ARCADIS Design & Consultancy for natural and built assets

Revitalizing Auto Communities Environmental Response Trust

INTERIM MEASURES WORK PLAN: PLANT 3 STORM SEWER MODIFICATIONS

Lansing Industrial Land

Lansing, Michigan

April 19, 2018

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Jacelyn Saling, P.E.-MI
Principal Engineer

Patrick J. Curry, C.P.G.
Principal Geologist

Prepared for:

Revitalizing Auto Communities Environmental Response Trust

Prepared by:

Arcadis of Michigan, LLC
28550 Cabot Drive
Suite 500
Novi
Michigan 48377
Tel 248 994 2240
Fax 248 994 2241

Our Ref.:

B0064479.2018.01202

Date:

April 19, 2018

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ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
DW	Drinking Water
HNV	Human Non-Cancer Screening Value
IGMP	Interim Groundwater Monitoring Program
IM	Interim Measures
JSA	Job Safety Analysis
MDEQ	Michigan Department of Environmental Quality
ng/L	Nanograms per Liter
PFAS	Poly- and Perfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic acid
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
RACER	Revitalizing Auto Communities Environmental Response
Rule 57 Criteria	MDEQ Rule 57 Human Non-Cancer Screening Value (HNV) for Surface Water from a Non-Drinking Water Source
TGI	Technical Guidance Instructions
UST	Underground Storage Tank

1 INTRODUCTION

Arcadis of Michigan, LLC prepared this Interim Measures (IM) Workplan (Work Plan) on behalf of the Revitalizing Auto Communities Environmental Response (RACER) Trust for the Plant 3 portion of the RACER Lansing Industrial Land (Site) located in Lansing, Michigan (**Figure 1**). The purpose of this Work Plan is to provide information to support Michigan Department of Environmental Quality's (MDEQ) approval of the Plant 3 storm sewer abandonment proposed for implementation at the Site to address per- and polyfluoroalkyl substances (PFAS) discharges to surface water. It is noted that even though this Work Plan is being submitted as an interim measure while other matters related to the Site are being addressed, it is intended that this interim measure will be a part of the final corrective measure to address PFAS.

This IM Work Plan outlines proposed modifications to the Plant 3 storm sewer system to eliminate the Site's PFAS impacted storm water discharges to an off-Site storm sewer owned by the City of Lansing. The proposed scope of work includes: abandoning the two primary stormwater mains draining the Site; bulkheading two potential connections to a County sewer; and capping selected catch basins to reduce inflow into the abandoned system. This Work Plan also includes post-installation monitoring of the property boundary manhole to ensure flows containing unacceptable concentrations of PFAS are eliminated at the property boundary manhole.

1.1 Perched PFAS Overview

The perched PFAS at Plant 3 originates in the former plating area in the north-central portion of Plant 3. PFAS in groundwater was initially detected in December 2016, when sampling for PFAS was conducted due to emerging concerns that vapor suppressants containing PFAS could have potentially been used in former plating operations at the Site. Following the initial detection of PFAS during groundwater sampling in December 2016, Arcadis has conducted several field investigations throughout 2017 to characterize and define the extent of contamination.

The geologic setting of the perched zone surrounding the former plating area consists of a large area of sandy fill material, extending to depths of up to 17 feet below ground surface (bgs), surrounded by native soils that consist predominately of clayey sediments with thin, intermittent, discontinuous, typically saturated sand seams of varying permeability occurring between approximately 4 to 23 feet bgs. The fill material is related to excavation of the plating line (completed in 1989) and subsequent installation of former press pits that were subsequently filled in 2010. Fill material is also present in a former underground storage tank (UST) basin and former plating waste treatment area basement located to the east of the former plating line and press pits (Arcadis, 2017a). The perched zone is underlain by approximately 40 to 50 feet of unsaturated dense glacial tills which separate the perched zone from saturated deep overburden found at approximately 55 to 70 feet bgs.

Analytical results from subsequent investigations indicate that PFAS impacts are centered in the former plating area and radiate in all directions (**Figure 2**) (Arcadis, 2017a). Of the PFAS detected at the Site, perfluorooctanesulfonic acid (PFOS) is the dominant compound in both concentration and extent. Other compounds are generally detected in low concentrations and are co-located with elevated concentrations of PFOS. Concentrations of PFOS and various other PFAS extend throughout the shallow groundwater

perched within the fill material and are detected in groundwater samples collected from native sand and silt seams which are believed to intersect the fill. Perched groundwater in the PFAS area is concentrated in relatively higher-permeability sand lenses between 840 and 859 ft elevation (approximately 4 to 23 feet bgs). Based on invert depths, the RACER storm sewers and County storm main are within this same elevation range, and therefore infiltration of PFAS impacts into the sewers is a concern.

