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Subject:
Combined Second Quarter 2017 Investigation Workplan
RACER Trust, Plants 2 and 3, Lansing, Michigan

Date:
March 24, 2017

Contact:
Patrick Curry

Phone:
810-225-1926

Email:
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Our ref:
B0064479.2017
B0064480.2017

Dear Mr. Quackenbush:

This work plan has been prepared by Arcadis on behalf of the Revitalizing Auto Communities Environmental Response (RACER) Trust for Plants 2 and 3 located in Lansing, Michigan (Site). This work plan describes the field activities proposed for the second quarter of 2017 including:

- Plant 3 PFAS Investigation - Delineation of poly- and perfluoral alkyl substances (PFAS) on Plant 3.
- Plant 2 LNAPL Area 1,4-Dioxane Investigation - Evaluation 1,4-dioxane potentially present within the Plant 2 light non-aqueous phase liquid (LNAPL) area.
- Monitoring Well Installation - Abandon and replacement of bedrock monitoring well MW-12-05. Installation of additional bedrock monitoring well along the western Plant 2 property boundary. Installation of an additional weathered bedrock well east of the Plant 2 LNAPL area.

UTILITY CLEARANCE

Prior to advancing borings at the Site, utility clearance will be completed for all proposed locations. Reliable lines of evidence that may be utilized in accordance with the site-specific utility

clearance plan include: Miss Dig call, client provided maps of utilities, visual site inspection, and/or hand clearing to a depth of 5 feet below grade.

PLANT 3 PFAS INVESTIGATION

In December 2016, Arcadis conducted groundwater sampling at four locations to evaluate the potential PFAS associated with the former chromium plating operations at RACER Lansing Plant 3. Groundwater samples were collected from two perched groundwater monitoring wells (CH-14-RO and P3-SB-07), and two deep overburden wells (MW-91-2 and MW-13-41). Arcadis identified the following exceedances of 2016 proposed MDEQ Part 201 Drinking Water (DW) and Groundwater-Surface Water Interface (GSI) Criteria:

- CH-14-RO – a perched monitoring well near the plating line, historically impacted with hexavalent chromium. PFOS was detected at a concentration of 13,000 nanograms per liter (ng/L) exceeding both the DW Criteria of 80 ng/L and GSI Criteria of 12 ng/L. PFOA was detected at 190 ng/L, exceeding the DW Criteria of 89 ng/L.

- P3-SB-07 - located in the perched zone near the former plating area. PFOS was detected at 25 ng/L which exceeds the proposed GSI criterion.

Low concentrations of various PFAS, below the proposed criteria, were detected in deep overburden monitoring wells MW-91-2 and MW-13-41. Results of the December 2016 PFAS sampling are included as **Attachment 1**.

The objectives of the proposed PFAS investigation are as follows:

1. Evaluate the extent of PFAS in perched water near the former plating line and determine whether a French drain and backfilled excavation are a potential migration pathway.
2. Evaluate the shallow hydrogeology of Area 14 and the potential connection to sand seams west of former plating line.
3. Determine whether PFAS is present in vadose zone soils near the former plating area.
4. Evaluate the GSI pathway via storm water discharge.

Scope of Work

The PFAS investigation scope of work was developed given the above objectives and the intended use of the data. The proposed soil borings and existing monitoring well locations are depicted on **Figure 1**. For reference, **Attachment 1** includes a figure and table showing groundwater analytical data from the December 2016 PFAS sampling. The scope of work for the Plant 3 PFAS investigation will include:

- Ten (10) soil borings will be advanced in Area 14 of Plant 3 to delineate PFAS impacts identified during December 2016 groundwater sampling.
    - Five (5) of the borings will be advanced along the length of the french drain, extending north and south of monitoring well CH-14-RO and evaluate the potential for the drain and associated excavation to act as a preferential pathway for migration.
    - One (1) boring will be advanced due west of CH-14-RO,
    - Four (4) borings will be completed around monitoring well P3-SB-07 to evaluate the extent of PFAS impacts in this area and the potential connection to the former plating line.
- Soil borings will be completed to a max depth of 20 feet bgs, which will be sufficient to penetrate the fill material near the former plating area, as well as target sand seams located to the west of the plating area.
    - One (1), and potentially two (2), vertical aquifer profile (VAP) groundwater samples will be collected at each borehole, depending on saturated thickness and/or sand seams encountered.
    - Three soil samples will be collected from the three soil borings closest to monitoring well CH-14-RO to evaluate the potential for PFAS mass within vadose zone soils. Soil sample intervals will be selected based on field observations of potential impacts (discoloration or odor), or located immediately underneath the fill material.
- If a suitable interval cannot be identified at a boring location, up to two (2) contingency soil borings are included as potential step outs to identify perched water.
- Two (2) existing perched monitoring wells (UNK-09 and LMW-12-09) located east of the former plating area will be sampled to provide additional delineation.
- Three (3) existing deep overburden monitoring wells (MW-02-02(3), MW-02-03(3), and MW-02-04(3)) located downgradient of Area 14 will be sampled to confirm that PFAS is not impacting the deep overburden.
- A stormsewer sample will be collected from the Plant 3 outfall at P3-MH-NE to evaluate potential off-site GSI.

