WV
PFOA	ng/L	12,000	880,000	Not Applicable
PFOS	ng/L	12	140,000	Not Applicable

The human health drinking water value is not applicable to this GSI investigation. Rather, the applicable criteria are the generic GSI criteria, which are the lesser of HNDV, FCV, and WV. The GSI criteria are derived using surface-water concentrations, but for the purpose of this evaluation they will be used for the evaluation of pore-water data to aid in evaluating compliance at the surface water compliance point. This does not imply that GSI criteria are necessarily applicable to the pore-water concentrations.

Compound	Threshold Value (µg/L)	Basis for Value
PFOA	12	GSI
PFOS	0.012	GSI

9.0 SITE SAMPLING RESULTS

The following section summarizes the analytical results from groundwater and pore-water collected during the investigation activities. During pore-water sampling and the concurrent groundwater sampling event, samples were collected from a total of 46 locations. Of those 46 locations, 0 samples exceeded GSI criteria for PFOA

(12,000 ng/L). For PFOS, 32 samples were greater than the GSI criteria (12 ng/l). Likewise, for PFOS, 14 samples were less than 12 ng/l or were non-detect in laboratory analysis. The PFOS concentrations are further described by each area:

- **HSP Study Area (South/Southeast, downgradient of the HSP plume along Rogue River)**

>12 ng/L	HS-PW-2.5A, HS-PW-2.5B, HS-PW-3A, HS-PW-3B, HS-PW-3A, HS-PW-3B, HS-PW-3.5A, HS-PW-3B, HS-PW-4, HS-PW-5, and HS-PW-8
<12 ng/L	HS-PW-1A, HS-PW-1B, HS-PW-2, HS-PW-6, HS-PW-7, and HS-PW-9

- **HSP Study Area (Northwest of the HSP)**

Non-Detect	HS-PW-10, and HS-PW-11

- **Wolven/Jewell Study Area (downgradient of the Wolven Northwest plume)**

>12 ng/L	WVNW-PW-3, WVNW-PW-4
<12 ng/L	WVNW-PW-1A, WVNW-PW-1B, WVNW-PW-2A, and WVNW-PW-2B

- **Wolven/Jewell Study Area (downgradient/northeast of the Wolven plume)**

>12 ng/L	Area19-GSI-1, Area19-PW-1, Area19-PW-2A, Area19-PW-2B, Area19-PW-3, Area19-PW-4A, Area19-PW-4B, Area19-PW-5, Area19-GSI-2, Area19-PW-6A, Area19-PW-6B, Area19-PW-7, and Area19-GSI-3
<12 ng/L	None
Non-Detect	WV-DEQ-MW9-57

- **Wolven/Childsdale Study Area**

>12 ng/L	WV/CH-PW-1, WV/CH-PW-2, WV/CH-PW-3, WV/CH-PW-4, WV/CH-PW-5, and WV/CH-PW-6A
<12 ng/L	None
Non-Detect	WV/CH-PW-6B

Pore-water sample results are summarized on **Table 4.** Groundwater sample results are summarized on **Table 5**. **Figures 6A** through **6C** summarize pore-water samples results for PFOS concentrations in each study area.

10.0 DATA QUALITY ASSURANCE AND CONTROL

QC samples were collected at a rate of one per 20 samples in accordance with the project-specific QAPP and approved GSI WP which included: field blanks, field duplicates, and MS/MSDs. All QA/QC samples were collected using the methods described in the SOPs and analyzed using the same analytical methods used for the primary sample.

Selected GSI data has been validated according to performance requirements and the QA/QC limits in Table D.1.1 of Revision 2 of the QAPP. In addition, R&W/GZA consulted the general guidance in the EPA Contract Laboratory Program National Functional Guidance for Organic and Inorganic Superfund Data Review and relevant analytical methods to assess data usability. Approximately 5% of all PFAS samples collected are included for data validation. Sample delivery group WA28027 from pore-water sampling was included within the 5% PFOS samples selected for data validation. Analytical deficiencies relative to the QAPP requirements will be identified and noted as a

result of the data validation. All analytical data has been provided to EGLE via EDD. Stage 4 Data Validation Report - Groundwater Surface Water Interface Area, produced by Environmental Standards, is included in **Appendix C**.

11.0 GSI WORK PLAN

Based on the groundwater monitoring and pore-water investigation data presented above, the following provides a summary of the WP. The proposed GSI sampling locations are shown on **Figures 6A** to **6C.** Actual monitoring well locations may vary slightly from the proposed locations during installation. While the target locations for the well clusters are shown, limitations for access on private properties, site conditions, and utilities may require moving monitoring well locations. GSI monitoring locations are proposed to monitor locations of highest PFOS concentrations in each study area. GSI monitoring locations will also be used to monitor the lateral extent of PFOS concentrations greater than 12 ng/L at the upstream and downstream extent of each study area. This WP outlines the initial phase of GSI investigation to further characterize each study area, and additional phases of GSI investigation (well installation) may be performed based on these results.

11.1. GSI RECOMMENDATIONS

As indicated in **Figures 3A**, **3B** and **3C**, the depth of the vertical groundwater discharge zone becomes less as the location approaches the Rogue River shoreline and becomes greater as the location is away from the Rogue River shoreline. As shown in **Figure 3A**, the limit of the vertical discharge zone at HS-MW-29A/B/C/D cluster is approximately 15 feet below the groundwater table, and only MW-29A appears to be an appropriate monitoring well that is capable of monitoring PFOS venting to the Rogue River. Monitoring well WV-MW-7S/M is located approximately 1,000 feet away from the Rogue River in **Figure 3B**, and the limit of the vertical groundwater discharge zone is approximately 55 feet BGT. Both WV-MW-7S and WV-MW-7M are screened within the estimated groundwater discharge zone and are capable of monitoring PFOS venting to the GSI. In **Figure 3C**, monitoring well cluster WV-DEQ-MW9 is located approximately 400 feet away from the Rogue River, and the shallowest well screen WV-DEQ-MW9-57 is below the estimated groundwater discharge zone, and therefore, is not an appropriate GSI monitoring well for that location. On the other hand, PFOS data collected from the shallow monitoring wells, such as AREA19-GSI-1, AREA19-GSI-2 and AREA19-GSI-3, which are screened within the estimated vertical discharge zone, were consistent with the pore-water sampling data. In short, monitoring wells located close to the Rogue River and screened in the shallow groundwater zone will provide effective GSI monitoring. Based on the groundwater flow evaluation and the existing PFOS groundwater monitoring data, VAP in the top 50 feet of the saturated zone should be sufficient for the proposed GSI monitoring wells if the locations are less than 500 feet away from the Rogue River shoreline. Existing monitoring wells will be evaluated for possible use as GSI monitoring points. Proposed RAP monitoring well clusters will also be evaluated for possible use as GSI monitoring points as they are installed, and groundwater measurements are collected. If determined to meet GSI monitoring criteria, the alternative locations for GSI monitoring will be provided to EGLE.

The GSI monitoring wells are to be placed as close to the Rogue River as possible, within 50 to 500 feet from the Rogue River shoreline. At each location, the soil boring will be advanced to approximately 50 feet BGT and VAP sampling (SOP A25) will be performed by setting a temporary well screen and collecting groundwater samples at an interval of 10 feet in the saturated zone. The VAP intervals will be 5 to 10 feet BGT, 15 to 20 feet BGT, 25 to 30 feet BGT, 35 to 40 feet BGT, and 45 to 50 feet BGT, assuming groundwater is encountered throughout the borehole depth. If fine-grained soil is present or groundwater column is discontinuous, the VAP intervals will be adjusted based on field observations.

The VAP data will be evaluated to determine the appropriate location for the placement of monitoring well screens. The wells in each study area that are located upstream and downstream of the PFOS concentrations

currently known to be over 12 ng/L are those used to delineate the lateral extent of each discharge area. If the VAP data from these locations indicates PFOS is found throughout the aquifer at detections greater than GSI criteria, a step-out boring may be completed further from the source area to better delineate the PFOS concentrations prior to the installation of the monitoring well cluster.

Upon the completion of soil boring and VAP sampling, one monitoring well will be installed within the top 10 feet of the saturated zone. If PFOS is not detected in the VAP samples, one well will be installed at the location. If PFOS is detected in the VAP samples, up to three monitoring wells will be installed at depths which will be selected based on PFOS concentrations and vertical monitoring spacing. The screen position of the deeper monitoring well will be selected based on the distance of the monitoring well to the shoreline, geology, and estimated groundwater flow path.

11.2. PROPOSED MONITORING LOCATIONS

Wolven Northwest

In the Wolven Northwest area, three GSI monitoring well locations are proposed.

- WVNW-MW-201 is positioned near the pore-water sample location WVNW-PW-3, where the highest PFOS concentration was detected in the pore-water sample in the area.

- Three locations are proposed to delineate the lateral extent of PFOS concentrations exceeding 12 ng/L in this area.
  - WVNW-MW-200 is proposed at the upstream reach of the Wolven Northwest area near WVNW-PW-2
  - WVNW-MW-202 is proposed at the downstream reach of the Wolven Northwest area near WVNW-PW-3
  - WVNW-MW-203 is proposed near the WV-MW-7S/M/D monitoring well cluster to straddle the groundwater table interface

Wolven Northeast

In Wolven Northeast, five GSI monitoring well locations are proposed to spatially cover the river reach from pore-water sample location AREA19-PW-1 to AREA19-PW-5, where PFOS was detected.

- Area19-MW-222 is positioned next to AREA19-PW-5, where the highest PFOS concentration in the pore-water samples was detected.

- The other four locations (Area19-MW-7 (Area 19 RAP well), Area19-MW-221, 223, and 224) are proposed near AREA19-GSI-1, between AREA19-PW-2 and AREA19-PW-3, near AREA19-PW-6, and south of AREA19-GSI-3 to delineate the PFOS extent upstream and downstream of this study area.

Wolven/Childsdale

In the Wolven/Childsdale study area, three GSI monitoring well locations are proposed.

- WV/CH-MW-241 is positioned next to WV/CH-PW-3 and downstream of WV/CH-PW-2, where the highest PFOS concentration in the pore-water samples was detected in this area.

- Two locations are proposed to delineate the lateral extent of PFOS concentrations exceeding 12 ng/L in this area.
  - WV/CH-MW-240 is proposed at the upstream reach of the Wolven/Childsdale area near WV/CH-PW-1
  - WV/CH-MW-242 is proposed at the downstream reach of the Wolven/Childsdale area near WV/CH-PW-5

HSP South/Southeast

In the HSP area to the southeast, six GSI monitoring well locations are proposed, including one existing monitoring well.

- In the HSP area to the southeast, three GSI monitoring well locations (HS-MW-260, 261, and 262) are proposed centered around HS-PW-3, where the highest PFOS concentration was detected in this area.

- HS-MW-266 is proposed near the northeast end of the Department of Natural Resource fishponds, hydraulically upgradient of proposed HS-MW-261.

- Two locations are proposed to delineate the lateral extent of PFOS concentrations upstream and downstream of HW-PW-3.
  - HS-MW-260 is proposed at the upstream reach of the HSP area near HS-PW-2.5
  - HS-MW-262 is proposed at the downstream reach of the HSP area near HS-PW-4

- Existing groundwater monitoring well HS-MW-29A is located near pore-water sample location HS-PW-3 and will be included as a GSI monitoring well.

- Three locations are proposed for downstream monitoring of the HSP plume:
  - HS-MW-263 is proposed near HS-PW-5
  - HS-MW-264 is proposed near HS-PW-8
  - HS-MW-265 is proposed near the Grand River to monitor potential PFOS migration to the south of the HSP plume.

Proposed GSI monitoring locations are provided on **Figures 6A** through **6C**.

Upon completion of the GSI monitoring well installation, the GSI monitoring wells and the existing groundwater monitoring wells in the HSP and Wolven/Jewell study areas will be sampled and analyzed for PFAS Compounds under the CD. The results of VAP sampling and groundwater sampling results will be evaluated to further determine if additional GSI monitoring wells are necessary. If no additional GSI monitoring wells are needed, the well network will be considered substantially complete. The first round of sampling completed at construction will be considered quarter one and three additional sampling events will take place in that year. If additional wells are needed, the four quarters of monitoring will not commence until the network is deemed substantially complete.

12.0 INVESTIGATION METHODOLOGY

Relevant tasks completed under this WP will be completed in accordance with the most recent revision of the QAPP prepared for Wolverine by R&W/GZA as well as methodologies outlined in the approved GSI WP.

The proposed well cluster locations will be drilled using either hollow-stem auger or rotosonic methods in accordance with SOPs A03 through A06 of the QAPP. When possible, the initial boring at each location will be drilled 50 feet into the groundwater table or upon refusal. The borehole-terminal depth will also be evaluated based on the depths of adjacent water wells and the presence of confining strata.

As the original borings are drilled at each location, VAP samples will be collected for PFAS analysis from water-bearing and permeable formation(s) at an interval of 10 feet. VAP will be completed in accordance with *SOP A25, Vertical Aquifer Profiling* included in the QAPP. The turn-around time for laboratory samples will be approximately three to four weeks.

Well installation depths are not predetermined. Based on the combination of profiling data, encountered geology, and corresponding piezometer and river elevations, R&W/GZA will determine the depth(s) of wells installed at each nest location. The monitoring wells will be developed in accordance with *SOP A13, Well Development* in the QAPP. Upon completion, the wells will also be surveyed by a licensed surveyor.

13.0 SAMPLING AND ANALYTICAL PROCEDURES

This section provides a generalized SAP for the GSI monitoring well sampling. Specific information regarding sampling procedures and analytical methods is provided in the site-specific QAPP and approved GSI WP.

Once the GSI well network is substantially complete (as identified in **Section 11**), all newly installed wells will be sampled quarterly for one year.

13.1. SAMPLING LOCATIONS

As discussed in **Section 11.1**, the following GSI monitoring and sampling locations are proposed:

Table 13.1.1 Proposed GSI Sampling Locations

Area of Investigation	GSI Monitoring Wells
Wolven Northwest • Downgradient of the northwest portion of the Wolven/Jewell plume along the Rogue River	• WVNW-MW-200 • WVNW-MW-201 • WVNW-MW-202 • WVNW-MW-203
Wolven Northeast • Downgradient of Wolven Northeast plume within the Rogue River	• Area19-MW-7 (Area 19 RAP well) • Area19-MW-221 • Area19-MW-222 • Area19-MW-223 • Area19-MW-224
North Childsdale Area • Downgradient of the Wolven study area	• WV/CH-MW-240 • WV/CH-MW-241 • WV/CH-MW-242

Downgradient of the HSP to the southeast • Southeast downgradient of the HSP primary plume along Rogue River	• HS-MW-260 • HS-MW-29A (existing well) • HS-MW-261 • HS-MW-262 • HS-MW-263 • HS-MW-264 • HS-MW-266
Downgradient of the HSP to the south • Downgradient of the HSP near Grand River	• HS-MW-265

13.2. SAMPLE COLLECTION AND LABELING

Samples will be collected for PFAS analysis following the methods summarized in **Section 13.0** and detailed in the sampling SOPs for Groundwater Monitoring Wells (*SOP A16; Low Flow Sampling*). Detailed field and laboratory requirements are provided in the site-specific QAPP.

Sample identification will consist of nomenclatures that include the unique location identification (see reference table above). If applicable, sample identification for each sample will be repeated for each sampling event with consistent spelling.

To prevent misidentification of samples, legible labels will be affixed to each sample container. The labels will be sufficiently durable to remain legible even when wet. At a minimum, the labels will contain the following information:

- Location ID;
- Name or initials of collector; and
- Date and time of collection.

13.3. SAMPLE SHIPPING

Sample bottles will be placed into the cooler and packed with double-bagged wet ice immediately following collection. Packing material will be used as necessary. A temperature blank will be placed in the cooler prior to shipment. The cooler shall be addressed to the appropriate laboratory and dispatched as soon as practical to ensure timely arrival.

13.4. ANALYTICAL METHOD AND PARAMETERS

PFAS will be analyzed using DoD QSM 5.3 guidelines for PFAS by isotope dilution methodology. The analyte list will include the 28 PFAS compounds specified in the CD, and reporting limits are provided in Table A.7.7 of the project-specific QAPP.

14.0 DATA QUALITY ASSURANCE AND CONTROL

The following field QC samples will be collected at a rate of one per 20 samples in accordance with the project-specific QAPP: Field blanks, field duplicates, and MS/MSDs. Field QC sample collection methodologies are outlined in the approved GSI RAP.

15.0 INVESTIGATION DERIVED WASTE

Soil cuttings will be containerized and transported to the HSP for staging/storage until off-site treatment/disposal or other approved handling can be arranged. The monitoring well development and purge water will be managed as follows:

- For locations where PFAS concentrations are known to be below Part 201 GRCC, the water can be discharged to the ground surface in accordance with EGLE interoffice communication regarding purge-water disposal from well sampling and development (EGLE, 1999).

- For locations where PFAS concentrations are unknown or known to exceed Part 201 GRCC, the water will be disposed of appropriately in accordance with the EGLE interoffice communication regarding purge water disposal from well sampling and development (EGLE, 1999), and not discharged to the ground surface.

16.0 ANTICIPATED SCHEDULE

The schedule for GSI monitoring well installation will depend greatly on R&W/GZA's ability to obtain access to the desired location or proximate alternate. The following table outlines R&W/GZA's current estimates of the steps and approximate timeframes for the tasks in this WP (upon EGLE approval).

Task	Estimated Timeframe per Location
Access	1 to 3 months
Initial Drilling	2 to 3 weeks
VAP analysis	3 weeks
Monitoring Wells Installation	1 to 2 weeks
Development Wait Time	2 weeks
First Groundwater Sampling	1 week
First Laboratory Analysis	3 weeks

The table includes a completion timeframe estimate of each task per location. Based upon the 19 proposed locations in this WP, R&W/GZA estimates this WP will require a total of 17 months to complete drilling, VAP analysis, and installation of the proposed monitoring wells. Access is likely to be granted piecemeal and will therefore create overlap in the schedule of tasks. If access issues do arise, the protocol laid out in **Section 9.0** of the CD will be implemented. Additional phases of well installation may be necessary to ensure that the well network is substantially complete. Quarterly sampling of the well network will begin following substantial completion of the network. Following the full year of quarterly sampling of the well network (i.e., receipt of final EDD), Wolverine will submit, within 180 days, a Completion Report per Section 7.12(a)(viii) of the CD.

17.0 REFERENCES

Michigan Department of Environmental Quality. 1999. *Interoffice Communication, Operation Memo Gen-10, Re: Purge Water Disposal from Well Sampling and Development.* https://www.michigan.gov/documents/deq/deq-whm-hwp-Op-Memo-Gen-10-Rev1_235127_7.pdf

R&W/GZA. 2018. *Conceptual Site Model Update and Status Report, Former House Street Disposal Area, Wolverine World Wide, Inc., Rockford, Michigan*.

R&W/GZA. 2018. *Quality Assurance Project Plan, Former Wolverine Tannery and House Street Disposal Area, Revision 2.* Submitted to EPA August 29, 2018 with errata pages submitted October 31, 2018 and April 15, 2019.

R&W/GZA. 2019. *Implementation of 2018 Work Plan - Summary Report, Former Wolverine World Wide Tannery Facility*. Submitted to USEPA January 11, 2019.

R&W/GZA. 2020. *Groundwater-Surface Water Interface (GSI) Response Activity Plan, North Kent Study Area*. Submitted to Michigan Department of Environment, Great Lakes, and Energy (EGLE) September 23, 2020.

TABLES

TABLE 1
GSI Piezometer Summary
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Piezometer I.D.	Date Installed	Piezometer Easting (ft.)	Piezometer Northing (ft.)	Top of Casing (ft. amsl)	Grade Elevation (ft. amsl)	Top of Screen (ft. bg.)	Total Boring Depth (ft. bg.)	Distance to River (ft.)
WVNW-GS1-1	10/29/2020	12790197.62	598854.06	716.38	711.68	2.20	6.20	4.00
WVNW-GS1-2	10/29/2020	12788280.45	597285.30	719.58	715.49	6.00	10.00	6.00
HS-GS1-1	10/27/2020	12796409.12	580037.74	635.84	631.76	3.00	7.00	3.00
HS-GS1-2	10/27/2020	12794382.15	578575.97	629.76	625.68	2.90	6.90	2.00
HS-GS1-3	10/27/2020	12794540.64	575395.34	622.55	619.47	2.80	6.80	5.00
HS-GS1-4	10/26/2020	12796056.76	572277.56	612.64	610.72	1.30	5.30	6.50
HS-GS1-5	10/26/2020	12796142.39	572339.83	615.42	612.54	4.50	8.50	6.00
HS-GS1-6	10/26/2020	12795200.75	569770.43	611.34	608.72	4.25	8.25	8.00
HS-GS1-7	10/26/2020	12793161.54	570470.86	611.68	608.68	5.00	9.00	12.80
HS-GS1-8	10/26/2020	12791378.50	571769.65	612.03	610.15	7.40	11.40	12.00
HS-GS1-9	10/29/2020	12783447.92	594138.68	722.50	717.75	5.00	9.00	13.00
AREA19-GS1-1	10/29/2020	12803671.73	602250.59	703.04	698.71	3.70	7.70	4.00
AREA19-GS1-2	10/29/2020	12805441.24	598178.39	695.90	692.09	4.00	8.00	4.00
AREA19-GS1-3	10/29/2020	12805120.16	595643.55	695.34	691.50	4.20	8.20	6.70
WV/CH-GS1-1	10/27/2020	12804580.97	590400.63	679.59	675.75	1.00	5.00	3.00
WV/CH-GS1-2	10/27/2020	12803034.54	588938.87	674.84	671.95	2.10	6.10	4.00

TABLE 2

GSI Groundwater and Surface Water Gauging
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Station ID	Reference Elevation (ft, M.S.L.)	Date	Depth to Water (ft)	Water Elevation (ft, M.S.L.)
Rogue River				
HS-GSI-9	722.5	11/09/20	5.73	716.77
		11/11/20	5.41	717.09
		11/13/20	5.32	717.18
		11/16/20	5.15	717.35
		11/18/20	4.86	717.64
		11/20/20	5.24	717.26
		11/23/20	5.50	717.00
		11/25/20	5.40	717.10
		11/27/20	4.77	717.73
SG-11 Mile Bridge	725.85	11/09/20	12.80	713.05
		11/11/20	12.57	713.28
		11/13/20	12.45	713.40
		11/16/20	12.25	713.60
		11/18/20	12.02	713.83
		11/20/20	12.35	713.50
		11/23/20	12.64	713.21
		11/25/20	12.55	713.30
		11/27/20	11.95	713.90
WV/NW-GSI-2	719.58	11/09/20	7.03	712.55
		11/11/20	6.78	712.80
		11/13/20	6.64	712.94
		11/16/20	6.39	713.19
		11/18/20	6.26	713.32
		11/20/20	6.55	713.03
		11/23/20	6.83	712.75
		11/25/20	6.72	712.86
		11/27/20	6.22	713.36
WV/NW-GSI-1	716.38	11/09/20	5.61	710.77
		11/11/20	5.48	710.90
		11/13/20	5.46	710.92
		11/16/20	5.35	711.03
		11/18/20	5.28	711.10
		11/20/20	5.40	710.98
		11/23/20	5.52	710.86
		11/25/20	5.42	710.96
		11/27/20	5.23	711.15
SG-Algoma Bridge	722.06	11/09/20	12.55	709.51
		11/11/20	12.30	709.76
		11/13/20	12.10	709.96
		11/16/20	12.00	710.06
		11/18/20	11.90	710.16
		11/20/20	12.16	709.90
		11/23/20	12.30	709.76
		11/25/20	12.30	709.76
		11/27/20	11.85	710.21

TABLE 2

GSI Groundwater and Surface Water Gauging
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Station ID	Reference Elevation (ft, M.S.L.)	Date	Depth to Water (ft)	Water Elevation (ft, M.S.L.)
Rogue River				
SG-12 Mile Bridge	718.41	11/09/20	12.56	705.85
		11/11/20	12.13	706.28
		11/13/20	12.15	706.26
		11/16/20	12.20	706.21
		11/18/20	11.78	706.63
		11/20/20	12.00	706.41
		11/23/20	12.20	706.21
		11/25/20	12.10	706.31
		11/27/20	11.72	706.69
Area-19-GSI-1	703.04	11/09/20	5.50	697.54
		11/11/20	5.37	697.67
		11/13/20	5.39	697.65
		11/16/20	5.26	697.78
		11/18/20	5.24	697.80
		11/20/20	5.33	697.71
		11/23/20	5.44	697.60
		11/25/20	5.40	697.64
		11/27/20	5.21	697.83
Area-19-GSI-2	695.90	11/09/20	4.87	691.03
		11/11/20	4.66	691.24
		11/13/20	4.69	691.21
		11/16/20	4.48	691.42
		11/18/20	4.50	691.40
		11/20/20	4.60	691.30
		11/23/20	4.79	691.11
		11/25/20	4.70	691.20
		11/27/20	4.46	691.44
Area-19-GSI-3	695.34	11/09/20	4.69	690.65
		11/11/20	4.52	690.82
		11/13/20	4.57	690.77
		11/16/20	4.47	690.87
		11/18/20	4.54	690.80
		11/20/20	4.58	690.76
		11/23/20	4.67	690.67
		11/25/20	4.51	690.83
		11/27/20	4.50	690.84
Rum Creek SG	695.11	11/09/20	3.93	691.18
		11/11/20	3.88	691.23
		11/13/20	3.88	691.23
		11/16/20	3.79	691.32
		11/18/20	2.90	692.21
		11/20/20	2.90	692.21
		11/23/20	N/A	N/A
		11/25/20	3.60	691.51
		11/27/20	3.80	691.31

TABLE 2

GSI Groundwater and Surface Water Gauging
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Station ID	Reference Elevation (ft, M.S.L.)	Date	Depth to Water (ft)	Water Elevation (ft, M.S.L.)
Rogue River				
Dam Seawall	681.06	11/09/20	2.02	679.04
		11/11/20	1.80	679.26
		11/13/20	1.85	679.21
		11/16/20	1.67	679.39
		11/18/20	1.70	679.36
		11/20/20	1.81	679.25
		11/23/20	1.94	679.12
		11/25/20	1.85	679.21
		11/27/20	1.64	679.42
Bridge Street Bridge	694.33	11/09/20	15.60	678.73
		11/11/20	15.30	679.03
		11/13/20	15.40	678.93
		11/16/20	15.23	679.10
		11/18/20	15.27	679.06
		11/20/20	15.32	679.01
		11/23/20	15.40	678.93
		11/25/20	15.35	678.98
		11/27/20	15.15	679.18
WV/CH-GSI-1	679.59	11/09/20	4.60	674.99
		11/11/20	4.47	675.12
		11/13/20	4.55	675.04
		11/16/20	4.36	675.23
		11/18/20	4.43	675.16
		11/20/20	4.48	675.11
		11/23/20	4.54	675.05
		11/25/20	4.51	675.08
		11/27/20	4.37	675.22
Jericho Road Bridge	687.48	11/09/20	17.25	670.23
		11/11/20	17.03	670.45
		11/13/20	17.10	670.38
		11/16/20	16.90	670.58
		11/18/20	16.92	670.56
		11/20/20	17.03	670.45
		11/23/20	17.15	670.33
		11/25/20	17.05	670.43
		11/27/20	16.85	670.63
WV/CH-GSI-2	674.84	11/09/20	4.65	670.19
		11/11/20	3.48	671.36
		11/13/20	3.54	671.30
		11/16/20	3.36	671.48
		11/18/20	3.40	671.44
		11/20/20	3.51	671.33
		11/23/20	3.61	671.23
		11/25/20	3.52	671.32
		11/27/20	3.35	671.49

TABLE 2

GSI Groundwater and Surface Water Gauging
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Station ID	Reference Elevation (ft, M.S.L.)	Date	Depth to Water (ft)	Water Elevation (ft, M.S.L.)
Rogue River				
HS-GSI-1	635.84	11/09/20	5.30	630.54
		11/11/20	5.12	630.72
		11/13/20	5.22	630.62
		11/16/20	5.02	630.82
		11/18/20	5.04	630.80
		11/20/20	5.13	630.71
		11/23/20	5.23	630.61
		11/25/20	5.18	630.66
		11/27/20	5.02	630.82
Packer Bridge	N/A	11/09/20	N/A	628.76
		11/11/20		629.03
		11/13/20		628.99
		11/16/20		629.23
		11/18/20		629.21
		11/20/20		629.04
		11/23/20		628.89
		11/25/20		629.03
		11/27/20		629.27
HS-GSI-2	629.76	11/09/20	4.73	625.03
		11/11/20	4.55	625.21
		11/13/20	4.60	625.16
		11/16/20	4.48	625.28
		11/18/20	4.50	625.26
		11/20/20	4.56	625.20
		11/23/20	4.64	625.12
		11/25/20	4.60	625.16
		11/27/20	4.46	625.30
HS-GSI-3	622.55	11/09/20	4.70	617.85
		11/11/20	4.56	617.99
		11/13/20	4.60	617.95
		11/16/20	4.48	618.07
		11/18/20	4.50	618.05
		11/20/20	4.59	617.96
		11/23/20	4.68	617.87
		11/25/20	4.55	618.00
		11/27/20	4.44	618.11
Rogue River Bridge	628.35	11/09/20	10.55	617.80
		11/11/20	10.40	617.95
		11/13/20	10.45	617.90
		11/16/20	10.34	618.01
		11/18/20	10.38	617.97
		11/20/20	10.43	617.92
		11/23/20	10.51	617.84
		11/25/20	10.45	617.90
		11/27/20	10.31	618.04

TABLE 2

GSI Groundwater and Surface Water Gauging
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Station ID	Reference Elevation (ft, M.S.L.)	Date	Depth to Water (ft)	Water Elevation (ft, M.S.L.)
Rogue River				
HS-GSI-4	612.64	11/09/20	3.80	608.84
		11/11/20	3.66	608.98
		11/13/20	3.71	608.93
		11/16/20	3.60	609.04
		11/18/20	3.60	609.04
		11/20/20	3.68	608.96
		11/23/20	3.78	608.86
		11/25/20	3.72	608.92
		11/27/20	3.57	609.07
HS-GSI-5	615.42	11/09/20	6.50	608.92
		11/11/20	6.30	609.12
		11/13/20	6.74	608.68
		11/16/20	6.20	609.22
		11/18/20	6.20	609.22
		11/20/20	6.27	609.15
		11/23/20	6.39	609.03
		11/25/20	6.33	609.09
		11/27/20	6.17	609.25
Grand River				
HS-GSI-6	611.34	11/09/20	5.30	606.04
		11/11/20	4.94	606.40
		11/13/20	5.02	606.32
		11/16/20	4.80	606.54
		11/18/20	4.78	606.56
		11/20/20	4.78	606.56
		11/23/20	5.03	606.31
		11/25/20	4.98	606.36
		11/27/20	4.72	606.62
HS-GSI-7	611.68	11/09/20	5.80	605.88
		11/11/20	5.49	606.19
		11/13/20	5.58	606.10
		11/16/20	5.31	606.37
		11/18/20	5.31	606.37
		11/20/20	5.31	606.37
		11/23/20	5.60	606.08
		11/25/20	5.56	606.12
		11/27/20	5.29	606.39
HS-GSI-8	612.03	11/09/20	6.00	606.03
		11/11/20	5.67	606.36
		11/13/20	5.73	606.30
		11/16/20	5.43	606.60
		11/18/20	5.48	606.55
		11/20/20	5.54	606.49
		11/23/20	5.85	606.18
		11/25/20	5.65	606.38
		11/27/20	5.38	606.65

TABLE 3A
Pore-Water Geochemistry Data
GSI Investigation
Alpine and Plainfield Townships, Kent County, Michigan

Date	Location ID	Sample Time	Time of Reading	Water Level (inches)	Purge Rate (mL/min)	Tempurature (°C)		Specific Conductivity (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
						River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
11/30/2020	Area19-PW-1	10:35	10:20	12	-	4.2	-	506	-	13.13	-	256.6	-	8.57	-	4	-
			10:25	-	300	-	6	-	582	-	1.4	-	256	-	7.9	-	4
			10:30	-	300	-	6	-	582	-	1.3	-	198	-	7.8	-	2
			10:35	-	300	-	6	-	582	-	1.3	-	130	-	7.6	-	1
11/30/2021	Area19-PW-2(A)	13:55	13:35	9	-	4.2	-	548	-	27.1	-	250	-	7.9	-	3	-
			13:40	-	100	-	6	-	1289	-	4.9	-	260	-	7.5	-	30
			13:45	-	100	-	6	-	1292	-	2.6	-	186	-	7.4	-	46
			13:50	-	100	-	6	-	1289	-	2.1	-	107	-	7.3	-	29
			13:55	-	100	-	6	-	1286	-	1.7	-	43	-	7.4	-	65
11/30/2020	Area19-PW-2(B)	14:30	14:10	9	-	4.2	-	599	-	13.7	-	-70	-	7.6	-	16	-
			14:15	-	150	-	6.4	-	1242	-	1.4	-	-28	-	7.4	-	6
			14:20	-	150	-	6.5	-	1242	-	1	-	-50	-	7.2	-	8
			14:25	-	150	-	6.8	-	1236	-	1	-	-68	-	7.1	-	10
			14:30	-	150	-	6.7	-	1237	-	1.1	-	-74	-	7.1	-	7
11/30/2020	Area19-PW-3	15:35	15:15	3	-	4.4	-	600	-	13.3	-	-61	-	7.5	-	4	-
			15:20	-	150	-	6.9	-	760	-	8.2	-	-15	-	7.4	-	14
			15:25	-	150	-	6.6	-	762	-	6.1	-	-5.4	-	7.4	-	20
			15:30	-	150	-	7	-	737	-	5.5.	-	-9.4	-	7.4	-	12
			15:35	-	150	-	6.7	-	737	-	5.3	-	23.1	-	7.9	-	10
12/1/2020	Area19-PW-4(A)	10:50	10:25	9	-	3.2	-	523.9	-	19.38	-	121.9	-	9.43	-	3	-
			10:35	-	150	-	5.7	-	966	-	1.9	-	122	-	8.3	-	296
			10:40	-	150	-	5.8	-	962	-	1.2	-	107	-	8	-	114
			10:45	-	150	-	6	-	952	-	1.2	-	96	-	7.8	-	78
			10:50	-	150	-	5.7	-	941	-	1.2	-	86	-	7.7.	-	70
12/1/2020	Area19-PW-4(B)	11:35	11:15	-	-	3.2	-	524	-	11.8	-	79	-	7.9	-	17	-
			11:20	-	150	-	5.2	-	931	-	1.4	-	94	-	7.7.	-	192
			11:25	-	150	-	5.3	-	921	-	1.2	-	90	-	7.7	-	71
			11:30	-	150	-	5.3	-	906	-	1.3	-	89	-	7.7	-	56
			11:35	-	150	-	5.4	-	890	-	1.4	-	89	-	7.6	-	10
12/1/2020	Area19-PW-6(A)	15:15	14:55	-	-	3.7	-	520.2	-	12.8	-	195.2	-	8.13	-	2	-
			15:00	-	-	-	6.4	-	562	-	1.2	-	179	-	7.9	-	478
			15:05	-	-	-	6.9	-	562	-	1	-	34	-	7.8	-	40
			15:10	-	-	-	6.9	-	562	-	1	-	-27	-	7.7	-	32
			15:15	-	-	-	6.9	-	561	-	1	-	-48	-	7.6	-	17
12/1/2020	Area19-PW-6(B)	15:50	15:30	-	-	3.7	-	518.7	-	12.4	-	-11.1	-	7.96	-	8	-
			15:35	-	-	-	6.6	-	559.7	-	1.11	-	-38.6	-	7.79	-	55
			15:40	-	-	-	6.9	-	561.5	-	0.75	-	-48.9	-	7.7	-	26
			15:45	-	-	-	6.9	-	561.9	-	0.78	-	-55.4	-	7.63	-	14
			15:50	-	-	-	6.8	-	561.8	-	0.78	-		-	7.57	-	9
12/1/2020	Area19-PW-7	16:40	16:20	-	-	3.6	-	519.6	-	12.19	-	48.8	-	7.81	-	10	-
			16:25	-	-	-	8.3	-	644	-	1.24	-	82	-	7.6	-	49
			16:30	-	-	-	7.8	-	697	-	0.7	-	59	-	7.6	-	28
			16:35	-	-	-	8	-	698	-	0.7	-	40	-	7.6	-	12
			16:40	-	-	-	8	-	699	-	0.7	-	30	-	7.5	-	-
12/2/2020	WVNW-PW-4(A)	12:00	11:35	-	-	2.1	-	498	-	26.3	-	137	-	9.6	-	5	-
			11:45	-	150	-	6.2	-	684	-	5.2	-	167	-	8.4	-	266
			11:50	-	150	-	6.8	-	706	-	1.4	-	43	-	7.9	-	279
			11:55	-	150	-	6.8	-	716	-	1.3	-	-24	-	7.5	-	78
			12:00	-	150	-	6.9	-	716	-	1.2	-	-41	-	7.5	-	16
12/2/2020	WVNW-PW-3	14:40	14:20	-	-	2.6	-	623	-	1245	-	171.7	-	7.8	-	9	-
			14:25	-	150	-	7.2	-	554	-	1.4	-	171	-	7.7	-	26
			14:30	-	150	-	7.3	-	557	-	1.2	-	157	-	7.6	-	5
			14:35	-	150	-	7.4	-	557	-	1.1	-	143	-	7.6	-	1
			14:40	-	150	-	7.4	-	557	-	1.1	-	133	-	7.5	-	1
12/3/2020	HS-PW-1(A)	12:05	11:40	-	-	2.8	-	513.8	-	62.62	-	268.6	-	7.86	-	1	-
			11:50	-	-	-	4.6	-	1053	-	2.09	-	225.9	-	7.6	-	4
			11:55	-	-	-	6.1	-	1066	-	1.24	-	189	-	7.48	-	3
			12:00	-	-	-	5.8	-	1069	-	1.22	-	181.2	-	7.44	-	2
			12:05	-	-	-	5.6	-	1067	-	1.19	-	177	-	7.4	-	2

TABLE 3A
Pore-Water Geochemistry Data
GSI Investigation
Alpine and Plainfield Townships, Kent County, Michigan

Date	Location ID	Sample Time	Time of Reading	Water Level (inches)	Purge Rate (mL/min)	Tempurature (°C)		Specific Conductivity (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
						River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
12/1/2020	Area19-PW-5(A)	12:20	12:00	-	-	3.3	-	522.8	-	12.32	-	147.6	-	7.95	-	24	-
			12:05	-	150	-	6.3	-	528	-	1.3	-	144	-	7.8	-	74
			12:10	-	150	-	6.5	-	534	-	0.8	-	6.2	-	7.7	-	20
			12:15	-	150	-	6.7	-	533	-	0.7	-	-42	-	7.6	-	9
			12:20	-	150	-	6.7	-	533	-	0.8	-	-58	-	7.5	-	5
12/3/2020	HS-PW-1(B)	12:50	12:20	-	-	2.6	-	571.9	-	12.89	-	186.2	-	7.83	-	15	-
			12:35	-	-	-	5.9	-	1060	-	2.48	-	198.8	-	7.4	-	4
			12:40	-	-	-	6	-	1061	-	1.22	-	192.4	-	7.35	-	3
			12:45	-	-	-	6.1	-	1062	-	1.05	-	187.8	-	7.31	-	2
			12:50	-	-	-	5.8	-	1064	-	0.9	-	185	-	7.3	-	1
12/3/2020	HS-PW-7(A)	15:45	15:25	-	-	3.1	-	562.1	-	15.41	-	-62.5	-	7.78	-	4	-
			15:30	-	150	-	5.5	-	857	-	2.22	-	-20.7	-	7.42	-	0.5
			15:35	-	150	-	6	-	925	-	1.18	-	-57.8	-	7.32	-	3
			15:40	-	150	-	6.1	-	943	-	1.16	-	-75.5	-	7.2	-	3
			15:45	-	150	-	6.1	-	945	-	1.14	-	-78.3	-	7.18	-	2
12/4/2020	HS-PW-2(A)	14:45	14:15	-	-	2.9	-	566.5	-	16.3	-	240.3	-	7.94	-	76	-
			14:30	-	150	-	5.9	-	809	-	1.13	-	143.1	-	7.84	-	2
			14:35	-	150	-	5.7	-	818	-	1.03	-	-75.4	-	7.74	-	4
			14:40	-	150	-	5.9	-	819	-	0.94	-	-110.8	-	7.66	-	2
			14:45	-	150	-	5.9	-	820	-	0.94	-	-123	-	7.63	-	2
12/4/2020	HS-PW-3(A)	10:40	10:05	-	-	3.2	-	573.6	-	23.93	-	252.7	-	7.16	-	77.3	-
			10:25	-	-	-	7.2	-	485.1	-	1.08	-	257.6	-	6.81	-	18.1
			10:30	-	-	-	6.9	-	489.7	-	0.95	-	178.2	-	6.6	-	3.5
			10:35	-	-	-	7.1	-	489.9	-	0.94	-	120	-	6.54	-	3
			10:40	-	-	-	7.1	-	492.1	-	1.02	-	71.8	-	6.51	-	2.3
12/4/2020	HS-PW-4(A)	11:40	11:10	-	-	7.1	-	671.3	-	19.05	-	63.3	-	6.71	-	17.5	-
			11:25	-	-	-	9.3	-	-	-	1.04	-	78	-	6.91	-	4.8
			11:30	-	-	-	9.5	-	655.6	-	0.73	-	25.5	-	7.01	-	2
			11:35	-	-	-	9.6	-	655.7	-	0.67	-	-10.1	-	7.05	-	1.3
12/4/2020	HS-PW-5(A)	14:20	13:55	-	-	4.1	-	582.6	-	21.09	-	285.9	-	7.41	-	11.7	-
			14:05	-	-	-	6.5	-	950	-	1.38	-	225.4	-	7.13	-	-
			14:10	-	-	-	6.6	-	951	-	1.26	-	160.9	-	7.08	-	-
			14:15	-	-	-	6.6	-	951	-	1.14	-	-0.3	-	6.98	-	-
			14:20	-	-	-	6.6	-	953	-	1.05	-	-22.3	-	6.95	-	-
12/4/2020	HS-PW-6(A)	15:15	14:45	-	-	4.7	-	649.8	-	15.73	-	15.41	-	7.46	-	-	-
			15:00	-	-	-	6.9	-	707.8	-	1	-	13.2	-	7.38	-	-
			15:05	-	-	-	6.9	-	707.6	-	0.78	-	-23.9	-	7.38	-	-
			15:10	-	-	-	6.9	-	707.1	-	0.77	-	-49.7	-	7.36	-	-
			15:15	-	-	-	6.9	-	707.7	-	0.7	-	-66.4	-	7.34	-	-
12/7/2020	WV/CH-PW-1(A)	11:00	10:40	-	-	2.8	-	892	-	12	-	147	-	8.4	-	2.9	-
			10:45	-	-	-	4.3	-	1104	-	0.9	-	-58	-	7.4	-	3.6
			10:50	-	-	-	4.8	-	1101	-	1.1	-	-77	-	7.4	-	2.5
			10:55	-	-	-	4.7	-	1100	-	0.8	-	-90	-	7.4	-	2.8
			11:00	-	-	-	4.6	-	1102	-	0.8	-	-95	-	7.4	-	3
12/7/2020	WV/CH-PW-2(A)	11:55	11:35	-	-	2.8	-	604	-	11.82	-	113.4	-	8.45	-	3.76	-
			11:40	-	150	-	5.4	-	788	-	0.3	-	-42	-	7.4	-	1.4
			11:45	-	150	-	5.2	-	790	-	0.2	-	-60	-	7.5	-	0.2
			11:50	-	150	-	5.2	-	790	-	0.1	-	-65	-	7.4	-	0.3
			11:55	-	150	-	4.8	-	790	-	0.1	-	-69	-	7.4	-	3
12/7/2020	WV/CH-PW-3(A)	14:40	14:20	-	-	3.2	-	603	-	13	-	124	-	8.8	-	3.6	-
			14:25	-	-	-	4.9	-	711	-	6.8	-	170	-	7.6	-	8.6
			14:30	-	-	-	4.9	-	722	-	6.7	-	192	-	7.6	-	5.6
			14:35	-	-	-	4.9	-	721	-	6.7	-	213	-	7.6	-	3.9
			14:40	-	-	-	4.9	-	723	-	6.7	-	227	-	7.6	-	1.3
12/7/2020	WV/CH-PW-4(A)	15:30	15:10	-	-	3.3	-	604	-	13.6	-	213.8	-	8.73	-	2.68	-
			15:15	-	150	-	5.2	-	1015	-	0.3	-	2	-	6.9	-	2.3
			15:20	-	150	-	5.3	-	1024	-	0.1	-	-25	-	7.1	-	0.6
			15:25	-	150	-	5.4	-	1024	-	0.1	-	-32	-	7.1	-	0.4
			15:30	-	150	-	5.4	-	1025	-	0.1	-	-37	-	7.1	-	0.4

TABLE 3A
Pore-Water Geochemistry Data
GSI Investigation
Alpine and Plainfield Townships, Kent County, Michigan

Date	Location ID	Sample Time	Time of Reading	Water Level (inches)	Purge Rate (mL/min)	Tempurature (°C)		Specific Conductivity (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
						River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
12/8/2020	WV/CH-PW-5(A)	11:30	11:10	-	-	3.4	-	674	-	5.05	-	97.3	-	8.4	-	2.9	-
			11:15	-	100	-	5.3	-	786	-	1.93	-	97.5	-	7.46	-	295
			11:20	-	100	-	5.3	-	797	-	0.16	-	58.6	-	7.28	-	36.9
			11:25	-	100	-	5.3	-	799	-	0.11	-	43.4	-	7.33	-	13.4
			11:30	-	100	-	5.3	-	798	-	0.09	-	31.6	-	7.28	-	15.6
12/8/2020	WV/CH-PW-6(A)	12:30	12:00	-	-	3.3	-	674	-	12.78	-	216.7	-		-	8.9	-
			12:10	-	100	-	5.5	-	747	-	0.96	-	-46.1	8.42	7.06	-	7.97
			12:15	-	`	-	5.5	-	743	-	0.47	-	-63.4	-	7.03	-	3.58
			12:20	-	-	-	5.5	-	743.8	-	0.46	-	-665	-	7.03	-	2.07
			12:25	-	-	-	5.4	-	749	-	0.47	-	-67.5	-	7.03	-	0.99
12/8/2020	WV/CH-PW-6(B)	13:10	12:45	-	-	3.3	-	674	-	12.78	-	216.7	-	8.42	-	8.5	-
			12:50	-	-	-	6.9	-	686	-	1.2	-	-82.1	-	7.42	-	4.06
			12:55	-	-	-	7	-	685	-	1.52	-	-85.2	-	7.34	-	1.61
			13:00	-	-	-	7	-	684	-	1.67	-	-86.8	-	7.38	-	1.4
			13:05	-	-	-	7	-	686	-	1.29	-	-89.6	-	7.38	-	-
12/8/2020	HS-PW-8	15:10	14:40	-	-	3.5	-	682	-	12.66	-	25.9	-172	8.85	-	-	-
			14:45	-	-	-	5.5	-	660	-	0.35	-	-175	-	7.89	-	36.5
			14:50	-	-	-	5.6	-	660	-	0.21	-	-175	-	7.6	-	3.75
			14:55	-	-	-	5.5	-	660	-	0.21	-	-175.9	-	7.6	-	3.4
			15:00	-	-	-	5.5	-	661	-	0.22	-	-176.3	-	7.69	-	2.5
			15:05	-	-	-	5.6	-	660	-	0.24	-		-	7.66	-	1.25
12/8/2020	HS-PW-9	16:45	16:20	-	-	3.5	-	679	-	12.48	-	-12.3	-	8.8	-	2.88	-
			16:25	-	-	-	3.9	-	668	-	4.49	-	-44.9	-	7.74	-	18.1
			16:30	-	-	-	3.8	-	683	-	0.93	-	-79.9	-	7.82	-	4.03
			16:35	-	-	-	3.8	-	682	-	0.72	-	-81.7	-	7.47	-	0.8
			16:40	-	-	-	3.7	-	682	-	0.71	-	-83.6	-	7.75	-	0.63
12/9/2020	WVNW-PW-1(B)	16:55	16:30	-	-	3.7	-	654	-	11.47	-	4.2	-	6.9	-	2.79	-
			16:35	-	-	-	4.5	-	849	-	0.42	-	-31	-	7.52	-	32.2
			16:40	-	-	-	4.5	-	622	-	0.4	-	-33	-	7.49	-	17.5
			16:45	-	-	-	4.5	-	560	-	0.11	-	-38.2	-	7.52	-	9.5
			16:50	-	-	-	4.5	-	450	-	0.8	-	-39.6	-	7.47	-	12.8
12/9/2020	WVNW-PW-1(A)	16:15	15:45	-	-	3.7	-	654	-	11.47	-	4.2	-	6.9	-	2.79	-
			15:50	-	-	-	5.1	-	837	-	0.49	-	-13.6	-	7.5	-	10.8
			15:55	-	-	-	5	-	841	-	0.43	-	-24.2	-	7.47	-	5.5
			16:00	-	-	-	4.9	-	842	-	0.41	-	-28.9	-	7.56	-	19.3
			16:05	-	-	-	4.8	-	842	-	0.41	-	-27.2	-	7.54	-	13.7
12/9/2020	WVNW-PW-2(B)	15:20	14:50	-	-	3.6	-	654	-	11.18	-	-9.8	-	8.5	-	6.06	-
			15:00	-	100	-	5.5	-	631	-	0.22	-	-15.7	-	6.84	-	9.34
			15:05	-	100	-	5.6	-	631	-	0.1	-	-20.9	-	6.89	-	2.94
			15:10	-	100	-	5.6	-	631	-	0.11	-	-23	-	6.89	-	1.95
			15:15	-	100	-	5.6	-	631	-	0.09	-	-25.4	-	6.87	-	1.37
12/9/2020	WVNW-PW-2(A)	14:40	14:10	-	-	3.6	-	654	-	11.18	-	-9.8	-	8.51	-	6.06	-
			14:20	-	100	-	5.8	-	597	-	0.8	-	-29.3	-	6.93	-	6.85
			14:25	-	100	-	5.8	-	599	-	0.23	-	-21.4	-	6.89	-	3.44
			14:30	-	100	-	5.8	-	608	-	0.1	-	-25.4	-	6.88	-	2.47
			14:35	-	100	-	5.9	-	613	-	0.19	-	-28.2	-	6.88	-	2.53
12/9/2020	HS-PW-10(A)	10:05	9:30	-	-	3	-	649	-	10.58	-	58.8	-	8.48	-	2.79	-
			9:45	-	100	-	6.4	-	648	-	3.48	-	-89.3	-	7.82	-	3.15
			9:50	-	100	-	6.7	-	649	-	0.41	-	-97.4	-	7.82	-	0.71
			9:55	-	100	-	6.8	-	649	-	0.2	-	-101.2	-	7.72	-	0.66
			10:00	-	100	-	6.7	-	649	-	0.11	-	-105.3	-	7.97	-	0.26
12/9/2020	HS-PW-11(A)	11:35	10:40	-	-	3.1	-	657	-	10.8	-	82.4	-	8.48	-	5.17	-
			11:15	-	100	-	5.6	-	624	-	0.51	-	-101	-	7.84	-	13.1
			11:20	-	100	-	5.7	-	623	-	0.18	-	-108	-	7.79	-	7.24
			11:25	-	100	-	5.7	-	624	-	0.11	-	-112	-	7.82	-	5.25
			11:30	-	100	-	5.6	-	625	-	0.08	-	-114.8	-	7.85	-	-

TABLE 3B
Re-Sample Pore-Water Geochemistry Data
Alpine and Plainfield Townships, Kent County, Michigan

Date	Location ID	Sample Time	Reading Time	Water Level	Purge Rate (mL/min)	Tempurature (°C)		Specific Conductivity (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
						River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1/26/2021	HS-PW-2.5(A)	11:30	11:10	-	-	0	-	623	-	12.8	-	481	-	8.5	-	6.8	-
			11:15	-	-	-	5.6	-	466	-	1.69	-	240	-	7.3	-	3.2
			11:18	-	-	-	5.5	-	466	-	0.57	-	232	-	7.3	-	2.1
			11:25	-	-	-	5.5	-	465	-	0.45	-	225	-	7.2	-	-
			11:30	-	-	-	5.7	-	463	-	0.09	-	221	-	7.2	-	-
1/26/2021	HS-PW-2.5(B)	12:15	11:55	-	-	0	-	623	-	12.8	-	481	-	8.5	-	6.8	-
			12:00	-	-	-	7	-	454	-	1.7	-	398	-	7.4	-	8
			12:05	-	-	-	T	-	464	-	0.4	-	385	-	7.4	-	3
			12:10	-	-	-	6.9	-	465	-	0.2	-	380	-	7.4	-	3
			12:15	-	-	-	6.9	-	466	-	0.1	-	378	-	7.4	-	3
1/26/2021	HS-PW-3(A)	14:30	14:10	-	-	0.1	-	619	-	13.3	-	455	-	8.7	-	5.3	-
			14:15	-	-	-	5	-	528	-	0.88	-	204	-	7.3	-	11
			14:20	-	-	-	5	-	528	-	0.22	-	201	-	7.2	-	5.1
			14:25	-	-	-	5	-	530	-	0.13	-	198	-	7.2	-	5.7
			14:30	-	-	-	5	-	531	-	0.12	-	197	-	7.2	-	3
1/26/2021	HS-PW-3.5(A)	15:40	15:10	-	-	0.2	-	612	-	15	-	337	-	8.5	-	4.2	-
			15:20	-	-	-	5	-	720	-	3.4	-	228	-	7.5	-	5
			15:25	-	-	-	5.9	-	780	-	0.13	-	258	-	7.5	-	2.5
			15:30	-	-	-	5.2	-	784	-	0.1	-	271	-	7.5	-	-
			15:35	-	-	-	5	-	784	-	0.1	-	279	-	7.5	-	10.6
			15:40	-	-	-	5.2	-	781	-	0	-	285	-	7.5	-	12.7

TABLE 3C
Monitoring Well Geochemistry Data
Alpine and Plainfield Townships, Kent County, Michigan

Date	Location ID	Sample Time	Reading Time	Water Level	Drawdown	Pump Speed	Purge Rate (mL/min)	Tempurature (°C)	Specific Conductivity (us/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	pH (SU)	Turbidity (NTU)
12/8/2020	Area19-GSI-1	10:45	9:55	5.43	0	180	300	3.47	218	6.5	60	7.7	123
			10:05	5.43	0	180	300	8.86	376	6.1	66	7	38.5
			10:15	5.43	0	180	300	8.89	373	6	71	6.9	19.4
			10:20	5.43	0	180	300	8.9	372	6	73	6.9	9.2
			10:25	5.43	0	180	300	8.95	372	6	80	6.9	5.75
			10:30	5.43	0	180	300	8.96	372	6	83	6.9	3.76
			10:35	5.43	0	180	300	8.89	372	6	84	6.9	3
			10:40	5.43	0	180	300	8.98	371	6	85	6.9	2.7
12/8/2020	Area19-GSI-2	13:45	13:05	5.1	0.25	180	300	8	441	0.6	-107	7.1	61
			13:15	5.12	0.27	170	290	8.4	433	0.3	-112	7.1	20
			13:25	5.12	0.27	170	290	8.5	432	0.4	-113	7.1	11.7
			13:30	5.12	0.27	170	290	8.6	432	0.3	-102	7.1	7
			13:35	5.14	0.29	170	290	8.6	432	0.2	-98	7	5
			13:38	5.14	0.29	170	290	8.6	432	0.3	-97	7	<5
			13:41	5.14	0.29	170	290	8.6	432	0.2	-96	7	<5
12/8/2020	Area19-GSI-3	14:45	14:15	4.93	0.26	175	200	7.5	182	1	-282	9.1	61.1
			14:35	4.9	(+)0.03	175	200	8.6	300	1.9	-294	8.6	14
			14:35	4.9	0	175	200	8.6	350	1.6	-162	7.8	<5
			14:40	4.9	0	175	200	8.6	356	1.6	-171	7.6	<5
			14:43	4.9	0	175	200	8.6	359	1.6	-166	7.5	<5
12/9/2020	HS-MW-29A	10:20	9:30	6.25	0.03	200	350	9.7	814	0.2	-85	7.3	59
			9:40	6.25	0	200	350	9.7	836	0.2	-67	7	42
			9:45	6.25	0	200	350	9.7	845	0.3	-59	7	32
			9:48	6.25	0	200	350	9.7	852	0.2	-62	7	23
			9:52	6.25	0	200	350	9.7	850	0.2	-65	7	18
			10:00	6.25	0	200	350	9.8	855	0.2	-70	7	12
			10:05	6.25	0	200	350	9.8	857	0.2	-72	7	8
			10:08	6.25	0	200	350	9.8	854	0.2	-69	7	6
			10:11	6.25	0	200	350	9.8	863	0.2	-75	7	6
			10:14	6.25	0	200	350	9.8	863	0.14	-77	7	<5

TABLE 4
SUMMARY OF GROUNDWATER SAMPLE ANALYSIS - PFAS
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Area	Part 201 Generic Groundwater Cleanup Criteria – Groundwater Surface Water Interface[2]	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven Northeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast
Location		AREA19-GSI-1	AREA19-GSI-2	AREA19-GSI-3	WV-DEQ-MW9-57	HS-MW-19S	HS-MW-19D	HS-MW-29A	HS-MW-29A
Sample Name		AREA19-GSI-1	AREA19-GSI-2	AREA19-GSI-3	DEQ-MW-9-57	HS-MW-19S	HS-MW-19D	HS-MW-29A	HS-MW-29A-DUP
Screen Interval (feet below the ground surface)		3.7-7.7	4-8	4.2-8.2	51.85-56.85	58.4-61.4	85.9-95.9	3.5-13.5	3.5-13.5
Laboratory Sample ID		VL11070-002	VL11070-003	VL11070-004	VL11070-007	VL11070-008	VL11070-009	VL11070-005	VL11070-006
Sample Date		12/08/2020	12/08/2020	12/08/2020	12/09/2020	12/09/2020	12/09/2020	12/09/2020	12/09/2020
Parameter (µg/L)									
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
1H,1H,2H,2H-perfluorohexane sulfonate (4:2FTS)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	NCL	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
Perfluorobutane sulfonic acid (PFBS)	NA	0.012	0.021	0.017	0.0067	<0.0035	<0.0034	0.012	0.012
Perfluorodecane sulfonic acid (PFDS)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluoroheptane sulfonic acid (PFHpS)	NCL	<0.0035	0.0079	0.0046	<0.0035	<0.0035	<0.0034	0.0066	0.0058
Perfluorononane sulfonic acid (PFNS)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluorooctane sulfonamide (FOSA)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluoropentane sulfonic acid (PFPeS)	NCL	<0.0035	0.0044	<0.0037	<0.0035	<0.0035	<0.0034	0.0036	0.0036
Perfluorohexane sulfonic acid (PFHxS)	NA	0.0076	0.018	0.013	0.0053	<0.0035	<0.0034	0.02	0.023
Perfluorobutanoic acid (PFBA)	NCL	<0.0035	0.012	0.0052	<0.0035	<0.0035	<0.0034	0.01	0.01
Perfluorodecanoic acid (PFDA)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluorododecanoic acid (PFDoDA)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluoroheptanoic acid (PFHpA)	NCL	<0.0035	0.0075	0.0074	<0.0035	<0.0035	<0.0034	0.0056	0.0053
Perfluorohexanoic acid (PFHxA)	NA	<0.0035	0.011	0.0074	<0.0035	<0.0035	<0.0034	0.017	0.017
Perfluorononanoic acid (PFNA)	NA	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluorooctanoic acid (PFOA)	12	0.016	0.084	0.058	0.0091	<0.0035	<0.0034	0.03	0.029
Perfluorooctane sulfonic acid (PFOS)	0.012	***0.017***	***0.17***	***0.13***	<0.0035	<0.0035	<0.0034	***0.28***	***0.29***
PFOA + PFOS (Calculated)	NCL	0.033	0.25	0.19	0.0091	ND	ND	0.31	0.32
Perfluoropentanoic acid (PFPeA)	NCL	<0.0035	0.0054	0.0039	<0.0035	<0.0035	<0.0034	0.0099	0.011
Perfluorotetradecanoic acid (PFTeDA)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluorotridecanoic acid (PFTrDA)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Perfluoroundecanoic acid (PFUnDA)	NCL	<0.0035	<0.0036	<0.0037	<0.0035	<0.0035	<0.0034	<0.0036	<0.0036
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (GenX)	NA	<0.0071	<0.0073	<0.0074	<0.0069	<0.007	<0.0067	<0.0072	<0.0072
Total PFAS (Calculated)	NCL	0.053	0.34	0.25	0.021	ND	ND	0.39	0.41

TABLE 4 NOTES
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

NOTES:

1. Concentration and criteria units are micrograms per Liter (µg/L) or parts per billion (ppb). Calculated criteria and concentrations are rounded to two significant digits. "ND" indicates the parameters used in the calculation were not detected.
2. Michigan Part 201 Groundwater Cleanup Criteria are based on "Table 1, Groundwater: Residential and Nonresidential Part 201 Generic Cleanup Criteria and Screening Levels/Part 213 Tier I Risk Based Screening Levels," Michigan Administrative Code, Cleanup Criteria Requirements for Response Activity, Rules 299.44 and 299.49, effective December 30, 2013; last updated December 20, 2020.
   Abbreviations Include:
   "NCL" indicates no criterion listed in EGLE Table 1.
   "NA" indicates not available.
3. Bold, italic number with thick line border or italic parameter name indicates that parameter was detected above the Michigan Part 201 Groundwater Cleanup Criteria listed.
4. Abbreviations include:
   "< RL" indicates the parameter was analyzed for but not detected above the method detection limit; RL = Reporting Limit.
   "DUP" indicates a duplicate sample.
   "-" indicates the parameter was not analyzed.
5. Screen interval presented is the top of the screen to the bottom of the screen in feet below ground surface.

TABLE 5
SUMMARY OF PORE WATER SAMPLE ANALYSIS - PFAS
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Area	Part 201 Generic Groundwater Cleanup Criteria – Groundwater Surface Water Interface[2]	Wolven Northwest	Wolven Northwest	Wolven Northwest	Wolven Northwest	Wolven Northwest	Wolven Northwest	Wolven Northwest	Wolven Northeast	Wolven Northeast
Location		WVNW-PW-1	WVNW-PW-1	WVNW-PW-2	WVNW-PW-2	WVNW-PW-3	WVNW-PW-4	WVNW-PW-4	AREA19-PW-1	AREA19-PW-2
Sample Name		WVNW-PW-1(A)	WVNW-PW-1(B)	WVNW-PW-2(A)	WVNW-PW-2(B)	WVNW-PW-3(A)	WVNW-PW-4(A)	WVNW-PW-4(A)-DUP	Area19-PW-1(A)	Area19-PW-2(A)
Sample Depth (feet below the ground surface of the river bottom)		3 - 3.13	4 - 4.13	2.33 - 2.46	3.33 - 3.46	1.5 - 1.63	1.67 - 1.79	1.67 - 1.79	1 - 1.13	1 - 1.13
Laboratory Sample ID		VL11053-012	VL11053-014	VL11053-010	VL11053-011	VL06012-013	VL06012-011	VL06012-012	VL06012-001	VL06012-002
Sample Date		12/09/2020	12/09/2020	12/09/2020	12/09/2020	12/02/2020	12/02/2020	12/02/2020	11/30/2020	11/30/2020
Parameter (µg/L)										
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
1H,1H,2H,2H-perfluorohexane sulfonate (4:2FTS)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	NCL	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
Perfluorobutane sulfonic acid (PFBS)	NA	0.0038	0.0045	0.0046	<0.0037	0.0051	0.01	0.011	0.013	0.016
Perfluorodecane sulfonic acid (PFDS)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluoroheptane sulfonic acid (PFHpS)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	0.0054	0.0069	0.0061	0.0093	<0.0054
Perfluorononane sulfonic acid (PFNS)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluorooctane sulfonamide (FOSA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluoropentane sulfonic acid (PFPeS)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	0.0053	0.0042	<0.0037	<0.0054
Perfluorohexane sulfonic acid (PFHxS)	NA	<0.0038	<0.0038	<0.0039	<0.0037	0.0092	0.019	0.019	0.017	0.011
Perfluorobutanoic acid (PFBA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	0.0063	0.0057	0.012	0.011
Perfluorodecanoic acid (PFDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluorododecanoic acid (PFDoDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluoroheptanoic acid (PFHpA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	0.0088	0.0092	0.015	<0.0054
Perfluorohexanoic acid (PFHxA)	NA	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	0.0068	0.0076	0.013	0.0069
Perfluorononanoic acid (PFNA)	NA	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluorooctanoic acid (PFOA)	12	0.0055	0.0073	0.012	0.0075	0.028	0.066	0.065	0.11	0.03
Perfluorooctane sulfonic acid (PFOS)	0.012	0.007	0.0097	0.01	0.011	***0.26***	***0.1***	***0.094***	***0.13***	***0.03***
PFOA + PFOS (Calculated)	NCL	0.013	0.017	0.022	0.019	0.29	0.17	0.16	0.24	0.06
Perfluoropentanoic acid (PFPeA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	0.004	<0.0036	0.0055	<0.0054
Perfluorotetradecanoic acid (PFTeDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluorotridecanoic acid (PFTrDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Perfluoroundecanoic acid (PFUnDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0037	<0.0041	<0.0036	<0.0036	<0.0037	<0.0054
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (GenX)	NA	<0.0076	<0.0076	<0.0078	<0.0075	<0.0082	<0.0072	<0.0073	<0.0073	<0.011
Total PFAS (Calculated)	NCL	0.016	0.022	0.027	0.019	0.31	0.23	0.22	0.32	0.1

TABLE 5
SUMMARY OF PORE WATER SAMPLE ANALYSIS - PFAS
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Area	Part 201 Generic Groundwater Cleanup Criteria – Groundwater Surface Water Interface[2]	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven Northeast	Wolven-North Childsdale
Location		AREA19-PW-2	AREA19-PW-3	AREA19-PW-4	AREA19-PW-4	AREA19-PW-5	AREA19-PW-6	AREA19-PW-6	AREA19-PW-7	WV/CH-PW-1
Sample Name		Area19-PW-2(B)	Area19-PW-3(A)	Area19-PW-4(A)	Area19-PW-4(B)	Area19-PW-5(A)	Area19-PW-6(A)	Area19-PW-6(B)	Area19-PW-7(A)	WV/CH-PW-1(A)
Sample Depth (feet below the ground surface of the river bottom)		1.42 - 1.54	1 - 1.13	1 - 1.13	1.42 - 1.54	1 - 1.13	1.5 - 1.63	2 - 2.13	5 - 5.13	0.75 - 0.88
Laboratory Sample ID		VL06012-003	VL06012-004	VL06012-005	VL06012-006	VL06012-007	VL06012-008	VL06012-009	VL06012-010	VL11053-001
Sample Date		11/30/2020	11/30/2020	12/01/2020	12/01/2020	12/01/2020	12/01/2020	12/01/2020	12/01/2020	12/07/2020
Parameter (µg/L)										
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
1H,1H,2H,2H-perfluorohexane sulfonate (4:2FTS)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	NCL	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
Perfluorobutane sulfonic acid (PFBS)	NA	0.012	0.015	0.015	0.013	0.022	0.017	0.016	0.022	0.031
Perfluorodecane sulfonic acid (PFDS)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluoroheptane sulfonic acid (PFHpS)	NCL	<0.0038	0.0041	0.0053	0.0054	0.013	0.0083	0.0086	0.0052	<0.0039
Perfluorononane sulfonic acid (PFNS)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluorooctane sulfonamide (FOSA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluoropentane sulfonic acid (PFPeS)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	0.0043	0.0038	<0.0037	0.0049	0.014
Perfluorohexane sulfonic acid (PFHxS)	NA	0.0083	0.011	0.016	0.013	0.022	0.014	0.014	0.021	0.018
Perfluorobutanoic acid (PFBA)	NCL	0.0075	0.0039	<0.0037	<0.0037	0.0083	0.0053	0.0051	0.0071	<0.0039
Perfluorodecanoic acid (PFDA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluorododecanoic acid (PFDoDA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluoroheptanoic acid (PFHpA)	NCL	<0.0038	0.004	<0.0037	<0.0037	0.0076	0.01	0.0093	0.013	0.0086
Perfluorohexanoic acid (PFHxA)	NA	0.0053	<0.0037	<0.0037	<0.0037	0.009	0.0084	0.0087	0.011	0.0068
Perfluorononanoic acid (PFNA)	NA	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluorooctanoic acid (PFOA)	12	0.019	0.033	0.031	0.029	0.095	0.08	0.081	0.084	0.044
Perfluorooctane sulfonic acid (PFOS)	0.012	***0.024***	***0.089***	***0.067***	***0.064***	***0.23***	***0.06***	***0.064***	***0.02***	***0.016***
PFOA + PFOS (Calculated)	NCL	0.043	0.12	0.098	0.093	0.33	0.14	0.15	0.1	0.06
Perfluoropentanoic acid (PFPeA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	0.0041	<0.0037	<0.0037	0.0051	<0.0039
Perfluorotetradecanoic acid (PFTeDA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluorotridecanoic acid (PFTrDA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Perfluoroundecanoic acid (PFUnDA)	NCL	<0.0038	<0.0037	<0.0037	<0.0037	<0.0038	<0.0037	<0.0037	<0.0037	<0.0039
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (GenX)	NA	<0.0077	<0.0075	<0.0074	<0.0074	<0.0075	<0.0074	<0.0074	<0.0075	<0.0078
Total PFAS (Calculated)	NCL	0.076	0.16	0.13	0.12	0.42	0.21	0.21	0.19	0.14

TABLE 5
SUMMARY OF PORE WATER SAMPLE ANALYSIS - PFAS
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Area	Part 201 Generic Groundwater Cleanup Criteria – Groundwater Surface Water Interface[2]	Wolven-North Childsdale	Wolven-North Childsdale	Wolven-North Childsdale	Wolven-North Childsdale	Wolven-North Childsdale	Wolven-North Childsdale	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast
Location		WV/CH-PW-2	WV/CH-PW-3	WV/CH-PW-4	WV/CH-PW-5	WV/CH-PW-6	WV/CH-PW-6	HS-PW-1	HS-PW-1	HS-PW-2
Sample Name		WV/CH-PW-2(A)	WV/CH-PW-3(A)	WV/CH-PW-4(A)	WV/CH-PW-5(A)	WV/CH-PW-6(A)	WV/CH-PW-6(B)	HS-PW-1(A)	HS-PW-1(B)	HS-PW-2(A)
Sample Depth (feet below the ground surface of the river bottom)		0.75 - 0.88	1 - 1.13	1 - 1.13	0.83 - 0.96	1 - 1.13	2 - 2.13	2 - 2.13	2.5 - 2.63	1 - 1.13
Laboratory Sample ID		VL11053-002	VL11053-003	VL11053-004	VL11053-005	VL11053-006	VL11053-007	VL06031-001	VL06031-002	VL06031-003
Sample Date		12/07/2020	12/07/2020	12/07/2020	12/08/2020	12/08/2020	12/08/2020	12/03/2020	12/03/2020	12/03/2020
Parameter (µg/L)										
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
1H,1H,2H,2H-perfluorohexane sulfonate (4:2FTS)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	NCL	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
Perfluorobutane sulfonic acid (PFBS)	NA	0.011	0.0045	0.015	0.017	0.0098	0.0095	0.0087	0.0083	<0.0038
Perfluorodecane sulfonic acid (PFDS)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluoroheptane sulfonic acid (PFHpS)	NCL	0.0054	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorononane sulfonic acid (PFNS)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorooctane sulfonamide (FOSA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluoropentane sulfonic acid (PFPeS)	NCL	<0.0038	<0.0038	0.0041	0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorohexane sulfonic acid (PFHxS)	NA	0.011	<0.0038	0.012	0.012	0.0087	0.0099	<0.0038	<0.0036	<0.0038
Perfluorobutanoic acid (PFBA)	NCL	<0.0038	<0.0038	0.0059	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorodecanoic acid (PFDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorododecanoic acid (PFDoDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluoroheptanoic acid (PFHpA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorohexanoic acid (PFHxA)	NA	0.0041	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorononanoic acid (PFNA)	NA	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorooctanoic acid (PFOA)	12	0.043	0.01	0.024	0.019	0.01	0.008	<0.0038	<0.0036	0.0046
Perfluorooctane sulfonic acid (PFOS)	0.012	***0.079***	***0.032***	***0.02***	***0.032***	***0.015***	<0.0038	<0.0038	<0.0036	0.0052
PFOA + PFOS (Calculated)	NCL	0.12	0.042	0.044	0.051	0.025	0.008	ND	ND	0.0098
Perfluoropentanoic acid (PFPeA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorotetradecanoic acid (PFTeDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluorotridecanoic acid (PFTrDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Perfluoroundecanoic acid (PFUnDA)	NCL	<0.0038	<0.0038	<0.0039	<0.0038	<0.0038	<0.0038	<0.0038	<0.0036	<0.0038
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (GenX)	NA	<0.0077	<0.0077	<0.0078	<0.0076	<0.0076	<0.0077	<0.0076	<0.0073	<0.0077
Total PFAS (Calculated)	NCL	0.15	0.047	0.081	0.084	0.044	0.027	0.0087	0.0083	0.0098

TABLE 5
SUMMARY OF PORE WATER SAMPLE ANALYSIS - PFAS
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Area	Part 201 Generic Groundwater Cleanup Criteria – Groundwater Surface Water Interface[2]	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast
Location		HS-PW-2.5	HS-PW-2.5	HS-PW-3	HS-PW-3R	HS-PW-3R	HS-PW-3.5	HS-PW-4	HS-PW-5	HS-PW-6
Sample Name		HS-PW-2.5 (A)	HS-PW-2.5 (B)	HS-PW-3(A)	HS-PW-3 (A)	HS-PW-3 (A) DUP	HS-PW-3.5 (A)	HS-PW-4(A)	HS-PW-5(A)	HS-PW-6(A)
Sample Depth (feet below the ground surface of the river bottom)		0.5 - 0.63	1 - 1.13	1.33 - 1.46	0.5 - 0.63	0.5 - 0.63	0.83 - 0.96	0.75 - 0.88	1.33 - 1.46	1 - 1.13
Laboratory Sample ID		WA28027-001	WA28027-002	VL06031-006	WA28027-003	WA28027-004	WA28027-005	VL06031-007	VL06031-008	VL06031-009
Sample Date		01/26/2021	01/26/2021	12/04/2020	01/26/2021	01/26/2021	01/26/2021	12/04/2020	12/04/2020	12/04/2020
Parameter (µg/L)										
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
1H,1H,2H,2H-perfluorohexane sulfonate (4:2FTS)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	NCL	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
Perfluorobutane sulfonic acid (PFBS)	NA	<0.018	0.0075	0.011	<0.019	<0.017	0.032	0.05	<0.0039	<0.0038
Perfluorodecane sulfonic acid (PFDS)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluoroheptane sulfonic acid (PFHpS)	NCL	<0.018	0.0074	0.023	0.019	0.018	<0.0036	<0.0037	<0.0039	<0.0038
Perfluorononane sulfonic acid (PFNS)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluorooctane sulfonamide (FOSA)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluoropentane sulfonic acid (PFPeS)	NCL	<0.018	0.0056	0.0068	<0.019	<0.017	0.017	0.035	<0.0039	<0.0038
Perfluorohexane sulfonic acid (PFHxS)	NA	0.025	0.02	0.042	0.028	0.026	0.019	0.056	<0.0039	<0.0038
Perfluorobutanoic acid (PFBA)	NCL	0.021	0.0091	0.022	0.021	0.02	0.0095	0.015	<0.0039	<0.0038
Perfluorodecanoic acid (PFDA)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluorododecanoic acid (PFDoDA)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluoroheptanoic acid (PFHpA)	NCL	<0.018	0.0056	0.016	<0.019	<0.017	0.0072	0.022	<0.0039	<0.0038
Perfluorohexanoic acid (PFHxA)	NA	0.033	0.015	0.045	0.041	0.038	0.012	0.027	<0.0039	<0.0038
Perfluorononanoic acid (PFNA)	NA	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluorooctanoic acid (PFOA)	12	0.054	0.025	0.074	0.077	0.071	0.021	0.074	0.0079	0.007
Perfluorooctane sulfonic acid (PFOS)	0.012	***0.82 J***	***0.56 J***	***1.1***	***0.90 J***	***0.90 J***	***0.092 J***	***0.013***	***0.03***	0.0046
PFOA + PFOS (Calculated)	NCL	0.87	0.59	1.2	0.98	0.97	0.11	0.087	0.038	0.012
Perfluoropentanoic acid (PFPeA)	NCL	0.027	0.011	0.027	0.023	0.022	0.006	0.015	<0.0039	<0.0038
Perfluorotetradecanoic acid (PFTeDA)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluorotridecanoic acid (PFTrDA)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Perfluoroundecanoic acid (PFUnDA)	NCL	<0.018	<0.0035	<0.0039	<0.019	<0.017	<0.0036	<0.0037	<0.0039	<0.0038
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (GenX)	NA	<0.035	<0.0071	<0.0078	<0.037	<0.035	<0.0072	<0.0075	<0.0079	<0.0076
Total PFAS (Calculated)	NCL	0.98	0.67	1.4	1.1	1.1	0.22	0.31	0.038	0.012

TABLE 5
SUMMARY OF PORE WATER SAMPLE ANALYSIS - PFAS
GSI Investigation
Algoma and Plainfield Townships, Kent County, Michigan

Area	Part 201 Generic Groundwater Cleanup Criteria – Groundwater Surface Water Interface[2]	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast	House Street Property South/Southeast
Location		HS-PW-7	HS-PW-8	HS-PW-9	HS-PW-10	HS-PW-11
Sample Name		HS-PW-7(A)	HS-PW-8(A)	HS-PW-9(A)	HS-PW-10(A)	HS-PW-11(A)
Sample Depth (feet below the ground surface of the river bottom)		1.5 - 1.63	1 - 1.13	1 - 1.13	5 - 5.13	4.5 - 4.63
Laboratory Sample ID		VL06031-004	VL11053-008	VL11070-001	VL11070-010	VL11053-009
Sample Date		12/03/2020	12/08/2020	12/08/2020	12/09/2020	12/09/2020
Parameter (µg/L)						
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CL-PF3OUdS)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
1H,1H,2H,2H-perfluorohexane sulfonate (4:2FTS)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	NCL	0.078	0.044	<0.0072	<0.0073	<0.0075
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	NCL	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
Perfluorobutane sulfonic acid (PFBS)	NA	0.0095	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorodecane sulfonic acid (PFDS)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluoroheptane sulfonic acid (PFHpS)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorononane sulfonic acid (PFNS)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorooctane sulfonamide (FOSA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluoropentane sulfonic acid (PFPeS)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorohexane sulfonic acid (PFHxS)	NA	0.0058	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorobutanoic acid (PFBA)	NCL	0.0047	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorodecanoic acid (PFDA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorododecanoic acid (PFDoDA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluoroheptanoic acid (PFHpA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorohexanoic acid (PFHxA)	NA	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorononanoic acid (PFNA)	NA	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorooctanoic acid (PFOA)	12	0.0038	0.007	<0.0036	<0.0036	<0.0038
Perfluorooctane sulfonic acid (PFOS)	0.012	0.0089	***0.026***	0.0082	<0.0036	<0.0038
PFOA + PFOS (Calculated)	NCL	0.013	0.033	0.0082	ND	ND
Perfluoropentanoic acid (PFPeA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorotetradecanoic acid (PFTeDA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluorotridecanoic acid (PFTrDA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Perfluoroundecanoic acid (PFUnDA)	NCL	<0.0037	<0.0036	<0.0036	<0.0036	<0.0038
Tetrafluoro-2-(heptafluoropropoxy)propanoic acid (GenX)	NA	<0.0075	<0.0072	<0.0072	<0.0073	<0.0075
Total PFAS (Calculated)	NCL	0.11	0.077	0.0082	ND	ND

TABLE 5 NOTES

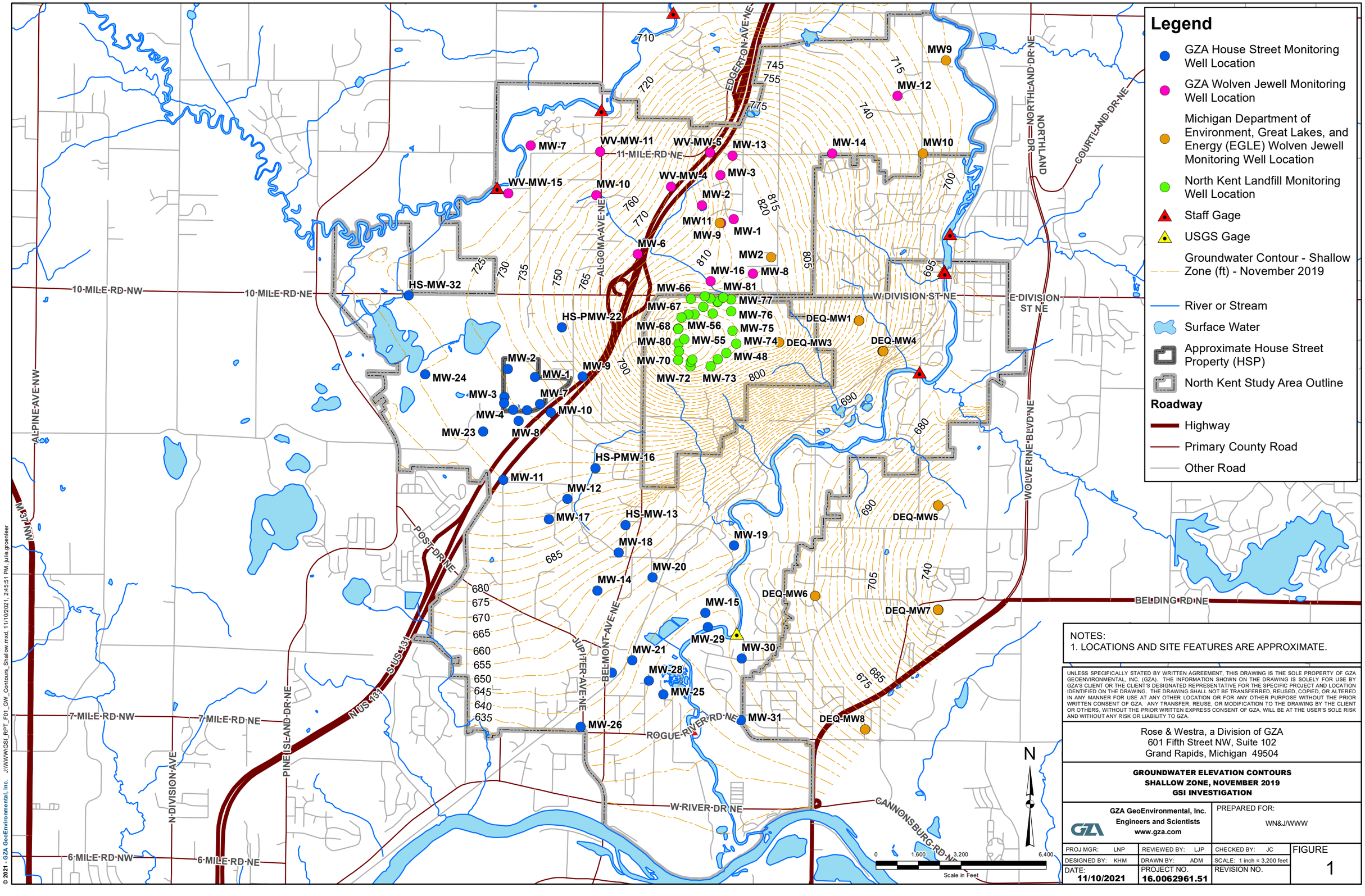
GSI Investigation

Algoma and Plainfield Townships, Kent County, Michigan

NOTES:

1. Concentration and criteria units are micrograms per Liter (µg/L) or parts per billion (ppb). Calculated criteria and concentrations are rounded to two significant digits. "ND" indicates the parameters used in the calculation were not detected.
2. Michigan Part 201 Groundwater Cleanup Criteria are based on "Table 1, Groundwater: Residential and Nonresidential Part 201 Generic Cleanup Criteria and Screening Levels/Part 213 Tier I Risk Based Screening Levels," Michigan Administrative Code, Cleanup Criteria Requirements for Response Activity, Rules 299.44 and 299.49, effective December 30, 2013; last updated December 21, 2020.
   Abbreviations Include:
   "NCL" indicates no criterion listed in EGLE Table 1.
   "NA" indicates not available.
3. Bold, italic number with thick line border or italic parameter name indicates that parameter was detected above the Michigan Part 201 Groundwater Cleanup Criteria listed.
4. Sample results from lab delivery group WA28027 were validated by Environmental Standards, Inc. as part of the five percent validation requirement in the consent decree.
5. Abbreviations include:
   "< RL" indicates the parameter was analyzed for but not detected above the method detection limit; RL = Reporting Limit.
   "DUP" indicates a duplicate sample.
   "-" indicates the parameter was not analyzed.
6. Validator qualifiers for WA28027 include:
   "J" indicates the result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
7. Screen interval presented is the top of the screen to the bottom of the screen in feet below ground surface of the river bottom.

FIGURES



NOTES:
1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

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GROUNDWATER ELEVATION CONTOURS
SHALLOW ZONE, NOVEMBER 2019
GSI INVESTIGATION

GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: WN&J/WWW	
PROJ MGR: LNP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 1
DESIGNED BY: KHM	DRAWN BY: ADM	SCALE: 1 inch = 3,200 feet	
DATE: 11/10/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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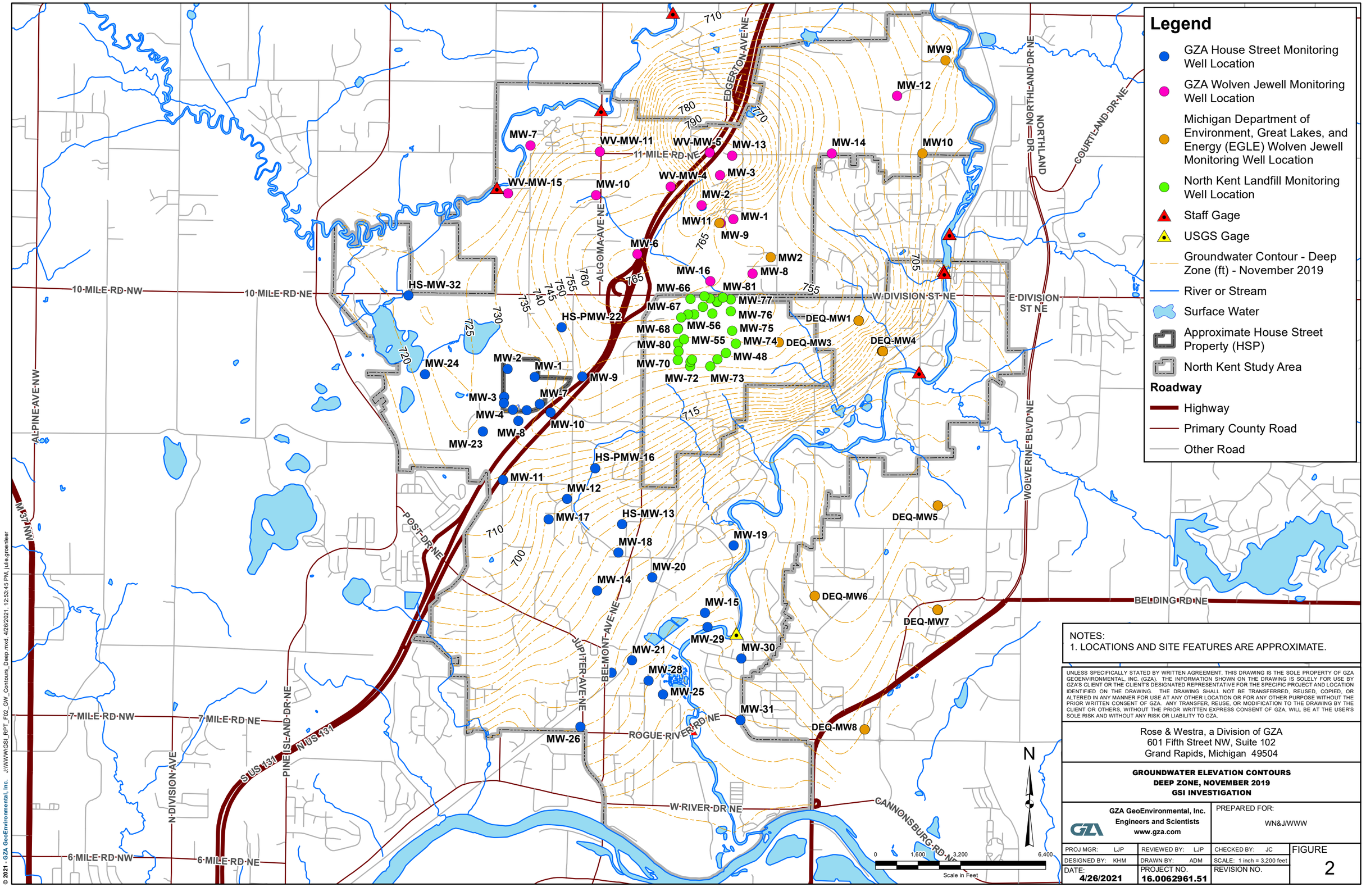

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GROUNDWATER ELEVATION CONTOURS
DEEP ZONE, NOVEMBER 2019
GSI INVESTIGATION

GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: WN&J/WWW	
PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 2
DESIGNED BY: KHM	DRAWN BY: ADM	SCALE: 1 inch = 3,200 feet	
DATE: 4/26/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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Legend

- GSI Pore Water Sample Location
- GSI Piezometer Location
- Residential Water Well
- Monitoring Well
- Cross Section Line
- River or Stream
- Surface Water
- Approximate House Street Property (HSP)
- North Kent Study Area Outline
- Highway
- Primary County Road
- Other Road

Approximate Total PFAS Extent (nanograms per liter [ng/L])

- < 4 ng/L
- 4 - 10 ng/L
- 11 - 70 ng/L
- 71 - 1,000 ng/L
- 1,001 - 127,000 ng/L (MAX)

NOTES:
1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

2. ACRONYMS
- (MAX) = MAXIMUM DETECTED CONCENTRATION IN THE SAMPLES.
- ng/L = NANOGRAM PER LITER
- PFAS = PER- AND POLY-FLUOROALKYL SUBSTANCES

3. NO TOTAL PFAS CRITERIA / SCREENING LEVELS.

4. MAXIMUM CONCENTRATION FROM MONITORING AND RESIDENTIAL WELL SAMPLE RESULTS (INCLUDING THE NORTH KENT LANDFILL STUDY AREA) WERE USED TO DEVELOP CONCENTRATION ISOPLETHS.