1.2 Plant 3 Storm Sewer Network

Stormwater at Plant 3 drains through a storm sewer system consisting of catch basins and sewer mains (**Figures 2 and 3**). For the purposes of this Work Plan, a catch basin is defined as a stormwater collection structure with an open top and a sump. A manhole is an access point along a main with a solid lid and does not receive stormwater. Catch basins and manholes are differentiated on **Figure 3** but further evaluation is necessary to confirm this information prior to implementation.

Stormwater from the portion of Plant 3 where groundwater is impacted with PFAS ultimately flows into one of two storm mains: a 48-inch diameter concrete main (West Main) and a 30-inch diameter east concrete main (East Main) (**Figure 3**). These two mains eventually join at the property outfall (manhole P3-MH-NE), where the stormwater flows north off-Site in a 54-inch diameter storm main owned by the City of Lansing. From there, stormwater travels approximately a half mile through City of Lansing sewers and eventually discharges to the Grand River.

1.3 Storm Sewer Survey and Sampling

Arcadis conducted a video survey of portions of the East and West Mains during an extended period of dry weather in September of 2017. Though the pipes were in overall good condition considering their presumed age, the inspection confirmed that there was groundwater infiltration into the storm mains. Evidence of groundwater infiltration was observed in the mains themselves (actively leaking joints and longitudinal cracks). There was also active water flow observed into the mains from tributary laterals that apparently derived from infiltration.

Storm sewer water samples collected from 15 manholes along the mains in September and October of 2017 were analyzed for PFOS and perfluorooctanoic acid (PFOA). Results confirmed PFOS concentrations exceeding the MDEQ Rule 57 Human Non-Cancer Screening Value (HNV) for Surface Water from a Non-Drinking Water Source criteria (Rule 57 criteria) of 12 nanograms per liter (ng/L) in 12 manholes (**Table 1**, **Figure 2**). The laboratory reports are included as **Appendix A**.

1.4 Corrective Action Objectives

The corrective action objective of this IM Work Plan is to eliminate off-Site storm sewer discharges exceeding the Rule 57 criteria of 12 nanograms per liter (ng/L) for PFOS. The point of compliance is the Plant 3 outfall (manhole P3-MH-NE) (**Figure 2**).

2 STORM SEWER MODIFICATIONS

The primary components of this Work Plan are as follows, listed in order of planned implementation:

1. Capping of selected catch basins to minimize inflow to the abandoned storm system after rain events in order to reduce the possibility of impacted sewer water daylighting.
2. Bulkheading two potential connection points between the RACER system and County storm main in order to eliminate alternate pathways for impacted storm water to discharge from the Site.
3. Blocking the East and West Mains to eliminate impacted storm water from reaching the outfall at Willow Street. This involves excavation and installation of two concrete monoliths to block the sewer mains and pipe bedding.

All work will be completed per the requirements of the Arcadis Site-Specific Health and Safety Plan (Arcadis 2017b) and industry best practices.

2.1 Capping of Selected Catch Basins

Prior to the installation of the concrete monoliths and bulkheads, selected Site catch basins will be capped to minimize surface water inflow into the portion of the sewer system to be deactivated. Capping catch basins is considered a best practice to reduce the possibility of water from storm sewer lines daylighting to ground surface through open catch basins following large storm events. Prior to capping, Arcadis will perform a field survey to finalize quantity and locations of the catch basins to be capped. Selected catch basins will be capped by removing the existing grate, placing a polyvinyl chloride (PVC) liner with a silicone bead sealant over the opening, reinstalling the existing catch basin grate over the PVC liner, followed by placing a galvanized steel plate on top as shown by the detail on **Figure 5**. The steel plate will also be sealed with silicone and covered with gravel to mitigate theft **(Figure 5)**. Note that one catch basin located in the drainage ditch along the western property will remain open to minimize risk of overflows along the property boundary (**Figure 3**).

2.2 Bulkheading Potential Connections to County Storm Main

A 54-inch diameter Ingham County storm main flows through the western portion of Plant 3 (**Figure 2**). Based on the proximity of the County storm drain to the RACER storm sewer system and available Site sewer maps, there is the potential for connection points between the County storm main and the RACER storm sewer system. The proposed blocking of the East and West Mains presents the possibility, although unlikely, that impacted sewer water could back up into the County main during major storm events. To eliminate this possible pathway for PFAS discharges, concrete bulkheads will be installed in the downstream inverts of two manholes (**Figure 3).** The proposed bulkhead locations will be inspected via sewer camera prior to completing scope to verify construction and conditions.