Soil and groundwater samples will be shipped to Test America Laboratories, Inc. in Sacramento, California (Test America) for PFAS analysis by LC-MS/MS with isotope dilution by modified US EPA Method 537. Sampling bottles will be provided by the laboratory. The standard list of 17 compounds included in the analysis is included as **Attachment 2**. Due to the ubiquitous nature of PFAS in everyday materials, numerous precautions must be taken during sample collection to prevent the potential for cross-contamination. The PFAS sample collection field procedures, as well as a field checklist are included as **Attachment 3**. The field checklist will be provided to the sampling team to help insure the chance of cross-contamination is minimized.

Soil borings for the PFAS investigation will be advanced using direct push drilling methods using a dual-tube setup that utilizes an outer 2.25” casing. Continuous soil cores will be obtained from the ground surface to glacial till below the perched zone (up to 20 feet bgs) at each boring

location. Where groundwater is encountered, a retractable stainless steel screen, or one inch diameter polyvinyl chloride (PVC) temporary well will be deployed to collect the sample. Arcadis will log and describe the overburden in accordance with the Arcadis Soil Description Standard Operating Procedures included with the MDEQ approved Field Sampling Plan (FSP, Arcadis 2011).

PLANT 2 LNAPL AREA 1,4-DIOXANE INVESTIGATION

The results of the lower 1,4-dioxane toe investigations (Arcadis 2016a, 2016b, 2017a) suggest that although some comingling may occur with the main Plant 3 plume, the 1,4-dioxane mass in weathered bedrock beneath the Plant 2 LNAPL area appears primarily related to leakage from the perched zone. However, 1,4-dioxane has not been directly observed in perched soil samples within the LNAPL plume due to elevated detection limits associated with high concentrations of 1,1,1-Trichloroethane (TCA) and other VOCs. It is not known, therefore, whether 1,4-dioxane is still present and leachable from LNAPL impacted soils.

The 1,4-dioxane leachability investigation is proposed to complete the following objectives:

1. Determine if leachate analysis can be used to evaluate the Plant 2 LNAPL zone for the presence of 1,4-dioxane, and if so

2. Determine if 1,4-dioxane is present in the LNAPL impacted soils and potentially co-located with TCA impacts in the Plant 2 LNAPL area.

Scope of Work

The proposed soil boring locations within the Plant 2 LNAPL plume are shown on **Figure 2**. The scope of work will include completion of five (5) soil borings:

- Soil borings will be completed to a depth consistent with glacial till located below LNAPL impacts (up to 25 feet bgs) at locations where elevated TCA has been observed previously and locations within the LNAPL footprint. At each location, the following will be completed:
    - Collection of up to two (2) soil samples from the LNAPL impacted zone.
        - If a second discreet perched LNAPL zone is encountered (i.e. deeper LNAPL zone), then 1-2 additional soil samples will be collected.
    - One (1) additional soil sample will be collected from the glacial till below the perched LNAPL zone.

  - If a saturated sand zone is encountered below the LNAPL impacted zone and appears suitable for sampling, one (1) VAP sample will be collected per boring.

- Soil samples will be submitted to Merit Analytical Laboratory (Merit) in East Lansing, Michigan for the following analyses:

  - VOCs (USEPA Method 8260) and 1,4-dioxane (USEPA Method 8260SIM).

  - Synthetic Precipitation Leaching Procedure (SPLP) testing for 1,4-dioxane (USEPA Methods 1312/8260SIM).

- If collected, groundwater samples will be submitted to Merit for analysis of

  - VOCs (USEPA Method 8260) and 1,4-dioxane (USEPA Method 8260SIM).

Direct push drilling methods will be utilized for the Plant 2 1,4-dioxane source area scope of work generally consistent with the drilling methods described above as part of the PFAS investigation. Each soil sample will be collected using a clean, disposable, gas-tight syringe in a manner consistent with United States Environmental Protection Agency (USEPA) Method 5035 sampling protocols. The samples will be extruded into individual laboratory prepared pre-weighed 40-milliliter (mL) vials containing methanol preservative and be submitted to Merit Laboratories for analysis of VOCs and 1,4-dioxane. A split sample from each interval will be collected from the core immediately adjacent to the VOC sample location using a 25-gram EnCore® Sampler and submitted to Merit for SPLP.