5. CONCENTRATION ISOPLETHS WERE DEVELOPED USING NATURAL NEIGHBOR INTERPOLATION IN ARCGIS. CONCENTRATIONS WERE NOT EXTRAPOLATED OUTSIDE OF THE AREA OF KNOWN CONCENTRATIONS.

6. RESIDENTIAL WELL SAMPLES WERE ANALYZED FOR PFAS USEING EPA METHOD 537.1 WHICH REPORTS THE RESULTS FOR 14 COMPOUNDS.

7. MONITORING WELL SAMPLES WERE ANALYZED FOR PFAS USING DOD QSM BY ISOTOPE DILUTION, WHICH REPORTS THE RESULTS FOR 23 COMPOUNDS.

8. THE TOTAL PFAS PRESENTED ON THIS FIGURE ARE CALCULATED FROM THE SUM OF THE 12 PFAS COMPOUNDS THAT ARE COMMON BETWEEN EPA METHOD 537.1 AND THE ISOTOPE DILUTION, DOD QSM METHODOLOGY.

AREA19-GSI-1
AREA19-PW-1
AREA19-PW-2
AREA19-PW-3
AREA19-PW-4
AREA19-PW-5
AREA19-GSI-2
AREA19-PW-6
AREA19-PW-7
AREA19-GSI-3
WVNW-PW-1
WVNW-GSI-1
WVNW-PW-2
WVNW-GSI-2
WVNW-PW-3
WVNW-PW-4
HS-PW-10
HS-GSI-9
HS-PW-11
WV/CH-PW-1
WV/CH-PW-2
WV/CH-GSI-1
WV/CH-GSI-2
WV/CH-PW-3
WV/CH-PW-5
WV/CH-PW-6
WV/CH-PW-4
HS-PW-1
HS-PW-3.5
HS-PW-4
HS-GSI-1
HS-PW-2
HS-GSI-2
HS-PW-2.5
HS-PW-5
HS-PW-3
HS-PW-3R
HS-PW-6
HS-GSI-3
HS-PW-7
HS-PW-8
HS-PW-9
HS-GSI-5
HS-GSI-8
HS-GSI-4
HS-GSI-7
HS-GSI-6
A
A'
B
B'
C
C'
11 MILE RD NE
10 MILE RD NE
7 MILE RD NW
7 MILE RD NE
6 MILE RD NW
6 MILE RD NE
BELDING RD NE
W DIVISION ST NE
E DIVISION ST NE
N DIVISION AVE
PINE ISLAND DR NE
ALGOMA AVE NE
EDGERTON AVE NE
COURTLAND DR NE
WOLVERINE BLVD NE
MYERS LAKE AVE NE
ROSE DR NE
W RIVER DR NE
JUPITER AVE NE
NORTH LAND DR NE
CANNONSBURG RD NE
US 131
0 2,000 4,000 8,000
Scale in Feet
N

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CROSS SECTIONS
OVERVIEW
GSI INVESTIGATION

GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR: WN&J/WWW

PROJ MGR: LIP	REVIEWED BY: LIP	CHECKED BY: JC	FIGURE 3
DESIGNED BY: KHM	DRAWN BY: ADM	SCALE: 1 inch = 3,166.67 feet	
DATE: 11/15/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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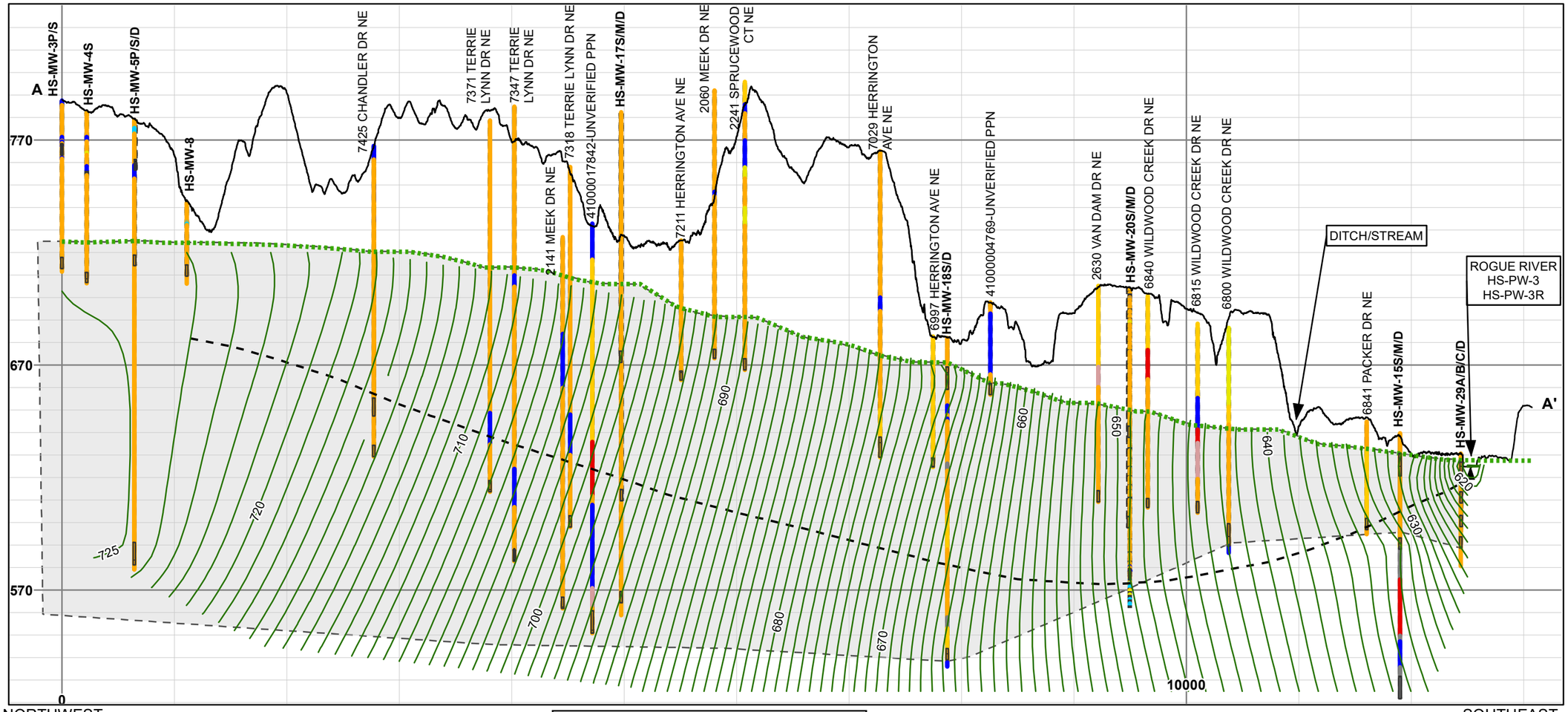


CROSS SECTION LEGEND

- GROUNDWATER CONTOUR, FT (INTERVAL = 1 FT)
- INTERPRETED GROUNDWATER FLOWLINE
- WELL SCREEN
- ESTIMATED POTENTIOMETRIC SURFACE (11/2019)
- GROUND SURFACE
- APPROXIMATE VERTICAL EXTENT OF TOTAL PFAS DETECTIONS

BOREHOLE LITHOLOGY

- GRAVEL
- SAND AND GRAVEL
- SAND
- SAND/GRAVEL W/ CLAY/SILT
- CLAY/SILT W/ SAND/GRAVEL
- SILT
- CLAY AND SILT
- CLAY
- NOT AVAILABLE

OVERVIEW MAP LEGEND

- PORE WATER SAMPLE LOCATION
- GSI PIEZOMETER LOCATION
- RESIDENTIAL WATER WELL
- MONITORING WELL
- CROSS SECTION LINE
- HIGHWAY
- PRIMARY COUNTY ROAD
- OTHER ROAD
- RIVER OR STREAM
- SURFACE WATER
- APPROXIMATE HOUSE STREET PROPERTY (HSP)
- NORTH KENT LANDFILL

APPROXIMATE TOTAL PFAS EXTENT (NANOGRAMS PER LITER [NG/L])

- < 4 ng/L
- 4 - 10 ng/L
- 11 - 70 ng/L
- 71 - 1,000 ng/L
- 1,001 - 127,000 ng/L (MAX)

NOTES:

1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE. VERTICAL EXTENT OF TOTAL PFAS DETECTIONS IS APPROXIMATE.

2. GROUND SURFACE ELEVATIONS ARE BASED ON DIGITAL RASTER FILES OF BARE EARTH DIGITAL ELEVATION MODELS (DEMS), GENERATED FROM LIDAR DATA WITH 1-METER HORIZONTAL ACCURACY AND 18.5-CENTIMETER VERTICAL ACCURACY. DIGITAL FILES OF DEMS AND LIDAR DATA WERE PROVIDED BY KENT COUNTY.

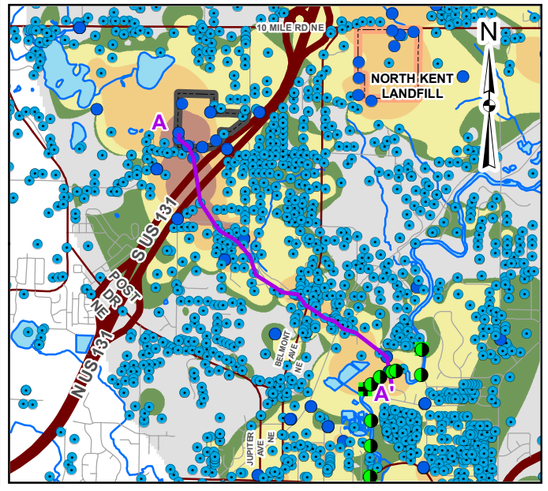
3. ESTIMATED POTENTIOMETRIC SURFACE WAS DEVELOPED BASED ON MEASUREMENTS MADE IN GROUNDWATER MONITORING WELLS IN NOVEMBER 2019. GROUNDWATER ELEVATIONS WERE NOT MEASURED FROM RESIDENTIAL WATER SUPPLY WELLS.

4. WELL SCREEN ELEVATIONS PROVIDED IN FEET ABOVE MEAN SEA LEVEL, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). RESIDENTIAL WELL SCREEN ELEVATIONS AND BOREHOLE LITHOLOGY ELEVATIONS WERE CALCULATED USING WELL INFORMATION PROVIDED BY THE STATE OF MICHIGAN'S WELLOGIC DATABASE AND GROUND SURFACE ELEVATIONS OF THE CENTER OF THE PPN GENERATED FROM LIDAR DATA PROVIDED BY KENT COUNTY. ELEVATIONS ARE ROUNDED TO THE NEAREST FOOT.

5. MAXIMUM CONCENTRATION FROM MONITORING AND RESIDENTIAL WELL SAMPLE RESULTS (INCLUDING THE NORTH KENT LANDFILL STUDY AREA) WERE USED TO DEVELOP CONCENTRATION ISOPLETHS. RESIDENTIAL WELL SAMPLES WERE ANALYZED FOR PFAS USEING EPA METHOD 537.1 WHICH REPORTS THE RESULTS FOR 14 COMPOUNDS. 12 PFAS COMPOUNDS IN COMMON ON BOTH LISTS WERE USED.

6. CONCENTRATION ISOPLETHS WERE DEVELOPED USING NATURAL NEIGHBOR INTERPOLATION IN ARCGIS. CONCENTRATIONS WERE NOT EXTRAPOLATED OUTSIDE OF THE AREA OF KNOWN CONCENTRATIONS.

OVERVIEW MAP



0 2,750 5,500 11,000

SCALE IN FEET

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HOUSE STREET AREA
GEOLOGICAL CROSS SECTION A-A'
GSI INVESTIGATION

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		WN&J/WWW	
PROJ MGR: LJP	REVIEWED BY: MW	CHECKED BY: LMN	FIGURE
DESIGNED BY: JC	DRAWN BY: JMG	SCALE: 1 in = 5,500 ft	3A
DATE: 11/11/2021	PROJECT NO: 16.0062961.51	REVISION NO:	

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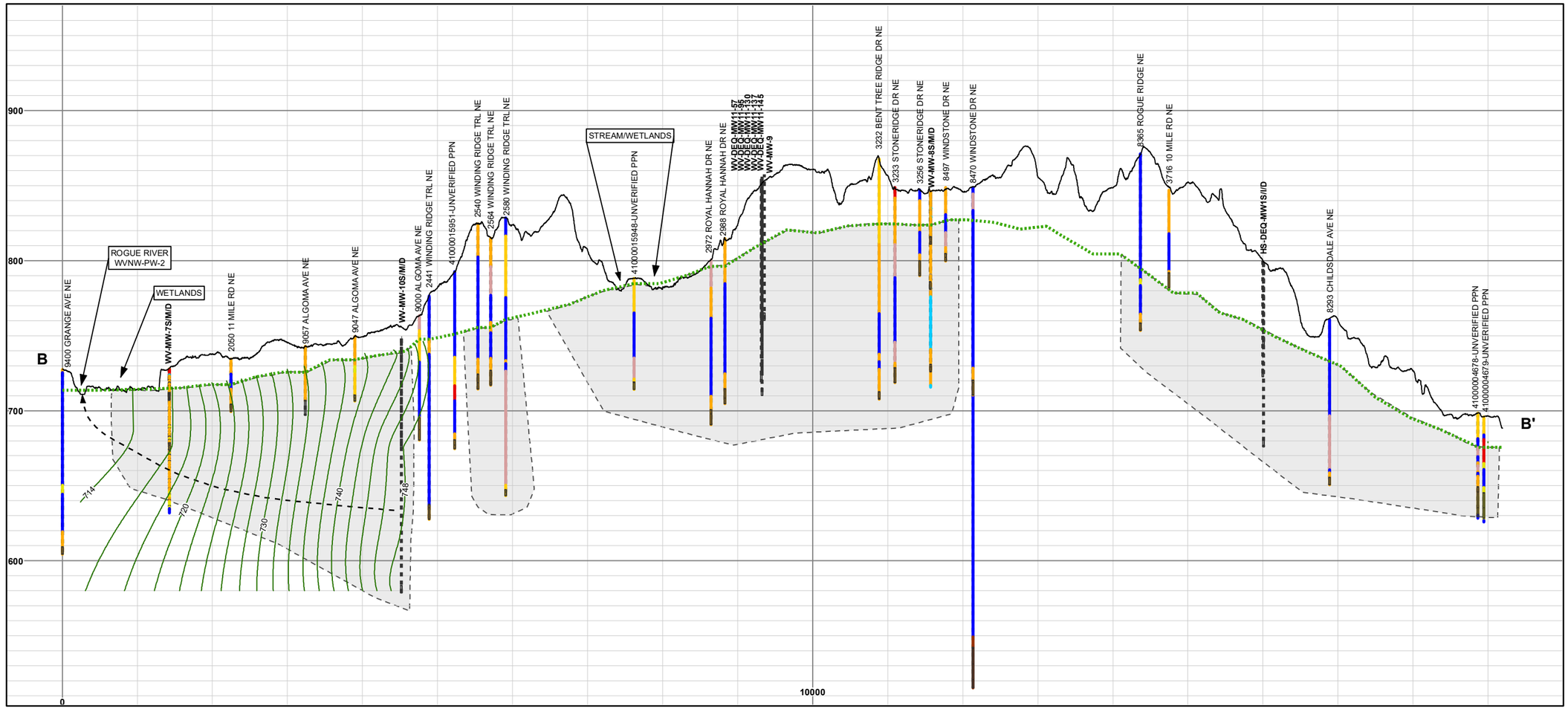

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- CLAY/SILT W/ SAND/GRAVEL
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- CLAY
- BEDROCK
- NOT AVAILABLE

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3. ESTIMATED POTENTIOMETRIC SURFACE WAS DEVELOPED BASED ON MEASUREMENTS MADE IN GROUNDWATER MONITORING WELLS IN NOVEMBER 2019. GROUNDWATER ELEVATIONS WERE NOT MEASURED FROM RESIDENTIAL WATER SUPPLY WELLS.

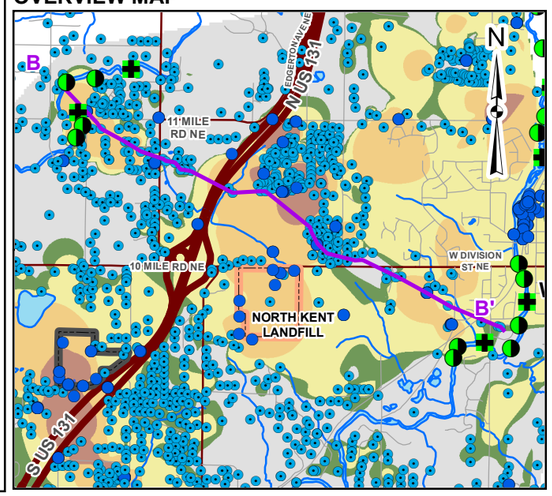
4. WELL SCREEN ELEVATIONS PROVIDED IN FEET ABOVE MEAN SEA LEVEL, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). RESIDENTIAL WELL SCREEN ELEVATIONS AND BOREHOLE LITHOLOGY ELEVATIONS WERE CALCULATED USING WELL INFORMATION PROVIDED BY THE STATE OF MICHIGAN'S WELLOGIC DATABASE AND GROUND SURFACE ELEVATIONS OF THE CENTER OF THE PPN GENERATED FROM LIDAR DATA PROVIDED BY KENT COUNTY. ELEVATIONS ARE ROUNDED TO THE NEAREST FOOT.

5. MAXIMUM CONCENTRATION FROM MONITORING AND RESIDENTIAL WELL SAMPLE RESULTS (INCLUDING THE NORTH KENT LANDFILL STUDY AREA) WERE USED TO DEVELOP CONCENTRATION ISOPLETHS.

6. RESIDENTIAL WELL SAMPLES WERE ANALYZED FOR PFAS USING EPA METHOD 537.1 WHICH REPORTS THE RESULTS FOR 14 COMPOUNDS. MONITORING WELL SAMPLES WERE ANALYZED FOR PFAS USING DOD QSM BY ISOTOPE DILUTION, WHICH REPORTS THE RESULTS FOR 23 COMPOUNDS.

7. CONCENTRATION ISOPLETHS WERE DEVELOPED USING NATURAL NEIGHBOR INTERPOLATION IN ARCGIS. CONCENTRATIONS WERE NOT EXTRAPOLATED OUTSIDE OF THE AREA OF KNOWN CONCENTRATIONS. THE TOTAL PFAS ISOPLETHS ARE CALCULATED FROM THE SUM OF THE 12 PFAS COMPOUNDS THAT ARE COMMON BETWEEN EPA METHOD 537.1 AND THE ISOTOPE DILUTION, DOD QSM METHODOLOGY.

OVERVIEW MAP



0 2,750 5,500 11,000

SCALE IN FEET

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WOLVEN NORTHWEST STUDY AREA
GEOLOGICAL CROSS SECTION B-B'
GSI INVESTIGATION

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: WN&J/WWW	
PROJ MGR: LJP	REVIEWED BY: MW	CHECKED BY: LMN	FIGURE 3B
DESIGNED BY: JC	DRAWN BY: JMG	SCALE: 1 in = 5,500 ft	
DATE: 11/12/2021	PROJECT NO: 16.0062961.51	REVISION NO:	

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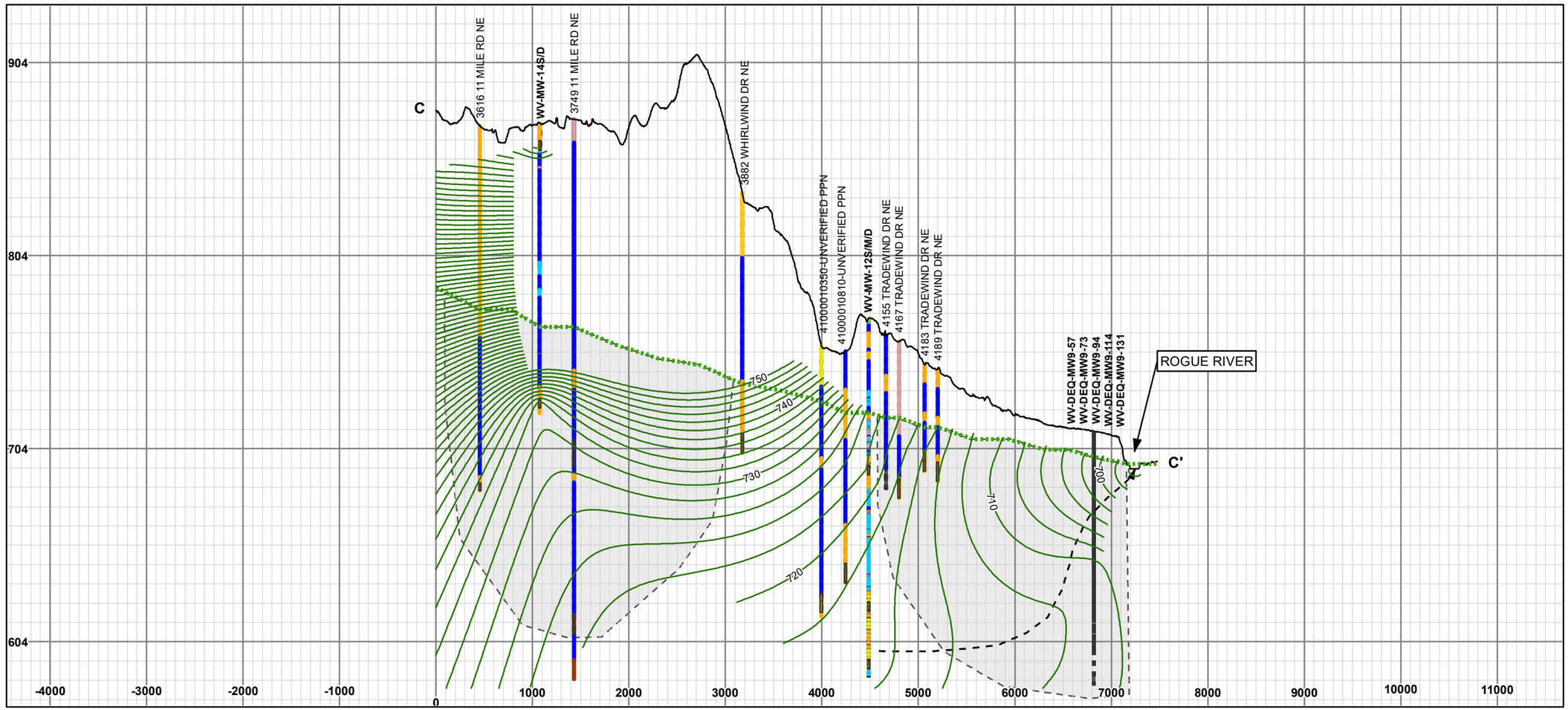

SOUTHWEST NORTHEAST

CROSS SECTION LEGEND

- GROUNDWATER CONTOUR, FT (INTERVAL = 1 FT)
- INTERPRETED GROUNDWATER FLOWLINE
- WELL SCREEN
- ESTIMATED POTENTIOMETRIC SURFACE (11/2019)
- GROUND SURFACE
- APPROXIMATE VERTICAL EXTENT OF TOTAL PFAS DETECTIONS

BOREHOLE LITHOLOGY

- GRAVEL
- SAND AND GRAVEL
- SAND
- CLAY/SILT W/ SAND/GRAVEL
- SILT
- CLAY AND SILT
- CLAY
- BEDROCK
- NOT AVAILABLE

OVERVIEW MAP LEGEND

- GSI PIEZOMETER LOCATION
- PORE WATER SAMPLE LOCATION
- RESIDENTIAL WATER WELL
- MONITORING WELL
- CROSS SECTION LINE
- HIGHWAY
- PRIMARY COUNTY ROAD
- OTHER ROAD
- RIVER OR STREAM
- SURFACE WATER
- NORTH KENT LANDFILL

APPROXIMATE TOTAL PFAS EXTENT (NANOGRAMS PER LITER [NG/L])

- < 4 NG/L
- 4 - 10 NG/L
- 11 - 70 NG/L
- 71 - 1,000 NG/L
- 1,001 - 127,000 NG/L (MAX)

NOTES:

1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE. VERTICAL EXTENT OF TOTAL PFAS DETECTIONS IS APPROXIMATE.

2. GROUND SURFACE ELEVATIONS ARE BASED ON DIGITAL RASTER FILES OF BARE EARTH DIGITAL ELEVATION MODELS (DEMS), GENERATED FROM LIDAR DATA WITH 1-METER HORIZONTAL ACCURACY AND 18.5-CENTIMETER VERTICAL ACCURACY. DIGITAL FILES OF DEMS AND LIDAR DATA WERE PROVIDED BY KENT COUNTY.

3. ESTIMATED POTENTIOMETRIC SURFACE WAS DEVELOPED BASED ON MEASUREMENTS MADE IN GROUNDWATER MONITORING WELLS IN NOVEMBER 2019. GROUNDWATER ELEVATIONS WERE NOT MEASURED FROM RESIDENTIAL WATER SUPPLY WELLS.

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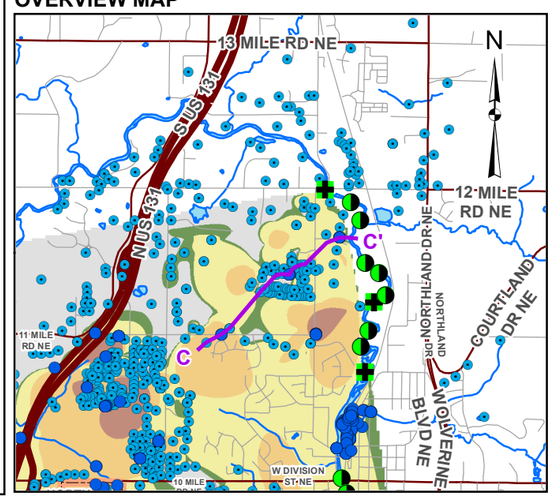
OVERVIEW MAP



0 2,750 5,500 11,000

SCALE IN FEET

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WOLVEN NORTHEAST
GEOLOGICAL CROSS SECTION C-C'
GSI INVESTIGATION

PREPARED BY:		PREPARED FOR:		
GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		WN&J/WWW		
PROJ MGR: LJP	REVIEWED BY: MW	CHECKED BY: LMN		FIGURE
DESIGNED BY: JC	DRAWN BY: JMG	SCALE: 1 in = 5,500 ft		3C
DATE: 11/12/2021	PROJECT NO: 16.0062961.51	REVISION NO:		

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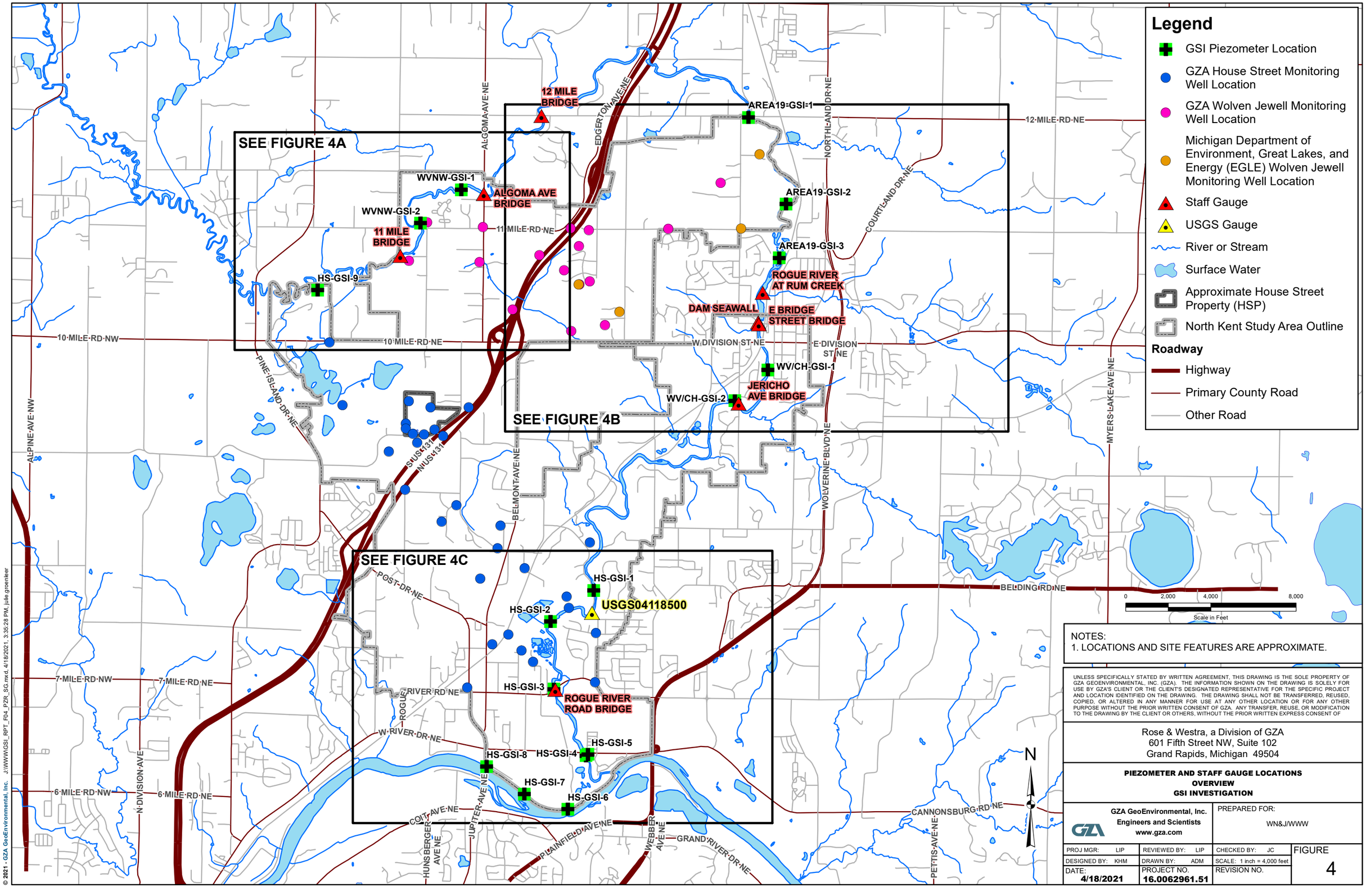

NOTES:
1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

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PIEZOMETER AND STAFF GAUGE LOCATIONS
OVERVIEW
GSI INVESTIGATION

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PREPARED FOR: WN&J/WWW

PROJ MGR: LIP	REVIEWED BY: LIP	CHECKED BY: JC	FIGURE 4
DESIGNED BY: KHM	DRAWN BY: ADM	SCALE: 1 inch = 4,000 feet	
DATE: 4/18/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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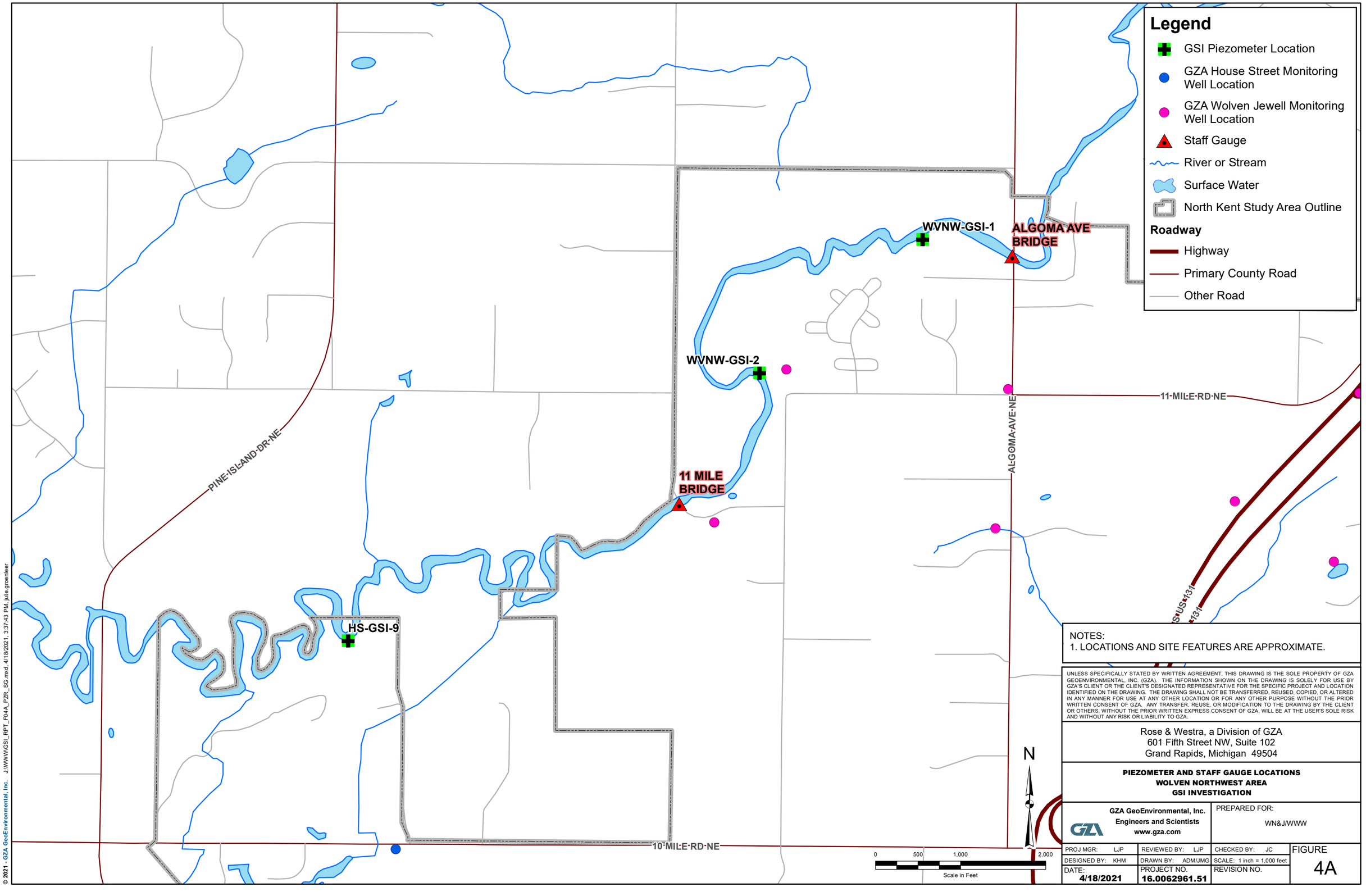

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PIEZOMETER AND STAFF GAUGE LOCATIONS
WOLVEN NORTHWEST AREA
GSI INVESTIGATION

GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: WN&J/WWW	
PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 4A
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 1,000 feet	
DATE: 4/18/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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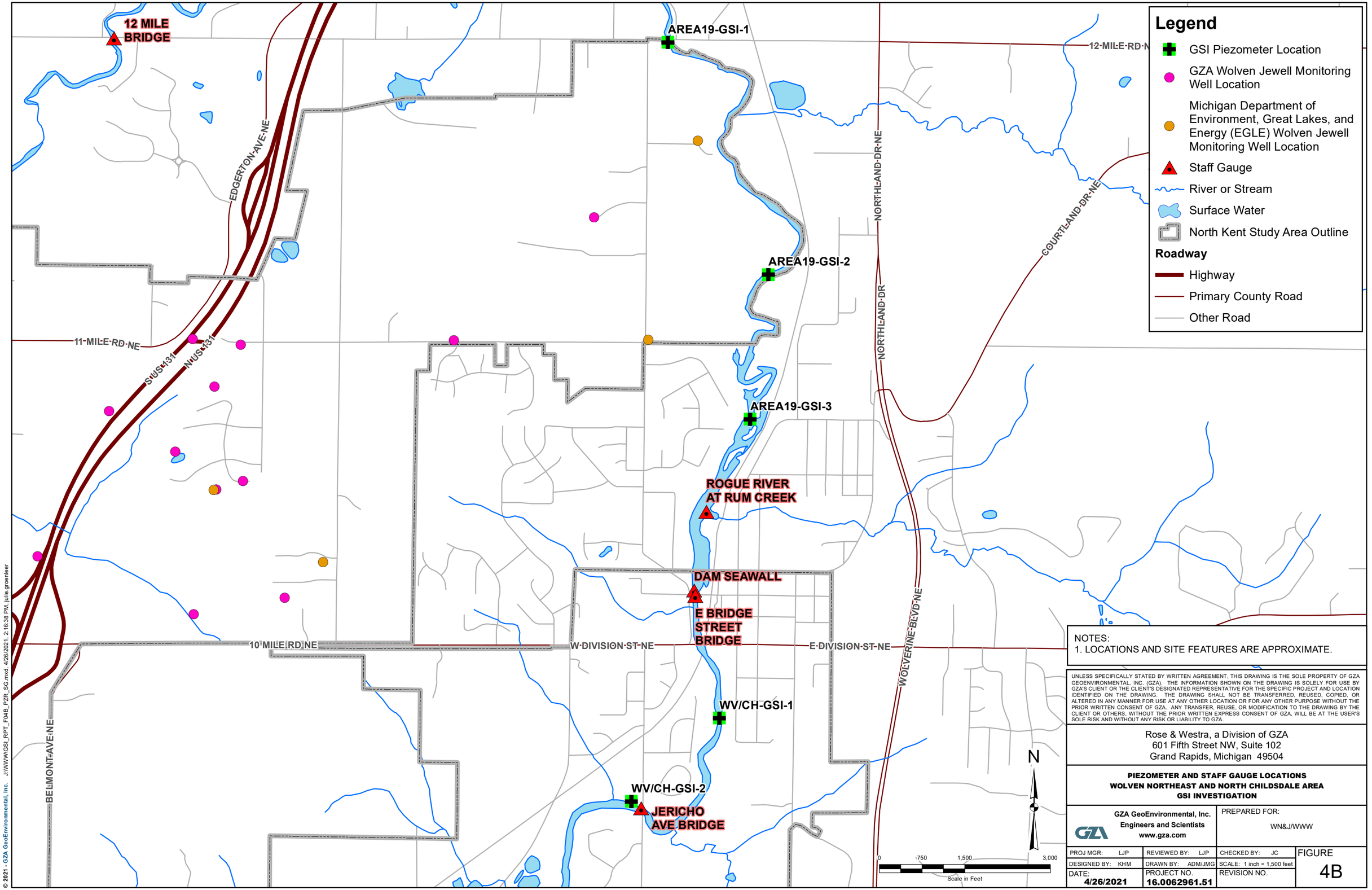

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PIEZOMETER AND STAFF GAUGE LOCATIONS
WOLVEN NORTHEAST AND NORTH CHILDSDALE AREA
GSI INVESTIGATION

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PREPARED FOR: WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 4B
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 1,500 feet	
DATE: 4/26/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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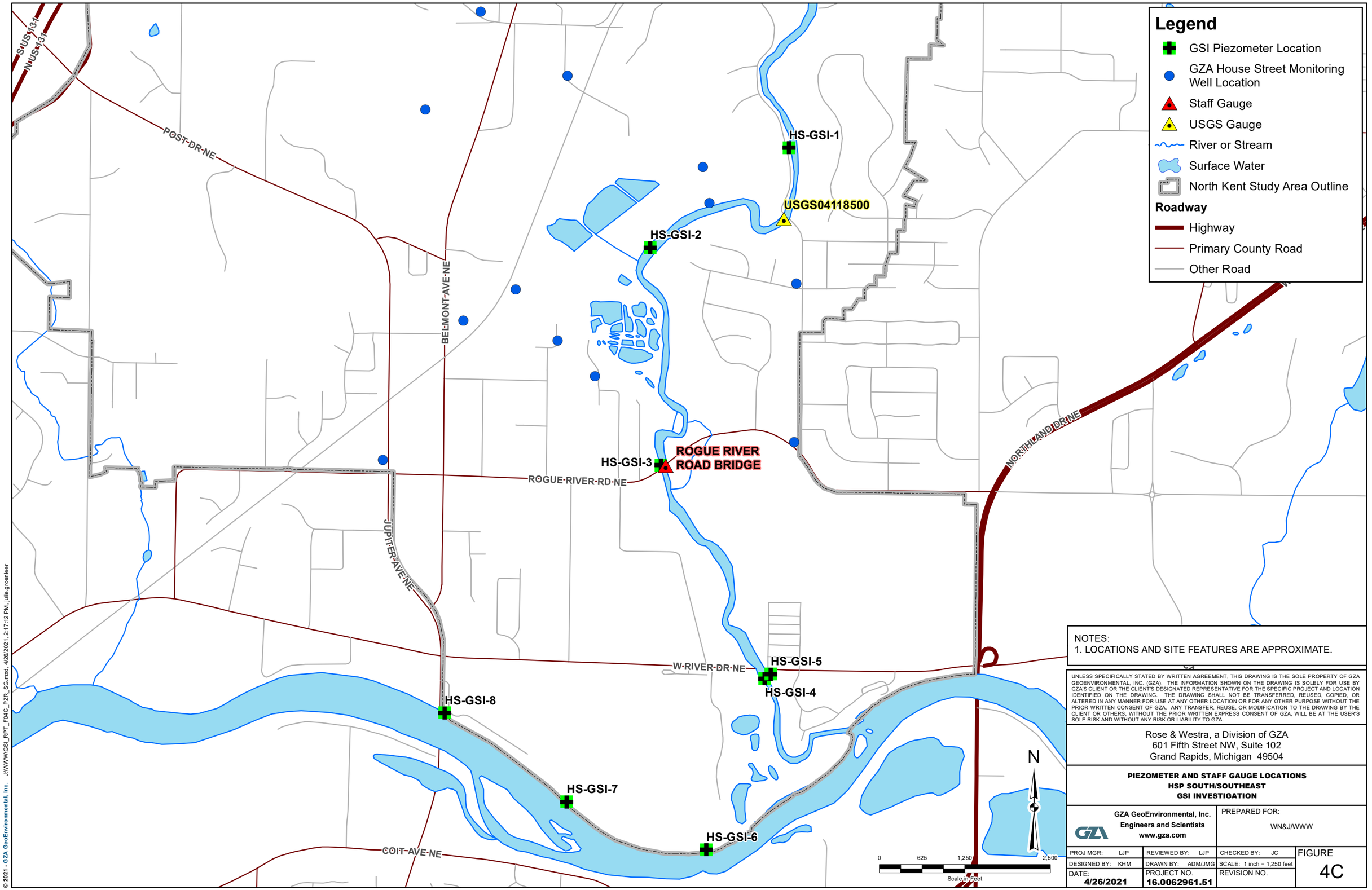

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PIEZOMETER AND STAFF GAUGE LOCATIONS
HSP SOUTH/SOUTHEAST
GSI INVESTIGATION

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Engineers and Scientists
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PREPARED FOR: WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 4C
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 1,250 feet	
DATE: 4/26/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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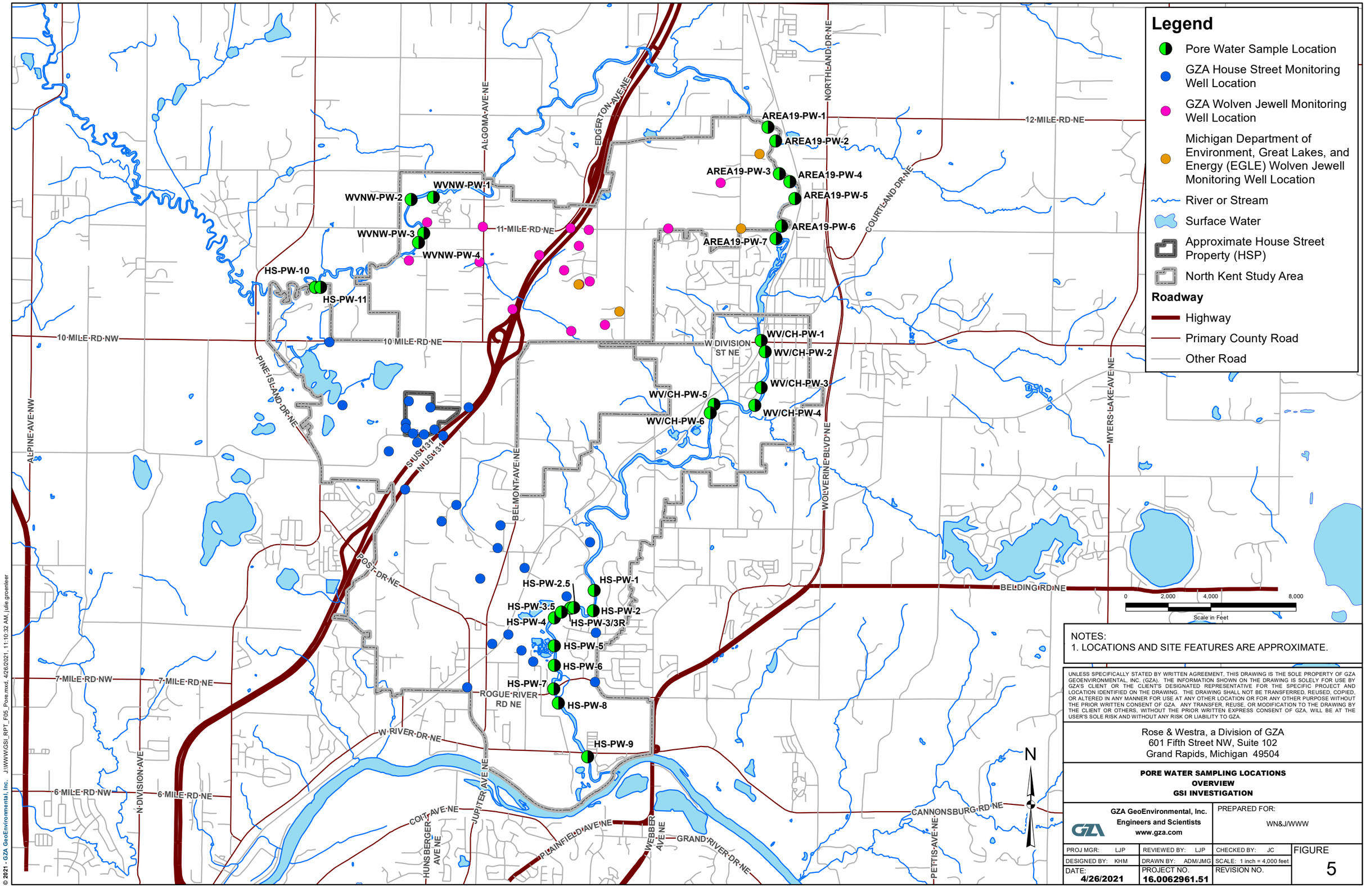

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PORE WATER SAMPLING LOCATIONS
OVERVIEW
GSI INVESTIGATION

GZA GeoEnvironmental, Inc.
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PREPARED FOR: WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 5
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 4,000 feet	
DATE: 4/26/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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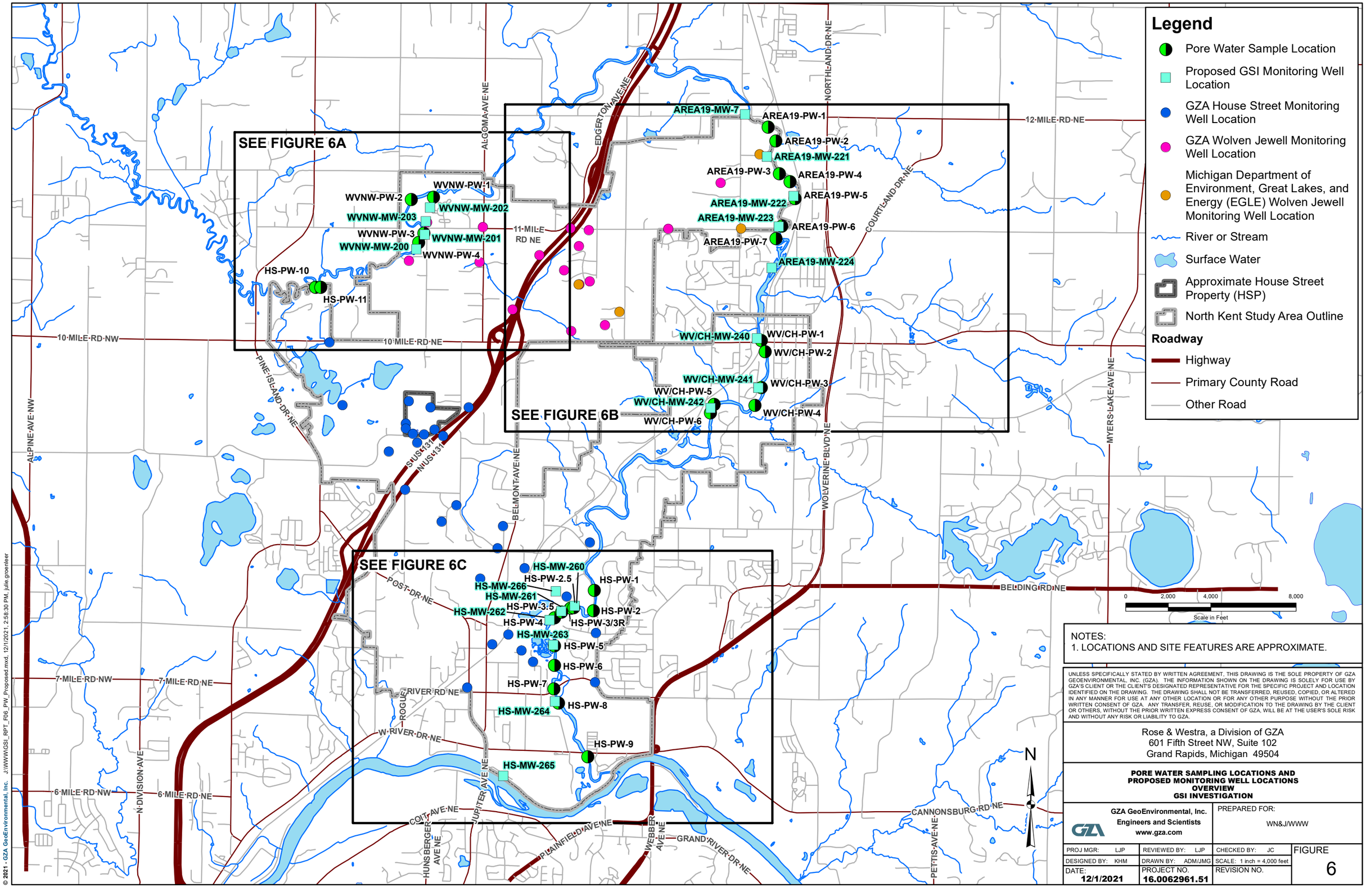

Legend

- Pore Water Sample Location
- Proposed GSI Monitoring Well Location
- GZA House Street Monitoring Well Location
- GZA Wolven Jewell Monitoring Well Location
- Michigan Department of Environment, Great Lakes, and Energy (EGLE) Wolven Jewell Monitoring Well Location
- River or Stream
- Surface Water
- Approximate House Street Property (HSP)
- North Kent Study Area Outline

Roadway

- Highway
- Primary County Road
- Other Road

NOTES:
1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

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PORE WATER SAMPLING LOCATIONS AND PROPOSED MONITORING WELL LOCATIONS OVERVIEW
GSI INVESTIGATION

GZA GeoEnvironmental, Inc.
Engineers and Scientists
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PREPARED FOR: WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 6
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 4,000 feet	
DATE: 12/1/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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NOTES:
1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

2. PFOS = PERFLUOROOCTANE SULFONATE

3. NG/L = NANOGRAM PER LITER; ND = NOT DETECTED

4. MAXIMUM CONCENTRATION FROM SAMPLING INTERVAL IS SHOWN.

5. ABBREVIATIONS FOR MICHIGAN PART 201 GENERIC CLEANUP CRITERIA FOR RESIDENTIAL USES:

GSI = GROUNDWATER - SURFACE WATER INTERFACE CRITERIA.

6. ESTIMATED POTENTIOMETRIC SURFACE WAS DEVELOPED USING INTERPOLATION IN AQUAVEO GROUNDWATER MODELING SYSTEM (GMS) VERSION 10.4 BASED ON MEASUREMENTS MADE IN GROUNDWATER MONITORING WELLS IN NOVEMBER 2019. ESTIMATED POTENTIOMETRIC SURFACE IS BASED ON LIMITED WELL INSTALLATIONS, AND DATA GAPS MAY ALTER THE POTENTIOMETRIC SURFACE. POTENTIOMETRIC SURFACE WAS NOT EXTRAPOLATED OUTSIDE OF THE AREAS OF MEASURED ELEVATIONS.

7. PERFLUORO-N-OCTANOIC ACID (PFOA) CONCENTRATIONS ARE NOT SHOWN BECAUSE THERE WERE NO EXCEEDANCES OF THE PFOA GSI CRITERIA OF 12,000 NG/L.

WVNW-PW-1
3 - 3.13 FT
PFOS: 7 ng/L

WVNW-PW-1
4 - 4.13 FT
PFOS: 9.7 ng/L

WVNW-PW-2
2.33 - 2.46 FT
PFOS: 10 ng/L

WVNW-PW-2
3.33 - 3.46 FT
PFOS: 11 ng/L

WVNW-MW-202

WVNW-MW-203

WVNW-PW-3
1.5 - 1.63 FT
PFOS: 260 ng/L

WVNW-MW-201

WVNW-PW-4
1.67 - 1.79 FT
PFOS: 100 ng/L

WVNW-MW-200

HS-PW-10
5 - 5.13 FT
PFOS: ND

HS-PW-11
4.5 - 4.63 FT
PFOS: ND

715
720
725
730
735
740
745
750
755
760
765
770
805

PINE ISLAND DR NE
ALGOMA AVE NE
11 MILE RD NE
10 MILE RD NE
S US 131
N US 131

Legend

- Pore Water PFOS Sample < 12 ng/L (GSI)
- Pore Water PFOS Sample > 12 ng/L (GSI)
- Proposed GSI Monitoring Well Location
- Existing Monitoring Well Cluster WV-MW-7S/M/D
- Groundwater Potentiometric Surface - Shallow Zone (ft) - November 2019
- River or Stream
- Surface Water
- North Kent Study Area

Roadway

- Highway
- Primary County Road
- Other Road

N

0 500 1,000 2,000
Scale in Feet

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PORE WATER PFOS CONCENTRATIONS AND PROPOSED MONITORING WELL LOCATIONS
WOLVEN NORTHWEST AREA
GSI INVESTIGATION

GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR: WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 6A
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 1,000 feet	
DATE: 11/11/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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5. ABBREVIATIONS FOR MICHIGAN PART 201 GENERIC CLEANUP CRITERIA FOR RESIDENTIAL USES:

GSI = GROUNDWATER - SURFACE WATER INTERFACE CRITERIA.

6. ESTIMATED POTENTIOMETRIC SURFACE WAS DEVELOPED USING INTERPOLATION IN AQUAVEO GROUNDWATER MODELING SYSTEM (GMS) VERSION 10.4 BASED ON MEASUREMENTS MADE IN GROUNDWATER MONITORING WELLS IN NOVEMBER 2019. ESTIMATED POTENTIOMETRIC SURFACE IS BASED ON LIMITED WELL INSTALLATIONS, AND DATA GAPS MAY ALTER THE POTENTIOMETRIC SURFACE. POTENTIOMETRIC SURFACE WAS NOT EXTRAPOLATED OUTSIDE OF THE AREAS OF MEASURED ELEVATIONS.

7. PERFLUORO-N-OCTANOIC ACID (PFOA) CONCENTRATIONS ARE NOT SHOWN BECAUSE THERE WERE NO EXCEEDANCES OF THE PFOA GSI CRITERIA OF 12,000 NG/L.

AREA19-GSI-1
3.7 - 7.7 FT
PFOS: 17 ng/L

AREA19-MW-7

AREA19-PW-1
1 - 1.13 FT
PFOS: 130 ng/L

AREA19-PW-2
1 - 1.13 FT
PFOS: 30 ng/L

AREA19-PW-2
1.42 - 1.54 FT
PFOS: 24 ng/L

WV-DEQ-MW9-57
51.85 - 56.85 FT
PFOS: ND

MW9

AREA19-MW-221

AREA19-PW-3
1 - 1.13 FT
PFOS: 89 ng/L

AREA19-PW-4
1 - 1.13 FT
PFOS: 67 ng/L

AREA19-PW-4
1.42 - 1.54 FT
PFOS: 64 ng/L

AREA19-GSI-2
4 - 8 FT
PFOS: 170 ng/L

AREA19-MW-222

AREA19-PW-5
1 - 1.13 FT
PFOS: 230 ng/L

AREA19-PW-6
1.5 - 1.63 FT
PFOS: 60 ng/L

AREA19-MW-223

AREA19-PW-6
2 - 2.13 FT
PFOS: 64 ng/L

AREA19-PW-7
5 - 5.13 FT
PFOS: 20 ng/L

AREA19-GSI-3
4.2 - 8.2 FT
PFOS: 130 ng/L

AREA19-MW-224

WV/CH-PW-1
0.75 - 0.88 FT
PFOS: 16 ng/L

WV/CH-MW-240

WV/CH-PW-2
0.75 - 0.88 FT
PFOS: 79 ng/L

WV/CH-PW-5
0.83 - 0.96 FT
PFOS: 32 ng/L

WV/CH-PW-3
1 - 1.13 FT
PFOS: 32 ng/L

WV/CH-MW-241

WV/CH-PW-6
1 - 1.13 FT
PFOS: 15 ng/L

WV/CH-PW-4
1 - 1.13 FT
PFOS: 20 ng/L

WV/CH-PW-6
2 - 2.13 FT
PFOS: ND

WV/CH-MW-242

12-MILE-RD-NE
11-MILE-RD-NE
10-MILE-RD-NE
W-DIVISION-ST-NE
E-DIVISION-ST-NE
NORTHLAND-DR-NE
COURTLAND-DR-NE
WOLVERINE-BLVD-NE
BELMONT-AVE-NE
S-US-131
N-US-131

Legend

- Pore Water PFOS Sample < 12 ng/L (GSI)
- Pore Water PFOS Sample > 12 ng/L (GSI)
- Monitoring Well PFOS Sample < 12 ng/L (GSI)
- Piezometer PFOS Sample > 12 ng/L (GSI)
- Proposed GSI Monitoring Well Location
- Groundwater Potentiometric Surface - Shallow Zone (ft) - November 2019
- River or Stream
- Surface Water
- North Kent Study Area Outline

Roadway

- Highway
- Primary County Road
- Other Road

N

0 750 1,500 3,000
Scale in Feet

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PORE WATER, PIEZOMETER, AND MONITORING WELL PFOS CONCENTRATIONS AND PROPOSED MONITORING WELL LOCATIONS WOLVEN NORTHEAST AND NORTH CHILDSDALE AREA GSI INVESTIGATION

GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR: WN&J/WWW

PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 6B
DESIGNED BY: KHM	DRAWN BY: JMG	SCALE: 1 inch = 1,500 feet	
DATE: 12/1/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

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NOTES:
1. LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

2. PFOS = PERFLUOROOCTANE SULFONATE

3. NG/L = NANOGRAM PER LITER; ND = NOT DETECTED

4. MAXIMUM CONCENTRATION FROM SAMPLING INTERVAL IS SHOWN.

5. ABBREVIATIONS FOR MICHIGAN PART 201 GENERIC CLEANUP CRITERIA FOR RESIDENTIAL USES:

GSI = GROUNDWATER - SURFACE WATER INTERFACE CRITERIA.

6. ESTIMATED POTENTIOMETRIC SURFACE WAS DEVELOPED USING INTERPOLATION IN AQUAVEO GROUNDWATER MODELING SYSTEM (GMS) VERSION 10.4 BASED ON MEASUREMENTS MADE IN GROUNDWATER MONITORING WELLS IN NOVEMBER 2019. ESTIMATED POTENTIOMETRIC SURFACE IS BASED ON LIMITED WELL INSTALLATIONS, AND DATA GAPS MAY ALTER THE POTENTIOMETRIC SURFACE. POTENTIOMETRIC SURFACE WAS NOT EXTRAPOLATED OUTSIDE OF THE AREAS OF MEASURED ELEVATIONS.

7. PERFLUORO-N-OCTANOIC ACID (PFOA) CONCENTRATIONS ARE NOT SHOWN BECAUSE THERE WERE NO EXCEEDANCES OF THE PFOA GSI CRITERIA OF 12,000 NG/L.

HS-MW-19S
58.4 - 61.4 FT
PFOS: ND

HS-MW-19D
85.9 - 95.9 FT
PFOS: ND

HS-PW-1
2 - 2.13 FT
PFOS: 0 ng/L

HS-PW-1
2.5 - 2.63 FT
PFOS: 0 ng/L

HS-PW-2.5
0.5 - 0.63 FT
PFOS: 820 ng/L

HS-PW-2.5
1 - 1.13 FT
PFOS: 560 ng/L

HS-MW-29A
3.5 - 13.5 FT
PFOS: 290 ng/L

HS-MW-266

HS-MW-260

HS-MW-261

HS-PW-4
0.75 - 0.88 FT
PFOS: 13 ng/L

HS-MW-262

HS-PW-2
1 - 1.125 FT
PFOS: 5.2 ng/L

HS-MW-263

HS-PW-3.5
0.83 - 0.96 FT
PFOS: 92 ng/L

HS-PW-3R
0.5 - 0.63 FT
PFOS: 900 ng/L

HS-PW-6
1 - 1.13 FT
PFOS: 4.6 ng/L

HS-PW-5
1.33 - 1.46 FT
PFOS: 30 ng/L

HS-PW-3
1.33 - 1.46 FT
PFOS: 1,100 ng/L

HS-PW-7
1.5 - 1.63 FT
PFOS: 8.9 ng/L

HS-MW-264

HS-PW-8
1 - 1.13 FT
PFOS: 26 ng/L

HS-PW-9
1 - 1.13 FT
PFOS: 8.2 ng/L

HS-MW-265

655
650
645
640
635
630
625
685
680
675
670
665
660
655
650
645
640

BELMONT-AVE-NE
JUPITER-AVE-NE
ROGUE-RIVER-RD-NE
W-RIVER-DR-NE
NORTHLAND-DR-NE

Legend

- Pore Water PFOS Sample < 12 ng/L (GSI)
- Pore Water PFOS Sample > 12 ng/L (GSI)
- Monitoring Well PFOS Sample < 12 ng/L (GSI)
- Monitoring Well PFOS Sample > 12 ng/L (GSI)
- Proposed GSI Monitoring Well Location
- Groundwater Potentiometric Surface - Shallow Zone (ft) - November 2019
- River or Stream
- Surface Water

Roadway

- Highway
- Primary County Road
- Other Road

N

0 625 1,250 2,500
Scale in Feet

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PORE WATER AND MONITORING WELL PFOS CONCENTRATIONS AND PROPOSED MONITORING WELL LOCATIONS
HSP SOUTH/SOUTHEAST
GSI INVESTIGATION

GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR: WN&J/WWW

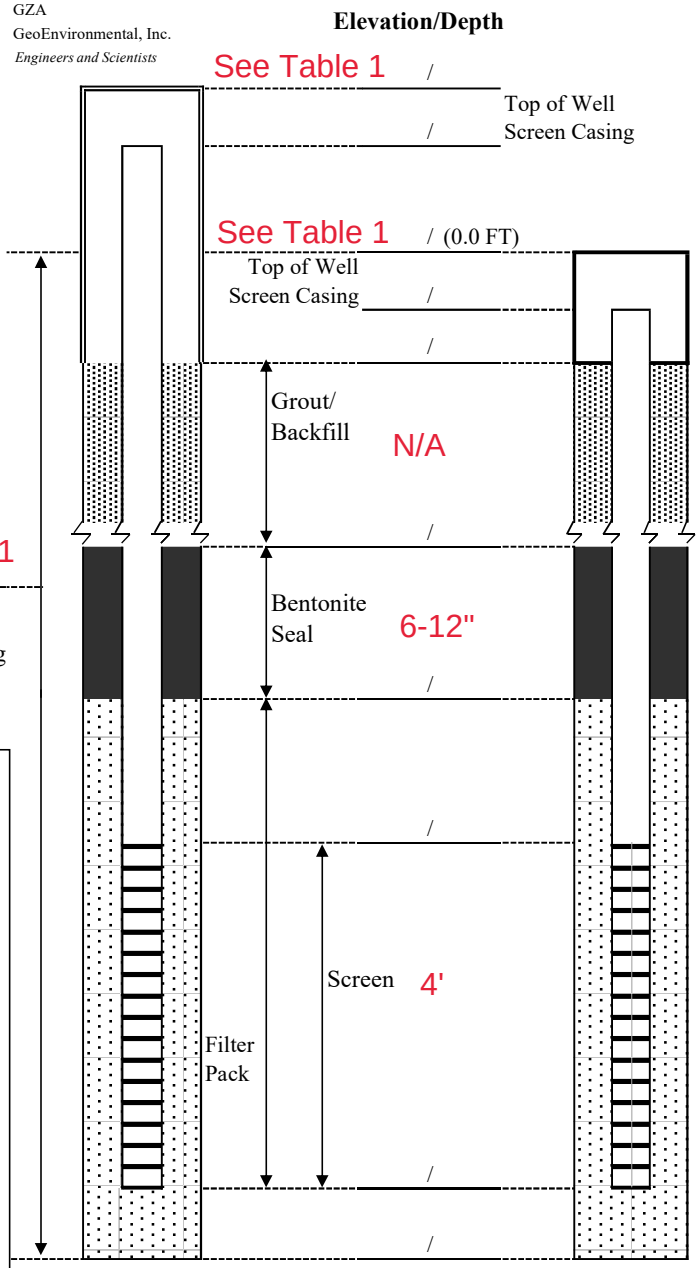
PROJ MGR: LJP	REVIEWED BY: LJP	CHECKED BY: JC	FIGURE 6C
DESIGNED BY: KHM	DRAWN BY: ADM/JMG	SCALE: 1 inch = 1,250 feet	
DATE: 11/11/2021	PROJECT NO. 16.0062961.51	REVISION NO.	

APPENDIX A

GENERAL PIEZOMETER CONSTRUCTION DETAIL

General Piezometer Construction Detail

GZA
GeoEnvironmental, Inc.
Engineers and Scientists



MONITORING WELL DETAILS

Wellscreen Dia: 1.25" Type: Steel

Slot Size: 80 gauze Well Screen Length: 4'

Well Riser Dia: 1.25" Type: Galvanized

Pipe Connections: Couplings Well Riser Length: Varies

Filter Sand Type: #1 Sand Other: _____

Protective Casing (Circle): YES / (NO)

Locked Cap (Circle): YES / (NO) Lock No: _____

DESCRIPTION OF MATERIAL BEING MONITORED

Groundwater Flow to Rogue & Grand Rivers

APPENDIX B

SAMPLING WORKSHEETS

Attachment A – Pore Water Sampling Worksheet

Date: 11/30/20

Location ID: Area 19 - PW-1

Weather Conditions: Overcast, 34°

Sampler's Name: MKM

Water Depth (ft): 12"

Sampler Screen Interval ~~(ft) (below water surface)~~ 0 12"

Sediment Thickness (ft) (est): 12"

Start time 1020

Sample Time 1035

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
10:20	12"	—	—	4.2		596.0		13.13		256.1		8.57		4	
1025		—	300		6		582		1.4		256		7.9		4
1030		—	300		6		582		1.3		198		7.8		2
1035		—	300		6		582		1.3		130		7.6		1

Attachment A – Pore Water Sampling Worksheet

Date: 11/30/20

Location ID: Area19- PW-2

Weather Conditions: Overcast

Sampler's Name: MKM

Water Depth (ft): 9"

Sampler Screen Interval ~~(ft) (below water surface)~~ 12"

Sediment Thickness (ft) (est): No sediment

Start time 1335

Sample Time 1355

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1335	9"	—	—	4.2		548		27.1		250		7.9		3	
1340			150	~~6.0~~	6.0		1289		4.9		200		7.5		30
1345			150		6.0		1292		2.6		186		7.4		46
1350			150		6.0		1289		2.1		107		7.3		29
1355			150		6.0		1286		1.7		43		7.4		65

Attachment A – Pore Water Sampling Worksheet

Date: 11/30

Location ID: Area19-PW-2B

Weather Conditions: Cloudy, Low 30's

Sampler's Name: TAL/MKM

Water Depth (ft): 9"

Sampler Screen Interval (~~ft) (below water surface)~~ 17"

Sediment Thickness (ft) (est): none

Start time 1415

Sample Time 1430

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1410	9"			4.2		599.0		13.7		-70		7.6		16	
1415			150		6.4		1212		1.4		-28		7.4		6
1420			150		6.5		1212		1.0		<50		7.2		8
1425			150		6.8		1230		1.0		-68		7.1		10
1430			150		6.7		1237		1.1		-74		7.1		7

Attachment A – Pore Water Sampling Worksheet

Date: 11/30/20 **Location ID:** Area19-PW-3

Weather Conditions: Overcast, 34° **Sampler's Name:** JAL

Water Depth (ft): 3" **Sampler Screen Interval ~~(ft) (below water surface)~~** 12"

Sediment Thickness (ft) (est): none

Start time 1520 **Sample Time** 1535

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1515	3"	—	—	4.4		600		13.3		-61	[illegible]	7.5		4	
1520			150		6.9		760		8.2		-15		7.4		14
1525			150		6.60		762		6.1		-5.4		7.4		20
1530			150		7.0		737		5.5		9.4		7.4		12
1535			150		6.7		737		5.3		23.1		7.9		10

Attachment A – Pore Water Sampling Worksheet

Date: 12/1/20

Location ID: Area 19 - PW-4(A)

Weather Conditions: Partly Sunny, 30°

Sampler's Name: TAL

Water Depth (ft): 9"

Sampler Screen Interval (~~ft) (below water surface)~~ 12"

Sediment Thickness (ft) (est): 2"

Start time 1035

Sample Time 1050

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
10:25	9"	—	—	3.2		523.9		19.38		121.9		9.43		3	
1035		—	150		5.7		946		1.9		122		8.3		296
1040		—	150		5.8		962		1.2		107		8.0		114
1045		—	150		6.0		952		1.2		96.0		7.8		78
1050		—	150		5.7		941		1.2		84		7.7		70

Attachment A – Pore Water Sampling Worksheet

Date: 12/1/20 Location ID: Area19-PW-4(B)

Weather Conditions: Sunny, 30° Sampler's Name: TAL

Water Depth (ft): 9" Sampler Screen Interval ~~(ft) (below water surface)~~ 17"

Sediment Thickness (ft) (est): 2"

Start time 1120 Sample Time 1135

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1115				3.2		534		11.8		79		7.9		17	
1120			150		5.1		931		1.4		94		7.7		192
1125			150		5.3		921		1.2		90		7.7		71
1130			150		5.3		906		1.3		89		7.7		56
1135			150		5.4		890		1.4		89		7.6		70

Attachment A – Pore Water Sampling Worksheet

Date: 12/1/20 **Location ID:** Area19-PW-6(A)

Weather Conditions: Sunny, 38° **Sampler's Name:** TAL

Water Depth (ft): ~~8~~ 12" **Sampler Screen Interval (~~ft) (below water surface~~):** ~~12~~ 18"

Sediment Thickness (ft) (est): ~~8~~ 3"

Start time 1500 **Sample Time** 1515

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
14:55				3.7		520.2		12.8		195.2		8.13		2	
1500				~~5.4~~	6.4		562		1.2		179		7.9		478
1505					6.9		562		1.0		34		7.8		40
1510					6.9		562		1.0		-27		7.7		32
1515					6.9		561		1.0		-48		7.6		17

Attachment A – Pore Water Sampling Worksheet

Date: 12/1/20

Location ID: Area19-PW-6(B)

Weather Conditions: Sunny, 39°

Sampler's Name: TAL

Water Depth (ft): 12"

Sampler Screen Interval ~~(ft) (below water surface)~~ 24"

Sediment Thickness (ft) (est): 3"

Start time 15:35

Sample Time 15:50

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
15:30	~	~		3.7		518.7		12.4		-11.1		7.96		8	
15:35	–	–		[illegible]	6.6		559.7	[illegible]	1.11		8.1		7.79		55
15:40	–	–			6.9		561.5		.75		-38.6		7.70		26
15:45	–	–			6.9		561.9		.78		-48.9		7.63		14
15:50	–	–			6.8		561.8		.78		-55.4		7.57		9

Attachment A – Pore Water Sampling Worksheet

Date: 12/1/20

Location ID: Area 9- PW-7

Weather Conditions: Sunny 38°

Sampler's Name: TAL

Water Depth (ft): 2"

Sampler Screen Interval ~~(ft) (below water surface)~~ 5'

Sediment Thickness/Muck (ft) (est): 4.5'

Start time 1625

Sample Time 1640

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1620				3.6		519.6		12.19		488		7.81		10	
1625				~~8.3~~	8.3		644		1.24		82		7.6		49
1630					7.9		697		0.7		59		7.4		28
1635					8.0		698		0.7		40		7.6		12
1640					8.0		699		0.7		30		7.5		

Attachment A – Pore Water Sampling Worksheet

Date: 12/1/2020

Location ID: Area19-PW-5(A)

Weather Conditions: Sunny 34°

Sampler's Name: TAL

Water Depth (ft): 6"

Sampler Screen Interval ~~(ft) (below water surface)~~ 12"

Sediment Thickness (ft) (est): 4"

Start time 1205

Sample Time 1220

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
12:00				3.3		522.8		12.32		147.6		7.95		24	
1205			150		6.3		528		1.3		144		7.8		74
1210			150		6.5		534		0.8		6.2		7.7		20
1215			150		6.7		533		0.7		-42		7.6		9
1220			150		6.7		533		0.8		-58		7.5		5
~~1225~~			"												

★ DUP taken "WVNW-PW-4(A)-DUP"

Attachment A – Pore Water Sampling Worksheet

Date: 12/2/20

Location ID: WVNW-PW-4(A)

Weather Conditions: mid 40's, sunny

Sampler's Name: JAL / MKM

Water Depth (ft): 12"

Sampler Screen Interval ~~(ft) (below water surface)~~ 20"

Sediment Thickness (ft) (est): 19"

Start time 1140

Sample Time 1200

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1135				2.1		498		26.3		137		9.6		5	
1145			150		6.2		604		5.2		167		8.4		2616
1150			150		6.8		706		1.4		43		7.9		279
1155			150		6.8		716		1.3		-24		7.5		78
1200			150		6.9		716		1.2		-41		7.5		16

Attachment A – Pore Water Sampling Worksheet

★ MS/MSD taken

Date: 12/2/20

Location ID: WWW-PW-3

Weather Conditions: Sunny, 45°

Sampler's Name: TAL

Water Depth (ft): 12"

Sampler Screen Interval ~~(ft) (below water surface)~~ 18"

Sediment Thickness (ft) (est): 16"

Start time 1425

Sample Time 1440

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
14:20	–	–		2.6		C23		12.95		171.7		7.8		9	
1425			150		7.2		554		1.4		171		7.7		26
1430			150		7.3		557		1.2		157		7.6		5
1435			150		7.4		557		1.1		143		7.6		7
1440			150		7.4		557		1.1		133		7.5		1

Attachment A – Pore Water Sampling Worksheet

Date: 12/3/20 **Location ID:** HS - PW-1 (A)

Weather Conditions: Cloudy & 30's **Sampler's Name:** Alexis Blackmore

Water Depth (ft): 12 in **Sampler Screen Interval (~~ft) (below water surface)~~** ~~22~~ 24

Sediment Thickness (ft) (est): 10 in

Start time 1150 **Sample Time** 1205

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1140				2.8		513.8		6.62		268.6		7.86		1	
1150			150		4.6	~~1053~~	1053		2.09		225.9	~~7.60~~	7.60		4
1155			150		6.1		1066		1.24		189.0		7.48		3
1200			150		5.8		1064		1.22		181.2		7.44		2
1205			150		5.6		1067		1.19		177		7.4		2

Attachment A – Pore Water Sampling Worksheet

Date: 12/3/20

Location ID: HS-PW-1(3)

Weather Conditions: Cloudy & 30's

Sampler's Name: Alexis Blackmore

Water Depth (ft): 12in

Sampler Screen Interval (~~ft) (below water surface~~) 30 in.

Sediment Thickness (ft) (est): 10in

Start time 1230

Sample Time 1250

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1220				2.6		571.9		12.84		186.2		7.83		15	
1230															
1235					5.9		1060		2.48		198.8		7.40		4
1240					6.0		1061		1.22		192.4		7.36		3
1245					6.1		1062		1.05		187.8		7.31		2
1250					5.8		1064		0.9		185		7.3		1

YSI turned off

Attachment A – Pore Water Sampling Worksheet

Date: 12/3/20 **Location ID:** HS-PW-7 (A)

Weather Conditions: Cloudy & 30s **Sampler's Name:** Alexis Blackmon

Water Depth (ft): 6" **Sampler Screen Interval (ft) ~~(below water surface)~~** 18"

Sediment Thickness (ft) (est): 3"

Start time 1530 **Sample Time** 1545

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1525				3.1		562.1		15.41		-62.5		7.78		4	
1530			150		5.5		857		2.22		-20.7		7.42		0.5
1535			↓		6.0		925		1.18		-57.8		7.37		3
1540					6.1		943		1.16		-75.5		7.20		3
1545					6.1		945		1.14		-78.3		7.18		2

Attachment A – Pore Water Sampling Worksheet

Date: 12/4/2020 **Location ID:** HS - PW-2 (A)

Weather Conditions: cloudy & 30s **Sampler's Name:** Alexis Blackmore

Water Depth (ft): 5 in **Sampler Screen Interval (~~ft) (below water surface)~~** 12 in

Sediment Thickness (ft) (est): 2 in * Pore water has strong sulfur odor

Start time 1430 **Sample Time** 1445

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1415				2.9		566.5		16.30		240.3	.	7.94		76	
1430			150		5.9		809		1.13		143.1		7.84		2
1435			150		5.7		818		1.03		-75.4		7.74		4
1440			150		5.9		819		0.94		-110.8		7.66		2
1445			150		5.9		820		0.94		-123		7.63		2

Attachment A – Pore Water Sampling Worksheet

Date: 12/4/20 Location ID: HS-PW-3 (A)

Weather Conditions: Cloudy & 30s Sampler's Name: Alexis Blackmore

Water Depth (ft): 2:n Sampler Screen Interval (ft) ~~(below water surface)~~ 16:n

Sediment Thickness (ft) (est): 2:n

Start time 1020 Sample Time 1040

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1005				3.2		573.6		23.93		252.7		7.16		77.3	
1025					7.2	X	485.1		1.08		257.6		6.81		18.1
1030					6.9		489.7		0.95		178.2		6.60		3.5
1035					7.1		489.9		0.94		120.0		6.54		3.0
1040					7.1		492.1		1.02		71.8		6.51		2.3

Attachment A – Pore Water Sampling Worksheet

Date: 12/4/20

Location ID: MS-PW-4 (A)

Weather Conditions: Partly sunny & 30s

Sampler's Name: Alexis Blackmore

Water Depth (ft): 12in

Sampler Screen Interval ~~(ft) (below water surface)~~ 9in.