Where a saturated zone is encountered below the LNAPL impacted zone, a retractable stainless steel screen, or one inch diameter polyvinyl chloride (PVC) temporary well will be deployed to collect a groundwater sample.

Due to the high concentrations of VOCs, and the potential presence of LNAPL in the soil matrix, it is anticipated that analytical detection limits for soil will be elevated and 1,4-dioxane may not be observed, consistent with previous investigations. Similarly, it is uncertain what effect the potentially high concentrations of VOCs and LNAPL will have on the SPLP sample results. It is possible the 1,4-dioxane SPLP detection limits will be similarly elevated if large concentrations of other VOCs or LNAPL leach during the tumbling process. This scope of work is designed as a first step to validate the SPLP sampling approach and determine if this this process can be used to further evaluate the Plant 2 1,4-dioxane source mass, if necessary.

Note: As of this submittal, Arcadis is evaluating other options for 1,4-dioxane and SPLP analysis. If another option is identified that may provide advantages over standard SPLP, Arcadis will provide the MDEQ an addendum outlining proposed changes to this workplan.

PLANT 2 MONITORING WELL INSTALLTION

Bedrock monitoring well MW-12-05 is located in the central portion Plant 2 west of the Plant 2 LNAPL and installed below the lower 1,4-dioxane plume. Monitoring well MW-12-05 was installed before the lower 1,4-dioxane plume was identified during an initial round of bedrock assessment completed in 2012. The well is constructed with an open borehole from 75 to 99 feet below ground surface (bgs) and a 4-inch diameter steel casing cemented in place from the surface to 75 feet bgs. Subsequent characterization of the lower 1,4-dioxane at Plant 2 suggests that in many areas, the weathered zone and associated 1,4-dioxane impacts can extend to depths of up to 80 feet bgs. Therefore, the open borehole of MW-12-05 appears to intersect both the weathered bedrock and consolidated bedrock. Well MW-12-05 is the only bedrock well at the site with detections of 1,4-dioxane and is likely receiving 1,4-dioxane from the overlying weathered bedrock zone.

Also, in response to MDEQ concerns, an additional weathered bedrock monitoring well will be installed east of the Plant 2 LNAPL area to strengthen the sentinel network used to monitor the lower 1,4-dioxane plume.

Further, a bedrock well will be installed along the western Plant 2 property boundary near Rosemary and Genesee Streets to fill a perceived data gap in the bedrock monitoring network, and provide an additional data point between the Site and the Lansing Township municipal wells.

The goals of the abandonment and well installation activities are as follows:

1. Eliminate potential migration of 1,4-dioxane from the weathered zone into the consolidated bedrock.

2. Provide a monitoring point below the lower 1,4-dioxane plume representative of consolidated bedrock.

3. Provide a weathered bedrock monitoring point east of the Plant 2 LNAPL area to further monitor lower 1,4-dioxane plume stability.

4. Provide a bedrock monitoring point along the western property boundary to act as a sentinel between the lower 1,4-dioxane plume and township well TWP-90-3 to the west.

Scope of Work

The proposed monitoring well locations are shown on **Figure 3**. The scope of work will include:

- Abandonment of bedrock monitoring well MW-12-05.

- Installation of bedrock monitoring well MW-12-05R 20 to 30 feet north of MW-12-05.

- Installation of a weathered bedrock monitoring well MW-17-86 east of the northeast lobe of the lower 1,4-dioxane plume.

- Installation of bedrock monitoring well MW-17-87 along to western property boundary.

The new wells will be incorporated into the current Interim Groundwater Monitoring Plan (Arcadis 2017b) and sampled as part of the second quarter 2017sampling event, if available.

Well Abandonment

Bedrock monitoring well MW-12-05 will abandoned by pressure grouting the well through a tremie pipe from the bottom to ground surface. The grout used to abandon MW-12-05 will consist of neat cement containing no more than 5% bentonite. Following grout emplacement, the 4-inch diameter steel casing will be cut at least on foot below grade and the hole will be backfilled with concrete to a level consistent with the surrounding concrete pad.

Drilling and Well Construction

Monitoring wells will be installed using rotary-sonic drilling methods as well as rock coring for replacement bedrock well MW-12-05R. Continuous soil cores will be obtained from the ground surface to the bedrock (up to 80 feet bgs) at each boring location. Bedrock core will be collected from the open borehole interval of MW-12-05R (approximately 100 to 110 feet bgs). Arcadis will log and describe the overburden and bedrock in accordance with the Arcadis Soil Description Standard Operating Procedures included with the MDEQ approved Field Sampling Plan (FSP, Arcadis 2011). Boring logs will be generated based on the field descriptions.

Due to proximity to the Plant 2 LNAPL and perched impacts, bedrock monitoring well MW-12-05R will be installed using a “telescopic” approach to isolate each water bearing zone and prevent drag down or vertical migration. A temporary 10-inch diameter surface casing will be installed into the glacial till below the perched zone to isolate the perched zone during drilling. The 8-inch casing can then be advanced through the outer temporary casing to the consolidated rock (~100 ft bgs) where a 4” permanent steel casing will be cemented in place from competent rock to the surface. The 8-inch casing will be retracted as cement is added, followed by the 10-inch temporary casing. Once the cement has been allowed to cure for a minimum of 24 hours, the borehole will be completed using rotary rock coring to a target depth of approximately 110 feet bgs. Well MW-12-05R will be completed as an open borehole bedrock well. The 4-inch casing will be cut to approximately three feet above grade and fitted with a lockable cover. Bedrock monitoring well MW-17-87 will be installed following the same procedures as MW-12-05R except for installation of a temporary surface casing.

To the east of the Plant 2 LNAPL area, monitoring well MW-17-86 will be advanced 10 to 15 feet into the weathered bedrock and screened from approximately 72 to 77 feet bgs consistent with the depth of the nearest 1,4-dioxane detections in the weathered zone. The monitoring well will be constructed with a 5-foot stainless-steel wire-wrapped 0.010-slot screen and 2-inch PVC riser. An appropriate sand pack will be placed around the screen interval to a depth of 1-foot above the well screen followed by 1-2 feet of choker sand and then bentonite grout to grade.

Following installation, bedrock wells MW-12-05R and MW-17-87 will be developed using the rig and wench lines by cycling a surge block and pumping until at least the volume of water used for rock coring has been recovered and the well is reasonably free of fine grained material. Weathered bedrock well MW-17-86 will be developed by hand using a combination of purging and surging until reasonably free of fine grained material.

REPORTING

Following completion of the fieldwork, Arcadis will prepare a summary report outlining the results of the PFAS and LNAPL source investigations. It is anticipated this report can be completed within 4 to 6 weeks after receipt of the analytical results from Merit and Test America. The reports will include a brief discussion of the field activities, figures illustrating the results of the investigations, analytical summary tables, and attachments including laboratory analytical reports and any other relevant information.

Sampling of proposed weathered bedrock monitoring well MW-17-86, and proposed bedrock well MW-12-05R, as well as low-level 1,4-dioxane sampling of municipal wells will be completed during the annual groundwater sampling event near the beginning of the second quarter of 2017. A discussion of new monitoring wells will be included in the second quarter groundwater monitoring report, which also includes figures and summary tables of groundwater elevations and analytical results as outlined in the approved interim groundwater monitoring plan.

INVESTIGATION DERIVED WASTE (IDW) HANDLING

Soil cuttings and Liquid IDW (purge and decon water) will be placed in labeled and sealed 55-gallon steel drums and stored in a secured area. Liquid IDW will include water from decontamination of drilling tooling and purge water from VAP sampling and monitoring well development. If possible, an existing waste profile will be used for waste profiling, otherwise composite samples will be collected from IDW for permitting purposes.

SCHEDULE

The tentative scheduled start date for the PFAS investigation is April 3, 2017. The Plant 2 LNAPL source area investigation will immediately follow completion of the PFAS investigation. The

duration of the fieldwork is estimated to be four days for the PFAS investigation and two days for the LNAPL source area investigation.

The tentative scheduled start date for the monitoring well abandonment and installation activities is April 10, but is dependent upon the availability of the drilling rig. The estimated duration for this event is 6 to 8 days.

If you have any questions regarding the scope of work described above, please contact Patrick Curry (Arcadis) at 810-225-1926 or Dave Favero (RACER Trust) at 734-879-9525.

Sincerely,

ARCADIS of Michigan, LLC

Patrick Curry, PG, CPG
Principal Geologist

Copies:

Dave Favero, RACER Trust

Enclosures:

Figures

1 PFAS Investigation

2 LNAPL Investigation

3 Proposed Monitoring Well Locations

Attachments

1. December 2016 PFAS Sampling Results

2. Modified USEPA Method 537 Analyte List

3. PFAS Sample Collection Field Procedures and Sampling Checklist

References

Arcadis. 2016a. Lower 1,4-Dioxane Plume Toe Investigation. RACER Trust, Lansing, Michigan Plant 2. March 11.

Arcadis. 2016b. Supplemental Lower 1,4-Dioxane Toe Investigation Report. RACER Trust, Lansing, Michigan Plant 2. September 21.

Arcadis. 2017a. Lower 1,4-Dioxane Plume Northeast Lobe Investigation Report. RACER Trust, Lansing, Michigan Plant 2. February 3.