Sediment Thickness (ft) (est): 2in

Start time 1120

Sample Time 1140

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1116				7.1		671.3		19.05		63.3		6.71		17.5	
1126					9.3				1.04		78.0		6.91		4.8
1130					9.5		655.6		0.73		25.5		7.01		2.0
1135					9.6		655.7		0.67		-10.1		7.05		1.3
1140															

Date: 12/4/20

Attachment A – Pore Water Sampling Worksheet

Location ID: HS- PW- 5 (A)

Weather Conditions: Cloudy and 40s

Sampler's Name: Alexis Blackmore

Water Depth (ft): 4 in

Sampler Screen Interval (ft) ~~(below water surface)~~ 16 in

Sediment Thickness (ft) (est): 2 in

Start time 1400

Sample Time 1420

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1355				4.1		582.6		21.09		285.9		7.41		11.7	
1405					6.5		950		1.38		225.4		7.13		
1410					6.6		951		1.26		160.9		7.08		
1415					6.6		951		1.14		-0.3		6.98		
1420					6.6		953		1.05		-22.3		6.95		

*Turbidimeter Malfunctioning

Attachment A – Pore Water Sampling Worksheet

Date: 12/4/20

Location ID: HS-PW-6 (A)

Weather Conditions: Cloudy and 30s

Sampler's Name: Alexis Blackmore

Water Depth (ft): 2 in

Sampler Screen Interval ~~(ft) (below water surface)~~ 12 in

Sediment Thickness (ft) (est): 5 in

Start time 1455

Sample Time 1515

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1445				4.7		644.8		15.73	x	15.41		7.46		x	
1500					6.9		707.8		1.00		13.7		7.38		
1505					6.9		707.6		0.78		-23.9		7.38		
1510					6.9		707.1		0.77		-49.7		7.36		
1515					6.9		707.7		0.70		-66.4		7.34		

Turbidimeter malfunctioning

Attachment A – Pore Water Sampling Worksheet

Date: 12/7/20

Location ID: WV/CH-PW-1(A)

Weather Conditions: Cloudy, 29°

Sampler's Name: TAL

Water Depth (ft): 3"

Sampler Screen Interval ~~(ft) (below water surface)~~ 9"

Sediment Thickness (ft) (est): 0"

Start time 10:45

Sample Time 1100

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1040	-	-	-	2.8		892		12.0		147		8.4		2.9	
1045					4.3		1104		0.9		-58		7.4		3.6
1050					4.8		1101		1.1		-77		7.4		2.5
1055					4.7		1100		0.8		-90		7.4		2.8
1100					4.6		1102		0.8		-95		7.4		3.0

Attachment A – Pore Water Sampling Worksheet

Date: 12/7/20 **Location ID:** WV/CH-PW-2(A)

Weather Conditions: Cloudy. 31° **Sampler's Name:** TAL

Water Depth (ft): 5" **Sampler Screen Interval (ft) ~~(below water surface)~~** 9"

Sediment Thickness (ft) (est): 2"

Start time 1140 **Sample Time** 1155

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1135	–	–		2.8		604		11.82		113.4		8.45		3.76	
1140	–	–	150		5.4		788		0.3		-42		7.4		1.4
1145	–	–	150		5.2		790		0.2		-60		7.5		0.2
1150	–	–	150		5.2		790		0.1		-65		7.4		0.3
1155	–	–	150		4.8		790		0.1		-69		7.4		3.0

Attachment A – Pore Water Sampling Worksheet

Date: 12/7/20

Location ID: WV/CH -PW-3(A)

Weather Conditions: Cloudy, 30°s

Sampler's Name: TAL

Water Depth (ft): 7"

Sampler Screen Interval (ft) ~~(below water surface)~~ 12"

Sediment Thickness (ft) (est): ~~B~~ 0"

Start time 1425

Sample Time 1440

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1420				3.2		603.0		13.0		124		8.8		4.36	
1425					4.9		711		6.8		170		7.6		8.6
1430					4.9		722		6.7		192		7.6		5.4
1435					4.9		721		6.7		213		7.6		3.9
1440					4.9		723		6.7		227		7.6		1.3

MS/MSD taken

Attachment A – Pore Water Sampling Worksheet

Date: 12/7/20

Location ID: [redacted] WW/CH-PW-4(A)

Weather Conditions: Cloudy, 35°

Sampler's Name: TAL

Water Depth (ft): 5"

Sampler Screen Interval (ft) ~~(below water surface)~~: 12"

Sediment Thickness (ft) (est): 0"

Start time 1515

Sample Time 1530

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
15:10	—	—		3.3		604		13.6		213.8		8.73		2.68	
1515	5"		150		5.2		1015		0.3		2.0		6.9		2.3
1520			150		5.3		1024		0.1		-25		7.1		0.6
1525			150		5.4		1024		0.1		-32		7.1		0.4
1530			150		5.4		1025		0.1		-37		7.1		0.4

Attachment A – Pore Water Sampling Worksheet

Date: 12/8/2020

Location ID: WV/CH-PW-5(A)

Weather Conditions: Cloudy, 33

Sampler's Name: TAL

Water Depth (ft): 6"

Sampler Screen Interval (~~ft) (below water surface~~) 10"

Sediment Thickness (ft) (est): 0"

Start time 11:15

Sample Time 11:30

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
11:10	—	—		3.4		674		5.05		97.3		8.47		2.9	
11:15			100ml		5.3		786		1.43		97.5		7.46		295
11:20			100ml		5.3		797		.16		58.6		7.28		36.9
11:25			100ml		5.3		796		.11		43.4		7.33		13.4
11:30			100ml		5.3		798		.09		31.6		7.28		15.6

Attachment A – Pore Water Sampling Worksheet

Date: 12/8/20

Location ID: WV/LH-PW 6(A)

Weather Conditions: Cloudy, 38°

Sampler's Name: TAL

Water Depth (ft): 5"

Sampler Screen Interval (ft) ~~(below water surface)~~ 12"

Sediment Thickness (ft) (est): 4"

Start time 12:10

Sample Time 12:30

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
12:00	—	-		33		674		12.78		216.7		8.42		8.9	
12:10			100		5.5		747		.96		-46.1		7.06		7.97
12:15					5.5		743		.47		-63.4		7.03		3.58
12:20					5.5		743.7		.46		-66.5		7.03		2.07
12:25					5.4		749		.47		-67.3		7.07		.99

Attachment A – Pore Water Sampling Worksheet

Date: 12/8/20 Location ID: WV/CH-PW-6(B)

Weather Conditions: Cloudy, 34° Sampler's Name: TAL

Water Depth (ft): 5" Sampler Screen Interval (~~ft) (below water surface)~~ 24"

Sediment Thickness (ft) (est): 4"

Start time 12:50 Sample Time 13:10

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
12:45	—	—		3.3		674		12.78		216.7		8.42		8.5	
12:50			100ml		6.9		686		1.20		-82.1		7.40		4.06
12:55			100		7.0		695		1.52		-95.1		7.34		1.61
13:00			100		7.0		684		1.67		-86.4		7.33		~~1.84~~ 1.4
13:05			100		7.0		686		1.29		-89.6		7.38		

Attachment A – Pore Water Sampling Worksheet

Date: 12/8/2020

Location ID: HS-PW-8

Weather Conditions: Cloudy, 37

Sampler's Name: TAL

Water Depth (ft): 6"

Sampler Screen Interval (~~ft) (below water surface~~) 12"

Sediment Thickness (ft) (est): 4"

Start time 14:45

Sample Time 15:10

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
14:40	—	—		3.5		682		12.66		25.9		8.85			
14:45	—	—	100 ml		5.5		660		.35		-172		7.89		36.5
14:50	—	—	100 ml		5.6		660		.21		-175		7.6		3.75
14:55	—	—	100		5.5		660		.21		-175		7.6		3.4
15:00	—	—	100		5.5		661		.22		-175.9		7.69		2.5
15:05	—	—	100		5.6		660		0.24		-176.3		7.66		1.25

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/20

Location ID: HS-PW-9

Weather Conditions: Cloudy, ~~33~~ 36°

Sampler's Name: TAL

Water Depth (ft): 7"

Sampler Screen Interval (~~ft) (below water surface)~~ 12"

Sediment Thickness (ft) (est): 2"

Start time 16:25

Sample Time 16:45

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
16:20	—	—		3.5		679		12.48		-13.3		8.8		2.88	
16:25	—	—	100 ml		3.9		668		4.49		-44.9		7.74		18.1
16:30	—	—	100 ml		3.8		683		.93		-79.9		7.82		4.03
16:35	—	—	100 ml		3.9		682		.72		-81.7		7.47		0.80
16:40	—	—	100 ml		3.7		682		.71		-83.6		7.75		.63

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/20

Location ID: WWW-PW-1(B)

Weather Conditions: Sunny, 46°

Sampler's Name: TAL

Water Depth (ft): 5'

Sampler Screen Interval (ft) (~~below water surface~~) 4'

Sediment Thickness (ft) (est): 2.5'

Start time 16:35

Sample Time 16:55

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
16:30	–	–		3.7		654		11.47		4.2		6.9		2.79	
16:35	–	–			4.5		849		.42		-31		7.52		32.3
16:40					4.5		622		.40		-33		7.49		17.5
16:45					4.5		560		.11		-38.2		7.52		9.5
16:50					4.5		450.1		.08		-39.6		7.47		10.8

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/20

Location ID: WWW-PW-1(A)

Weather Conditions: Sunny, 46°

Sampler's Name: ~~TAZ~~

Water Depth (ft): 3'11

Sampler Screen Interval (ft) ~~(below water surface)~~ 3'

Sediment Thickness (ft) (est): 25'

Start time 15:53

Sample Time 16:15

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
15:45				3.7		654		11.47		4.2		6.9		2.79	
15:55					5.1		837		0.49		-13.6		7.5		10,8
16:00					5.0		841		.43		-24.2		7.47		5.50
16:05					4.9		842		.41		-28.9		7.56		19.3
16:10					4.8		842		.41		-27.2		7.54		13.7

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/20

Location ID: WWW-PW-2(B)

Weather Conditions: Sunny, 46°

Sampler's Name: TAL

Water Depth (ft): 4'11"

Sampler Screen Interval (ft) ~~(below water surface)~~ 3.3'

Sediment Thickness (ft) (est): Sediment/clay - 2'

Start time 15:00

Sample Time 15:20

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
14:50 ~~Time~~	—	—		3.6		654		11.18		-9.7		8.51		6.06	
15:00	—	—	100 ml		5.5		631		.22		-15.7		6.94		9.34
15:05	—	—	100 ml		5.6		631		.10		-20.9		6.89		~~2.94~~ 2.94
15:10	—	—	100 ml		5.6		631		.11		-23		6.89		1.95
15:15	—	—	100 ml		5.6		631		.09		-25.4		6.87		1.37

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/2020 Location ID: WVNW - PW - 2(A)

Weather Conditions: Sunny, 45° Sampler's Name: TAL

Water Depth (ft): 4'' Sampler Screen Interval (ft) ~~(below water surface)~~ 2.3'

Sediment Thickness (ft) (est): Sediment / Clay - 2'

Start time 14:20 Sample Time 14:40

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
14:10	—	-		3.6		654		11.17		-9.8		8.51		6.06	
14:20	—	—	100ml		5.8		597		.80		-29.3		6.93		6.85
14:25	—	-	100 ml		5.7		599		.23		-21.4		6.89		3.44
14:30	—	—	100 ml		5.8		608		.10		-25.4		6.87		2.47
14:35	—	-	100 ml		5.9		613		.19		-28.2		6.87		2.53

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/20 **Location ID:** HS-PW-10(A)

Weather Conditions: Cloudy, 39 **Sampler's Name:** TAL

Water Depth (ft): ~~5~~ 8" **Sampler Screen Interval ~~(ft) (below water surface)~~** 10" + Sediment

Sediment Thickness (ft) (est): 4.5', some clay / mud

Start time 9:45 **Sample Time** 10:05

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
9:39	–	–		3.0	~~6.4~~	649	~~648~~	10.58	~~3.48~~	58.3		8.49	~~7.82~~	2.79	~~3.15~~
9:45	–	–	100 ml		6.4		648		3.48		-89.3		7.82		3.15
9:50	–	–	100ml		6.7		649		.41		-97.4		7.87		0.71
9:55	–	–	100		6.8		649		.20		-101.2		7.72		0.64
10:00					6.7		649		.11		-105.3		7.97		0.26

Attachment A – Pore Water Sampling Worksheet

Date: 12/9/2020

Location ID: HS-PW-11(A)

Weather Conditions: Cloudy, 40°

Sampler's Name: TAL

Water Depth (ft): 4"

Sampler Screen Interval (ft) ~~(below water surface)~~ 4.5' total depth

Sediment Thickness (ft) (est): 4.2'

Start time 11:15

Sample Time 11:35

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
10:40	—	—	-	3.1		657		10.8		82.4		8.48		5.17	
11:15	—	—	100 ml		5.6		624		.51		-101		7.84		13.1
11:20	—	—	100 ml		5.7		623		.18		-108		7.79		7.21
11:25	—	—	100 ml		5.7		624		.11		-112		7.82		5.25
11:30	—	—	100 ml		5.6		625		.08		-114.8		7.85		

Attachment A – Pore Water Sampling Worksheet

Date: 1/26/21

Location ID: HS-PW-~~3~~2.5A

Weather Conditions: snow, low 20's, cloudy

Sampler's Name: Mallayla Myers

Water Depth (ft): 6"

Sampler Screen Interval (~~ft) (below water surface)~~ 6-12

Sediment Thickness (ft) (est): 6-12"

Start time 1015 (arrive & setup)

Sample Time 1130

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1110				0.0		623		12.8		481		8.5		6.8	
1115					5.4		466		1.69		240		7.3		3.2
1118					5.5		466		0.57		232		7.3		2.1
1125					5.5		465		0.15		225		7.2		N.R.
1130					5.7		463		0.09		221		7.2		

Attachment A – Pore Water Sampling Worksheet

Date: 1/26/21

Location ID: HS-PW-2.5(B)

Weather Conditions: Snow,

Sampler's Name: Mackayla Rogers

Water Depth (ft): 6"

Sampler Screen Interval ~~(ft) (below water surface)~~ 12- 18"

Sediment Thickness (ft) (est): 12- 18"

Start time 1155

Sample Time 1215

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1155				0.0		623		12.8		481		8.5		6.8	
1200					7.0		454		1.7		398		7.4		8.0
1205					6.9		464		0.4		385		7.4		3
1210					6.9		465		0.2		380		7.4		3
1215					6.9		466		0.1		378		7.4		3

Attachment A – Pore Water Sampling Worksheet

Date: 1/26/21 Location ID: HS-PW-3(A) & DUP

Weather Conditions: Snowy, cloudy, 28°F Sampler's Name: [illegible]

Water Depth (ft): 6" Sampler Screen Interval ~~(ft) (below water surface)~~ 6-12"

Sediment Thickness (ft) (est): 6-12"

Start time 1410 Sample Time 1430

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C)		Specific Conductance (us/cm)		Dissolved Oxygen (mg/L)		Oxidation Reduction Potential (mV)		pH (SU)		Turbidity (NTU)	
				River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water	River Water	Pore Water
1410				0.1		619		13.3		455		8.7		5.3	8
1415					5.0		528		0.88		224		7.3		11
1420					5.0		528		0.22		201		7.2		5.1
1425					5.0		530		0.13		198		7.2		5.7
1430					5.0		531		0.12		197		7.2		3.0

Attachment A – Pore Water Sampling Worksheet

Date: 1/26/21

Location ID: HS-~~[illegible]~~ PW - 3.5(A) & MS/MSD

Weather Conditions: snow, cloudy, 28°

Sampler's Name: [illegible]

Water Depth (ft): 1.5'

Sampler Screen Interval (ft) (below water surface) ~~[illegible]~~ 10-14

Sediment Thickness (ft) (est): ~~6-12~~ 4"

FB @ 1550

Start time 1515

Sample Time 1540

Time	Water Level (ft)	Drawdown (ft)	Purge Rate	Temp (°C) River Water	Temp (°C) Pore Water	Specific Conductance (us/cm) River Water	Specific Conductance (us/cm) Pore Water	Dissolved Oxygen (mg/L) River Water	Dissolved Oxygen (mg/L) Pore Water	Oxidation Reduction Potential (mV) River Water	Oxidation Reduction Potential (mV) Pore Water	pH (SU) River Water	pH (SU) Pore Water	Turbidity (NTU) River Water	Turbidity (NTU) Pore Water
1510	—	—	—	0.2		612		15.0		337		8.5		4.2	
1515					3.3	NOT >10% difference for all parameters → moved to new spot ~ 5ft downstream									
1520					5.1		720		3.4		228		7.5		5
1525					5.9		780		0.13		258		7.5		2.5
1530					5.2		784		0.10		271		7.5		N.R
1535					5.0		784		0.10		279		7.5		10.6
1540					5.2		781		0.08		295		7.5		12.7

APPENDIX G - WELL SAMPLING WORKSHEET

For use with Peristaltic Pumps

Site Name

Page _____of_____

Date: 12/8/20 Well ID: Area 19-GSI-1

Weather Conditions: cloudy, high 40's

Sampler's Name (Print) Mariayla Myers

Purging Device & Serial # (pump type): GZA-Peri-B

Reference Measuring Point (Top of PVC/Top of Casing): Casing

Well Depth (ft, ref. to measuring point): 12'

Screen Interval (ft, ref. to measuring point): 9-12 ft

Samples Collected: PFAS

Initial Water Level (ft, ref. to measuring point): 5.43

Tubing Intake (ft, ref. to measuring point): 10'

Total Purge Volume (gallons): 2.45

PVC/Inner Well Casing ID (inches): 1.25"

Tubing ID (inches): 1/4"

Indicator Parameter Stabilization: yes OR no (circle one)

Two Hour Time Limit Reached ? yes OR no (circle one)

Purging Start Time: 950 (24 hour cycle) Sample Time: 1045 (24 hour cycle) Time at Sample Completion: 1050 (24 hour cycle)

Clock Time (24 HR)	Water Level (ft)	Drawdown (ft)	Cumulative Drawdown (ft)	Pump Speed	Purge Rate (ml/min)	Temp +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
955	5.43	0	0	180	300	8.47	278	6.5	7.7	60	123	
1005	5.43	0	0	180	300	8.86	376	6.1	7.0	66	38.5	
1015	5.43	0	0	180	300	8.89	373	6.0	6.9	71	19.4	
1020	5.43	0	0	180	300	8.90	372	6.0	6.9	73	9.2	
1025	5.43	0	0	180	300	8.95	372	6.0	6.9	80	5.75	
1030	5.43	0	0	180	300	8.96	372	6.0	6.9	83	3.76	
1035	5.43	0	0	180	300	8.89	372	6.0	6.9	84	3.0	
1040	5.43	0	0	180	300	8.98	371	6.0	6.9	85	2.7	
FPV (gallons) =	Calculations:											

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

Sampler's Signature

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

APPENDIX G - WELL SAMPLING WORKSHEET

For use with Peristaltic Pumps

Site Name

Page ____ of ____

Date: 12/8/20 Well ID: ATCA 19-GS1-2

Weather Conditions: Cloudy, High 30's

Sampler's Name (Print): Makayla Myers

Purging Device & Serial # (pump type): G2A-Dem-5

Reference Measuring Point (Top of PVC/Top of Casing): Casing

Well Depth (ft, ref. to measuring point): 11.8'

Screen Interval (ft, ref. to measuring point): 8-12

Samples Collected: 10 PFAS

Purging Start Time: 12:55 (24 hour cycle) Sample Time: 1345 (24 hour cycle)

Initial Water Level (ft, ref. to measuring point): 4.85

Tubing Intake (ft, ref. to measuring point): 10'

Total Purge Volume (gallons): 24gal

PVC/Inner Well Casing ID (inches): 1.25"

Tubing ID (inches): 1/4"

Indicator Parameter Stabilization: yes OR no (circle one)

Two Hour Time Limit Reached ? yes OR no (circle one)

Time at Sample Completion: 1350 (24 hour cycle)

Clock Time (24 HR)	Water Level (ft)	Drawdown (ft)	Cumulative Drawdown (ft)	Pump Speed	Purge Rate (ml/min)	Temp +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
1305	5.10	0.25	0.25	180	300	8.0	441	0.6	7.1	-107	61	
1315	5.12	0.02	0.27	170	290	8.4	433	0.3	7.1	-112	20	
1325	5.12	0.0	0.27	170	290	8.5	432	0.4	7.1	-113	11.7	
1330	5.12	0.0	0.27	170	290	8.6	432	0.3	7.1	-102	7	
1335	5.12	0.02	0.29	170	290	8.6	432	0.2	7.0	-98	5	
1338	5.14	0.00	0.29	170	290	8.6	432	0.3	7.0	-97	<5	
1341	5.14	0.0	0.29	170	290	8.6	432	0.2	7.0	-96	<5	
FPV (gallons) =	Calculations:											

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

Sampler's Signature

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

APPENDIX G - WELL SAMPLING WORKSHEET

For use with Peristaltic Pumps

Site Name

Page ____ of ____

Date: 12/8/20 Well ID: Area 19-651-3

Weather Conditions: cloudy, windy, mid 30s

Sampler's Name (Print): Makayla Hayes

Purging Device & Serial # (pump type): GZA-Peri-B

Reference Measuring Point (Top of PVC/Top of Casing): Casing

Well Depth (ft, ref. to measuring point): 11.95'

Screen Interval (ft, ref. to measuring point): 9-12'

Samples Collected: PFAS

Initial Water Level (ft, ref. to measuring point): 4.67

Tubing Intake (ft, ref. to measuring point): 10'

Total Purge Volume (gallons): 24.5

PVC/Inner Well Casing ID (inches): 1.25'

Tubing ID (inches): .25'

Indicator Parameter Stabilization: **yes** OR **no** (circle one)

Two Hour Time Limit Reached ? yes OR no (circle one)

Purging Start Time: 1405 (24 hour cycle) Sample Time: 1445 (24 hour cycle) Time at Sample Completion: 1450 (24 hour cycle)

Clock Time (24 HR)	Water Level (ft)	Drawdown (ft)	Cumulative Drawdown (ft)	Pump Speed	Purge Rate (ml/min)	Temp +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
1415	4.93	0.26	0.26	175	200	7.5	182	1.0	9.1	-282	61.1	
1425	4.90	+0.03	0.23	175	200	8.6	300	1.9	8.6	-214	14	
1435	4.90	0.0	0.23	175	200	8.6	350	1.6	7.8	-162	<5	
1440	4.90	0.0	0.23	175	200	8.6	356	1.6	7.6	-171	<5	
1443	4.9	0.0	0.23	175	200	8.6	359	1.6	7.5	~~-166~~ -166	<5	

FPV (gallons) = Calculations:

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

Sampler's Signature

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

APPENDIX G - WELL SAMPLING WORKSHEET

For use with Peristaltic Pumps

Site Name

Page ____of____

Date: 12/9/20 Well ID: 45-MW-29A

Weather Conditions: cloudy, 40°

Sampler's Name (Print): Makayla Myers

Purging Device & Serial # (pump type): GZA-Peri-03

Reference Measuring Point (Top of PVC/Top of Casing): (casing)

Well Depth (ft, ref. to measuring point): 17'

Screen Interval (ft, ref. to measuring point): 3.5-13.5'

Samples Collected: PFAS

Purging Start Time: 0920 (24 hour cycle) Sample Time: 1020 (24 hour cycle)

Initial Water Level (ft, ref. to measuring point): 6.22'

Tubing Intake (ft, ref. to measuring point): 12'

Total Purge Volume (gallons): 5.5 gal

PVC/Inner Well Casing ID (inches): 2"

Tubing ID (inches): 3/8"

Indicator Parameter Stabilization: yes OR no (circle one)

Two Hour Time Limit Reached ? yes OR no (circle one)

Time at Sample Completion: 1025 (24 hour cycle)

Clock Time (24 HR)	Water Level (ft)	Drawdown (ft)	Cumulative Drawdown (ft)	Pump Speed	Purge Rate (ml/min)	Temp +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
930	6.25	0.03	0.03	~~350~~ 200	350	9.7	814	0.2	7.3	-85	59	
940	6.25	0.0	0.03	200	350	9.7	836	0.2	7.0	-67	42	
945	6.25	0.0	0.03	200	350	9.7	845	0.3	7.0	-59	32	
948	6.25	0.0	0.03	200	350	9.7	852	0.2	7.0	-62	23	
952	6.25	0.0	0.03	200	350	9.7	850	0.2	7.0	-65	18	
1000	6.25	0.0	0.03	200	350	9.8	855	0.2	7.0	-70	12	
1005	6.25	0.0	0.03	200	350	9.8	857	0.2	7.0	-72	8	
1008	6.25	0.0	0.03	200	350	9.8	859	0.2	7.0	-69	6	
1011	6.25	0.0	0.03	200	350	9.8	863	0.2	7.0	-75	6	
1014	6.25	0.0	0.03	200	350	9.8	863	0.14	7.0	-77	5	

FPV (gallons) = Calculations:

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

Sampler's Signature

APPENDIX G - WELL SAMPLING WORKSHEET

For use with Peristaltic Pumps

Site Name

Page ____of____

Date : 12/9/20 Well ID : DEQ-MW-9-57

Weather Conditions : cloudy, 40's

Sampler's Name (Print) Makayla Myers

Purging Device & Serial # (pump type): GZA - PER-3

Reference Measuring Point (Top of PVC/Top of Casing): PVC

Well Depth (ft, ref. to measuring point): 56.7

Screen Interval (ft, ref. to measuring point): 52-57

Samples Collected: PFAS

Purging Start Time : 1100 (24 hour cycle) Sample Time: 1215 (24 hour cycle)

Initial Water Level (ft, ref. to measuring point): 10.85

Tubing Intake (ft, ref. to measuring point): 51.5'

Total Purge Volume (gallons): 4 gal

PVC/Inner Well Casing ID (inches): 2"

Tubing ID (inches): 3/8"

Indicator Parameter Stabilization: ~~yes~~ OR no (circle one)

Two Hour Time Limit Reached ? yes OR ~~no~~ (circle one)

Time at Sample Completion: 1220 (24 hour cycle)

Clock Time (24 HR)	Water Level (ft)	Drawdown (ft)	Cumulative Drawdown (ft)	Pump Speed	Purge Rate (ml/min)	Temp +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
1115	10.95	0.10	0.10	200	275	10.2	842	1.4	7.5	-38	87	
1125	10.95	0.0	0.10	200	275	10.4	842	1.2	7.5	-82	44	
1140	10.95	0.0	0.10	200	275	11.1	846	1.5	7.5	-96	13	
1155	10.95	0.0	0.10	200	275	10.9	845	1.9	7.5	-109	9	
1200	10.95	0.0	0.10	200	275	10.6	843	2.1	7.5	-93	6	
1205	10.95	0.0	0.10	200	275	10.4	844	0.32	7.5	-107	5	bubble on D.O. probe
1206	10.95	0.0	0.10	200	275	10.3	846	0.14	7.5	-113	<5	
1209	10.95	0.0	0.10	200	275	10.3	850	0.19	7.5	-115	<5	
1212	10.95	0.0	0.10	200	275	10.3	851	0.19	7.5	-116	<5	

FPV (gallons) = Calculations:

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

Sampler's Signature

APPENDIX E - WELL SAMPLING WORKSHEET

For use with Bladder Pumps

Site Name

Page ____ of ____

Date: 12/9/20 Well ID: HS-MW-19S

Weather Conditions: partly sunny, 40's

Sampler's Name (Print): Makayla Mayers

Purging Device & Serial # (pump type): GZA-1

Reference Measuring Point (Top of PVC/Top of Casing): PVC

Well Depth (ft, ref. to measuring point): 61.4

Screen Interval (ft, ref. to measuring point): 58.4-61.4

PVC/Inner Well Casing ID (inches): 2" Tubing ID (inches): 1/4" & 3/8"

Purging Start Time: 1345 (24 hour cycle) Sample Time: 1440 (24 hour cycle)

Initial Water Level (ft., ref. to measuring point): 37.01

Pump Intake (ft., ref. to measuring point): 60.9

Head Above Pump Intake (ft., ref. measuring point): ~30

Total Purge Volume (gallons): ____

Indicator Parameter Stabilization: **yes** OR **no** (circle one)

Two Hour Time Limit Reached ? yes OR no (circle one)

Cycle Setting should be set to "1"

Samples Collected: PFAS

Time at Sample Completion: 1445 (24 hour cycle)

Clock Time (24 HR.)	Water Level (ft.)	Drawdown (ft.)	Cumulative Drawdown (ft.)	Bladder Refill Time setting	Bladder Discharge Time setting	Pressure (psi)	Purge Rate (ml/min)	Temp. +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
1400	37.35	7.34	7.34	20	10	47	300	10.3	762	1.9	7.7	-41	128	
1415	38.10	0.75		20	10	30	150	9.9	759	1.7	7.7	-54	88	pump shutting off
1420	38.43			20	15	30	200	10.0	756	1.0	7.7	-68	813	
1425	38.50			20	15	30	~200	9.9	753	0.7	7.7	-78	67	bubble on D.O. probe
1430	38.45			25	5	60	~150	9.9	751	0.7	7.6	-90	47	
1445	38.29			25	5	50	~150	9.8	749	0.8	7.6	-93	35	
1450	38.28			25	5	50	~150	9.9	748	0.6	7.6	-99	32	
1453	38.49			25	5	50	~150	9.9	747	0.6	7.6	-103	31	
1436	38.50			25	5	50	~150	9.9	747	0.5	7.6	-105	30	
FPV (gallons) =	Calculations:													

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

MKM

Sampler's Signature

APPENDIX E - WELL SAMPLING WORKSHEET

For use with Bladder Pumps

Site Name

Page ____of____

Date: 12/9/20 Well ID: HS-MW-9D

Weather Conditions: partly sunny, 40's

Sampler's Name (Print): Meredyth Myers

Purging Device & Serial # (pump type): GZA-BPC-38

Reference Measuring Point (Top of PVC/Top of Casing): PVC

Well Depth (ft, ref. to measuring point): 85.9 - 95.9

Screen Interval (ft, ref. to measuring point): 95.9

PVC/Inner Well Casing ID (inches): 2" Tubing ID (inches): 1/4 & 3/8

Purging Start Time: 1570 (24 hour cycle) Sample Time: 1615 (24 hour cycle)

Initial Water Level (ft., ref. to measuring point): 32.80

Pump Intake (ft., ref. to measuring point): 88.4

Head Above Pump Intake (ft., ref. measuring point): 55.6

Total Purge Volume (gallons):

Indicator Parameter Stabilization: yes OR no (circle one)

Two Hour Time Limit Reached ? yes OR no (circle one)

Cycle Setting should be set to "1"

Samples Collected: PFAS

Time at Sample Completion: 1620 (24 hour cycle)

Clock Time (24 HR.)	Water Level (ft.)	Drawdown (ft.)	Cumulative Drawdown (ft.)	Bladder Refill Time setting	Bladder Discharge Time setting	Pressure (psi)	Purge Rate (ml/min)	Temp. +/- 1 ºC (ºC)	Spec. Cond. +/- 3% (µS/cm)	DO +/- 10% if > 0.5 (mg/L)	pH +/- 0.1 units	ORP +/-10 (mV)	Turbidity +/- 10% if > 5 (NTU)	Comments/Adjustments
1530	32.100	+0.2	+0.2	15	10	70	400	10.1	2468	0.43	7.4	-93	246	
1535	32.100	—	+0.2	15	10	70	~400	10.1	2499	0.42	7.4	-98	105	
1545	32.100	-	+0.2	15	10	70	~400	10.0	2508	0.57	7.4	-100	69	
1550	32.100	-	+0.2	15	10	70	~400	10.1	2512	0.36	7.4	-103	39.0	
1600	32.50	+0.1	+0.3	15	10	70	~400	10.1	2509	0.29	7.3	-105.3	25	
1603	32.50	0	+0.30	15	10	70	~400	10.1	2505	0.33	7.3	-106	22	
1606	32.5	—	+0.3	15	10	70	~400	10.0	2509	0.42	7.3	-106	22	
1609	32.5	-	+0.3	15	10	70	~400	9.9	2510	0.46	7.3	-106	20	
FPV (gallons) =	Calculations:													

Notes: 1. All depths in feet below the referenced measuring point, unless specified. 2. "NR" indicates no reading taken. 3. ID = Inside Diameter

4. When recording pH and dissolved oxygen data, only use one decimal place. When recording specific conductance, temperature, turbidity, and ORP data, record only whole numbers. When DO data is less than 0.5 mg/L, data should be recorded as "<0.5" or "less than 0.5". DO values between 0.5 and 1.0 are typically considered stable within +/- 0.1 mg/L. When turbidity data is less than 5 NTU, data should be recorded as "< 5" or "less than 5". Turbidity values between 5 and 10 are typically considered stable within +/- 1 NTU.

5. Tubing Factors - Milliliters to purge standing water in tubing: 1/2" ID: height in ft. x 38.6 = ml needed 3/8" ID: height in ft. x 21.7 = ml needed 1/4" ID: height in ft. x 9.8 = ml needed 0.17" ID: height in ft. x 4.5 = ml needed

6. Final Purge Volume (FPV) in gallons = (Total Tubing Length x Tubing Capacity) + (Total Drawdown x Well Capacity) Record N/A in box if not applicable. Note: Include the length of tubing that is outside the well to the Total Tubing Length.

Sampler's Signature

APPENDIX C

LEVEL 4 DATA VALIDATION MEMORANDUM

ENVIRONMENTAL® STANDARDS

Setting the Standards for Innovative Environmental Solutions

Stage 4 Data Validation Report
Groundwater Surface Water Interface Area
Per- and Polyfluoroalkyl Substances Investigation Program
Sample Delivery Group: WA28027

Introduction

This quality assurance (QA) review is based upon an examination of the data generated from the analyses of the samples collected as part of the Per- and Polyfluoroalkyl Substances (PFAS) Investigation Program at the Wolverine World Wide, Inc.'s (Wolverine's) Groundwater Surface Water Interface Area in Rockford, Michigan, in accordance with the Quality Assurance Project Plan Former Wolverine Tannery, House Street Property, and Wolven/Jewell Area (QAPP; GZA GeoEnvironmental, Inc. [GZA], November 1, 2018; Revision June 2021). The samples were analyzed for select PFAS by Pace Analytical Services, LLC (Pace) of West Columbia, South Carolina. Data were examined to determine compliance relative to Pace's standard operating procedure (SOP) "Determination of Per- and Polyfluoroalkyl Substances (PFAS) by LC/MS/MS (Isotope Dilution) QSM 5.1 Table B-15 (EPA 537 MOD ID)" (Pace Document Number: ME00213-14) and the usability of the analytical results in accordance with the Data Validation SOP for PFAS data for samples generated by this Pace SOP.

The analytical results for the organic target analytes are presented on the validated data summary tables in Section 2 of this report. These validated data summary tables were generated from the GZA database. The "Validation Result," "Validation LOQ" (*i.e.*, the limit of quantitation [LOQ]), and "Validation Detect Flag" fields on the validated data summary tables have been updated to reflect all final data validation qualifiers and results. Validation qualifier codes have been placed in the "Validation Qualifiers" fields on the data tables to enable the data user to quickly assess the qualitative and/or quantitative reliability of a result based on the criteria evaluated during this QA review. Finally, the "Validation Reason Code" field has been populated with codes that indicate the reason for the validation qualifiers. Definitions of the validation qualifiers and reason codes are presented with the validated data summary tables in Section 2.

The data reviewer has included copies of validation forms, quality control (QC) summary forms, and other documentation needed to support the findings in this QA review in the Data Support Documentation (Section 3). The cover sheet for this section is a checklist of the QA procedures required by the protocol and examined in this data review. The Case Narrative and Chain-of-Custody (COC) Record are included in Section 4. Project Correspondence is presented in Section 5.

The nine samples that have undergone a QA review for PFAS are on Table 1.

TABLE 1 – SUMMARY OF SAMPLES REVIEWED

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HS-PW-2.5 (A)	WA28027-001	Aqueous	1/26/21
HS-PW-2.5 (B)	WA28027-002	Aqueous	1/26/21
HS-PW-3 (A)	WA28027-003	Aqueous	1/26/21
HS-PW-3 (A) DUP (Field Duplicate of HS-PW-3 (A))	WA28027-004	Aqueous	1/26/21
HS-PW-3.5 (A)	WA28027-005	Aqueous	1/26/21
HS-PW-3.5 (A)MS (Matrix Spike)	WA28027-005MS	Aqueous	1/26/21
HS-PW-3.5 (A)MSD (Matrix Spike Duplicate)	WA28027-005MSD	Aqueous	1/26/21
FB-1/26 (Field Blank)	WA28027-006	Aqueous	1/26/21
EB-HT (Equipment Blank)	WA28027-007	Aqueous	1/26/21

Section 1 Quality Assurance Review

The findings offered in this report for analyses that underwent a Stage 4 QA review are based upon a rigorous review of the tabulated summary forms and raw data, including the following checks and QC measures as applicable to this data set:

- Data completeness
- COC Record and sample condition upon laboratory receipt
- Sample preparation and analysis holding times
- Field and laboratory blank analysis results
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses
- Matrix spike/matrix spike duplicate (MS/MSD) analyses
- Surrogate/labeled pre-extraction internal standard recoveries
- Field duplicate precision
- Mass spectrometer tune checks
- Instrument calibration and verification
- Internal standard responses
- Quantitation and qualitative identification

Data were examined to determine compliance and usability of the analytical results relative to the QAPP and SOPs referenced above. Any findings are identified in the sections below.

Data Completeness

The Level 4 data deliverables were prepared by the laboratory and were reviewed by Environmental Standards, Inc. (Environmental Standards). The analytical data package was checked for completeness to ensure that all data requested were actually present in the data deliverables (refer to completeness forms in the Data Support Documentation [Section 3]). The data package was complete with any exceptions noted on the completeness forms.

Chain-of-Custody Record and Sample Condition upon Laboratory Receipt

All sample identifications (IDs) were consistent with the COC Record.

The sample reports were consistent with the analytical request designated on the COC Record.

The samples for PFAS analysis were received in good condition and within the acceptance criterion of ≤ 10°C.

Sample Preparation and Analysis Holding Times

All samples were extracted and analyzed within the QAPP-specified holding times.

Field and Laboratory Blank Analyses

Laboratory blank analyses were performed at the required frequencies. A summary of any positive results observed in the blanks associated with the samples is included in Section 3.

Instrument blanks were analyzed daily, at a minimum, and were evaluated to the LOQ. Qualification of data due to instrument blank contamination was not warranted.

Laboratory method blanks were evaluated to the LOQ for samples prepared within the same preparation batch. Qualification of data due to method blank contamination was not warranted.

Two aqueous field and equipment blanks (samples FB-1/26 and EB-HT) were evaluated to the LOQ for the aqueous samples included in this Sample Delivery Group (SDG). Qualification of aqueous sample data due to field and equipment blank contamination was not warranted.

Laboratory Control Sample/Laboratory Control Sample Duplicate Analyses

An LCS was included in each extraction batch as required.

All LCS percent recoveries (%Rs) were within QC acceptance limits.

In this SDG, the reported 50-150% LCS percent recovery QC acceptance limits were inconsistent with historically reported LCS percent recovery QC acceptance limits of 70-150%. The data reviewer evaluated the data to the historically reported acceptance limits.

Matrix Spike/Matrix Spike Duplicate Analyses

An MS (as well as a laboratory duplicate) was included in the extraction batch associated with samples HS-PW-2.5 (A), HS-PW-2.5 (B), HS-PW-3 (A), and HS-PW-3 (A) DUP; however, it was not evaluated, as it was performed on a sample that was not included in this data set.

An MS/MSD pair was included in the second extraction batch associated with sample HS-PW-3.5 (A). However, according to the Case Narrative, the pre-extraction internal standard (surrogate mix) was double spiked, and insufficient volume was available for a re-extraction, the data was reported as is. Theoretically, the MS/MSD results were approximately half of what they should have been, but due to possibly slight variations in spike volumes, the data reviewer did not assume an extract correction factor of 2 to be applied to the results. Based on professional judgment, the data reviewer did not use this erroneously spiked MS/MSD pair to qualify data. The data reviewer was unable to evaluate potential matrix interference within the extraction batches due to this issue.

In this SDG, the reported 50-150% MS/MSD percent recovery QC acceptance limits were inconsistent with historically reported MS/MSD percent recovery QC acceptance limits of 70-150%. The data reviewer evaluated the data to the historically reported acceptance limits.

Surrogate/Labeled Pre-extraction Internal Standard Recoveries

Surrogates were spiked prior to extraction and used as internal standards for the quantitation of target PFAS results. All surrogate (labeled pre-extraction internal standard) %Rs were within the QAPP acceptance criterion.

In this SDG, the reported 25-150% (10-150% for PFOSA) surrogate percent recovery acceptance limits were inconsistent with historically reported surrogate percent recovery acceptance limits of 50-150%. The data reviewer evaluated the data to the historically reported acceptance limits.

Field Duplicate Analyses

One field duplicate pair was collected and analyzed for PFAS with the aqueous samples in this data set (refer to Table 1). All field duplicate analyses were within QC acceptance limits (relative percent difference was < 30% when both of the results were > 5× the LOQ, or the difference was < 1× the LOQ when at least one result was ≤ 5× the LOQ).

Mass Spectrometer Tune Checks

The liquid chromatography/tandem mass spectrometry (LC/MS/MS) tune check was performed at the required frequency and met acceptance criteria.

Instrument Calibration and Verification

Instrument calibration, second-source initial calibration verification (ICV), and continuing calibration verification (CCV) analyses were performed at the required frequency and met acceptance criteria (“not-detected” results associated with high recoveries are excluded).

Pre-injection Internal Standard Responses

Pre-injection internal standards were spiked prior to injection. All pre-injection internal standard responses were within QC acceptance criteria (50-150% of the response in the associated mid-point of the initial calibration or associated CCV on days when the initial calibration was not performed).

Quantitation and Qualitative Identification

The laboratory-reported values (*e.g.*, sample results, instrument calibration results) were verified by recalculating the values using the raw instrument data provided by the laboratory. In addition, the raw data chromatograms were checked to ensure that the laboratory-reported analytes were correctly identified and quantitated. These checks were performed on a fraction of the results. Additional results were verified and/or recalculated if any issues were noted with the initial checks. Issues were not noted, with the exception of the following.

Samples HS-PW-2.5 (A), HS-PW-3 (A), and HS-PW-3 (A) DUP were reported from initial dilutions (5×) due to the high levels of PFAS present, with no undiluted analyses provided. As the laboratory raised the LOQs accordingly, qualification of the data was not warranted.

The reported positive results for the analyte in the following samples should be considered estimated. In the chromatograms for these samples, the composition of the linear and branched isomer peaks included in the response for the analyte in the sample was significantly different than the composition of the calibration standard.

Samples	Analyte	Qualifier	Validation Reason Code
HS-PW-2.5 (A), HS-PW-2.5 (B), HS-PW-3 (A), HS-PW-3 (A) DUP, and HS-PW-3.5 (A)	PFOS	J	LB

The compounds on the table below were reported by the laboratory with LOQs inconsistent with historically reported data. The data reviewer evaluated the raw data and determined that the change in LOQ was not impactful, as the compounds were “not-detected” to the historic LOQs; or were greater than the reported elevated LOQs.

Analyte(s)	Reported LOQ (ng/L)	Historically Reported LOQ (ng/L)
6:2 FTS and 8:2 FTS	8	4
PFOA	4	2

Conclusions

This QA review has identified a few aspects of the data that required qualification. The analytical data should be considered acceptable for use unless otherwise indicated in the QA review. Positive results that demonstrate a combination of low bias ("J-"), high bias ("J+"), and/or bias of unknown direction ("J") have been flagged "J" (unknown direction of bias) on the data tables as the direction of bias could not be assigned. In order to use any of the data, the data user should understand the qualifications and limitations specified in this QA review.

Report Prepared by,

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Date: 11/23/21

SECTION 2

ANALYTICAL RESULTS

Lab Sample ID	WA28027-001
Sample Name	HS-PW-2.5 (A)
Sample Type	N
Sample Date	1/26/2021 11:30:00 AM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	5		35	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	5		35	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	5		35	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	5		35	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	5		35	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	5		35	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	5		35	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	5		35	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	5		35	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	5		18	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	5		18	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	5		18	ng/l	U	U	N	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	5		18	ng/l	U	U	N	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	5	21	18	ng/l			Y	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	5		18	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	5		18	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	5		18	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	5		18	ng/l	U	U	N	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	5		18	ng/l	U	U	N	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	5	25	18	ng/l			Y	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	5	33	18	ng/l			Y	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	5		18	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	5	820	18	ng/l		J	Y	LB
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	5	54	18	ng/l			Y	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	5	27	18	ng/l			Y	

Lab Sample ID	WA28027-001
Sample Name	HS-PW-2.5 (A)
Sample Type	N
Sample Date	1/26/2021 11:30:00 AM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	5		18	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	5		18	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	5		18	ng/l	U	U	N	

Lab Sample ID	WA28027-002
Sample Name	HS-PW-2.5 (B)
Sample Type	N
Sample Date	1/26/2021 12:15:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	1		7.1	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	1		7.1	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	1		7.1	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	1		7.1	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	1		7.1	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	1		7.1	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	1		7.1	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	1		7.1	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	1		7.1	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	1		3.5	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	1		3.5	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	1	5.6	3.5	ng/l			Y	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	1	7.5	3.5	ng/l			Y	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	1	9.1	3.5	ng/l			Y	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	1		3.5	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	1		3.5	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	1		3.5	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	1	7.4	3.5	ng/l			Y	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	1	5.6	3.5	ng/l			Y	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	1	20	3.5	ng/l			Y	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	1	15	3.5	ng/l			Y	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	1		3.5	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	1	560	3.5	ng/l		J	Y	LB
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	1	25	3.5	ng/l			Y	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	1	11	3.5	ng/l			Y	

Lab Sample ID	WA28027-002
Sample Name	HS-PW-2.5 (B)
Sample Type	N
Sample Date	1/26/2021 12:15:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	1		3.5	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	1		3.5	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	1		3.5	ng/l	U	U	N	

Lab Sample ID	WA28027-003
Sample Name	HS-PW-3 (A)
Sample Type	N
Sample Date	1/26/2021 2:30:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	5		37	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	5		37	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	5		37	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	5		37	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	5		37	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	5		37	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	5		37	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	5		37	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	5		37	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	5		19	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	5		19	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	5		19	ng/l	U	U	N	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	5		19	ng/l	U	U	N	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	5	21	19	ng/l			Y	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	5		19	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	5		19	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	5		19	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	5	19	19	ng/l			Y	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	5		19	ng/l	U	U	N	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	5	28	19	ng/l			Y	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	5	41	19	ng/l			Y	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	5		19	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	5	900	19	ng/l		J	Y	LB
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	5	77	19	ng/l			Y	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	5	23	19	ng/l			Y	

Lab Sample ID	WA28027-003
Sample Name	HS-PW-3 (A)
Sample Type	N
Sample Date	1/26/2021 2:30:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	5		19	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	5		19	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	5		19	ng/l	U	U	N	

Lab Sample ID	WA28027-004
Sample Name	HS-PW-3 (A) DUP
Sample Type	N
Sample Date	1/26/2021 2:30:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	5		35	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	5		35	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	5		35	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	5		35	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	5		35	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	5		35	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	5		35	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	5		35	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	5		35	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	5		17	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	5		17	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	5		17	ng/l	U	U	N	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	5		17	ng/l	U	U	N	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	5	20	17	ng/l			Y	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	5		17	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	5		17	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	5		17	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	5	18	17	ng/l			Y	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	5		17	ng/l	U	U	N	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	5	26	17	ng/l			Y	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	5	38	17	ng/l			Y	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	5		17	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	5	900	17	ng/l		J	Y	LB
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	5	71	17	ng/l			Y	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	5	22	17	ng/l			Y	

Lab Sample ID	WA28027-004
Sample Name	HS-PW-3 (A) DUP
Sample Type	N
Sample Date	1/26/2021 2:30:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	5		17	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	5		17	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	5		17	ng/l	U	U	N	

Lab Sample ID	WA28027-005
Sample Name	HS-PW-3.5 (A)
Sample Type	N
Sample Date	1/26/2021 3:40:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	1		7.2	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	1		7.2	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	1		7.2	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	1		7.2	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	1		7.2	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	1		7.2	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	1		7.2	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	1		7.2	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	1		7.2	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	1		3.6	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	1		3.6	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	1	17	3.6	ng/l			Y	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	1	32	3.6	ng/l			Y	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	1	9.5	3.6	ng/l			Y	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	1		3.6	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	1		3.6	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	1		3.6	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	1		3.6	ng/l	U	U	N	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	1	7.2	3.6	ng/l			Y	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	1	19	3.6	ng/l			Y	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	1	12	3.6	ng/l			Y	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	1		3.6	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	1	92	3.6	ng/l		J	Y	LB
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	1	21	3.6	ng/l			Y	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	1	6	3.6	ng/l			Y	

Lab Sample ID	WA28027-005
Sample Name	HS-PW-3.5 (A)
Sample Type	N
Sample Date	1/26/2021 3:40:00 PM
Sample Matrix	WG
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	1		3.6	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	1		3.6	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	1		3.6	ng/l	U	U	N	

Lab Sample ID	WA28027-006
Sample Name	FB-1/26
Sample Type	FB
Sample Date	1/26/2021 3:50:00 PM
Sample Matrix	WQ
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	1		7.4	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	1		7.4	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	1		7.4	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	1		7.4	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	1		7.4	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	1		7.4	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	1		7.4	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	1		7.4	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	1		7.4	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	1		3.7	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	1		3.7	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	1		3.7	ng/l	U	U	N	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	1		3.7	ng/l	U	U	N	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	1		3.7	ng/l	U	U	N	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	1		3.7	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	1		3.7	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	1		3.7	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	1		3.7	ng/l	U	U	N	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	1		3.7	ng/l	U	U	N	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	1		3.7	ng/l	U	U	N	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	1		3.7	ng/l	U	U	N	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	1		3.7	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	1		3.7	ng/l	U	U	N	
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	1		3.7	ng/l	U	U	N	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	1		3.7	ng/l	U	U	N	

Lab Sample ID	WA28027-006
Sample Name	FB-1/26
Sample Type	FB
Sample Date	1/26/2021 3:50:00 PM
Sample Matrix	WQ
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	1		3.7	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	1		3.7	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	1		3.7	ng/l	U	U	N	

Lab Sample ID	WA28027-007
Sample Name	EB-HT
Sample Type	EB
Sample Date	1/26/2021 5:05:00 PM
Sample Matrix	WH
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-	763051-92-9	Initial	1		8.1	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluohexane sulfonic acid (4:2 FTS)	757124-72-4	Initial	1		8.1	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	Initial	1		8.1	ng/l	U	U	N	
	1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	Initial	1		8.1	ng/l	U	U	N	
	4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	Initial	1		8.1	ng/l	U	U	N	
	9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-	756426-58-1	Initial	1		8.1	ng/l	U	U	N	
	Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	Initial	1		8.1	ng/l	U	U	N	
	N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	Initial	1		8.1	ng/l	U	U	N	
	N-methylperfluoro-1-octanesulfonamidoacetic acid	2355-31-9	Initial	1		8.1	ng/l	U	U	N	
	Perfluoro-1-nonane sulfonic acid (PFNS)	68259-12-1	Initial	1		4	ng/l	U	U	N	
	Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	Initial	1		4	ng/l	U	U	N	
	Perfluoro-1-pentane sulfonic acid (PFPeS)	2706-91-4	Initial	1		4	ng/l	U	U	N	
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	Initial	1		4	ng/l	U	U	N	
	Perfluorobutanoic Acid (PFBA)	375-22-4	Initial	1		4	ng/l	U	U	N	
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	Initial	1		4	ng/l	U	U	N	
	Perfluorodecanoic acid (PFDA)	335-76-2	Initial	1		4	ng/l	U	U	N	
	Perfluorododecanoic acid (PFDoA)	307-55-1	Initial	1		4	ng/l	U	U	N	
	Perfluoroheptanesulfonic acid (PFHPS)	375-92-8	Initial	1		4	ng/l	U	U	N	
	Perfluoroheptanoic acid (PFHpA)	375-85-9	Initial	1		4	ng/l	U	U	N	
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	Initial	1		4	ng/l	U	U	N	
	Perfluorohexanoic acid (PFHxA)	307-24-4	Initial	1		4	ng/l	U	U	N	
	Perfluorononanoic acid (PFNA)	375-95-1	Initial	1		4	ng/l	U	U	N	
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	Initial	1		4	ng/l	U	U	N	
	Perfluorooctanoic acid (PFOA)	335-67-1	Initial	1		4	ng/l	U	U	N	
	Perfluoropentanoic Acid (PFPeA)	2706-90-3	Initial	1		4	ng/l	U	U	N	

Lab Sample ID	WA28027-007
Sample Name	EB-HT
Sample Type	EB
Sample Date	1/26/2021 5:05:00 PM
Sample Matrix	WH
Validated?	Y
Validation Level	Level 4

ANALYTIC METHOD	Chemical Name	CAS	Test Type	DF	Validation Result	Validation LOQ	UNIT	Lab Qualifiers	Validation Qualifiers	Validation Detect Flag	Validation Reason Code
PFAS by ID SO	Perfluorotetradecanoic acid (PFTA)	376-06-7	Initial	1		4	ng/l	U	U	N	
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	Initial	1		4	ng/l	U	U	N	
	Perfluoroundecanoic Acid (PFUnA)	2058-94-8	Initial	1		4	ng/l	U	U	N	

SECTION 3

DATA SUPPORT DOCUMENTATION

ENVIRONMENTAL STANDARDS

HI-RES AND PFAS ORGANIC ANALYSIS SUPPORT DOCUMENTATION

Client Name:	WWW	EnvStd Project Manager:	Jared A
Site/Project Name:	Groundwater Surface Water Interface Area	Reviewed by:	Jared A
Job Number/Task/Subtask:	20219475.A000/00007/01	Approved by:	Meg M
Laboratory/Location:	Pace SC	Completion Date:	5/2021
SDG:	WA28027	Validation Level:	L4
Sample Collection Dates:	1/26/21		

The following table indicates criteria that were examined, the identified problems, and support documentation attachments.

	Criteria Examined in Detail **Note:** All items examined have been included in the Support Document unless otherwise noted.							Problems Identified						
	Check (√) if Yes or Footnote Letter for Comments Below													
Parameter/ Method	PFAS							PFAS						
Condition Upon Receipt	X													
Sample Preservation	X													
Holding Times	X													
Blank Analysis Results	X													
Laboratory Control Sample/Laboratory Fortified Blank/ On-going Precision and Recovery Standard	X													
Surrogates														
PFAS Pre-Extraction Internal Standards	X													
Laboratory Duplicate														
Field Duplicate	X													
Matrix Spike/Matrix Spike Duplicate	X													
Sample Preparation	X													
Mass Tuning	X													
Initial Calibration	X													
Second-Source Calibration Verification	X													
PFAS Signal Suppression Check	X													
Peak Asymmetry	X													
Continuing Calibrations	X													
Resolution Check Standards	X													
Detection Limit/Sensitivity	X													
Post-Extraction Internal Standards														
Quantitation of Results	X													
Linear/Branched Identification/Quantitation	X							X						
Qualitative Identification	X													
2,3,7,8-TCDD – 2nd column confirmation														
PFAS Ion Transition Ratio/Hi-Res Ion Ratio	X													
Hi-Res Lock Mass Monitoring														
Dioxin/Furan Chlorodiphenyl Ethers Monitoring														
Analytical Sequence	X													
Percent Solids														
Deliverable was Complete	X													
Others:														

Comments: Qualitative Identification and Quantitation of Results are not included in the Support Documentation unless a problem was identified.

WWW Data Package Deliverable Checklist
Pace SC EPA 537 MOD ID

Reviewer: JKA	Laboratory:			Project: Groundwater Surface Water Interface Area
Date of Review: 5/2021	Pace SC			SDG#: WA28027
Items	**YES**	**NO**	**N/A**	**Comments**
1. Laboratory Case Narrative	X			
2. Chain-of-Custody	X			
3. Sample Receipt Checklist	X			
4. Sample Results Summary (Form 1)	X			
A. Sample Raw Data	X			
B. Correct Reporting Limits?		X		Evaluated to historically reported LOQs
C. All analytes requested are reported?	X			
5. Surrogate (Pre-Extraction Internal Standard) Summary (Form 2)	X			
A. Correct Recovery Limits?		X		Evaluated to historically reported recovery limits
6. MS/MSD Summary (Form 3A)	X			
A. MS/MSD Raw Data	X			
B. Correct MS/MSD Recovery and RPD Limits?		X		Evaluated to historically reported recovery limits
4. LCS/LCSD Summary (Form 3B)	X			
A. LCS/LCSD Raw Data	X			
B. Correct LCS/LCSD Recovery and RPD Limits?		X		Evaluated to historically reported recovery limits
5. Blank Summary and Association (Form 4)	X			
A. Blank Raw Data	X			
6. Internal Standard Summary (Form 8)			X	Laboratory no longer provides (see Case Narrative)
A. Correct Internal Standard Limits?			X	
7. Initial Calibration Summary - Target Analytes	X			
A. Initial Calibration Summary - Surrogates	X			
B. Initial Calibration Raw Data	X			
C. Qualitative Linear/Branched PFOA Standard Raw Data	X			
8. Initial Calibration Verification Summary	X			
A. Initial Calibration Verification Raw Data	X			
9. Continuing Calibration Verification Summary	X			
A. Daily Instrument Sensitivity Check	X			
B. Continuing Calibration Verification Raw Data	X			
10. Tune Data	X			
11. Instrument Blank Raw Data	X			
12. Analytical Sequence Logs	X			
13. Extraction Logs	X			
14. Percent Solids Raw Data			X	
15. Standard Preparation Sheets	X			
16. Certificates of Analysis	X			
17. Other				

BLANK ANALYSIS RESULTS FOR ORGANIC PARAMETERS

Fraction	Matrix (Aq., S)	Blank Type (1)	Blank Sample ID	Contaminant	Concentration ng/L	Qualification limit	
						5×	10×
PFAS			all WA28027 blanks	none			

1 - MB = Method Blank; TB = Trip Blank; EB = Equipment Blank; FB = Field Blank; IB = Instrument Blank; RB = Rinse Blank

Notes: _____

** Columns G and H contains formulas

ENVIRONMENTAL STANDARDS, INC.
EVALUATION OF DUPLICATE RESULTS

Effective Date: 11/23/2015
Revision: 0

Matrix: (•) Aqueous ( ) Non-aq.
Reporting Level: (•) MDL ( ) QL
Units: ng/L

PRECISION OBJECTIVES:
If Both Results ≥ 5 × Their QL, RPD ≤: 30
If Either Result < 5 × Its QL, Dif. ≤: 1.0 **× Highest QL**

Sample ID:	HS-PW-3 (A)				**Duplicate Sample ID:**	HS-PW-3 (A) DUP					
Analyte	**Sample Concentration**	**Qual**	**QL**	**MDL**	**Duplicate Concentration**	**Qual**	**QL**	**MDL**	**Difference**	**RPD**	**Flag**
PFHpS	19		19	NA	18		17	NA	1	NA	
PFHxS	28		19	NA	26		17	NA	2	NA	
PFBA	21		19	NA	20		17	NA	1	NA	
PFHxA	41		19	NA	38		17	NA	3	NA	
PFOA	77		19	NA	71		17	NA	6	NA	
PFPeA	23		19	NA	22		17	NA	1	NA	
PFOS	900		19	NA	900		17	NA	NA	0%	

NOTES:

Qual: Qualifier(s) based on evaluation(s) other than Total/ vs. Dissolved comparison, if applicable (J, U, U* or B)
RPD: Relative Percent Difference
QL: Quantitation Limit
MDL: Method Detection Limit
RL: Reporting Limit. RL = QL for QL reporting and MDL for MDL reporting
J: The analyte concentration should be considered estimated
U: The analyte was not detected in the sample at or above the RL indicated. The RL will be used for comparison purposes.
UJ: The analyte was not detected in the sample at or above the Reporting Limit Indicated. The RL is approximate.
R: The analyte was analyzed for and detected, but sample results are unreliable. The presence or absence of the analyte cannot be verified.
UR: The analyte was analyzed for and not detected, but the determination that the analyte was not present in the sample is unreliable. The presence or absence of the analyte cannot be verified.
U* The result was blank qualified. The RL will be used for comparison purposes.
NA: The MDL (for QL reporting), RPD or Difference is not applicable

Comments:

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-001
Description: HS-PW-2.5 (A)
Matrix: Aqueous
Date Sampled: 01/26/2021 1130
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	5	02/08/2021 2027	JJG	02/04/2021 1209	81803

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		35	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		35	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		35	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		35	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		35	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		35	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		35	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		35	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		35	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		18	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	25	✓	18	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	21		18	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	33		18	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	54		18	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	27		18	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		18	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		18	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	820	J LB	18	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		97	25-150
13C2_6:2FTS		90	25-150
13C2_8:2FTS		102	25-150
13C2_PFDoA		94	25-150
13C2_PFTeDA		91	25-150
13C3_PFBS		96	25-150
13C3_PFHxS		100	25-150
13C3-HFPO-DA		101	25-150
13C4_PFBA		99	25-150
13C4_PFHpA		98	25-150
13C5_PFHxA		97	25-150
13C5_PFPeA		98	25-150
13C6_PFDA		92	25-150
13C7_PFUdA		97	25-150

all "surrogate" results evaluated 50-150 as historically reported. all acceptable

6:2 FTS, 8:2 FTS, and PFOA LOQs are twice that of historically reported LOQs. The data reviewer confirmed in the raw data that this increase of LOQ had no impact, as the samples had no positive results for the compounds, or the result of the compound was greater than the LOQ.

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-001
Description: HS-PW-2.5 (A)
Matrix: Aqueous
Date Sampled: 01/26/2021 1130
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		103	25-150
13C8_PFOS		92	25-150
13C8_PFOSA		97	10-150
13C9_PFNA		93	25-150
d5-EtFOSAA		96	25-150
d3-MeFOSAA		100	25-150



LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821053.d		
Injection Date:	08-Feb-2021 20:27:25	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	46
Lab Sample ID:	WA28027-001	Lab Prep. Batch:	81803
Client ID:	HS-PW-2.5 (A)	Sample Group:	WA28027
Sample Info:	WA28027-001,5	Misc. Info:	
Inst. ID:	LCMSMS02	Operator:	Stephen E. Somerville
Method Name:	LCMSMS02_PFAS-ID	Version:	2020-09-22 16:12:14
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0354610

Name	Value	Units	Description
DF	5		Dilution Factor
VF	10000	ul	Final Volume
VI	282	ml	Initial Sample Volume
AlsDf	1		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.731	1.742	0	625857	24	>100:1			1100.00	937.72	99.4	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.737	1.742	0/0	69617	23	31:1			119.21	21.137		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.120	2.119	1	595561	17	>100:1			1100.00	940.18	98.4	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													
262.9 > 218.9	50	2.130	2.119	1/0	83471	17	26:1			150.07	26.608		
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.183	2.182	1	186325	20	>100:1			1100.00	973.90	95.8	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													J
298.9 > 80	44	2.183	2.182	1/0	11609	19	56:1	Target = 3.82	✓	57.595	10.212		
298.9 > 99	44	2.172	2.182		4155	19	15:1	2.79 (1.91-5.73)					
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													J
349 > 80	44	2.505	2.513	0/-1	4873	24	30:1	Target = 3.03	✓	34.244	6.0716		
349 > 99	44	2.496	2.513		1771	13	9.5:1	2.75 (1.51-4.54)					
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.442	2.441	1	103793	20	>100:1			5500.00	4664.51	96.8	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.441		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.478	2.477	1	671099	19	>100:1			1100.00	973.61	96.9	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													
313 > 269	49	2.478	2.477	1/0	114049	20	>100:1	Target = 18.18	✓	186.71	33.105		
313 > 119	49	2.478	2.477		5692	18	56:1	20.03 (9.09-27.28)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.583	2.590	0	1211721	21	>100:1			5500.00	5024.88	101	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.590		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.837	2.845	0	519891	20	>100:1			1100.00	987.03	97.7	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													J
363 > 319	47	2.837	2.836	1/1	39181	19	39:1	Target = 3.91		76.773	13.612		
363 > 169	47	2.837	2.836		9371	16	31:1	4.18 (1.95-5.86)					
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.855	2.863	0	135808	21	>100:1			1100.00	1025.02	99.8	
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													
399 > 80	45	2.855	2.854	1/1	19354	30	>100:1	Target = 3.01	0.11	140.15	24.849		
399 > 99	45	2.855	2.854		5650	27	38:1	3.42 (1.50-4.52)	0.05				
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.880		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													J
449 > 80	45	3.223	3.229	0/0	7505	22	19:1	Target = 3.08		63.332	11.229		
449 > 99	45	3.216	3.229		2194	14	14:1	3.42 (1.54-4.63)					
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.189	3.202	0	77330	24	>100:1			5500.00	4607.76	90.3	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.195		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.216	3.222	0	540156	24	>100:1			1100.00	1047.72	103	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.216	3.222	0/0	157384	35	60:1	Target = 3.13	0.12	303.69	53.846		M
413 > 169	53	3.209	3.222		53137	39	>100:1	2.96 (1.56-4.70)	0.14				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.592	3.599	0	112188	23	>100:1			1100.00	972.02	91.7	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													
499 > 80	54	3.592	3.599	0/0	614297	59	>100:1	Target = 3.63	0.89	4608.18	817.05		M
499 > 99	54	3.592	3.599		171660	38	>100:1	3.57 (1.81-5.45)	0.29				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.817		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.939		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.257		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.405		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.600	3.607	0	633967	21	>100:1			1100.00	982.13	93.1	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.599		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.915	3.922	0	270964	19	>100:1			1100.00	1079.66	97.1	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.931		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.948	3.939	1	79976	19	>100:1			5500.00	4887.96	102	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.931		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.948	3.956	0	583644	19	>100:1			1100.00	970.46	91.7	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		3.956		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.109	4.108	1	678801	21	>100:1			5500.00	5231.71	99.8	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.108		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.258	4.267	0	539875	17				1100.00	998.97	96.6	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.267		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.258	4.257	1	580597	20	>100:1			5500.00	5320.28	96.2	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.267		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.528	4.528	1	555819	18				1100.00	1063.87	94.2	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.528		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.771		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		4.990	4.989	1	679105	21	>100:1			1100.00	924.62	90.8	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		4.989		ND								
*** 37 13C2_PFDA**													
515 > 470		3.948	3.956	0	709495	20	>100:1					106	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.478	2.477	1	748785	19	>100:1					113	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.216	3.222	0	635804	24	>100:1					115	
*** 43 13C3_PFBA**													
216 > 172		1.731	1.742	0	686550	24	>100:1					117	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.592	3.599	0	157227	20	>100:1					117	

Compound Type Legend

D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

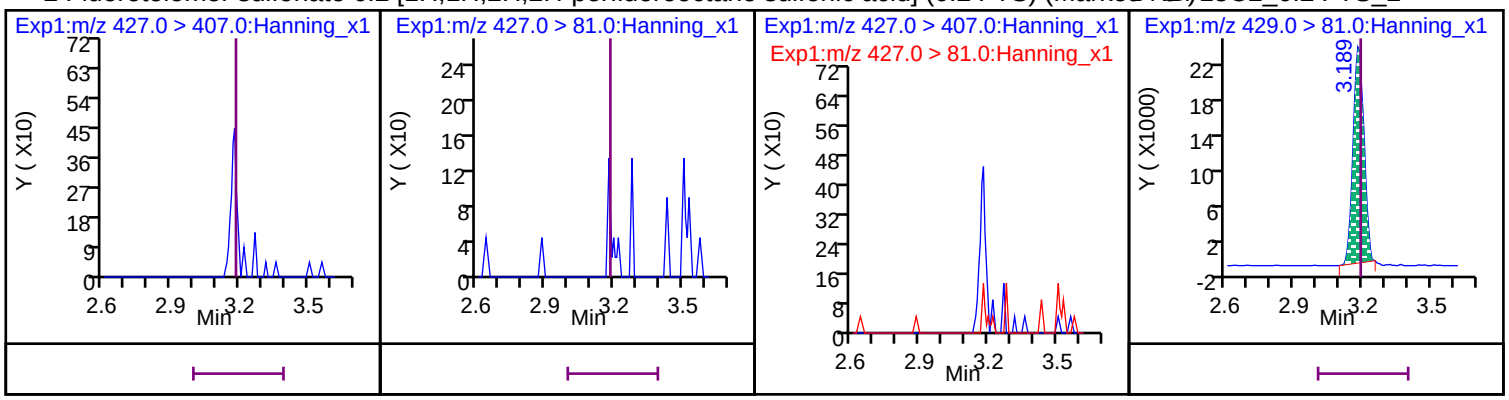
U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
M - Compound Hit/Peak Manually Integrated



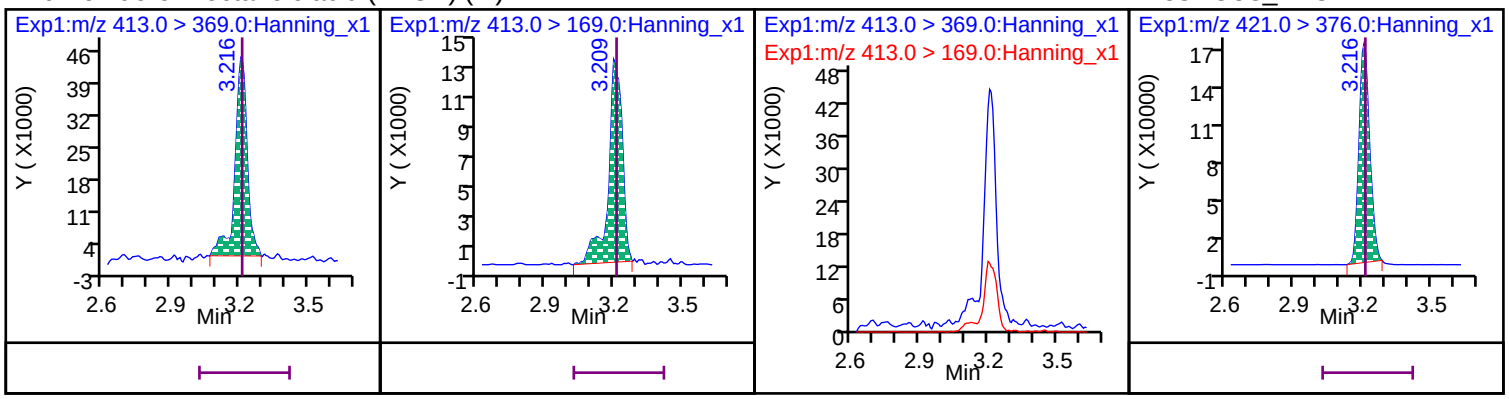
pre-injection IS summaries no longer provided (see Project Correspondence)

raw data is evaluated for project samples

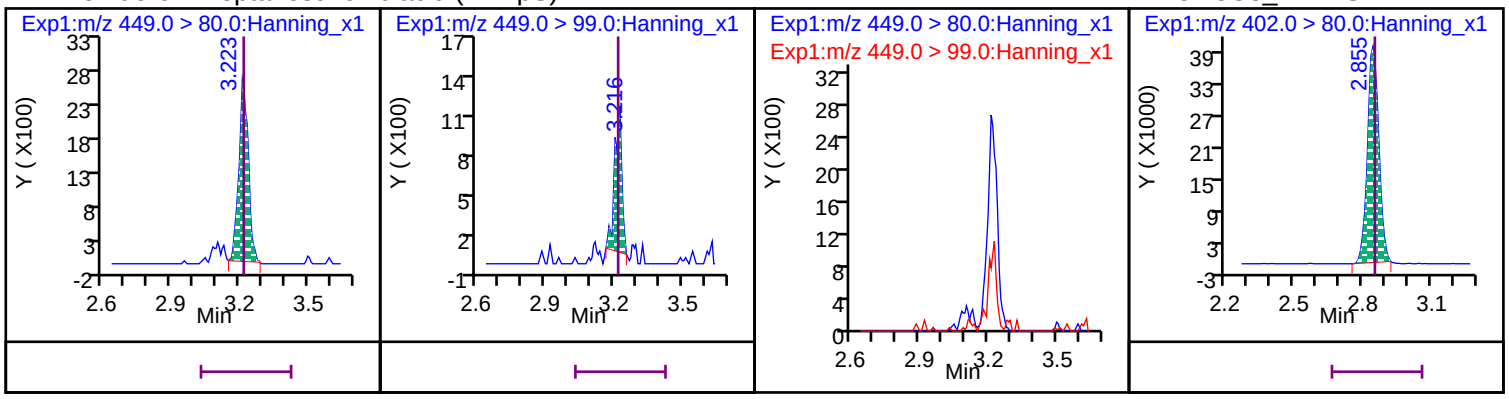
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) (Marked DNU) D 64 13C2_6:2 FTS_2



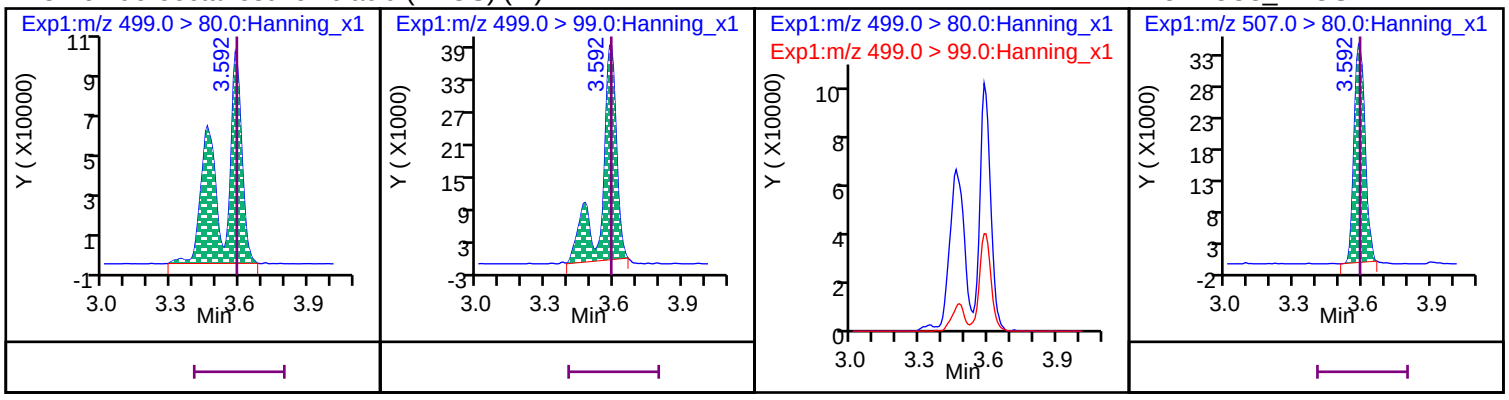
20 Perfluoro-n-octanoic acid (PFOA) (M) D 53 13C8_PFOA



12 Perfluoro-1-heptanesulfonic acid (PFHpS) D 45 13C3_PFHxS



18 Perfluorooctanesulfonic acid (PFOS) (M) D 54 13C8_PFOS



PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-002
Description: HS-PW-2.5 (B)
Matrix: Aqueous
Date Sampled: 01/26/2021 1215
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	02/08/2021 2016	JJG	02/04/2021 1209	81803

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		7.1	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		7.1	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		7.1	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		7.1	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		7.1	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		7.1	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		7.1	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		7.1	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		7.1	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	7.5		3.5	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	7.4		3.5	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	5.6		3.5	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	20		3.5	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	9.1		3.5	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	5.6		3.5	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	15		3.5	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	25		3.5	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	11		3.5	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		3.5	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	560	J LB	3.5	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		107	25-150
13C2_6:2FTS		103	25-150
13C2_8:2FTS		110	25-150
13C2_PFDoA		97	25-150
13C2_PFTeDA		87	25-150
13C3_PFBS		96	25-150
13C3_PFHxS		95	25-150
13C3-HFPO-DA		101	25-150
13C4_PFBA		96	25-150
13C4_PFHpA		105	25-150
13C5_PFHxA		101	25-150
13C5_PFPeA		105	25-150
13C6_PFDA		96	25-150
13C7_PFUdA		96	25-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the LOQ
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
H = Out of holding time
W = Reported on wet weight basis

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-002
Description: HS-PW-2.5 (B)
Matrix: Aqueous
Date Sampled: 01/26/2021 1215
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		105	25-150
13C8_PFOS		85	25-150
13C8_PFOSA		94	10-150
13C9_PFNA		94	25-150
d5-EtFOSAA		92	25-150
d3-MeFOSAA		101	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821052.d		
Injection Date:	08-Feb-2021 20:16:48	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	45
Lab Sample ID:	WA28027-002	Lab Prep. Batch:	81803
Client ID:	HS-PW-2.5 (B)	Sample Group:	WA28027
Sample Info:	WA28027-002	Misc. Info:	
Inst. ID:	LCMSMS02	Operator:	Stephen E. Somerville
Method Name:	LCMSMS02_PFAS-ID	Version:	2020-09-22 16:12:14
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0388304

Name	Value	Units	Description
DF	1		Dilution Factor
VF	10000	ul	Final Volume
VI	283	ml	Initial Sample Volume
AlsDf	0.91		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.731	1.742	0	604858	22	>100:1			1001.00	906.25	96.1	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.737	1.742	0/0	145854	20	75:1			235.17	9.1318		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.130	2.119	1	633294	16	>100:1			1001.00	999.74	105	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													
262.9 > 218.9	50	2.130	2.119	1/0	178881	13	33:1			275.22	10.687		M
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.183	2.182	1	186835	16	>100:1			1001.00	976.56	96.1	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													
298.9 > 80	44	2.183	2.182	1/0	42670	16	>100:1	Target = 3.82		192.12	7.4600		
298.9 > 99	44	2.183	2.182		11784	17	36:1	3.62 (1.91-5.73)					
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													
349 > 80	44	2.514	2.513	1/0	22516	17	>100:1	Target = 3.03		143.59	5.5758		
349 > 99	44	2.514	2.513		7936	19	30:1	2.83 (1.51-4.54)					
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.442	2.441	1	114433	17	>100:1			5005.00	5142.68	107	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.441		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.478	2.477	1	699216	18	>100:1			1001.00	1014.40	101	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													
313 > 269	49	2.478	2.477	1/0	269369	15	>100:1	Target = 18.18		385.17	14.956		M
313 > 119	49	2.478	2.477		12743	23	>100:1	21.13 (9.09-27.28)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.591	2.590	1	1212456	19	>100:1			5005.00	5027.93	101	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.590		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.837	2.845	0	560484	17	>100:1			1001.00	1064.09	105	

Signal	Quant Std	RT (min.)	Exp RT (min.)	ΔRT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													
363 > 319	47	2.846	2.836	1/1	87267	16	66:1	Target = 3.91	✓	144.34	5.6046		M
363 > 169	47	2.846	2.836		23305	22	>100:1	3.74 (1.95-5.86)					
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.855	2.863	0	128984	17	>100:1			1001.00	973.51	94.8	
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													
399 > 80	45	2.864	2.854	1/1	73781	24	>100:1	Target = 3.01	✓ 0.12	511.92	19.878		
399 > 99	45	2.855	2.854		23247	28	98:1	3.17 (1.50-4.52)	0.05				
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.880		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													
449 > 80	45	3.230	3.229	1/1	23539	29	22:1	Target = 3.08	✓	190.32	7.3903		
449 > 99	45	3.237	3.229		8211	25	23:1	2.86 (1.54-4.63)					
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.196	3.202	0	88448	24	>100:1			5005.00	5270.24	103	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.195		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.223	3.222	1	550278	23	>100:1			1001.00	1067.35	105	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.223	3.222	1/0	367797	34	>100:1	Target = 3.13	✓ 0.16	633.96	24.617		
413 > 169	53	3.223	3.222		124056	35	>100:1	2.96 (1.56-4.70)	0.20				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.600	3.599	1	103997	20	>100:1			1001.00	901.05	85	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													
499 > 80	54	3.600	3.599	1/0	1941274	60	>100:1	Target = 3.63	✓ 0.69	14296	555.11		M
499 > 99	54	3.600	3.599		526293	39	>100:1	3.68 (1.81-5.45)	0.27				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.817		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.939		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.257		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.405		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.608	3.607	1	639758	20	>100:1			1001.00	991.10	93.9	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.599		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.915	3.922	0	261798	20				1001.00	1043.14	93.8	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.931		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.948	3.939	1	86488	26	>100:1			5005.00	5285.96	110	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.931		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.948	3.956	0	609958	18	>100:1			1001.00	1014.21	95.9	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		3.956		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.109	4.108	1	689653	18	>100:1			5005.00	5315.35	101	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.108		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.268	4.267	1	538850	17	>100:1			1001.00	997.08	96.4	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.267		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.268	4.257	1	552777	18	>100:1			5005.00	5065.35	91.6	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.267		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.537	4.528	1	569438	17	>100:1			1001.00	1089.93	96.5	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.528		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.771		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		4.990	4.989	1	649333	22	>100:1			1001.00	884.09	86.8	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		4.989		ND								
*** 37 13C2_PFDA**													
515 > 470		3.957	3.956	1	791307	19						119	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.478	2.477	1	787851	17	>100:1					119	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.223	3.222	1	674946	24	>100:1					122	
*** 43 13C3_PFBA**													
216 > 172		1.737	1.742	0	687052	22	>100:1					117	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.600	3.599	1	150399	21	>100:1					112	

Compound Type Legend

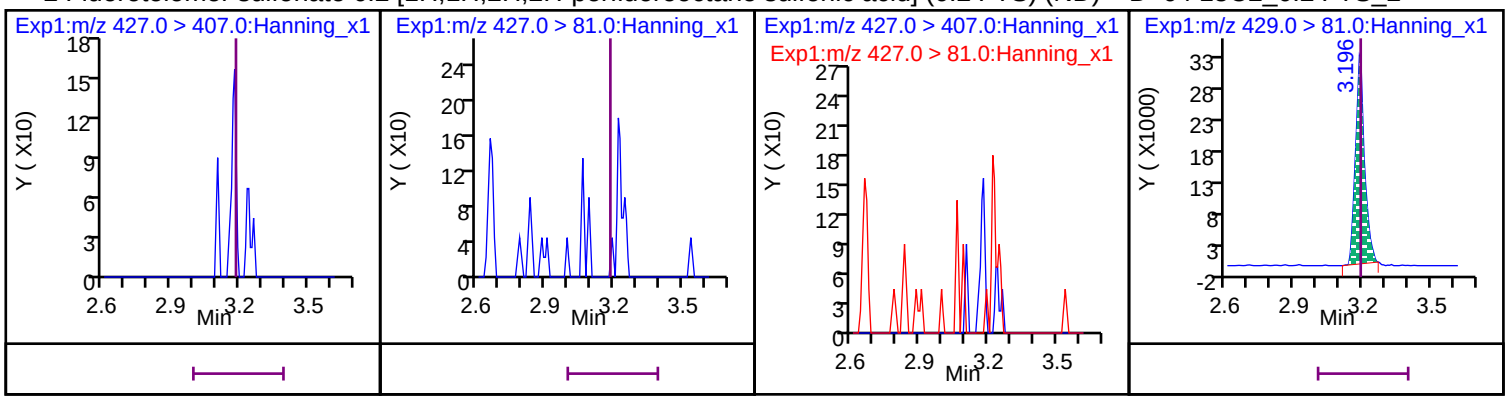
D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

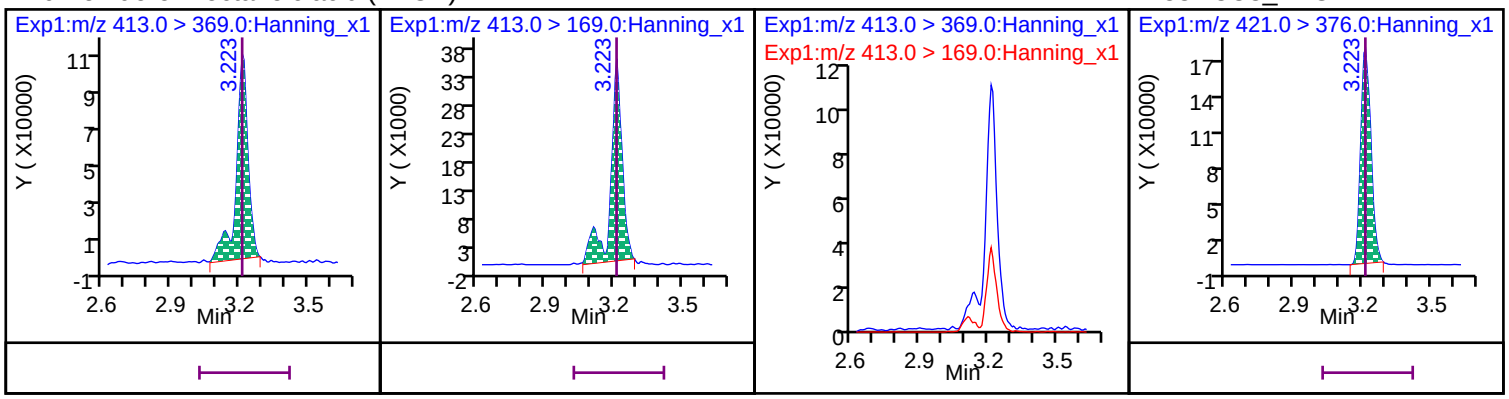
U - Result Less Than Method Detection Limit
M - Compound Hit/Peak Manually Integrated



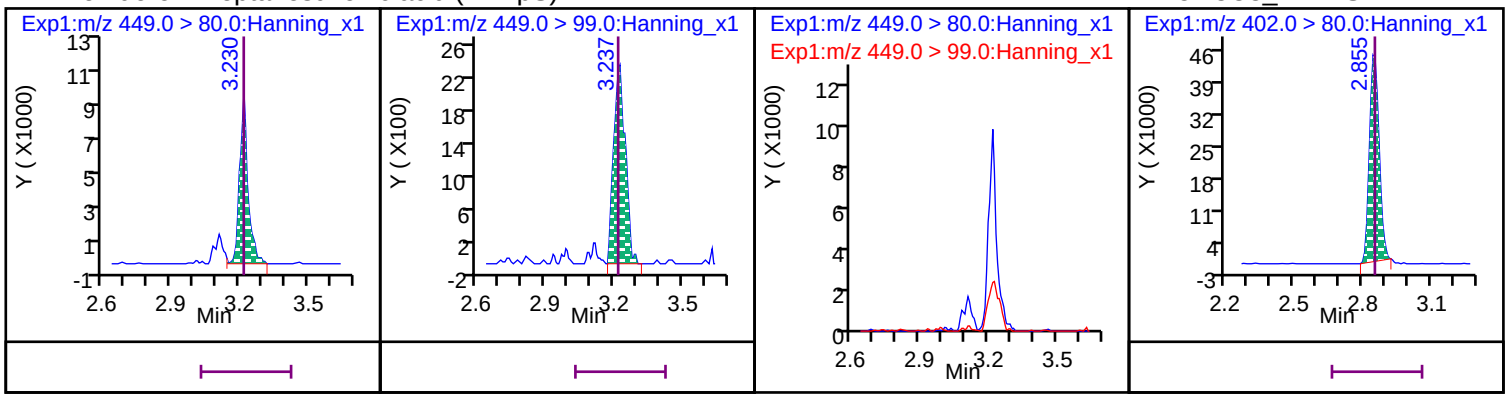
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) (ND) D 64 13C2_6:2 FTS_2



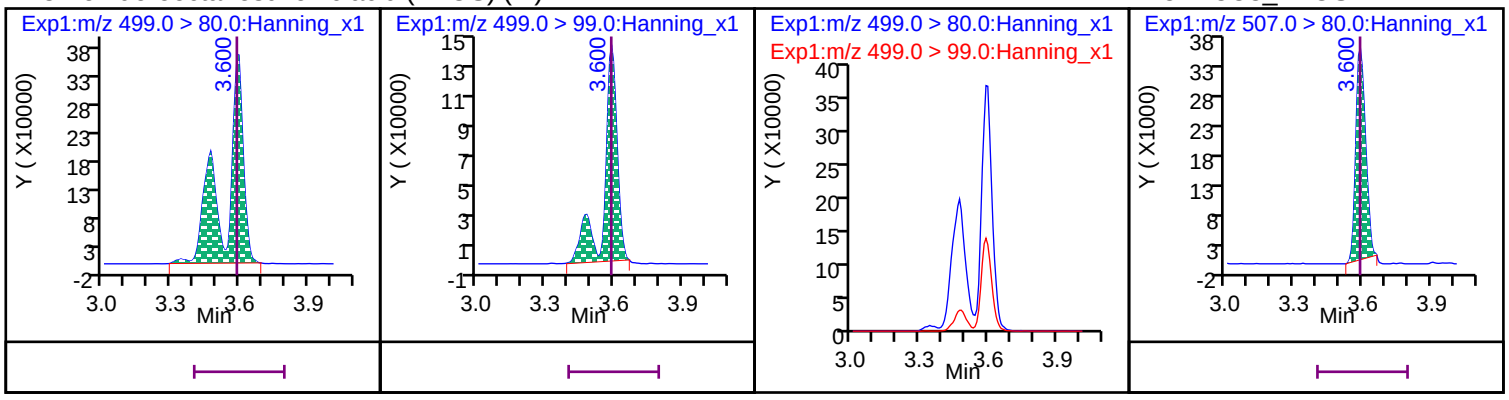
20 Perfluoro-n-octanoic acid (PFOA) D 53 13C8_PFOA



12 Perfluoro-1-heptanesulfonic acid (PFHpS) D 45 13C3_PFHxS



18 Perfluorooctanesulfonic acid (PFOS) (M) D 54 13C8_PFOS



PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-003
Description: HS-PW-3 (A)
Matrix: Aqueous
Date Sampled: 01/26/2021 1430
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	5	02/08/2021 2038	JJG	02/04/2021 1209	81803

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		37	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		37	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		37	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		37	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		37	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		37	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		37	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		37	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		37	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	19		19	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		19	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	28		19	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	21		19	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	41		19	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	77		19	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	23		19	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		19	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		19	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	900	J LB	19	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		110	25-150
13C2_6:2FTS		108	25-150
13C2_8:2FTS		108	25-150
13C2_PFDoA		101	25-150
13C2_PFTeDA		97	25-150
13C3_PFBS		109	25-150
13C3_PFHxS		103	25-150
13C3-HFPO-DA		107	25-150
13C4_PFBA		108	25-150
13C4_PFHpA		106	25-150
13C5_PFHxA		103	25-150
13C5_PFPeA		112	25-150
13C6_PFDA		100	25-150
13C7_PFUdA		103	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-003
Description: HS-PW-3 (A)
Matrix: Aqueous
Date Sampled: 01/26/2021 1430
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		109	25-150
13C8_PFOS		102	25-150
13C8_PFOSA		103	10-150
13C9_PFNA		104	25-150
d5-EtFOSAA		105	25-150
d3-MeFOSAA		110	25-150



LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821054.d		
Injection Date:	08-Feb-2021 20:38:06	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	47
Lab Sample ID:	WA28027-003	Lab Prep. Batch:	81803
Client ID:	HS-PW-3 (A)	Sample Group:	WA28027
Sample Info:	WA28027-003,5	Misc. Info:	
Inst. ID:	LCMSMS02	Operator:	Stephen E. Somerville
Method Name:	LCMSMS02_PFAS-ID	Version:	2020-09-22 16:12:14
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0370370

Name	Value	Units	Description
DF	5		Dilution Factor
VF	10000	ul	Final Volume
VI	270	ml	Initial Sample Volume
AlsDf	1		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.731	1.742	0	677291	23	>100:1			1100.00	1014.78	108	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.737	1.742	0/0	70922	27	25:1			112.22	20.782		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.120	2.119	1	680303	17	>100:1			1100.00	1073.95	112	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													
262.9 > 218.9	50	2.130	2.119	1/0	78484	14	22:1			123.52	22.875		M
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.183	2.182	1	211505	18	>100:1			1100.00	1105.51	109	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													J
298.9 > 80	44	2.183	2.182	1/0	13427	21	58:1	Target = 3.82	✓	58.684	10.867		
298.9 > 99	44	2.194	2.182		2999	18	9.2:1	4.47 (1.91-5.73)					
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													J
349 > 80	44	2.514	2.513	1/0	4610	17	33:1	Target = 3.03	✓	28.539	5.2850		
349 > 99	44	2.505	2.513		1641	22	14:1	2.80 (1.51-4.54)					
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.442	2.441	1	118054	20	>100:1			5500.00	5305.41	110	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.441		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.478	2.477	1	713634	19	>100:1			1100.00	1035.32	103	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													
313 > 269	49	2.478	2.477	1/0	144586	17	92:1	Target = 18.18	✓	222.60	41.222		M
313 > 119	49	2.469	2.477		7247	24	25:1	19.95 (9.09-27.28)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.591	2.590	1	1282864	22	>100:1			5500.00	5319.90	107	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.590		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.837	2.845	0	565823	21	>100:1			1100.00	1074.23	106	

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													J
363 > 319	47	2.837	2.836	1/1	41208	17	60:1	Target = 3.91	✓	74.190	13.739		
363 > 169	47	2.846	2.836		13095	18	72:1	3.14 (1.95-5.86)					
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.855	2.863	0	139851	21	>100:1			1100.00	1055.53	103	
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													
399 > 80	45	2.855	2.854	1/1	21631	22	>100:1	Target = 3.01	✓	152.11	28.169		
399 > 99	45	2.855	2.854		7285	26	61:1	2.96 (1.50-4.52)					
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.880		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													
449 > 80	45	3.230	3.229	1/1	12339	23	28:1	Target = 3.08	✓	101.11	18.725		
449 > 99	45	3.223	3.229		4459	15	16:1	2.76 (1.54-4.63)					
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.196	3.202	0	92742	23	>100:1			5500.00	5526.10	108	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.195		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.216	3.222	0	566627	23	>100:1			1100.00	1099.06	109	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.216	3.222	0/0	226855	36	>100:1	Target = 3.13	✓ 0.10	417.30	77.277		M
413 > 169	53	3.216	3.222		73175	35	>100:1	3.10 (1.56-4.70)	0.17				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.592	3.599	0	124784	22	>100:1			1100.00	1081.15	102	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													
499 > 80	54	3.592	3.599	0/0	723126	57	>100:1	Target = 3.63	05	4877.00	903.15		M
499 > 99	54	3.600	3.599		195192	38	>100:1	3.70 (1.81-5.45)	✓ 0.36				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.817		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.939		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.257		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.405		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.600	3.607	0	705862	24	>100:1			1100.00	1093.51	104	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.599		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.915	3.922	0	286844	21	>100:1			1100.00	1142.94	103	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.931		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.940	3.939	1	84824	20	>100:1			5500.00	5184.26	108	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.931		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.948	3.956	0	638022	20	>100:1			1100.00	1060.87	100	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		3.956		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.109	4.108	1	746072	18	>100:1			5500.00	5750.18	110	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.108		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.268	4.267	1	573353	16	>100:1			1100.00	1060.92	103	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.267		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.268	4.257	1	634293	18	>100:1			5500.00	5812.32	105	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.267		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.537	4.528	1	596598	18				1100.00	1141.92	101	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.528		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.771		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		4.990	4.989	1	723127	23	>100:1			1100.00	984.56	96.7	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		4.989		ND								
*** 37 13C2_PFDA**													
515 > 470		3.948	3.956	0	694456	20						104	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.478	2.477	1	703057	20	>100:1					106	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.216	3.222	0	594613	23	>100:1					107	
*** 43 13C3_PFBA**													
216 > 172		1.737	1.742	0	661527	23	>100:1					113	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.600	3.599	1	148662	22	>100:1					110	

Compound Type Legend

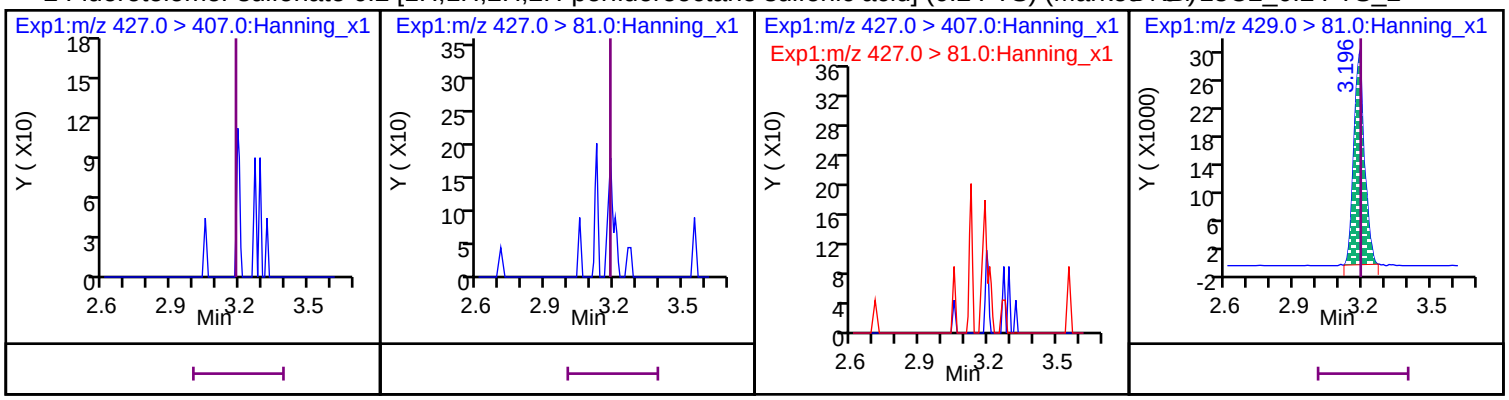
D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