Arcadis. 2017b. Revised Interim Groundwater Monitoring Work Plan. RACER Trust, Lansing, Michigan Plants 2,3, & 6. January 30.

Figures

RACER TRUST
PLANTS 2, 3 & 6
LANSING, MICHIGAN

PFAS INVESTIGATION WORKPLAN

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FIGURE
1

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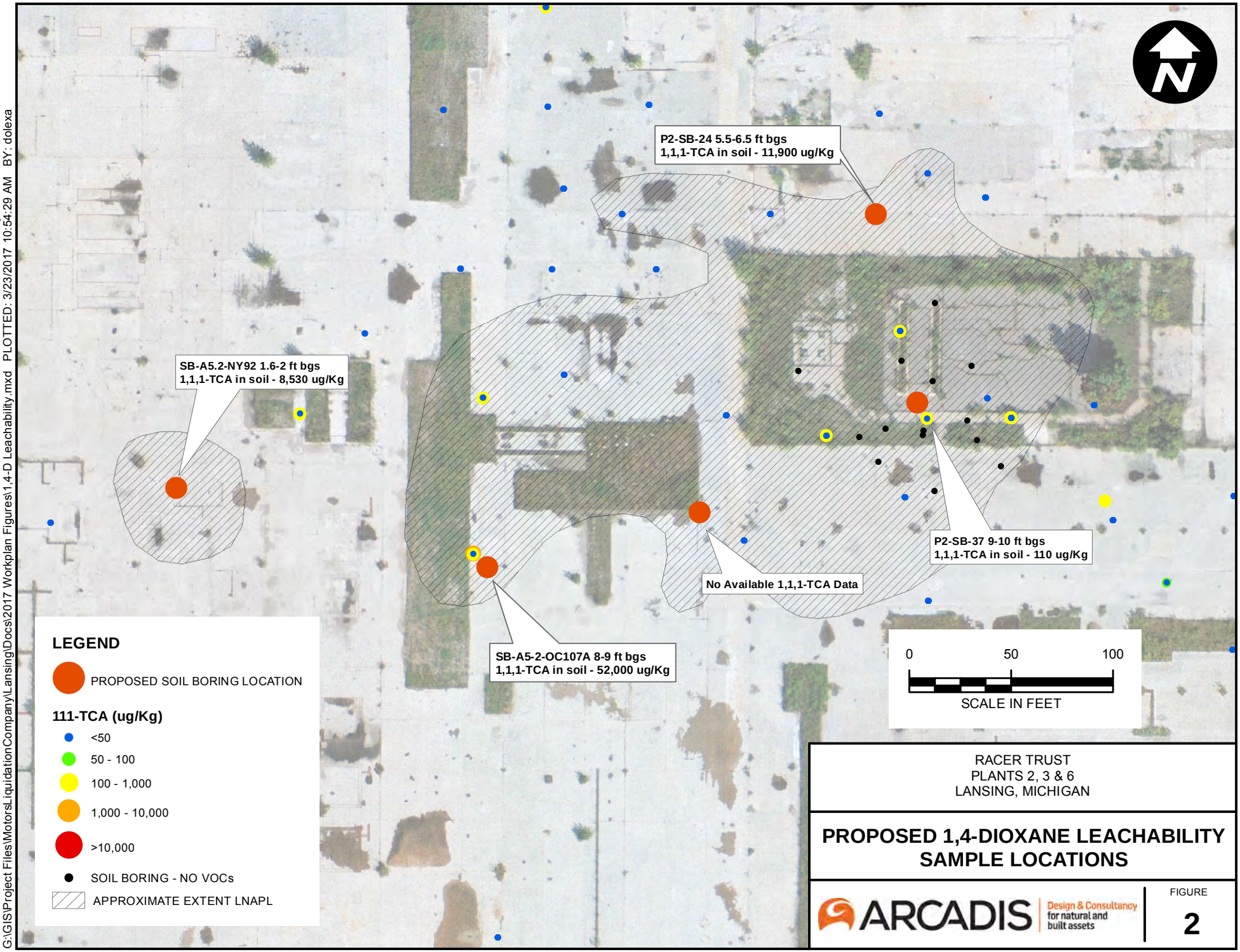

RACER TRUST
PLANTS 2, 3 & 6
LANSING, MICHIGAN

PROPOSED 1,4-DIOXANE LEACHABILITY SAMPLE LOCATIONS

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FIGURE
2

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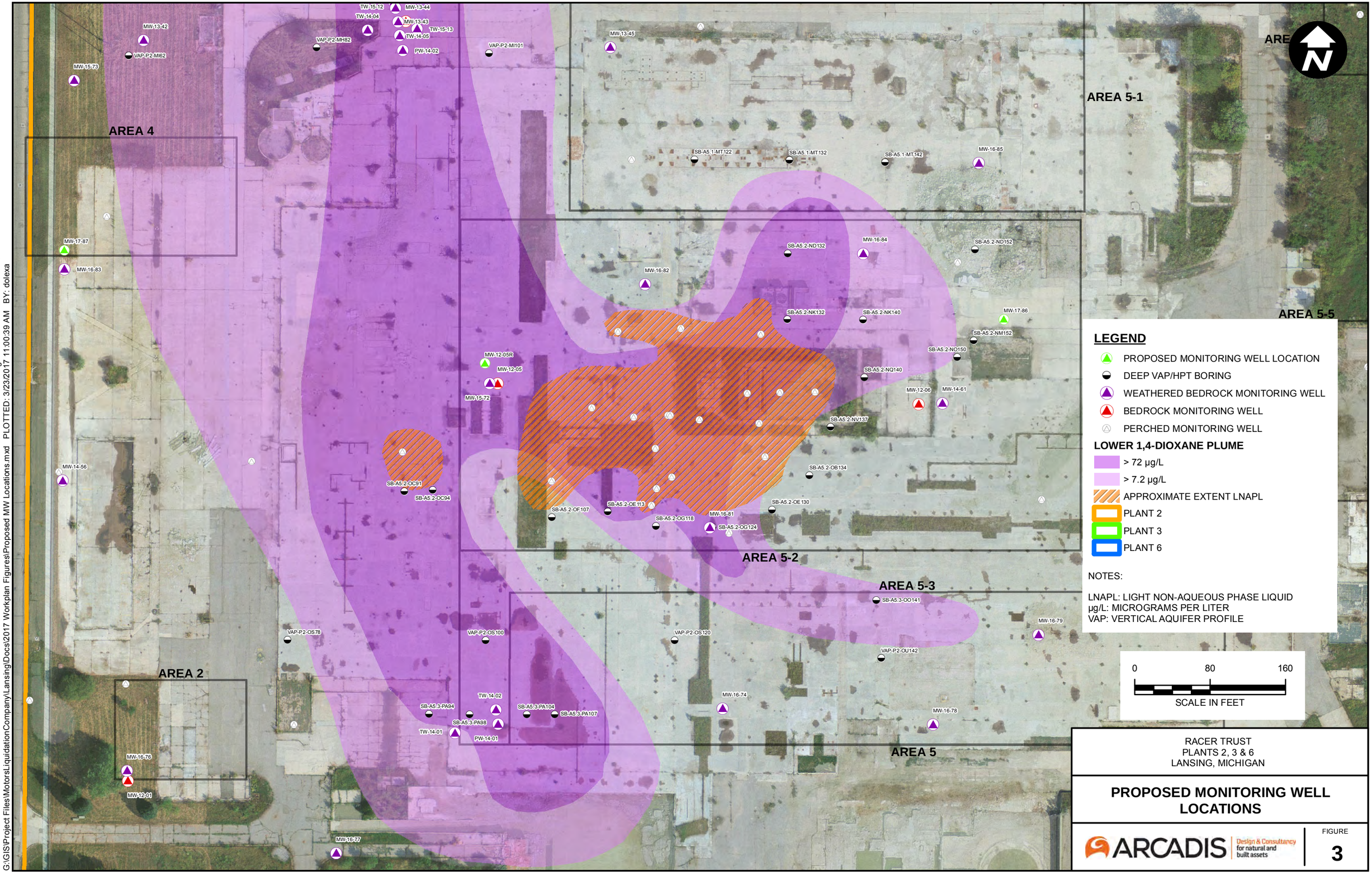

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RACER TRUST
PLANTS 2, 3 & 6
LANSING, MICHIGAN

PROPOSED MONITORING WELL LOCATIONS

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FIGURE
3

ATTACHMENT 1

December 2016 PFAS Sampling Results

RACER TRUST
PLANTS 2, 3 & 6
LANSING, MICHIGAN

PFAS SAMPLING RESULTS

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FIGURE
A1-1

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Table A-1
Summary of Poly- and Perfluorinated Alkyl Substances (PFAS) Analytical Data – December 2016
RACER Trust Plant 3 - Lansing, Michigan