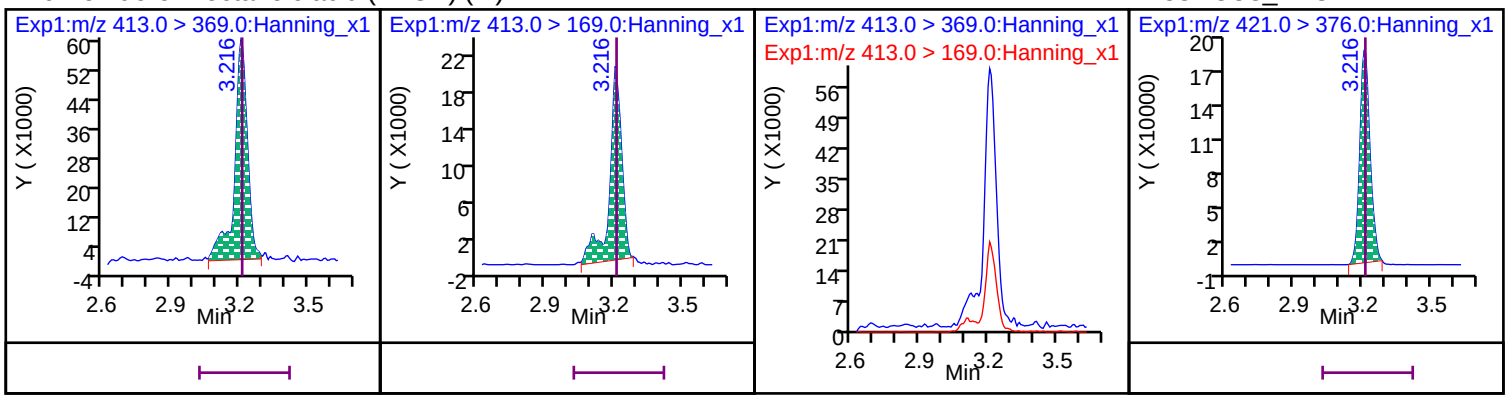
U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
M - Compound Hit/Peak Manually Integrated



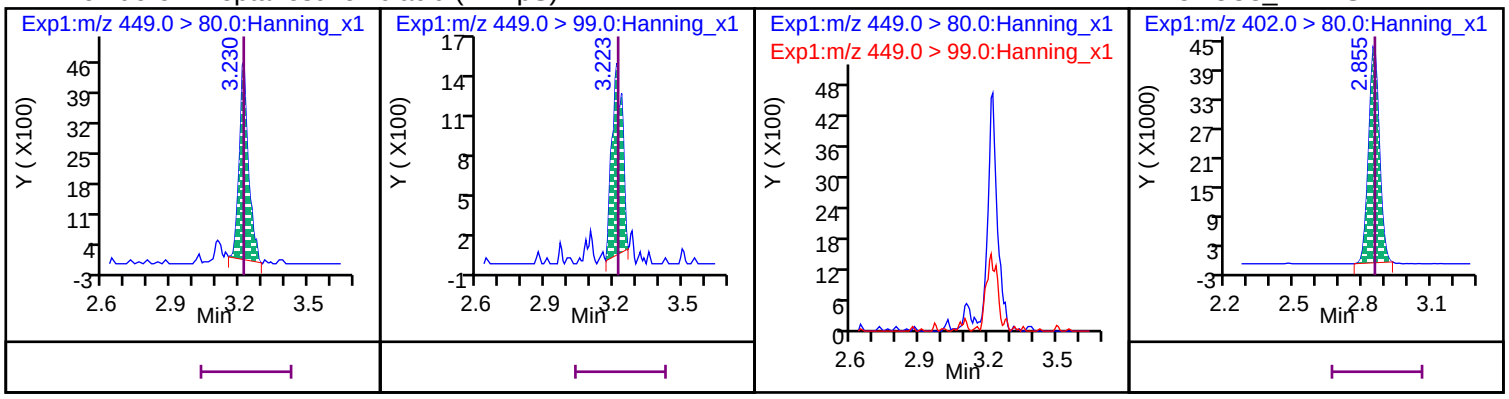
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) (Marked DNU) D 52 13C2_6:2 FTS_2



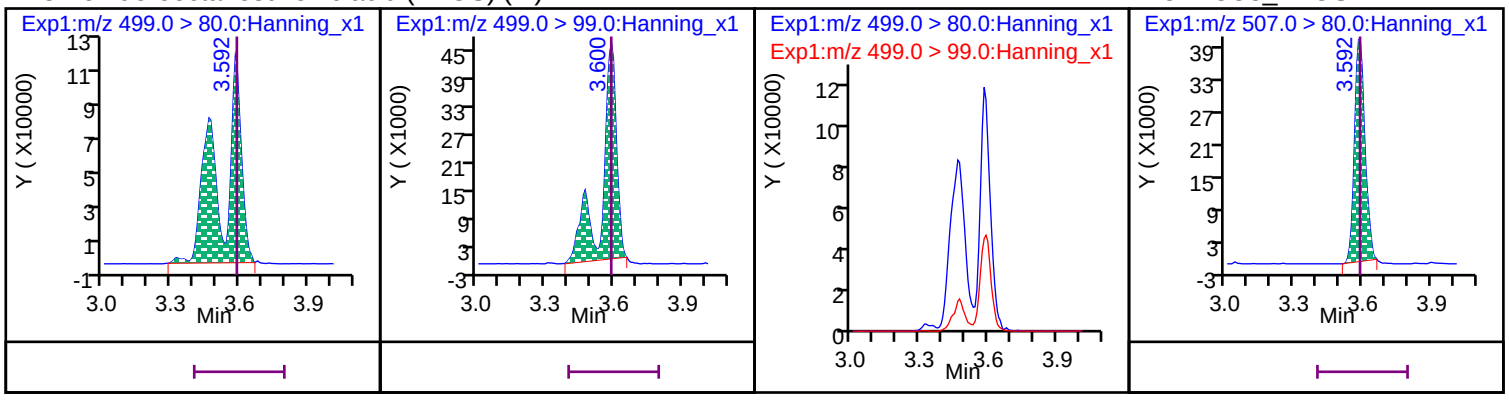
20 Perfluoro-n-octanoic acid (PFOA) (M) D 53 13C8_PFOA



12 Perfluoro-1-heptanesulfonic acid (PFHpS) D 45 13C3_PFHxS



18 Perfluorooctanesulfonic acid (PFOS) (M) D 54 13C8_PFOS



PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-004
Description: HS-PW-3 (A) DUP
Matrix: Aqueous
Date Sampled: 01/26/2021 1430
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	5	02/08/2021 2048	JJG	02/04/2021 1209	81803

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		35	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		35	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		35	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		35	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		35	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		35	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		35	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		35	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		35	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	18		17	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		17	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	26		17	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	20		17	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	38		17	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	71		17	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	22		17	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		17	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		17	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	900	J LB	17	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		105	25-150
13C2_6:2FTS		92	25-150
13C2_8:2FTS		106	25-150
13C2_PFDoA		93	25-150
13C2_PFTeDA		95	25-150
13C3_PFBS		105	25-150
13C3_PFHxS		102	25-150
13C3-HFPO-DA		101	25-150
13C4_PFBA		104	25-150
13C4_PFHpA		99	25-150
13C5_PFHxA		96	25-150
13C5_PFPeA		103	25-150
13C6_PFDA		103	25-150
13C7_PFUdA		98	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
L = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-004
Description: HS-PW-3 (A) DUP
Matrix: Aqueous
Date Sampled: 01/26/2021 1430
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		101	25-150
13C8_PFOS		95	25-150
13C8_PFOSA		97	10-150
13C9_PFNA		96	25-150
d5-EtFOSAA		91	25-150
d3-MeFOSAA		101	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

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Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821055.d		
Injection Date:	08-Feb-2021 20:48:46	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	48
Lab Sample ID:	WA28027-004	Lab Prep. Batch:	81803
Client ID:	HS-PW-3 (A) DUP	Sample Group:	WA28027
Sample Info:	WA28027-004,5	Misc. Info:	
Inst. ID:	LCMSMS02	Operator:	Stephen E. Somerville
Method Name:	LCMSMS02_PFAS-ID	Version:	2020-09-22 16:12:14
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0347222

Name	Value	Units	Description
DF	5		Dilution Factor
VF	10000	ul	Final Volume
VI	288	ml	Initial Sample Volume
AlsDf	1		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.737	1.742	0	652617	23	>100:1			1100.00	977.81	104	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.737	1.742	0/0	71773	24	30:1			117.86	20.462		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.130	2.119	1	622135	17	>100:1			1100.00	982.13	103	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													
262.9 > 218.9	50	2.130	2.119	1/0	75278	14	21:1			129.56	22.492		M
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.183	2.182	1	203475	19	>100:1			1100.00	1063.54	105	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													J
298.9 > 80	44	2.183	2.182	1/0	12679	17	94:1	Target = 3.82	✓	57.602	10.000		
298.9 > 99	44	2.183	2.182		3965	18	12:1	3.19 (1.91-5.73)					
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													J
349 > 80	44	2.514	2.513	1/0	4225	13	32:1	Target = 3.03	✓	27.188	4.7201		M
349 > 99	44	2.505	2.513		1483	20	12:1	2.84 (1.51-4.54)					
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.442	2.441	1	112201	19	>100:1			5500.00	5042.37	105	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.441		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.478	2.477	1	664229	19	>100:1			1100.00	963.64	95.9	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													
313 > 269	49	2.478	2.477	1/0	133047	15	>100:1	Target = 18.18	✓	220.07	38.207		M
313 > 119	49	2.478	2.477		7280	18	55:1	18.27 (9.09-27.28)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.591	2.590	1	1213578	21	>100:1			5500.00	5032.58	101	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.590		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.837	2.845	0	526879	21	>100:1			1100.00	1000.29	99	

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													J
363 > 319	47	2.846	2.836	1/1	37818	19	40:1	Target = 3.91		73.119	12.694		
363 > 169	47	2.837	2.836		11394	21	73:1	3.31 (1.95-5.86)					
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.855	2.863	0	138245	20	>100:1			1100.00	1043.41	102	
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													
399 > 80	45	2.864	2.854	1/1	21028	23	>100:1	Target = 3.01		149.59	25.970		M
399 > 99	45	2.864	2.854		6121	19	43:1	3.43 (1.50-4.52)	0.09				
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.880		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													
449 > 80	45	3.230	3.229	1/1	12656	21	21:1	Target = 3.08		104.92	18.215		
449 > 99	45	3.223	3.229		3931	19	9.1:1	3.21 (1.54-4.63)					
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.196	3.202	0	79120	24	>100:1			5500.00	4714.42	92.4	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.195		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.216	3.222	0	528311	23	>100:1			1100.00	1024.74	101	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.216	3.222	0/0	207342	32	>100:1	Target = 3.13	0.12	409.06	71.018		M
413 > 169	53	3.216	3.222		72278	34	>100:1	2.86 (1.56-4.70)	0.12				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.600	3.599	1	115662	22	>100:1			1100.00	1002.11	94.6	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													
499 > 80	54	3.600	3.599	1/0	710170	58	>100:1	Target = 3.63	1.05	5167.37	897.11		M
499 > 99	54	3.600	3.599		187442	40	>100:1	3.78 (1.81-5.45)	0.40				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.817		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.939		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.257		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.405		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.600	3.607	0	654017	23	>100:1			1100.00	1013.19	96	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.599		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.915	3.922	0	271734	19				1100.00	1082.73	97.4	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.931		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.949	3.939	1	83106	19	>100:1			5500.00	5079.26	106	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.931		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.957	3.956	1	654947	19	>100:1			1100.00	1089.02	103	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		3.956		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.109	4.108	1	686920	20	>100:1			5500.00	5294.28	101	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.108		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.268	4.267	1	546218	18	>100:1			1100.00	1010.71	97.7	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.267		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.268	4.257	1	545886	17	>100:1			5500.00	5002.20	90.5	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.267		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.538	4.528	1	550221	18	>100:1			1100.00	1053.15	93.3	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.528		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.771		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		4.990	4.989	1	711851	23	>100:1			1100.00	969.21	95.2	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		4.989		ND								
*** 37 13C2_PFDA**													
515 > 470		3.957	3.956	1	741192	19	>100:1					111	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.478	2.477	1	723710	21	>100:1					109	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.216	3.222	0	618574	24	>100:1					111	
*** 43 13C3_PFBA**													
216 > 172		1.737	1.742	0	676918	23	>100:1					115	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.600	3.599	1	144610	22	>100:1					107	

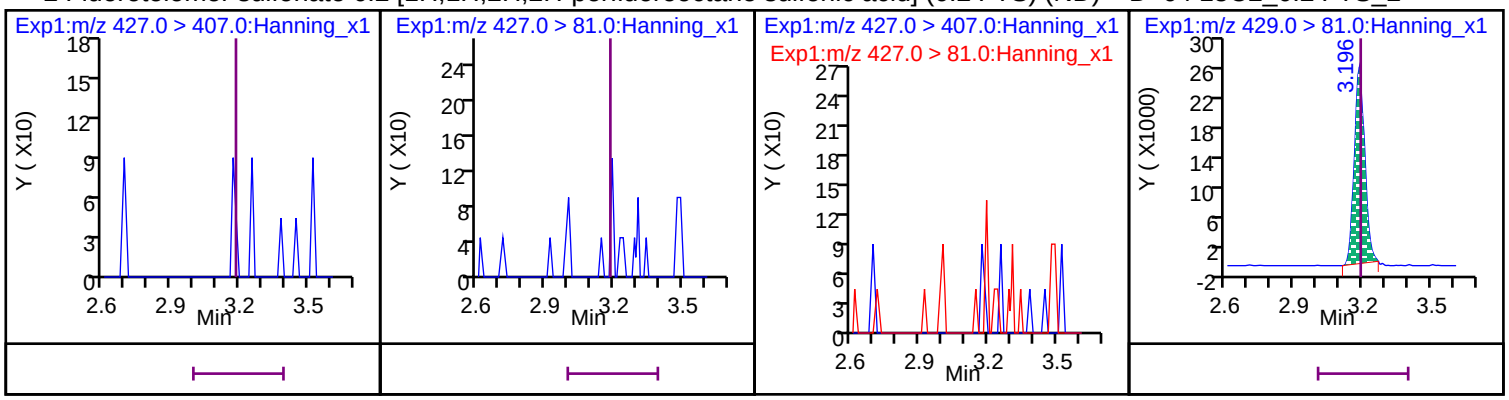
Compound Type Legend

D - Isotopic Dilution Std.
* - ISTD

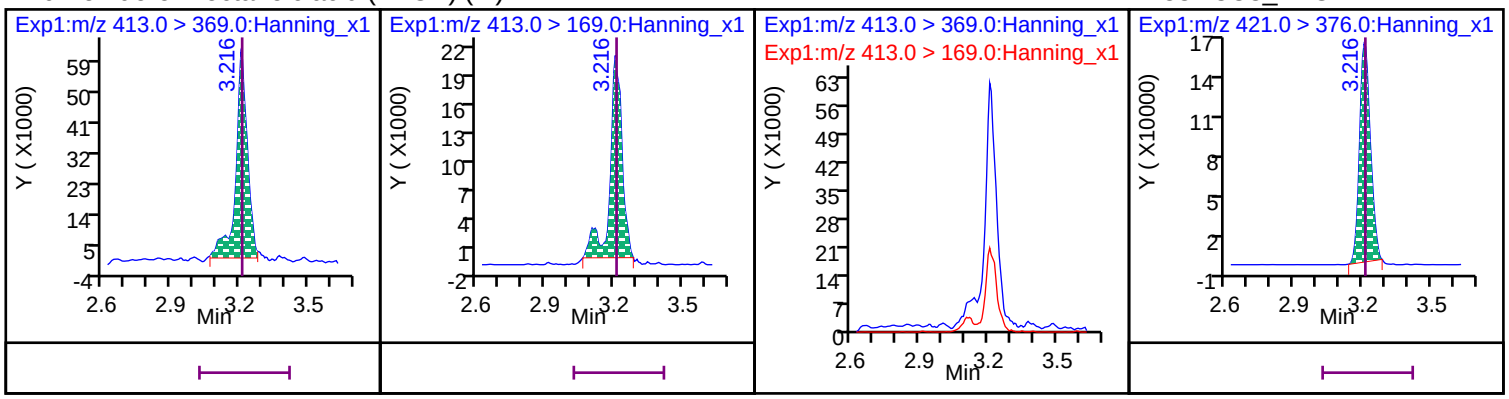
QC Flag Legend

U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
M - Compound Hit/Peak Manually Integrated

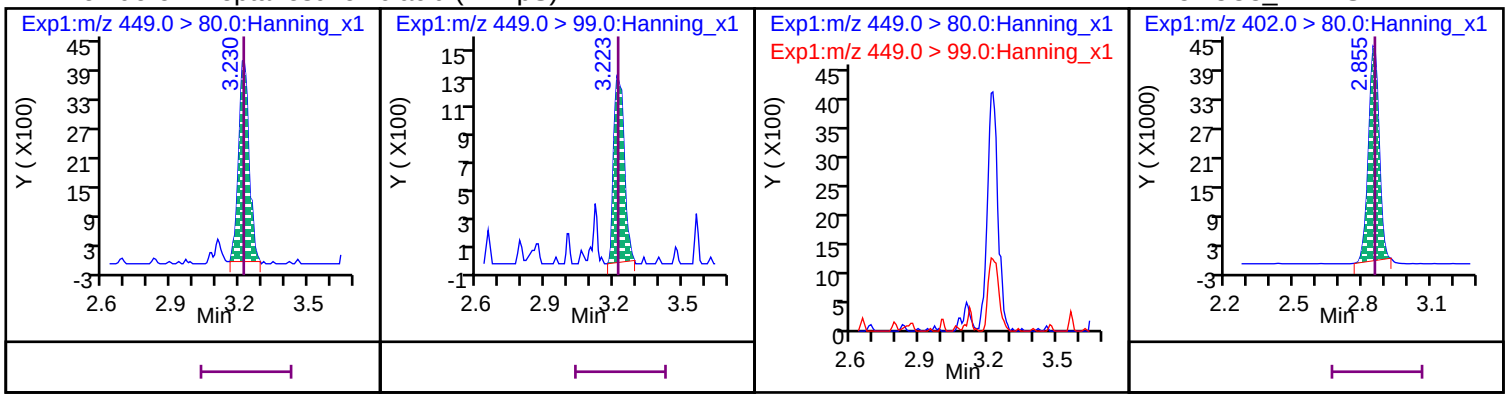
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) (ND) D 64 13C2_6:2 FTS_2



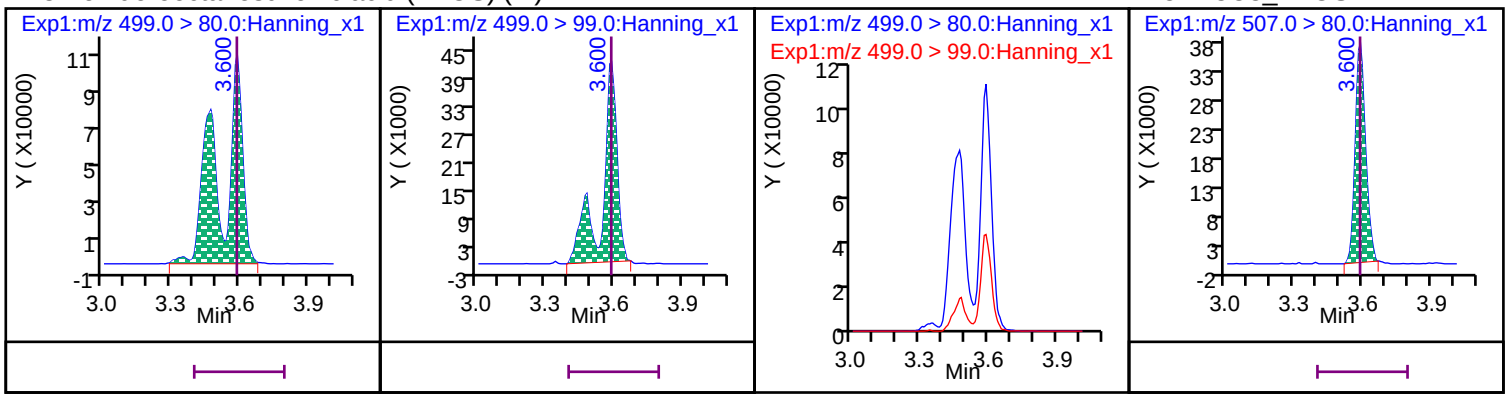
20 Perfluoro-n-octanoic acid (PFOA) (M) D 53 13C8_PFOA



12 Perfluoro-1-heptanesulfonic acid (PFHpS) D 45 13C3_PFHxS



18 Perfluorooctanesulfonic acid (PFOS) (M) D 54 13C8_PFOS



PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-005
Description: HS-PW-3.5 (A)
Matrix: Aqueous
Date Sampled: 01/26/2021 1540
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	02/08/2021 1726	MMM	02/05/2021 1201	81968

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		7.2	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		7.2	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		7.2	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		7.2	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		7.2	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		7.2	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		7.2	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		7.2	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		7.2	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	32		3.6	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	17		3.6	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	19		3.6	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	9.5		3.6	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	7.2		3.6	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	12		3.6	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	21		3.6	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	6.0		3.6	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		3.6	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	92	J LB	3.6	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		97	25-150
13C2_6:2FTS		92	25-150
13C2_8:2FTS		100	25-150
13C2_PFDoA		81	25-150
13C2_PFTeDA		77	25-150
13C3_PFBS		88	25-150
13C3_PFHxS		89	25-150
13C3-HFPO-DA		97	25-150
13C4_PFBA		91	25-150
13C4_PFHpA		95	25-150
13C5_PFHxA		102	25-150
13C5_PFPeA		95	25-150
13C6_PFDA		92	25-150
13C7_PFUdA		94	25-150

LOQ = Limit of Quantitation
B = Detected in the method blank
= Quantitation of compound exceeded the calibration range
ND = Not detected at or above the LOQ
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
H = Out of holding time
W = Reported on wet weight basis

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-005
Description: HS-PW-3.5 (A)
Matrix: Aqueous
Date Sampled: 01/26/2021 1540
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		93	25-150
13C8_PFOS		79	25-150
13C8_PFOSA		96	10-150
13C9_PFNA		95	25-150
d5-EtFOSAA		78	25-150
d3-MeFOSAA		100	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821047.d		
Injection Date:	08-Feb-2021 17:26:20	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	32
Lab Sample ID:	WA28027-005	Lab Prep. Batch:	81968
Client ID:	HS-PW-3.5 (A)	Sample Group:	WA28027
Sample Info:	WA28027-005	Misc. Info:	
Inst. ID:	LCMSMS01	Operator:	Matthew M. Miller
Method Name:	LCMSMS01_PFAS-ID	Version:	2020-09-23 10:00:21
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0396715

Name	Value	Units	Description
DF	1		Dilution Factor
VF	10000	ul	Final Volume
VI	277	ml	Initial Sample Volume
AlsDf	0.91		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.719	1.721	0	924386	17	>100:1			1001.00	1013.98	90.8	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													
212.9 > 168.9	46	1.726	1.728	0/0	245506	17	>100:1			238.83	9.4749		
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.109	2.110	0	974730	12	>100:1			1001.00	1050.73	94.9	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													
262.9 > 218.9	50	2.109	2.110	0/0	149411	12	24:1			151.74	6.0198		M
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.172	2.162	1	307648	14	>100:1			1001.00	981.56	87.9	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													
298.9 > 80	44	2.172	2.162	1/0	298945	16	>100:1	Target = 3.46	✓	808.23	32.064		
298.9 > 99	44	2.172	2.162		81330	16	>100:1	3.67 (1.73-5.20)					
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													
349 > 80	44	2.520	2.520	0/-1	114933	14	85:1	Target = 3.26	✓	422.07	16.744		M
349 > 99	44	2.520	2.520		40573	15	>100:1	2.83 (1.63-4.89)					M
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.441	2.442	0	271040	16	>100:1			5005.00	5442.50	97.1	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.442		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.485	2.485	0	890786	15	>100:1			1001.00	1042.25	102	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													
313 > 269	49	2.493	2.477	2/2	261336	12	>100:1	Target = 17.17	✓	302.26	11.991		
313 > 119	49	2.485	2.477		14473	15	57:1	18.05 (8.58-25.76)					
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.610	2.602	1	728063	17	>100:1			5005.00	4993.36	97.1	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.602		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.874	2.865	1	805518	17	>100:1			1001.00	1034.44	94.5	

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													
363 > 319	47	2.874	2.873	1/0	135380	13	>100:1	Target = 3.04	✓	181.81	7.2126		
363 > 169	47	2.874	2.873		40474	14	>100:1	3.34 (1.52-4.57)					
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.891	2.891	1	234522	17	>100:1			1001.00	1019.24	89.4	
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													
399 > 80	45	2.891	2.891	1/0	124865	27	>100:1	Target = 3.66	✓ 0.34	483.28	19.172		
399 > 99	45	2.891	2.891		36706	25	>100:1	3.40 (1.83-5.50)	0.22				
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.922		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													J
449 > 80	45	3.292	3.277	1/0	12408	20	83:1	Target = 3.56	✓	49.987	1.9831		
449 > 99	45	3.278	3.277		3362	19	13:1	3.69 (1.78-5.34)					
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.246	3.244	1	242262	20	>100:1			5005.00	6007.46	91.9	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.244		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.278	3.270	1	743918	20	>100:1			1001.00	1009.19	92.9	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.272	3.270	1/0	393695	34	62:1	Target = 2.38	✓ 0.57	525.45	20.845		
413 > 169	53	3.278	3.270		190746	34	>100:1	2.06 (1.19-3.57)	0.76				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.657	3.648	1	178436	19	>100:1			1001.00	853.78	78.8	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													
499 > 80	54	3.649	3.656	0/-1	486306	57	>100:1	Target = 4.00	✓ 0.85	2319.75	92.028		
499 > 99	54	3.657	3.656		111111	38	>100:1	4.37 (2.00-6.01)	0.30				
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.863		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.991		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.280		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.449		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.657	3.656	1	751786	19	>100:1			1001.00	1053.49	95.1	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.656		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.964	3.955	1	446786	17	>100:1			1001.00	1044.23	96.2	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.964		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.991	3.991	1	200438	17	>100:1			5005.00	6315.67	99.5	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.991		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		4.001	4.000	1	639261	17	>100:1			1001.00	1086.08	91.8	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		4.000		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.150	4.158	0	773564	19	>100:1			5005.00	4992.18	100	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.158		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.299	4.308	0	678751	17	>100:1			5005.00	4844.04	78.1	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.308		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.299	4.308	0	578867	16	>100:1			1001.00	1072.58	94	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.308		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.563	4.570	0	538739	17	>100:1			1001.00	870.70	81	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.570		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.813		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		5.017	5.029	0	582380	19	>100:1			1001.00	881.52	77.2	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		5.029		ND								
*** 37 13C2_PFDA**													
515 > 470		4.001	4.000	1	565182	16	>100:1					88.6	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.485	2.485	0	723398	15	>100:1					93.6	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.278	3.277	1	719318	21	>100:1					82.3	
*** 43 13C3_PFBA**													
216 > 172		1.726	1.721	1	764117	18	>100:1					85.5	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.657	3.656	1	211391	18	>100:1					86.3	

Compound Type Legend

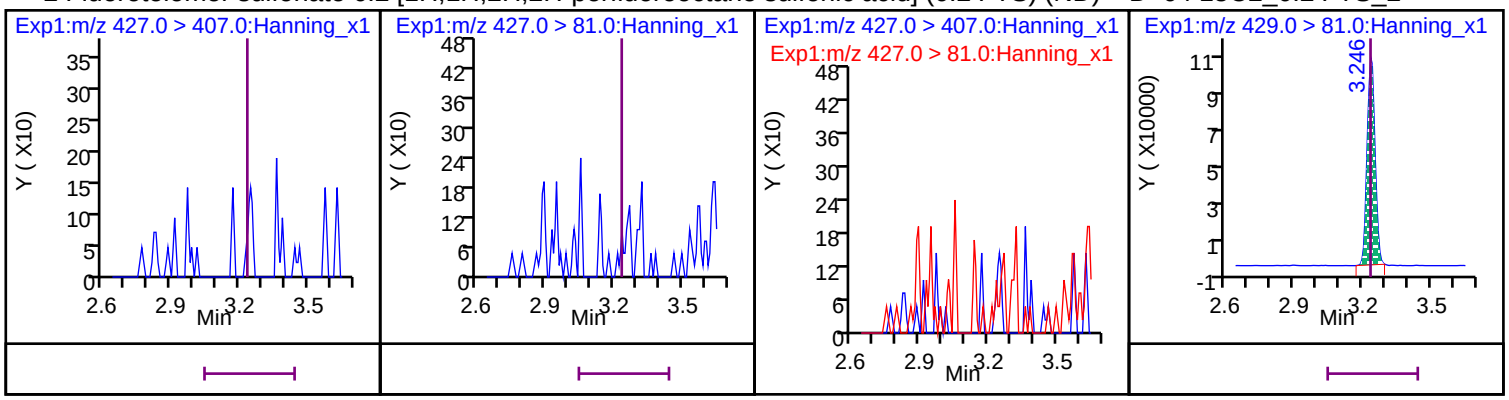
D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

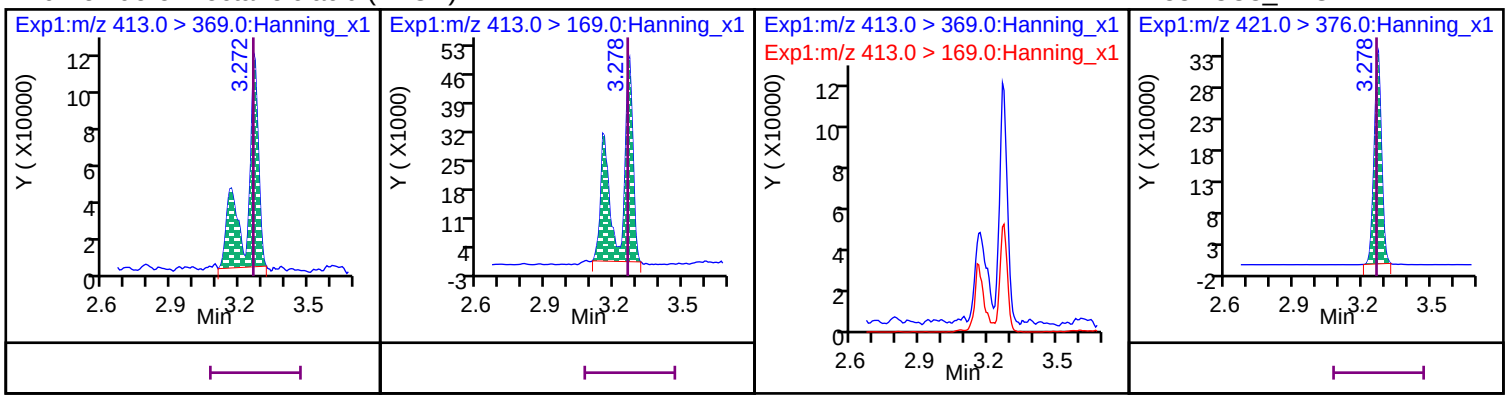
U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
M - Compound Hit/Peak Manually Integrated



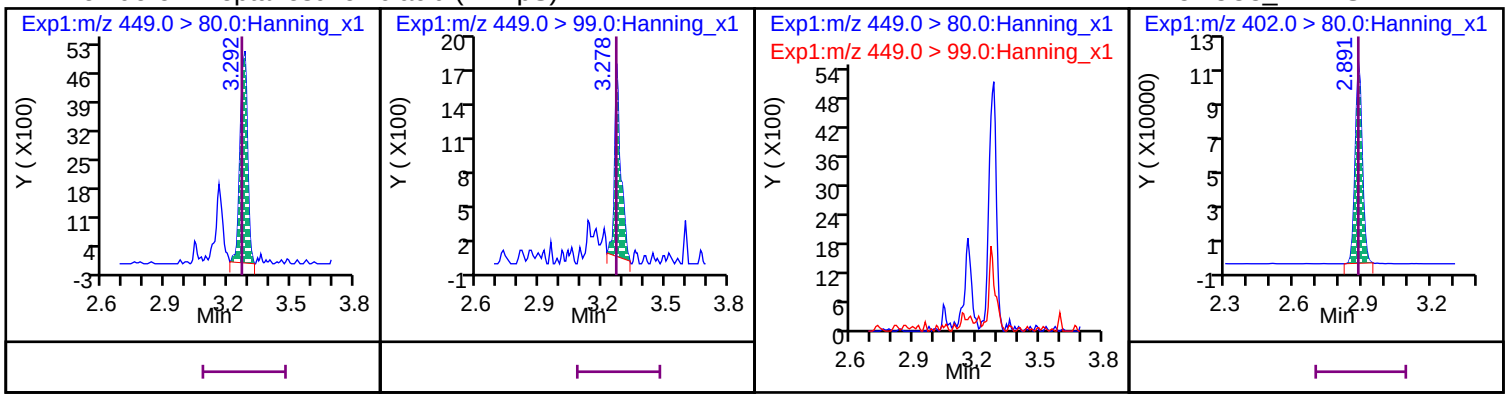
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) (ND) D 64 13C2_6:2 FTS_2



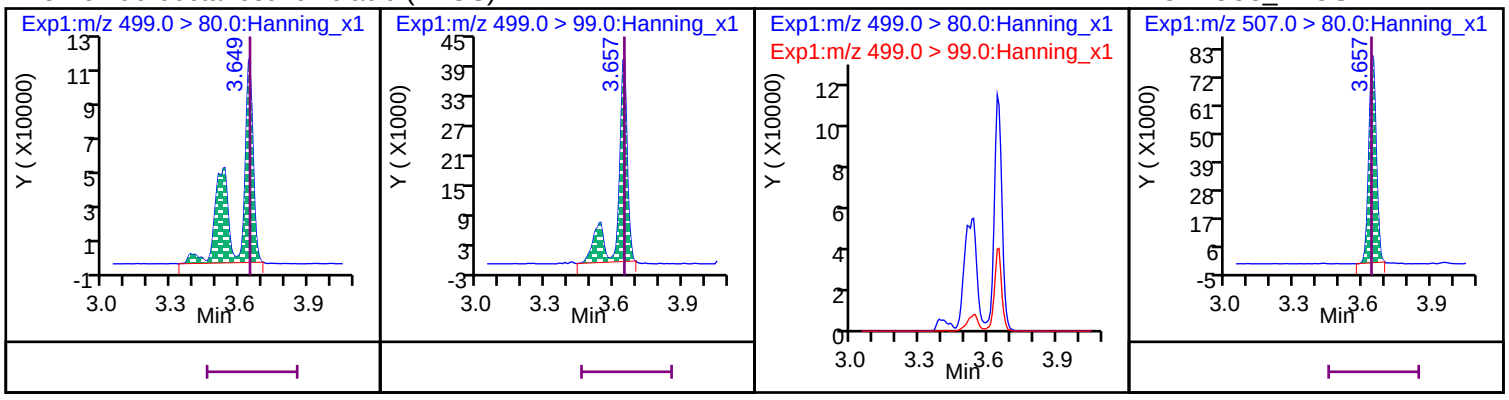
20 Perfluoro-n-octanoic acid (PFOA) D 53 13C8_PFOA



12 Perfluoro-1-heptanesulfonic acid (PFHpS) D 45 13C3_PFHxS



18 Perfluorooctanesulfonic acid (PFOS) D 54 13C8_PFOS



PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-006
Description: FB-1/26
Matrix: Aqueous
Date Sampled: 01/26/2021 1550
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	02/08/2021 1758	MMM	02/05/2021 1201	81968

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		7.4	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		7.4	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		7.4	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		7.4	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		7.4	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		7.4	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		7.4	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		7.4	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		7.4	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		3.7	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		3.7	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		98	25-150
13C2_6:2FTS		85	25-150
13C2_8:2FTS		91	25-150
13C2_PFDoA		106	25-150
13C2_PFTeDA		85	25-150
13C3_PFBS		93	25-150
13C3_PFHxS		92	25-150
13C3-HFPO-DA		106	25-150
13C4_PFBA		93	25-150
13C4_PFHpA		98	25-150
13C5_PFHxA		103	25-150
13C5_PFPeA		97	25-150
13C6_PFDA		84	25-150
13C7_PFUdA		90	25-150

LOQ = Limit of Quantitation
B = Detected in the method blank
E = Quantitation of compound exceeded the calibration range
ND = Not detected at or above the LOQ
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
H = Out of holding time
W = Reported on wet weight basis

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-006
Description: FB-1/26
Matrix: Aqueous
Date Sampled: 01/26/2021 1550
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		101	25-150
13C8_PFOS		90	25-150
13C8_PFOSA		95	10-150
13C9_PFNA		101	25-150
d5-EtFOSAA		93	25-150
d3-MeFOSAA		112	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821050.d		
Injection Date:	08-Feb-2021 17:58:02	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	35
Lab Sample ID:	WA28027-006	Lab Prep. Batch:	81968
Client ID:	FB-1/26	Sample Group:	WA28027
Sample Info:	WA28027-006	Misc. Info:	
Inst. ID:	LCMSMS01	Operator:	Matthew M. Miller
Method Name:	LCMSMS01_PFAS-ID	Version:	2020-09-23 10:00:21
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0407000

Name	Value	Units	Description
DF	1		Dilution Factor
VF	10000	ul	Final Volume
VI	270	ml	Initial Sample Volume
AlsDf	0.91		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.726	1.721	1	944822	17	>100:1			1001.00	1036.40	92.8	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													Js
212.9 > 168.9	46		1.728		ND								
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.109	2.110	0	996260	13	>100:1			1001.00	1073.94	97	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													U
262.9 > 218.9	50		2.110		ND								
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.172	2.162	1	323963	15	>100:1			1001.00	1033.61	92.6	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													U
298.9 > 80	44		2.162		ND								
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													U
349 > 80	44		2.520		ND								
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.441	2.442	0	274844	17	>100:1			5005.00	5518.89	98.4	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.442		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.485	2.485	0	896678	15	>100:1			1001.00	1049.15	103	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													U
313 > 269	49		2.477		ND								
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.602	2.602	0	798471	17	>100:1			5005.00	5476.25	106	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.602		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.874	2.865	1	833860	17	>100:1			1001.00	1070.83	97.8	
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													U
363 > 319	47		2.873		ND								
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.891	2.891	1	240545	17	>100:1			1001.00	1045.41	91.7	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													U
399 > 80	45		2.891		ND								
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.922		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													U
449 > 80	45		3.277		ND								
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.245	3.244	1	223814	20	>100:1			5005.00	5550.00	84.9	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.244		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.278	3.270	1	808569	21	>100:1			1001.00	1096.90	101	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													U
413 > 369	53		3.270		ND								
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.649	3.648	1	204115	18	>100:1			1001.00	976.65	90.1	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													U
499 > 80	54		3.656		ND								
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.863		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.991		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.280		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.449		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.656	3.656	1	795522	19	>100:1			1001.00	1114.78	101	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.656		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.964	3.955	1	438851	16	>100:1			1001.00	1025.69	94.5	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.964		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.991	3.991	1	183121	16	>100:1			5005.00	5770.03	90.9	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.991		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		4.000	4.000	1	586092	17	>100:1			1001.00	995.75	84.2	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		4.000		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.150	4.158	0	866635	18	>100:1			5005.00	5592.81	112	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.158		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.299	4.308	0	805361	17	>100:1			5005.00	5747.62	92.7	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.308		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.299	4.308	0	551546	16	>100:1			1001.00	1021.96	89.6	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.308		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.563	4.570	0	703381	16	>100:1			1001.00	1136.79	106	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.570		ND								

Signal	Quant Std	RT (min.)	Exp RT (min.)	□ RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.813		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		5.016	5.029	0	641269	18	>100:1			1001.00	970.66	85	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		5.029		ND								
*** 37 13C2_PFDA**													
515 > 470		4.000	4.000	1	720204	17	>100:1					113	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.485	2.485	0	868677	16	>100:1					112	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.278	3.277	1	824217	22	>100:1					94.3	
*** 43 13C3_PFBA**													
216 > 172		1.726	1.721	1	942726	18	>100:1					105	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.656	3.656	1	231615	18	>100:1					94.5	

Compound Type Legend

D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

U - Result Less Than Method Detection Limit
J - Compound Concentration Below Quantitation Limit
s - Detector Saturated or Negative Concentration



PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-007
Description: EB-HT
Matrix: Aqueous
Date Sampled: 01/26/2021 1705
Date Received: 01/28/2021

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	02/08/2021 1808	MMM	02/05/2021 1201	81968

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		8.1	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		8.1	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		8.1	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		8.1	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		8.1	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		8.1	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		8.1	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		8.1	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		8.1	ng/L	1
Perfluoro-1-butanesulfonic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-butanoic acid (PFBA)	375-22-4	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluoro-n-undecanoic acid (PFUdA)	2058-94-8	PFAS by ID SOP	ND		4.0	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		4.0	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		94	25-150
13C2_6:2FTS		103	25-150
13C2_8:2FTS		100	25-150
13C2_PFDoA		89	25-150
13C2_PFTeDA		87	25-150
13C3_PFBS		96	25-150
13C3_PFHxS		85	25-150
13C3-HFPO-DA		109	25-150
13C4_PFBA		98	25-150
13C4_PFHpA		106	25-150
13C5_PFHxA		110	25-150
13C5_PFPeA		98	25-150
13C6_PFDA		91	25-150
13C7_PFUdA		89	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Analytical Services, LLC *(formerly Shealy Environmental Services, Inc.)*
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.
Laboratory ID: WA28027-007
Description: EB-HT
Matrix: Aqueous
Date Sampled: 01/26/2021 1705
Date Received: 01/28/2021

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C8_PFOA		102	25-150
13C8_PFOS		99	25-150
13C8_PFOSA		95	10-150
13C9_PFNA		108	25-150
d5-EtFOSAA		83	25-150
d3-MeFOSAA		106	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
H = Out of holding time
B = Detected in the method blank
N = Recovery is out of criteria
W = Reported on wet weight basis
E = Quantitation of compound exceeded the calibration range
P = The RPD between two GC columns exceeds 40%

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821051.d		
Injection Date:	08-Feb-2021 18:08:36	Injection Vol:	10.0 uL
Sample Type:	Client	Auto Sampler:	36
Lab Sample ID:	WA28027-007	Lab Prep. Batch:	81968
Client ID:	EB-HT	Sample Group:	WA28027
Sample Info:	WA28027-007	Misc. Info:	
Inst. ID:	LCMSMS01	Operator:	Matthew M. Miller
Method Name:	LCMSMS01_PFAS-ID	Version:	2020-09-23 10:00:21
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0444899

Name	Value	Units	Description
DF	1		Dilution Factor
VF	10000	ul	Final Volume
VI	247	ml	Initial Sample Volume
AlsDf	0.91		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.719	1.721	0	996066	18	>100:1			1001.00	1092.61	97.8	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													U
212.9 > 168.9	46		1.728		ND								
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.109	2.110	0	1008728	13	>100:1			1001.00	1087.38	98.2	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													U
262.9 > 218.9	50		2.110		ND								
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.172	2.162	1	337338	17	>100:1			1001.00	1076.28	96.4	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													U
298.9 > 80	44		2.162		ND								
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													U
349 > 80	44		2.520		ND								
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.450	2.442	1	262929	17	>100:1			5005.00	5279.63	94.2	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.442		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.485	2.485	0	960530	16	>100:1			1001.00	1123.86	110	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													U
313 > 269	49		2.477		ND								
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.602	2.602	0	820263	16	>100:1			5005.00	5625.71	109	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.602		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.874	2.865	1	904478	18	>100:1			1001.00	1161.52	106	
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													U
363 > 319	47		2.873		ND								
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.891	2.891	1	223594	18	>100:1			1001.00	971.74	85.3	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													U
399 > 80	45		2.891		ND								
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.922		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													U
449 > 80	45		3.277		ND								
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.245	3.244	1	271485	21	>100:1			5005.00	6732.12	103	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.244		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.278	3.270	1	820351	21	>100:1			1001.00	1112.88	102	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													U
413 > 369	53		3.270		ND								
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.657	3.648	1	224194	20	>100:1			1001.00	1072.72	99	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													U
499 > 80	54		3.656		ND								
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.863		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.991		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.280		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.449		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.657	3.656	1	858010	18	>100:1			1001.00	1202.35	108	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.656		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.964	3.955	1	440974	18	>100:1			1001.00	1030.65	95	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.964		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.991	3.991	1	200993	16	>100:1			5005.00	6333.16	99.8	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.991		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		4.000	4.000	1	635685	16	>100:1			1001.00	1080.01	91.3	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		4.000		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.150	4.158	0	817214	18	>100:1			5005.00	5273.87	106	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.158		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.299	4.308	0	720139	18	>100:1			5005.00	5139.41	82.9	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.308		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.299	4.308	0	544460	16	>100:1			1001.00	1008.83	88.5	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.308		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.571	4.570	1	592342	17	>100:1			1001.00	957.33	89	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.570		ND								

Signal	Quant Std	RT (min.)	Exp RT (min.)	□ RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.813		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		5.017	5.029	0	659771	20	>100:1			1001.00	998.67	87.4	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		5.029		ND								
*** 37 13C2_PFDA**													
515 > 470		4.000	4.000	1	675641	17	>100:1					106	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.485	2.485	0	760891	16	>100:1					98.5	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.272	3.277	0	894157	21	>100:1					102	
*** 43 13C3_PFBA**													
216 > 172		1.719	1.721	0	913029	18	>100:1					102	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.657	3.656	1	254401	20	>100:1					104	

Compound Type Legend

D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

U - Result Less Than Method Detection Limit



PFAS by LC/MS/MS - MB

Sample ID: WQ81803-001
Batch: 81803
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/04/2021 1209

Parameter	Result	Q	Dil	LOQ	Units	Analysis Date
9Cl-PF3ONS	ND		1	8.0	ng/L	02/05/2021 1246
11Cl-PF3OUdS	ND		1	8.0	ng/L	02/05/2021 1246
8:2 FTS	ND		1	8.0	ng/L	02/05/2021 1246
6:2 FTS	ND		1	8.0	ng/L	02/05/2021 1246
4:2 FTS	ND		1	8.0	ng/L	02/05/2021 1246
GenX	ND		1	8.0	ng/L	02/05/2021 1246
ADONA	ND		1	8.0	ng/L	02/05/2021 1246
EtFOSAA	ND		1	8.0	ng/L	02/05/2021 1246
MeFOSAA	ND		1	8.0	ng/L	02/05/2021 1246
PFBS	ND		1	4.0	ng/L	02/05/2021 1246
PFDS	ND		1	4.0	ng/L	02/05/2021 1246
PFHpS	ND		1	4.0	ng/L	02/05/2021 1246
PFNS	ND		1	4.0	ng/L	02/05/2021 1246
PFOSA	ND		1	4.0	ng/L	02/05/2021 1246
PFPeS	ND		1	4.0	ng/L	02/05/2021 1246
PFHxS	ND		1	4.0	ng/L	02/05/2021 1246
PFBA	ND		1	4.0	ng/L	02/05/2021 1246
PFDA	ND		1	4.0	ng/L	02/05/2021 1246
PFDoA	ND		1	4.0	ng/L	02/05/2021 1246
PFHpA	ND		1	4.0	ng/L	02/05/2021 1246
PFHxA	ND		1	4.0	ng/L	02/05/2021 1246
PFNA	ND		1	4.0	ng/L	02/05/2021 1246
PFOA	ND		1	4.0	ng/L	02/05/2021 1246
PFPeA	ND		1	4.0	ng/L	02/05/2021 1246
PFTeDA	ND		1	4.0	ng/L	02/05/2021 1246
PFTrDA	ND		1	4.0	ng/L	02/05/2021 1246
PFUdA	ND		1	4.0	ng/L	02/05/2021 1246
PFOS	ND	✓	1	4.0	ng/L	02/05/2021 1246

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		108	25-150
13C2_6:2FTS		105	25-150
13C2_8:2FTS		111	25-150
13C2_PFDoA		101	25-150
13C2_PFTeDA		99	25-150
13C3_PFBS		97	25-150
13C3_PFHxS		96	25-150
13C3-HFPO-DA		101	25-150
13C4_PFBA		102	25-150
13C4_PFHpA		101	25-150
13C5_PFHxA		97	25-150
13C5_PFPeA		103	25-150

✓

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: WQ81803-001
Batch: 81803
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/04/2021 1209

Surrogate	Q	% Rec	Acceptance Limit
13C6_PFDA		107	25-150
13C7_PFUdA		99	25-150
13C8_PFOA		104	25-150
13C8_PFOS		87	25-150
13C8_PFOSA		96	10-150
13C9_PFNA		104	25-150
d5-EtFOSAA		99	25-150
d3-MeFOSAA		100	25-150



LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File:	\\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521010.d		
Injection Date:	05-Feb-2021 12:46:56	Injection Vol:	10.0 uL
Sample Type:	MBlk	Auto Sampler:	3
Lab Sample ID:	WQ81803-001	Lab Prep. Batch:	81803
Sample Info:	WQ81803-001	Misc. Info:	
Inst. ID:	LCMSMS02	Operator:	Stephen E. Somerville
Method Name:	LCMSMS02_PFAS-ID	Version:	2020-09-22 16:12:14
Calib Method:	PFAS-ID	Lock State:	Unlocked
Quant Method:	IsoDil	Integrator:	picker
Final Conc.:	Amt * DF * CF	Matrix/Level:	Aqueous

Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0439560

Name	Value	Units	Description
DF	1		Dilution Factor
VF	10000	ul	Final Volume
VI	250	ml	Initial Sample Volume
AlsDf	0.91		Auto Sampler Dilution Factor

Reagent:	Istds	Conc. Level:	Smp	Vol. Added:	0.0100 ml
Reagent:	Surrogates	Conc. Level:	Smp	Vol. Added:	0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.736	1.738	0	619843	22	>100:1			1001.00	928.70	102	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													U
212.9 > 168.9	46		1.738		ND								
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.129	2.131	0	604769	16	>100:1			1001.00	954.71	103	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													U
262.9 > 218.9	50		2.131		ND								
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.182	2.184	0	178667	17	>100:1			1001.00	933.87	97.4	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													U
298.9 > 80	44		2.184		ND								
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													U
349 > 80	44		2.514		ND								
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.442	2.443	0	105361	17	>100:1			5005.00	4734.98	108	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.434		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.477	2.479	0	629302	20	>100:1			1001.00	912.97	96.7	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													U
313 > 269	49		2.479		ND								
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.590	2.583	1	1184283	20	>100:1			5005.00	4911.09	101	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.591		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.845	2.837	1	524925	18	>100:1			1001.00	996.58	101	
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													U
363 > 319	47		2.847		ND								
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.863	2.865	0	124404	19	>100:1			1001.00	938.95	95.6	

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													U
399 > 80	45		2.856		ND								
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.882		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													U
449 > 80	45		3.231		ND								
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.209	3.204	1	80745	23	>100:1			5005.00	4811.25	105	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.211		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.236	3.224	1	535050	22	>100:1			1001.00	1037.81	104	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													U
413 > 369	53		3.224		ND								
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.616	3.610	1	102713	27	>100:1			1001.00	889.92	86.9	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													U
499 > 80	54		3.618		ND								
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.814		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.953		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.254		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.410		ND								
34 Perfluorododecanesulfonic acid (PFDOS) CAS: 79780-39-5													U
699 > 80	54		4.755		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.616	3.618	0	642376	22	>100:1			1001.00	995.16	104	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.618		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.932	3.927	1	245925	19	>100:1			1001.00	979.90	95.6	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.927		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.957	3.953	1	77515	20	>100:1			5005.00	4737.55	111	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.944		ND								
4 1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2FTS) CAS: 120226-60-0													U
627 > 607	65		4.551		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.967	3.962	1	618570	17	>100:1			1001.00	1028.53	107	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		3.962		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.118	4.122	0	628349	19	>100:1			5005.00	4842.86	100	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.113		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.268	4.274	0	546526	17	>100:1			1001.00	1011.28	98.6	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.274		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.278	4.274	1	575607	18	>100:1			5005.00	5274.55	98.9	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.284		ND								

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 61 d7-MeFOSE CAS: SESI-0129													
623 > 59		4.357	4.353	1	92507	17	>100:1			1001.00	1115.32	95.9	
32 2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE) CAS: 24448-09-7													U
616 > 59	61		4.363		ND								
D 57 d3-MeFOSA CAS: SESI-0109													
515 > 169		4.376	4.379	0	43891	16	>100:1			1001.00	965.96	119	
26 N-methylperfluoro-1-octanesulfonamide (MeFOSA) CAS: 31506-32-8													U
512 > 169	57		4.372		ND								
D 62 d9-EtFOSE CAS: SESI-0130													
639 > 59		4.519	4.515	1	110581	16	>100:1			1001.00	1152.43	111	
33 2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE) CAS: 1691-99-2													U
630 > 59	62		4.524		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.537	4.542	0	526214	18	>100:1			1001.00	1007.20	101	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.542		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.775		ND								
D 59 d5-EtFOSA CAS: SESI-0108													
531 > 169		4.537	4.533	1	37774	18	>100:1			1001.00	894.61	85.8	
27 N-ethylperfluoro-1-octanesulfonamide (EtFOSA) CAS: 4151-50-2													U
526 > 169	59		4.542		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		4.990	4.992	0	699924	23	>100:1			1001.00	952.97	98.8	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		4.992		ND								
D 40 13C2_PFHxDA CAS: SESI-0103													
815 > 770		5.377	5.382	0	740097	19	>100:1			1001.00	993.41	95.4	
35 Perfluoro-n-hexadecanoic acid (PFHxDA) CAS: 67905-19-5													U
813 > 769	40		5.382		ND								
36 Perfluoro-n-octadecanoic acid (PFODA) CAS: 16517-11-6													U
913 > 869	40		5.740		ND								
*** 37 13C2_PFDA**													
515 > 470		3.967	3.962	1	647080	18	>100:1					98.4	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.477	2.479	0	643874	18	>100:1					100	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.229	3.231	0	544162	21	>100:1					100	
*** 43 13C3_PFBA**													
216 > 172		1.736	1.738	0	617777	22	>100:1					106	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.608	3.610	0	125834	22	>100:1					102	

Compound Type Legend

D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

U - Result Less Than Method Detection Limit

PFAS by LC/MS/MS - MB

Sample ID: WQ81968-001
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Parameter	Result	Q	Dil	LOQ	Units	Analysis Date
9Cl-PF3ONS	ND		1	8.0	ng/L	02/08/2021 1643
11Cl-PF3OUdS	ND		1	8.0	ng/L	02/08/2021 1643
8:2 FTS	ND		1	8.0	ng/L	02/08/2021 1643
6:2 FTS	ND		1	8.0	ng/L	02/08/2021 1643
4:2 FTS	ND		1	8.0	ng/L	02/08/2021 1643
GenX	ND		1	8.0	ng/L	02/08/2021 1643
ADONA	ND		1	8.0	ng/L	02/08/2021 1643
EtFOSAA	ND		1	8.0	ng/L	02/08/2021 1643
MeFOSAA	ND		1	8.0	ng/L	02/08/2021 1643
PFBS	ND		1	4.0	ng/L	02/08/2021 1643
PFDS	ND		1	4.0	ng/L	02/08/2021 1643
PFHpS	ND		1	4.0	ng/L	02/08/2021 1643
PFNS	ND		1	4.0	ng/L	02/08/2021 1643
PFOSA	ND		1	4.0	ng/L	02/08/2021 1643
PFPeS	ND		1	4.0	ng/L	02/08/2021 1643
PFHxS	ND		1	4.0	ng/L	02/08/2021 1643
PFBA	ND		1	4.0	ng/L	02/08/2021 1643
PFDA	ND		1	4.0	ng/L	02/08/2021 1643
PFDoA	ND		1	4.0	ng/L	02/08/2021 1643
PFHpA	ND		1	4.0	ng/L	02/08/2021 1643
PFHxA	ND		1	4.0	ng/L	02/08/2021 1643
PFNA	ND		1	4.0	ng/L	02/08/2021 1643
PFOA	ND		1	4.0	ng/L	02/08/2021 1643
PFPeA	ND		1	4.0	ng/L	02/08/2021 1643
PFTeDA	ND		1	4.0	ng/L	02/08/2021 1643
PFTrDA	ND		1	4.0	ng/L	02/08/2021 1643
PFUdA	ND		1	4.0	ng/L	02/08/2021 1643
PFOS	ND		1	4.0	ng/L	02/08/2021 1643

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		120	25-150
13C2_6:2FTS		109	25-150
13C2_8:2FTS		119	25-150
13C2_PFDoA		112	25-150
13C2_PFTeDA		100	25-150
13C3_PFBS		101	25-150
13C3_PFHxS		109	25-150
13C3-HFPO-DA		123	25-150
13C4_PFBA		113	25-150
13C4_PFHpA		112	25-150
13C5_PFHxA		114	25-150
13C5_PFPeA		109	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
* = RSD is out of criteria
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: WQ81968-001
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Surrogate	Q	% Rec	Acceptance Limit
13C6_PFDA		101	25-150
13C7_PFUdA		101	25-150
13C8_PFOA		112	25-150
13C8_PFOS		102	25-150
13C8_PFOSA		103	10-150
13C9_PFNA		108	25-150
d5-EtFOSAA		98	25-150
d3-MeFOSAA		121	25-150



LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Pace Environmental Services, LLC
Analyte Quantitation Report

Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821043.d
Injection Date: 08-Feb-2021 16:43:57 Injection Vol: 10.0 uL
Sample Type: MBlk Auto Sampler: 28
Lab Sample ID: WQ81968-001 Lab Prep. Batch: 81968
Sample Info: WQ81968-001 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Final Conc.: Amt * DF * CF Matrix/Level: Aqueous
Concentration Formula: CF = (VF/1000) * 1/VI *(1/AlsDf) = 0.0392465

Name	Value	Units	Description
DF	1		Dilution Factor
VF	10000	ul	Final Volume
VI	280	ml	Initial Sample Volume
AlsDf	0.91		Auto Sampler Dilution Factor

Reagent: Istds Conc. Level: Smp Vol. Added: 0.0100 ml
Reagent: Surrogates Conc. Level: Smp Vol. Added: 0.1100 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.719	1.721	0	1148765	18	>100:1			1001.00	1260.11	113	
8 Perfluoro-n-butanoic acid (PFBA) CAS: 375-22-4													U
212.9 > 168.9	46		1.728		ND								
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.109	2.110	0	1121586	14	>100:1			1001.00	1209.04	109	
21 Perfluoro-n-pentanoic acid (PFPeA) CAS: 2706-90-3													U
262.9 > 218.9	50		2.110		ND								
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.161	2.162	0	354878	14	>100:1			1001.00	1132.25	101	
7 Perfluoro-1-butanesulfonic acid (PFBS) CAS: 375-73-5													U
298.9 > 80	44		2.162		ND								
22 Perfluoro-1-pentanesulfonic acid (PFPeS) CAS: 2706-91-4													U
349 > 80	44		2.520		ND								
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.441	2.442	0	336230	16	>100:1			5005.00	6751.52	120	
1 Fluorotelomer sulfonate 4:2 [1H,1H,2H,2H-perfluorohexane sulfonic acid] (4:2 FTS) CAS: 757124-72-4													U
327 > 307	63		2.442		ND								
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.485	2.485	0	995488	16	>100:1			1001.00	1164.76	114	
15 Perfluoro-n-hexanoic acid (PFHxA) CAS: 307-24-4													U
313 > 269	49		2.477		ND								
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.602	2.602	0	923356	17	>100:1			5005.00	6332.76	123	
28 Hexafluoropropylene oxide dimer acid (GenX) CAS: 13252-13-6													U
285 > 119	66		2.602		ND								
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.874	2.865	1	955453	17	>100:1			1001.00	1226.98	112	
13 Perfluoro-n-heptanoic acid (PFHpA) CAS: 375-85-9													U
363 > 319	47		2.873		ND								
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.891	2.891	1	285457	17	>100:1			1001.00	1240.60	109	

Signal	Quant Std	RT (min.)	Exp RT (min.)	□RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
14 Perfluorohexanesulfonic acid (PFHxS) CAS: 355-46-4													U
399 > 80	45		2.891		ND								
29 4,8-dioxa-3H-perfluorononanoic acid (ADONA) CAS: 919005-14-4													U
377 > 251	45		2.922		ND								
12 Perfluoro-1-heptanesulfonic acid (PFHpS) CAS: 375-92-8													U
449 > 80	45		3.277		ND								
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.252	3.244	1	288378	21	>100:1			5005.00	7151.02	109	
2 Fluorotelomer sulfonate 6:2 [1H,1H,2H,2H-perfluorooctane sulfonic acid] (6:2 FTS) CAS: 27619-97-2													U
427 > 407	64		3.244		ND								
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.272	3.270	1	896778	21	>100:1			1001.00	1216.56	112	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													U
413 > 369	53		3.270		ND								
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.649	3.648	1	229957	20	>100:1			1001.00	1100.30	102	
18 Perfluorooctanesulfonic acid (PFOS) CAS: 1763-23-1													U
499 > 80	54		3.656		ND								
30 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS) CAS: 756426-58-1													U
531 > 351	54		3.863		ND								
16 Perfluoro-1-nonanesulfonic acid (PFNS) CAS: 68259-12-1													U
549 > 80	54		3.991		ND								
9 Perfluoro-1-decanesulfonic acid (PFDS) CAS: 335-77-3													U
599 > 80	54		4.280		ND								
31 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS) CAS: 763051-92-9													U
631 > 451	54		4.449		ND								
34 Perfluorododecanesulfonic acid (PFDOS) CAS: 79780-39-5													U
699 > 80	54		4.782		ND								
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.649	3.656	0	850851	20	>100:1			1001.00	1192.32	108	
17 Perfluoro-n-nonanoic acid (PFNA) CAS: 375-95-1													U
463 > 419	56		3.656		ND								
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.955	3.955	1	476255	17	>100:1			1001.00	1113.11	103	
19 Perfluoro-1-octanesulfonamide (PFOSA) CAS: 754-91-6													U
498 > 78	55		3.964		ND								
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.982	3.991	0	239210	21	>100:1			5005.00	7537.35	119	
3 Fluorotelomer sulfonate 8:2 [1H,1H,2H,2H-perfluorodecane sulfonic acid] (8:2 FTS) CAS: 39108-34-4													U
527 > 507	65		3.991		ND								
4 1H,1H,2H,2H-perfluorododecane sulfonic acid (10:2FTS) CAS: 120226-60-0													U
627 > 607	65		4.586		ND								
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		4.000	4.000	1	701826	16	>100:1			1001.00	1192.38	101	
10 Perfluoro-n-decanoic acid (PFDA) CAS: 335-76-2													U
513 > 469	51		4.000		ND								
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.150	4.158	0	933884	19	>100:1			5005.00	6026.80	121	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													U
570 > 419	58		4.158		ND								
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.299	4.308	0	847429	16	>100:1			5005.00	6047.84	97.6	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													U
584 > 419	60		4.308		ND								
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.299	4.308	0	624236	15	>100:1			1001.00	1156.64	101	
25 Perfluoro-n-undecanoic acid (PFUdA) CAS: 2058-94-8													U
563 > 519	52		4.308		ND								

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	OnCol Conc ng/L	Final Conc ng/L	%Rec	Flags
D 61 d7-MeFOSE CAS: SESI-0129													
623 > 59		4.381	4.372	1	160538	15	>100:1			1001.00	978.94	100	
32 2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE) CAS: 24448-09-7													U
616 > 59	61		4.389		ND								
D 57 d3-MeFOSA CAS: SESI-0109													
515 > 169		4.407	4.398	1	51375	15	>100:1			1001.00	848.17	77.9	
26 N-methylperfluoro-1-octanesulfonamide (MeFOSA) CAS: 31506-32-8													U
512 > 169	57		4.398		ND								
D 38 13C2_PFDoA CAS: SESI-0118													
615 > 570		4.571	4.570	1	741844	17	>100:1			1001.00	1198.95	112	
11 Perfluoro-n-dodecanoic acid (PFDoA) CAS: 307-55-1													U
613 > 569	38		4.570		ND								
24 Perfluoro-n-tridecanoic acid (PFTrDA) CAS: 72629-94-8													U
663 > 619	38		4.813		ND								
D 62 d9-EtFOSE CAS: SESI-0130													
639 > 59		4.547	4.538	1	158672	15	>100:1			1001.00	1026.40	92	
33 2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE) CAS: 1691-99-2													U
630 > 59	62		4.554		ND								
D 59 d5-EtFOSA CAS: SESI-0108													
531 > 169		4.563	4.563	1	55515	16	>100:1			1001.00	919.36	90.7	
27 N-ethylperfluoro-1-octanesulfonamide (EtFOSA) CAS: 4151-50-2													U
526 > 169	59		4.563		ND								
D 42 13C2_PFTeDA CAS: SESI-0119													
715 > 670		5.017	5.029	0	754703	19	>100:1			1001.00	1142.36	100	
23 Perfluoro-n-tetradecanoic acid (PFTeDA) CAS: 376-06-7													U
713 > 669	42		5.029		ND								
D 40 13C2_PFHxDA CAS: SESI-0103													
815 > 770		5.396	5.412	0	417157	17	>100:1			1001.00	1175.75	112	
35 Perfluoro-n-hexadecanoic acid (PFHxDA) CAS: 67905-19-5													U
813 > 769	40		5.421		ND								
36 Perfluoro-n-octadecanoic acid (PFODA) CAS: 16517-11-6													U
913 > 869	40		5.785		ND								
*** 37 13C2_PFDA**													
515 > 470		4.000	4.000	1	699650	17	>100:1					110	
*** 39 13C2_PFHxA CAS: SESI-0120**													
315 > 270		2.485	2.485	0	839211	16	>100:1					109	
*** 41 13C2_PFOA CAS: 864071-08-9**													
415 > 370		3.272	3.277	0	874548	20	>100:1					100	
*** 43 13C3_PFBA**													
216 > 172		1.719	1.721	0	958922	18	>100:1					107	
*** 48 13C4_PFOS CAS: 2795-39-3**													
503 > 80		3.649	3.656	0	255050	20	>100:1					104	

Compound Type Legend

D - Isotopic Dilution Std.
* - ISTD

QC Flag Legend

U - Result Less Than Method Detection Limit

PFAS by LC/MS/MS - LCS

Sample ID: WQ81803-002
Batch: 81803
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/04/2021 1209

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
9Cl-PF3ONS	15	14		1	97	50-150	02/05/2021 1257
11Cl-PF3OUdS	15	14		1	95	50-150	02/05/2021 1257
8:2 FTS	15	14		1	93	50-150	02/05/2021 1257
6:2 FTS	15	16		1	109	50-150	02/05/2021 1257
4:2 FTS	15	13		1	89	50-150	02/05/2021 1257
GenX	32	32		1	100	50-150	02/05/2021 1257
ADONA	15	16		1	108	50-150	02/05/2021 1257
EtFOSAA	16	17		1	105	50-150	02/05/2021 1257
MeFOSAA	16	17		1	103	50-150	02/05/2021 1257
PFBS	14	13		1	94	50-150	02/05/2021 1257
PFDS	15	15		1	100	50-150	02/05/2021 1257
PFHpS	15	16		1	108	50-150	02/05/2021 1257
PFNS	15	16		1	103	50-150	02/05/2021 1257
PFOSA	16	16		1	98	50-150	02/05/2021 1257
PFPeS	15	15		1	101	50-150	02/05/2021 1257
PFHxS	15	15		1	103	50-150	02/05/2021 1257
PFBA	16	15		1	97	50-150	02/05/2021 1257
PFDA	16	16		1	97	50-150	02/05/2021 1257
PFDoA	16	16		1	100	50-150	02/05/2021 1257
PFHpA	16	15		1	93	50-150	02/05/2021 1257
PFHxA	16	16		1	102	50-150	02/05/2021 1257
PFNA	16	17		1	109	50-150	02/05/2021 1257
PFOA	16	16		1	101	50-150	02/05/2021 1257
PFPeA	16	15		1	95	50-150	02/05/2021 1257
PFTeDA	16	17		1	106	50-150	02/05/2021 1257
PFTrDA	16	19		1	117	50-150	02/05/2021 1257
PFUdA	16	15		1	93	50-150	02/05/2021 1257
PFOS	15	14		1	96	50-150	02/05/2021 1257

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		96	25-150
13C2_6:2FTS		99	25-150
13C2_8:2FTS		110	25-150
13C2_PFDoA		96	25-150
13C2_PFTeDA		94	25-150
13C3_PFBS		90	25-150
13C3_PFHxS		87	25-150
13C3-HFPO-DA		95	25-150
13C4_PFBA		97	25-150
13C4_PFHpA		100	25-150
13C5_PFHxA		94	25-150
13C5_PFPeA		97	25-150

LCS/MS/MSD spikes evaluated 70-150 as historically reported

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ81803-002
Batch: 81803
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/04/2021 1209

Surrogate	Q	% Rec	Acceptance Limit
13C6_PFDA		99	25-150
13C7_PFUdA		98	25-150
13C8_PFOA		96	25-150
13C8_PFOS		87	25-150
13C8_PFOSA		94	10-150
13C9_PFNA		94	25-150
d5-EtFOSAA		88	25-150
d3-MeFOSAA		98	25-150



LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ81968-002
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
9Cl-PF3ONS	14	13		1	98	50-150	02/08/2021 1654
11Cl-PF3OUdS	14	13		1	95	50-150	02/08/2021 1654
8:2 FTS	14	12		1	85	50-150	02/08/2021 1654
6:2 FTS	14	14		1	99	50-150	02/08/2021 1654
4:2 FTS	14	15		1	114	50-150	02/08/2021 1654
GenX	29	31		1	107	50-150	02/08/2021 1654
ADONA	14	15		1	111	50-150	02/08/2021 1654
EtFOSAA	14	15		1	107	50-150	02/08/2021 1654
MeFOSAA	14	18		1	123	50-150	02/08/2021 1654
PFBS	13	13		1	101	50-150	02/08/2021 1654
PFDS	14	15		1	110	50-150	02/08/2021 1654
PFHpS	14	14		1	98	50-150	02/08/2021 1654
PFNS	14	14		1	101	50-150	02/08/2021 1654
PFOSA	14	15		1	101	50-150	02/08/2021 1654
PFPeS	14	14		1	100	50-150	02/08/2021 1654
PFHxS	13	12	✓	1	94	50-150	02/08/2021 1654
PFBA	14	14		1	96	50-150	02/08/2021 1654
PFDA	14	17		1	119	50-150	02/08/2021 1654
PFDoA	14	15		1	102	50-150	02/08/2021 1654
PFHpA	14	14		1	99	50-150	02/08/2021 1654
PFHxA	14	15		1	100	50-150	02/08/2021 1654
PFNA	14	15		1	102	50-150	02/08/2021 1654
PFOA	14	15	✓	1	105	50-150	02/08/2021 1654
PFPeA	14	14		1	98	50-150	02/08/2021 1654
PFTeDA	14	15		1	104	50-150	02/08/2021 1654
PFTrDA	14	15		1	102	50-150	02/08/2021 1654
PFUdA	14	15		1	102	50-150	02/08/2021 1654
PFOS	13	14		1	107	50-150	02/08/2021 1654

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		111	25-150
13C2_6:2FTS		105	25-150
13C2_8:2FTS		112	25-150
13C2_PFDoA		104	25-150
13C2_PFTeDA		98	25-150
13C3_PFBS		93	25-150
13C3_PFHxS		97	25-150
13C3-HFPO-DA		111	25-150
13C4_PFBA		105	25-150
13C4_PFHpA		109	25-150
13C5_PFHxA		120	25-150
13C5_PFPeA		110	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ81968-002
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Surrogate	Q	% Rec	Acceptance Limit
13C6_PFDA		91	25-150
13C7_PFUdA		103	25-150
13C8_PFOA		112	25-150
13C8_PFOS		92	25-150
13C8_PFOSA		105	10-150
13C9_PFNA		100	25-150
d5-EtFOSAA		98	25-150
d3-MeFOSAA		108	25-150



LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
* = RSD is out of criteria
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MS

Sample ID: WA28027-005MS
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Parameter	Sample Amount (ng/L)	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
9Cl-PF3ONS	ND	13	7.2		1	55	50-150	02/08/2021 1736
11Cl-PF3OUdS	ND	13	6.6		1	50	50-150	02/08/2021 1736
8:2 FTS	ND	13	8.0		1	59	50-150	02/08/2021 1736
6:2 FTS	ND	13	8.7		1	65	50-150	02/08/2021 1736
4:2 FTS	ND	13	7.1		1	54	50-150	02/08/2021 1736
GenX	ND	28	16		1	57	50-150	02/08/2021 1736
ADONA	ND	13	7.6		1	57	50-150	02/08/2021 1736
EtFOSAA	ND	14	7.4		1	52	50-150	02/08/2021 1736
MeFOSAA	ND	14	9.0		1	64	50-150	02/08/2021 1736
PFBS	32	12	25	N	1	-56	50-150	02/08/2021 1736
PFDS	ND	14	6.6	N	1	49	50-150	02/08/2021 1736
PFHpS	ND	13	8.5		1	63	50-150	02/08/2021 1736
PFNS	ND	14	6.8		1	50	50-150	02/08/2021 1736
PFOSA	ND	14	6.7	N	1	48	50-150	02/08/2021 1736
PFPeS	17	13	17	N	1	-1.6	50-150	02/08/2021 1736
PFHxS	19	13	18	N	1	-9.3	50-150	02/08/2021 1736
PFBA	9.5	14	12	N	1	20	50-150	02/08/2021 1736
PFDA	ND	14	7.2		1	51	50-150	02/08/2021 1736
PFDoA	ND	14	8.4		1	60	50-150	02/08/2021 1736
PFHpA	7.2	14	12	N	1	34	50-150	02/08/2021 1736
PFHxA	12	14	14	N	1	11	50-150	02/08/2021 1736
PFNA	ND	14	8.2		1	58	50-150	02/08/2021 1736
PFOA	21	14	18	N	1	-22	50-150	02/08/2021 1736
PFPeA	6.0	14	11	N	1	34	50-150	02/08/2021 1736
PFTeDA	ND	14	8.0		1	57	50-150	02/08/2021 1736
PFTrDA	ND	14	8.1		1	58	50-150	02/08/2021 1736
PFUdA	ND	14	7.4		1	52	50-150	02/08/2021 1736
PFOS	92	13	59	N	1	-252	50-150	02/08/2021 1736

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS	N	181	25-150
13C2_6:2FTS	N	159	25-150
13C2_8:2FTS	N	169	25-150
13C2_PFDoA	N	163	25-150
13C2_PFTeDA	N	156	25-150
13C3_PFBS	N	167	25-150
13C3_PFHxS	N	166	25-150
13C3-HFPO-DA	N	186	25-150
13C4_PFBA	N	175	25-150
13C4_PFHpA	N	182	25-150
13C5_PFHxA	N	212	25-150
13C5_PFPeA	N	179	25-150

"surrogate" double spiked per case narrative, results theoretically halved. not used to evaluate

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MS

Sample ID: WA28027-005MS
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Surrogate	Q	% Rec	Acceptance Limit
13C6_PFDA	N	174	25-150
13C7_PFUdA	N	177	25-150
13C8_PFOA	N	182	25-150
13C8_PFOS	N	157	25-150
13C8_PFOSA	N	212	10-150
13C9_PFNA	N	174	25-150
d5-EtFOSAA	N	152	25-150
d3-MeFOSAA	N	168	25-150

LOQ = Limit of Quantitation
ND = Not detected at or above the LOQ
N = Recovery is out of criteria
P = The RPD between two GC columns exceeds 40%
* = RSD is out of criteria
+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MSD

Sample ID: WA28027-005MD
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Parameter	Sample Amount (ng/L)	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
9Cl-PF3ONS	ND	14	6.5	N	1	47	10	50-150	30	02/08/2021 1747
11Cl-PF3OUdS	ND	14	5.8	N	1	41	13	50-150	30	02/08/2021 1747
8:2 FTS	ND	14	5.7	N,+	1	40	34	50-150	30	02/08/2021 1747
6:2 FTS	ND	14	7.9		1	57	9.3	50-150	30	02/08/2021 1747
4:2 FTS	ND	14	7.8		1	57	9.7	50-150	30	02/08/2021 1747
GenX	ND	30	16		1	56	2.6	50-150	30	02/08/2021 1747
ADONA	ND	14	8.7		1	63	14	50-150	30	02/08/2021 1747
EtFOSAA	ND	15	6.8	N	1	46	7.5	50-150	30	02/08/2021 1747
MeFOSAA	ND	15	8.0		1	54	12	50-150	30	02/08/2021 1747
PFBS	32	13	25	N	1	-57	1.9	50-150	30	02/08/2021 1747
PFDS	ND	14	7.0	N	1	49	5.1	50-150	30	02/08/2021 1747
PFHpS	ND	14	9.5		1	68	12	50-150	30	02/08/2021 1747
PFNS	ND	14	7.2		1	51	5.8	50-150	30	02/08/2021 1747
PFOSA	ND	15	8.5		1	58	23	50-150	30	02/08/2021 1747
PFPeS	17	14	19	N	1	13	12	50-150	30	02/08/2021 1747
PFHxS	19	13	20	N	1	4.5	9.5	50-150	30	02/08/2021 1747
PFBA	9.5	15	13	N	1	21	2.6	50-150	30	02/08/2021 1747
PFDA	ND	15	7.3	N	1	49	1.9	50-150	30	02/08/2021 1747
PFDoA	ND	15	7.9		1	54	6.4	50-150	30	02/08/2021 1747
PFHpA	7.2	15	11	N	1	24	10	50-150	30	02/08/2021 1747
PFHxA	12	15	15	N	1	17	7.0	50-150	30	02/08/2021 1747
PFNA	ND	15	8.3		1	57	1.4	50-150	30	02/08/2021 1747
PFOA	21	15	20	N	1	-5.3	12	50-150	30	02/08/2021 1747
PFPeA	6.0	15	11	N	1	36	4.1	50-150	30	02/08/2021 1747
PFTeDA	ND	15	8.3		1	56	3.1	50-150	30	02/08/2021 1747
PFTrDA	ND	15	8.0		1	54	1.4	50-150	30	02/08/2021 1747
PFUdA	ND	15	9.1		1	61	21	50-150	30	02/08/2021 1747
PFOS	92	14	57	N	1	-259	4.4	50-150	30	02/08/2021 1747

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS	N	209	25-150
13C2_6:2FTS	N	179	25-150
13C2_8:2FTS	N	209	25-150
13C2_PFDoA	N	172	25-150
13C2_PFTeDA	N	157	25-150
13C3_PFBS	N	159	25-150
13C3_PFHxS	N	156	25-150
13C3-HFPO-DA	N	196	25-150
13C4_PFBA	N	176	25-150
13C4_PFHpA	N	203	25-150
13C5_PFHxA	N	199	25-150
13C5_PFPeA	N	177	25-150

"surrogate" double spiked per case narrative, results theoretically halved. not used to evaluate

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MSD

Sample ID: WA28027-005MD
Batch: 81968
Analytical Method: PFAS by ID SOP

Matrix: Aqueous
Prep Method: SOP SPE
Prep Date: 02/05/2021 1201

Surrogate	Q	% Rec	Acceptance Limit
13C6_PFDA	N	170	25-150
13C7_PFUdA	N	166	25-150
13C8_PFOA	N	186	25-150
13C8_PFOS	N	162	25-150
13C8_PFOSA	N	180	10-150
13C9_PFNA	N	176	25-150
d5-EtFOSAA	N	160	25-150
d3-MeFOSAA	N	202	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

AnalyticalMethod: PFAS by ID SOP Matrix: Water

CLIENT SAMPLE ID	IDS1	IDS2	IDS3	IDS4	IDS5	IDS6	IDS7	IDS8	IDS9
HS-PW-2.5 (A)	97	90	102	94	91	96	100	101	99
HS-PW-2.5 (B)	107	103	110	97	87	96	95	101	96
HS-PW-3 (A)	110	108	108	101	97	109	103	107	108
HS-PW-3 (A) DUP	105	92	106	93	95	105	102	101	104
HS-PW-3.5 (A)	97	92	100	81	77	88	89	97	91
FB-1/26	98	85	91	106	85	93	92	106	93
EB-HT	94	103	100	89	87	96	85	109	98
WQ81803-001	108	105	111	101	99	97	96	101	102
WQ81803-002	96	99	110	96	94	90	87	95	97
WQ81968-001	120	109	119	112	100	101	109	123	113
WQ81968-002	111	105	112	104	98	93	97	111	105
HS-PW-3.5 (A)MS	181 *	159 *	169 *	163 *	156 *	167 *	166 *	186 *	175 *
HS-PW-3.5 (A)MSD	209 *	179 *	209 *	172 *	157 *	159 *	156 *	196 *	176 *

	QC LIMITS
IDS1 = 13C2_4:2FTS	25-150
IDS2 = 13C2_6:2FTS	25-150
IDS3 = 13C2_8:2FTS	25-150
IDS4 = 13C2_PFDoA	25-150
IDS5 = 13C2_PFTeDA	25-150
IDS6 = 13C3_PFBS	25-150
IDS7 = 13C3_PFHxS	25-150
IDS8 = 13C3-HFPO-DA	25-150
IDS9 = 13C4_PFBA	25-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

AnalyticalMethod: PFAS by ID SOP Matrix: Water

CLIENT SAMPLE ID	IDS10	IDS11	IDS12	IDS13	IDS14	IDS15	IDS16	IDS17	
HS-PW-2.5 (A)	98	97	98	92	97	103	92	97	
HS-PW-2.5 (B)	105	101	105	96	96	105	85	94	
HS-PW-3 (A)	106	103	112	100	103	109	102	103	
HS-PW-3 (A) DUP	99	96	103	103	98	101	95	97	
HS-PW-3.5 (A)	95	102	95	92	94	93	79	96	
FB-1/26	98	103	97	84	90	101	90	95	
EB-HT	106	110	98	91	89	102	99	95	
WQ81803-001	101	97	103	107	99	104	87	96	
WQ81803-002	100	94	97	99	98	96	87	94	
WQ81968-001	112	114	109	101	101	112	102	103	
WQ81968-002	109	120	110	91	103	112	92	105	
HS-PW-3.5 (A)MS	182 *	212 *	179 *	174 *	177 *	182 *	157 *	212 *	
HS-PW-3.5 (A)MSD	203 *	199 *	177 *	170 *	166 *	186 *	162 *	180 *	

	QC LIMITS
IDS10 = 13C4_PFHpA	25-150
IDS11 = 13C5_PFHxA	25-150
IDS12 = 13C5_PFPeA	25-150
IDS13 = 13C6_PFDA	25-150
IDS14 = 13C7_PFUdA	25-150
IDS15 = 13C8_PFOA	25-150
IDS16 = 13C8_PFOS	25-150
IDS17 = 13C8_PFOSA	10-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 2
ISOTOPE DILUTION STANDARD RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

AnalyticalMethod: PFAS by ID SOP Matrix: Water

CLIENT SAMPLE ID	IDS18	IDS19	IDS20						TOT OUT
HS-PW-2.5 (A)	93	96	100						0
HS-PW-2.5 (B)	94	92	101						0
HS-PW-3 (A)	104	105	110						0
HS-PW-3 (A) DUP	96	91	101						0
HS-PW-3.5 (A)	95	78	100						0
FB-1/26	101	93	112						0
EB-HT	108	83	106						0
WQ81803-001	104	99	100						0
WQ81803-002	94	88	98						0
WQ81968-001	108	98	121						0
WQ81968-002	100	98	108						0
HS-PW-3.5 (A)MS	174 *	152 *	168 *						20
HS-PW-3.5 (A)MSD	176 *	160 *	202 *						20

	QC LIMITS
IDS18 = 13C9_PFNA	25-150
IDS19 = d5-EtFOSAA	25-150
IDS20 = d3-MeFOSAA	25-150

* Recoveries outside QC limits
D IDS Diluted Out

FORM 3
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

Analytical Method: PFAS by ID SOP Matrix: Water

Client Sample ID (Matrix Spike/Matrix Spike Duplicate): HS-PW-3.5 (A)

Instrument ID: _Sciex 4500_LCMSMS1 Lab Sample ID: WA28027-005MS

Concentration Units (ug/L, mg/L, ug/kg): ng/L

ANALYTE	SPIKE ADDED	SAMPLE CONCENTRATION	MS CONCENTRATION	MS %REC	#	QC LIMITS REC.
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	13		7.2	55		50-150
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	13		6.6	50		50-150
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	13		8	59		50-150
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	13		8.7	65		50-150
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	13		7.1	54		50-150
Hexafluoropropylene oxide dimer acid (GenX)	28		16	57		50-150
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	13		7.6	57		50-150
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	14		7.4	52		50-150
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	14		9	64		50-150
Perfluoro-1-butanesulfonic acid (PFBS)	12	32	25	-56	*	50-150
Perfluoro-1-decanesulfonic acid (PFDS)	14		6.6	49	*	50-150
Perfluoro-1-heptanesulfonic acid (PFHpS)	13		8.5	63		50-150
Perfluoro-1-nonanesulfonic acid (PFNS)	14		6.8	50		50-150
Perfluoro-1-octanesulfonamide (PFOSA)	14		6.7	48	*	50-150
Perfluoro-1-pentanesulfonic acid (PFPeS)	13	17	17	-1.6	*	50-150
Perfluorohexanesulfonic acid (PFHxS)	13	19	18	-9.3	*	50-150
Perfluoro-n-butanoic acid (PFBA)	14	9.5	12	20	*	50-150
Perfluoro-n-decanoic acid (PFDA)	14		7.2	51		50-150
Perfluoro-n-dodecanoic acid (PFDoA)	14		8.4	60		50-150
Perfluoro-n-heptanoic acid (PFHpA)	14	7.2	12	34	*	50-150
Perfluoro-n-hexanoic acid (PFHxA)	14	12	14	11	*	50-150
Perfluoro-n-nonanoic acid (PFNA)	14		8.2	58		50-150
Perfluoro-n-octanoic acid (PFOA)	14	21	18	-22	*	50-150
Perfluoro-n-pentanoic acid (PFPeA)	14	6	11	34	*	50-150
Perfluoro-n-tetradecanoic acid (PFTeDA)	14		8	57		50-150
Perfluoro-n-tridecanoic acid (PFTrDA)	14		8.1	58		50-150
Perfluoro-n-undecanoic acid (PFUdA)	14		7.4	52		50-150
Perfluorooctanesulfonic acid (PFOS)	13	92	59	-252	*	50-150

"surrogate" double spiked?

* Values outside of QC Limits

FORM 3
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

Analytical Method: PFAS by ID SOP Matrix: Water

Client Sample ID (Matrix Spike/Matrix Spike Duplicate): HS-PW-3.5 (A)

Instrument ID: _Sciex 4500_LCMSMS1 Lab Sample ID: WA28027-005MS

Concentration Units (ug/L, mg/L, ug/kg): ng/L

ANALYTE	SPIKE ADDED	MSD CONCENTRATION	MSD %R	#	RPD	#	QC LIMITS RPD	QC LIMITS %R
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	14	6.5	47	*	10		0-30	50-150
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	14	5.8	41	*	13		0-30	50-150
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	14	5.7	40	*	34	*	0-30	50-150
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	14	7.9	57		9.3		0-30	50-150
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	14	7.8	57		9.7		0-30	50-150
Hexafluoropropylene oxide dimer acid (GenX)	30	16	56		2.6		0-30	50-150
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	14	8.7	63		14		0-30	50-150
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	15	6.8	46	*	7.5		0-30	50-150
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	15	8	54		12		0-30	50-150
Perfluoro-1-butanesulfonic acid (PFBS)	13	25	-57	*	1.9		0-30	50-150
Perfluoro-1-decanesulfonic acid (PFDS)	14	7	49	*	5.1		0-30	50-150
Perfluoro-1-heptanesulfonic acid (PFHpS)	14	9.5	68		12		0-30	50-150
Perfluoro-1-nonanesulfonic acid (PFNS)	14	7.2	51		5.8		0-30	50-150
Perfluoro-1-octanesulfonamide (PFOSA)	15	8.5	58		23		0-30	50-150
Perfluoro-1-pentanesulfonic acid (PFPeS)	14	19	13	*	12		0-30	50-150
Perfluorohexanesulfonic acid (PFHxS)	13	20	4.5	*	9.5		0-30	50-150
Perfluoro-n-butanoic acid (PFBA)	15	13	21	*	2.6		0-30	50-150
Perfluoro-n-decanoic acid (PFDA)	15	7.3	49	*	1.9		0-30	50-150
Perfluoro-n-dodecanoic acid (PFDoA)	15	7.9	54		6.4		0-30	50-150
Perfluoro-n-heptanoic acid (PFHpA)	15	11	24	*	10		0-30	50-150
Perfluoro-n-hexanoic acid (PFHxA)	15	15	17	*	7.0		0-30	50-150
Perfluoro-n-nonanoic acid (PFNA)	15	8.3	57		1.4		0-30	50-150
Perfluoro-n-octanoic acid (PFOA)	15	20	-5.3	*	12		0-30	50-150
Perfluoro-n-pentanoic acid (PFPeA)	15	11	36	*	4.1		0-30	50-150
Perfluoro-n-tetradecanoic acid (PFTeDA)	15	8.3	56		3.1		0-30	50-150
Perfluoro-n-tridecanoic acid (PFTrDA)	15	8	54		1.4		0-30	50-150
Perfluoro-n-undecanoic acid (PFUdA)	15	9.1	61		21		0-30	50-150
Perfluorooctanesulfonic acid (PFOS)	14	57	-259	*	4.4		0-30	50-150

"surrogate" double spiked?