Location ID: Date Collected: Sample Name:	Units	MI GW (DEQ2016) RES DW	MI GW (DEQ2016) GSI	CH-14-RO 12/15/16 CH-14-RO_12152016	MW-13-41 12/15/16 MW-13-41_121516	MW-91-2 12/15/16 MW-91-2_121516	P3-SB-07 12/16/16 P3-SB-07_121616	Equipment Blank 12/16/16 EB01_121616
Field								
Conductance, specific	umhos/cm	- -	- -	990	5,960	1,660	910	NA
Dissolved oxygen (DO)	mg/L	- -	- -	1.67	0.34	0.24	6.69	NA
Oxidation reduction potential (ORP), field	millivolts	- -	- -	211.1	-85.7	-74.6	172	NA
pH	s.u.	- -	- -	7.21	7.19	7.25	7.28	NA
Temperature, field	Deg C	- -	- -	3.2	10.2	4.4	3.2	NA
Turbidity (field)	NTU	- -	- -	0.32	79.3	1.35	7.37	NA
Poly- and Perfluorinated Compounds								
Perfluorobutanesulfonic acid (PFBS)	ng/L	- -	- -	190 [190]	3.2	1.9	2.6	<1.8
Perfluorobutanoic acid (PFBA)	ng/L	- -	- -	29 [26]	0.94 J	26	17	<1.8
Perfluorodecanesulfonic acid (PFDS)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	<1.9	<1.8
Perfluorodecanoic acid (PFDA)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	4.8	<1.8
Perfluorododecanoic acid (PFDoA)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	1.1 J	<1.8
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	- -	- -	240 [250]	<1.9	<1.8	1.4 J	<1.8
Perfluoroheptanoic acid (PFHpA)	ng/L	- -	- -	33 [34]	<1.9	<1.8	12	<1.8
Perfluorohexanesulfonic acid (PFHxS)	ng/L	- -	- -	2,500 [2,400]	1.4 J	1.8	7.7	<1.8
Perfluorohexanoic acid (PFHxA)	ng/L	- -	- -	72 [75]	5	1.3 J	24	<1.8
Perfluorononanoic acid (PFNA)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	1.7 J	<1.8
Perfluorooctane Sulfonamide (FOSA)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	1.8 J	<1.8
Perfluorooctanesulfonic acid (PFOS)	ng/L	80	12	**13,000 [14,000]** ab	<1.9	2.5	**25** b	<1.8
Perfluorooctanoic acid (PFOA)	ng/L	89	12,000	**190 [190]** a	<1.9	<1.8	19	<1.8
Perfluoropentanoic acid (PFPeA)	ng/L	- -	- -	31 [31]	3	<1.8	20	<1.8
Perfluorotetradecanoic acid (PFTeA)	ng/L	- -	- -	0.57 JB [0.62 JB]	0.54 JB	0.88 JB	0.67 JB	0.77 JB
Perfluorotridecanoic Acid (PFTriA)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	< 1.9	<1.8
Perfluoroundecanoic acid (PFUnA)	ng/L	- -	- -	<1.8 [<1.9]	<1.9	<1.8	0.71 J	<1.8
6:2 Flourotelemer Sulfonate (6:2 FTS)	ng/L	- -	- -	<19 H [<19 H]	<21 H	<20 H	<19 H	<19 H
8:2 Flourotelemer Sulfonate (8:2 FTS)	ng/L	- -	- -	<19 H [<19 H]	<21 H	<20 H	<19 H	<19 H

Notes:
Bold result denotes detection is above the laboratory reporting limit but below MDEQ Part 201 Generic Cleanup Criteria.
Gray shading denotes exceedances of one or more Proposed 2016 MDEQ Part 201 Generic Cleanup Criteria.
Data shown in brackets [ ] represent duplicate sample analytical results.
- - = Not listed in the MDEQ Criteria Tables.

Footnotes:
a - Sample exceeds Proposed MDEQ Residential Drinking Water Criteria
b - Sample exceeds Proposed Groundwater Surface Water Interface Criteria

Acronyms and Abbreviations:
B = Compounds also found in associated method blank.
Deg. C. - degrees Celsius
H = Sample was prepped or analyzed beyond the specified holding time.
J = Compound positively detected above laboratory method detection limit below the quantitative reporting limit. The value reported is an estimated concentration.
ng/L - nanograms per liter
mS/cm - milli Siemens per centimeter
NA - Not Analyzed
NTU - Nephelometric Turbidity Unit
s.u. - standard unit

See Notes on last page.