* Values outside of QC Limits

FORM 3
LABORATORY CONTROL/LABORATORY CONTROL DUPLICATE SAMPLE RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

Analytical Method: PFAS by ID SOP Matrix: Water

Client Sample ID: WQ81803-002 Lab Sample ID: WQ81803-002

Instrument ID: Sciex_5060884 (QTRAP 4500)_LCMSMS2

Concentration Units (ug/L, mg/L, ug/kg): ng/L

ANALYTE	SPIKE ADDED	LCS CONCENTRATION	LCS %REC #	QC LIMITS REC.
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	15	14	95	50-150
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	15	14	93	50-150
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	15	16	109	50-150
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	15	13	89	50-150
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	15	16	108	50-150
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	15	14	97	50-150
Hexafluoropropylene oxide dimer acid (GenX)	32	32	100	50-150
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	16	17	105	50-150
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	16	17	103	50-150
Perfluoro-1-butanesulfonic acid (PFBS)	14	13	94	50-150
Perfluoro-1-decanesulfonic acid (PFDS)	15	15	100	50-150
Perfluoro-1-heptanesulfonic acid (PFHpS)	15	16	108	50-150
Perfluoro-1-nonanesulfonic acid (PFNS)	15	16	103	50-150
Perfluoro-1-octanesulfonamide (PFOSA)	16	16	98	50-150
Perfluoro-1-pentanesulfonic acid (PFPeS)	15	15	101	50-150
Perfluoro-n-butanoic acid (PFBA)	16	15	97	50-150
Perfluoro-n-decanoic acid (PFDA)	16	16	97	50-150
Perfluoro-n-dodecanoic acid (PFDoA)	16	16	100	50-150
Perfluoro-n-heptanoic acid (PFHpA)	16	15	93	50-150
Perfluoro-n-hexanoic acid (PFHxA)	16	16	102	50-150
Perfluoro-n-nonanoic acid (PFNA)	16	17	109	50-150
Perfluoro-n-octanoic acid (PFOA)	16	16	101	50-150
Perfluoro-n-pentanoic acid (PFPeA)	16	15	95	50-150
Perfluoro-n-tetradecanoic acid (PFTeDA)	16	17	106	50-150
Perfluoro-n-tridecanoic acid (PFTrDA)	16	19	117	50-150
Perfluoro-n-undecanoic acid (PFUdA)	16	15	93	50-150
Perfluorohexanesulfonic acid (PFHxS)	15	15	103	50-150
Perfluorooctanesulfonic acid (PFOS)	15	14	96	50-150

* Values outside of QC Limits

FORM 3
LABORATORY CONTROL/LABORATORY CONTROL DUPLICATE SAMPLE RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: WA28027

Project No.: 16.0062961.5

Analytical Method: PFAS by ID SOP Matrix: Water

Client Sample ID: WQ81968-002 Lab Sample ID: WQ81968-002

Instrument ID: _Sciex 4500_LCMSMS1

Concentration Units (ug/L, mg/L, ug/kg): ng/L

ANALYTE	SPIKE ADDED	LCS CONCENTRATION	LCS %REC #	QC LIMITS REC.
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	14	13	95	50-150
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	14	12	85	50-150
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	14	14	99	50-150
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	14	15	114	50-150
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	14	15	111	50-150
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	14	13	98	50-150
Hexafluoropropylene oxide dimer acid (GenX)	29	31	107	50-150
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	14	15	107	50-150
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	14	18	123	50-150
Perfluoro-1-butanesulfonic acid (PFBS)	13	13	101	50-150
Perfluoro-1-decanesulfonic acid (PFDS)	14	15	110	50-150
Perfluoro-1-heptanesulfonic acid (PFHpS)	14	14	98	50-150
Perfluoro-1-nonanesulfonic acid (PFNS)	14	14	101	50-150
Perfluoro-1-octanesulfonamide (PFOSA)	14	15	101	50-150
Perfluoro-1-pentanesulfonic acid (PFPeS)	14	14	100	50-150
Perfluoro-n-butanoic acid (PFBA)	14	14	96	50-150
Perfluoro-n-decanoic acid (PFDA)	14	17	119	50-150
Perfluoro-n-dodecanoic acid (PFDoA)	14	15	102	50-150
Perfluoro-n-heptanoic acid (PFHpA)	14	14	99	50-150
Perfluoro-n-hexanoic acid (PFHxA)	14	15	100	50-150
Perfluoro-n-nonanoic acid (PFNA)	14	15	102	50-150
Perfluoro-n-octanoic acid (PFOA)	14	15	105	50-150
Perfluoro-n-pentanoic acid (PFPeA)	14	14	98	50-150
Perfluoro-n-tetradecanoic acid (PFTeDA)	14	15	104	50-150
Perfluoro-n-tridecanoic acid (PFTrDA)	14	15	102	50-150
Perfluoro-n-undecanoic acid (PFUdA)	14	15	102	50-150
Perfluorohexanesulfonic acid (PFHxS)	13	12	94	50-150
Perfluorooctanesulfonic acid (PFOS)	13	14	107	50-150

* Values outside of QC Limits

CLIENT SAMPLE ID

WQ81803-001

FORM 4
METHOD BLANK SUMMARY

Lab Name: Shealy Environmental Services, Inc.
Lot No.: WA28027

Project No.: 16.0062961.5
Lab Sample ID: WQ81803-001

Analytical Method: PFAS by ID SOP
Matrix: Water

Instrument ID: Sciex_5060884 (QTRAP 4500)_LCMSMS2
Lab File ID:

Extraction Type: SOP SPE
Date Extracted: 02/04/2021

LC Column: Gemini C18 ID: 2.00 (mm)
Date Analyzed: 02/05/2021

Time Analyzed: 12:46

CLIENT SAMPLE ID	LAB SAMPLE ID	LAB FILE ID	DATE/TIME ANALYZED
HS-PW-2.5 (A)	WA28027-001		20:27
HS-PW-2.5 (B)	WA28027-002		20:16
HS-PW-3 (A)	WA28027-003		20:38
HS-PW-3 (A) DUP	WA28027-004		20:48
WQ81803-002	WQ81803-002		12:57

CLIENT SAMPLE ID

WQ81968-001

FORM 4
METHOD BLANK SUMMARY

Lab Name: Shealy Environmental Services, Inc.

Lot No.: WA28027

Project No.: 16.0062961.5

Lab Sample ID: WQ81968-001

Analytical Method: PFAS by ID SOP

Matrix: Water

Instrument ID: Sciex 4500_LCMSMS1

Lab File ID:

Extraction Type: SOP SPE

Date Extracted: 02/05/2021

LC Column: Gemini C18 ID: 2.00 (mm)

Date Analyzed: 02/08/2021

Time Analyzed: 16:43

CLIENT SAMPLE ID	LAB SAMPLE ID	LAB FILE ID	DATE/TIME ANALYZED
HS-PW-3.5 (A)	WA28027-005		17:26
FB-1/26	WA28027-006		17:58
EB-HT	WA28027-007		18:08
WQ81968-002	WQ81968-002		16:54
HS-PW-3.5 (A)MS	WA28027-005MS		17:36
HS-PW-3.5 (A)MSD	WA28027-005MD		17:47

SCIEX Triple Quad™ 4500 or SCIEX Triple Quad™ 4500MD System

Planned Maintenance Procedure



GEN-IDV-08-6710-B

January 2019

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Introduction 1

Note: For regulatory and safety information for the mass spectrometer, refer to the *System User Guide*.

The planned maintenance (PM) procedure is designed to help maintain overall system performance.

The PM is not intended to take the place of an Operational Qualification (OQ) nor is it intended to verify the instrument specifications. Separate Installation Qualification (IQ) and OQ services are available. Contact a SCIEX representative.

The procedure must be performed by a trained SCIEX Field Service Employee (FSE).

The procedure has been developed for the SCIEX Triple Quad™ 4500/4500MD system with the Turbo V™ ion source. It does not apply to any other products or processes.

The procedure does not address any customer-specific analytical protocol (performance qualification) or method validation.

Note: If an issue is identified and the system requires repair, then the customer is responsible for the repair at the expense of the customer, except to the extent that the system and the required repairs are covered by a SCIEX warranty or service contract. A separate repair service call must be opened and the repair hours must not be charged against this procedure.

Planned Maintenance Tasks 2

Note: Perform all procedures using the Turbo V™ ion source, unless otherwise specified.

Pre-Planned Maintenance

Note: Guideline values are for reference only. The pre-PM test results are not required to meet or exceed these values.

Pre-PM Tasks

Task	Complete	N/A
Ask the customer about system performance since the last visit and record comments. Performance ok.	✓	—
If the customer maintains a log for the system, then review it.	○	◉
Review the work to be performed with the customer.	✓	—

Task	Complete	N/A
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓	—
Check the status of the RAID 1 hard drives.	✓	—

Vacuum System Tests

<table>
<tr><th>Task</th><th colspan="2"></th><th>Complete</th></tr>
<tr><td colspan="3">Record the turbo pump operational values.<table><tr><th>Parameter</th><th>Results</th></tr><tr><td>Temperature (°C)</td><td>48</td></tr><tr><td>Current (A)</td><td>3.8</td></tr><tr><td>Voltage (V)</td><td>23</td></tr><tr><td>Power (W)</td><td>80</td></tr><tr><td>Driving frequency (Hz)</td><td>800</td></tr></table></td><td>✓</td></tr>
<tr><td rowspan="2">Inspect the vacuum gauge filament using the Analyst® Service Diagnostics (ASD) software and identify the filament position. If the mass spectrometer is using filament 2, then order a replacement vacuum gauge as a separate service call.</td><td>1</td><td>◉</td><td rowspan="2">✓</td></tr>
<tr><td>2</td><td>○</td></tr>
</table>

Pre-PM Pressure Test

Pre-PM Pressure Test is Complete	✓

Test	Guideline	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr $\leq P_{CAD\ 0} \leq 1.1 \times 10^{-5}$ torr	0.5e-5
Vacuum chamber pressure with CAD gas set to Full	1.8×10^{-5} torr $\leq (P_{CAD\ 12} - P_{CAD\ 0}) \leq 2.8 \times 10^{-5}$ torr	1.8e-5

Pre-PM System Tests

Q1 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	≥ 8.0×10^6	2.6e7	0.6 to 0.8	0.64
500.380	≥ 8.0×10^6	2.6e7	0.6 to 0.8	0.69
906.673	≥ 2.0×10^7	4.4e7	0.6 to 0.8	0.78
1952.427	≥ 8.8×10^5	5.4e6	0.6 to 0.8	0.83

Q3 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	≥ 8.0×10^6	3.0e7	0.6 to 0.8	0.76
500.380	≥ 8.0×10^6	2.3e7	0.6 to 0.8	0.73
906.673	≥ 2.0×10^7	5.3e7	0.6 to 0.8	0.80
1952.427	≥ 8.8×10^5	1.0e7	0.6 to 0.8	1.1

Q1 Negative PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	3.2e7	0.6 to 0.8	0.70
1863.306	$\geq 1.4 \times 10^6$	7.5e6	0.6 to 0.8	0.68

Q3 Negative PPGs Test is Complete	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	3.8e7	0.6 to 0.8	0.75
1863.306	$\geq 2.0 \times 10^6$	5.7e6	0.6 to 0.8	0.63

Planned Maintenance Tasks

Reserpine MS/MS Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information.

Guideline	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \geq 10\%$	11.6%

Planned Maintenance

Mass Spectrometer Maintenance

Task	Complete	N/A
Shut down the system and then disconnect the mains supply power cable.	✓	—
If required, replace the roughing pump oil. The recommended interval is every 3 years for long-life (ES) pumps, or every year for other pumps. **Note:** If an oil change is not required, then inspect the oil level and top up, if necessary. **CAUTION: Potential System Damage. Do not mix different types of oil. Mixing mineral oil with synthetic oil can cause pump failure.**	✓	—
If required, replace the roughing pump oil exhaust filter. The recommended interval is every 24 months.	○	◒
Clean or replace the four air filters in the base of the mass spectrometer chassis.	✓	—
(If applicable) Clean the turbo pump filter screen.	◒	○
(If applicable) Verify the operation of the SCIEX-supplied bench cooling fans.	◒	○
Inspect the mass spectrometer, components, and cabling, as required.	✓	—
Clean the curtain plate.	✓	—
Clean the orifice plate.	✓	—
Clean the QJet® ion guide and IQ0 lens.	✓	—

Task	Complete	N/A
(If contamination is detected) Clean the Q0 region.	○	◉ —
Start up the system.	✓	—

Turbo V™ Ion Source Maintenance

Task	Complete	N/A
If necessary, replace the electrode in the TurboIonSpray® and the APCI probe.	◉	○
With the TurboIonSpray® probe installed, verify that the temperature (TEM) reaches the recommended set point of 500 °C.	✓	—
(If applicable) With the APCI probe installed, verify that the temperature (TEM) reaches the recommended set point of 400 °C.	○	◉

Post-Planned Maintenance

Task	Complete
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓

Voltage Tests

Task		Complete
Inspect the RF tuning voltages at the QPS amplifier module and then, if required, tune the coil boxes.		✓
Inspect the detector voltage. Optimize, if required.		✓
Detector voltage	1800	

Post-PM Pressure Test

Post-PM Pressure Test is Complete	✓

Test	Specification	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr $\leq P_{CAD\ 0} \leq 1.1 \times 10^{-5}$ torr	0.7e-5
Vacuum chamber pressure with CAD gas set to Full	1.8×10^{-5} torr $\leq (P_{CAD\ 12} - P_{CAD\ 0}) \leq 2.8 \times 10^{-5}$ torr	2.2e-5

Post-PM System Tests

Q1 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	≥ 8.0×10^6	2.7e7	0.6 to 0.8	0.71
500.380	⇨ 8.0×10^6	3.4e7	0.6 to 0.8	0.71
906.673	⇨ 2.0×10^7	5.0e7	0.6 to 0.8	0.74
1952.427	⇨ 8.8×10^5	5.2e6	0.6 to 0.8	0.74

Q1 Positive PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Q3 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	≥ 8.0×10^6	3.8e7	0.6 to 0.8	0.75
500.380	≥ 8.0×10^6	3.3e7	0.6 to 0.8	0.71
906.673	≥ 2.0×10^7	6.3e7	0.6 to 0.8	0.77
1952.427	≥ 8.8×10^5	1.0e7	0.6 to 0.8	0.73

Q3 Positive PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1254.925, 1545.134, 1952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Q1 Negative PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	3.9e7	0.6 to 0.8	0.74
1863.306	$\geq 1.4 \times 10^6$	6.8e6	0.6 to 0.8	0.71

Q1 Negative PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Q3 Negative PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	4.4e7	0.6 to 0.8	0.76
1863.306	$\geq 2.0 \times 10^6$	5.2e6	0.6 to 0.8	0.66

Q3 Negative PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1223.845, 1572.097, 1863.306, 1979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Reserpine MS/MS Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information.

Specification	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \geq 10\%$	12.4%

Post-PM Tasks

Task	Complete	N/A
(Obtain customer approval first) Install any applicable Analyst®/Analyst® MD software HotFixes.	○	◉
Delete any unnecessary files.	✓	—
Back up the Analyst Data folder.	✓	—
(If applicable) Defragment the hard drive.	○	◉
(Not applicable for MD instrument families) If the customer has a Software Support Plan, then perform the Software Health Check: • (Obtain customer approval first) Install any compatible HotFixes and updates for SCIEX add-on software.	◉	○
Discuss warranty coverage for the StatusScope® remote monitoring service. Determine whether the customer already has StatusScope® remote monitoring service installed and, if not, whether it should be installed. **Note:** The StatusScope® remote monitoring service is not applicable for MD systems. **Note:** Installation of the StatusScope® remote monitoring service is available only to warranty and eligible contract customers. Refer to https://sciex.com/services/statusscope-remote-monitoring for a list of eligible contracts.	◉	○

StatusScope® Remote Monitoring Service Tasks

Task	Complete	N/A
If the StatusScope® remote monitoring service is not installed, then perform these tasks: 1. Complete the *StatusScope® User Access* form. 2. Verify the connection to the StatusScope® server. 3. Install the StatusScope® agent.	○	◉
Log on to the StatusScope® server using the FSE user name and then verify that the assets under the customer organization are connected to the StatusScope® server.	○	◉
Perform the post-PM fault test to verify that the mass spectrometer fault generated is shown in the StatusScope® remote monitoring service.	○	◉

Review

Task	Complete
Review the work performed with the customer.	✓
Record the verification data in this document and then attach all of the performance data.	✓
Review the routine maintenance schedule and the procedures with the customer.	✓
Complete this document: • Review the verification data with the customer. • Provide the customer with the completed document and the performance data. • If an electronic copy of the document is supplied to the customer, then save a copy on the Service drive.	✓

Signoff 3

Organization	Shealy Environmental		
Mass spectrometer serial number	BJ29321608	Service request number	4336406
FSE name	Lynne Russell	Date (yyyy-mm-dd)	2019-04-10
FSE signature	Lynne Russell		

Comments and Exceptions

LV 200 oil used.

Inspect for Contamination A

1. Run the **Q1 Pos PPG** method for 10 minutes, monitoring the TIC for degradation of the signal or sensitivity drops.
2. Change the polarity to negative, and then scan for one minute.
3. Change the polarity to positive, and then make sure that the **IS** parameter returns to the original value.
4. Run the method.

   If the signal sensitivity is restored temporarily but it starts to degrade again, then the charging effect is present.

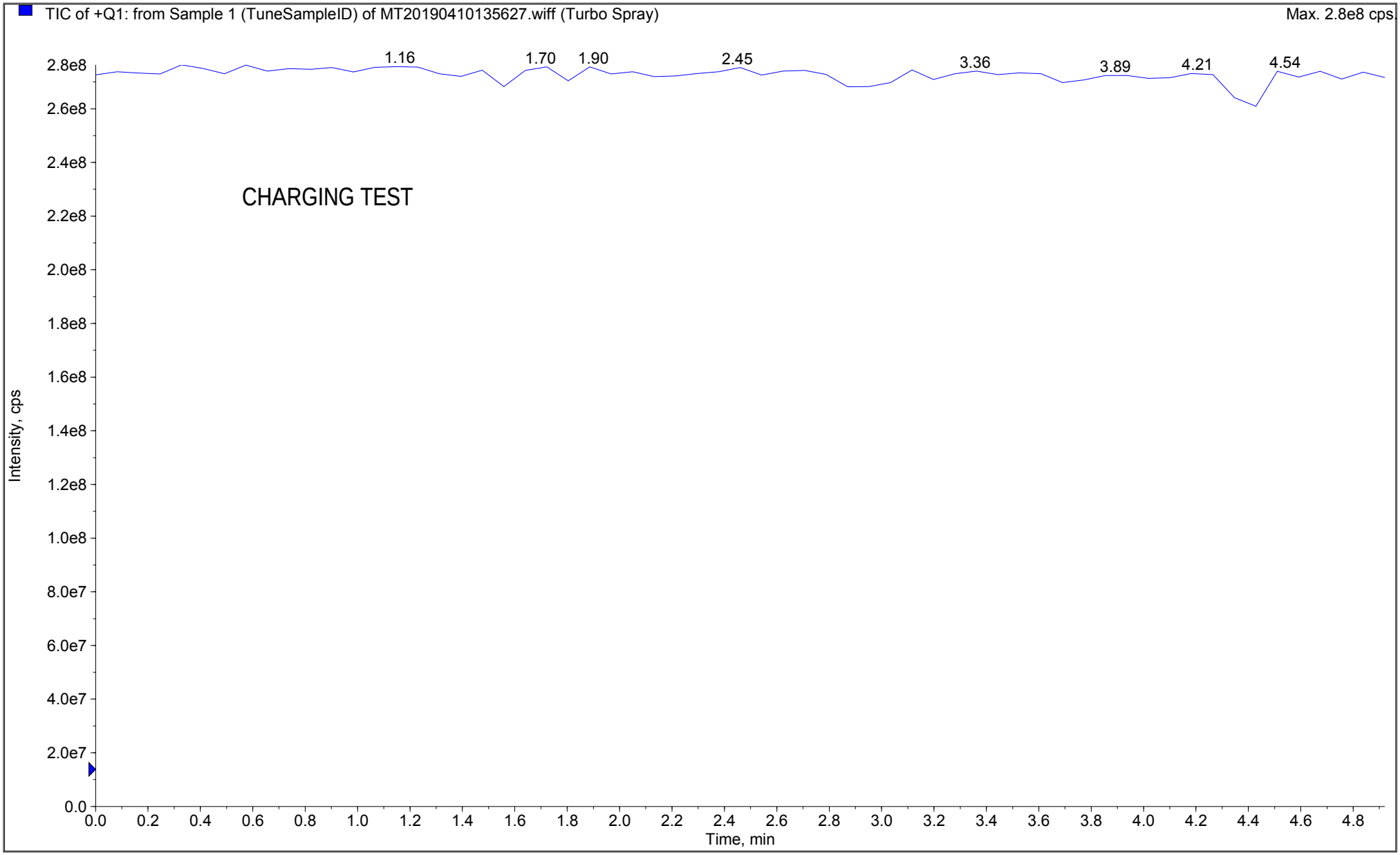
Guidelines for Identifying Components to be Cleaned

If the Q1 quadrupole is showing the charging effect and signal drop out, then clean the Q0 and the vacuum interface components (the curtain plate, orifice plate, the QJet® ion guide, and the Q0 side of the IQ0 lens) using the customer cleaning procedure, with the rod and tissues. In most cases, this will remove the contamination.

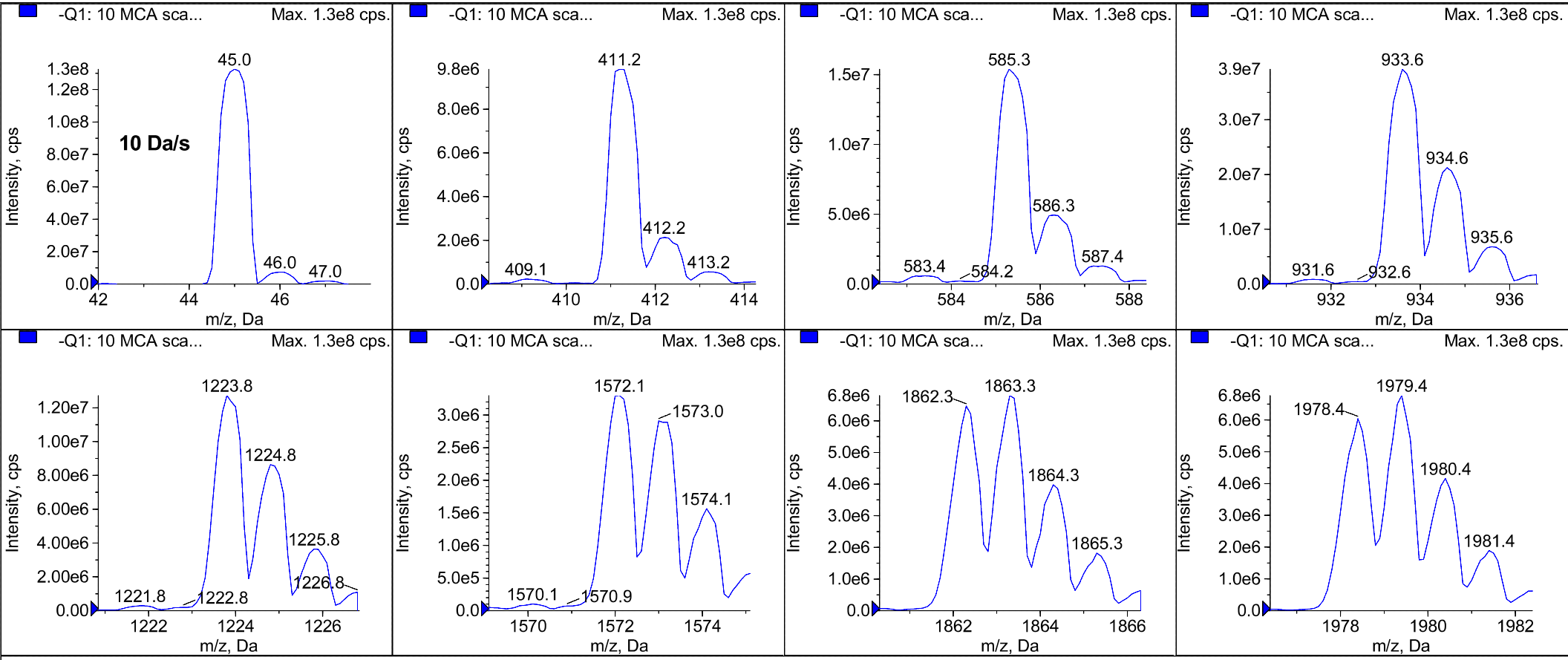
Notes:

- Do not remove the ion optics during a PM. This is considered to be a repair activity and requires a separate service call to be opened.
- Consider cleaning the Q1 quadrupole as well as other components (the stubbies and the IQ1 lens), if cleaning the front end does not eliminate the contamination.
- This guideline does not provide complete troubleshooting for all possible technical root causes of signal degradation or charging effect. Signal degradation might also result from a contaminated TurboIonSpray® probe or electrode, method parameters that are not optimized, and so on.

Printing Time: 6:20:07 PM
Printing Date: Friday, April 26, 2019
Polarity/Scan Type: Positive Q1 MS

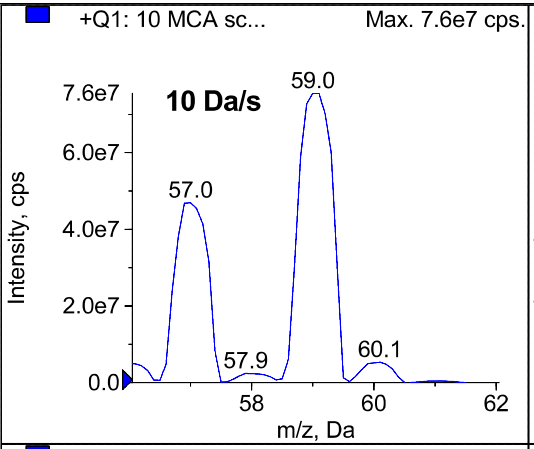


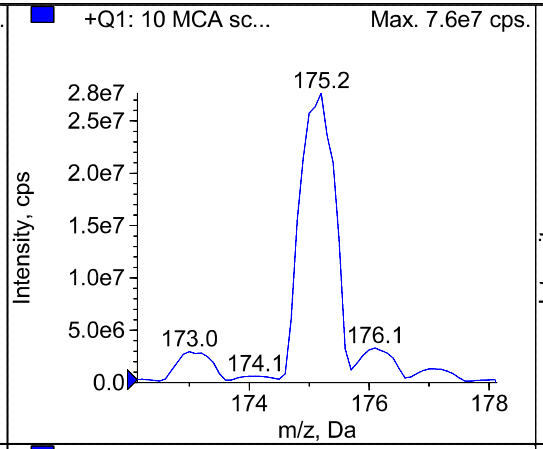
* FSE Lynne Russell
*Post-PM Results

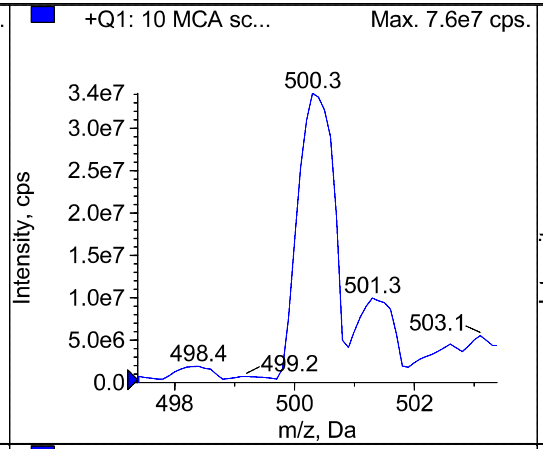


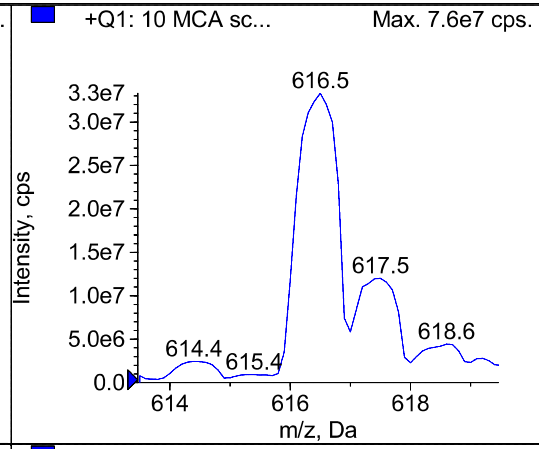
Peak List for " -Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20190410144335.wiff (Turbo Spray)"

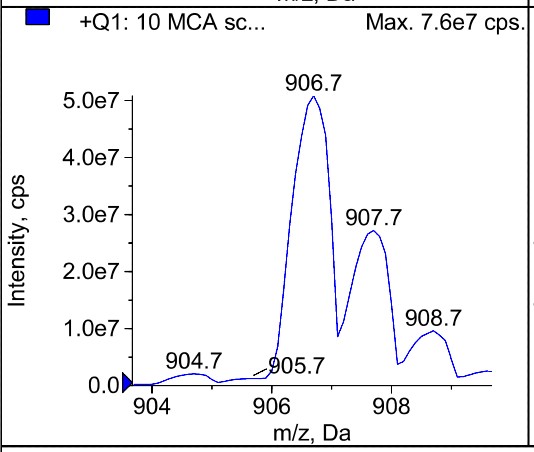
	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	44.9960	1.3258e8	0.7208	2.0090e-3
2	411.2590	411.2654	9.8269e6	0.6969	-6.4068e-3
3	585.3850	585.3826	1.5391e7	0.7499	2.4310e-3
4	933.6360	933.6249	3.9214e7	0.7447	0.0111
5	1223.8450	1223.8422	1.2723e7	0.7009	2.8400e-3
6	1572.0970	1572.0890	3.2995e6	0.7321	8.0035e-3
7	1863.3060	1863.3026	6.7988e6	0.7113	3.3643e-3
8	1979.3890	1979.3774	6.7711e6	0.6979	0.0116

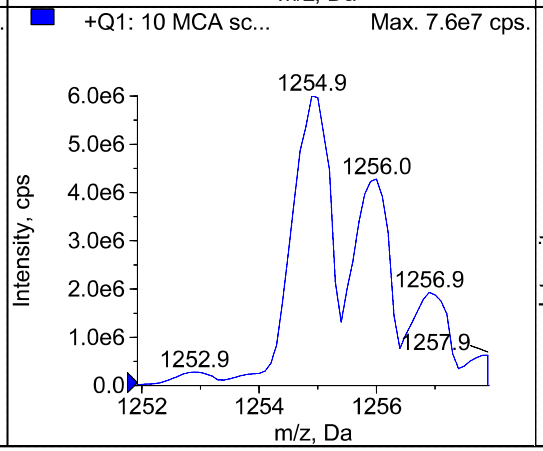


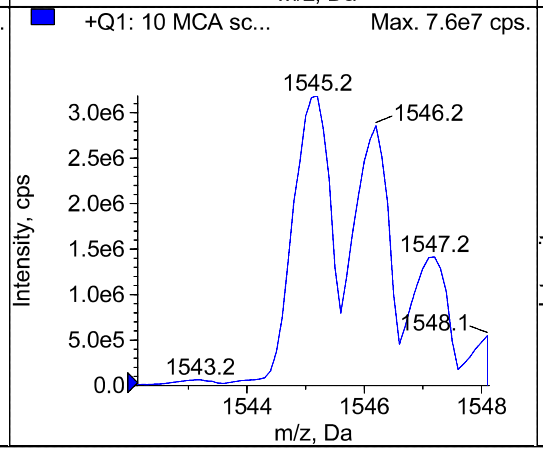


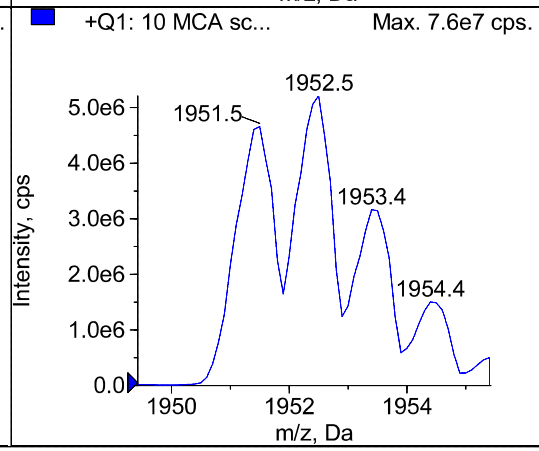






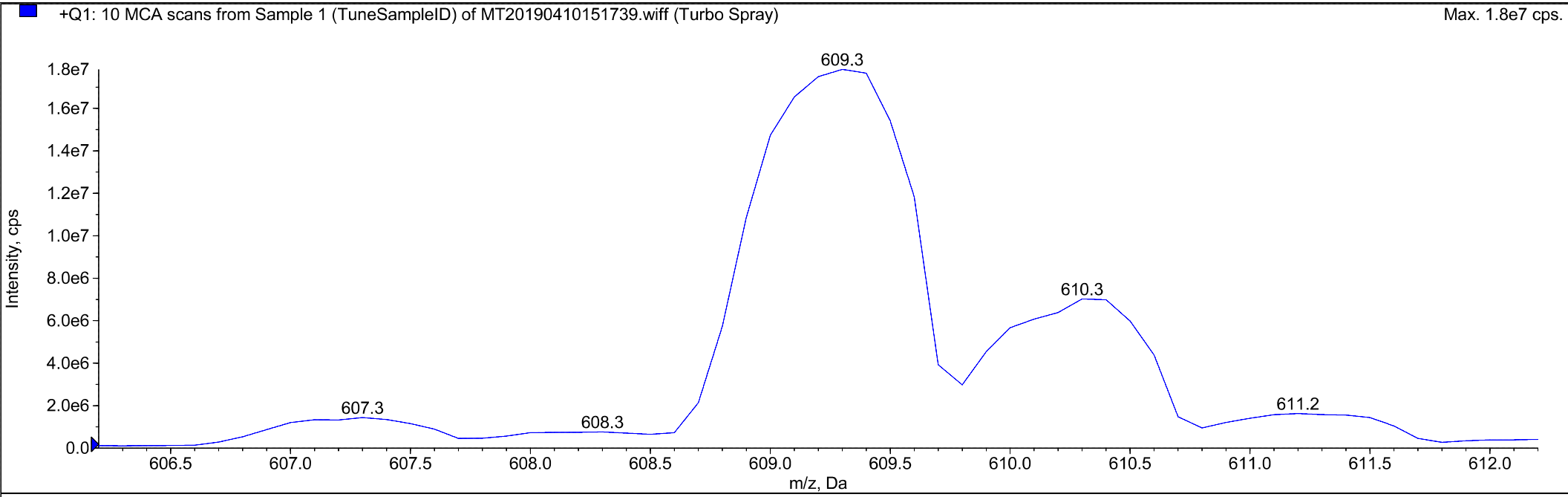






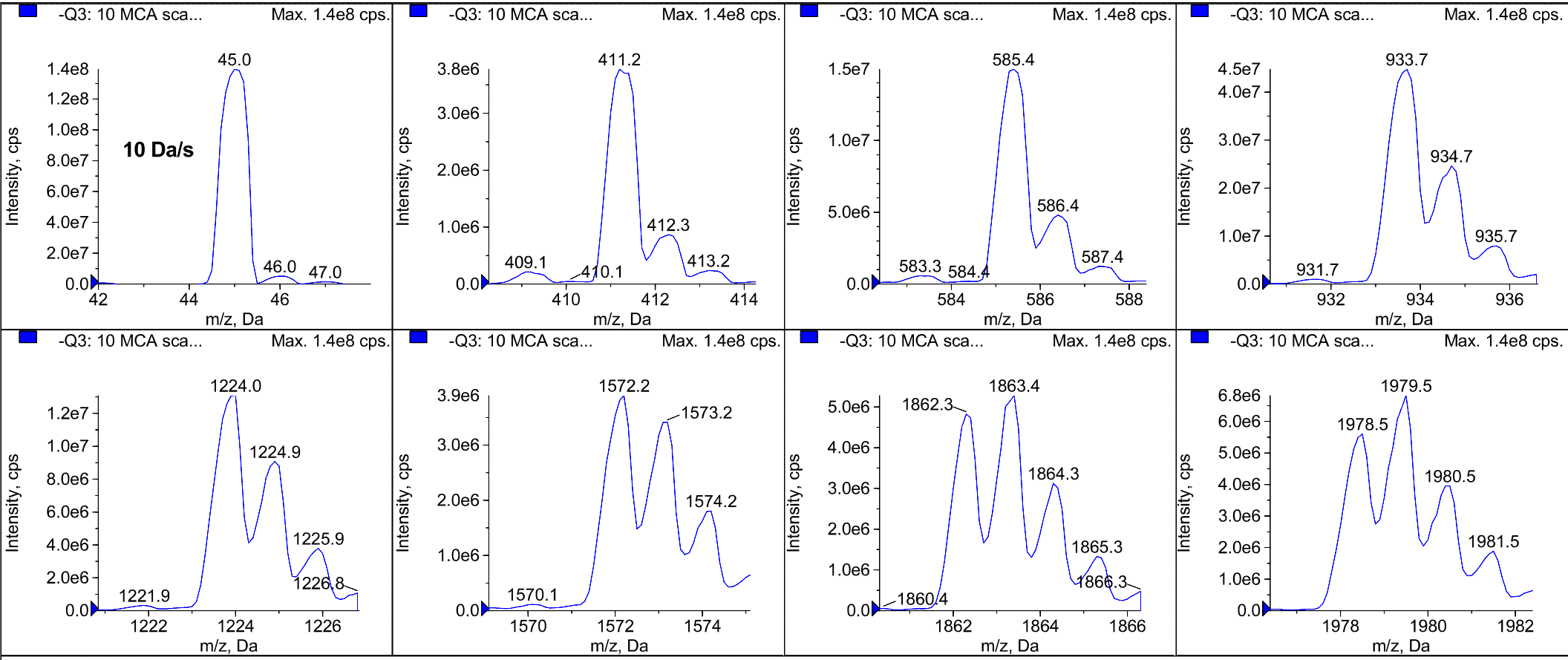
Peak List for " +Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20190410140504.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0496	7.5522e7	0.6480	3.5042e-4
2	175.1330	175.1354	2.7642e7	0.7140	-2.4039e-3
3	500.3800	500.3732	3.4129e7	0.7123	6.8383e-3
4	616.4640	616.4619	3.3315e7	0.7893	2.1491e-3
5	906.6730	906.6713	5.0848e7	0.7432	1.6744e-3
6	1254.9250	1254.9220	6.0055e6	0.7404	3.0310e-3
7	1545.1340	1545.1226	3.1869e6	0.7347	0.0114
8	1952.4270	1952.4270	5.2126e6	0.7365	-1.2862e-5



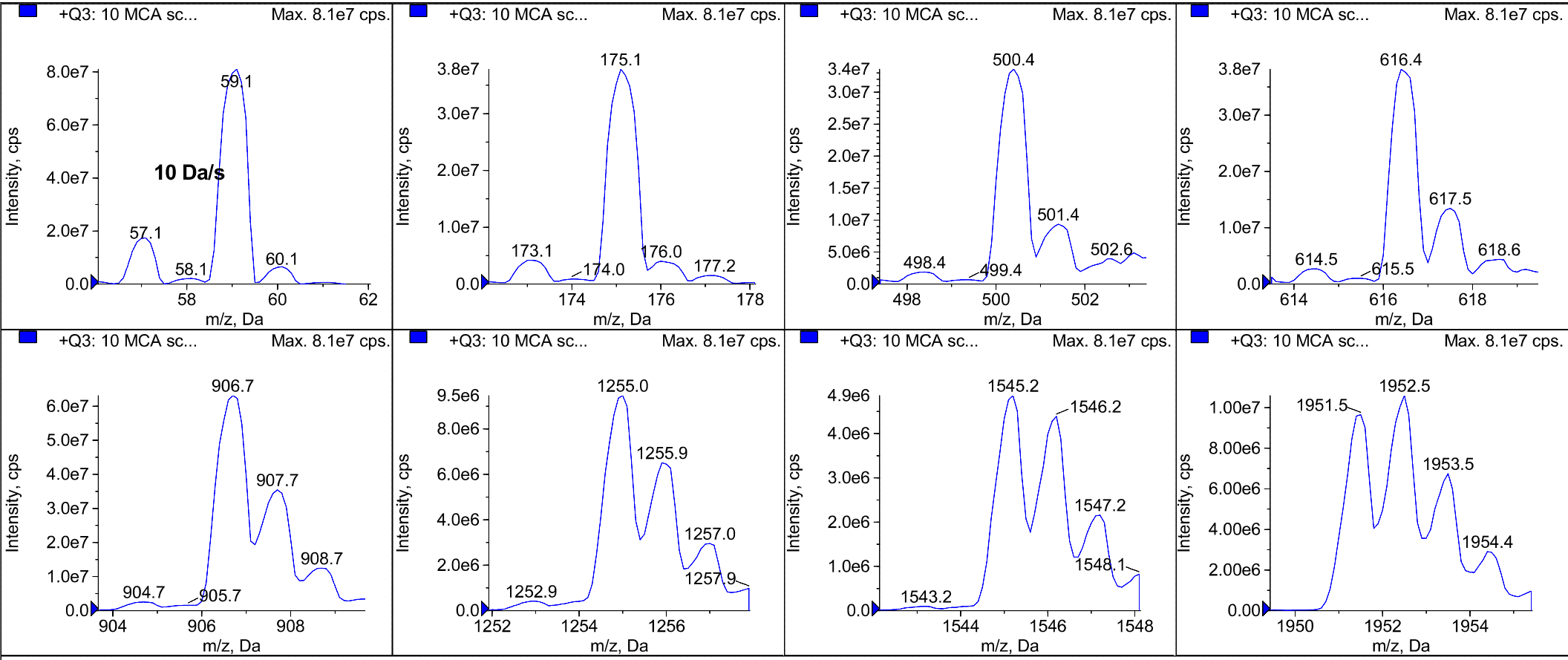
Peak List for " +Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20190410151739.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	174.1000	n/a	n/a	n/a	n/a
2	195.1000	n/a	n/a	n/a	n/a
3	397.2000	n/a	n/a	n/a	n/a
4	448.1000	n/a	n/a	n/a	n/a
5	609.2810	609.2637	1.7836e7	0.7749	0.0173



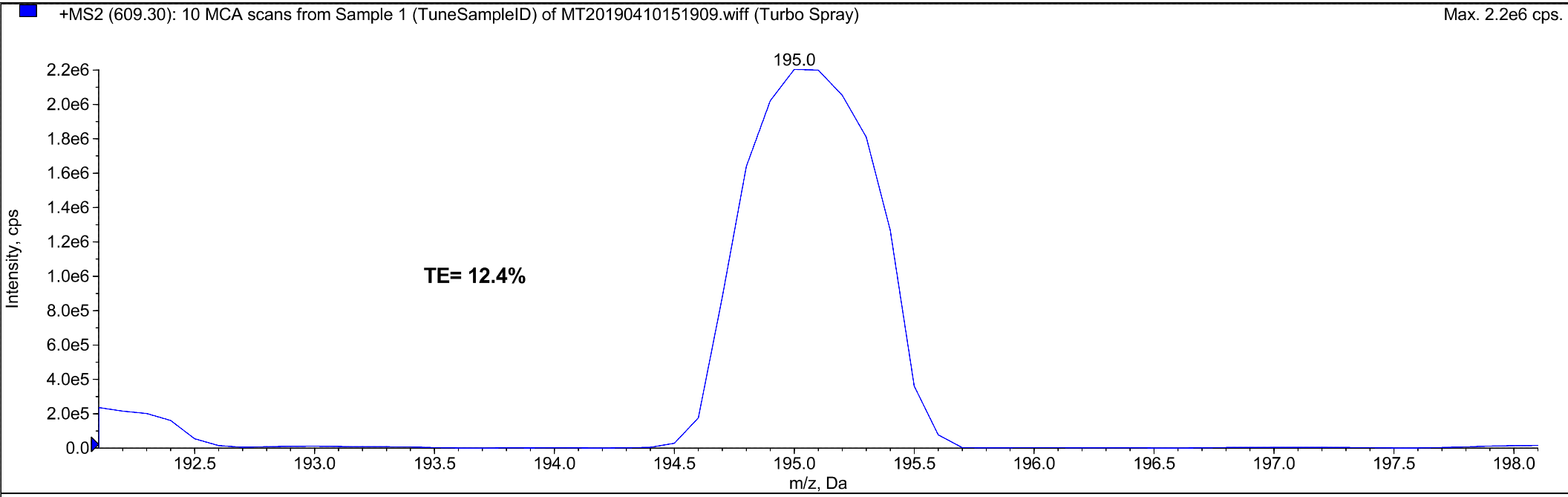
Peak List for " -Q3: 10 MCA scans from Sample 1 (TuneSampleID) of MT20190410145833.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	44.9997	1.3930e8	0.6906	-1.7028e-3
2	411.2590	411.2586	3.7750e6	0.7340	4.0505e-4
3	585.3850	585.3859	1.4951e7	0.7153	-9.0261e-4
4	933.6360	933.6250	4.4765e7	0.7611	0.0110
5	1223.8450	1223.8893	1.3086e7	0.7346	-0.0443
6	1572.0970	1572.1183	3.8989e6	0.7413	-0.0213
7	1863.3060	1863.2953	5.2795e6	0.6649	0.0107
8	1979.3890	1979.3951	6.8213e6	0.7412	-6.1049e-3



Peak List for " +Q3: 10 MCA scans from Sample 1 (TuneSampleID) of MT20190410142310.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0492	8.1037e7	0.6529	8.1344e-4
2	175.1330	175.1312	3.7823e7	0.7504	1.7640e-3
3	500.3800	500.3815	3.3582e7	0.7095	-1.4637e-3
4	616.4640	616.4596	3.8148e7	0.6573	4.3988e-3
5	906.6730	906.6704	6.3131e7	0.7736	2.5943e-3
6	1254.9250	1254.9236	9.4704e6	0.7407	1.4113e-3
7	1545.1340	1545.1290	4.8598e6	0.7188	5.0259e-3
8	1952.4270	1952.4303	1.0596e7	0.7325	-3.3111e-3



Peak List for " +MS2 (609.30): 10 MCA scans from Sample 1 (TuneSampleID) of MT20190410151909.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	174.1000	n/a	n/a	n/a	n/a
2	195.1000	195.0693	2.2039e6	0.6891	0.0307
3	397.2000	n/a	n/a	n/a	n/a
4	448.1000	n/a	n/a	n/a	n/a
5	609.2810	n/a	n/a	n/a	n/a

SCIEX Triple Quad™ 4500/4500MD System

Planned Maintenance Procedure



GEN-IDV-08-6710-C

August 2019

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Introduction 1

Note: For regulatory and safety information for the mass spectrometer, refer to the *System User Guide*.

The planned maintenance (PM) procedure is designed to help maintain overall system performance.

The PM is not intended to take the place of an Operational Qualification (OQ) nor is it intended to verify the instrument specifications. Separate Installation Qualification (IQ) and OQ services are available. Contact a SCIEX representative.

The procedure must be performed by a trained SCIEX Field Service Employee (FSE).

The procedure has been developed for the SCIEX Triple Quad™ 4500/4500MD system with the Turbo V™ ion source. It does not apply to any other products or processes.

The procedure does not address any customer-specific analytical protocol (performance qualification) or method validation.

Note: If an issue is identified and the system requires repair, then the customer is responsible for the repair at the expense of the customer, except to the extent that the system and the required repairs are covered by a SCIEX warranty or service contract. A separate repair service call must be opened and the repair hours must not be charged against this procedure.

Planned Maintenance Tasks 2

Note: Perform all procedures using the Turbo V™ ion source, unless otherwise specified.

Pre-Planned Maintenance

Note: Guideline values are for reference only. The pre-PM test results are not required to meet or exceed these values.

Pre-PM Tasks

Task	Complete	N/A
Ask the customer about system performance since the last visit and record comments.	✓	—
If the customer maintains a log for the system, then review it.	○	◉
Review the work to be performed with the customer.	✓	—

Task	Complete	N/A
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓	—
Check the status of the RAID 1 hard drives.		—

Vacuum System Tests

Task			Complete
Record the turbo pump operational values.			
Parameter	**Results**		
Temperature (°C)	see notes		
Current (A)	see notes		
Voltage (V)	see notes		
Power (W)	see notes		
Driving frequency (Hz)	see notes		
Inspect the vacuum gauge filament using the Analyst® Service Diagnostics (ASD) software and identify the filament position. If the mass spectrometer is using filament 2, then order a replacement vacuum gauge as a separate service call.	1	◯	
	2	◯	

Pre-PM Pressure Test

Pre-PM Pressure Test is Complete	✓

Test	Guideline	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr $\leq P_{CAD\ 0} \leq 1.1 \times 10^{-5}$ torr	0.8e-5
Pressure difference (CAD_{12} minus CAD_0)	1.8×10^{-5} torr $\leq (P_{CAD\ 12} - P_{CAD\ 0}) \leq 2.8 \times 10^{-5}$ torr	2.5e-5

Pre-PM System Tests

Q1 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	$\geq 8.0 \times 10^6$	2.1e7	0.6 to 0.8	0.80
500.380	$\geq 8.0 \times 10^6$	3.0e7	0.6 to 0.8	0.99
906.673	$\geq 2.0 \times 10^7$	4.3e7	0.6 to 0.8	0.98
1 952.427	$\geq 8.8 \times 10^5$	8.2e6	0.6 to 0.8	n/a

Q3 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
175.133	$\geq 8.0 \times 10^6$	3.2e7	0.6 to 0.8	0.74
500.380	$\geq 8.0 \times 10^6$	3.3e7	0.6 to 0.8	0.80
906.673	$\geq 2.0 \times 10^7$	5.6e7	0.6 to 0.8	0.84
1 952.427	$\geq 8.8 \times 10^5$	9.8e6	0.6 to 0.8	1.1

Q1 Negative PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	1.7e7	0.6 to 0.8	0.66
1 863.306	$\geq 1.4 \times 10^6$	1.8e6	0.6 to 0.8	0.75

Q3 Negative PPGs Test is Complete	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Guideline	Result	Guideline	Result
933.636	$\geq 1.8 \times 10^7$	2.8e7	0.6 to 0.8	0.85
1 863.306	$\geq 2.0 \times 10^6$	3.3e6	0.6 to 0.8	0.69

Planned Maintenance Tasks

Reserpine MS/MS Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information.

Guideline	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \Rightarrow 10\%$	4.3%

Planned Maintenance

Mass Spectrometer Maintenance

Task	Complete	N/A
Shut down the system and then disconnect the mains supply power cable.	✓	—
Verify the expiry date on the Powervar UPS battery system, and then recommend replacement of the battery tray, if required.	○	◉
If required, replace the roughing pump oil. The recommended interval is every 3 years. **Note:** If an oil change is not required, then inspect the oil level and top up, if necessary. **CAUTION: Potential System Damage. Do not mix different types of oil. Mixing mineral oil with synthetic oil can cause pump failure.**	✓	—
If required, replace the roughing pump oil exhaust filter. The recommended interval is every 3 years.	○	◉
Clean or replace the four air filters in the base of the mass spectrometer chassis.	✓	—
(If applicable) Clean the turbo pump filter screen.	○	◉
(If applicable) Verify the operation of the SCIEX-supplied bench cooling fans.	◉	○
Inspect the mass spectrometer, components, and cabling, as required.	✓	—
Clean the curtain plate.	✓	—
Clean the orifice plate.	✓	—
Clean the QJet® ion guide and IQ0 lens.	✓	—

Task	Complete	N/A
(If contamination is detected) Clean the Q0 region.	○	◉
Start up the system.	✓	—

Turbo V™ Ion Source Maintenance

Task	Complete	N/A
If necessary, replace the electrode in the TurboIonSpray® and the APCI probe.	◉	○
With the TurboIonSpray® probe installed, verify that the temperature (TEM) reaches the recommended set point of 500 °C.	✓	—
(If applicable) With the APCI probe installed, verify that the temperature (TEM) reaches the recommended set point of 400 °C.	○	◉

Software Maintenance

Note: This task is not applicable to MD systems.

Task	Complete	N/A
(Obtain customer approval first) Install any applicable Analyst® Software HotFixes.	○	◉

Post-Planned Maintenance

Task	Complete
Inspect for front-end contamination. Refer to Inspect for Contamination.	✓

Voltage Tests

Task	Complete
Inspect the RF tuning voltages at the QPS amplifier module and then, if required, tune the coil boxes.	✓
Inspect the detector voltage. Optimize, if required. Detector voltage: 2100	

Post-PM Pressure Test

Post-PM Pressure Test is Complete	✓

Test	Specification	Result
Vacuum chamber pressure with CAD gas off	0.4×10^{-5} torr $\leq P_{CAD\ 0} \leq 1.1 \times 10^{-5}$ torr	0.8e-5
Pressure difference (CAD_{12} minus CAD_0)	1.8×10^{-5} torr $\leq (P_{CAD\ 12} - P_{CAD\ 0}) \leq 2.8 \times 10^{-5}$ torr	3.4e-5

Post-PM System Tests

Q1 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	$\geq 8.0 \times 10^6$	2.1e7	0.6 to 0.8	0.75
500.380	$\geq 8.0 \times 10^6$	2.4e7	0.6 to 0.8	0.72
906.673	$\geq 2.0 \times 10^7$	3.6e7	0.6 to 0.8	0.72
1 952.427	$\geq 8.8 \times 10^5$	5.3e6	0.6 to 0.8	0.72

Q1 Positive PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Q3 Positive PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
175.133	$\geq 8.0 \times 10^6$	2.7e7	0.6 to 0.8	0.72
500.380	$\geq 8.0 \times 10^6$	3.0e7	0.6 to 0.8	0.76
906.673	$\geq 2.0 \times 10^7$	4.9e7	0.6 to 0.8	0.70
1 952.427	$\geq 8.8 \times 10^5$	5.4e6	0.6 to 0.8	0.74

Q3 Positive PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** POS PPG, 2e-6 M
- **Flow rate:** 5 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
59.050, 175.133, 500.380, 616.464, 906.673, 1 254.925, 1 545.134, 1 952.427	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Q1 Negative PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	2.2e7	0.6 to 0.8	0.76
1 863.306	$\geq 1.4 \times 10^6$	3.0e6	0.6 to 0.8	0.72

Q1 Negative PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Q3 Negative PPGs Test is Complete: Intensity and Peak Width	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **Scan rate**: 10 Da/s
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Intensity (cps)		Peak Width (Da)	
	Specification	Result	Specification	Result
933.636	$\geq 1.8 \times 10^7$	2.9e7	0.6 to 0.8	0.74
1 863.306	$\geq 2.0 \times 10^6$	4.5e6	0.6 to 0.8	0.74

Q3 Negative PPGs Test is Complete: Peak Width for Identified Masses	✓

- **Test solution:** NEG PPG, 3e-4 M
- **Flow rate:** 10 µL/min
- **MCA:** On
- **Printouts required:** Spectra for masses 44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389, with peak intensities, peak width, and mass shift results, complete with method file information.

Note: After calibration, the mass shift result must be within 0.1 Da for all assigned masses.

Mass (Da)	Scan Rate (Da/s)	Cycles	Specification (Da)	Result (Passed)
44.998, 411.259, 585.385, 933.636, 1 223.845, 1 572.097, 1 863.306, 1 979.389	10	10	0.6 to 0.8	✓
	200	50	0.6 to 0.8	
	1 000	50	0.6 to 0.8	
	2 000	100	0.6 to 0.8	

Reserpine MS/MS Test is Complete	✓

- **Test solution:** Reserpine solution 0.167 pmol/µL
- **Flow rate:** 5 µL/min
- **Scan rate:** 10 Da/s (both MS and MS/MS)
- **Scan mode:** Product Ion (MS2)
- **Product Of:** 609.3 (or as calibrated)
- **Product Ion:** 195.1
- **Cycles:** 10
- **MCA:** On
- **Printouts required:** Spectra for masses 609.3 and 195.1, with peak intensities, peak width, and mass shift results, complete with method file information.

Specification	Result
Transmission efficiency $\frac{Intensity\ for\ ion\ at\ m/z\ 195.1}{Intensity\ for\ ion\ at\ m/z\ 609.3\ (or\ as\ calibrated)} \times 100 \Rightarrow 10\%$	11.9%

Post-PM Tasks

Task	Complete	N/A
Delete any unnecessary files.	✓	—
Back up the Analyst Data folder.	✓	—
(If applicable) Defragment the hard drive.	○	◉
(Not applicable for MD instrument families) If the customer has a Software Support Plan, then perform the Software Health Check: • (Obtain customer approval first) Install any compatible HotFixes and updates for SCIEX add-on software.	◉	○
(Not applicable for MD instrument families) Discuss warranty coverage for the StatusScope® Remote Monitoring Service. Determine whether the customer already has StatusScope® Remote Monitoring Service installed and, if not, whether it should be installed. **Note:** Installation of the StatusScope® Remote Monitoring Service is available only to warranty and eligible contract customers. Refer to sciex.com/instrument-service-and-support/statusscope-remote-monitoring for a list of eligible contracts.	○	◉

StatusScope® Remote Monitoring Service Tasks

Note: The StatusScope® remote monitoring service is not applicable for MD systems.

Task	Complete	N/A
If the StatusScope® Remote Monitoring Service is not installed, then perform these tasks: 1. Make sure that the *StatusScope® Customer Remote Connectivity Authorization* and *Customer Remote Connectivity Registration* forms are both completed. 2. Verify the connection to the server for the StatusScope® Remote Monitoring Service. 3. Install the agent for the StatusScope® Remote Monitoring Service.	○	◉
Log on to the server for the StatusScope® Remote Monitoring Service using the FSE user name and then verify that the assets under the customer organization are connected to the server for the StatusScope® Remote Monitoring Service.	○	◉
Perform the post-PM fault test to verify that the mass spectrometer fault generated is shown in the StatusScope® Remote Monitoring Service.	○	◉

Wrap Up

Task	Complete	N/A
Review the work performed with the customer.	✓	—
Record the test results in this document and then attach all of the test data.	✓	—
Review the routine maintenance schedule and the procedures with the customer.	✓	—
Complete this document: • Review the test results with the customer. • Provide the customer with the completed document and the test data. • If an electronic copy of the document is supplied to the customer, then save a copy on the Service drive.	✓	—

Signoff 3

Organization	Shealy Environmental		
Mass spectrometer serial number	EB250231807	Service request number	4534266
FSE name	Lynne Russell	Date (yyyy-mm-dd)	2020-03-09
FSE signature			

Comments and Exceptions

Due to administrative restrictions, I was unable to use ASD to perform vacuum system test.
Oil and filter changes were not performed during this PM because they were not due. LER 09Mar2020

Inspect for Contamination A

1. Run the **Q1 Pos PPG** method for 10 minutes, monitoring the TIC for degradation of the signal or sensitivity drops.
2. Change the polarity to negative, and then scan for one minute.
3. Change the polarity to positive, and then make sure that the **IS** parameter returns to the original value.
4. Run the method.

   If the signal sensitivity is restored temporarily but it starts to degrade again, then the charging effect is present.

Guidelines for Identifying Components to be Cleaned

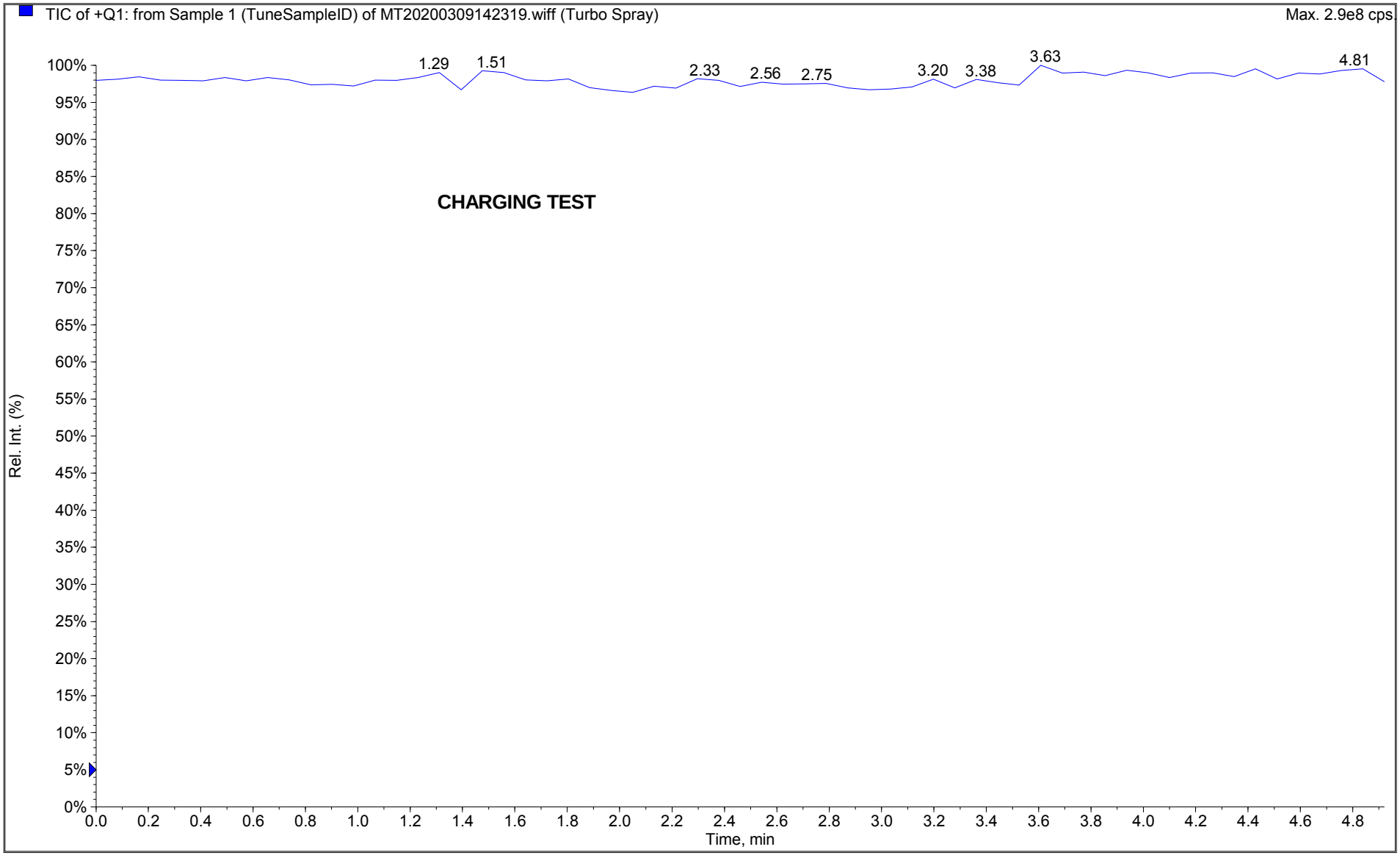
If the Q1 quadrupole is showing the charging effect and signal drop out, then clean the Q0 and the vacuum interface components (the curtain plate, orifice plate, the QJet® ion guide, and the Q0 side of the IQ0 and IQ1 lens) using the customer cleaning procedure, with the rod and tissues. In most cases, this will remove the contamination.

Notes:

- Do not remove the ion optics during a PM. This is considered to be a repair activity and requires a separate service call to be opened.
- Consider cleaning the Q1 quadrupole as well as other components (the stubbies and the IQ1 lens), if cleaning the front end does not eliminate the contamination.
- This guideline does not provide complete troubleshooting for all possible technical root causes of signal degradation or charging effect. Signal degradation might also result from a contaminated TurboIonSpray® probe or electrode, method parameters that are not optimized, and so on.

Acq. Time: 14:23
Acq. Date: Monday, March 09, 2020

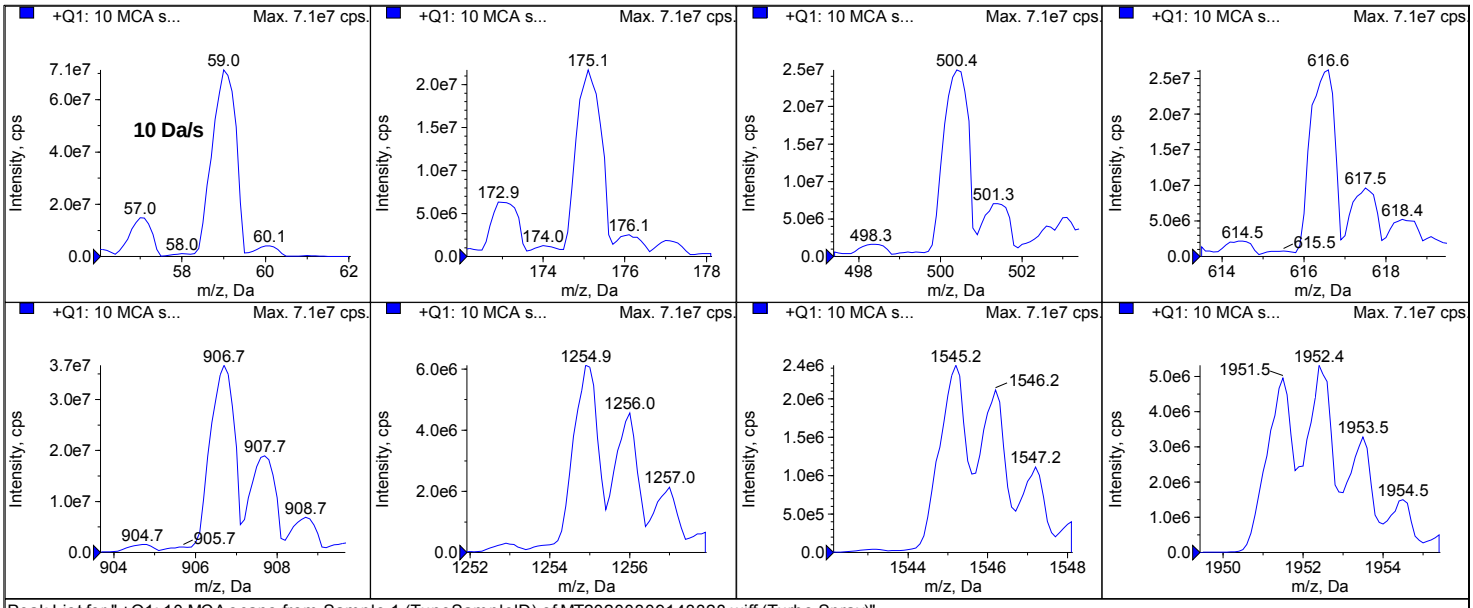
Analyst Version: 1.7.0
*SN: EB250231807



*Post-PM
*FSE: Lynne Russell

Acq. Time: 14:33
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



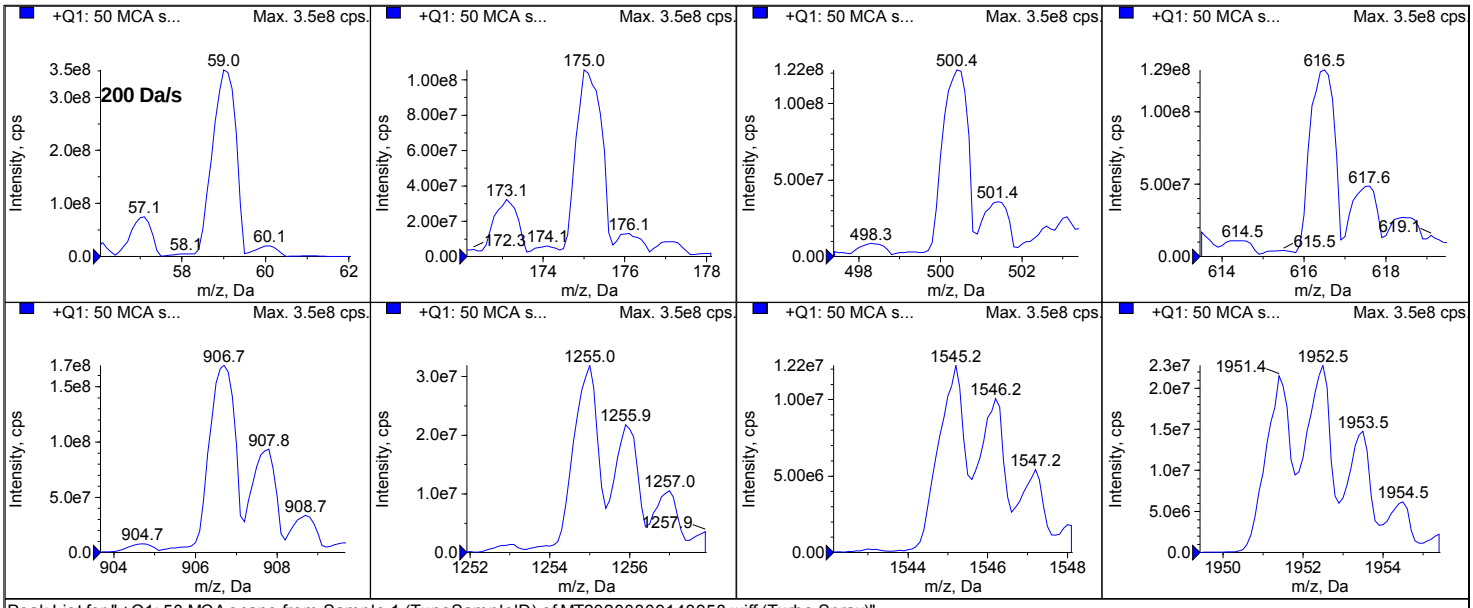
Peak List for " +Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200309143328.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0403	7.1359e7	0.6692	9.6940e-3
2	175.1330	175.1170	2.1686e7	0.7574	0.0160
3	500.3800	500.4049	2.4873e7	0.7296	-0.0249
4	616.4640	616.4564	2.6201e7	0.7194	7.6080e-3
5	906.6730	906.6762	3.6657e7	0.7211	-3.2397e-3
6	1254.9250	1254.9156	6.1174e6	0.7141	9.4336e-3
7	1545.1340	1545.1477	2.4373e6	0.7781	-0.0137
8	1952.4270	1952.4311	5.3103e6	0.7239	-4.1026e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 14:40
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



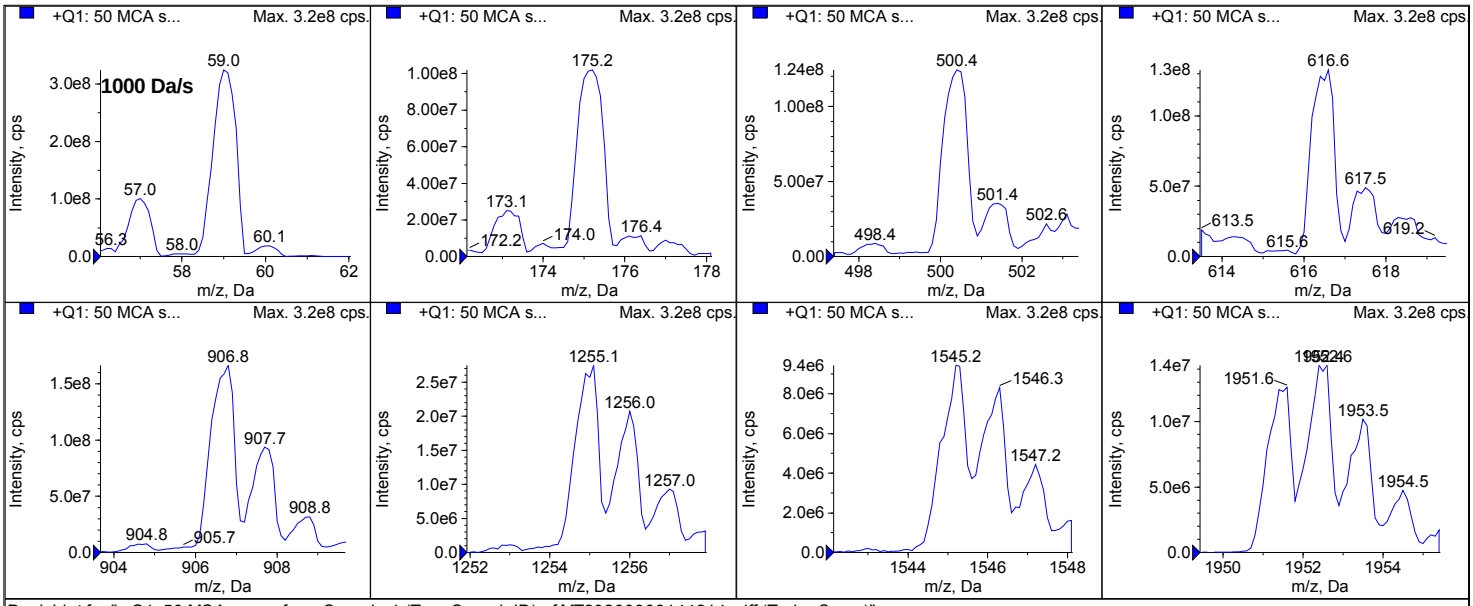
Peak List for " +Q1: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309143958.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0426	3.5185e8	0.6526	7.3620e-3
2	175.1330	175.1285	1.0569e8	0.7634	4.4530e-3
3	500.3800	500.3824	1.2207e8	0.7427	-2.3841e-3
4	616.4640	616.4559	1.2884e8	0.7249	8.1053e-3
5	906.6730	906.6721	1.6932e8	0.7323	8.6040e-4
6	1254.9250	1254.9208	3.1914e7	0.6958	4.2190e-3
7	1545.1340	1545.1217	1.2244e7	0.7698	0.0123
8	1952.4270	1952.3998	2.2800e7	0.7075	0.0272

*Post-PM
*FSE: Lynne Russell

Acq. Time: 14:42
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



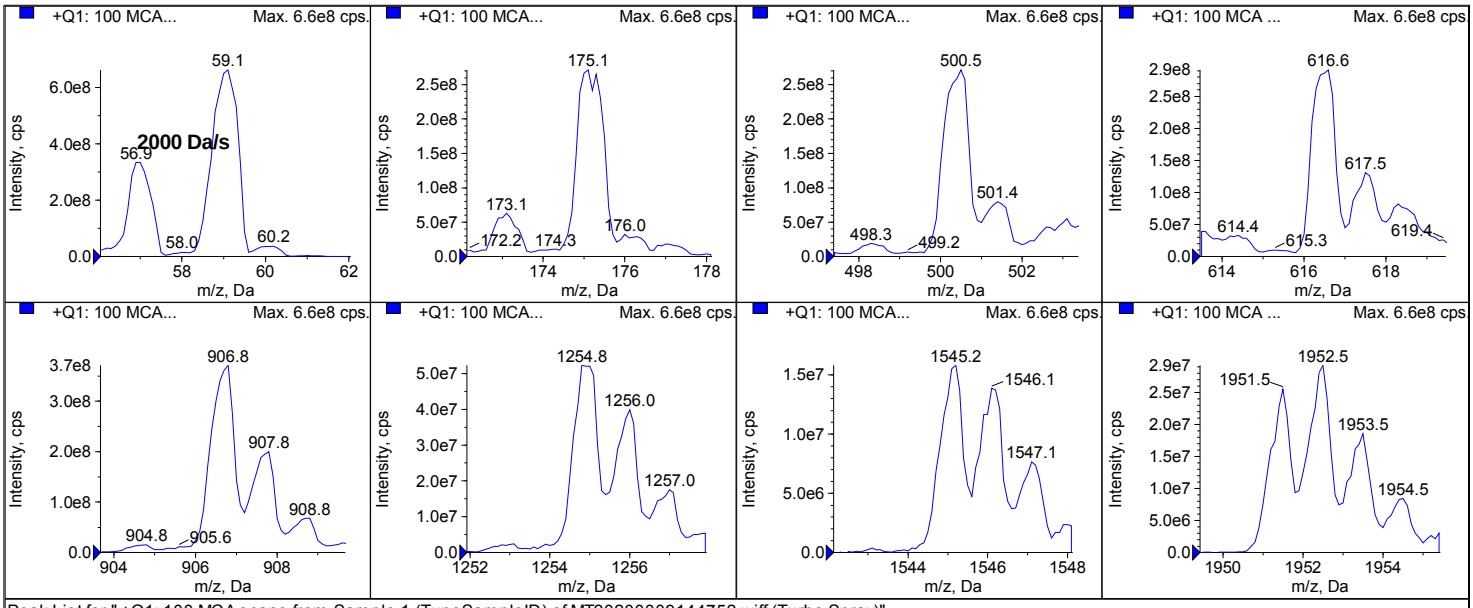
Peak List for " +Q1: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309144214.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0447	3.2454e8	0.6334	5.2631e-3
2	175.1330	175.1572	1.0197e8	0.7487	-0.0242
3	500.3800	500.3686	1.2434e8	0.6955	0.0114
4	616.4640	616.4687	1.3271e8	0.6439	-4.7115e-3
5	906.6730	906.6772	1.6629e8	0.6655	-4.1937e-3
6	1254.9250	1254.9605	2.7440e7	0.6670	-0.0355
7	1545.1340	1545.1771	9.4300e6	0.7409	-0.0431
8	1952.4270	1952.4754	1.4280e7	0.6846	-0.0484

*Post-PM
*FSE: Lynne Russell

Acq. Time: 14:47
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



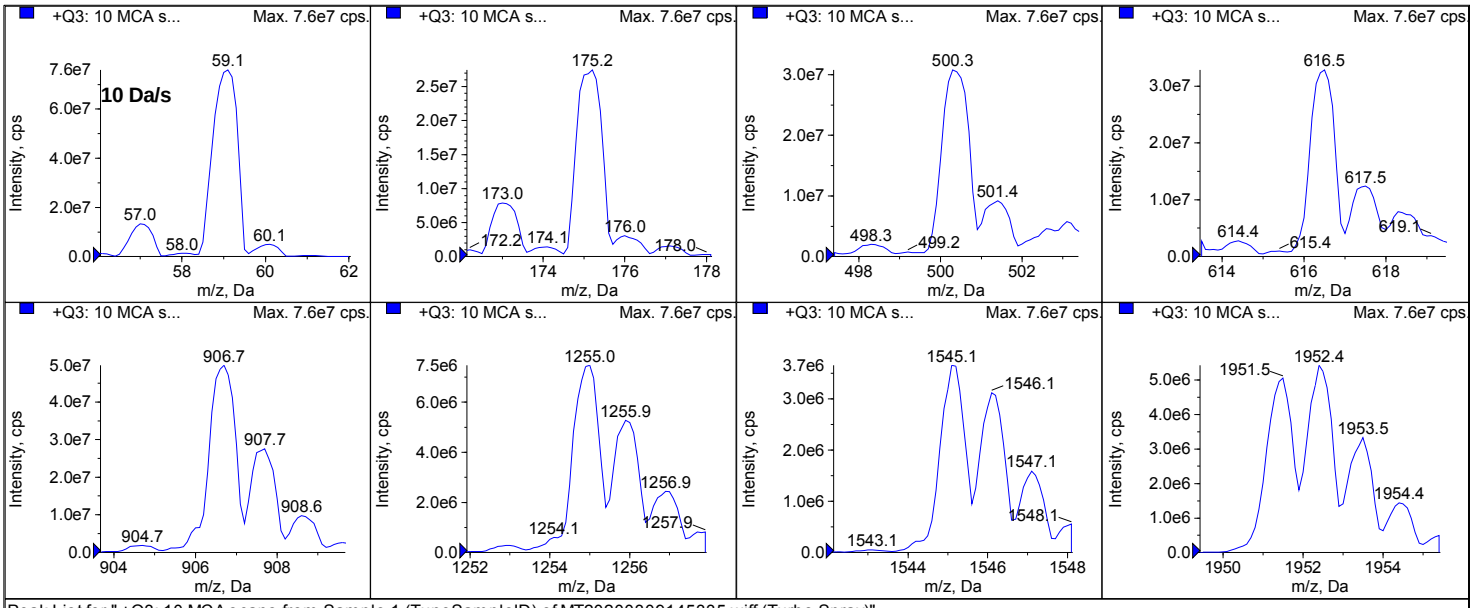
Peak List for " +Q1: 100 MCA scans from Sample 1 (TuneSampleID) of MT20200309144752.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0522	6.6290e8	0.7172	-2.2374e-3
2	175.1330	175.1580	2.7148e8	0.7493	-0.0250
3	500.3800	500.3949	2.7144e8	0.7271	-0.0149
4	616.4640	616.4704	2.9130e8	0.6476	-6.3561e-3
5	906.6730	906.6744	3.7100e8	0.6497	-1.3994e-3
6	1254.9250	1254.9073	5.2260e7	0.6858	0.0177
7	1545.1340	1545.1120	1.5800e7	0.6532	0.0220
8	1952.4270	1952.4295	2.9220e7	0.6414	-2.5268e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 14:53
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



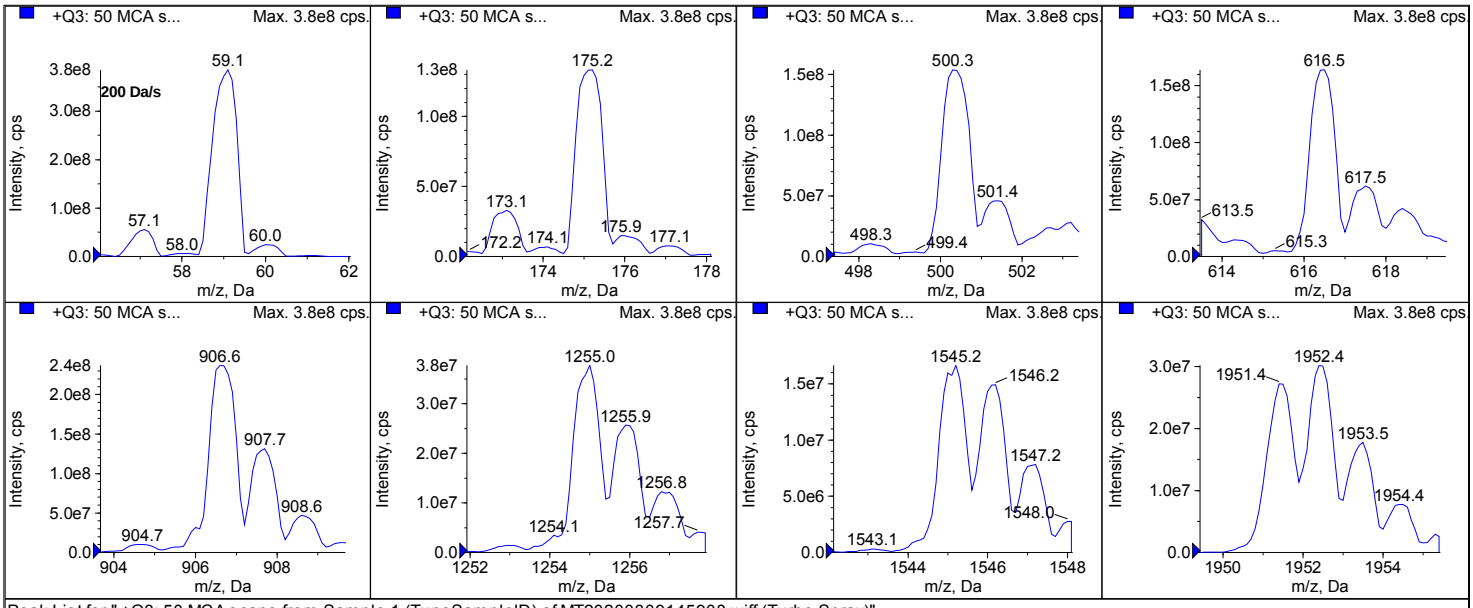
Peak List for " +Q3: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200309145335.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0513	7.5905e7	0.6954	-1.3188e-3
2	175.1330	175.1236	2.7460e7	0.7285	9.3617e-3
3	500.3800	500.3774	3.0791e7	0.7606	2.5750e-3
4	616.4640	616.4578	3.2865e7	0.6715	6.2175e-3
5	906.6730	906.6698	4.9688e7	0.7026	3.2171e-3
6	1254.9250	1254.9194	7.4667e6	0.7363	5.5598e-3
7	1545.1340	1545.1297	3.6516e6	0.7119	4.2899e-3
8	1952.4270	1952.4240	5.4222e6	0.7396	2.9901e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 14:59
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



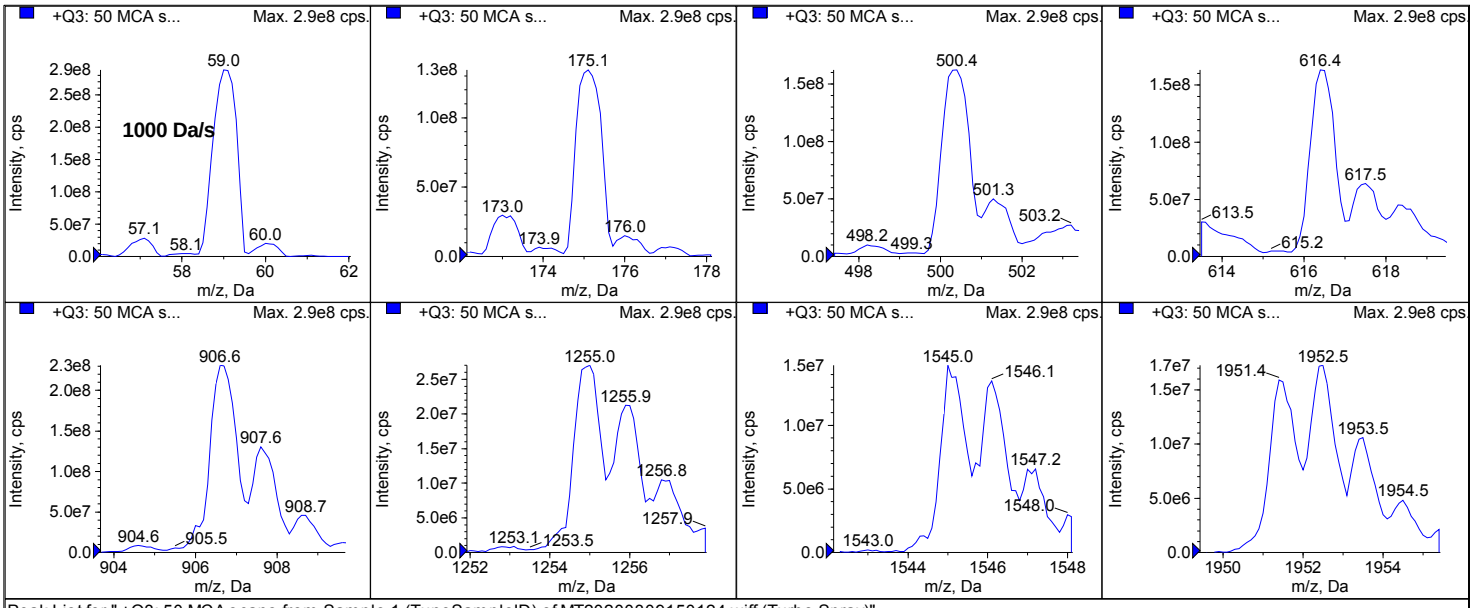
Peak List for " +Q3: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309145908.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0417	3.8495e8	0.6883	8.2519e-3
2	175.1330	175.1206	1.3316e8	0.7429	0.0124
3	500.3800	500.3761	1.5378e8	0.7795	3.8903e-3
4	616.4640	616.4581	1.6392e8	0.6983	5.8954e-3
5	906.6730	906.6698	2.3689e8	0.7180	3.1950e-3
6	1254.9250	1254.9230	3.7754e7	0.7466	2.0402e-3
7	1545.1340	1545.1237	1.6638e7	0.7683	0.0103
8	1952.4270	1952.4323	3.0168e7	0.7410	-5.3377e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:01
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



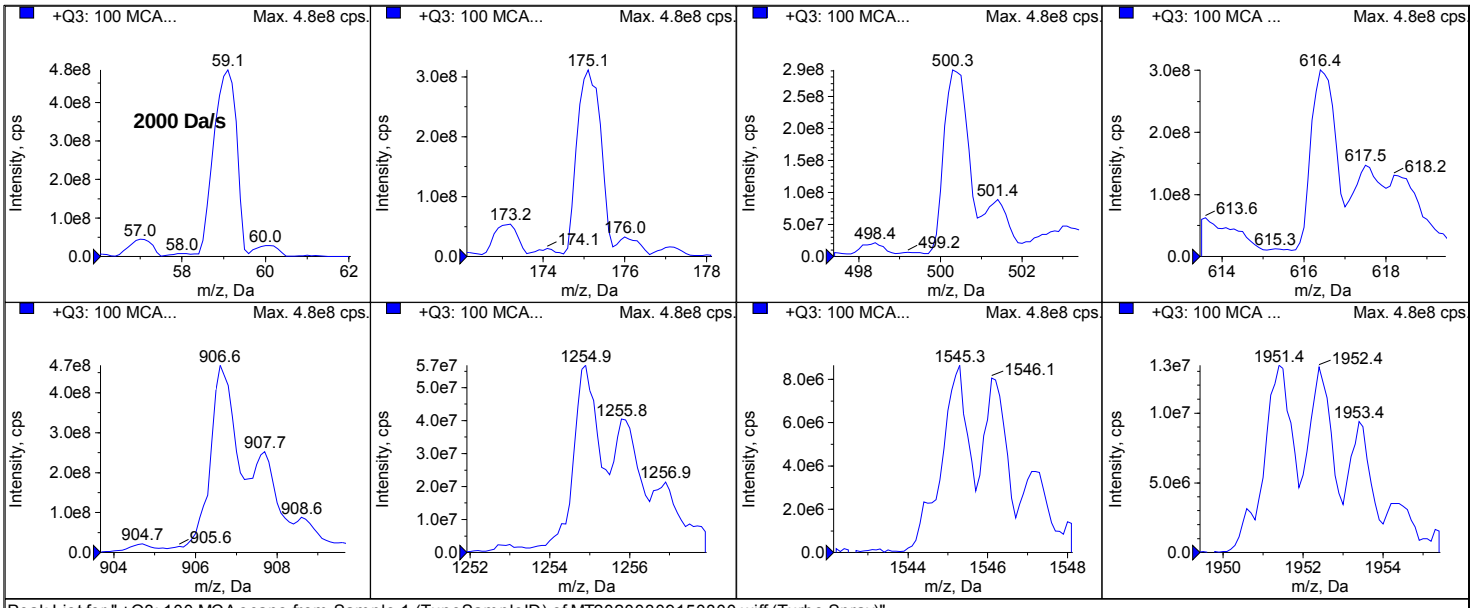
Peak List for " +Q3: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309150124.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0456	2.8843e8	0.6720	4.3685e-3
2	175.1330	175.1080	1.3443e8	0.7289	0.0250
3	500.3800	500.3716	1.6225e8	0.7737	8.4217e-3
4	616.4640	616.4572	1.6319e8	0.6772	6.8124e-3
5	906.6730	906.6761	2.3076e8	0.7093	-3.1097e-3
6	1254.9250	1254.9430	2.7010e7	0.7649	-0.0180
7	1545.1340	1545.1274	1.4710e7	0.7307	6.5536e-3
8	1952.4270	1952.4675	1.7250e7	0.7893	-0.0405

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:08
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



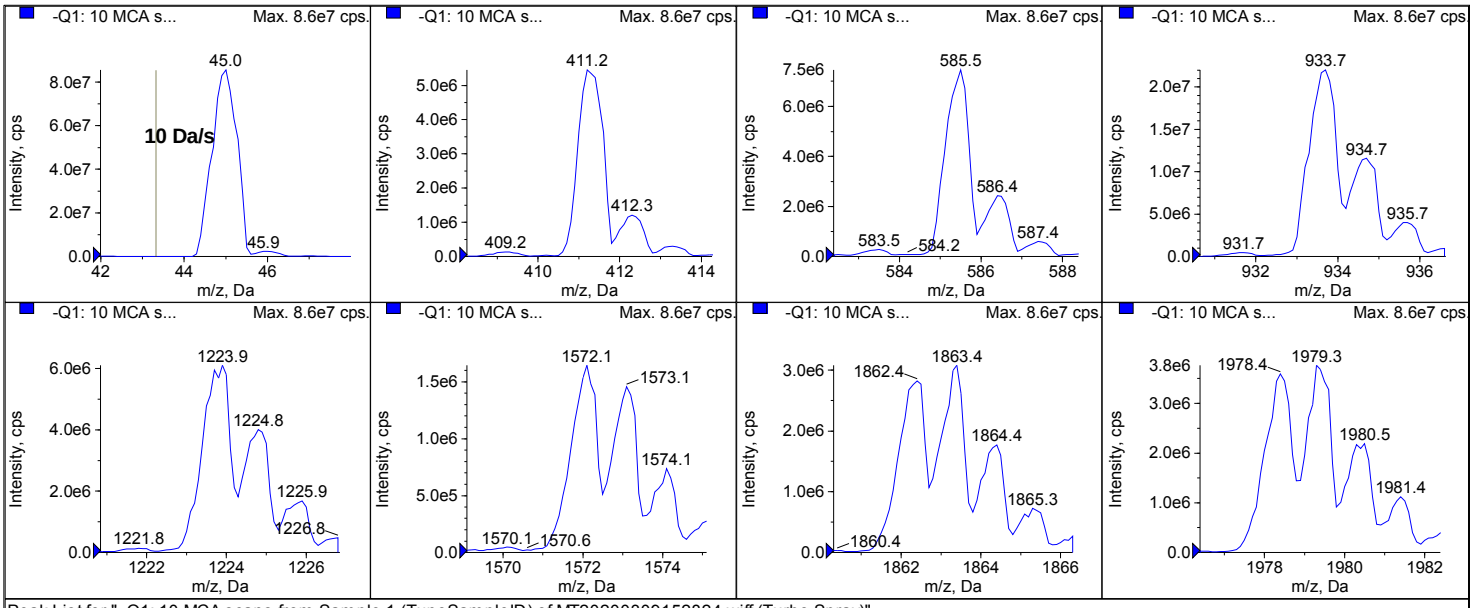
Peak List for " +Q3: 100 MCA scans from Sample 1 (TuneSampleID) of MT20200309150800.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	59.0500	59.0586	4.8450e8	0.6461	-8.6402e-3
2	175.1330	175.1219	3.1148e8	0.6940	0.0111
3	500.3800	500.3758	2.9134e8	0.6873	4.1700e-3
4	616.4640	616.4724	3.0084e8	0.7039	-8.3635e-3
5	906.6730	906.6726	4.6822e8	0.6683	4.4023e-4
6	1254.9250	1254.9151	5.6720e7	0.6771	9.9478e-3
7	1545.1340	1545.2148	8.6400e6	0.7237	-0.0808
8	1952.4270	1952.4301	1.3300e7	0.6979	-3.0947e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:28
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



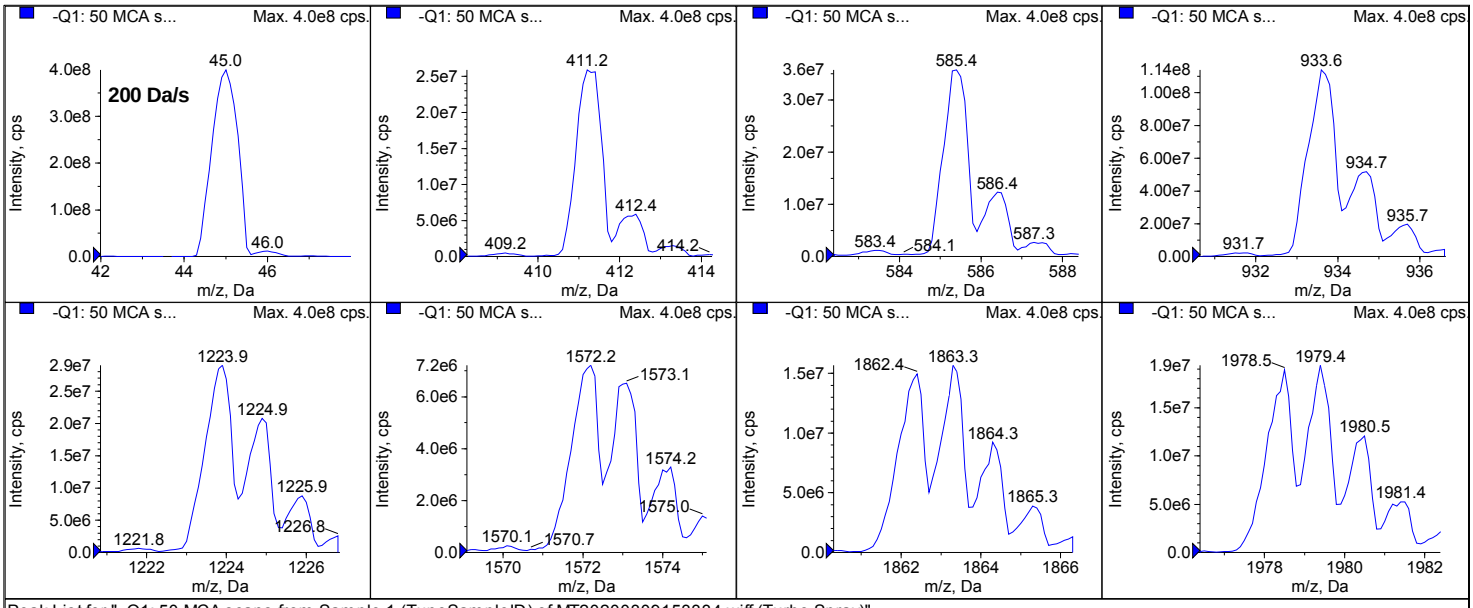
Peak List for "-Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200309152824.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	44.9918	8.5579e7	0.7257	6.1756e-3
2	411.2590	411.2931	5.4518e6	0.7033	-0.0341
3	585.3850	585.4343	7.4578e6	0.6701	-0.0493
4	933.6360	933.6510	2.2008e7	0.7625	-0.0150
5	1223.8450	1223.7823	6.0980e6	0.7651	0.0627
6	1572.0970	1572.0645	1.6439e6	0.7243	0.0325
7	1863.3060	1863.3143	3.0768e6	0.7252	-8.3485e-3
8	1979.3890	1979.3712	3.7634e6	0.7084	0.0178

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:33
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



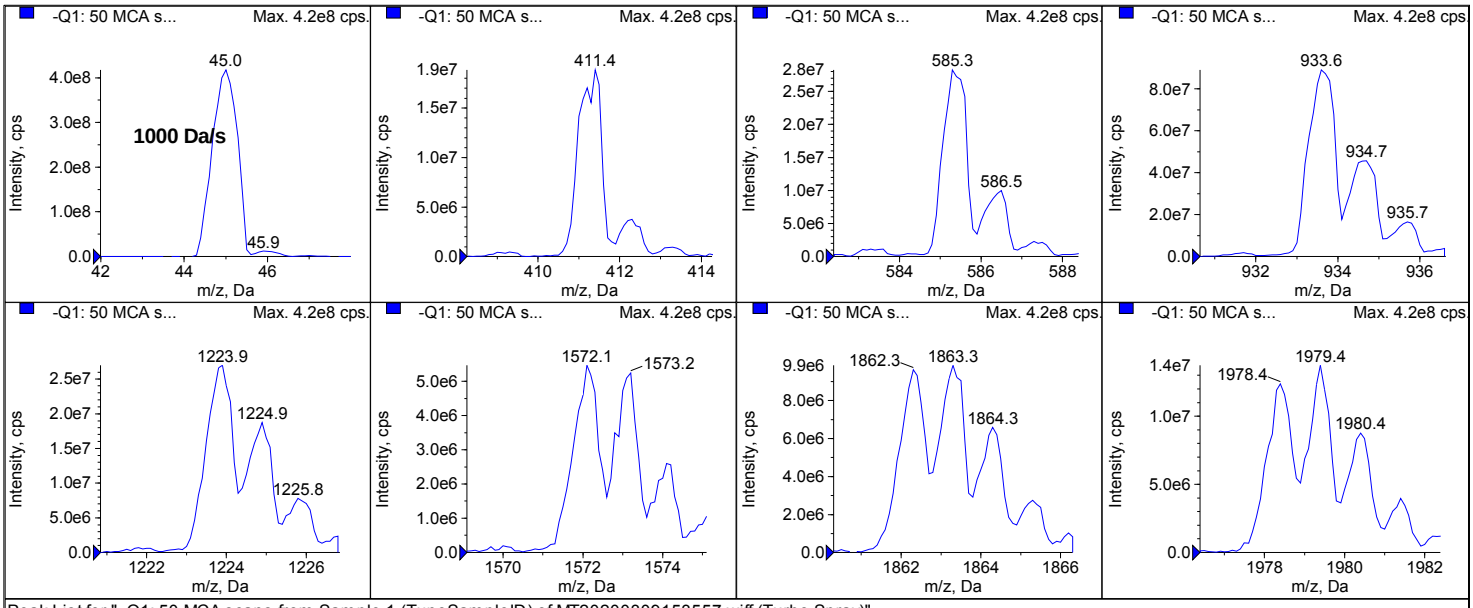
Peak List for "-Q1: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309153334.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	44.9917	3.9936e8	0.7353	6.3073e-3
2	411.2590	411.2565	2.5886e7	0.6981	2.5178e-3
3	585.3850	585.3937	3.5740e7	0.6784	-8.7106e-3
4	933.6360	933.6327	1.1394e8	0.7673	3.2736e-3
5	1223.8450	1223.8361	2.8978e7	0.7422	8.8585e-3
6	1572.0970	1572.1208	7.2060e6	0.7626	-0.0238
7	1863.3060	1863.3024	1.5666e7	0.6735	3.5534e-3
8	1979.3890	1979.3764	1.9374e7	0.7004	0.0126

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:35
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



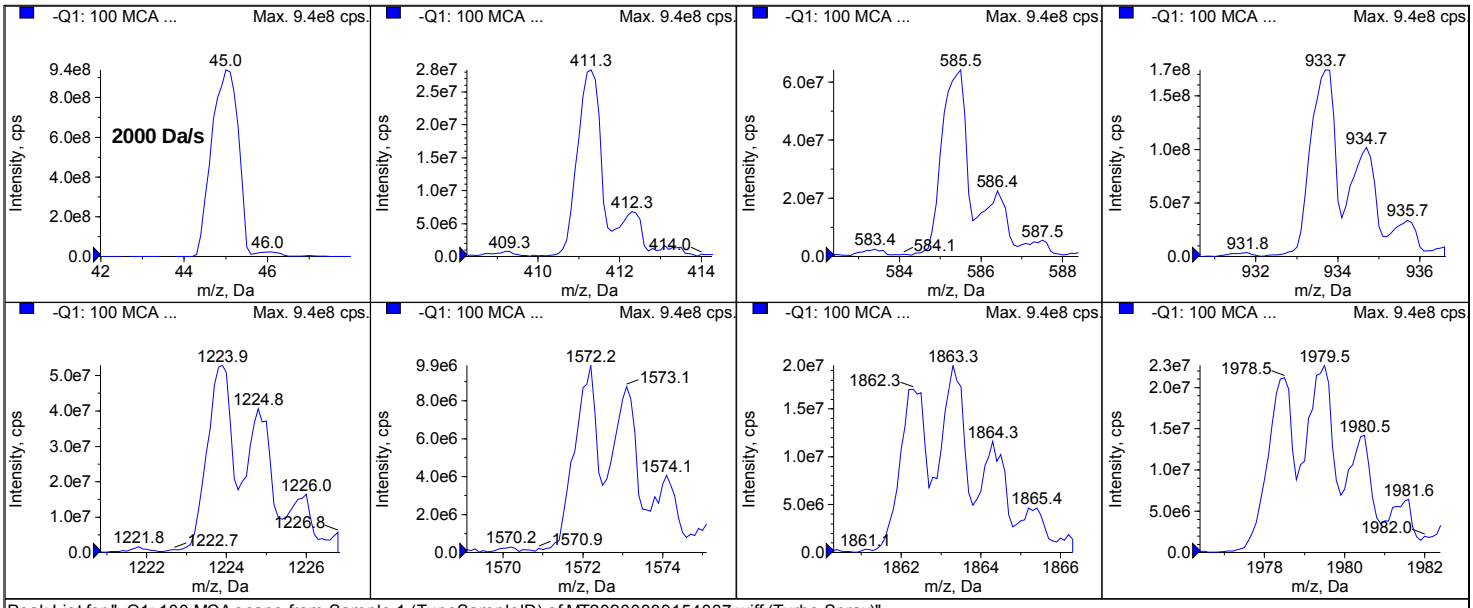
Peak List for "-Q1: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309153557.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	44.9936	4.1751e8	0.7157	4.4174e-3
2	411.2590	411.2776	1.8850e7	0.6512	-0.0186
3	585.3850	585.3771	2.8250e7	0.6670	7.8938e-3
4	933.6360	933.6294	8.9130e7	0.7626	6.5713e-3
5	1223.8450	1223.8444	2.6960e7	0.7422	6.2591e-4
6	1572.0970	1572.1041	5.4600e6	0.7252	-7.0655e-3
7	1863.3060	1863.2936	9.8500e6	0.7713	0.0124
8	1979.3890	1979.3925	1.3720e7	0.6952	-3.4915e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:40
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



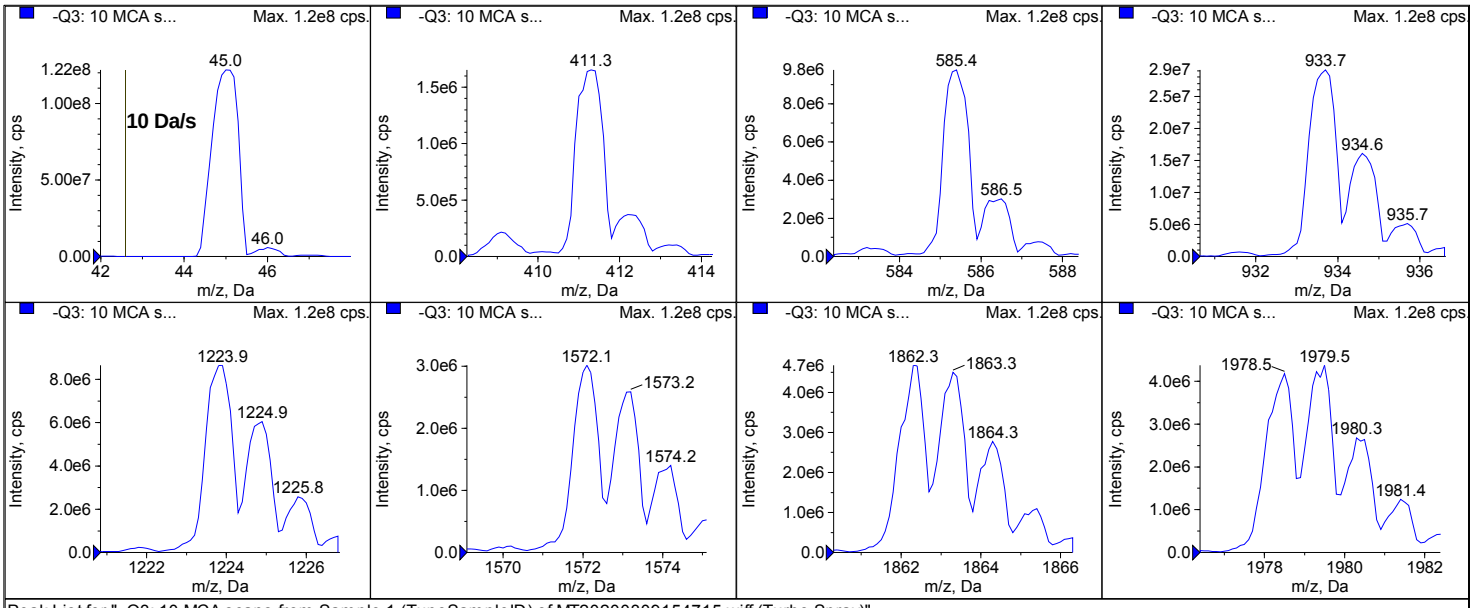
Peak List for "-Q1: 100 MCA scans from Sample 1 (TuneSampleID) of MT20200309154037.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	45.0003	9.3880e8	0.7560	-2.2824e-3
2	411.2590	411.2703	2.8340e7	0.6287	-0.0113
3	585.3850	585.3487	6.4180e7	0.6800	0.0363
4	933.6360	933.6511	1.7412e8	0.6811	-0.0151
5	1223.8450	1223.8511	5.2840e7	0.6856	-6.0596e-3
6	1572.0970	1572.1135	9.8600e6	0.6499	-0.0165
7	1863.3060	1863.3165	1.9540e7	0.6589	-0.0105
8	1979.3890	1979.3944	2.2660e7	0.7319	-5.3568e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:47
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



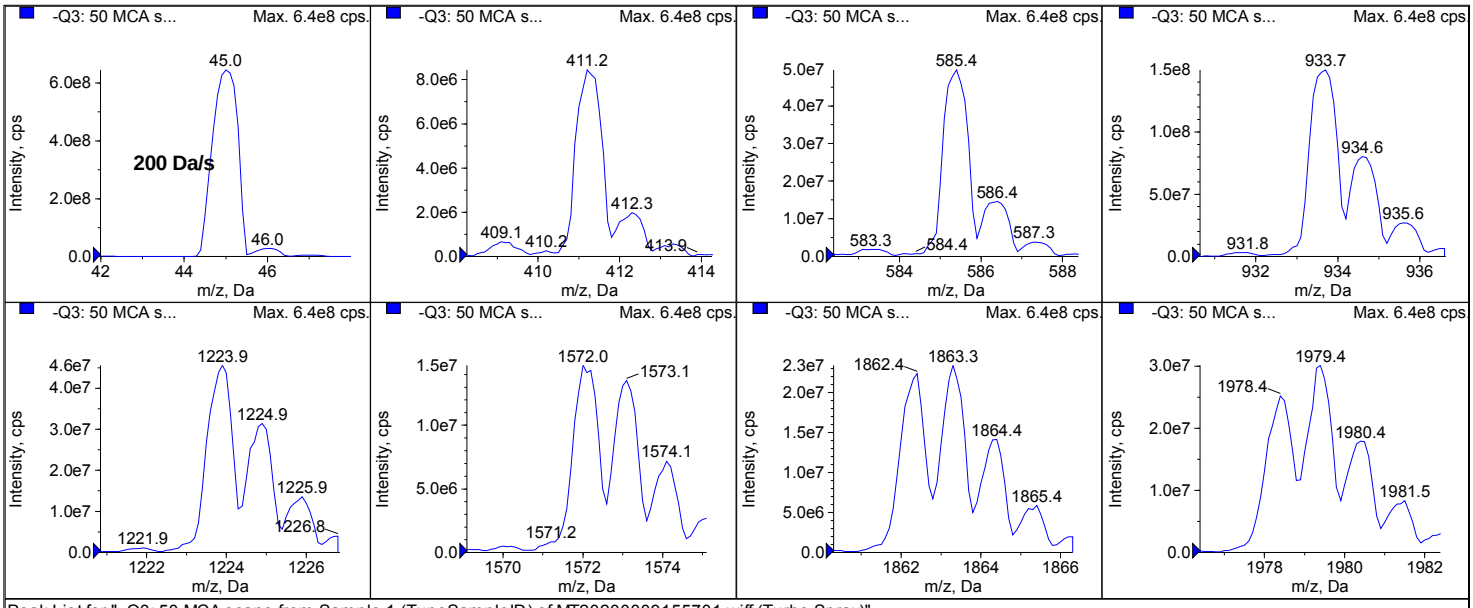
Peak List for "-Q3: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200309154715.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	45.0082	1.2180e8	0.7404	-0.0102
2	411.2590	411.2610	1.6539e6	0.7632	-2.0391e-3
3	585.3850	585.3872	9.7699e6	0.6984	-2.2009e-3
4	933.6360	933.6266	2.9123e7	0.7487	9.4038e-3
5	1223.8450	1223.8149	8.6389e6	0.7511	0.0301
6	1572.0970	1572.0850	3.0115e6	0.7067	0.0120
7	1863.3060	1863.2855	4.5025e6	0.7447	0.0205
8	1979.3890	1979.3871	4.3712e6	0.7716	1.9019e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 15:57
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



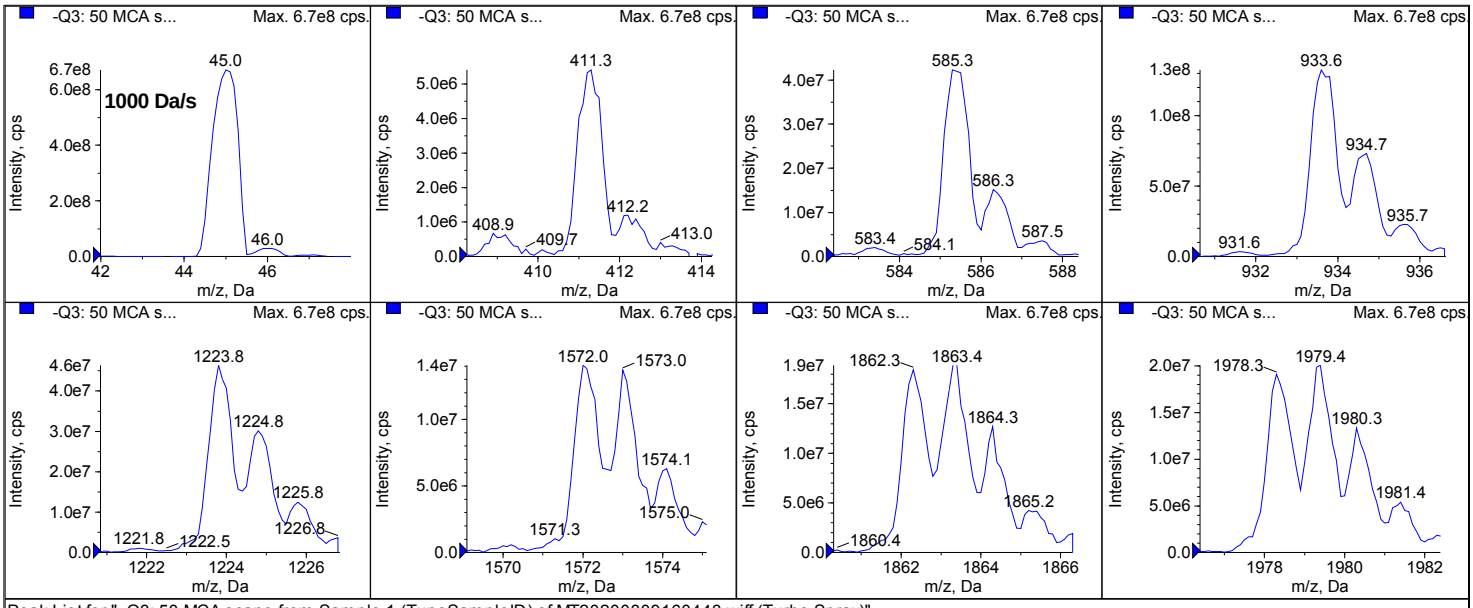
Peak List for "-Q3: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309155701.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	45.0060	6.4463e8	0.7254	-7.9934e-3
2	411.2590	411.2441	8.4440e6	0.7402	0.0149
3	585.3850	585.3776	4.9526e7	0.7000	7.4079e-3
4	933.6360	933.6448	1.4994e8	0.7558	-8.8291e-3
5	1223.8450	1223.8427	4.5540e7	0.7303	2.3178e-3
6	1572.0970	1572.0873	1.4708e7	0.7224	9.6943e-3
7	1863.3060	1863.3116	2.3372e7	0.6821	-5.6179e-3
8	1979.3890	1979.3871	3.0114e7	0.7684	1.9144e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 16:04
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



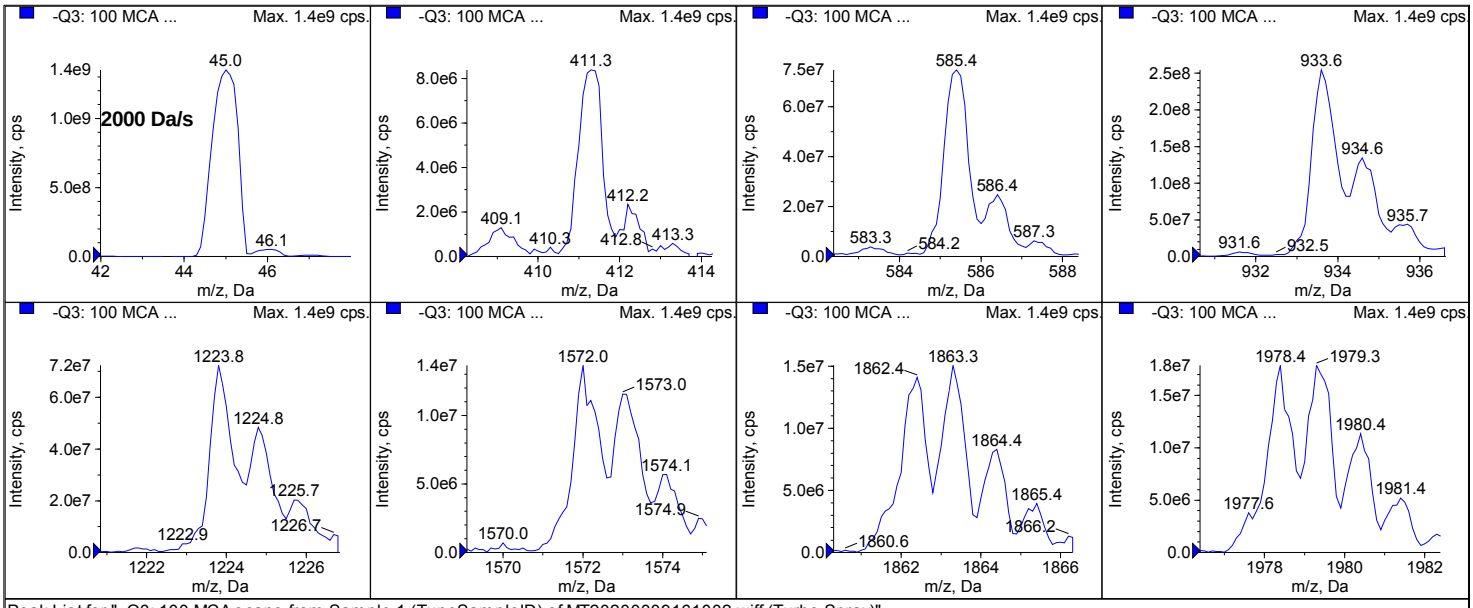
Peak List for "-Q3: 50 MCA scans from Sample 1 (TuneSampleID) of MT20200309160443.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	45.0043	6.7129e8	0.7277	-6.3300e-3
2	411.2590	411.2666	5.4100e6	0.6845	-7.6259e-3
3	585.3850	585.3966	4.2290e7	0.6976	-0.0116
4	933.6360	933.6496	1.3258e8	0.6805	-0.0136
5	1223.8450	1223.8557	4.6330e7	0.6552	-0.0107
6	1572.0970	1572.0882	1.4050e7	0.7080	8.8257e-3
7	1863.3060	1863.3356	1.8880e7	0.7932	-0.0296
8	1979.3890	1979.3810	2.0050e7	0.7797	7.9747e-3

*Post-PM
*FSE: Lynne Russell

Acq. Time: 16:10
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



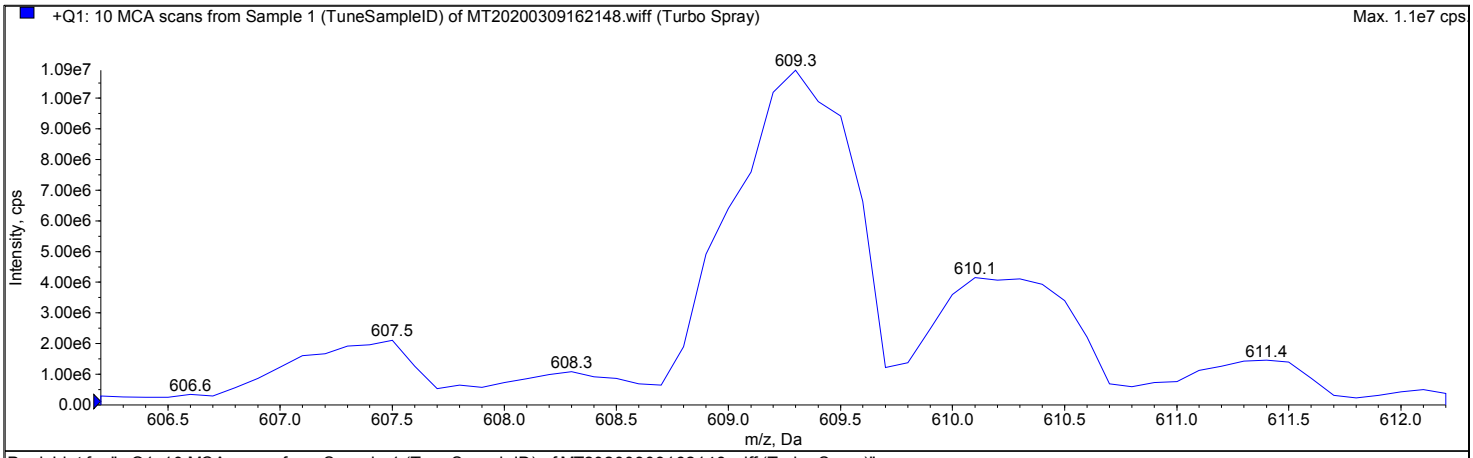
Peak List for "-Q3: 100 MCA scans from Sample 1 (TuneSampleID) of MT20200309161002.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	44.9980	45.0025	1.3512e9	0.7334	-4.5334e-3
2	411.2590	411.2920	8.3800e6	0.6384	-0.0330
3	585.3850	585.3849	7.4680e7	0.6377	5.1195e-5
4	933.6360	933.6396	2.5452e8	0.6599	-3.5625e-3
5	1223.8450	1223.8458	7.2340e7	0.6032	-7.8090e-4
6	1572.0970	1572.0918	1.3640e7	0.7449	5.2106e-3
7	1863.3060	1863.3134	1.5060e7	0.7096	-7.4095e-3
8	1979.3890	1978.4049	1.7860e7	0.7051	0.9841

*Post-PM
*FSE: Lynne Russell

Acq. Time: 16:21
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



Peak List for " +Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200309162148.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	174.1000	n/a	n/a	n/a	n/a
2	195.1000	n/a	n/a	n/a	n/a
3	397.2000	n/a	n/a	n/a	n/a
4	448.1000	n/a	n/a	n/a	n/a
5	609.2810	609.3177	1.0915e7	0.6852	-0.0367

*Post-PM
*FSE: Lynne Russell

Acq. Time: N/A
Acq. Date: N/A

Analyst Version: 1.7.0
*SN: EB250231807

State Parameter Editor

Ion Source: Turbo Spray
Ion Source Temperature Reached
Curtain Gas (CUR): 20.0
IonSpray Voltage (IS): 4000.0
Temperature (TEM): 0.0
Ion Source Gas 1 (GS1): 20.0
Ion Source Gas 2 (GS2): 0.0

Entrance Potential (EP): 10.0

Q1 Resolution: Unit
Ion Energy 1 (IE1): 1.0

Deflector (DF): -200.0
CEM (CEM): 2100.0

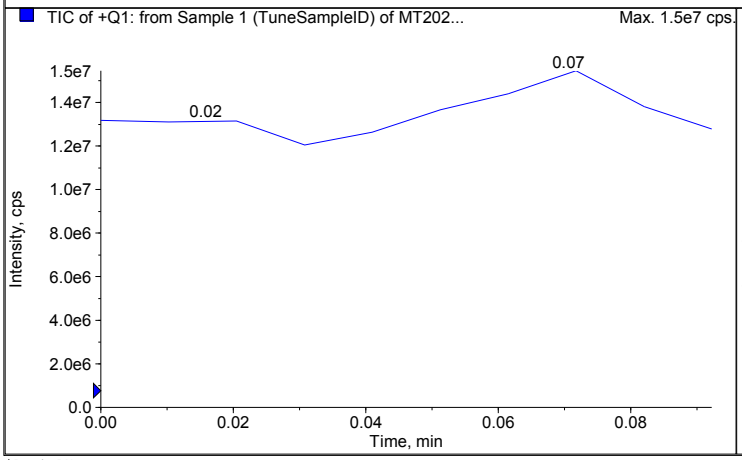
Mass Spectrometer Method Properties

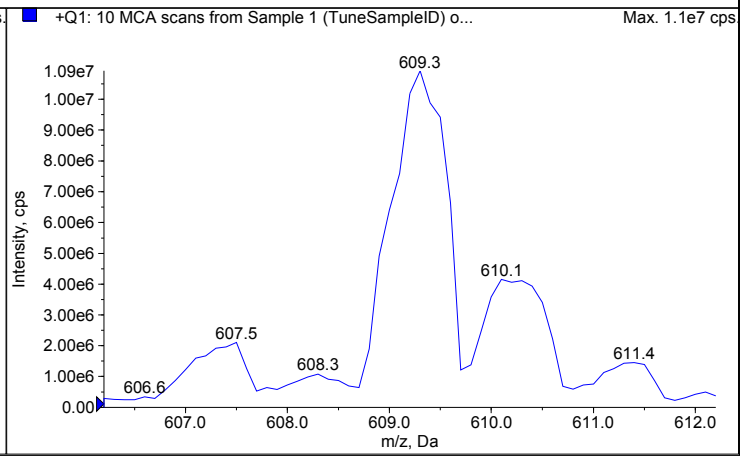
Period 1:

Scans in Period: 10
Relative Start Time: 0.00 msec
Scheduled Ionization: Off
Experiments in Period: 1

Period 1 Experiment 1:

Scan Type: Q1 MS (Q1)
Polarity: Positive
Scan Mode: Profile
Ion Source: Turbo Spray
Scans to Sum: 1

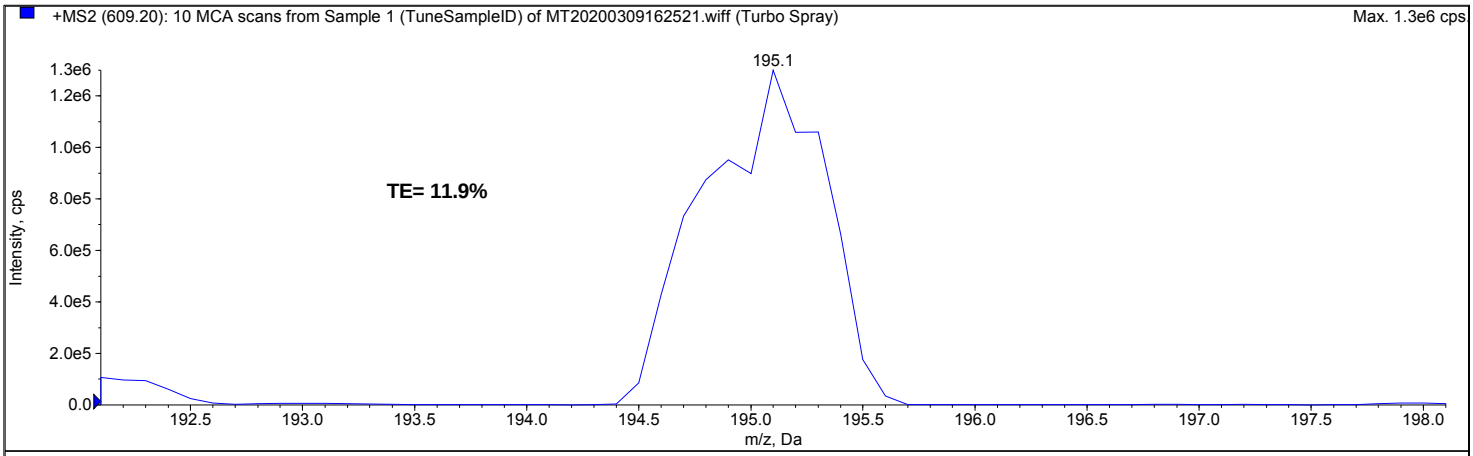




*Post-PM
*FSE: Lynne Russell

Acq. Time: 16:25
Acq. Date: Monday, March 09, 2020

Analyst Version: 1.7.0
*SN: EB250231807



Peak List for " +MS2 (609.20): 10 MCA scans from Sample 1 (TuneSampleID) of MT20200309162521.wiff (Turbo Spray)"

	Target Mass (Da)	Found At (Da)	Intensity (cps)	Width (Da)	Mass Shift (Da)
1	174.1000	n/a	n/a	n/a	n/a
2	195.1000	195.0747	1.3007e6	0.7298	0.0253
3	397.2000	n/a	n/a	n/a	n/a
4	448.1000	n/a	n/a	n/a	n/a
5	609.2810	n/a	n/a	n/a	n/a

*Post-PM
*FSE: Lynne Russell

Acq. Time: N/A
Acq. Date: N/A

Analyst Version: 1.7.0
*SN: EB250231807

State Parameter Editor

Ion Source: Turbo Spray
Ion Source Temperature Reached
Curtain Gas (CUR): 20.0
Collision Gas (CAD): 8
IonSpray Voltage (IS): 4000.0
Temperature (TEM): 0.0
Ion Source Gas 1 (GS1): 20.0
Ion Source Gas 2 (GS2): 0.0

Entrance Potential (EP): 10.0
Focusing Lens 1 (IQ1): -10.5
Collision Energy (CE): 44.0
Collision Cell Exit Potential (CXP): 7.0

Q1 Resolution: Unit Q3 Resolution: Unit

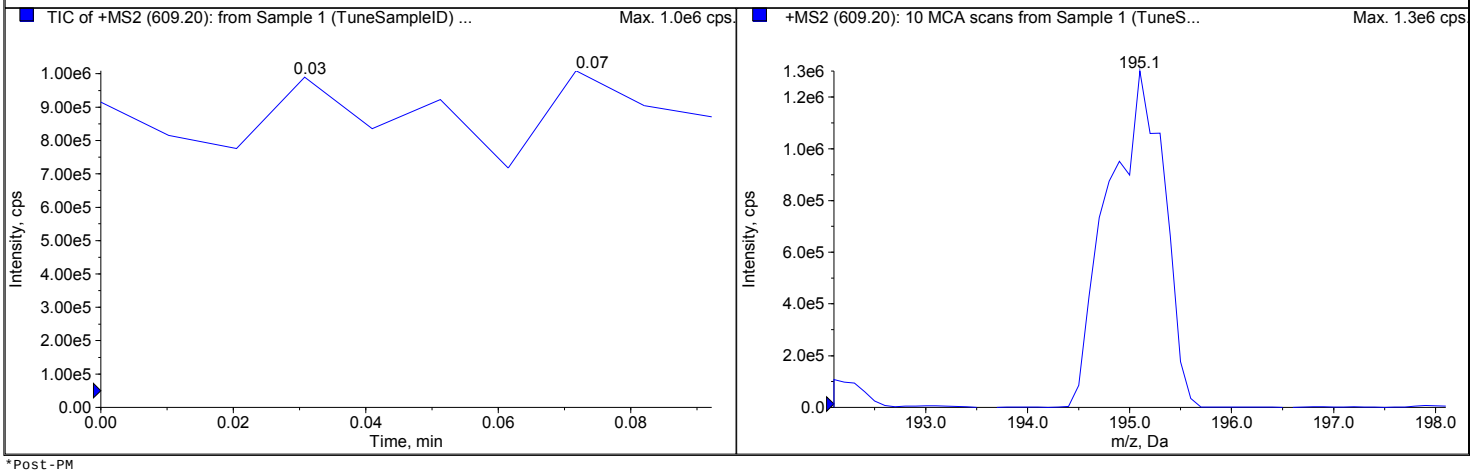
Mass Spectrometer Method Properties

Period 1:

Scans in Period: 10
Relative Start Time: 0.00 msec
Scheduled Ionization: Off
Experiments in Period: 1

Period 1 Experiment 1:

Scan Type: Product Ion (MS2)
Polarity: Positive
Scan Mode: Profile
Ion Source: Turbo Spray
Scans to Sum: 1



*Post-PM
*FSE: Lynne Russell

Pace Environmental Services, LLC
Initial Calibration Response Report

Batch: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b
Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02
Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	012621007.d	ICAL 50_SVLC-1272	26-Jan-2021 13:22:18
2	012621008.d	ICAL 100_SVLC-1273	26-Jan-2021 13:32:55
3	012621009.d	ICAL 200_SVLC-1274	26-Jan-2021 13:43:33
4	012621010.d	ICAL 500_SVLC-1275	26-Jan-2021 13:54:07
5	012621011.d	ICAL 1000_SVLC-1276	26-Jan-2021 14:04:47
6	012621012.d	ICAL 2000_SVLC-1277	26-Jan-2021 14:15:21
7	012621013.d	ICAL 5000_SVLC-1278	26-Jan-2021 14:25:58
8	012621014.d	ICAL 10000_SVLC-1279	26-Jan-2021 14:36:40
9	012621015.d	ICAL 15000_SVLC-1280	26-Jan-2021 14:47:21
10	012621016.d	ICAL 20000_SVLC-1281	26-Jan-2021 14:58:01

Quantitation Standards (* - Istd) (D - Iso Dil Std)

* 37 13C2_PFDA	* 39 13C2_PFHxA	* 41 13C2_PFOA
* 43 13C3_PFBA	* 48 13C4_PFOS	D 38 13C2_PFDoA
D 40 13C2_PFHxDA	D 42 13C2_PFTeDA	D 44 13C3_PFBS
D 45 13C3_PFHxS	D 46 13C4_PFBA	D 47 13C4_PFHpA
D 49 13C5_PFHxA	D 50 13C5_PFPeA	D 51 13C6_PFDA
D 52 13C7_PFUdA	D 53 13C8_PFOA	D 54 13C8_PFOS
D 55 13C8_PFOSA	D 56 13C9_PFNA	D 57 d3-MeFOSA
D 58 d3-MeFOSAA	D 59 d5-EtFOSA	D 60 d5-EtFOSAA
D 61 d7-MeFOSE	D 62 d9-EtFOSE	D 63 13C2_4:2 FTS_2
D 64 13C2_6:2 FTS_2	D 65 13C2_8:2 FTS_2	D 66 13C3_GenX

Column: 1 Detector: LCMS-Q3

Compound	Level 1 Conc/Rsp	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
D 46 13C4_PFBA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	683019	675994	684273	672473	720687	651337	644048	644832	666145	631467	
8 PFBA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#46
	38291	73157	144553	336486	737574	1307716	3227127	6316964	9987737	12564689	
D 50 13C5_PFPeA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	634189	646008	650219	636967	669031	646265	615145	608527	619477	608741	
21 PFPeA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#50
	37781	66352	138624	319548	666079	1228435	3082351	6185249	9425245	12256345	
D 44 13C3_PFBS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	191891	196982	187090	194402	208034	186911	185619	183527	195681	183052	
7 PFBS	44.200	88.400	176.80	442.00	884.00	1768.00	4420.00	8840.00	13260	17680	#44
	10861	22854	40333	98156	211986	377633	941809	1933556	2937715	3810877	
1 4:2 FTS	46.700	93.400	186.80	467.00	934.00	1868.00	4670.00	9340.00	14010	18680	#63
	2143	4343	9107	22749	51188	91520	222081	421709	670079	861078	
D 63 13C2_4:2 FTS_2	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	110710	109979	118247	107929	122994	114881	108442	112217	102946	104236	
D 49 13C5_PFHxA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	695717	694949	705868	695880	773207	671018	663610	677281	656835	658516	
15 PFHxA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#49
	35226	75115	139959	337858	740873	1359193	3422647	6566741	10217509	12470888	

Compound	Level 1 Conc/Rsp	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
22 PFPeS	46.900	93.800	187.60	469.00	938.00	1876.00	4690.00	9380.00	14070	18760	#44
	6832	14763	29062	78807	157706	306288	755101	1497844	2339904	3027304	
28 GenX	100.00	200.00	400.00	1000.00	2000.00	4000.00	10000	20000	30000	40000	#66
	17517	34442	73602	162510	369792	670477	1656532	3305338	5090244	6489165	
D 66 13C3_GenX	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	1225431	1193517	1227800	1205028	1294237	1189193	1193675	1182986	1223878	1121475	
13 PFHpA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#47
	32047	54894	114660	287635	589712	1118288	2661996	5459491	8426903	11091880	
D 47 13C4_PFHpA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	538894	543654	544215	527217	566534	531768	506304	511175	521771	475717	
14 PFHxS	45.500	91.000	182.00	455.00	910.00	1820.00	4550.00	9100.00	13650	18200	#45
	8352	15619	25426	67084	138237	261105	633398	1211840	1901996	2417291	
D 45 13C3_PFHxS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	137108	139492	127733	137437	147201	139769	126370	118351	127228	124243	
29 ADONA	47.100	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#45
	47366	97120	188020	457276	948544	1734787	4406343	8453357	13016038	17315419	
D 64 13C2_6:2 FTS_2	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	84936	87774	85627	84113	89400	89077	82227	79636	78543	77794	
2 6:2 FTS	47.400	94.800	189.60	474.00	948.00	1896.00	4740.00	9480.00	14220	18960	#64
	2410	4060	8396	20683	43048	71276	172333	329954	522020	650051	
D 53 13C8_PFOA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	546023	538525	533423	526729	568086	509472	492790	476054	488804	475647	
20 PFOA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#53
	29198	63214	115686	279355	590062	1019789	2571251	4924707	7558627	9671776	
12 PFHpS	47.600	95.200	190.40	476.00	952.00	1904.00	4760.00	9520.00	14280	19040	#45
	5467	13765	24658	60668	126107	251207	613172	1126156	1762665	2247232	
D 54 13C8_PFOS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	118012	117589	113334	115666	126288	113900	104943	108818	118833	116796	
18 PFOS	46.400	92.800	185.60	464.00	928.00	1856.00	4640.00	9280.00	13920	18560	#54
	9003	14339	27901	63088	147120	278028	658434	1294640	1970181	2633086	
D 56 13C9_PFNA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	653239	655826	646507	638062	703892	665794	639731	598888	626426	626662	
17 PFNA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#56
	32411	76646	143111	319219	730291	1298162	3150350	6315060	9566949	12327233	
30 9Cl-PF3ONS	46.600	93.200	186.40	466.00	932.00	1864.00	4660.00	9320.00	13980	18640	#54
	21669	43409	83891	191901	431623	792217	1998434	3858356	6122088	7876694	
D 55 13C8_PFOSA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	245906	263890	264706	253594	270927	245433	258598	243305	237386	225960	
19 PFOSA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#55
	13741	26543	56292	139419	281505	523694	1276898	2496481	3728297	4866255	
3 8:2 FTS	47.900	95.800	191.60	479.00	958.00	1916.00	4790.00	9580.00	14370	19160	#65
	1858	4574	6808	19413	37688	72682	172821	319182	509822	648828	
16 PFNS	48.000	96.000	192.00	480.00	960.00	1920.00	4800.00	9600.00	14400	19200	#54
	5133	9801	18403	46282	92157	179495	455857	851381	1310741	1652477	
D 65 13C2_8:2 FTS_2	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	85717	85819	79546	85094	91484	86437	81497	74666	72560	75271	
D 51 13C6_PFDA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	625394	622991	610209	596989	643340	603377	606074	588802	556862	560081	
10 PFDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#51
	33707	63666	122857	314562	646324	1174607	2915273	5655332	8613824	10869040	
D 58 d3-MeFOSAA	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	668378	649307	661578	643978	689696	644267	644653	593810	690968	600741	
6 N-MeFOSAA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#58
	4809	10468	20466	49641	102636	195793	478028	919895	1458648	1786874	
9 PFDS	48.200	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#54
	5182	9069	15404	46176	87539	158442	411150	766970	1250794	1544336	

Compound	Level 1 Conc/Rsp	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
D 52 13C7_PFUdA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	575743	554807	527405	555828	564025	547387	522375	519758	519977	517000	
D 60 d5-EtFOSAA	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	562672	580829	561602	549440	568396	560775	557305	521525	533271	460640	
25 PFUdA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#52
	29430	55461	121895	272285	537435	1037602	2444822	4585068	7650536	9135698	
5 N-EtFOSAA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#60
	5569	13427	24748	56375	117985	237535	523872	1039015	1585192	1935498	
D 61 d7-MeFOSE	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	88861	93125	80727	85662	84617	80900	81223	77080	83168	74059	
32 MeFOSE	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#61
	4110	7593	19125	44723	96720	165817	400340	808211	1309436	1523822	
D 57 d3-MeFOSA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	47095	41177	43607	48936	44332	44752	47183	40805	47305	49186	
26 MeFOSA		100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000		#57
		6433	13335	27540	63347	109887	264800	525211	840828		
31 11Cl-PF3OUDS	47.100	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#54
	19364	39707	70264	170205	353616	688870	1685340	3415328	5122767	6772481	
D 62 d9-EtFOSE	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	95826	100977	95840	101518	98326	95373	94474	92410	95725	89076	
11 PFDoA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	32449	58654	118246	262678	568760	1110803	2690311	4944659	7905263	9305148	
33 EtFOSE	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#62
	4911	10429	19306	47256	101931	179768	456455	832755	1379736	1723072	
D 38 13C2_PFDoA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	526437	556608	541488	531310	560944	503201	535210	487286	500925	481115	
4 10:2 FTS	48.200	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#65
	2042	4716	9714	20977	46472	77641	202451	385168	542269	728075	
D 59 d5-EtFOSA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	39142	42635	41724	41750	45663	43209	40516	43790	43209	40603	
27 EtFOSA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#59
	3013	5209	10980	22388	42180	90672	214862	438055	667451	833945	
34 PFDOS	48.400	96.800	193.60	484.00	968.00	1936.00	4840.00	9680.00	14520	19360	#54
	5322	11498	23051	56033	114903	211455	541908	1012764	1566090	2068671	
24 PFTrDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	29538	53463	106921	243250	554569	1037053	2555223	4910787	7215002	9458149	
D 42 13C2_PFTeDA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	736456	747482	739782	728253	782673	703860	736505	719959	741303	708403	
23 PFTeDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#42
	36144	71764	133986	318847	689532	1236083	3046229	6240118	9223660	12079475	
35 PFHxDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	30902	57400	104377	250537	520028	985088	2386535	4600812	7057697	8850408	
D 40 13C2_PFHxDA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	753644	755177	750700	733617	785856	730601	752213	737038	737566	713656	
36 PFODA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	42881	80091	154693	368356	782949	1493548	3714101	7139168	11035071	14065311	

Report Date: 27-Jan-2021 16:50:50 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Initial Calibration RF Report

Batch: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b

Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02

Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	012621007.d	ICAL 50_SVLC-1272	26-Jan-2021 13:22:18
2	012621008.d	ICAL 100_SVLC-1273	26-Jan-2021 13:32:55
3	012621009.d	ICAL 200_SVLC-1274	26-Jan-2021 13:43:33
4	012621010.d	ICAL 500_SVLC-1275	26-Jan-2021 13:54:07
5	012621011.d	ICAL 1000_SVLC-1276	26-Jan-2021 14:04:47
6	012621012.d	ICAL 2000_SVLC-1277	26-Jan-2021 14:15:21
7	012621013.d	ICAL 5000_SVLC-1278	26-Jan-2021 14:25:58
8	012621014.d	ICAL 10000_SVLC-1279	26-Jan-2021 14:36:40
9	012621015.d	ICAL 15000_SVLC-1280	26-Jan-2021 14:47:21
10	012621016.d	ICAL 20000_SVLC-1281	26-Jan-2021 14:58:01

Curve Legend: Ex. Avg:H Wt:C2 Org:F Dep:A

Curve Type: Avg, Ln, Qd Response Type: H-Height, A-Area

Wt: Curve Weighting, C-1/Conc, C2-1/Conc^2, R-1/Rsp, R2-1/Rsp^2, N-None

Org: Origin, F-Force, I-Include, N-Neither

Dep: Dependent Variable, A-Amount, R-Response

%Rec = (Measured Amount / True Amount) * 100

Column: 1 Detector: LCMS-Q3

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
D 46 13C4_PFBA	683	676	684	672	721	651	644	645	666	631	Avg:A Wt:C2	667		RSD=3.9	
	102	101	103	101	108	97.6	96.5	96.6	99.8	94.6	Org:N Dep:A		✓		✓
8 PFBA	1.121228	1.082214	1.056252	1.000742	1.023432	1.003871	1.002139	0.979629	0.999556	0.994881	Avg:A Wt:C2	1.026394		RSD=4.4	
	109 ✓	105 ✓	103 ✓	97.5 ✓	99.7 ✓	97.8 ✓	97.6 ✓	95.4 ✓	97.4 ✓	96.9 ✓	Org:N Dep:A				
D 50 13C5_PFPeA	634	646	650	637	669	646	615	609	619	609	Avg:A Wt:C2	633		RSD=3.2	
	100	102	103	101	106	102	97.1	96.1	97.8	96.1	Org:N Dep:A				
21 PFPeA	1.191474	1.027108	1.065979	1.003342	0.995588	0.950411	1.002154	1.016430	1.014323	1.006696	Avg:A Wt:C2	1.027351		RSD=6.3	
	116	100	104	97.7	96.9	92.5	97.5	98.9	98.7	98	Org:N Dep:A				
D 44 13C3_PFBS	192	197	187	194	208	187	186	184	196	183	Avg:A Wt:C2	191		RSD=4.0	
	100	103	97.8	102	109	97.7	97	95.9	102	95.7	Org:N Dep:A				
7 PFBS	1.280539	1.312452	1.219348	1.142336	1.152711	1.142754	1.147937	1.191803	1.132185	1.177520	Avg:A Wt:C2	1.189959		RSD=5.3	
	108	110	102	96	96.9	96	96.5	100	95.1	99	Org:N Dep:A				

✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓

Report Date: 27-Jan-2021 16:50:50 AIM Revision: 2.0 05-Oct-2020 14:59:22
Method Path: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b\LCMSMS02_PFAS-ID.m

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
1 4:2 FTS	2.072471	2.113991	2.061476	2.256718	2.227960	2.132362	2.192638	2.011765	2.322996	2.211148	Avg:A Wt:C2	2.160353		RSD=4.5	
	95.9	97.9	95.4	104	103	98.7	101	93.1	108	102	Org:N Dep:A				
D 63 13C2_4:2 FTS_2	22.1420	21.9958	23.6494	21.5858	24.5988	22.9762	21.6884	22.4434	20.5892	20.8472	Avg:A Wt:C2	22.2516		RSD=5.5	
	99.5	98.9	106	97	111	103	97.5	101	92.5	93.7	Org:N Dep:A				
D 49 13C5_PFHxA	696	695	706	696	773	671	664	677	657	659	Avg:A Wt:C2	689		RSD=5.0	
	101	101	102	101	112	97.3	96.3	98.3	95.3	95.5	Org:N Dep:A				
15 PFHxA	1.012653	1.080871	0.991396	0.971024	0.958182	1.012784	1.031524	0.969574	1.037045	0.946893	Avg:A Wt:C2	1.001195		RSD=4.2	
	101	108	99	97	95.7	101	103	96.8	104	94.6	Org:N Dep:A				
22 PFPeS	0.759137	0.798997	0.828022	0.864353	0.808186	0.873499	0.867381	0.870089	0.849875	0.881554	Avg:A Wt:C2	0.840109		RSD=4.8	
	90.4	95.1	98.6	103	96.2	104	103	104	101	105	Org:N Dep:A				
28 GenX	0.714728	0.721439	0.749328	0.674300	0.714305	0.704760	0.693879	0.698516	0.693185	0.723285	Avg:A Wt:C2	0.708773		RSD=2.9	
	101	102	106	95.1	101	99.4	97.9	98.6	97.8	102	Org:N Dep:A				
D 66 13C3_GenX	245	239	246	241	259	238	239	237	245	224	Avg:A Wt:C2	241		RSD=3.6	
	102	99	102	99.9	107	98.6	99	98.1	102	93	Org:N Dep:A				
13 PFHpA	1.189362	1.009723	1.053444	1.091145	1.040912	1.051481	1.051541	1.068028	1.076705	1.165807	Avg:A Wt:C2	1.079815		RSD=5.2	
	110	93.5	97.6	101	96.4	97.4	97.4	98.9	99.7	108	Org:N Dep:A				
D 47 13C4_PFHpA	539	544	544	527	567	532	506	511	522	476	Avg:A Wt:C2	527		RSD=4.8	
	102	103	103	100	108	101	96.1	97	99.1	90.3	Org:N Dep:A				
14 PFHxS	1.338802	1.230446	1.093713	1.072763	1.031982	1.026439	1.101593	1.125206	1.095202	1.069019	Avg:A Wt:C2	1.118517		RSD=8.6	
	120	110	97.8	95.9	92.3	91.8	98.5	101	97.9	95.6	Org:N Dep:A				
D 45 13C3_PFHxS	137	139	128	137	147	140	126	118	127	124	Avg:A Wt:C2	132		RSD=6.8	
	103	105	96.4	104	111	105	95.4	89.3	96	93.8	Org:N Dep:A				
29 ADONA	7.334711	7.391090	7.813040	7.064051	6.840626	6.588012	7.403096	7.582394	7.240256	7.397418	Avg:A Wt:C2	7.265470		RSD=4.9	
	101	102	108	97.2	94.2	90.7	102	104	99.7	102	Org:N Dep:A				
D 64 13C2_6:2 FTS_2	16.9872	17.5548	17.1254	16.8226	17.8800	17.8154	16.4454	15.9272	15.7086	15.5588	Avg:A Wt:C2	16.7825		RSD=5.1	
	101	105	102	100	107	106	98	94.9	93.6	92.7	Org:N Dep:A				
2 6:2 FTS	2.993070	2.439618	2.585791	2.593833	2.539669	2.110131	2.210781	2.185273	2.336953	2.203601	Avg:A Wt:C2	2.419872		RSD=11.1	
	124	101	107	107	105	87.2	91.4	90.3	96.6	91.1	Org:N Dep:A				
D 53 13C8_PFOA	546	539	533	527	568	509	493	470	489	476	Avg:A Wt:C2	516		RSD=6.2	
	106	104	103	102	110	98.8	95.6	92.3	94.8	92.3	Org:N Dep:A				
20 PFOA	1.069479	1.173836	1.084374	1.060716	1.038684	1.000829	1.043548	1.034485	1.030901	1.016697	Avg:A Wt:C2	1.055355		RSD=4.6	
	101	111	103	101	98.4	94.8	98.9	98	97.7	96.3	Org:N Dep:A				
12 PFHpS	0.837682	1.036549	1.013883	0.927361	0.899894	0.943961	1.019369	0.999516	0.970195	0.949968	Avg:A Wt:C2	0.959838		RSD=6.4	
	87.3	108	106	96.6	93.8	98.3	106	104	101	99	Org:N Dep:A				
D 54 13C8_PFOS	118	118	113	116	126	114	105	109	119	117	Avg:A Wt:C2	115		RSD=5.0	
	102	102	98.2	100	109	98.7	90.9	94.3	103	101	Org:N Dep:A				
18 PFOS	1.644156	1.314027	1.326422	1.175501	1.255341	1.315185	1.352200	1.282036	1.191050	1.214672	Avg:A Wt:C2	1.307059		RSD=10.2	
	126	101	101	89.9	96	101	103	98.1	91.1	92.9	Org:N Dep:A				
D 56 13C9_PFNA	653	656	647	638	704	666	640	599	626	627	Avg:A Wt:C2	646		RSD=4.3	
	101	102	100	98.8	109	103	99.1	92.8	97	97.1	Org:N Dep:A				
17 PFNA	0.992317	1.168694	1.106802	1.000589	1.037504	0.974898	0.984898	1.054464	1.018152	0.983563	Avg:A Wt:C2	1.032188		RSD=6.1	
	96.1	113	107	96.9	101	94.4	95.4	102	98.6	95.3	Org:N Dep:A				

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
30 9Cl-PF3ONS	3.940277	3.960930	3.971086	3.560292	3.667132	3.731423	4.086490	3.804395	3.685151	3.618013	Avg:A Wt:C2	3.802519		RSD=4.7	
	104	104	104	93.6	96.4	98.1	107	100	96.9	95.1	Org:N Dep:A				
D 55 13C8_PFOSA	246	264	265	254	271	245	259	243	237	226	Avg:A Wt:C2	251		RSD=5.5	
	98	105	105	101	108	97.8	103	96.9	94.6	90	Org:N Dep:A				
19 PFOSA	1.117582	1.005836	1.063293	1.099545	1.039044	1.066878	0.987554	1.026071	1.047042	1.076796	Avg:A Wt:C2	1.052964		RSD=3.8	
	106	95.5	101	104	98.7	101	93.8	97.4	99.4	102	Org:N Dep:A				
3 8:2 FTS	2.262628	2.781744	2.233447	2.381377	2.150119	2.194329	2.213550	2.231105	2.444750	2.249450	Avg:A Wt:C2	2.314250		RSD=8.0	
	97.8	120	96.5	103	92.9	94.8	95.6	96.4	106	97.2	Org:N Dep:A				
16 PFNS	0.906158	0.868225	0.845721	0.833614	0.760142	0.820781	0.904969	0.814989	0.765980	0.736896	Avg:A Wt:C2	0.825748		RSD=7.1	
	110	105	102	101	92.1	99.4	110	98.7	92.8	89.2	Org:N Dep:A				
D 65 13C2_8:2 FTS_2	17.1434	17.1638	15.9092	17.0188	18.2968	17.2874	16.2994	14.9332	14.5120	15.0542	Avg:A Wt:C2	16.3618		RSD=7.5	
	105	105	97.2	104	112	106	99.6	91.3	88.7	92	Org:N Dep:A				
D 51 13C6_PFDA	625	623	610	597	643	603	606	589	557	560	Avg:A Wt:C2	601		RSD=4.6	
	104	104	101	99.3	107	100	101	97.9	92.6	93.1	Org:N Dep:A				
10 PFDA	1.077944	1.021941	1.006680	1.053828	1.004638	0.973361	0.962019	0.960481	1.031234	0.970310	Avg:A Wt:C2	1.006244		RSD=4.0	
	107	102	100	105	99.8	96.7	95.6	95.5	102	96.4	Org:N Dep:A				
D 58 d3-MeFOSAA	134	130	132	129	138	129	129	119	138	120	Avg:A Wt:C2	130		RSD=5.0	
	103	100	102	99.3	106	99.3	99.4	91.5	107	92.6	Org:N Dep:A				
6 N-MeFOSAA	0.719503	0.806090	0.773378	0.770849	0.744067	0.759751	0.741528	0.774570	0.703674	0.743612	Avg:A Wt:C2	0.753702		RSD=3.9	
	95.5	107	103	102	98.7	101	98.4	103	93.4	98.7	Org:N Dep:A				
9 PFDS	0.911012	0.800047	0.704963	0.828254	0.719056	0.721505	0.812830	0.731140	0.727915	0.685815	Avg:A Wt:C2	0.764254		RSD=9.3	
	119	105	92.2	108	94.1	94.4	106	95.7	95.2	89.7	Org:N Dep:A				
D 52 13C7_PFUdA	576	555	527	556	564	547	522	520	520	517	Avg:A Wt:C2	540		RSD=4.0	
	107	103	97.6	103	104	101	96.7	96.2	96.2	95.7	Org:N Dep:A				
D 60 d5-EtFOSAA	113	116	112	110	114	112	111	104	107	92.1280	Avg:A Wt:C2	109		RSD=6.3	
	103	106	103	101	104	103	102	95.6	97.7	84.4	Org:N Dep:A				
25 PFUdA	1.022331	0.999645	1.155611	0.979746	0.952857	0.947777	0.936041	0.882154	0.980881	0.883530	Avg:A Wt:C2	0.974057		RSD=8.0	
	105	103	119	101	97.8	97.3	96.1	90.6	101	90.7	Org:N Dep:A				
5 N-EtFOSAA	0.989742	1.155848	1.101670	1.026045	1.037877	1.058959	0.940010	0.996132	0.990861	1.050440	Avg:A Wt:C2	1.034758		RSD=6.0	
	95.6	112	106	99.2	100	102	90.8	96.3	95.8	102	Org:N Dep:A				
D 61 d7-MeFOSE	88.8610	93.1250	80.7270	85.6620	84.6170	80.9000	81.2230	77.0800	83.1680	74.0590	Avg:A Wt:C2	82.9422		RSD=6.7	
	107	112	97.3	103	102	97.5	97.9	92.9	100	89.3	Org:N Dep:A				
32 MeFOSE	0.925040	0.815356	1.184548	1.044174	1.143033	1.024827	0.985780	1.048535	1.049631	1.028789	Avg:A Wt:C2	1.024971		RSD=10.1	
	90.3	79.5	116	102	112	100	96.2	102	102	100	Org:N Dep:A				
D 57 d3-MeFOSA	47.0950	41.1770	43.6070	48.9360	44.3320	44.7520	47.1830	40.8050	47.3050	49.1860	Avg:A Wt:C2	45.4378		RSD=6.6	
	104	90.6	96	108	97.6	98.5	104	89.8	104	108	Org:N Dep:A				
26 MeFOSA		1.562280	1.528998	1.125552	1.428923	1.227733	1.122438	1.287124	1.184974		Avg:A Wt:C2	1.308503		RSD=13.5	
	Disabled	119	117	86	109	93.8	85.8	98.4	90.6	Disabled	Org:N Dep:A				
31 11Cl-PF3OUDS	3.483758	3.584672	3.290726	3.124249	2.972480	3.210204	3.409676	3.331814	3.050882	3.077790	Avg:A Wt:C2	3.253625		RSD=6.2	
	107	110	101	96	91.4	98.7	105	102	93.8	94.6	Org:N Dep:A				
D 62 d9-EtFOSE	95.8260	101	95.8400	102	98.3260	95.3730	94.4740	92.4100	95.7250	89.0760	Avg:A Wt:C2	95.9545		RSD=3.9	
	99.9	105	99.9	106	102	99.4	98.5	96.3	99.8	92.8	Org:N Dep:A				

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
11 PFDoA	1.232778	1.053776	1.091862	0.988794	1.013934	1.103737	1.005329	1.014734	1.052089	0.967040	Avg:A Wt:C2	1.052407		RSD=7.3	
	117	100	104	94	96.3	105	95.5	96.4	100	91.9	Org:N Dep:A				
33 EtFOSE	1.024983	1.032809	1.007199	0.930988	1.036664	0.942447	0.966308	0.901152	0.960903	0.967192	Avg:A Wt:C2	0.977065		RSD=4.8	
	105	106	103	95.3	106	96.5	98.9	92.2	98.3	99	Org:N Dep:A				
D 38 13C2_PFDoA	526	557	541	531	561	503	535	487	501	481	Avg:A Wt:C2	522		RSD=5.4	
	101	107	104	102	107	96.3	102	93.3	95.9	92.1	Org:N Dep:A				
4 10:2 FTS	2.471222	2.850252	3.166961	2.557216	2.634749	2.329455	2.576922	2.675594	2.584159	2.508484	Avg:A Wt:C2	2.635502		RSD=8.8	
	93.8	108	120	97	100	88.4	97.8	102	98.1	95.2	Org:N Dep:A				
D 59 d5-EtFOSA	39.1420	42.6350	41.7240	41.7500	45.6630	43.2090	40.5160	43.7900	43.2090	40.6030	Avg:A Wt:C2	42.2241		RSD=4.5	
	92.7	101	98.8	98.9	108	102	96	104	102	96.2	Org:N Dep:A				
27 EtFOSA	1.539523	1.221766	1.315789	1.072479	0.923724	1.049226	1.060628	1.000354	1.029802	1.026950	Ln:A Wt:C2	1.022646	26.0501	R^2=0.993	
	99.6	94	116	99.8	87.8	101	103	97.6	101	100	Org:N Dep:A			RSE=7.6	
34 PFDOS	0.931758	1.010137	1.050568	1.000905	0.939927	0.958934	1.066907	0.961462	0.907639	0.914867	Avg:A Wt:C2	0.974310		RSD=5.7	
	95.6	104	108	103	96.5	98.4	110	98.7	93.2	93.9	Org:N Dep:A				
24 PFTrDA	1.122186	0.960514	0.987289	0.915661	0.988635	1.030456	0.954849	1.007783	0.960224	0.982941	Avg:A Wt:C2	0.991054		RSD=5.6	
	113	96.9	99.6	92.4	99.8	104	96.3	102	96.9	99.2	Org:N Dep:A				
D 42 13C2_PFTeDA	736	747	740	728	783	704	737	720	741	708	Avg:A Wt:C2	734		RSD=3.0	
	100	102	101	99.2	107	95.8	100	98	101	96.5	Org:N Dep:A				
23 PFTeDA	0.981566	0.960077	0.905578	0.875649	0.880996	0.878074	0.827212	0.866732	0.829500	0.852585	Avg:A Wt:C2	0.885797		RSD=5.7	
	111	108	102	98.9	99.5	99.1	93.4	97.8	93.6	96.3	Org:N Dep:A				
35 PFHxDA	0.820069	0.760087	0.695198	0.683019	0.661734	0.674163	0.634537	0.624230	0.637927	0.620075	Avg:A Wt:C2	0.681104		RSD=9.4	
	120	112	102	100	97.2	99	93.2	91.6	93.7	91	Org:N Dep:A				
D 40 13C2_PFHxDA	754	755	751	734	786	731	752	737	738	714	Avg:A Wt:C2	745		RSD=2.6	
	101	101	101	98.5	105	98.1	101	98.9	99	95.8	Org:N Dep:A				
36 PFODA	1.137964	1.060559	1.030325	1.004219	0.996301	1.022137	0.987513	0.968630	0.997431	0.985441	Avg:A Wt:C2	1.019052		RSD=4.8	
	112	104	101	98.5	97.8	100	96.9	95.1	97.9	96.7	Org:N Dep:A				

Pace Environmental Services, LLC
Initial Calibration RT Report

Batch: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b
Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02
Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	012621007.d	ICAL 50_SVLC-1272	26-Jan-2021 13:22:18
2	012621008.d	ICAL 100_SVLC-1273	26-Jan-2021 13:32:55
3	012621009.d	ICAL 200_SVLC-1274	26-Jan-2021 13:43:33
4	012621010.d	ICAL 500_SVLC-1275	26-Jan-2021 13:54:07
5	012621011.d	ICAL 1000_SVLC-1276	26-Jan-2021 14:04:47
6	012621012.d	ICAL 2000_SVLC-1277	26-Jan-2021 14:15:21
7	012621013.d	ICAL 5000_SVLC-1278	26-Jan-2021 14:25:58
8	012621014.d	ICAL 10000_SVLC-1279	26-Jan-2021 14:36:40
9	012621015.d	ICAL 15000_SVLC-1280	26-Jan-2021 14:47:21
10	012621016.d	ICAL 20000_SVLC-1281	26-Jan-2021 14:58:01

Column: 1 Detector: LCMS-Q3

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 46 13C4_PFBA	1.718	1.715	1.718	1.718	1.718	1.722	1.718	1.718	1.718	1.717	1.717	0.087
8 PFBA	1.718	1.722	1.718	1.724	1.724	1.722	1.724	1.724	1.724	1.724	1.722	0.165
D 50 13C5_PFPeA	2.099	2.104	2.098	2.109	2.109	2.104	2.109	2.109	2.109	2.108	2.106	0.211
21 PFPeA	2.099	2.104	2.109	2.109	2.109	2.104	2.109	2.109	2.109	2.108	2.107	0.171
D 44 13C3_PFBS	2.162	2.157	2.162	2.162	2.162	2.167	2.162	2.162	2.162	2.161	2.161	0.111
7 PFBS	2.162	2.157	2.162	2.162	2.162	2.167	2.162	2.162	2.162	2.161	2.161	0.111
1 4:2 FTS	2.416	2.424	2.424	2.424	2.416	2.423	2.425	2.425	2.425	2.415	2.421	0.175
D 63 13C2_4:2 FTS_2	2.416	2.415	2.416	2.424	2.416	2.423	2.416	2.416	2.425	2.415	2.418	0.177
D 49 13C5_PFHxA	2.451	2.450	2.451	2.460	2.460	2.459	2.460	2.460	2.460	2.460	2.457	0.179
15 PFHxA	2.451	2.459	2.460	2.460	2.460	2.459	2.460	2.460	2.460	2.460	2.459	0.113
22 PFPeS	2.487	2.486	2.496	2.487	2.496	2.495	2.496	2.496	2.496	2.495	2.492	0.179
28 GenX	2.567	2.566	2.567	2.567	2.567	2.566	2.567	2.567	2.567	2.567	2.567	0.019
D 66 13C3_GenX	2.567	2.566	2.567	2.567	2.567	2.566	2.567	2.567	2.567	2.567	2.567	0.019
13 PFHpA	2.819	2.818	2.819	2.818	2.819	2.827	2.828	2.828	2.828	2.827	2.822	0.169
D 47 13C4_PFHpA	2.819	2.818	2.819	2.818	2.828	2.827	2.828	2.828	2.828	2.827	2.823	0.167
14 PFHxS	2.837	2.845	2.837	2.837	2.837	2.845	2.846	2.846	2.846	2.836	2.841	0.169
D 45 13C3_PFHxS	2.837	2.836	2.837	2.837	2.846	2.845	2.846	2.846	2.837	2.845	2.841	0.176
29 ADONA	2.864	2.863	2.855	2.864	2.864	2.863	2.864	2.864	2.864	2.864	2.863	0.097
D 64 13C2_6:2 FTS_2	3.183	3.181	3.182	3.182	3.189	3.188	3.189	3.182	3.183	3.189	3.185	0.104
2 6:2 FTS	3.190	3.195	3.182	3.189	3.189	3.188	3.189	3.182	3.189	3.189	3.188	0.111
D 53 13C8_PFOA	3.203	3.208	3.209	3.209	3.210	3.215	3.216	3.216	3.209	3.216	3.211	0.133
20 PFOA	3.210	3.202	3.209	3.216	3.210	3.215	3.216	3.216	3.216	3.209	3.211	0.153
12 PFHpS	3.217	3.222	3.209	3.216	3.223	3.215	3.223	3.223	3.223	3.222	3.219	0.145
D 54 13C8_PFOS	3.593	3.591	3.592	3.584	3.592	3.591	3.592	3.592	3.584	3.592	3.590	0.091
18 PFOS	3.593	3.599	3.600	3.592	3.592	3.591	3.592	3.592	3.592	3.592	3.593	0.081
D 56 13C9_PFNA	3.593	3.591	3.592	3.592	3.592	3.598	3.600	3.592	3.592	3.592	3.593	0.088
17 PFNA	3.593	3.599	3.592	3.592	3.600	3.598	3.592	3.592	3.592	3.600	3.595	0.102
30 9Cl-PF3ONS	3.803	3.793	3.802	3.794	3.794	3.801	3.794	3.794	3.794	3.794	3.796	0.098
D 55 13C8_PFOSA	3.908	3.906	3.915	3.907	3.907	3.914	3.907	3.907	3.907	3.907	3.908	0.076
19 PFOSA	3.908	3.906	3.915	3.907	3.907	3.906	3.907	3.907	3.907	3.907	3.907	0.065
3 8:2 FTS	3.933	3.931	3.932	3.923	3.923	3.930	3.923	3.932	3.932	3.932	3.929	0.098
16 PFNS	3.933	3.931	3.932	3.923	3.932	3.930	3.932	3.932	3.932	3.932	3.930	0.065
D 65 13C2_8:2 FTS_2	3.933	3.931	3.932	3.932	3.932	3.930	3.923	3.932	3.923	3.932	3.929	0.086

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 51 13C6_PFDA	3.933	3.931	3.940	3.932	3.940	3.939	3.932	3.932	3.940	3.940	3.935	0.114
10 PFDA	3.950	3.931	3.940	3.932	3.940	3.939	3.932	3.940	3.940	3.940	3.938	0.146
D 58 d3-MeFOSAA	4.091	4.090	4.100	4.091	4.092	4.090	4.091	4.091	4.091	4.091	4.092	0.065
6 N-MeFOSAA	4.099	4.099	4.091	4.091	4.100	4.090	4.091	4.091	4.100	4.100	4.095	0.114
9 PFDS	4.227	4.227	4.238	4.228	4.228	4.227	4.228	4.228	4.228	4.228	4.228	0.077
D 52 13C7_PFUdA	4.247	4.247	4.248	4.248	4.238	4.247	4.238	4.248	4.248	4.248	4.245	0.093
D 60 d5-EtFOSAA	4.237	4.247	4.248	4.238	4.248	4.247	4.238	4.248	4.248	4.248	4.244	0.116
25 PFUdA	4.237	4.247	4.248	4.238	4.248	4.247	4.238	4.248	4.248	4.248	4.244	0.116
5 N-EtFOSAA	4.247	4.247	4.258	4.248	4.258	4.247	4.248	4.248	4.258	4.248	4.251	0.123
D 61 d7-MeFOSE	4.338	4.337	4.338	4.338	4.339	4.337	4.338	4.338	4.338	4.328	4.337	0.071
32 MeFOSE	4.347	4.347	4.348	4.348	4.348	4.347	4.338	4.348	4.348	4.348	4.346	0.068
D 57 d3-MeFOSA	4.357	4.357	4.357	4.348	4.358	4.356	4.348	4.358	4.358	4.348	4.354	0.107
26 MeFOSA		4.375	4.357	4.348	4.358	4.356	4.348	4.358	4.358		4.357	0.192
31 11Cl-PF3OUDS	4.383	4.383	4.384	4.384	4.384	4.383	4.384	4.384	4.384	4.384	4.383	0.013
D 62 d9-EtFOSE	4.501	4.500	4.501	4.501	4.501	4.500	4.492	4.501	4.501	4.492	4.499	0.081
11 PFDoA	4.510	4.509	4.510	4.510	4.510	4.509	4.510	4.510	4.510	4.510	4.510	0.011
33 EtFOSE	4.510	4.509	4.510	4.510	4.510	4.509	4.510	4.510	4.510	4.510	4.510	0.011
D 38 13C2_PFDoA	4.510	4.509	4.510	4.510	4.510	4.509	4.510	4.510	4.510	4.510	4.510	0.011
4 10:2 FTS	4.519	4.518	4.528	4.519	4.520	4.518	4.519	4.519	4.519	4.519	4.520	0.066
D 59 d5-EtFOSA	4.519	4.518	4.510	4.519	4.520	4.518	4.519	4.519	4.519	4.519	4.518	0.062
27 EtFOSA	4.510	4.536	4.528	4.528	4.520	4.527	4.519	4.528	4.528	4.528	4.525	0.164
34 PFDOS	4.717	4.723	4.724	4.724	4.725	4.723	4.724	4.724	4.731	4.724	4.724	0.075
24 PFTrDA	4.744	4.751	4.751	4.745	4.745	4.750	4.745	4.752	4.752	4.752	4.748	0.073
D 42 13C2_PFTeDA	4.964	4.970	4.964	4.964	4.964	4.963	4.964	4.964	4.971	4.964	4.965	0.060
23 PFTeDA	4.964	4.970	4.971	4.964	4.964	4.963	4.964	4.971	4.971	4.971	4.967	0.080
35 PFHxDA	5.351	5.351	5.351	5.351	5.343	5.350	5.352	5.352	5.351	5.352	5.350	0.046
D 40 13C2_PFHxDA	5.351	5.351	5.351	5.351	5.343	5.350	5.343	5.352	5.351	5.352	5.349	0.061
36 PFODA	5.702	5.702	5.702	5.702	5.703	5.701	5.703	5.703	5.709	5.703	5.702	0.041

Pace Environmental Services, LLC
Initial Calibration Signal Ratios Report

Batch: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b
Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02
Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	012621007.d	ICAL 50_SVLC-1272	26-Jan-2021 13:22:18
2	012621008.d	ICAL 100_SVLC-1273	26-Jan-2021 13:32:55
3	012621009.d	ICAL 200_SVLC-1274	26-Jan-2021 13:43:33
4	012621010.d	ICAL 500_SVLC-1275	26-Jan-2021 13:54:07
5	012621011.d	ICAL 1000_SVLC-1276	26-Jan-2021 14:04:47
6	012621012.d	ICAL 2000_SVLC-1277	26-Jan-2021 14:15:21
7	012621013.d	ICAL 5000_SVLC-1278	26-Jan-2021 14:25:58
8	012621014.d	ICAL 10000_SVLC-1279	26-Jan-2021 14:36:40
9	012621015.d	ICAL 15000_SVLC-1280	26-Jan-2021 14:47:21
10	012621016.d	ICAL 20000_SVLC-1281	26-Jan-2021 14:58:01

Column: 1 Detector: LCMS-Q3

Compound	Ratio Level 1	Ratio Level 2	Ratio Level 3	Ratio Level 4	Ratio Level 5	Ratio Level 6	Ratio Level 7	Ratio Level 8	Ratio Level 9	Ratio Level 10	Average Ratio	L-5 +/-3 SD Ratio Limits	StdD Limit	50% Limit
7 PFBS	3.180	4.148	3.337	3.477	3.822	3.557	3.590	3.600	3.605	3.759	3.607	3.009-4.634	0.27082	1.911
1 4:2 FTS	1.578	1.190	1.530	1.782	2.187	2.034	2.064	1.787	1.929	2.046	1.812	1.235-3.138	0.31721	1.093
15 PFHxA	23.313	18.271	16.477	16.423	18.187	19.962	19.695	19.548	19.594	18.565	19.003	12.316-24.057	1.95682	9.093
22 PFPeS	2.877	2.742	2.752	3.225	3.031	3.002	3.108	3.138	3.137	3.105	3.011	2.549-3.512	0.16060	1.515
28 GenX	0.730	0.777	0.875	0.742	0.841	0.801	0.803	0.806	0.785	0.796	0.795	0.720-0.961	0.04025	0.420
13 PFHpA	4.105	3.962	4.135	3.787	3.911	3.761	3.767	3.986	3.852	3.887	3.915	3.522-4.299	0.12948	1.955
14 PFHxS	3.320	4.697	3.266	3.169	3.015	3.129	3.115	2.991	3.103	3.128	3.293	1.463-4.566	0.51712	1.507
29 ADONA	3.511	3.353	3.411	3.180	3.134	3.246	3.359	3.192	3.190	3.200	3.277	2.761-3.506	0.12427	1.567
2 6:2 FTS	1.968	2.459	2.114	2.701	2.201	1.691	1.805	1.917	1.965	1.858	2.067	1.262-3.139	0.31275	1.100
20 PFOA	3.001	3.289	2.881	2.956	3.135	3.008	2.923	2.947	2.965	3.027	3.013	2.791-3.478	0.11444	1.567
12 PFHpS	2.721	3.171	2.886	3.008	3.089	3.474	3.467	3.299	3.205	3.360	3.168	2.375-3.802	0.23769	1.544
18 PFOS	4.238	3.106	2.930	3.966	3.635	3.608	3.503	3.700	3.554	3.805	3.604	2.540-4.729	0.36467	1.817
17 PFNA	5.656	8.721	6.560	6.489	6.413	6.351	6.328	6.926	6.503	6.213	6.616	4.015-8.810	0.79915	3.206
3 8:2 FTS	1.381	2.166	1.762	1.673	1.981	2.065	2.011	1.913	1.965	1.908	1.882	1.268-2.693	0.23763	0.990
16 PFNS	2.526	2.940	2.481	2.857	2.878	2.813	2.706	2.860	2.878	2.747	2.768	2.348-3.407	0.17648	1.439
10 PFDA	12.959	12.156	16.627	13.795	13.299	14.295	13.047	14.045	13.448	13.832	13.750	9.752-16.845	1.18220	6.649
6 N-MeFOSAA	1.324	1.640	1.491	1.277	1.349	1.331	1.391	1.267	1.324	1.271	1.366	0.981-1.716	0.12246	0.674
9 PFDS	3.157	2.406	2.463	3.034	2.678	2.395	2.774	2.715	2.839	2.743	2.720	1.757-3.598	0.30694	1.339
25 PFUdA	13.401	15.946	23.441	14.080	13.465	15.460	14.267	13.792	16.115	14.571	15.453	4.594-22.335	2.95690	6.732
5 N-EtFOSAA	1.606	1.668	1.665	1.603	1.661	1.569	1.517	1.585	1.579	1.588	1.604	1.515-1.806	0.04855	0.830
26 MeFOSA		1.319	1.078	1.060	1.141	1.079	1.061	1.050	1.090		1.109	0.856-1.425	0.09492	0.570
11 PFDoA	12.062	11.444	12.119	11.626	10.121	11.649	11.034	11.156	11.049	10.021	11.228	7.808-12.433	0.77070	5.060
4 10:2 FTS	3.180	2.813	4.203	3.383	3.471	3.181	3.377	3.354	3.226	3.366	3.355	2.472-4.469	0.33295	1.735
27 EtFOSA	1.847	0.940	1.369	1.058	0.882	1.044	1.010	1.024	1.026	1.007	1.120	-0.025-1.789	0.30240	0.441
34 PFDOS	2.768	3.306	3.426	3.289	3.398	3.068	3.335	3.231	3.198	3.232	3.225	2.815-3.980	0.19419	1.699
24 PFTrDA	8.434	8.268	8.361	7.679	8.643	7.950	8.461	8.643	8.312	8.427	8.317	7.729-9.556	0.30455	4.321
23 PFTeDA	12.092	12.413	11.552	12.259	12.552	12.003	11.923	12.650	12.118	11.985	12.154	11.557-13.546	0.33153	6.276
35 PFHxDA	11.294	11.500	11.423	12.230	11.541	12.009	11.424	11.307	11.443	11.494	11.566	10.571-12.510	0.32318	5.770
36 PFODA	15.380	14.711	15.469	14.891	14.589	15.244	15.137	15.108	14.743	14.602	14.987	13.618-15.559	0.32355	7.294

Report Date: 27-Jan-2021 16:50:51 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Initial Calibration Ion Suppression Report