ATTACHMENT 2

Modified USEPA Method 537 Analyte List

Method 537 PFAS Analyte List

Analysis Group	Analyte Description	CAS Number	RL	MDL	Units
PFAS in Water- TA Sacramento	Perfluorobutanoic acid (PFBA)	375-22-4	2.00	0.458	ng/L
Standard List	Perfluoropentanoic acid (PFPeA)	2706-90-3	2.00	0.989	ng/L
Modified Method 537	Perfluorohexanoic acid (PFHxA)	307-24-4	2.00	0.786	ng/L
	Perfluoroheptanoic acid (PFHpA)	375-85-9	2.00	0.802	ng/L
	Perfluorooctanoic acid (PFOA)	335-67-1	2.00	0.748	ng/L
	Perfluorononanoic acid (PFNA)	375-95-1	2.00	0.654	ng/L
	Perfluorodecanoic acid (PFDA)	335-76-2	2.00	0.440	ng/L
	Perfluoroundecanoic acid (PFUnA)	2058-94-8	2.00	0.748	ng/L
	Perfluorododecanoic acid (PFDoA)	307-55-1	2.00	0.584	ng/L
	Perfluorotridecanoic Acid (PFTriA)	72629-94-8	2.00	0.551	ng/L
	Perfluorotetradecanoic acid (PFTeA)	376-06-7	2.00	0.199	ng/L
	Perfluorobutanesulfonic acid (PFBS)	375-73-5	2.00	0.918	ng/L
	Perfluorohexanesulfonic acid (PFHxS)	355-46-4	2.00	0.870	ng/L
	Perfluoroheptanesulfonic Acid (PFHpS)	375-92-8	2.00	0.713	ng/L
	Perfluorooctanesulfonic acid (PFOS)	1763-23-1	2.00	1.28	ng/L
	Perfluorodecanesulfonic acid (PFDS)	335-77-3	2.00	1.21	ng/L
	Perfluorooctane Sulfonamide (FOSA)	754-91-6	2.00	0.638	ng/L

ATTACHMENT 3

PFAS Sample Collection Procedures and Sampling Checklist

Attachment 3 - PFAS Sample Collection Field Procedures and Sampling Checklist

Sampling for PFAS can present unique challenges to field sampling protocols as PFAS can be found in materials such as Teflon tape, pump bladders, and water and oil resistant gear. While most of these materials will not present a large source of contamination of PFAS, they should be avoided since analytical method detection limits are low (i.e. part per trillion). A field checklist, included in this attachment, is provided to the sampling team to help insure the chance of cross-contamination is minimized. The following procedures will be used when collecting samples for PFAS:

- Sampling equipment will not include anything is Teflon coated or otherwise noted to be organic resistant or non-stick.
- VAP, storm water, and perched monitoring well samples will be collected using a peristaltic pump.
- Storm water will be collected during normal flow conditions.
- Samples from deep monitoring wells (>25 feet below grade) will be collected using a Teflon free bladder pump.
- Sampling equipment will be decontaminated in between each sample using a distilled water and tri-sodium phosphate (TSP) mix, followed by a distilled water rinse, a rinse with laboratory certified PFAS free water, and a methanol rinse.
- Low flow sampling procedures will be used to collect the groundwater samples. Samples will be collected near the surface of the water column in the well once low-flow purging is complete. VAP intervals commonly do not produce sufficient water for low flow sampling, in which case the VAP interval will be purged dry and sampled upon recharge.
- Efforts will be made to minimize turbidity in groundwater samples. Samples will not be filtered.
- Labeling of sample bottles will be completed only when the sample bottle is closed.
- Samples will be collected in laboratory supplied containers and stored in a cooler with ice at 4° C for transport to the laboratory.
- QA/QC sampling will consist of:
    - One duplicate per every 10 soil or groundwater samples.
    - One equipment blank from the decontaminated bladder pump (using laboratory certified PFAS free water).

PFAS Sampling Checklist

Date: _____

Weather (*temp./precipitation*): _____ Site Name: _____

Field Staff On Site:

Field personnel:

- ☐ No clothing or boots containing Gore-Tex or other stain resistant performance wear.
- ☐ All safety boots made from polyurethane and PVC
- ☐ No materials containing Tyvek.
- ☐ Field crew has avoided use of all non-medically necessary personal care products this morning.

Field Equipment:

- ☐ No Teflon® or organic resistant materials near PFAS sampling equipment.
- ☐ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene.
- ☐ No waterproof field books on-site.
- ☐ Coolers filled with regular ice only. No chemical (blue) ice packs.
- ☐ "PFC-free" or "PFAS-free" water and methanol on-site for decontamination of sample equipment.

Sample Containers:

- ☐ All sample containers made of HDPE.
- ☐ Sample caps are unlined and made of HDE.
- ☐ Bottles are only labeled when they are closed.

Wet Weather (as applicable):

- ☐ Wet weather gear made of polyurethane and PVC only

Food & Drinks:

- ☐ Food should only be eaten away from sampling area and if possible, offsite. Hands should be washed after eating before returning to field work.
- ☐ Drinks should be kept away from sampling locations.

If there are any problems with complying with the above checklist, please attempt to comply through corrective action. Otherwise note non-compliance issues below. Also indicate any problems or irregularities that may impact sample integrity.

_____

_____

_____

Field Lead Name: _____

Field Lead Signature: _____ Time: _____