Batch: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b
Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02
Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	012621007.d	ICAL 50_SVLC-1272	26-Jan-2021 13:22:18
2	012621008.d	ICAL 100_SVLC-1273	26-Jan-2021 13:32:55
3	012621009.d	ICAL 200_SVLC-1274	26-Jan-2021 13:43:33
4	012621010.d	ICAL 500_SVLC-1275	26-Jan-2021 13:54:07
5	012621011.d	ICAL 1000_SVLC-1276	26-Jan-2021 14:04:47
6	012621012.d	ICAL 2000_SVLC-1277	26-Jan-2021 14:15:21
7	012621013.d	ICAL 5000_SVLC-1278	26-Jan-2021 14:25:58
8	012621014.d	ICAL 10000_SVLC-1279	26-Jan-2021 14:36:40
9	012621015.d	ICAL 15000_SVLC-1280	26-Jan-2021 14:47:21
10	012621016.d	ICAL 20000_SVLC-1281	26-Jan-2021 14:58:01

Column: 1 Detector: LCMS-Q3

Compound	Response Level 1	Response Level 2	Response Level 3	Response Level 4	Response Level 5	Response Level 6	Response Level 7	Response Level 8	Response Level 9	Response Level 10	RPD
* 37 13C2_PFDA	647660	639805	629380	636255	719384	630458	613187	587491	606195	595771	2.08
* 39 13C2_PFHxA	706562	679015	706106	681277	743628	661029	673718	643220	685960	648714	2.13
* 41 13C2_PFOA	563220	540114	556163	535037	584844	547271	533563	507346	512024	510390	2.46
* 43 13C3_PFBA	664462	658173	659260	635606	696867	629855	619965	607196	636670	606180	2.29
* 48 13C4_PFOS	139790	129956	133653	134096	139913	123626	126018	116836	127318	127299	2.33

13C2_PFDA ((|595771 - 647660| / (595771 + 647660)) / 2) * 100 = 2.09
13C2_PFHxA ((|648714 - 706562| / (648714 + 706562)) / 2) * 100 = 2.13
13C2_PFOA ((|510390 - 563220| / (510390 + 563220)) / 2) * 100 = 2.46
13C3_PFBA ((|606180 - 664462| / (606180 + 664462)) / 2) * 100 = 2.29
13C4_PFOS ((|127299 - 139790| / (127299 + 139790)) / 2) * 100 = 2.34



Pace Environmental Services, LLC
Analyte Quantitation Report

Data File: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b\012621019.d
Injection Date: 26-Jan-2021 15:29:51 Injection Vol: 10.0 uL
Sample Type: CheckStd Auto Sampler: 13
Sample Info: ISOMER CHECK_SVLC-1266 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Surrogates Conc. Level: Smp Vol. Added: 1.00 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	Cal Conc ng/L	OnCol Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.717	1.718	0	654453	23	>100:1			100000	980.56	90.8	
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.108	2.109	0	610244	18	>100:1			100000	963.36	91.2	
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.161	2.162	0	184485	17	>100:1			100000	964.28	88.7	
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.414	2.416	0	111864	21	>100:1			500000	5027.23	91	
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.450	2.460	0	652375	20	>100:1			100000	946.45	84.4	
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.566	2.567	0	1162594	21	>100:1			500000	4821.15	89.8	
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.817	2.828	0	514768	20	>100:1			100000	977.30	90.9	
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.836	2.846	0	131363	22	>100:1			100000	991.47	89.2	
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.188	3.189	0	80272	27	>100:1			500000	4783.07	89.8	
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.208	3.210	0	499667	23	>100:1			100000	969.18	88	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.215	3.210	1/1	5166087	36	>100:1	Target = 3.13	0.15	0	979676		
413 > 169	53	3.215	3.210		1877496	38	>100:1	2.75 (1.56-4.70)	0.24				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.598	3.592	1	116725	21	>100:1			100000	1011.32	92.4	
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.598	3.592	1	607013	23	>100:1			100000	940.37	86.2	
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.914	3.907	1	255788	20	>100:1			100000	1019.20	94.4	
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.930	3.932	0	82228	19	>100:1			500000	5025.60	89.9	
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.939	3.940	0	593218	20	>100:1			100000	986.38	92.2	
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.090	4.092	0	631186	19	>100:1			500000	4864.72	91.5	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													
570 > 419	58	4.099	4.100	0/0	1084420	31	>100:1	Target = 1.34	0.12	0	1139752		
570 > 483	58	4.099	4.100		867554	33	>100:1	1.24 (0.67-2.02)	0.22				
D 52 13C7_PFUdA CAS: SESI-0117													
570 > 525		4.247	4.238	1	538647	16				100000	996.70	95.5	
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.247	4.248	0	544435	17	>100:1			500000	4988.91	95.8	

Report Date: 27-Jan-2021 16:50:23 AIM Revision: 2.0 12-Dec-2020 09:34:50

Pace Environmental Services, LLC

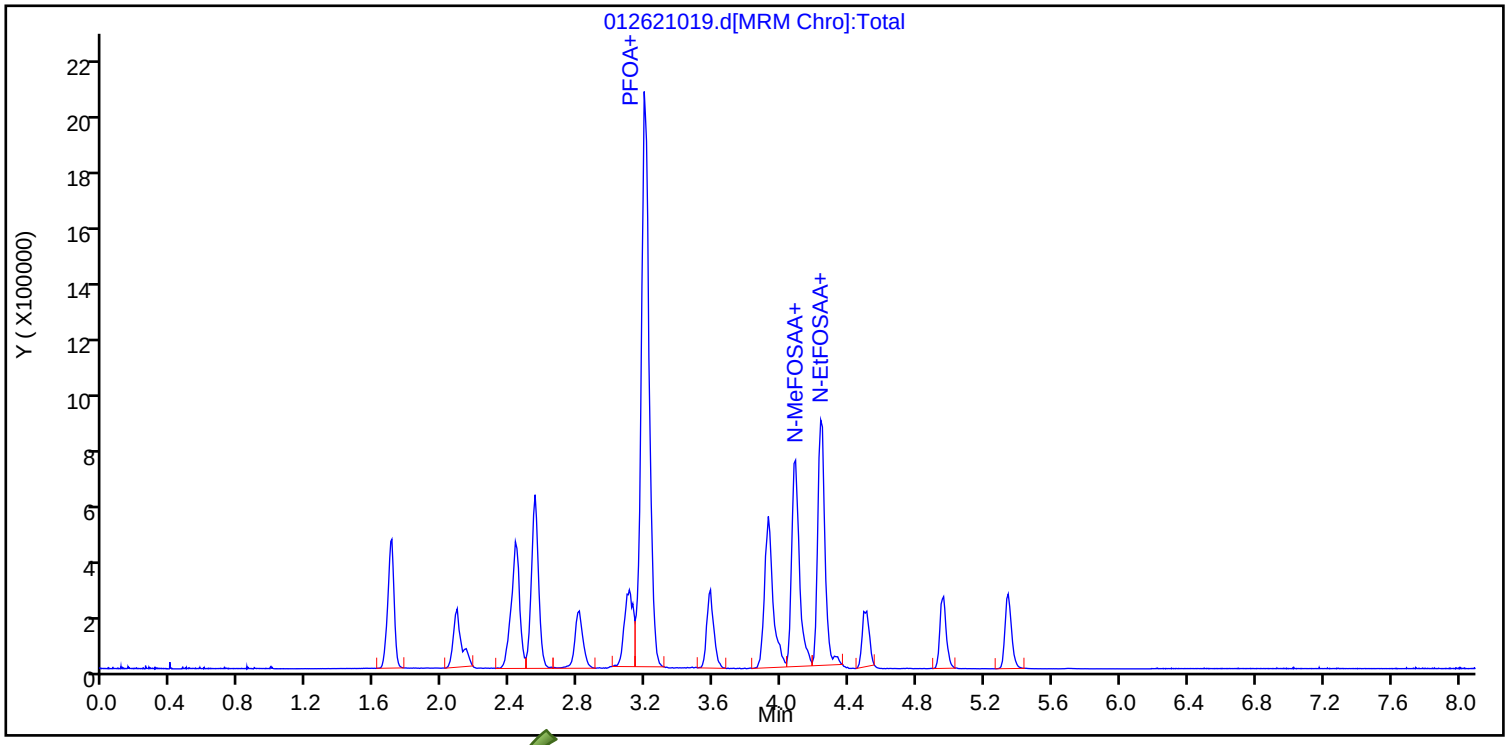
Data File: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b\012621019.d

Injection Date: 26-Jan-2021 15:29:51 Inst. ID: LCMSMS02

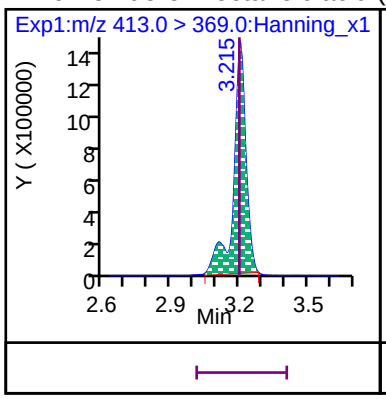
Client ID: Lab ID: ISOMER CHECK_SVLC-1266

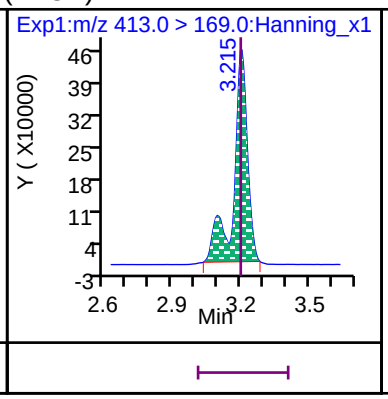
Sample Info: ISOMER CHECK_SVLC-1266

Dil. Factor: 1 Operator: Stephen E. Somerville

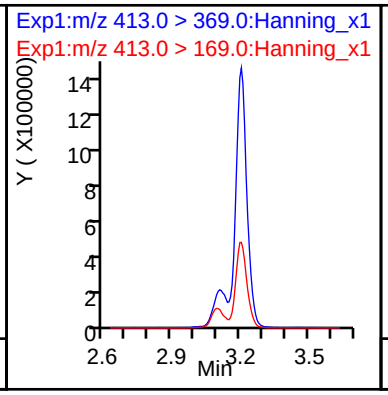


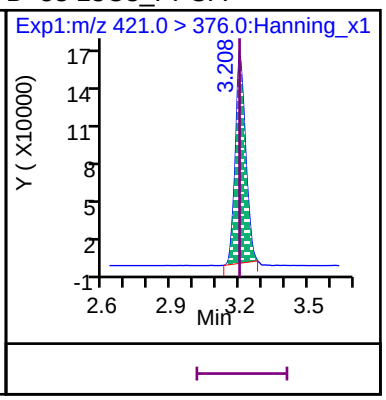
20 Perfluoro-n-octanoic acid (PFOA)



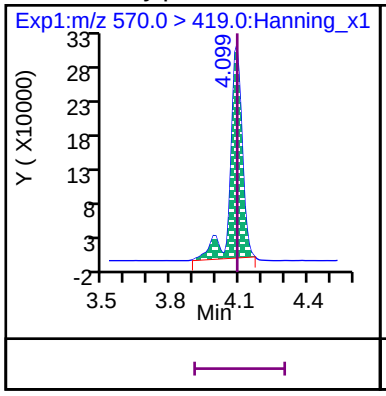


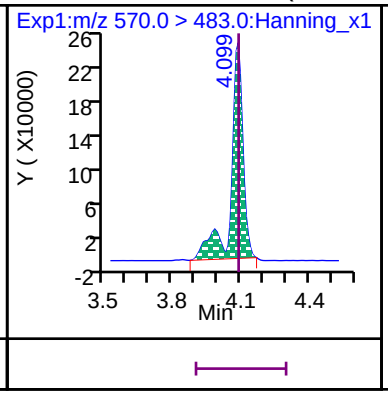
D 53 13C8_PFOA



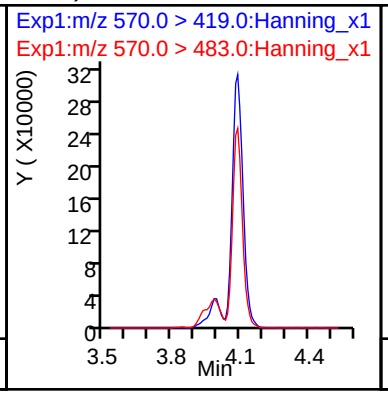


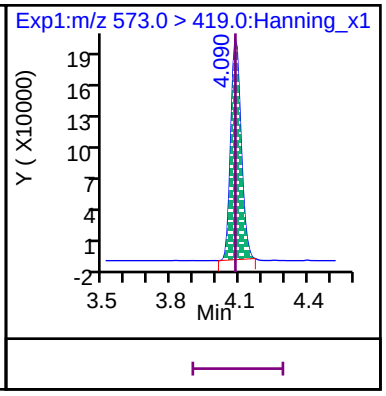
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA)





D 58 d3-MeFOSAA





Pace Environmental Services, LLC
Initial Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b\012621018.d
Injection Date: 26-Jan-2021 15:19:16 Injection Vol: 10.0 uL
Sample Type: ICV Auto Sampler: 12
Sample Info: ICV 500_SVLC-1285 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: ICV Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	720687	699035			97	50 - 150
8 PFBA			500.00	471.27	94.3	70 - 130
D 50 13C5_PFPeA	669031	680342			102	50 - 150
21 PFPeA			500.00	460.84	92.2	70 - 130
7 PFBS			442.50	406.75	91.9	70 - 130
D 44 13C3_PFBS	208034	198698			95.5	50 - 150
1 4:2 FTS			467.50	470.55	101	70 - 130
D 63 13C2_4:2 FTS_2	122994	116717			94.9	50 - 150
D 49 13C5_PFHxA	773207	709894			91.8	50 - 150
15 PFHxA			500.00	463.92	92.8	70 - 130
22 PFPeS			470.00	464.63	98.9	70 - 130
28 GenX			2500.00	2241.13	89.6	70 - 130
D 66 13C3_GenX	1294237	1281902			99	50 - 150
13 PFHpA			500.00	463.06	92.6	70 - 130
D 47 13C4_PFHpA	566534	560736			99	50 - 150
14 PFHxS			456.00	380.01	83.3	70 - 130
D 45 13C3_PFHxS	147201	140519			95.5	50 - 150
29 ADONA			2355.00	2182.02	92.7	70 - 130
D 64 13C2_6:2 FTS_2	89400	83804			93.7	50 - 150
2 6:2 FTS			475.00	392.81	82.7	70 - 130
20 PFOA			500.00	429.32	85.9	70 - 130
D 53 13C8_PFOA	568086	585654			103	50 - 150
12 PFHpS			475.00	436.25	91.8	70 - 130
18 PFOS			462.75	364.99	78.9	70 - 130
D 56 13C9_PFNA	703892	658324			93.5	50 - 150
D 54 13C8_PFOS	126288	124972			99	50 - 150
17 PFNA			500.00	485.78	97.2	70 - 130
30 9Cl-PF3ONS			2330.00	2128.26	91.3	70 - 130
D 55 13C8_PFOSA	270927	281894			104	50 - 150
19 PFOSA			500.00	429.55	85.9	70 - 130
3 8:2 FTS			480.00	502.90	105	70 - 130
16 PFNS			480.00	472.25	98.4	70 - 130
D 65 13C2_8:2 FTS_2	91484	83770			91.6	50 - 150
10 PFDA			500.00	457.62	91.5	70 - 130
D 51 13C6_PFDA	643340	651256			101	50 - 150
D 58 d3-MeFOSAA	689696	679685			98.5	50 - 150

Report Date: 27-Jan-2021 16:50:22 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b\012621018.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			500.00	508.30	102	70 - 130
9 PFDS			482.50	403.91	83.7	70 - 130
D 52 13C7_PFUdA	564025	568614			101	50 - 150
25 PFUdA			500.00	476.59	95.3	70 - 130
D 60 d5-EtFOSAA	568396	617946			109	50 - 150
5 N-EtFOSAA			500.00	516.53	103	70 - 130
D 61 d7-MeFOSE	84617	85662			101	50 - 150
D 57 d3-MeFOSA	44332	41455			93.5	50 - 150
31 11Cl-PF3OUDS			2355.00	2041.80	86.7	70 - 130
D 62 d9-EtFOSE	98326	96309			97.9	50 - 150
11 PFDoA			500.00	467.62	93.5	70 - 130
D 38 13C2_PFDoA	560944	602860			107	50 - 150
D 59 d5-EtFOSA	45663	42759			93.6	50 - 150
4 10:2 FTS			2410.00	2619.78	109	70 - 130
24 PFTrDA			500.00	490.52	98.1	70 - 130
23 PFTeDA			500.00	464.35	92.9	70 - 130
D 42 13C2_PFTeDA	782673	798669			102	50 - 150
D 40 13C2_PFHxDA	785856	792820			101	50 - 150



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521005.d
Injection Date: 05-Feb-2021 11:54:00 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 95
Sample Info: ID CCV 100_SVLC-1273 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-2 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	720687	609590			84.6	50 - 150
8 PFBA			100.00	110.29	110	70 - 130
D 50 13C5_PFPeA	669031	589875			88.2	50 - 150
21 PFPeA			100.00	100.78	101	70 - 130
7 PFBS			88.400	99.081	112	70 - 130
D 44 13C3_PFBS	208034	183373			88.1	50 - 150
1 4:2 FTS			93.400	111.84	120	70 - 130
D 63 13C2_4:2 FTS_2	122994	97964			79.6	50 - 150
D 49 13C5_PFHxA	773207	650690			84.2 ✓	50 - 150 ✓
15 PFHxA			100.00	102.41	102	70 - 130
22 PFPeS			93.800	107.08	114	70 - 130
28 GenX			200.00	216.51	108	70 - 130
D 66 13C3_GenX	1294237	1173114			90.6	50 - 150
13 PFHpA			100.00	96.366	96.4	70 - 130
D 47 13C4_PFHpA	566534	518637			91.5	50 - 150
14 PFHxS			91.000	106.46	117	70 - 130
D 45 13C3_PFHxS	147201	130090			88.4	50 - 150
29 ADONA			94.200	94.885	101	70 - 130
D 64 13C2_6:2 FTS_2	89400	76666			85.8	50 - 150
2 6:2 FTS			94.800	98.425	104	70 - 130
20 PFOA			100.00	102.10	102	70 - 130
D 53 13C8_PFOA	568086	515820			90.8	50 - 150
12 PFHpS			95.200	105.35	111	70 - 130
18 PFOS			92.800	82.143	88.5	70 - 130
D 56 13C9_PFNA	703892	620421			88.1	50 - 150
D 54 13C8_PFOS	126288	118203			93.6	50 - 150
17 PFNA			100.00	110.80	111	70 - 130
30 9Cl-PF3ONS			93.200	90.956	97.6	70 - 130
D 55 13C8_PFOSA	270927	257370			95	50 - 150
19 PFOSA			100.00	104.63	105	70 - 130
3 8:2 FTS			95.800	81.383	85	70 - 130
16 PFNS			96.000	93.847	97.8	70 - 130
D 65 13C2_8:2 FTS_2	91484	69608			76.1	50 - 150
10 PFDA			100.00	100.03	100 ✓	70 - 130 ✓
D 51 13C6_PFDA	643340	579706			90.1	50 - 150
D 58 d3-MeFOSAA	689696	625960			90.8	50 - 150

Report Date: 09-Feb-2021 14:28:24 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521005.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			100.00	129.25	129	70 - 130
9 PFDS			96.400	105.17	109	70 - 130
D 52 13C7_PFUdA	564025	554481			98.3	50 - 150
25 PFUdA			100.00	97.446	97.4	70 - 130
D 60 d5-EtFOSAA	568396	581940			102	50 - 150
5 N-EtFOSAA			100.00	104.41	104	70 - 130
D 61 d7-MeFOSE	84617	96466			114	50 - 150
32 MeFOSE			100.00	112.67	113	70 - 130
26 MeFOSA non target			100.00	139.79	140	70 - 130
D 57 d3-MeFOSA	44332	37017			83.5	50 - 150
31 11Cl-PF3OUDS			94.200	102.80	109	70 - 130
D 62 d9-EtFOSE	98326	99837			102	50 - 150
33 EtFOSE			100.00	102.01	102	70 - 130
11 PFDoA			100.00	103.03	103	70 - 130
D 38 13C2_PFDoA	560944	520987			92.9	50 - 150
D 59 d5-EtFOSA	45663	44014			96.4	50 - 150
4 10:2 FTS			96.400	83.428	86.5	70 - 130
27 EtFOSA			100.00	78.857	78.9	70 - 130
34 PFDOS			96.800	93.152	96.2	70 - 130
24 PFTrDA			100.00	122.27	122	70 - 130
23 PFTeDA			100.00	101.38	101	70 - 130
D 42 13C2_PFTeDA	782673	708324			90.5	50 - 150
35 PFHxDA			100.00	109.58	110	70 - 130
D 40 13C2_PFHxDA	785856	776051			98.8	50 - 150
36 PFODA			100.00	101.69	102	70 - 130



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521006.d
Injection Date: 05-Feb-2021 12:04:35 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 96
Sample Info: ID CCV 200_SVLC-1274 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-3 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	609590	629586			103	50 - 150
8 PFBA			200.00	201.80	101	70 - 130
D 50 13C5_PFPeA	589875	620165			105	50 - 150
21 PFPeA			200.00	198.08	99	70 - 130
7 PFBS			176.80	183.72	104	70 - 130
D 44 13C3_PFBS	183373	183205			99.9	50 - 150
1 4:2 FTS			186.80	186.72	100	70 - 130
D 63 13C2_4:2 FTS_2	97964	98470			101	50 - 150
D 49 13C5_PFHxA	650690	688380			106	50 - 150
15 PFHxA			200.00	191.68	95.8	70 - 130
22 PFPeS			187.60	195.22	104	70 - 130
28 GenX			400.00	437.35	109	70 - 130
D 66 13C3_GenX	1173114	1209972			103	50 - 150
13 PFHpA			200.00	211.07	106	70 - 130
D 47 13C4_PFHpA	518637	513594			99	50 - 150
14 PFHxS			182.00	167.32	91.9	70 - 130
D 45 13C3_PFHxS	130090	138180			106	50 - 150
29 ADONA			188.40	181.18	96.2	70 - 130
D 64 13C2_6:2 FTS_2	76666	80927			106	50 - 150
2 6:2 FTS			189.60	205.05	108	70 - 130
20 PFOA			200.00	197.00	98.5	70 - 130
D 53 13C8_PFOA	515820	522956			101	50 - 150
12 PFHpS			190.40	182.79	96	70 - 130
18 PFOS			185.60	173.26	93.3	70 - 130
D 56 13C9_PFNA	620421	646643			104	50 - 150
D 54 13C8_PFOS	118203	114561			96.9	50 - 150
17 PFNA			200.00	202.24	101	70 - 130
30 9Cl-PF3ONS			186.40	175.32	94.1	70 - 130
D 55 13C8_PFOSA	257370	271235			105	50 - 150
19 PFOSA			200.00	185.49	92.7	70 - 130
3 8:2 FTS			191.60	169.45	88.4	70 - 130
16 PFNS			192.00	206.97	108	70 - 130
D 65 13C2_8:2 FTS_2	69608	76031			109	50 - 150
10 PFDA			200.00	197.87	98.9	70 - 130
D 51 13C6_PFDA	579706	605872			105	50 - 150
D 58 d3-MeFOSAA	625960	646794			103	50 - 150

Report Date: 09-Feb-2021 14:28:26 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521006.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			200.00	215.65	108	70 - 130
9 PFDS			192.80	203.89	106	70 - 130
D 52 13C7_PFUdA	554481	555298			100	50 - 150
25 PFUdA			200.00	194.42	97.2	70 - 130
D 60 d5-EtFOSAA	581940	585851			101	50 - 150
5 N-EtFOSAA			200.00	213.02	107	70 - 130
D 61 d7-MeFOSE	96466	85435			88.6	50 - 150
32 MeFOSE			200.00	206.43	103	70 - 130
26 MeFOSA			200.00	171.48	85.7	70 - 130
D 57 d3-MeFOSA	37017	44923			121	50 - 150
31 11Cl-PF3OUDS			188.40	208.32	111	70 - 130
D 62 d9-EtFOSE	99837	97607			97.8	50 - 150
33 EtFOSE			200.00	235.56	118	70 - 130
11 PFDoA			200.00	194.33	97.2	70 - 130
D 38 13C2_PFDoA	520987	564223			108	50 - 150
D 59 d5-EtFOSA	44014	46266			105	50 - 150
4 10:2 FTS			192.80	213.39	111	70 - 130
27 EtFOSA			200.00	161.26	80.6	70 - 130
34 PFDOS			193.60	189.22	97.7	70 - 130
24 PFTrDA			200.00	236.38	118	70 - 130
23 PFTeDA			200.00	209.98	105	70 - 130
D 42 13C2_PFTeDA	708324	723182			102	50 - 150
35 PFHxDA			200.00	201.75	101	70 - 130
D 40 13C2_PFHxDA	776051	793722			102	50 - 150
36 PFODA			200.00	194.44	97.2	70 - 130



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521025.d
Injection Date: 05-Feb-2021 15:26:30 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 18
Sample Info: ID CCV 1000_SVLC-1324 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	609590	659196			108	50 - 150
8 PFBA			1000.00	940.88	94.1	70 - 130
D 50 13C5_PFPeA	589875	651937			111	50 - 150
21 PFPeA			1000.00	939.09	93.9	70 - 130
7 PFBS			884.00	804.62	91	70 - 130
D 44 13C3_PFBS	183373	203362			111	50 - 150
1 4:2 FTS			934.00	870.65	93.2	70 - 130
D 63 13C2_4:2 FTS_2	97964	111571			114	50 - 150
D 49 13C5_PFHxA	650690	692529			106	50 - 150
15 PFHxA			1000.00	941.11	94.1	70 - 130
22 PFPeS			938.00	934.43	99.6	70 - 130
28 GenX			2000.00	1905.84	95.3	70 - 130
D 66 13C3_GenX	1173114	1256801			107	50 - 150
13 PFHpA			1000.00	948.12	94.8	70 - 130
D 47 13C4_PFHpA	518637	554394			107	50 - 150
14 PFHxS			910.00	812.40	89.3	70 - 130
D 45 13C3_PFHxS	130090	150925			116	50 - 150
29 ADONA			942.00	831.12	88.2	70 - 130
D 64 13C2_6:2 FTS_2	76666	87644			114	50 - 150
2 6:2 FTS			948.00	823.25	86.8	70 - 130
20 PFOA			1000.00	874.18	87.4	70 - 130
D 53 13C8_PFOA	515820	567791			110	50 - 150
12 PFHpS			952.00	856.00	89.9	70 - 130
18 PFOS			928.00	777.67	83.8	70 - 130
D 56 13C9_PFNA	620421	675994			109	50 - 150
D 54 13C8_PFOS	118203	129043			109	50 - 150
17 PFNA			1000.00	971.23	97.1	70 - 130
30 9Cl-PF3ONS			932.00	855.40	91.8	70 - 130
D 55 13C8_PFOSA	257370	277291			108	50 - 150
19 PFOSA			1000.00	963.93	96.4	70 - 130
3 8:2 FTS			958.00	956.93	99.9	70 - 130
16 PFNS			960.00	808.53	84.2	70 - 130
D 65 13C2_8:2 FTS_2	69608	80483			116	50 - 150
10 PFDA			1000.00	997.09	99.7	70 - 130
D 51 13C6_PFDA	579706	662471			114	50 - 150
D 58 d3-MeFOSAA	625960	718325			115	50 - 150

Report Date: 09-Feb-2021 14:28:32 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\organics\LL\LCMSMS02.i\020521-nonDOD.b\020521025.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	912.31	91.2	70 - 130
9 PFDS			964.00	836.19	86.7	70 - 130
D 52 13C7_PFUdA	554481	585284			106	50 - 150
25 PFUdA			1000.00	867.10	86.7	70 - 130
D 60 d5-EtFOSAA	581940	665088			114	50 - 150
5 N-EtFOSAA			1000.00	887.60	88.8	70 - 130
D 61 d7-MeFOSE	96466	115424			120	50 - 150
32 MeFOSE			1000.00	864.66	86.5	70 - 130
26 MeFOSA			1000.00	859.67	86	70 - 130
D 57 d3-MeFOSA	37017	49133			133	50 - 150
31 11Cl-PF3OUDS			942.00	844.30	89.6	70 - 130
D 62 d9-EtFOSE	99837	120300			120	50 - 150
33 EtFOSE			1000.00	918.57	91.9	70 - 130
11 PFDoA			1000.00	952.89	95.3	70 - 130
D 38 13C2_PFDoA	520987	594033			114	50 - 150
D 59 d5-EtFOSA	44014	48707			111	50 - 150
4 10:2 FTS			964.00	928.14	96.3	70 - 130
27 EtFOSA			1000.00	918.47	91.8	70 - 130
34 PFDOS			968.00	884.88	91.4	70 - 130
24 PFTrDA			1000.00	1108.73	111	70 - 130
23 PFTeDA			1000.00	976.18	97.6	70 - 130
D 42 13C2_PFTeDA	708324	779910			110	50 - 150
35 PFHxDA			1000.00	935.49	93.5	70 - 130
D 40 13C2_PFHxDA	776051	848637			109	50 - 150
36 PFODA			1000.00	909.31	90.9	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821005.d
Injection Date: 08-Feb-2021 11:56:37 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 95
Sample Info: ID CCV 100_SVLC-1273 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-2 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	720687	629382			87.3	50 - 150
8 PFBA			100.00	105.74	106	70 - 130
D 50 13C5_PFPeA	669031	605332			90.5	50 - 150
21 PFPeA			100.00	101.31	101	70 - 130
7 PFBS			88.400	102.64	116	70 - 130
D 44 13C3_PFBS	208034	194467			93.5	50 - 150
1 4:2 FTS			93.400	109.75	118	70 - 130
D 63 13C2_4:2 FTS_2	122994	107257			87.2	50 - 150
D 49 13C5_PFHxA	773207	692380			89.5	50 - 150
15 PFHxA			100.00	99.439	99.4	70 - 130
22 PFPeS			93.800	97.048	103	70 - 130
28 GenX			200.00	208.26	104	70 - 130
D 66 13C3_GenX	1294237	1201937			92.9	50 - 150
13 PFHpA			100.00	104.13	104	70 - 130
D 47 13C4_PFHpA	566534	532291			94	50 - 150
14 PFHxS			91.000	94.746	104	70 - 130
D 45 13C3_PFHxS	147201	136023			92.4	50 - 150
29 ADONA			94.200	92.432	98.1	70 - 130
D 64 13C2_6:2 FTS_2	89400	85634			95.8	50 - 150
2 6:2 FTS			94.800	117.10	124	70 - 130
20 PFOA			100.00	112.58	113	70 - 130
D 53 13C8_PFOA	568086	522077			91.9	50 - 150
12 PFHpS			95.200	93.528	98.2	70 - 130
18 PFOS			92.800	95.323	103	70 - 130
D 56 13C9_PFNA	703892	680992			96.7	50 - 150
D 54 13C8_PFOS	126288	122286			96.8	50 - 150
17 PFNA			100.00	100.89	101	70 - 130
30 9Cl-PF3ONS			93.200	102.73	110	70 - 130
D 55 13C8_PFOSA	270927	279089			103	50 - 150
19 PFOSA			100.00	104.25	104	70 - 130
3 8:2 FTS			95.800	91.060	95.1	70 - 130
16 PFNS			96.000	88.604	92.3	70 - 130
D 65 13C2_8:2 FTS_2	91484	78772			86.1	50 - 150
10 PFDA			100.00	106.25	106	70 - 130
D 51 13C6_PFDA	643340	636238			98.9	50 - 150
D 58 d3-MeFOSAA	689696	680163			98.6	50 - 150

Report Date: 10-Feb-2021 17:19:43 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\ll\LCMSMS02.i\020821-nonDOD.b\020821005.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			100.00	112.95	113	70 - 130
9 PFDS			96.400	112.50	117	70 - 130
D 52 13C7_PFUdA	564025	559034			99.1	50 - 150
25 PFUdA			100.00	110.15	110	70 - 130
D 60 d5-EtFOSAA	568396	603434			106	50 - 150
5 N-EtFOSAA			100.00	96.515	96.5	70 - 130
D 61 d7-MeFOSE	84617	98439			116	50 - 150
32 MeFOSE			100.00	113.74	114	70 - 130
26 MeFOSA			100.00	97.364	97.4	70 - 130
D 57 d3-MeFOSA	44332	44882			101	50 - 150
31 11Cl-PF3OUDS			94.200	98.474	105	70 - 130
D 62 d9-EtFOSE	98326	111389			113	50 - 150
33 EtFOSE			100.00	107.82	108	70 - 130
11 PFDoA			100.00	106.48	106	70 - 130
D 38 13C2_PFDoA	560944	589944			105	50 - 150
D 59 d5-EtFOSA	45663	42428			92.9	50 - 150
4 10:2 FTS			96.400	116.91	121	70 - 130
27 EtFOSA			100.00	106.22	106	70 - 130
34 PFDOS			96.800	99.224	103	70 - 130
24 PFTrDA			100.00	111.07	111	70 - 130
23 PFTeDA			100.00	104.75	105	70 - 130
D 42 13C2_PFTeDA	782673	748079			95.6	50 - 150
35 PFHxDA			100.00	109.94	110	70 - 130
D 40 13C2_PFHxDA	785856	800223			102	50 - 150
36 PFODA			100.00	98.656	98.7	70 - 130



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821006.d
Injection Date: 08-Feb-2021 12:07:14 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 96
Sample Info: ID CCV 200_SVLC-1274 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-3 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	629382	605562			96.2	50 - 150
8 PFBA			200.00	211.28	106	70 - 130
D 50 13C5_PFPeA	605332	609735			101	50 - 150
21 PFPeA			200.00	202.48	101	70 - 130
7 PFBS			176.80	180.18	102	70 - 130
D 44 13C3_PFBS	194467	199562			103	50 - 150
1 4:2 FTS			186.80	175.52	94	70 - 130
D 63 13C2_4:2 FTS_2	107257	103224			96.2	50 - 150
D 49 13C5_PFHxA	692380	656668			94.8	50 - 150
15 PFHxA			200.00	211.18	106	70 - 130
22 PFPeS			187.60	191.79	102	70 - 130
28 GenX			400.00	424.43	106	70 - 130
D 66 13C3_GenX	1201937	1195486			99.5	50 - 150
13 PFHpA			200.00	207.13	104	70 - 130
D 47 13C4_PFHpA	532291	509777			95.8	50 - 150
14 PFHxS			182.00	200.51	110	70 - 130
D 45 13C3_PFHxS	136023	134329			98.8	50 - 150
29 ADONA			188.40	186.06	98.8	70 - 130
D 64 13C2_6:2 FTS_2	85634	81057			94.7	50 - 150
2 6:2 FTS			189.60	199.24	105	70 - 130
20 PFOA			200.00	213.33	107	70 - 130
D 53 13C8_PFOA	522077	530320			102	50 - 150
12 PFHpS			190.40	211.27	111	70 - 130
18 PFOS			185.60	186.67	101	70 - 130
D 56 13C9_PFNA	680992	643026			94.4	50 - 150
D 54 13C8_PFOS	122286	116691			95.4	50 - 150
17 PFNA			200.00	200.18	100	70 - 130
30 9Cl-PF3ONS			186.40	187.09	100	70 - 130
D 55 13C8_PFOSA	279089	268086			96.1	50 - 150
19 PFOSA			200.00	204.26	102	70 - 130
3 8:2 FTS			191.60	214.27	112	70 - 130
16 PFNS			192.00	211.15	110	70 - 130
D 65 13C2_8:2 FTS_2	78772	79545			101	50 - 150
10 PFDA			200.00	207.51	104	70 - 130
D 51 13C6_PFDA	636238	629968			99	50 - 150
D 58 d3-MeFOSAA	680163	642110			94.4	50 - 150

Report Date: 10-Feb-2021 17:19:44 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\ll\LCMSMS02.i\020821-nonDOD.b\020821006.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			200.00	209.66	105	70 - 130
9 PFDS			192.80	190.80	99	70 - 130
D 52 13C7_PFUdA	559034	565006			101	50 - 150
25 PFUdA			200.00	185.69	92.8	70 - 130
D 60 d5-EtFOSAA	603434	581533			96.4	50 - 150
5 N-EtFOSAA			200.00	220.96	110	70 - 130
D 61 d7-MeFOSE	98439	87744			89.1	50 - 150
32 MeFOSE			200.00	231.16	116	70 - 130
26 MeFOSA			200.00	183.39	91.7	70 - 130
D 57 d3-MeFOSA	44882	45090			100	50 - 150
31 11Cl-PF3OUDS			188.40	199.42	106	70 - 130
D 62 d9-EtFOSE	111389	114956			103	50 - 150
33 EtFOSE			200.00	213.60	107	70 - 130
11 PFDoA			200.00	192.39	96.2	70 - 130
D 38 13C2_PFDoA	589944	617396			105	50 - 150
D 59 d5-EtFOSA	42428	43530			103	50 - 150
4 10:2 FTS			192.80	247.59	128	70 - 130
27 EtFOSA			200.00	185.73	92.9	70 - 130
34 PFDOS			193.60	202.85	105	70 - 130
24 PFTrDA			200.00	206.67	103	70 - 130
23 PFTeDA			200.00	205.37	103	70 - 130
D 42 13C2_PFTeDA	748079	766523			102	50 - 150
35 PFHxDA			200.00	198.08	99	70 - 130
D 40 13C2_PFHxDA	800223	810023			101	50 - 150
36 PFODA			200.00	192.17	96.1	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821043.d
Injection Date: 08-Feb-2021 18:40:47 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 36
Sample Info: ID CCV 1000B_SVLC-1324 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	629382	638167			101	50 - 150
8 PFBA			1000.00	921.65	92.2	70 - 130
D 50 13C5_PFPeA	605332	621248			103	50 - 150
21 PFPeA			1000.00	954.72	95.5	70 - 130
7 PFBS			884.00	802.11	90.7	70 - 130
D 44 13C3_PFBS	194467	202691			104	50 - 150
1 4:2 FTS			934.00	926.72	99.2	70 - 130
D 63 13C2_4:2 FTS_2	107257	101474			94.6	50 - 150
D 49 13C5_PFHxA	692380	668977			96.6	50 - 150
15 PFHxA			1000.00	968.66	96.9	70 - 130
22 PFPeS			938.00	855.95	91.3	70 - 130
28 GenX			2000.00	1884.43	94.2	70 - 130
D 66 13C3_GenX	1201937	1248160			104	50 - 150
13 PFHpA			1000.00	997.16	99.7	70 - 130
D 47 13C4_PFHpA	532291	529257			99.4	50 - 150
14 PFHxS			910.00	890.54	97.9	70 - 130
D 45 13C3_PFHxS	136023	141260			104	50 - 150
29 ADONA			942.00	871.34	92.5	70 - 130
D 64 13C2_6:2 FTS_2	85634	81811			95.5	50 - 150
2 6:2 FTS			948.00	865.37	91.3	70 - 130
20 PFOA			1000.00	914.11	91.4	70 - 130
D 53 13C8_PFOA	522077	548624			105	50 - 150
12 PFHpS			952.00	969.60	102	70 - 130
18 PFOS			928.00	804.22	86.7	70 - 130
D 56 13C9_PFNA	680992	671327			98.6	50 - 150
D 54 13C8_PFOS	122286	123516			101	50 - 150
17 PFNA			1000.00	933.54	93.4	70 - 130
30 9Cl-PF3ONS			932.00	846.50	90.8	70 - 130
D 55 13C8_PFOSA	279089	271451			97.3	50 - 150
19 PFOSA			1000.00	984.84	98.5	70 - 130
3 8:2 FTS			958.00	940.31	98.2	70 - 130
16 PFNS			960.00	932.06	97.1	70 - 130
D 65 13C2_8:2 FTS_2	78772	82188			104	50 - 150
10 PFDA			1000.00	945.42	94.5	70 - 130
D 51 13C6_PFDA	636238	624601			98.2	50 - 150
D 58 d3-MeFOSAA	680163	740538			109	50 - 150

Report Date: 10-Feb-2021 17:20:05 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\ORGANICS\LL\LCMSMS02.i\020821-nonDOD.b\020821043.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	874.92	87.5	70 - 130
9 PFDS			964.00	950.17	98.6	70 - 130
D 52 13C7_PFUdA	559034	591262			106	50 - 150
25 PFUdA			1000.00	926.60	92.7	70 - 130
D 60 d5-EtFOSAA	603434	591746			98.1	50 - 150
5 N-EtFOSAA			1000.00	939.62	94	70 - 130
D 61 d7-MeFOSE	98439	101868			103	50 - 150
32 MeFOSE			1000.00	949.87	95	70 - 130
26 MeFOSA			1000.00	952.40	95.2	70 - 130
D 57 d3-MeFOSA	44882	45432			101	50 - 150
31 11Cl-PF3OUDS			942.00	905.20	96.1	70 - 130
D 62 d9-EtFOSE	111389	116548			105	50 - 150
33 EtFOSE			1000.00	960.20	96	70 - 130
11 PFDoA			1000.00	896.95	89.7	70 - 130
D 38 13C2_PFDoA	589944	604051			102	50 - 150
D 59 d5-EtFOSA	42428	48130			113	50 - 150
4 10:2 FTS			964.00	951.68	98.7	70 - 130
27 EtFOSA			1000.00	932.88	93.3	70 - 130
34 PFDOS			968.00	907.42	93.7	70 - 130
24 PFTrDA			1000.00	1063.01	106	70 - 130
23 PFTeDA			1000.00	970.78	97.1	70 - 130
D 42 13C2_PFTeDA	748079	742278			99.2	50 - 150
35 PFHxDA			1000.00	947.29	94.7	70 - 130
D 40 13C2_PFHxDA	800223	847510			106	50 - 150
36 PFODA			1000.00	907.29	90.7	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\organics\LL\LCMSMS02.i\020821-nonDOD.b\020821056.d
Injection Date: 08-Feb-2021 20:59:27 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 49
Sample Info: ID CCV 1000C_SVLC-1324 Misc. Info:
Inst. ID: LCMSMS02 Operator: Stephen E. Somerville

Method Name: LCMSMS02_PFAS-ID Version: 2020-09-22 16:12:14
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 46 13C4_PFBA	629382	698627			111	50 - 150
8 PFBA			1000.00	913.25	91.3	70 - 130
D 50 13C5_PFPeA	605332	704388			116	50 - 150
21 PFPeA			1000.00	911.03	91.1	70 - 130
7 PFBS			884.00	802.49	90.8	70 - 130
D 44 13C3_PFBS	194467	226798			117	50 - 150
1 4:2 FTS			934.00	787.89	84.4	70 - 130
D 63 13C2_4:2 FTS_2	107257	121296			113	50 - 150
D 49 13C5_PFHxA	692380	748114			108	50 - 150
15 PFHxA			1000.00	923.40	92.3	70 - 130
22 PFPeS			938.00	898.93	95.8	70 - 130
28 GenX			2000.00	1889.73	94.5	70 - 130
D 66 13C3_GenX	1201937	1357157			113	50 - 150
13 PFHpA			1000.00	989.57	99	70 - 130
D 47 13C4_PFHpA	532291	588463			111	50 - 150
14 PFHxS			910.00	839.24	92.2	70 - 130
D 45 13C3_PFHxS	136023	154546			114	50 - 150
29 ADONA			942.00	853.19	90.6	70 - 130
D 64 13C2_6:2 FTS_2	85634	94879			111	50 - 150
2 6:2 FTS			948.00	870.55	91.8	70 - 130
20 PFOA			1000.00	862.39	86.2	70 - 130
D 53 13C8_PFOA	522077	636867			122	50 - 150
12 PFHpS			952.00	965.95	101	70 - 130
18 PFOS			928.00	815.92	87.9	70 - 130
D 56 13C9_PFNA	680992	741942			109	50 - 150
D 54 13C8_PFOS	122286	142985			117	50 - 150
17 PFNA			1000.00	917.39	91.7	70 - 130
30 9Cl-PF3ONS			932.00	787.27	84.5	70 - 130
D 55 13C8_PFOSA	279089	306420			110	50 - 150
19 PFOSA			1000.00	928.41	92.8	70 - 130
3 8:2 FTS			958.00	847.59	88.5	70 - 130
16 PFNS			960.00	865.13	90.1	70 - 130
D 65 13C2_8:2 FTS_2	78772	94008			119	50 - 150
10 PFDA			1000.00	1025.86	103	70 - 130
D 51 13C6_PFDA	636238	668185			105	50 - 150
D 58 d3-MeFOSAA	680163	768922			113	50 - 150

Report Date: 10-Feb-2021 17:20:14 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\ORGANICS\LL\LCMSMS02.i\020821-nonDOD.b\020821056.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
6 N-MeFOSAA			1000.00	1007.89	101	70 - 130
9 PFDS			964.00	832.52	86.4	70 - 130
D 52 13C7_PFUdA	559034	664999			119	50 - 150
25 PFUdA			1000.00	874.78	87.5	70 - 130
D 60 d5-EtFOSAA	603434	683274			113	50 - 150
5 N-EtFOSAA			1000.00	957.75	95.8	70 - 130
D 61 d7-MeFOSE	98439	115699			118	50 - 150
32 MeFOSE			1000.00	887.20	88.7	70 - 130
26 MeFOSA			1000.00	846.23	84.6	70 - 130
D 57 d3-MeFOSA	44882	56406			126	50 - 150
31 11Cl-PF3OUDS			942.00	845.68	89.8	70 - 130
D 62 d9-EtFOSE	111389	127838			115	50 - 150
33 EtFOSE			1000.00	895.46	89.5	70 - 130
11 PFDoA			1000.00	921.60	92.2	70 - 130
D 38 13C2_PFDoA	589944	649121			110	50 - 150
D 59 d5-EtFOSA	42428	48914			115	50 - 150
4 10:2 FTS			964.00	931.76	96.7	70 - 130
27 EtFOSA			1000.00	979.75	98	70 - 130
34 PFDOS			968.00	865.35	89.4	70 - 130
24 PFTrDA			1000.00	1073.70	107	70 - 130
23 PFTeDA			1000.00	929.49	92.9	70 - 130
D 42 13C2_PFTeDA	748079	816326			109	50 - 150
35 PFHxDA			1000.00	960.03	96	70 - 130
D 40 13C2_PFHxDA	800223	938426			117	50 - 150
36 PFODA			1000.00	888.24	88.8	70 - 130



Pace Environmental Services, LLC
Initial Calibration Response Report

Batch: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b
Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01
Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	020721021.d	ICAL 50_SVLC-1333	07-Feb-2021 14:32:59
2	020721022.d	ICAL 100_SVLC-1334	07-Feb-2021 14:43:30
3	020721023.d	ICAL 200_SVLC-1335	07-Feb-2021 14:54:02
4	020721024.d	ICAL 500_SVLC-1336	07-Feb-2021 15:04:36
5	020721025.d	ICAL 1000_SVLC-1337	07-Feb-2021 15:15:08
6	020721026.d	ICAL 2000_SVLC-1338	07-Feb-2021 15:25:43
7	020721027.d	ICAL 5000_SVLC-1339	07-Feb-2021 15:36:16
8	020721028.d	ICAL 10000_SVLC-1340	07-Feb-2021 15:46:51
9	020721029.d	ICAL 15000_SVLC-1341	07-Feb-2021 15:57:27
10	020721030.d	ICAL 20000_SVLC-1342	07-Feb-2021 16:08:04

Quantitation Standards (* - Istd) (D - Iso Dil Std)

* 37 13C2_PFDA	* 39 13C2_PFHxA	* 41 13C2_PFOA
* 43 13C3_PFBA	* 48 13C4_PFOS	D 38 13C2_PFDoA
D 40 13C2_PFHxDA	D 42 13C2_PFTeDA	D 44 13C3_PFBS
D 45 13C3_PFHxS	D 46 13C4_PFBA	D 47 13C4_PFHpA
D 49 13C5_PFHxA	D 50 13C5_PFPeA	D 51 13C6_PFDA
D 52 13C7_PFUdA	D 53 13C8_PFOA	D 54 13C8_PFOS
D 55 13C8_PFOSA	D 56 13C9_PFNA	D 57 d3-MeFOSA
D 58 d3-MeFOSAA	D 59 d5-EtFOSA	D 60 d5-EtFOSAA
D 61 d7-MeFOSE	D 62 d9-EtFOSE	D 63 13C2_4:2 FTS_2
D 64 13C2_6:2 FTS_2	D 65 13C2_8:2 FTS_2	D 66 13C3_GenX

Column: 1 Detector: LCMS-Q3

Compound	Level 1 Conc/Rsp	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
D 46 13C4_PFBA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	901222	886400	968332	963607	940437	906240	902469	881761	820980	944971	
8 PFBA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#46
	77344	119455	211253	501023	935381	1854377	4362836	8540964	11888709	17121726	
D 50 13C5_PFPeA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	858447	912438	998952	1000355	980305	891737	923554	888535	850111	972233	
21 PFPeA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#50
	50991	97843	199890	538219	904402	1961187	4496670	8628879	11757673	17222944	
D 44 13C3_PFBS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	299249	299580	330601	341516	306015	321904	307314	308894	288335	330875	
7 PFBS	44.200	88.400	176.80	442.00	884.00	1768.00	4420.00	8840.00	13260	17680	#44
	22950	36287	71897	183496	333068	690386	1591181	3265604	4574427	6971400	
1 4:2 FTS	46.700	93.400	186.80	467.00	934.00	1868.00	4670.00	9340.00	14010	18680	#63
	4052	6981	14202	38569	81999	149217	337052	679170	950347	1423506	
D 63 13C2_4:2 FTS_2	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	235443	253854	241712	271700	258946	256205	240065	244931	227361	259814	
D 49 13C5_PFHxA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	832211	780674	876458	928356	925301	792263	925552	820798	793381	871732	
15 PFHxA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#49
	47022	96418	170202	434567	844592	1716616	3733007	7311433	10127070	15673511	

Compound	Level 1 Conc/Rsp	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
22 PFPeS	46.900	93.800	187.60	469.00	938.00	1876.00	4690.00	9380.00	14070	18760	#44
	13165	26749	54209	131260	266300	523596	1220275	2604422	3648320	5195862	
28 GenX	100.00	200.00	400.00	1000.00	2000.00	4000.00	10000	20000	30000	40000	#66
	13899	27687	54412	129352	263408	489288	1271317	2379166	3190790	4554993	
D 66 13C3_GenX	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	660623	714268	753305	731709	798996	767589	720275	735458	688373	719711	
D 47 13C4_PFHpA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	817200	810122	766797	835666	738956	794045	789434	779868	686519	768407	
13 PFHpA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#47
	38678	71314	151323	377509	766828	1483906	3418434	6936935	9091957	14226862	
14 PFHxS	45.500	91.000	182.00	455.00	910.00	1820.00	4550.00	9100.00	13650	18200	#45
	10587	24498	49344	122372	240876	484688	1115644	2283360	2986160	4465261	
D 45 13C3_PFHxS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	222702	247416	228268	255577	238770	214820	242552	225054	199213	226589	
29 ADONA	47.100	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#45
	58297	118484	254466	619232	1147535	2575302	5563777	11477594	14997499	21618370	
D 64 13C2_6:2 FTS_2	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	193300	198669	203934	206074	208098	206526	193374	202674	185967	217726	
2 6:2 FTS	47.400	94.800	189.60	474.00	948.00	1896.00	4740.00	9480.00	14220	18960	#64
	2846	4667	10665	28257	58183	98719	244563	484308	666461	1029574	
D 53 13C8_PFOA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	729032	703579	770973	788680	784254	807653	750051	700848	627097	709251	
20 PFOA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#53
	36292	77746	165414	430024	759340	1587385	3470589	6674915	9696101	13595083	
12 PFHpS	47.600	95.200	190.40	476.00	952.00	1904.00	4760.00	9520.00	14280	19040	#45
	11482	25252	46706	123648	246554	459422	1171859	2278688	2953858	4416856	
D 54 13C8_PFOS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	196976	227872	216215	230490	217839	218576	201274	176598	192041	212075	
18 PFOS	46.400	92.800	185.60	464.00	928.00	1856.00	4640.00	9280.00	13920	18560	#54
	12027	21443	50274	118570	218781	489552	1108489	2171461	3035261	4457960	
17 PFNA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#56
	30806	61743	126608	305968	612430	1157114	2673906	5683747	7683251	10936738	
D 56 13C9_PFNA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	686633	708861	696260	826362	714408	768130	711546	696705	615638	711579	
30 9Cl-PF3ONS	46.600	93.200	186.40	466.00	932.00	1864.00	4660.00	9320.00	13980	18640	#54
	27211	54715	102245	272763	513033	1131508	2352488	5165825	7024396	10920282	
D 55 13C8_PFOSA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	525230	434122	436500	460198	445030	377224	441039	368120	386742	404404	
3 8:2 FTS	47.900	95.800	191.60	479.00	958.00	1916.00	4790.00	9580.00	14370	19160	#65
	2529	4889	7651	21175	34783	86412	203374	374496	526211	748631	
16 PFNS	48.000	96.000	192.00	480.00	960.00	1920.00	4800.00	9600.00	14400	19200	#54
	10034	17819	41958	99145	171750	368068	887860	1774662	2545636	3635302	
19 PFOSA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#55
	19672	48094	91602	245875	492039	875507	1725613	3978818	5450711	8469644	
D 65 13C2_8:2 FTS_2	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	152739	157456	174468	153749	166309	158836	166003	149364	144445	163461	
D 51 13C6_PFDA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	566937	592709	657692	651893	558348	652423	551842	545885	541902	566298	
10 PFDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#51
	29724	64281	118830	292298	596398	1141131	2760833	5228069	6509228	10159243	
D 58 d3-MeFOSAA	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	671480	669833	848170	849486	774575	805878	770979	790490	768389	798485	
6 N-MeFOSAA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#58
	7143	11812	25433	55979	108347	206342	485920	1157260	1561007	2387349	
9 PFDS	48.200	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#54
	13258	19609	42289	109051	205399	416150	948656	1859262	2669223	3919041	

Compound	Level 1 Conc/Rsp	Level 2 Conc/Rsp	Level 3 Conc/Rsp	Level 4 Conc/Rsp	Level 5 Conc/Rsp	Level 6 Conc/Rsp	Level 7 Conc/Rsp	Level 8 Conc/Rsp	Level 9 Conc/Rsp	Level 10 Conc/Rsp	Std #
D 60 d5-EtFOSAA	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	
	691078	740307	693116	762620	690005	693851	708938	703246	644729	678152	
D 52 13C7_PFUdA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	427586	573256	574250	629677	575243	560632	531297	524676	473627	526717	
5 N-EtFOSAA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#60
	9318	13516	24331	68317	128914	249982	685434	1207121	1552086	2478173	
25 PFUdA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#52
	22238	52975	111460	299255	517369	1044245	2330825	4378846	5941524	8669733	
D 61 d7-MeFOSE	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	163270	176440	168549	166023	169919	160550	159644	155363	149701	170461	
32 MeFOSE	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#61
	7813	14215	30470	84028	143733	317130	702982	1527466	2033792	3224151	
26 MeFOSA		100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#57
		8009	14815	30605	63088	126885	274512	574470	829474	1321165	
D 57 d3-MeFOSA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	58638	55783	53635	66308	59860	67203	59183	61581	50131	73393	
31 11Cl-PF3OUDS	47.100	94.200	188.40	471.00	942.00	1884.00	4710.00	9420.00	14130	18840	#54
	20814	49709	91854	254199	473793	926555	2253249	4613155	6329931	10137194	
11 PFDoA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	26235	57423	125013	305431	575454	1169660	2707010	5560236	7431668	11282035	
D 38 13C2_PFDoA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	614041	608891	639847	694182	647718	622102	588140	622361	539674	610472	
4 10:2 FTS	48.200	96.400	192.80	482.00	964.00	1928.00	4820.00	9640.00	14460	19280	#65
	2293	4545	11714	25479	52827	102027	237783	468935	637465	900502	
D 62 d9-EtFOSE	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	139955	141002	168164	158286	157828	158142	153830	161651	148132	158918	
33 EtFOSE	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#62
	6404	14660	29153	63822	124930	256232	610856	1237595	1738597	2678025	
D 59 d5-EtFOSA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	59809	56267	65620	60318	60047	65526	58098	56740	55075	66341	
27 EtFOSA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#59
	2307	7370	13085	33737	59745	124430	302664	624889	839509	1330920	
34 PFDOS	48.400	96.800	193.60	484.00	968.00	1936.00	4840.00	9680.00	14520	19360	#54
	9488	16975	33031	91987	171480	357950	837794	1612773	2458637	3650462	
24 PFTrDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#38
	13823	22771	52182	127290	228525	496102	1130004	2283753	3148854	4985157	
D 42 13C2_PFTeDA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	597622	640095	684303	699909	680063	648501	653313	674191	626749	701764	
23 PFTeDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#42
	27667	51202	106894	266350	519338	1037132	2397039	5079664	6816439	9924989	
35 PFHxDA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	36307	63258	126879	309466	601035	1161853	2851081	5459847	7438392	11219825	
D 40 13C2_PFHxDA	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
	346221	341286	367178	374301	369178	357983	348686	342607	317066	383500	
36 PFODA	50.000	100.00	200.00	500.00	1000.00	2000.00	5000.00	10000	15000	20000	#40
	19384	36797	79775	203654	386352	779417	1810706	3710438	5334828	7949069	

Report Date: 11-Feb-2021 10:00:29 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Initial Calibration RF Report

Batch: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b

Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01

Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	020721021.d	ICAL 50_SVLC-1333	07-Feb-2021 14:32:59
2	020721022.d	ICAL 100_SVLC-1334	07-Feb-2021 14:43:30
3	020721023.d	ICAL 200_SVLC-1335	07-Feb-2021 14:54:02
4	020721024.d	ICAL 500_SVLC-1336	07-Feb-2021 15:04:36
5	020721025.d	ICAL 1000_SVLC-1337	07-Feb-2021 15:15:08
6	020721026.d	ICAL 2000_SVLC-1338	07-Feb-2021 15:25:43
7	020721027.d	ICAL 5000_SVLC-1339	07-Feb-2021 15:36:16
8	020721028.d	ICAL 10000_SVLC-1340	07-Feb-2021 15:46:51
9	020721029.d	ICAL 15000_SVLC-1341	07-Feb-2021 15:57:27
10	020721030.d	ICAL 20000_SVLC-1342	07-Feb-2021 16:08:04

Curve Legend: Ex. Avg:H Wt:C2 Org:F Dep:A

Curve Type: Avg, Ln, Qd Response Type: H-Height, A-Area

Wt: Curve Weighting, C-1/Conc, C2-1/Conc^2, R-1/Rsp, R2-1/Rsp^2, N-None

Org: Origin, F-Force, I-Include, N-Neither

Dep: Dependent Variable, A-Amount, R-Response

%Rec = (Measured Amount / True Amount) * 100

Column: 1 Detector: LCMS-Q3

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
D 46 13C4_PFBA	901	886	968	964	940	906	902	882	821	945	Avg:A Wt:C2	912		RSD=4.9	
	98.9	97.2	106	106	103	99.4	99	96.7	90.1	104	Org:N Dep:A				
8 PFBA	1.716425	1.347642	1.090809	1.039891	0.994624	1.023116	0.966867	0.968626	0.965408	0.905939	Ln:A Wt:C2	0.954414	37.9067	R^2=0.998	
	100	101	94.4	101	100	105	101	101	101	94.7	Org:N Dep:A			RSE=3.4	
D 50 13C5_PFPeA	858	912	999	1000	980	892	924	889	850	972	Avg:A Wt:C2	928		RSD=6.1	
	92.5	98.4	108	108	106	96.1	99.6	95.8	91.6	105	Org:N Dep:A				
21 PFPeA	1.187982	1.072325	1.000499	1.076056	0.922572	1.099644	0.973775	0.971136	0.922050	0.885742	Avg:A Wt:C2	1.011178		RSD=9.4	
	117	106	98.9	106	91.2	109	96.3	96	91.2	87.6	Org:N Dep:A				
D 44 13C3_PFBS	299	300	331	342	306	322	307	309	288	331	Avg:A Wt:C2	313		RSD=5.4	
	95.5	95.6	105	109	97.6	103	98	98.6	92	106	Org:N Dep:A				
7 PFBS	1.735113	1.370206	1.230054	1.215607	1.231226	1.213063	1.171426	1.195919	1.196453	1.191719	Ln:A Wt:C2	1.175491	22.6217	R^2=0.998	
	104	94.8	93.8	99.1	103	102	99.2	102	102	101	Org:N Dep:A			RSE=3.6	

Report Date: 11-Feb-2021 10:00:29 AIM Revision: 2.0 05-Oct-2020 14:59:22
Method Path: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b\LCMSMS01_PFAS-ID.m

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
1 4:2 FTS	1.842624	1.472166	1.572695	1.519854	1.695206	1.558920	1.503215	1.484424	1.491757	1.466526	Avg:A Wt:C2	1.560739		RSD=7.7	
	118	94.3	101	97.4	109	99.9	96.3	95.1	95.6	94	Org:N Dep:A				
D 63 13C2_4:2 FTS_2	47.0886	50.7708	48.3424	54.3400	51.7892	51.2410	48.0130	48.9862	45.4722	51.9628	Avg:A Wt:C2	49.8006		RSD=5.4	
	94.6	102	97.1	109	104	103	96.4	98.4	91.3	104	Org:N Dep:A				
D 49 13C5_PFHxA	832	781	876	928	925	792	926	821	793	872	Avg:A Wt:C2	855		RSD=6.9	
	97.4	91.3	103	109	108	92.7	108	96	92.8	102	Org:N Dep:A				
15 PFHxA	1.130050	1.235061	0.970965	0.936208	0.912775	1.083362	0.806655	0.890771	0.850963	0.898987	Avg:A Wt:C2	0.971580		RSD=13.9	
	116	127	99.9	96.4	93.9	112	83	91.7	87.6	92.5	Org:N Dep:A				
22 PFPeS	0.938027	0.951901	0.874046	0.819499	0.927739	0.867036	0.846647	0.898874	0.899294	0.837068	Avg:A Wt:C2	0.886013		RSD=5.0	
	106	107	98.6	92.5	105	97.9	95.6	101	101	94.5	Org:N Dep:A				
28 GenX	1.051962	0.969069	0.902888	0.883903	0.824184	0.796794	0.882522	0.808736	0.772544	0.791115	Avg:A Wt:C2	0.868372		RSD=10.2	
	121	112	104	102	94.9	91.8	102	93.1	89	91.1	Org:N Dep:A				
D 66 13C3_GenX	132	143	151	146	160	154	144	147	138	144	Avg:A Wt:C2	146		RSD=5.4	
	90.6	98	103	100	110	105	98.8	101	94.4	98.7	Org:N Dep:A				
D 47 13C4_PFHpA	817	810	767	836	739	794	789	780	687	768	Avg:A Wt:C2	779		RSD=5.5	
	105	104	98.5	107	94.9	102	101	100	88.2	98.7	Org:N Dep:A				
13 PFHpA	0.946598	0.880287	0.986721	0.903493	1.037718	0.934397	0.866047	0.889501	0.882904	0.925737	Avg:A Wt:C2	0.925340	✓	RSD=5.8	✓
	102	95.1	107	97.6	112	101	93.6	96.1	95.4	100	Org:N Dep:A				
14 PFHxS	1.044810	1.088082	1.187731	1.052323	1.108594	1.239699	1.010903	1.114927	1.098153	1.082771	Avg:A Wt:C2	1.102799		RSD=6.1	
	94.7	98.7	108	95.4	101	112	91.7	101	99.6	98.2	Org:N Dep:A				
D 45 13C3_PFHxS	223	247	228	256	239	215	243	225	199	227	Avg:A Wt:C2	230		RSD=7.2	
	96.8	108	99.2	111	104	93.4	105	97.8	86.6	98.5	Org:N Dep:A				
29 ADONA	5.557778	5.083713	5.917031	5.144116	5.101939	6.363156	4.870168	5.413937	5.327936	5.064111	Avg:A Wt:C2	5.384388		RSD=8.5	
	103	94.4	110	95.5	94.8	118	90.4	101	99	94.1	Org:N Dep:A				
D 64 13C2_6:2 FTS_2	38.6600	39.7338	40.7868	41.2148	41.6196	41.3052	38.6748	40.5348	37.1934	43.5452	Avg:A Wt:C2	40.3268		RSD=4.5	
	95.9	98.5	101	102	103	102	95.9	101	92.2	108	Org:N Dep:A				
2 6:2 FTS	1.553083	1.238994	1.379123	1.446420	1.474653	1.260543	1.334088	1.260333	1.260112	1.247036	Avg:A Wt:C2	1.345439		RSD=8.4	
	115	92.1	103	108	110	93.7	99.2	93.7	93.7	92.7	Org:N Dep:A				
D 53 13C8_PFOA	729	704	771	789	784	808	750	701	627	709	Avg:A Wt:C2	737		RSD=7.4	
	98.9	95.4	105	107	106	110	102	95.1	85.1	96.2	Org:N Dep:A				
20 PFOA	0.995622	1.105007	1.072761	1.090490	0.968232	0.982715	0.925427	0.952406	1.030792	0.958411	Avg:A Wt:C2	1.008186		RSD=6.2	
	98.8	110	106	108	96	97.5	91.8	94.5	102	95.1	Org:N Dep:A				
12 PFHpS	1.083145	1.072090	1.074634	1.016385	1.084664	1.123234	1.014994	1.063558	1.038350	1.023782	Avg:A Wt:C2	1.059484		RSD=3.3	
	102	101	101	95.9	102	106	95.8	100	98	96.6	Org:N Dep:A		✓		✓
D 54 13C8_PFOS	197	228	216	230	218	219	201	177	192	212	Avg:A Wt:C2	209		RSD=8.1	
	94.2	109	103	110	104	105	96.3	84.5	91.9	101	Org:N Dep:A		✓		
18 PFOS	1.315909	1.014020	1.252794	1.108676	1.082246	1.206753	1.186932	1.325007	1.135436	1.132580	Avg:A Wt:C2	1.176035		RSD=8.6	✓
	112	86.2	107	94.3	92	103	101	113	96.5	96.3	Org:N Dep:A				
17 PFNA	0.897306	0.871017	0.909201	0.740518	0.857255	0.753202	0.751576	0.815804	0.832010	0.768484	Avg:A Wt:C2	0.819637		RSD=7.7	
	109	106	111	90.3	105	91.9	91.7	99.5	102	93.8	Org:N Dep:A				
D 56 13C9_PFNA	687	709	696	826	714	768	712	697	616	712	Avg:A Wt:C2	714		RSD=7.6	
	96.2	99.3	97.6	116	100	108	99.7	97.6	86.3	99.7	Org:N Dep:A				

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
30 9Cl-PF3ONS	2.964458	2.576318	2.536941	2.539496	2.526933	2.777213	2.508152	3.138615	2.616422	2.762476	Avg:A Wt:C2	2.694702		RSD=8.0	
	110	95.6	94.1	94.2	93.8	103	93.1	116	97.1	103	Org:N Dep:A				
D 55 13C8_PFOSA	525	434	437	460	445	377	441	368	387	404	Avg:A Wt:C2	428		RSD=10.9	
	123	101	102	108	104	88.2	103	86	90.4	94.5	Org:N Dep:A				
3 8:2 FTS	1.728357	1.620561	1.144398	1.437625	1.091581	1.419710	1.278833	1.308596	1.267566	1.195166	Avg:A Wt:C2	1.349239		RSD=15.1	
	128	120	84.8	107	80.9	105	94.8	97	93.9	88.6	Org:N Dep:A				
16 PFNS	1.061255	0.814556	1.010713	0.896143	0.821277	0.877050	0.919000	1.046788	0.920534	0.892791	Avg:A Wt:C2	0.926011		RSD=9.4	
	115	88	109	96.8	88.7	94.7	99.2	113	99.4	96.4	Org:N Dep:A				
19 PFOSA	0.749081	1.107845	1.049278	1.068562	1.105631	1.160460	0.782522	1.080848	0.939595	1.047176	Avg:A Wt:C2	1.009100		RSD=13.9	
	74.2	110	104	106	110	115	77.5	107	93.1	104	Org:N Dep:A				
D 65 13C2_8:2 FTS_2	30.5478	31.4912	34.8936	30.7498	33.2618	31.7672	33.2006	29.8728	28.8890	32.6922	Avg:A Wt:C2	31.7366		RSD=5.7	
	96.3	99.2	110	96.9	105	100	105	94.1	91	103	Org:N Dep:A				
D 51 13C6_PFDA	567	593	658	652	558	652	552	546	542	566	Avg:A Wt:C2	589		RSD=8.0	
	96.3	101	112	111	94.9	111	93.8	92.7	92.1	96.2	Org:N Dep:A				
10 PFDA	1.048582	1.084529	0.903386	0.896767	1.068147	0.874533	1.000588	0.957724	0.800788	0.896987	Avg:A Wt:C2	0.953203		RSD=9.9	
	110	114	94.8	94.1	112	91.7	105	100	84	94.1	Org:N Dep:A				
D 58 d3-MeFOSAA	134	134	170	170	155	161	154	158	154	160	Avg:A Wt:C2	155		RSD=8.0	
	86.7	86.5	109	110	100	104	99.5	102	99.2	103	Org:N Dep:A				
6 N-MeFOSAA	1.063770	0.881712	0.749643	0.658975	0.699396	0.640116	0.630264	0.731989	0.677177	0.747462	Ln:A Wt:C2	0.672568	19.3959	R^2=0.995	
	100	102	97	92.2	101	93.7	93.1	109	100	111	Org:N Dep:A			RSE=6.7	
9 PFDS	1.396425	0.892663	1.014459	0.981591	0.978105	0.987507	0.977854	1.092139	0.961220	0.958481	Ln:A Wt:C	0.986207	9.372732	R^2=0.997	
	122	80.7	97.9	97.6	98.2	99.6	99	111	97.4	97.1	Org:N Dep:A			RSE=11.2	
D 60 d5-EtFOSAA	138	148	139	153	138	139	142	141	129	136	Avg:A Wt:C2	140		RSD=4.6	
	98.6	106	98.9	109	98.5	99	101	100	92	96.8	Org:N Dep:A				
D 52 13C7_PFUdA	428	573	574	630	575	561	531	525	474	527	Avg:A Wt:C2	540		RSD=10.6	
	79.2	106	106	117	107	104	98.4	97.2	87.8	97.6	Org:N Dep:A				
5 N-EtFOSAA	1.348328	0.912865	0.877595	0.895820	0.934153	0.900705	0.966846	0.858249	0.802449	0.913576	Ln:A Wt:C	0.874106	17.2040	R^2=0.995	
	115	84.8	90.6	98.5	105	102	110	98	91.7	104	Org:N Dep:A			RSE=9.8	
25 PFUdA	1.040165	0.924107	0.970483	0.950503	0.899392	0.931311	0.877409	0.834581	0.836315	0.822997	Avg:A Wt:C2	0.908726		RSD=7.6	
	114	102	107	105	99	102	96.6	91.8	92	90.6	Org:N Dep:A				
D 61 d7-MeFOSE	163	176	169	166	170	161	160	155	150	170	Avg:A Wt:C2	164		RSD=4.8	
	99.6	108	103	101	104	97.9	97.3	94.7	91.3	104	Org:N Dep:A				
32 MeFOSE	0.957065	0.805656	0.903891	1.012245	0.845891	0.987636	0.880687	0.983159	0.905713	0.945715	Avg:A Wt:C2	0.922766		RSD=7.2	
	104	87.3	98	110	91.7	107	95.4	107	98.2	102	Org:N Dep:A				
26 MeFOSA		1.435742	1.381094	0.923116	1.053926	0.944043	0.927672	0.932869	1.103075	0.900062	Ln:A Wt:C	0.964691	48.6017	R^2=0.991	
	Disabled	98.4	118	85.6	104	95.3	95.2	96.2	114	93	Org:N Dep:A			RSE=11	
D 57 d3-MeFOSA	58.6380	55.7830	53.6350	66.3080	59.8600	67.2030	59.1830	61.5810	50.1310	73.3930	Avg:A Wt:C2	60.5715		RSD=11.4	
	96.8	92.1	88.5	109	98.8	111	97.7	102	82.8	121	Org:N Dep:A				
31 11Cl-PF3OUDS	2.243475	2.315758	2.254921	2.341536	2.308884	2.250028	2.376844	2.773073	2.332721	2.537157	Avg:A Wt:C2	2.373440		RSD=6.9	
	94.5	97.6	95	98.7	97.3	94.8	100	117	98.3	107	Org:N Dep:A				
11 PFDoA	0.854503	0.943075	0.976898	0.879974	0.888433	0.940087	0.920533	0.893410	0.918044	0.924042	Avg:A Wt:C2	0.913900		RSD=3.9	
	93.5	103	107	96.3	97.2	103	101	97.8	100	101	Org:N Dep:A				

Compound	Level 1 / %Rec	Level 2 / %Rec	Level 3 / %Rec	Level 4 / %Rec	Level 5 / %Rec	Level 6 / %Rec	Level 7 / %Rec	Level 8 / %Rec	Level 9 / %Rec	Level 10 / %Rec	Curve	M1	B	Curve Errors	Flags
D 38 13C2_PFDoA	614	609	640	694	648	622	588	622	540	610	Avg:A Wt:C2	619		RSD=6.5	
	99.2	98.4	103	112	105	101	95.1	101	87.2	98.7	Org:N Dep:A				
4 10:2 FTS	1.557317	1.497158	1.741215	1.719068	1.647529	1.665824	1.485894	1.628395	1.526004	1.428675	Avg:A Wt:C2	1.589708		RSD=6.7	
	98	94.2	110	108	104	105	93.5	102	96	89.9	Org:N Dep:A				
D 62 d9-EtFOSE	140	141	168	158	158	158	154	162	148	159	Avg:A Wt:C2	155		RSD=5.8	
	90.5	91.2	109	102	102	102	99.5	105	95.8	103	Org:N Dep:A				
33 EtFOSE	0.915151	1.039702	0.866803	0.806414	0.791558	0.810133	0.794196	0.765597	0.782454	0.842581	Avg:A Wt:C2	0.841459		RSD=9.8	
	109	124	103	95.8	94.1	96.3	94.4	91	93	100	Org:N Dep:A				
D 59 d5-EtFOSA	59.8090	56.2670	65.6200	60.3180	60.0470	65.5260	58.0980	56.7400	55.0750	66.3410	Avg:A Wt:C2	60.3841		RSD=6.8	
	99	93.2	109	99.9	99.4	109	96.2	94	91.2	110	Org:N Dep:A				
27 EtFOSA	0.771456	1.309826	0.997028	1.118638	0.994971	0.949470	1.041908	1.101320	1.016201	1.003090	Avg:A Wt:C2	1.030391		RSD=13.3	
	74.9	127	96.8	109	96.6	92.1	101	107	98.6	97.4	Org:N Dep:A				
34 PFDOS	0.995213	0.769562	0.789097	0.824573	0.813210	0.845891	0.860011	0.943435	0.881726	0.889105	Avg:A Wt:C2	0.861182		RSD=8.1	
	116	89.4	91.6	95.7	94.4	98.2	99.9	110	102	103	Org:N Dep:A				
24 PFTrDA	0.450231	0.373975	0.407769	0.366734	0.352816	0.398730	0.384264	0.366950	0.388982	0.408303	Avg:A Wt:C2	0.389875		RSD=7.2	
	115	95.9	105	94.1	90.5	102	98.6	94.1	99.8	105	Org:N Dep:A				
D 42 13C2_PFTeDA	598	640	684	700	680	649	653	674	627	702	Avg:A Wt:C2	661		RSD=5.1	
	90.5	96.9	104	106	103	98.2	98.9	102	94.9	106	Org:N Dep:A				
23 PFTeDA	0.925903	0.799913	0.781043	0.761099	0.763662	0.799638	0.733810	0.753446	0.725058	0.707146	Avg:A Wt:C2	0.775072		RSD=7.9	
	119	103	101	98.2	98.5	103	94.7	97.2	93.5	91.2	Org:N Dep:A				
35 PFHxDA	2.097331	1.853519	1.727759	1.653568	1.628036	1.622777	1.635329	1.593618	1.564005	1.462819	Avg:A Wt:C2	1.683876		RSD=10.5	
	125	110	103	98.2	96.7	96.4	97.1	94.6	92.9	86.9	Org:N Dep:A				
D 40 13C2_PFHxDA	346	341	367	374	369	358	349	343	317	384	Avg:A Wt:C2	355		RSD=5.5	
	97.6	96.2	103	105	104	101	98.3	96.6	89.4	108	Org:N Dep:A				
36 PFODA	1.119747	1.078187	1.086326	1.088183	1.046520	1.088623	1.038588	1.083001	1.121707	1.036384	Avg:A Wt:C2	1.078727		RSD=2.8	
	104	99.9	101	101	97	101	96.3	100	104	96.1	Org:N Dep:A				

Pace Environmental Services, LLC
Initial Calibration RT Report

Batch: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b
Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01
Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	020721021.d	ICAL 50_SVLC-1333	07-Feb-2021 14:32:59
2	020721022.d	ICAL 100_SVLC-1334	07-Feb-2021 14:43:30
3	020721023.d	ICAL 200_SVLC-1335	07-Feb-2021 14:54:02
4	020721024.d	ICAL 500_SVLC-1336	07-Feb-2021 15:04:36
5	020721025.d	ICAL 1000_SVLC-1337	07-Feb-2021 15:15:08
6	020721026.d	ICAL 2000_SVLC-1338	07-Feb-2021 15:25:43
7	020721027.d	ICAL 5000_SVLC-1339	07-Feb-2021 15:36:16
8	020721028.d	ICAL 10000_SVLC-1340	07-Feb-2021 15:46:51
9	020721029.d	ICAL 15000_SVLC-1341	07-Feb-2021 15:57:27
10	020721030.d	ICAL 20000_SVLC-1342	07-Feb-2021 16:08:04

Column: 1 Detector: LCMS-Q3

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 46 13C4_PFBA	1.720	1.719	1.718	1.719	1.718	1.719	1.719	1.719	1.719	1.719	1.719	0.025
8 PFBA	1.720	1.719	1.718	1.719	1.718	1.719	1.719	1.719	1.719	1.719	1.719	0.025
D 50 13C5_PFPeA	2.099	2.098	2.097	2.098	2.095	2.099	2.098	2.098	2.098	2.098	2.097	0.054
21 PFPeA	2.099	2.098	2.097	2.098	2.095	2.099	2.098	2.098	2.098	2.098	2.097	0.054
D 44 13C3_PFBS	2.161	2.161	2.160	2.161	2.158	2.161	2.161	2.150	2.160	2.161	2.159	0.153
7 PFBS	2.161	2.161	2.160	2.161	2.158	2.161	2.161	2.160	2.160	2.161	2.160	0.053
1 4:2 FTS	2.424	2.423	2.431	2.432	2.424	2.433	2.432	2.432	2.432	2.432	2.429	0.157
D 63 13C2_4:2 FTS_2	2.433	2.432	2.431	2.432	2.424	2.433	2.432	2.432	2.432	2.432	2.431	0.097
D 49 13C5_PFHxA	2.467	2.467	2.474	2.467	2.468	2.467	2.467	2.467	2.475	2.467	2.468	0.140
15 PFHxA	2.467	2.475	2.474	2.467	2.468	2.467	2.475	2.467	2.475	2.467	2.470	0.174
22 PFPeS	2.502	2.501	2.500	2.501	2.502	2.502	2.502	2.501	2.510	2.501	2.502	0.101
28 GenX	2.587	2.586	2.586	2.586	2.587	2.587	2.586	2.586	2.586	2.594	2.587	0.085
D 66 13C3_GenX	2.587	2.586	2.586	2.586	2.587	2.587	2.586	2.586	2.594	2.586	2.587	0.085
D 47 13C4_PFHpA	2.856	2.854	2.854	2.847	2.848	2.856	2.847	2.845	2.854	2.854	2.851	0.153
13 PFHpA	2.856	2.854	2.854	2.847	2.848	2.847	2.855	2.845	2.854	2.854	2.851	0.149
14 PFHxS	2.865	2.872	2.872	2.864	2.866	2.865	2.873	2.872	2.872	2.872	2.869	0.126
D 45 13C3_PFHxS	2.865	2.872	2.872	2.873	2.866	2.865	2.864	2.863	2.881	2.872	2.869	0.190
29 ADONA	2.899	2.898	2.898	2.891	2.900	2.899	2.891	2.890	2.898	2.898	2.896	0.148
D 64 13C2_6:2 FTS_2	3.220	3.226	3.219	3.219	3.221	3.220	3.219	3.219	3.226	3.219	3.220	0.078
2 6:2 FTS	3.220	3.219	3.219	3.219	3.221	3.220	3.219	3.219	3.226	3.219	3.220	0.059
D 53 13C8_PFOA	3.245	3.251	3.245	3.245	3.247	3.245	3.245	3.245	3.252	3.251	3.247	0.098
20 PFOA	3.245	3.245	3.245	3.245	3.247	3.245	3.251	3.245	3.258	3.251	3.247	0.144
12 PFHpS	3.252	3.258	3.251	3.251	3.253	3.258	3.251	3.258	3.265	3.258	3.255	0.134
D 54 13C8_PFOS	3.620	3.624	3.624	3.624	3.622	3.627	3.624	3.617	3.634	3.624	3.624	0.122
18 PFOS	3.627	3.632	3.624	3.624	3.629	3.627	3.624	3.624	3.634	3.624	3.627	0.092
17 PFNA	3.627	3.624	3.632	3.632	3.629	3.627	3.624	3.632	3.634	3.632	3.629	0.091
D 56 13C9_PFNA	3.627	3.624	3.624	3.632	3.629	3.627	3.624	3.624	3.634	3.632	3.627	0.096
30 9Cl-PF3ONS	3.834	3.832	3.832	3.832	3.831	3.834	3.832	3.832	3.834	3.832	3.832	0.034
D 55 13C8_PFOSA	3.947	3.952	3.952	3.952	3.944	3.947	3.952	3.952	3.955	3.953	3.951	0.085
3 8:2 FTS	3.955	3.952	3.961	3.961	3.961	3.964	3.961	3.961	3.972	3.961	3.961	0.131
16 PFNS	3.964	3.961	3.961	3.952	3.961	3.964	3.961	3.961	3.964	3.961	3.961	0.081
19 PFOSA	3.955	3.952	3.952	3.952	3.961	3.955	3.944	3.952	3.955	3.953	3.953	0.102
D 65 13C2_8:2 FTS_2	3.955	3.961	3.961	3.952	3.961	3.955	3.961	3.961	3.964	3.961	3.959	0.091

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Avg. RT	%Rsd RT
D 51 13C6_PFDA	3.964	3.970	3.970	3.970	3.969	3.964	3.970	3.970	3.972	3.970	3.968	0.072
10 PFDA	3.973	3.970	3.970	3.970	3.969	3.973	3.970	3.970	3.972	3.970	3.970	0.037
D 58 d3-MeFOSAA	4.118	4.114	4.114	4.114	4.122	4.117	4.122	4.122	4.125	4.122	4.119	0.109
6 N-MeFOSAA	4.126	4.130	4.122	4.122	4.122	4.126	4.122	4.122	4.133	4.122	4.124	0.098
9 PFDS	4.253	4.258	4.249	4.248	4.258	4.253	4.249	4.258	4.262	4.258	4.254	0.115
D 60 d5-EtFOSAA	4.271	4.267	4.267	4.267	4.267	4.271	4.267	4.277	4.280	4.277	4.271	0.113
D 52 13C7_PFUdA	4.262	4.267	4.267	4.267	4.276	4.271	4.267	4.277	4.271	4.268	4.269	0.103
5 N-EtFOSAA	4.281	4.277	4.277	4.277	4.276	4.281	4.286	4.277	4.280	4.277	4.278	0.072
25 PFUdA	4.271	4.267	4.267	4.267	4.276	4.271	4.267	4.277	4.280	4.277	4.272	0.114
D 61 d7-MeFOSE	4.381	4.377	4.377	4.377	4.377	4.381	4.377	4.386	4.381	4.377	4.378	0.070
32 MeFOSE	4.390	4.394	4.394	4.386	4.394	4.390	4.386	4.395	4.389	4.386	4.390	0.090
26 MeFOSA		4.394	4.403	4.403	4.403	4.407	4.403	4.403	4.407	4.403	4.402	0.079
D 57 d3-MeFOSA	4.399	4.403	4.394	4.395	4.403	4.398	4.394	4.403	4.398	4.395	4.398	0.083
31 11Cl-PF3OUDS	4.407	4.411	4.411	4.411	4.410	4.415	4.411	4.411	4.414	4.411	4.410	0.051
11 PFDoA	4.530	4.534	4.534	4.534	4.534	4.538	4.534	4.534	4.538	4.534	4.534	0.050
D 38 13C2_PFDoA	4.530	4.534	4.534	4.534	4.534	4.538	4.534	4.534	4.538	4.534	4.534	0.050
4 10:2 FTS	4.538	4.534	4.551	4.543	4.542	4.547	4.543	4.551	4.546	4.551	4.544	0.119
D 62 d9-EtFOSE	4.547	4.543	4.543	4.543	4.542	4.547	4.543	4.543	4.546	4.543	4.543	0.043
33 EtFOSE	4.547	4.551	4.559	4.551	4.559	4.555	4.551	4.559	4.555	4.559	4.554	0.104
D 59 d5-EtFOSA	4.563	4.567	4.567	4.559	4.567	4.563	4.559	4.567	4.571	4.567	4.565	0.082
27 EtFOSA	4.563	4.575	4.575	4.567	4.575	4.571	4.567	4.575	4.571	4.567	4.570	0.094
34 PFDOS	4.746	4.743	4.743	4.743	4.743	4.746	4.743	4.749	4.746	4.743	4.744	0.049
24 PFTrDA	4.771	4.767	4.767	4.767	4.773	4.771	4.767	4.773	4.771	4.773	4.770	0.052
D 42 13C2_PFTeDA	4.983	4.980	4.980	4.980	4.980	4.983	4.980	4.987	4.990	4.987	4.983	0.073
23 PFTeDA	4.983	4.980	4.980	4.980	4.987	4.983	4.987	4.987	4.990	4.987	4.984	0.070
35 PFHxDA	5.353	5.356	5.356	5.356	5.356	5.361	5.356	5.356	5.361	5.356	5.357	0.050
D 40 13C2_PFHxDA	5.353	5.356	5.348	5.348	5.356	5.353	5.356	5.356	5.361	5.356	5.354	0.082
36 PFODA	5.691	5.694	5.693	5.686	5.694	5.691	5.694	5.693	5.698	5.695	5.692	0.058

Pace Environmental Services, LLC
Initial Calibration Signal Ratios Report

Batch: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b
Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01
Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	020721021.d	ICAL 50_SVLC-1333	07-Feb-2021 14:32:59
2	020721022.d	ICAL 100_SVLC-1334	07-Feb-2021 14:43:30
3	020721023.d	ICAL 200_SVLC-1335	07-Feb-2021 14:54:02
4	020721024.d	ICAL 500_SVLC-1336	07-Feb-2021 15:04:36
5	020721025.d	ICAL 1000_SVLC-1337	07-Feb-2021 15:15:08
6	020721026.d	ICAL 2000_SVLC-1338	07-Feb-2021 15:25:43
7	020721027.d	ICAL 5000_SVLC-1339	07-Feb-2021 15:36:16
8	020721028.d	ICAL 10000_SVLC-1340	07-Feb-2021 15:46:51
9	020721029.d	ICAL 15000_SVLC-1341	07-Feb-2021 15:57:27
10	020721030.d	ICAL 20000_SVLC-1342	07-Feb-2021 16:08:04

Column: 1 Detector: LCMS-Q3

Compound	Ratio Level 1	Ratio Level 2	Ratio Level 3	Ratio Level 4	Ratio Level 5	Ratio Level 6	Ratio Level 7	Ratio Level 8	Ratio Level 9	Ratio Level 10	Average Ratio	L-5 +/-3 SD Ratio Limits	StdD Limit	50% Limit
7 PFBS	3.028	3.005	3.373	3.778	3.467	3.750	3.827	3.672	3.704	3.607	3.521	2.467-4.466	0.33308	1.733
1 4:2 FTS	1.365	1.262	1.277	1.655	1.718	1.513	1.511	1.572	1.589	1.514	1.497	1.243-2.192	0.15805	0.859
15 PFHxA	18.246	16.484	15.299	16.952	17.175	15.593	15.031	16.445	15.697	15.058	16.198	13.540-20.809	1.21159	8.587
22 PFPeS	3.432	3.187	3.465	3.076	3.263	2.973	3.143	3.227	3.478	3.165	3.240	2.766-3.759	0.16551	1.631
28 GenX	0.952	0.905	0.816	0.881	0.852	0.782	1.021	0.812	0.852	0.852	0.872	0.628-1.075	0.07437	0.426
13 PFHpA	3.358	2.960	2.995	2.805	3.049	3.173	3.023	3.228	3.023	3.064	3.067	2.607-3.490	0.14712	1.524
14 PFHxS	2.372	3.670	2.915	3.172	3.667	3.215	3.413	3.613	3.227	3.353	3.261	2.538-4.795	0.37615	1.833
29 ADONA	2.259	2.441	2.509	2.313	2.508	2.843	2.680	2.399	2.299	2.199	2.445	1.836-3.179	0.22370	1.254
2 6:2 FTS	1.199	1.072	1.005	1.138	1.398	1.093	1.269	1.163	1.235	1.182	1.175	1.077-1.718	0.10687	0.699
20 PFOA	2.042	2.457	2.566	2.560	2.383	2.477	2.372	2.402	2.361	2.432	2.405	1.939-2.826	0.14799	1.191
12 PFHpS	3.109	4.252	3.365	3.598	3.561	3.400	3.756	3.803	3.489	3.638	3.597	2.634-4.487	0.30885	1.780
18 PFOS	4.623	3.495	4.114	3.814	4.006	4.674	4.243	4.189	4.136	3.962	4.125	2.920-5.091	0.36169	2.003
17 PFNA	4.222	4.113	4.104	3.913	3.995	4.082	3.884	4.133	4.158	3.703	4.030	3.517-4.472	0.15925	1.997
3 8:2 FTS	1.820	1.306	1.307	1.122	0.977	1.086	1.156	1.183	1.211	1.231	1.239	0.308-1.645	0.22272	0.488
16 PFNS	2.798	2.919	3.469	3.457	2.713	3.101	3.433	3.289	3.263	3.529	3.197	1.794-3.631	0.30619	1.356
10 PFDA	9.720	11.919	8.988	8.960	9.021	8.511	9.948	8.917	7.590	8.395	9.196	5.632-12.409	1.12946	4.510
6 N-MeFOSAA	1.514	1.466	1.258	1.157	1.305	1.226	1.248	1.509	1.402	1.301	1.338	0.790-1.819	0.17134	0.652
9 PFDS	4.140	3.292	3.349	3.322	3.647	3.226	3.408	2.975	3.288	3.449	3.409	2.728-4.565	0.30627	1.823
5 N-EtFOSAA	1.959	2.136	1.634	1.707	1.631	1.637	1.923	1.784	1.596	1.669	1.767	1.084-2.177	0.18201	0.815
25 PFUdA	5.608	6.898	12.027	10.019	8.378	8.528	8.189	7.710	7.838	7.683	8.287	3.424-13.331	1.65123	4.189
26 MeFOSA		1.614	0.931	0.991	1.240	1.210	1.124	1.148	1.188	1.356	1.200	0.637-1.842	0.20083	0.620
11 PFDoA	5.009	5.486	6.127	5.702	6.026	6.168	6.480	6.262	6.300	6.035	5.959	4.525-7.526	0.50017	3.013
4 10:2 FTS	1.693	1.211	1.640	1.778	1.696	1.939	1.846	1.764	1.831	1.724	1.712	1.135-2.256	0.18696	0.848
27 EtFOSA	0.581	1.344	1.213	1.168	1.114	1.079	1.114	1.148	1.148	1.142	1.105	0.506-1.721	0.20238	0.557
34 PFDOS	3.499	3.830	3.533	3.642	3.155	3.327	3.455	3.121	3.438	3.404	3.440	2.519-3.790	0.21167	1.577
24 PFTrDA	3.005	2.852	2.909	2.762	2.644	2.951	2.709	2.855	2.809	2.992	2.848	2.292-2.995	0.11720	1.322
23 PFTeDA	8.229	8.349	7.936	7.775	7.710	7.835	7.413	7.732	7.477	7.232	7.768	6.577-8.842	0.37750	3.855
35 PFHxDA	12.943	12.854	12.443	12.706	12.078	12.082	13.172	12.549	12.315	11.780	12.492	10.763-13.392	0.43811	6.039
36 PFODA	10.321	11.488	11.194	11.183	10.675	10.883	10.763	11.129	11.190	11.130	10.995	9.582-11.767	0.36432	5.337

Report Date: 11-Feb-2021 10:00:30 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Initial Calibration Ion Suppression Report

Batch: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b
Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01
Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04
Method Lock: Unlocked Lock Date:
No.Compounds: 66 Integrator: picker
Calib Method: PFAS-ID
Calibration Concentration Units: ng/L

Initial Calibration Samples: Primary Reagent: Analytes

Level	Cal File	Cal Sample ID	Cal Date
1	020721021.d	ICAL 50_SVLC-1333	07-Feb-2021 14:32:59
2	020721022.d	ICAL 100_SVLC-1334	07-Feb-2021 14:43:30
3	020721023.d	ICAL 200_SVLC-1335	07-Feb-2021 14:54:02
4	020721024.d	ICAL 500_SVLC-1336	07-Feb-2021 15:04:36
5	020721025.d	ICAL 1000_SVLC-1337	07-Feb-2021 15:15:08
6	020721026.d	ICAL 2000_SVLC-1338	07-Feb-2021 15:25:43
7	020721027.d	ICAL 5000_SVLC-1339	07-Feb-2021 15:36:16
8	020721028.d	ICAL 10000_SVLC-1340	07-Feb-2021 15:46:51
9	020721029.d	ICAL 15000_SVLC-1341	07-Feb-2021 15:57:27
10	020721030.d	ICAL 20000_SVLC-1342	07-Feb-2021 16:08:04

Column: 1 Detector: LCMS-Q3

Compound	Response Level 1	Response Level 2	Response Level 3	Response Level 4	Response Level 5	Response Level 6	Response Level 7	Response Level 8	Response Level 9	Response Level 10	RPD
* 37 13C2_PFDA	618359	562439	587666	650609	608256	558319	591928	559560	546670	577103	1.72
* 39 13C2_PFHxA	695820	732591	821730	861966	836294	726113	753233	718857	676987	790551	3.18
* 41 13C2_PFOA	752472	805148	773358	829061	794645	801033	748016	720801	670983	729223	0.78
* 43 13C3_PFBA	861081	821418	842918	912455	830556	863456	836036	812446	755323	856318	0.13
* 48 13C4_PFOS	217314	224894	225272	229533	217059	218308	215527	211143	196556	223206	0.66

13C2_PFDA ((|577103 - 618359| / (577103 + 618359)) / 2) * 100 = 1.73
13C2_PFHxA ((|790551 - 695820| / (790551 + 695820)) / 2) * 100 = 3.19
13C2_PFOA ((|729223 - 752472| / (729223 + 752472)) / 2) * 100 = 0.78
13C3_PFBA ((|856318 - 861081| / (856318 + 861081)) / 2) * 100 = 0.14
13C4_PFOS ((|223206 - 217314| / (223206 + 217314)) / 2) * 100 = 0.67



Pace Environmental Services, LLC
Analyte Quantitation Report

Data File: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b\020721033.d
Injection Date: 07-Feb-2021 16:39:49 Injection Vol: 10.0 uL
Sample Type: CheckStd Auto Sampler: 12
Sample Info: ISOMER CHECK_SVLC-1266 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Surrogates Conc. Level: Smp Vol. Added: 1.00 ml

Signal	Quant Std	RT (min.)	Exp RT (min.)	RT (secs.)	Response	Peak Pts	S/N	Ion Ratio	Isomer Ratio	Cal Conc ng/L	OnCol Conc ng/L	%Rec	Flags
D 46 13C4_PFBA CAS: SESI-0111													
217 > 172		1.719	1.718	1	985446	19	>100:1			100000	1080.96	105	
D 50 13C5_PFPeA CAS: SESI-0112													
267.9 > 223		2.099	2.095	1	985384	16	>100:1			100000	1062.22	101	
D 44 13C3_PFBS CAS: SESI-0116													
302 > 80		2.161	2.158	1	349762	14	>100:1			100000	1115.92	114	
D 63 13C2_4:2 FTS_2 CAS: SESI-0104													
329 >81		2.433	2.424	1	255426	17	>100:1			500000	5128.97	98.6	
D 49 13C5_PFHxA CAS: SESI-0113													
318 > 273		2.476	2.468	1	819022	17	>100:1			100000	958.29	88.5	
D 66 13C3_GenX CAS: SESI-0121													
287 > 185		2.595	2.587	1	771095	17	>100:1			500000	5288.49	96.5	
D 47 13C4_PFHpA CAS: SESI-0114													
367 > 322		2.856	2.848	1	859152	18	>100:1			100000	1103.31	116	
D 45 13C3_PFHxS CAS: SESI-0096													
402 > 80		2.874	2.866	1	247935	18	>100:1			100000	1077.53	104	
D 64 13C2_6:2 FTS_2 CAS: SESI-0105													
429 > 81		3.226	3.221	1	199392	20	>100:1			500000	4944.40	95.8	
D 53 13C8_PFOA CAS: SESI-0097													
421 > 376		3.246	3.247	0	730884	21	>100:1			100000	991.51	93.2	
20 Perfluoro-n-octanoic acid (PFOA) CAS: 335-67-1													
413 > 369	53	3.252	3.247	1/1	7923014	34	>100:1	Target = 2.38	0.14	0	1075229		
413 > 169	53	3.246	3.247		3460356	35	>100:1	2.28 (1.19-3.57)	0.22				
D 54 13C8_PFOS CAS: SESI-0098													
507 > 80		3.627	3.622	1	212284	20	>100:1			100000	1015.73	97.4	
D 56 13C9_PFNA CAS: SESI-0099													
472 > 427		3.634	3.629	1	692973	18	>100:1			100000	971.08	97	
D 55 13C8_PFOSA CAS: SESI-0107													
506 > 78		3.955	3.944	1	485027	17	>100:1			100000	1133.61	109	
D 65 13C2_8:2 FTS_2 CAS: SESI-0106													
529 > 81		3.955	3.961	0	220564	17	>100:1			500000	6949.83	133	
D 51 13C6_PFDA CAS: SESI-0115													
519 > 474		3.964	3.969	0	688611	19	>100:1			100000	1169.93	123	
D 58 d3-MeFOSAA CAS: SESI-0102													
573 > 419		4.118	4.122	0	842437	17	>100:1			500000	5436.65	109	
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) CAS: 2355-31-9													
570 > 419	58	4.126	4.122	1/1	1457762	35	>100:1	Target = 1.30	0.12	0	1286392		M
570 > 483	58	4.126	4.122		1023460	31	>100:1	1.42 (0.65-1.95)	0.27				
D 60 d5-EtFOSAA CAS: SESI-0110													
589 > 419		4.272	4.267	1	701485	18	>100:1			500000	5006.29	102	
5 N-ethylperfluoro-1-octanesulfonamidoacetic acid (N-EtFOSAA) CAS: 2991-50-6													
584 > 419	60	4.281	4.276	1/0	1765750	31	>100:1	Target = 1.63	0.13	0	1439828		
584 > 526	60	4.281	4.276		976515	32	>100:1	1.80 (0.81-2.44)	0.23				

Report Date: 11-Feb-2021 10:00:28 AIM Revision: 2.0 12-Dec-2020 09:34:50

Pace Environmental Services, LLC

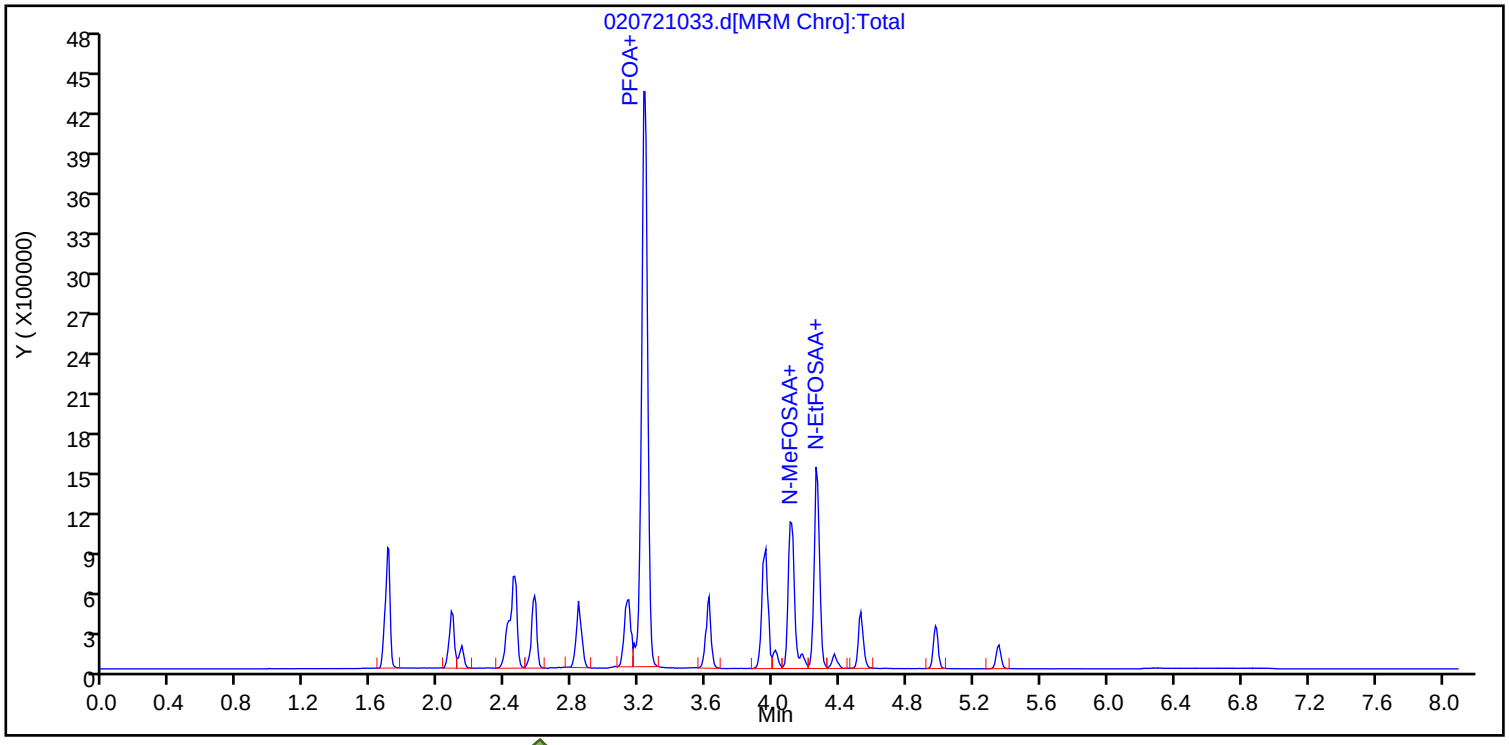
Data File: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b\020721033.d

Injection Date: 07-Feb-2021 16:39:49 Inst. ID: LCMSMS01

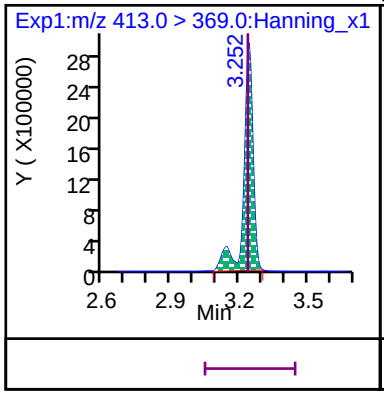
Client ID: Lab ID: ISOMER CHECK_SVLC-1266

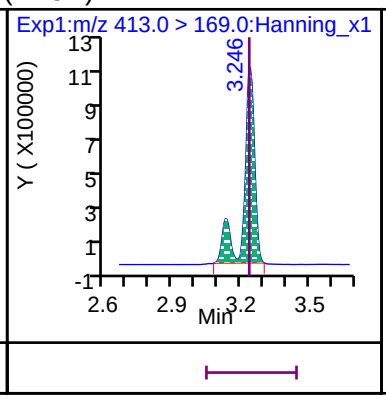
Sample Info: ISOMER CHECK_SVLC-1266

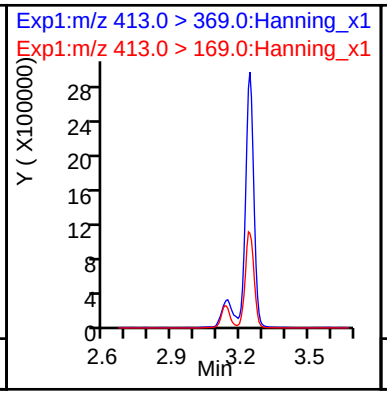
Dil. Factor: 1 Operator: Matthew M. Miller



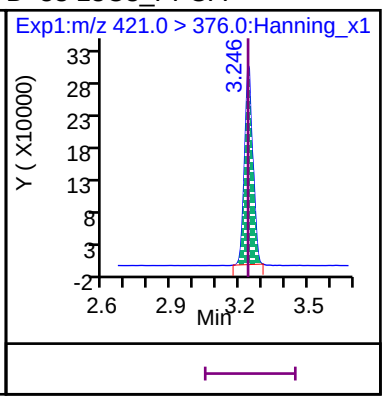
20 Perfluoro-n-octanoic acid (PFOA)



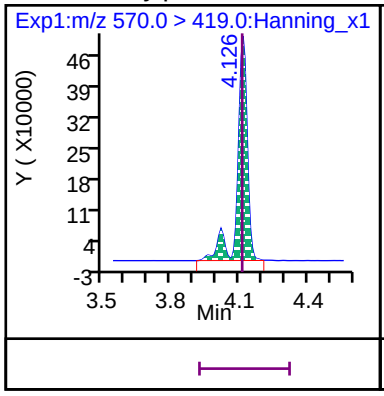


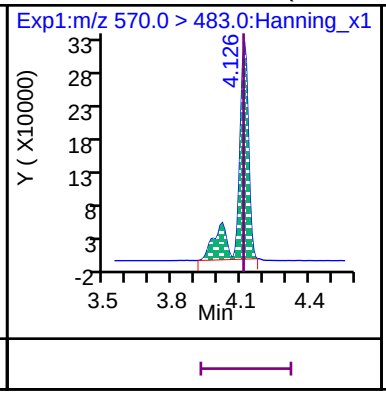


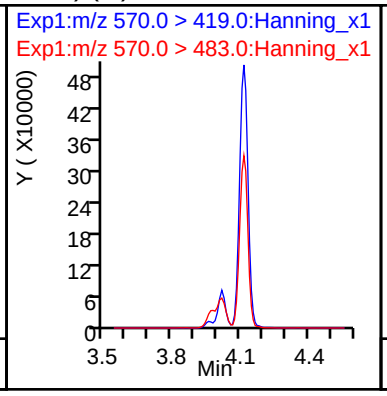
D 53 13C8_PFOA



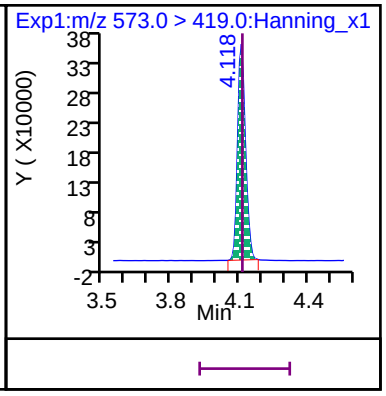
6 N-methylperfluoro-1-octanesulfonamidoacetic acid (N-MeFOSAA) (M)







D 58 d3-MeFOSAA



Pace Environmental Services, LLC
Initial Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b\020821015.d
Injection Date: 08-Feb-2021 11:48:09 Injection Vol: 10.0 uL
Sample Type: ICV Auto Sampler: 98
Sample Info: ID ICV 500_SVLC-1343 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: ICV Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			500.00	470.96	94.2	70 - 130
D 46 13C4_PFBA	940437	1027111			109	50 - 150
D 50 13C5_PFPeA	980305	1053070			107	50 - 150
21 PFPeA			500.00	470.79	94.2	70 - 130
7 PFBS			442.50	465.67	105	70 - 130
D 44 13C3_PFBS	306015	348660			114	50 - 150
1 4:2 FTS			467.50	486.95	104	70 - 130
D 63 13C2_4:2 FTS_2	258946	332040			128	50 - 150
D 49 13C5_PFHxA	925301	1013144			109	50 - 150
15 PFHxA			500.00	495.74	99.1	70 - 130
22 PFPeS			470.00	493.36	105	70 - 130
28 GenX			2500.00	2401.91	96.1	70 - 130
D 66 13C3_GenX	798996	792864			99.2	50 - 150
D 47 13C4_PFHpA	738956	905397			123	50 - 150
13 PFHpA			500.00	459.63	91.9	70 - 130
D 45 13C3_PFHxS	238770	280828			118	50 - 150
14 PFHxS			456.00	423.78	92.9	70 - 130
29 ADONA			2355.00	2028.25	86.1	70 - 130
D 64 13C2_6:2 FTS_2	208098	274530			132	50 - 150
2 6:2 FTS			475.00	485.86	102	70 - 130
20 PFOA			500.00	495.29	99.1	70 - 130
D 53 13C8_PFOA	784254	872046			111	50 - 150
12 PFHpS			475.00	422.67	89	70 - 130
D 54 13C8_PFOS	217839	245629			113	50 - 150
18 PFOS			462.75	408.34	88.2	70 - 130
17 PFNA			500.00	483.61	96.7	70 - 130
D 56 13C9_PFNA	714408	821116			115	50 - 150
30 9Cl-PF3ONS			2330.00	2055.22	88.2	70 - 130
D 55 13C8_PFOSA	445030	537480			121	50 - 150
16 PFNS			480.00	442.10	92.1	70 - 130
19 PFOSA			500.00	454.45	90.9	70 - 130
D 65 13C2_8:2 FTS_2	166309	225085			135	50 - 150
3 8:2 FTS			480.00	377.88	78.7	70 - 130
10 PFDA			500.00	459.03	91.8	70 - 130
D 51 13C6_PFDA	558348	680851			122	50 - 150
6 N-MeFOSAA			500.00	597.14	119	70 - 130

Report Date: 11-Feb-2021 10:00:28 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b\020821015.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 58 d3-MeFOSAA	774575	949383			123	50 - 150
9 PFDS			482.50	477.64	99	70 - 130
D 60 d5-EtFOSAA	690005	897991			130	50 - 150
25 PFUdA			500.00	540.31	108	70 - 130
D 52 13C7_PFUdA	575243	555310			96.5	50 - 150
5 N-EtFOSAA			500.00	494.54	98.9	70 - 130
D 61 d7-MeFOSE	169919	167867			98.8	50 - 150
D 57 d3-MeFOSA	59860	61923			103	50 - 150
31 11Cl-PF3OUDS			2355.00	2157.07	91.6	70 - 130
11 PFDoA			500.00	515.52	103	70 - 130
D 38 13C2_PFDoA	647718	687377			106	50 - 150
D 62 d9-EtFOSE	157828	166828			106	50 - 150
4 10:2 FTS			2410.00	1813.65	75.3	70 - 130
D 59 d5-EtFOSA	60047	58625			97.6	50 - 150
24 PFTrDA			500.00	521.35	104	70 - 130
D 42 13C2_PFTeDA	680063	760607			112	50 - 150
23 PFTeDA			500.00	514.53	103	70 - 130
D 40 13C2_PFHxDA	369178	410169			111	50 - 150



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821005.d
Injection Date: 08-Feb-2021 10:02:45 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 95
Sample Info: ID CCV 100_SVLC-1334 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-2 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			100.00	87.246	87.2	70 - 130
D 46 13C4_PFBA	940437	1018417			108	50 - 150
D 50 13C5_PFPeA	980305	1027157			105	50 - 150
21 PFPeA			100.00	98.141	98.1	70 - 130
7 PFBS			88.400	93.986	106	70 - 130
D 44 13C3_PFBS	306015	349891			114	50 - 150
1 4:2 FTS			93.400	101.05	108	70 - 130
D 63 13C2_4:2 FTS_2	258946	279266			108	50 - 150
D 49 13C5_PFHxA	925301	870198			94	50 - 150
15 PFHxA			100.00	112.35	112	70 - 130
22 PFPeS			93.800	91.940	98	70 - 130
28 GenX			200.00	237.03	119	70 - 130
D 66 13C3_GenX	798996	749783			93.8	50 - 150
D 47 13C4_PFHpA	738956	852436			115 ✓	50 - 150
13 PFHpA			100.00	98.103	98.1 ✓	70 - 130 ✓
D 45 13C3_PFHxS	238770	262249			110	50 - 150
14 PFHxS			91.000	77.280	84.9	70 - 130
29 ADONA			94.200	92.809	98.5	70 - 130
D 64 13C2_6:2 FTS_2	208098	263528			127	50 - 150
2 6:2 FTS			94.800	118.43	125 ✓	70 - 130 ✓
20 PFOA			100.00	111.50	111	70 - 130
D 53 13C8_PFOA	784254	801193			102	50 - 150
12 PFHpS			95.200	87.130	91.5	70 - 130
D 54 13C8_PFOS	217839	226466			104	50 - 150
18 PFOS			92.800	90.049	97	70 - 130
17 PFNA			100.00	98.531	98.5	70 - 130
D 56 13C9_PFNA	714408	790887			111	50 - 150
30 9Cl-PF3ONS			93.200	98.661	106	70 - 130
D 55 13C8_PFOSA	445030	464386			104	50 - 150
16 PFNS			96.000	108.06	113	70 - 130
19 PFOSA			100.00	109.67	110	70 - 130
D 65 13C2_8:2 FTS_2	166309	201463			121	50 - 150
3 8:2 FTS			95.800	75.693	79	70 - 130
10 PFDA			100.00	94.048	94	70 - 130
D 51 13C6_PFDA	558348	696423			125	50 - 150
6 N-MeFOSAA			100.00	99.726	99.7	70 - 130

Report Date: 11-Feb-2021 10:19:07 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821005.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 58 d3-MeFOSAA	774575	771725			99.6	50 - 150
9 PFDS			96.400	78.943	81.9	70 - 130
D 60 d5-EtFOSAA	690005	868665			126	50 - 150
25 PFUdA			100.00	101.11	101	70 - 130
D 52 13C7_PFUdA	575243	615503			107	50 - 150
5 N-EtFOSAA			100.00	101.63	102	70 - 130
D 61 d7-MeFOSE	169919	160062			94.2	50 - 150
32 MeFOSE			100.00	110.03	110	70 - 130
D 57 d3-MeFOSA	59860	65967			110	50 - 150
26 MeFOSA non target			100.00	56.898	56.9	70 - 130
31 11Cl-PF3OUDS			94.200	102.40	109	70 - 130
11 PFDoA no +			100.00	139.45	139	70 - 130
D 38 13C2_PFDoA	647718	665222			103	50 - 150
D 62 d9-EtFOSE	157828	172463			109	50 - 150
4 10:2 FTS			96.400	97.981	102	70 - 130
33 EtFOSE			100.00	87.224	87.2	70 - 130
D 59 d5-EtFOSA	60047	61187			102	50 - 150
27 EtFOSA			100.00	101.83	102	70 - 130
34 PFDOS			96.800	100.00	103	70 - 130
24 PFTrDA			100.00	99.733	99.7	70 - 130
D 42 13C2_PFTeDA	680063	754678			111	50 - 150
23 PFTeDA			100.00	104.38	104	70 - 130
35 PFHxDA			100.00	111.20	111	70 - 130
D 40 13C2_PFHxDA	369178	372820			101	50 - 150
36 PFODA			100.00	109.00	109	70 - 130



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821006.d
Injection Date: 08-Feb-2021 10:13:17 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 96
Sample Info: ID CCV 200_SVLC-1335 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-3 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			200.00	172.88	86.4	70 - 130
D 46 13C4_PFBA	1018417	995278			97.7	50 - 150
D 50 13C5_PFPeA	1027157	1021752			99.5	50 - 150
21 PFPeA			200.00	211.83	106	70 - 130
7 PFBS			176.80	165.28	93.5	70 - 130
D 44 13C3_PFBS	349891	342829			98	50 - 150
1 4:2 FTS			186.80	185.86	99.5	70 - 130
D 63 13C2_4:2 FTS_2	279266	293804			105	50 - 150
D 49 13C5_PFHxA	870198	935627			108	50 - 150
15 PFHxA			200.00	213.26	107	70 - 130
22 PFPeS			187.60	182.65	97.4	70 - 130
28 GenX			400.00	374.35	93.6	70 - 130
D 66 13C3_GenX	749783	786896			105	50 - 150
D 47 13C4_PFHpA	852436	868482			102	50 - 150
13 PFHpA			200.00	208.35	104	70 - 130
D 45 13C3_PFHxS	262249	248976			94.9	50 - 150
14 PFHxS			182.00	190.20	105	70 - 130
29 ADONA			188.40	193.16	103	70 - 130
D 64 13C2_6:2 FTS_2	263528	265874			101	50 - 150
2 6:2 FTS			189.60	190.91	101	70 - 130
20 PFOA			200.00	199.38	99.7	70 - 130
D 53 13C8_PFOA	801193	831812			104	50 - 150
12 PFHpS			190.40	203.46	107	70 - 130
D 54 13C8_PFOS	226466	244575			108	50 - 150
18 PFOS			185.60	183.99	99.1	70 - 130
17 PFNA			200.00	201.96	101	70 - 130
D 56 13C9_PFNA	790887	818008			103	50 - 150
30 9Cl-PF3ONS			186.40	176.08	94.5	70 - 130
D 55 13C8_PFOSA	464386	495386			107	50 - 150
16 PFNS			192.00	183.95	95.8	70 - 130
19 PFOSA			200.00	188.08	94	70 - 130
D 65 13C2_8:2 FTS_2	201463	195053			96.8	50 - 150
3 8:2 FTS			191.60	228.73	119	70 - 130
10 PFDA			200.00	186.81	93.4	70 - 130
D 51 13C6_PFDA	696423	742353			107	50 - 150
6 N-MeFOSAA			200.00	231.78	116	70 - 130

Report Date: 11-Feb-2021 10:19:08 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821006.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 58 d3-MeFOSAA	771725	828824			107	50 - 150
9 PFDS			192.80	183.26	95.1	70 - 130
D 60 d5-EtFOSAA	868665	864294			99.5	50 - 150
25 PFUdA			200.00	211.81	106	70 - 130
D 52 13C7_PFUdA	615503	670702			109	50 - 150
5 N-EtFOSAA			200.00	153.25	76.6	70 - 130
D 61 d7-MeFOSE	160062	183649			115	50 - 150
32 MeFOSE			200.00	210.56	105	70 - 130
D 57 d3-MeFOSA	65967	65677			99.6	50 - 150
26 MeFOSA			200.00	225.20	113	70 - 130
31 11Cl-PF3OUDS			188.40	177.24	94.1	70 - 130
11 PFDoA			200.00	216.46	108	70 - 130
D 38 13C2_PFDoA	665222	678240			102	50 - 150
D 62 d9-EtFOSE	172463	153262			88.9	50 - 150
4 10:2 FTS			192.80	216.22	112	70 - 130
33 EtFOSE			200.00	195.58	97.8	70 - 130
D 59 d5-EtFOSA	61187	60261			98.5	50 - 150
27 EtFOSA			200.00	222.28	111	70 - 130
34 PFDOS			193.60	181.10	93.5	70 - 130
24 PFTrDA			200.00	197.11	98.6	70 - 130
D 42 13C2_PFTeDA	754678	756837			100	50 - 150
23 PFTeDA			200.00	197.47	98.7	70 - 130
35 PFHxDA			200.00	203.13	102	70 - 130
D 40 13C2_PFHxDA	372820	392693			105	50 - 150
36 PFODA			200.00	203.21	102	70 - 130

Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821042.d
Injection Date: 08-Feb-2021 16:33:23 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 27
Sample Info: ID CCV 1000A_SVLC-1337 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	1025.19	103	70 - 130
D 46 13C4_PFBA	1018417	954683			93.7	50 - 150
D 50 13C5_PFPeA	1027157	1004174			97.8	50 - 150
21 PFPeA			1000.00	1019.71	102	70 - 130
7 PFBS			884.00	900.31	102	70 - 130
D 44 13C3_PFBS	349891	347711			99.4	50 - 150
1 4:2 FTS			934.00	987.46	106	70 - 130
D 63 13C2_4:2 FTS_2	279266	295925			106	50 - 150
D 49 13C5_PFHxA	870198	921108			106	50 - 150
15 PFHxA			1000.00	845.41	84.5	70 - 130
22 PFPeS			938.00	904.25	96.4	70 - 130
28 GenX			2000.00	1796.10	89.8	70 - 130
D 66 13C3_GenX	749783	843785			113	50 - 150
D 47 13C4_PFHpA	852436	858139			101	50 - 150
13 PFHpA			1000.00	1074.84	107	70 - 130
D 45 13C3_PFHxS	262249	263569			101	50 - 150
14 PFHxS			910.00	904.82	99.4	70 - 130
29 ADONA			942.00	919.98	97.7	70 - 130
D 64 13C2_6:2 FTS_2	263528	258487			98.1	50 - 150
2 6:2 FTS			948.00	909.54	95.9	70 - 130
20 PFOA			1000.00	966.82	96.7	70 - 130
D 53 13C8_PFOA	801193	793804			99.1	50 - 150
12 PFHpS			952.00	926.64	97.3	70 - 130
D 54 13C8_PFOS	226466	222205			98.1	50 - 150
18 PFOS			928.00	881.85	95	70 - 130
17 PFNA			1000.00	1139.35	114	70 - 130
D 56 13C9_PFNA	790887	731290			92.5	50 - 150
30 9Cl-PF3ONS			932.00	996.83	107	70 - 130
D 55 13C8_PFOSA	464386	506686			109	50 - 150
16 PFNS			960.00	930.95	97	70 - 130
19 PFOSA			1000.00	976.18	97.6	70 - 130
D 65 13C2_8:2 FTS_2	201463	275668			137	50 - 150
3 8:2 FTS			958.00	678.24	70.8	70 - 130
10 PFDA			1000.00	911.69	91.2	70 - 130
D 51 13C6_PFDA	696423	665623			95.6	50 - 150
6 N-MeFOSAA			1000.00	1034.16	103	70 - 130

Report Date: 11-Feb-2021 10:19:19 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821042.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 58 d3-MeFOSAA	771725	936944			121	50 - 150
9 PFDS			964.00	1009.50	105	70 - 130
D 60 d5-EtFOSAA	868665	879638			101	50 - 150
25 PFUdA			1000.00	1156.54	116	70 - 130
D 52 13C7_PFUdA	615503	587870			95.5	50 - 150
5 N-EtFOSAA			1000.00	954.60	95.5	70 - 130
D 61 d7-MeFOSE	160062	181158			113	50 - 150
32 MeFOSE			1000.00	994.67	99.5	70 - 130
D 57 d3-MeFOSA	65967	70799			107	50 - 150
26 MeFOSA			1000.00	830.67	83.1	70 - 130
31 11Cl-PF3OUDS			942.00	953.31	101	70 - 130
11 PFDoA			1000.00	1147.98	115	70 - 130
D 38 13C2_PFDoA	665222	603198			90.7	50 - 150
D 62 d9-EtFOSE	172463	166767			96.7	50 - 150
4 10:2 FTS			964.00	685.09	71.1	70 - 130
33 EtFOSE			1000.00	995.63	99.6	70 - 130
D 59 d5-EtFOSA	61187	64798			106	50 - 150
27 EtFOSA			1000.00	1103.33	110	70 - 130
34 PFDOS			968.00	1011.66	105	70 - 130
24 PFTrDA			1000.00	1050.56	105	70 - 130
D 42 13C2_PFTeDA	754678	724869			96.1	50 - 150
23 PFTeDA			1000.00	1032.49	103	70 - 130
35 PFHxDA			1000.00	940.48	94	70 - 130
D 40 13C2_PFHxDA	372820	390351			105	50 - 150
36 PFODA			1000.00	963.02	96.3	70 - 130



Pace Environmental Services, LLC
Continuing Calibration Verification Report

Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821057.d
Injection Date: 08-Feb-2021 19:12:13 Injection Vol: 10.0 uL
Sample Type: CCV Auto Sampler: 42
Sample Info: ID CCV 1000B_SVLC-1337 Misc. Info:
Inst. ID: LCMSMS01 Operator: Matthew M. Miller

Method Name: LCMSMS01_PFAS-ID Version: 2020-09-23 10:00:21
Calib Method: PFAS-ID Lock State: Unlocked
Quant Method: IsoDil Integrator: picker

Reagent: Analytes Conc. Level: L-5 Vol. Added: 1.00 ml

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
8 PFBA			1000.00	973.15	97.3	70 - 130
D 46 13C4_PFBA	1018417	964623			94.7	50 - 150
D 50 13C5_PFPeA	1027157	1007602			98.1	50 - 150
21 PFPeA			1000.00	948.29	94.8	70 - 130
7 PFBS			884.00	898.27	102	70 - 130
D 44 13C3_PFBS	349891	344226			98.4	50 - 150
1 4:2 FTS			934.00	1010.84	108	70 - 130
D 63 13C2_4:2 FTS_2	279266	280895			101	50 - 150
D 49 13C5_PFHxA	870198	916492			105	50 - 150
15 PFHxA			1000.00	965.17	96.5	70 - 130
22 PFPeS			938.00	918.37	97.9	70 - 130
28 GenX			2000.00	1957.49	97.9	70 - 130
D 66 13C3_GenX	749783	742945			99.1	50 - 150
D 47 13C4_PFHpA	852436	847091			99.4	50 - 150
13 PFHpA			1000.00	939.01	93.9	70 - 130
D 45 13C3_PFHxS	262249	252649			96.3	50 - 150
14 PFHxS			910.00	899.40	98.8	70 - 130
29 ADONA			942.00	932.77	99	70 - 130
D 64 13C2_6:2 FTS_2	263528	246197			93.4	50 - 150
2 6:2 FTS			948.00	958.36	101	70 - 130
20 PFOA			1000.00	1026.42	103	70 - 130
D 53 13C8_PFOA	801193	767248			95.8	50 - 150
12 PFHpS			952.00	1034.14	109	70 - 130
D 54 13C8_PFOS	226466	233425			103	50 - 150
18 PFOS			928.00	881.48	95	70 - 130
17 PFNA			1000.00	1137.62	114	70 - 130
D 56 13C9_PFNA	790887	680800			86.1	50 - 150
30 9Cl-PF3ONS			932.00	885.27	95	70 - 130
D 55 13C8_PFOSA	464386	451200			97.2	50 - 150
16 PFNS			960.00	921.13	96	70 - 130
19 PFOSA			1000.00	1073.60	107	70 - 130
D 65 13C2_8:2 FTS_2	201463	196514			97.5	50 - 150
3 8:2 FTS			958.00	1013.32	106	70 - 130
10 PFDA			1000.00	1041.07	104	70 - 130
D 51 13C6_PFDA	696423	590827			84.8	50 - 150
6 N-MeFOSAA			1000.00	1302.33	130	70 - 130

Report Date: 11-Feb-2021 10:19:38 AIM Revision: 2.0 12-Dec-2020 09:34:50
Data File: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b\020821057.d

Compound	Std Area	CCV Area	Exp. Conc ng/L	Conc ng/L	%Rec	%Rec Limits
D 58 d3-MeFOSAA	771725	742853			96.3	50 - 150
9 PFDS			964.00	896.50	93	70 - 130
D 60 d5-EtFOSAA	868665	788304			90.7	50 - 150
25 PFUdA			1000.00	891.56	89.2	70 - 130
D 52 13C7_PFUdA	615503	646576			105	50 - 150
5 N-EtFOSAA			1000.00	1033.49	103	70 - 130
D 61 d7-MeFOSE	160062	165834			104	50 - 150
32 MeFOSE			1000.00	988.49	98.8	70 - 130
D 57 d3-MeFOSA	65967	66308			101	50 - 150
26 MeFOSA			1000.00	949.37	94.9	70 - 130
31 11Cl-PF3OUDS			942.00	967.74	103	70 - 130
11 PFDoA			1000.00	979.97	98	70 - 130
D 38 13C2_PFDoA	665222	680113			102	50 - 150
D 62 d9-EtFOSE	172463	155424			90.1	50 - 150
4 10:2 FTS			964.00	866.73	89.9	70 - 130
33 EtFOSE			1000.00	941.79	94.2	70 - 130
D 59 d5-EtFOSA	61187	56649			92.6	50 - 150
27 EtFOSA			1000.00	1079.05	108	70 - 130
34 PFDOS			968.00	925.46	95.6	70 - 130
24 PFTrDA			1000.00	932.88	93.3	70 - 130
D 42 13C2_PFTeDA	754678	698159			92.5	50 - 150
23 PFTeDA			1000.00	1026.31	103	70 - 130
35 PFHxDA			1000.00	955.82	95.6	70 - 130
D 40 13C2_PFHxDA	372820	374092			100	50 - 150
36 PFODA			1000.00	1014.93	101	70 - 130



Report Date: 27-Jan-2021 16:50:50 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\organics\LL\LCMSMS02.i\012621-nonDOD+ICAL.b

Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02

Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
1	ICAL 50_SVLC-1272	26-Jan-2021 13:22:18	012621007.d	ICal					Analytes	L-1	1.00		
2	ICAL 100_SVLC-1273	26-Jan-2021 13:32:55	012621008.d	ICal					Analytes	L-2	1.00		
3	ICAL 200_SVLC-1274	26-Jan-2021 13:43:33	012621009.d	ICal					Analytes	L-3	1.00		
4	ICAL 500_SVLC-1275	26-Jan-2021 13:54:07	012621010.d	ICal					Analytes	L-4	1.00		
5	ICAL 1000_SVLC-1276	26-Jan-2021 14:04:47	012621011.d	ICal					Analytes	L-5	1.00		
6	ICAL 2000_SVLC-1277	26-Jan-2021 14:15:21	012621012.d	ICal					Analytes	L-6	1.00		
7	ICAL 5000_SVLC-1278	26-Jan-2021 14:25:58	012621013.d	ICal					Analytes	L-7	1.00		
8	ICAL 10000_SVLC-1279	26-Jan-2021 14:36:40	012621014.d	ICal					Analytes	L-8	1.00		
9	ICAL 15000_SVLC-1280	26-Jan-2021 14:47:21	012621015.d	ICal					Analytes	L-9	1.00		
10	ICAL 20000_SVLC-1281	26-Jan-2021 14:58:01	012621016.d	ICal					Analytes	L-10	1.00		
11	ID IBLK A	26-Jan-2021 15:08:41	012621017.d	InstBlk					Surrogates	Smp	0.1100		
12	ICV 500_SVLC-1285	26-Jan-2021 15:19:16	012621018.d	ICV					Analytes	ICV	1.00		
13	ISOMER CHECK_SVLC-1266	26-Jan-2021 15:29:51	012621019.d	CheckStd					Surrogates	Smp	1.00		
14	ID BLK B	26-Jan-2021 15:51:09	012621021.d	InstBlk					Surrogates	Smp	0.1100		
17	ID CCV 1000_SVLC-1276	26-Jan-2021 16:12:22	012621023.d	CCV					Analytes	L-5	1.00		
18	WQ80489-001	26-Jan-2021 16:23:01	012621024.d	MBlk		Aqueous	1	80489	Surrogates	Smp	0.1100		
19	WQ80489-002	26-Jan-2021 16:33:38	012621025.d	LCS		Aqueous	1	80489	Analytes	100x PDS	0.2000		
20	WA11027-006	26-Jan-2021 16:44:17	012621026.d	Client	MDLv PFAS AQ Full List L	Aqueous	1	80206	Surrogates	Smp	0.1100		
21	WA11029-006	26-Jan-2021 16:54:58	012621027.d	Client	LOQ PFAS AQ Full List LC	Aqueous	1	80206	Surrogates	Smp	0.1100		
22	WA11027-008	26-Jan-2021 17:05:32	012621028.d	Client	MDLv PFAS SOIL Full List	Soil	1	80348	Surrogates	Smp	0.1100		RX
23	WA11029-008	26-Jan-2021 17:16:10	012621029.d	Client	LOQ PFAS SOIL Full List	Soil	1	80348	Surrogates	Smp	0.1100		RX
24	WA14018-001	26-Jan-2021 17:26:48	012621030.d	Client	Effluent Grab	Aqueous	1	79746	Surrogates	Smp	0.1100		
25	WA20010-009	26-Jan-2021 17:37:27	012621031.d	Client	MW-13	Aqueous	1	80206	Surrogates	Smp	0.1100		SUR/ND, NCM
26	WA20010-009DU	26-Jan-2021 17:48:04	012621032.d	Client		Aqueous	1	80206	Surrogates	Smp	0.1100		SUR/ND
27	WA20010-010	26-Jan-2021 17:58:42	012621033.d	Client	MW-9D	Aqueous	1	80206	Surrogates	Smp	0.1100		SUR, RR
28	WA20010-011	26-Jan-2021 18:09:24	012621034.d	Client	S8MW-R	Aqueous	1	80206	Surrogates	Smp	0.1100		
29	WA16019-016	26-Jan-2021 18:20:04	012621035.d	Client	MW-3	Aqueous	1	80489	Surrogates	Smp	0.1100		
30	WA16019-016MS	26-Jan-2021 18:30:42	012621036.d	MS		Aqueous	1	80489	Analytes	100x PDS	0.2000		
31	WA16019-017	26-Jan-2021 18:41:21	012621037.d	Client	MW-3I	Aqueous	1	80489	Surrogates	Smp	0.1100		
32	ID CCV 1000A_SVLC-1276	26-Jan-2021 18:51:55	012621038.d	CCV					Analytes	L-5	1.00		
33	WA16019-018	26-Jan-2021 19:02:31	012621039.d	Client	MW-3D	Aqueous	1	80489	Surrogates	Smp	0.1100		
34	WA16019-019	26-Jan-2021 19:13:06	012621040.d	Client	MW-9	Aqueous	1	80489	Surrogates	Smp	0.1100		SUR 4:2(ND), 6:2(DETECT); RR to confirm
35	WA16019-020	26-Jan-2021 19:23:44	012621041.d	Client	MW-9I	Aqueous	1	80489	Surrogates	Smp	0.1100		
36	WA16019-020DU	26-Jan-2021 19:34:27	012621042.d	Client		Aqueous	1	80489	Surrogates	Smp	0.1100		
37	WA16019-021	26-Jan-2021 19:45:05	012621043.d	Client	Duplicate #1	Aqueous	1	80489	Surrogates	Smp	0.1100		
38	WA16019-022	26-Jan-2021 19:55:44	012621044.d	Client	Equipment Blank #2	Aqueous	1	80489	Surrogates	Smp	0.1100		
39	WA16019-023	26-Jan-2021 20:06:22	012621045.d	Client	MW-28	Aqueous	1	80489	Surrogates	Smp	0.1100		
40	WA19030-001	26-Jan-2021 20:17:02	012621046.d	Client	335-0	Aqueous	1	80489	Surrogates	Smp	0.1100		
41	WA19030-002	26-Jan-2021 20:27:46	012621047.d	Client	362-0	Aqueous	1	80489	Surrogates	Smp	0.1100		
42	WA19030-003	26-Jan-2021 20:38:22	012621048.d	Client	182-0	Aqueous	1	80489	Surrogates	Smp	0.1100		
43	WA20026-001	26-Jan-2021 20:48:58	012621049.d	Client	1694-0	Aqueous	1	80489	Surrogates	Smp	0.1100		
44	ID CCV 1000B_SVLC-1276	26-Jan-2021 20:59:38	012621050.d	CCV					Analytes	L-5	1.00		
45	WA20027-001	26-Jan-2021 21:10:16	012621051.d	Client	1694-16	Aqueous	1	80489	Surrogates	Smp	0.1100		
46	WA20028-001	26-Jan-2021 21:20:53	012621052.d	Client	372-0	Aqueous	1	80489	Surrogates	Smp	0.1100		

Report Date: 09-Feb-2021 14:28:36 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\organics\LL\LCMSMS02.i\020521-nonDOD.b

Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02

Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
95	ID CCV 100_SVLC-1273	05-Feb-2021 11:54:00	020521005.d	CCV					Analytes	L-2	1.00		
96	ID CCV 200_SVLC-1274	05-Feb-2021 12:04:35	020521006.d	CCV					Analytes	L-3	1.00		
97	ID IBLK A	05-Feb-2021 12:15:09	020521007.d	InstBlk					Surrogates	Smp	0.1100		
1	WQ81820-001	05-Feb-2021 12:25:44	020521008.d	MBlk		Soil	1	81820	Surrogates	Smp	0.1100		
2	WQ81820-002	05-Feb-2021 12:36:21	020521009.d	LCS		Soil	1	81820	Analytes	100x PDS	0.1000		
3	WQ81803-001	05-Feb-2021 12:46:56	020521010.d	MBlk		Aqueous	1	81803	Surrogates	Smp	0.1100		
4	WQ81803-002	05-Feb-2021 12:57:34	020521011.d	LCS		Aqueous	1	81803	Analytes	100x PDS	0.2000		
7	WA29014-001	05-Feb-2021 13:29:25	020521014.d	Client	EQ Blank	Aqueous	1	81803	Surrogates	Smp	0.1100		
9	WA28026-007	05-Feb-2021 13:50:47	020521016.d	Client	FIELD BLANK	Aqueous	1	81803	Surrogates	Smp	0.1100		
10	WA28026-008	05-Feb-2021 14:01:27	020521017.d	Client	EQUIPMENT BLANK	Aqueous	1	81803	Surrogates	Smp	0.1100		
18	ID CCV 1000_SVLC-1324	05-Feb-2021 15:26:30	020521025.d	CCV					Analytes	L-5	1.00		
43	ID CCV 1000B_SVLC-1324	05-Feb-2021 19:52:32	020521050.d	CCV					Analytes	L-5	1.00		
59	WA29014-002	05-Feb-2021 22:11:03	020521066.d	Client	LMW-6	Aqueous	1	81803	Surrogates	Smp	0.1100		RR - 10+ SAMPLES B/W CCVs
60	WA29014-003	05-Feb-2021 22:21:43	020521067.d	Client	LMW-10	Aqueous	1	81803	Surrogates	Smp	0.1100		RR - 10+ SAMPLES B/W CCVs
61	WA29014-004	05-Feb-2021 22:32:27	020521068.d	Client	LMW-11R	Aqueous	1	81803	Surrogates	Smp	0.1100		RR - 10+ SAMPLES B/W CCVs
62	WA29014-005	05-Feb-2021 22:43:09	020521069.d	Client	LMW-12	Aqueous	1	81803	Surrogates	Smp	0.1100		RR - 10+ SAMPLES B/W CCVs
63	WA29014-006	05-Feb-2021 22:53:48	020521070.d	Client	LMW-14	Aqueous	1	81803	Surrogates	Smp	0.1100		RR - 10+ SAMPLES B/W CCVs
64	ID CCV 1000D_SVLC-1324	05-Feb-2021 23:04:28	020521071.d	CCV					Analytes	L-5	1.00		

Report Date: 10-Feb-2021 17:20:23 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\organics\LL\LCMSMS02.i\020821-nonDOD.b

Method: LCMSMS02_PFAS-ID.M Instrument: LCMSMS02

Cal Start Date: 26-Jan-2021 13:22:18 Cal End Date: 26-Jan-2021 14:58:01

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
95	ID CCV 100_SVLC-1273	08-Feb-2021 11:56:37	020821005.d	CCV					Analytes	L-2	1.00		
96	ID CCV 200_SVLC-1274	08-Feb-2021 12:07:14	020821006.d	CCV					Analytes	L-3	1.00		
97	ID IBLK A	08-Feb-2021 12:17:49	020821007.d	InstBlk					Surrogates	Smp	0.1100		
1	WQ82105-001	08-Feb-2021 12:28:23	020821008.d	MBlk		Aqueous	1	82105	Surrogates	Smp	0.1100		
2	WQ82105-002	08-Feb-2021 12:39:00	020821009.d	LCS		Aqueous	1	82105	Analytes	100x PDS	0.2000		
4	WA28028-008	08-Feb-2021 13:00:13	020821011.d	Client	BLANK-10	Aqueous	1	82105	Surrogates	Smp	0.1100		
5	WB04011-003	08-Feb-2021 13:10:51	020821012.d	Client	EQB-1	Aqueous	1	82105	Surrogates	Smp	0.1100		
6	WB04011-004	08-Feb-2021 13:21:27	020821013.d	Client	Field Blank	Aqueous	1	82105	Surrogates	Smp	0.1100		
7	WB04011-015	08-Feb-2021 13:32:02	020821014.d	Client	EQB-2	Aqueous	1	82105	Surrogates	Smp	0.1100		
8	WA29014-002	08-Feb-2021 13:42:44	020821015.d	Client	LMW-6	Aqueous	1	81803	Surrogates	Smp	0.1100		SUR; 4:2,6:2 (ND), NCM
9	WA29014-003	08-Feb-2021 13:53:26	020821016.d	Client	LMW-10	Aqueous	1	81803	Surrogates	Smp	0.1100		SUR: 4:2, 6:2, 8:2(ND), NCM
10	WA29014-004	08-Feb-2021 14:04:05	020821017.d	Client	LMW-11R	Aqueous	1	81803	Surrogates	Smp	0.1100		SUR; 4:2, 6:2, 8:2 (ND), NCM
11	WA29014-005	08-Feb-2021 14:14:45	020821018.d	Client	LMW-12	Aqueous	1	81803	Surrogates	Smp	0.1100		SUR; 4:2 (ND), NCM
12	WA29014-006	08-Feb-2021 14:25:19	020821019.d	Client	LMW-14	Aqueous	1	81803	Surrogates	Smp	0.1100		SUR; 4:2 (ND), NCM
13	ID CCV 1000_SVLC-1324	08-Feb-2021 14:35:54	020821020.d	CCV					Analytes	L-5	1.00		
17	WA29015-012	08-Feb-2021 15:18:27	020821024.d	Client	B-6	Aqueous	1	82105	Surrogates	Smp	0.1100		
18	WA29015-013	08-Feb-2021 15:29:05	020821025.d	Client	B-7	Aqueous	1	82105	Surrogates	Smp	0.1100		
19	WA29015-014	08-Feb-2021 15:39:43	020821026.d	Client	B-5	Aqueous	1	82105	Surrogates	Smp	0.1100		
20	WA29015-015	08-Feb-2021 15:50:24	020821027.d	Client	B-4	Aqueous	1	82105	Surrogates	Smp	0.1100		
21	WA29015-017	08-Feb-2021 16:01:08	020821028.d	Client	B-2	Aqueous	1	82105	Surrogates	Smp	0.1100		
22	WA28028-005	08-Feb-2021 16:11:47	020821029.d	Client	375-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
23	WA28028-006	08-Feb-2021 16:22:23	020821030.d	Client	471-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
24	ID CCV 1000A_SVLC-1324	08-Feb-2021 16:32:57	020821031.d	CCV					Analytes	L-5	1.00		
25	WA29015-016	08-Feb-2021 16:43:38	020821032.d	Client	EB-126	Aqueous	1	82105	Surrogates	Smp	0.1100		
28	WA29014-007	08-Feb-2021 17:15:34	020821035.d	Client	LMW-7	Aqueous	1	81803	Surrogates	Smp	0.1100		SUR 4:2, 6:2, 8:2 (ND) - NCM 47952 - REPORT
29	WA28026-003	08-Feb-2021 17:26:11	020821036.d	Client	SMW-5	Aqueous	5	81803	Surrogates	Smp	0.1100		
30	WA28026-004	08-Feb-2021 17:36:52	020821037.d	Client	CPMW02	Aqueous	5	81803	Surrogates	Smp	0.1100		
31	WA28026-005	08-Feb-2021 17:47:31	020821038.d	Client	CPMW03	Aqueous	5	81803	Surrogates	Smp	0.1100		
32	WA28026-005DU	08-Feb-2021 17:58:05	020821039.d	Client		Aqueous	5	81803	Surrogates	Smp	0.1100		
33	WA28026-006	08-Feb-2021 18:08:41	020821040.d	Client	DUPLICATE	Aqueous	5	81803	Surrogates	Smp	0.1100		
34	WA28028-007	08-Feb-2021 18:19:26	020821041.d	Client	DUP 10	Aqueous	1	82105	Surrogates	Smp	0.1100		
35	WA28028-009	08-Feb-2021 18:30:04	020821042.d	Client	406-2	Aqueous	1	82105	Surrogates	Smp	0.1100		
36	ID CCV 1000B_SVLC-1324	08-Feb-2021 18:40:47	020821043.d	CCV					Analytes	L-5	1.00		
37	WA28028-010	08-Feb-2021 18:51:26	020821044.d	Client	144-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
38	WA28028-011	08-Feb-2021 19:02:07	020821045.d	Client	85-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
39	WA28028-012	08-Feb-2021 19:12:46	020821046.d	Client	94-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
40	WA28028-013	08-Feb-2021 19:23:25	020821047.d	Client	408-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
41	WA28028-014	08-Feb-2021 19:34:11	020821048.d	Client	412-0	Aqueous	1	82105	Surrogates	Smp	0.1100		
42	WA28028-014MS	08-Feb-2021 19:44:50	020821049.d	MS		Aqueous	1	82105	Analytes	100x PDS	0.2000		
43	WA28028-015	08-Feb-2021 19:55:27	020821050.d	Client	144-1	Aqueous	1	82105	Surrogates	Smp	0.1100		
44	WA28028-015DU	08-Feb-2021 20:06:08	020821051.d	Client		Aqueous	1	82105	Surrogates	Smp	0.1100		
45	WA28027-002	08-Feb-2021 20:16:48	020821052.d	Client	HS-PW-2.5 (B)	Aqueous	1	81803	Surrogates	Smp	0.1100		
46	WA28027-001	08-Feb-2021 20:27:25	020821053.d	Client	HS-PW-2.5 (A)	Aqueous	5	81803	Surrogates	Smp	0.1100		
47	WA28027-003	08-Feb-2021 20:38:06	020821054.d	Client	HS-PW-3 (A)	Aqueous	5	81803	Surrogates	Smp	0.1100		

Report Date: 10-Feb-2021 17:20:23 AIM Revision: 2.0 05-Oct-2020 14:59:22

Batch Path: \\organics\LL\LCMSMS02.i\020821-nonDOD.b

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
48	WA28027-004	08-Feb-2021 20:48:46	020821055.d	Client	HS-PW-3 (A) DUP	Aqueous	5	81803	Surrogates	Smp	0.1100		
49	ID CCV 1000C_SVLC-1324	08-Feb-2021 20:59:27	020821056.d	CCV					Analytes	L-5	1.00		
50	WB03046-001	08-Feb-2021 21:10:08	020821057.d	Client	MW-1 (0-6-inch)	Soil	1	81820	Surrogates	Smp	0.1100		
51	WB03046-002	08-Feb-2021 21:20:48	020821058.d	Client	MW-1 (6-inch-2ft)	Soil	1	81820	Surrogates	Smp	0.1100		
52	WB03046-003	08-Feb-2021 21:31:23	020821059.d	Client	SB-7 (0-6-inch)	Soil	1	81820	Surrogates	Smp	0.1100		
53	WB03046-004	08-Feb-2021 21:41:59	020821060.d	Client	SB-7 (6-24-inch)	Soil	1	81820	Surrogates	Smp	0.1100		
54	WB02009-001	08-Feb-2021 21:52:39	020821061.d	Client	B1 @1	Soil	1	81820	Surrogates	Smp	0.1100		
55	WB02009-001MS	08-Feb-2021 22:03:22	020821062.d	MS		Soil	1	81820	Analytes	100x PDS	0.1000		
56	WB02009-001MD	08-Feb-2021 22:14:08	020821063.d	MSD		Soil	1	81820	Analytes	100x PDS	0.1000		
57	WB02009-002	08-Feb-2021 22:24:48	020821064.d	Client	B1 @10	Soil	1	81820	Surrogates	Smp	0.1100		
58	WB02009-003	08-Feb-2021 22:35:28	020821065.d	Client	B3 @5	Soil	1	81820	Surrogates	Smp	0.1100		
59	WB02009-004	08-Feb-2021 22:46:09	020821066.d	Client	B3 @15	Soil	1	81820	Surrogates	Smp	0.1100		
60	ID CCV 1000D_SVLC-1324	08-Feb-2021 22:57:08	020821067.d	CCV					Analytes	L-5	1.00		
61	WB02009-007	08-Feb-2021 23:07:47	020821068.d	Client	B13 @1	Soil	1	81820	Surrogates	Smp	0.1100		
62	WB02009-008	08-Feb-2021 23:18:27	020821069.d	Client	B13 @10	Soil	1	81820	Surrogates	Smp	0.1100		
63	WB02009-009	08-Feb-2021 23:29:03	020821070.d	Client	B1300 @10	Soil	1	81820	Surrogates	Smp	0.1100		
64	ID CCV 1000E_SVLC-1324	08-Feb-2021 23:39:44	020821071.d	CCV					Analytes	L-5	1.00		

Report Date: 11-Feb-2021 10:00:29 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\Organics\LL\LCMSMS01.i\020721-nonDOD-ICAL.b

Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01

Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
1	ICAL 50_SVLC-1333	07-Feb-2021 14:32:59	020721021.d	ICal					Analytes	L-1	1.00		
2	ICAL 100_SVLC-1334	07-Feb-2021 14:43:30	020721022.d	ICal					Analytes	L-2	1.00		
3	ICAL 200_SVLC-1335	07-Feb-2021 14:54:02	020721023.d	ICal					Analytes	L-3	1.00		
4	ICAL 500_SVLC-1336	07-Feb-2021 15:04:36	020721024.d	ICal					Analytes	L-4	1.00		
5	ICAL 1000_SVLC-1337	07-Feb-2021 15:15:08	020721025.d	ICal					Analytes	L-5	1.00		
6	ICAL 2000_SVLC-1338	07-Feb-2021 15:25:43	020721026.d	ICal					Analytes	L-6	1.00		
7	ICAL 5000_SVLC-1339	07-Feb-2021 15:36:16	020721027.d	ICal					Analytes	L-7	1.00		
8	ICAL 10000_SVLC-1340	07-Feb-2021 15:46:51	020721028.d	ICal					Analytes	L-8	1.00		
9	ICAL 15000_SVLC-1341	07-Feb-2021 15:57:27	020721029.d	ICal					Analytes	L-9	1.00		
10	ICAL 20000_SVLC-1342	07-Feb-2021 16:08:04	020721030.d	ICal					Analytes	L-10	1.00		
95	ID BLK	07-Feb-2021 16:18:43	020721031.d	InstBlk					Surrogates	Smp	0.1100		
12	ISOMER CHECK_SVLC-1266	07-Feb-2021 16:39:49	020721033.d	CheckStd					Surrogates	Smp	1.00	Yes	
98	ID ICV 500_SVLC-1343	08-Feb-2021 11:48:09	020821015.d	ICV					Analytes	ICV	1.00		

Report Date: 11-Feb-2021 10:19:47 AIM Revision: 2.0 05-Oct-2020 14:59:22

Pace Environmental Services, LLC

Batch Run Log Report

Batch: \\Organics\LL\LCMSMS01.i\020821-nonDOD.b

Method: LCMSMS01_PFAS-ID.M Instrument: LCMSMS01

Cal Start Date: 07-Feb-2021 14:32:59 Cal End Date: 07-Feb-2021 16:08:04

Method Lock: Unlocked Lock Date:

No.Compounds: 66 Integrator: picker

Calib Method: PFAS-ID

ALS Vial	LIMS Sample ID	Injection Date/Time	Data File	Sample Type	Client Sample ID	Matrix/ Level	Dil Fact	Prep Batch	Primary Reagent	Conc Level	Vol. Added	Inst QC	Comments
95	ID CCV 100_SVLC-1334	08-Feb-2021 10:02:45	020821005.d	CCV					Analytes	L-2	1.00		RR-PFDoA high
96	ID CCV 200_SVLC-1335	08-Feb-2021 10:13:17	020821006.d	CCV					Analytes	L-3	1.00		All dilutions refortified w/EIS SVLC-1328
97	ID IBLK A	08-Feb-2021 10:23:47	020821007.d	InstBlk					Surrogates	Smp	0.1100		
95	ID CCV 100A_SVLC-1334	08-Feb-2021 10:34:22	020821008.d	CCV					Analytes	L-2	1.00		All pass
95	ID CCV 100A DUP_SVLC-1334	08-Feb-2021 10:44:55	020821009.d	CCV					Analytes	L-2	1.00		Confirms all pass
97	ID IBLK A	08-Feb-2021 10:55:27	020821010.d	InstBlk					Surrogates	Smp	0.1100		
98	ID ICV 500_SVLC-1343	08-Feb-2021 11:06:02	020821011.d	Client		Aqueous	1						
1	WQ81967-001	08-Feb-2021 11:16:36	020821012.d	MBlk		Aqueous	1	81967	Surrogates	Smp	0.1100		RR after ICV
94	ID BLK B2	08-Feb-2021 11:27:08	020821013.d	InstBlk					Surrogates	Smp	0.1100		
94	ID BLK B3	08-Feb-2021 11:37:39	020821014.d	InstBlk					Surrogates	Smp	0.1100		
98	ID ICV 500_SVLC-1343	08-Feb-2021 11:48:09	020821015.d	ICV					Analytes	ICV	1.00		
27	ID CCV 1000A_SVLC-1337	08-Feb-2021 16:33:23	020821042.d	CCV					Analytes	L-5	1.00		
28	WQ81968-001	08-Feb-2021 16:43:57	020821043.d	MBlk		Aqueous	1	81968	Surrogates	Smp	0.1100		
29	WQ81968-002	08-Feb-2021 16:54:33	020821044.d	LCS		Aqueous	1	81968	Analytes	100x PDS	0.2000		
30	WQ81971-001	08-Feb-2021 17:05:09	020821045.d	MBlk		Soil	1	81971	Surrogates	Smp	0.1100		
31	WQ81971-002	08-Feb-2021 17:15:47	020821046.d	LCS		Soil	1	81971	Analytes	100x PDS	0.1000		
32	WA28027-005	08-Feb-2021 17:26:20	020821047.d	Client	HS-PW-3.5 (A)	Aqueous	1	81968	Surrogates	Smp	0.1100		
33	WA28027-005MS	08-Feb-2021 17:36:54	020821048.d	MS		Aqueous	1	81968	Analytes	100x PDS	0.2000		EIS double spiked, NCM #47852
34	WA28027-005MD	08-Feb-2021 17:47:28	020821049.d	MSD		Aqueous	1	81968	Analytes	100x PDS	0.2000		
35	WA28027-006	08-Feb-2021 17:58:02	020821050.d	Client	FB-1/26	Aqueous	1	81968	Surrogates	Smp	0.1100		
36	WA28027-007	08-Feb-2021 18:08:36	020821051.d	Client	EB-HT	Aqueous	1	81968	Surrogates	Smp	0.1100		
37	WA28028-001	08-Feb-2021 18:19:13	020821052.d	Client	354-0	Aqueous	1	81968	Surrogates	Smp	0.1100		
38	WA28028-002	08-Feb-2021 18:29:49	020821053.d	Client	358-0	Aqueous	1	81968	Surrogates	Smp	0.1100		
39	WA28028-003	08-Feb-2021 18:40:24	020821054.d	Client	359-0	Aqueous	1	81968	Surrogates	Smp	0.1100		
40	WA28028-004	08-Feb-2021 18:51:01	020821055.d	Client	381-0	Aqueous	1	81968	Surrogates	Smp	0.1100		
41	WB03053-001	08-Feb-2021 19:01:40	020821056.d	Client	GTW-3	Aqueous	1	81968	Surrogates	Smp	0.1100		
42	ID CCV 1000B_SVLC-1337	08-Feb-2021 19:12:13	020821057.d	CCV					Analytes	L-5	1.00		
43	WB04011-001	08-Feb-2021 19:22:48	020821058.d	Client	MW-3 (0-6-inch)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
44	WB04011-002	08-Feb-2021 19:33:23	020821059.d	Client	MW-3 (6-inch-2ft)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
45	WB04011-005	08-Feb-2021 19:43:57	020821060.d	Client	SB-8 (0-6-inch)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
46	WB04011-006	08-Feb-2021 19:54:33	020821061.d	Client	SB-8 (6-inch-2ft)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
47	WB04011-007	08-Feb-2021 20:05:07	020821062.d	Client	SB-9 (0-6-inch)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
48	WB04011-008	08-Feb-2021 20:15:43	020821063.d	Client	SB-9 (6-inch-2ft)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
49	WB04011-009	08-Feb-2021 20:26:18	020821064.d	Client	SB-10 (0-6-inch)	Soil	50	81971	Surrogates	Smp	0.1100		RR-1X
50	WB04011-010	08-Feb-2021 20:36:55	020821065.d	Client	SB-10 (6-inch-2ft)	Soil	50	81971	Surrogates	Smp	0.1100		

Analyst: MBR **Level 2 Analyst:** N/A

Status: Level 1 review released

Matrix: Aqueous

Printed: 02/16/21 0834

Prep Batch: 81803

PFAS Prep by ID - PFAS Aqueous Preparation

Start Date: 02/04/2021 1209

End Date: 02/04/2021 1621

Conc Analyst: MBR

Conc Start Date: 02/04/2021 1621

Conc End Date: 02/04/2021 1621

Ext Solvent: MEOH>96%/MEOH/4%/H2O

Reagents Vol. (mL): 10

Chem ID: 20-2857>20-2857/21-252

Surrogate: SVLC-1307B

Surrogate Vol. (mL): 0.110

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
WQ81803-001	MB		1	PFAS by ID SOP	280	30	250		0.000	10.0	MB init:300.77g,fin:30.95g;LCS init:301.82g,fin:30.68g;
WQ81803-002	LCS		1	PFAS by ID SOP	280	30	250	SVLC-1327	0.200	10.0	Sorbent dry start/end:1st:1306/1311,2nd:1534/1539;Buf 384;Amm-MeOH:SV21-385(4mL);QC Water:21-252
WA29014-001	Sample	EQ Blank	1	PFAS by ID SOP	307.89	42.59	265		0.000	10.0	Bottletop#:329;Pipettes:383,20-2315;QC Bottles:M0-322-01BB;XL-AW 20-2827;Reservoirs:20-2623
WA29014-002	Sample	LMW-6	1	PFAS by ID SOP	302.89	43.45	259		0.000	10.0	Filter cartridges: 21-254/21-190; Elution tubes:20-1843;Falcon tubes:21-33;Centrifuge tubes:20-2051
WA29014-003	Sample	LMW-10	1	PFAS by ID SOP	301.48	43.23	258		0.000	10.0	Storage bottles:20-2252;MeOH Ext:4mL,Filt:2mL;IS:SVLC-1303(0.010mL); ASV/Caps:21-208/21-207
WA29014-004	Sample	LMW-11R	1	PFAS by ID SOP	297.8	43.59	254		0.000	10.0	NCM#47659
WA29014-005	Sample	LMW-12	1	PFAS by ID SOP	290.94	43.67	247		0.000	10.0	
WA29014-006	Sample	LMW-14	1	PFAS by ID SOP	295.1	43.43	252		0.000	10.0	
WA29014-007	Sample	LMW-7	1	PFAS by ID SOP	288.3	43.98	244		0.000	10.0	
WA28022-001	Sample	C-6 (110)	1	PFAS by ID SOP	308.43	40.17	268		0.000	10.0	
WA28026-001	Sample	SMW-1	1	PFAS by ID SOP	308.26	32.41	276		0.000	10.0	NCM#47660
WA28026-002	Sample	SMW-2	1	PFAS by ID SOP	313.11	60.25	253		0.000	10.0	NCM#47662
WA28026-003	Sample	SMW-5	1	PFAS by ID SOP	314.55	32.17	282		0.000	10.0	
WA28026-003MSMS			1	PFAS by ID SOP	322.58	31.97	291	SVLC-1327	0.200	10.0	

Analyst: MBR **Level 2 Analyst:** N/A

Status: Level 1 review released

Matrix: Aqueous

Printed: 02/16/21 0834

Prep Batch: 81803

PFAS Prep by ID - PFAS Aqueous Preparation

Start Date: 02/04/2021 1209

End Date: 02/04/2021 1621

Conc Analyst: MBR

Conc Start Date: 02/04/2021 1621

Conc End Date: 02/04/2021 1621

Surrogate: SVLC-1307B

Surrogate Vol. (mL): 0.110

Ext Solvent: MECH>96%/MECH/4%/H2O

Reagents Vol. (mL): 10

Chem ID: 20-2857>20-2857/21-252

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
WA28026-004	Sample	CPMW02	1	PFAS by ID SOP	313.57	31.62	282		0.000	10.0	
WA28026-005	Sample	CPMW03	1	PFAS by ID SOP	311.86	32.04	280		0.000	10.0	
WA28026-005DU	Duplicate		1	PFAS by ID SOP	320.58	31.82	289		0.000	10.0	
WA28026-006	Sample	DUPLICATE	1	PFAS by ID SOP	321.42	32.2	289		0.000	10.0	
WA28026-007	Sample	FIELD BLANK	1	PFAS by ID SOP	265.69	32.17	234		0.000	10.0	
WA28026-008	Sample	EQUIPMENT BLANK	1	PFAS by ID SOP	274.03	32.01	242		0.000	10.0	
WA28027-001	Sample	HS-PW-2.5 (A)	1	PFAS by ID SOP	315.32	33.61	282		0.000	10.0	
WA28027-002	Sample	HS-PW-2.5 (B)	1	PFAS by ID SOP	314.27	31.52	283		0.000	10.0	
WA28027-003	Sample	HS-PW-3 (A)	1	PFAS by ID SOP	301.91	31.83	270		0.000	10.0	
WA28027-004	Sample	HS-PW-3 (A) DUP	1	PFAS by ID SOP	321.87	33.51	288		0.000	10.0	

(end of report) **Total Samples: 20**

Analyst: ALM **Level 2 Analyst:** N/A

Status: Level 1 review released

Matrix: Aqueous

Printed: 02/16/21 0835

Prep Batch: 81968

PFAS Prep by ID - PFAS Aqueous Preparation

Start Date: 02/05/2021 1201

End Date: 02/05/2021 1530

Conc Analyst: ALM

Conc Start Date: 02/05/2021 1530

Conc End Date: 02/05/2021 1530

Surrogate: SVLC-1326

Surrogate Vol. (mL): 0.110

Ext Solvent: MECH>96%/MECH/4%/H2O

Reagents Vol. (mL): 10

Chem ID: 20-2857>20-2857/21-252

Balance ID: Balance # 20-1123

Sample ID	QC Code	Client Sample ID	Run	Analysis Method	Container + Sample (g)	Container Empty (g)	Initial Vol. (mL)	Spike ID	Spike Vol. (mL)	Final Vol. (mL)	Comments
WQ81968-001	MB		1	PFAS by ID SOP	310.93	31.23	280		0.000	10.0	Init: 310.93g; Final: 31.23g
WQ81968-002	LCS		1	PFAS by ID SOP	307.37	31.56	276	SVLC-1327	0.200	10.0	Init: 307.37g; Final: 31.56g
WA28027-005	Sample	HS-PW-3.5 (A)	1	PFAS by ID SOP	307.94	31.4	277		0.000	10.0	Sorbent dry start/end:1431/1436;Buffer:SV21-384;Amm+MeOH:SV21-385(4mL);QC Water:21-252;
WA28027-005MS	MS	HS-PW-3.5 (A)MS	1	PFAS by ID SOP	316.99	33.26	284	SVLC-1327	0.200	10.0	NCM47724
WA28027-005MD	MSD	HS-PW-3.5 (A)MD	1	PFAS by ID SOP	302.37	31.62	271	SVLC-1327	0.200	10.0	NCM47724
WA28027-006	Sample	FB-1/26	1	PFAS by ID SOP	303.36	33.1	270		0.000	10.0	Bottletop#:329;Pipettes:383,20-2315;QC Bottles:M0-322-01BB;XL-AW: 20-2827;Reservoirs:20-2623;
WA28027-007	Sample	EB-HT	1	PFAS by ID SOP	279.5	32.9	247		0.000	10.0	Filter cartridges: 21-254; Elution tubes:20-1843;Storage bottles:20-2828;
WA28028-001	Sample	354-0	1	PFAS by ID SOP	272.66	32.43	240		0.000	10.0	MeOHExt:4mL,Filt:2mL;IS:SVLC-1303(0.010mL); ASV/Caps:21-208/21-207;
WA28028-002	Sample	358-0	1	PFAS by ID SOP	265.27	32.06	233		0.000	10.0	
WA28028-003	Sample	359-0	1	PFAS by ID SOP	298.83	32.99	266		0.000	10.0	
WA28028-004	Sample	381-0	1	PFAS by ID SOP	289.41	32.44	257		0.000	10.0	
WB03053-001	Sample	GTW-3	1	PFAS by ID SOP	273.73	32.94	241		0.000	10.0	

(end of report) **Total Samples: 8**

SECTION 4

CASE NARRATIVE AND CHAIN-OF-CUSTODY RECORD

Sample Summary

GZA GeoEnvironmental, Inc.

Lot Number: WA28027

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	HS-PW-2.5 (A)	Aqueous	01/26/2021 1130	01/28/2021
002	HS-PW-2.5 (B)	Aqueous	01/26/2021 1215	01/28/2021
003	HS-PW-3 (A)	Aqueous	01/26/2021 1430	01/28/2021
004	HS-PW-3 (A) DUP	Aqueous	01/26/2021 1430	01/28/2021
005	HS-PW-3.5 (A)	Aqueous	01/26/2021 1540	01/28/2021
006	FB-1/26	Aqueous	01/26/2021 1550	01/28/2021
007	EB-HT	Aqueous	01/26/2021 1705	01/28/2021

(7 samples)

Case Narrative
GZA GeoEnvironmental, Inc.
Lot Number: WA28027

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Pace Project Manager listed on the cover page.

Due to a spiking error, the WA28027-005 Matrix Spike and Matrix Spike Duplicate (MS/MSD) were double-spiked with the EIS and Surrogate standard, affecting the recoveries. There was insufficient sample remaining to perform a re-extraction; therefore, the data have been reported and qualified. Parent sample WA28027-005 was correctly spiked.

double spike confirmed. MS/MSD not used to qualify data as the parent had acceptable "surrogate" recoveries

REVISED REPORT - February 11, 2021
A revised report was issued. The following PFAS note below was added to the Case Narrative page.

All other sample results are as reported in the original PDF report. This report supersedes and replaces any prior reports issued under this lot number.

PFAS – by Isotope Dilution

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the Pace Quality Assurance Management Plan (QAMP), applicable Shealy standard operating procedures (SOPs), the 2003 NELAC standard, and Shealy policies. Additionally, the DoD QSM version 5.3 has been followed for these samples, and specifically Table B-15 was followed for all PFAS samples. Any exceptions to the QAMP, SOPs, NELAC standards, the DoD QSM, or policies are qualified on the results page or discussed below.

All QC associated with these samples was in compliance with DOD QSM 5.3 table B-15 and our PFAS SOP.

Correction factors (CF) are used to calculate the original sample concentration. The CF is the inverse of the concentration factor (sample volume / extract final volume) times the dilution factor (DF). For undiluted analysis. For undiluted analysis, the extract is prepared for injection by adding 182 uL of

sample extract + 8 uL of reagent water + 10 uL of internal standard solution to a polypropylene autosampler vial. An extra correction factor of 0.91 (182 uL / 200 uL = 0.91) applies. The CF is calculated as follows:

CF = DF * FV / Vo

FV is volume of extract (mL)
Vo is initial sample volume (mL)
DF is dilution factor. For undiluted analysis, DF = 1/0.91.

Sample concentration for aqueous samples:
Concentration (ng/L) = Cs*CF,

$$C_s = \frac{\left(\frac{(A_s x C_{is})}{A_{is}}\right) - B}{M1}$$

Where

C_s is on column concentration of target analyte in the sample (ng/L)
C_{is} is concentration of internal standard in the sample (ng/L)
A_s is peak response of target analyte in the sample
A_{is} is peak response of internal standard in the sample
M1 is the average RF from ICAL or the slope from linear regression ICAL
B is the y-intercept from the ICAL

SHEALY

Chain of Custody Record

Shealy Environmental Services, Inc.
106 Vantage Point Drive
West Columbia, South Carolina 29172
Telephone No. (803) 791-9700 Fax No. (803) 791-9111
www.shealylab.com

Number

Client: **Rose and Westra / GZA**	Report to Contact: Lori Powers	Telephone No. / E-mail: 616-956-6123 loretta.powers@gza.com	Quote No.
Address: 601 Fifth Street NW, Suite 102	Sampler's Signature: X [signature] Printed Name: Makayla Myers	Analysis (Attach list if more space is needed)	Page 1 of 1
City: Grand Rapids; State: MI; Zip Code: 49504			
Project Name: 16.0062961.51 T1			
Project Number: 16.0062961.51 T1; P.O No.			

WA28027

KL02

Sample ID / Description (Containers for each sample may be combined on one line)	Date	Time	G=Grab C=Composite	Matrix: Aqueous	Solid	Non-Aqueous		No of Containers by Preservative Type: Unpres	H2SO4	HNO3	HCl	NaOH	H2O	MeOH	PFAS									Remarks / Cooler I.D.
HS-PW-2.5(A)	1/26/2021	11:30	G	x				2							x									
HS-PW-2.5(B)	1/26/2021	12:15	G	x				2							x									
HS-PW-3(A)	1/26/2021	14:30	G	x				2							x									
HS-PW-3(A) DUP	1/26/2021	14:30	G	x				2							x									
HS-PW-3.5(A)	1/26/2021	15:40	G	x				2							x									
HS-PW-3.5(A) MD/MSD	1/26/2021	15:40	G	x				2							x									
FB-1/26	1/26/2021	15:50	G	x				2							x									
EB-HT	1/26/2021	17:05	G	x				2							x									

Turn Around Time Required (Prior lab approval required for expedited TAT): ☐ Standard ☒ Rush (Please Specify) 2 week

Sample Disposal: ☐ Return to Client ☒ Disposal by Lab

Possible Hazard Identification (List any known hazards in the remarks): ☒ Non-Hazardous ☐ Flammable ☐ Skin Irritant ☐ SDS provided ☐ Unknown

QC Requirements

	Date	Time		Date	Time
1. Relinquished by: Makayla Myers	1/27/2021	12:00	1. Received by		
2. Relinquished by			2. Received by		
3. Relinquished by			3. Received by		
4. Relinquished by: FedEx	1/28/21	0930	4. Laboratory Received by: [signature]	1/28/21	0930

Note: All samples are retained for four weeks from receipt unless other arrangements are made.

LAB USE ONLY
Received on Ice (Check) ☒ Y ☐ N ☐ Ice Pack

Receipt Temp. 1.8 °C

Document Number: ME002OW-01

Pace Analytical

Samples Receipt Checklist (SRC) (ME0018C-15)
Issuing Authority: Pace ENV - WCOL

Revised:9/29/2020
Page 1 of 1

Sample Receipt Checklist (SRC)

Client: GZA Cooler Inspected by/date: JSH / 01/28/2021 Lot #: WA28027

Means of receipt: ☐ Pace ☐ Client ☐ UPS ☑ FedEx ☐ Other: ____

☑ Yes	☐ No		1. Were custody seals present on the cooler?
☑ Yes	☐ No	☐ NA	2. If custody seals were present, were they intact and unbroken?

pH Strip ID: NA Chlorine Strip ID: NA Tested by: NA

Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Snap-Cup ID: NA

1.8 / 1.8 °C NA / NA °C NA / NA °C NA / NA °C

Method: ☑ Temperature Blank ☐ Against Bottles IR Gun ID: 5 IR Gun Correction Factor: 0 °C

Method of coolant: ☑ Wet Ice ☐ Ice Packs ☐ Dry Ice ☐ None

☐ Yes	☐ No	☑ NA	3. If temperature of any cooler exceeded 6.0°C, was Project Manager Notified? PM was Notified by: phone / email / face-to-face (circle one).
☑ Yes	☐ No	☐ NA	4. Is the commercial courier's packing slip attached to this form?
☑ Yes	☐ No		5. Were proper custody procedures (relinquished/received) followed?
☑ Yes	☐ No		6. Were sample IDs listed on the COC?
☑ Yes	☐ No		7. Were sample IDs listed on all sample containers?
☑ Yes	☐ No		8. Was collection date & time listed on the COC?
☑ Yes	☐ No		9. Was collection date & time listed on all sample containers?
☑ Yes	☐ No		10. Did all container label information (ID, date, time) agree with the COC?
☑ Yes	☐ No		11. Were tests to be performed listed on the COC?
☑ Yes	☐ No		12. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)? ____
☑ Yes	☐ No		13. Was adequate sample volume available?
☑ Yes	☐ No		14. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
☐ Yes	☑ No		15. Were any samples containers missing/excess (circle one) samples Not listed on COC?
☐ Yes	☐ No	☑ NA	16. For VOA and RSK-175 samples, were bubbles present >"pea-size" (¼"or 6mm in diameter) in any of the VOA vials?
☐ Yes	☐ No	☑ NA	17. Were all DRO/metals/nutrient samples received at a pH of < 2?
☐ Yes	☐ No	☑ NA	18. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
☐ Yes	☐ No	☑ NA	19. Were all applicable NH_3/TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
☐ Yes	☐ No	☑ NA	20. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc…) correctly transcribed from the COC into the comment section in LIMS?
☐ Yes	☑ No		21. Was the quote number listed on the container label? If yes, Quote # NA

Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)

Sample(s) NA ____ were received incorrectly preserved and were adjusted accordingly in sample receiving with NA mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # NA.
Time of preservation NA. If more than one preservative is needed, please note in the comments below.

Sample(s) NA ____ were received with bubbles >6 mm in diameter.

Samples(s) NA ____ were received with TRC > 0.5 mg/L (If #19 is ***no***) and were adjusted accordingly in sample receiving with sodium thiosulfate ($Na_2S_2O_3$) with Shealy ID: NA.

SR barcode labels applied by: KHS Date: 01/28/2021

Comments:

SECTION 5

PROJECT CORRESPONDENCE

From:	Karen Coonan
To:	Jared K. Acker; Katherine McDonald
Cc:	Meg Michell; David Blye
Subject:	RE: Pace SC / GZA requests for VI10034,VJ29012,WA28027
Date:	Wednesday, May 26, 2021 2:49:37 PM
Attachments:	image001.png image002.png image003.png VJ29012_Report (1).pdf VI10034_Report.pdf

This sender is trusted.

Hi Jared,

I have attached a revised Level 2 report for VJ29012 and VI10034. The Level IVs are in the process of being revised to include the attached Level 2 reports. As soon as those are completed, I will forward to you.

For VJ29012, the COC was revised to reflect the correct preservative.

For VI10034, a note has been added to the Case Narrative page regarding the VI10034-001DU and VI10034-005MS.

For WA28027 – We no longer supply Internal Standard summary sheets (Form 8) for the Isotope Dilution (ID) methods (ID-AQ and ID-Solid) as they are not required by the methods (QSM Table B-15 or Wisconsin guidance); they are not used in the calculation of PFAS by ID. We only provide Form 8 for EPA 537.1 and 533.

Thank you,

Karen Coonan
Project Manager | Pace South Carolina
formerly Shealy Environmental Services, Inc.
106 Vantage Point Drive, West Columbia, SC 29172
office: 803.509.8398 | main: 803.791.9700 X106 | pacelabs.com

Pace Analytical®

From: Karen Coonan
Sent: Monday, May 17, 2021 12:20 PM
To: 'Jared K. Acker' <jacker@envstd.com>; Katherine McDonald <Katherine.McDonald@gza.com>
Cc: Meg Michell <mmichell@envstd.com>; David Blye <DBLYE@envstd.com>; Mike McFadden <mcflylab@aol.com>; Dan Wright <Dan.Wright@pacelabs.com>
Subject: RE: Pace SC / GZA requests for VI10034,VJ29012,WA28027

Hi Jared,

For WA28027, the revision to the report was that the "PFAS – by Isotope Dilution" note that was added to the Case Narrative. It is the note following the statement that is bold. The note pertains to the correction factor.

For the other requests below, I have asked the lab to look into these and provide the requested information. I will forward the information as soon as I receive it.

Thank you,

Karen Coonan
Project Manager | Pace South Carolina
formerly Shealy Environmental Services, Inc.
106 Vantage Point Drive, West Columbia, SC 29172
office: 803.509.8398 | main: 803.791.9700 X106 | pacelabs.com

---

From: Jared K. Acker <jacker@envstd.com>
Sent: Monday, May 17, 2021 11:59 AM
To: Karen Coonan <Karen.Coonan@pacelabs.com>; Katherine McDonald <Katherine.McDonald@gza.com>
Cc: Meg Michell <mmichell@envstd.com>; David Blye <DBLYE@envstd.com>; Mike McFadden <mcflylab@aol.com>; Dan Wright <Dan.Wright@pacelabs.com>
Subject: Pace SC / GZA requests for VI10034,VJ29012,WA28027

CAUTION: This email originated from outside Pace Analytical. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good afternoon all, we have some requests for both the laboratory and GZA for a few items in SDGs VI10034, VJ29012, WA28027. Can these please be addressed and revised data packages issued?

VI10034 – Samples VI10034-001DU and VI10034-005 each had a failing pre-injection internal standard, the run log indicated they were to be re-ran. Can details of these failures be noted in the Case Narrative (if the samples were re-ran and confirmed the failure, ect) as it is a method deviation?

VJ29012 – Page 2 of the Chain of Custody indicated water preservation instead of Trizma, this appears to be in error; can this be confirmed and a revised CoC issued?

WA28027 –

1. A pre-injection internal standard summary form was not included. Historically this was provided for 537ID in the old data package format. Can this please be provided?
2. The Case Narrative includes language about the report being revised with a note added. However, I'm not seeing a note indicating a reason for the revision, only language about the repot superseding prior reports. Can this be checked or explained?

Thanks everyone

Jared Acker
Staff Chemist III
Environmental Standards, Inc.
1140 Valley Forge Road • PO Box 810 • Valley Forge, PA 19482
610.935.5577 x403 • www.envstd.com • jacker@envstd.com

Emergency Response Quality Assurance Hotline: 855.374.7272



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GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
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