Prior to bulkheading, the contractor will stop the water flow by installing inflatable plugs at upstream manholes (**Figure 3**). Bulkheads will then be installed in the manholes by pouring a reinforced concrete form (bulkhead) inside the downstream invert (**Figure 5**). Concrete placement will follow standard construction practices including but not limited to consolidation (i.e. vibrating) to eliminate air bubbles and ensure complete placement around rebar reinforcement. Once the bulkhead has been installed, a

polyurethane grout will be injected around the circumference of the bulkhead to help seal the contact surface between the new concrete and the sewer pipe as indicated in **Figure 5**. The temporary plugs will be left in place for up to 30 days to allow the concrete to cure. Bulkhead installation will involve confined space entry which will be performed according to contractor health and safety standards.

2.3 Blocking East and West Mains: Concrete Monoliths

Blocking the East and West mains will be achieved by installation of two concrete monoliths, one in each main. Concrete monoliths are advantageous in comparison to standard bulkheads because they block flow of impacted water through both the storm sewer itself and, if present, permeable pipe bedding around the pipe. The monoliths will be installed downstream of manholes P3-MH-1-1 (West Main) and P3-MH-2-1N (East Main), and upstream of the property outfall (**Figure 3**). These locations prevent the flow of impacted water from approaching the northern property boundary, while also limiting the potential for perched PFAS-impacted groundwater to migrate through pipe bedding toward the north property boundary.

Prior to excavation, the contractor will install temporary inflatable plugs in manholes P3-MH-1-1 and P3-MH-2-1N, immediately upstream of the working area, to block the flow of water to the excavation areas (**Figure 3**). Work will be completed during dry weather conditions to minimize the volume of water expected in the mains. The contractor will then excavate to the storm main, located 15 to 20 feet bgs, with sidewall sloping or shoring, whichever is deemed most practical and safe. Dewatering may be necessary for the excavation associated with water in pipe bedding materials. When the pipe is exposed, the contractor will cut and remove a 4 to 5-foot section of the main, then excavate at least 3 feet beneath the exposed section (**Figure 4**). Actual excavation depth beneath the pipe will depend on observed pipe bedding thickness. Sacrificial forms (sandbags, an inflatable plug, or crushed concrete) will be installed inside both ends of the remaining pipe to allow concrete to fill the pipe completely without traveling too far up or down the pipe as it is poured. A heavy concrete mix will then be poured from the bottom of the excavation to at least three feet above the top of pipe. Concrete placement will follow standard construction practices including but not limited to consolidation (i.e. vibrating) to eliminate air bubbles. The concrete mix will have low water content to minimize formation of cracks during curing.

The concrete will be allowed to cure for 2 to 3 days while Arcadis monitors for signs of cracking, settling, or imperfect seals. The monolith will be repaired accordingly. When the monolith is determined to be built to scope, the excavation will be backfilled. No evidence of soil impacts has been observed in nearby soil borings or a recent test pit excavation, therefore, it is expected that excavation will be backfilled with original excavation spoils in lifts to a of minimum 90% compaction.

Following monolith installation, standing water in manhole P3-MH-NE will be pumped out to remove remaining PFAS impacts.

3 MONITORING

Storm sewer water quality monitoring will be conducted prior to and following the storm sewer modification activities to monitor impacts at the property outfall. Stormwater runoff conditions will be monitored based on the possibility of increased ponding and runoff. Groundwater water levels and water chemistry in the area will continue to be monitored in accordance with the MDEQ approved Interim Groundwater Monitoring Plan (Arcadis, 2017c).

Storm sewer monitoring was completed in late 2017 as discussed in Section 1.3 (**Table 1**, **Figure 2**). Prior to implementation, Arcadis will collect a PFAS sample at manhole P3-MH-NE so the effectiveness of the remedy can be assessed.

3.1 Performance Monitoring

The property Outfall P3-MH-NE manhole will be inspected quarterly for the first year following installation to evaluate remedy effectiveness. This will include an inspection of the manhole during the first heavy rain event following bulkheading to assess the remedy during a high-flow event.

The standing water will be pumped out of manhole P3-MN-NE following installation. pumping out the standing water in manhole P3-MH-NE, confirmatory sampling from manhole P3-MH-NE will be performed approximately three months after completion to verify impacted storm water is not reaching this manhole. Additional sampling will be completed as necessary based on the results of the initial sampling event, but at least one sample will be collected per year. All sampling data will be collected in accordance with the Site-specific Quality Assurance Project Plan (QAPP) (Arcadis 2011a), the Arcadis Technical Guidance Instructions (TGI) for PFAS Sampling (Arcadis, 2017d), and the Arcadis Job Safety Analysis (JSA) for storm sewer manhole sampling.

3.2 Runoff Monitoring

After blocking the storm sewers, increased surface ponding may occur following rain events. This ponding is expected to dissipate relatively quickly in most areas. In order to observe storm water ponding and potential runoff, the Site will be observed following three or four precipitation events of various intensity after completion. Based on these observations a determination will be made if any additional runoff monitoring is necessary.

3.3 Water Level Monitoring

The overall expected rise in groundwater level (or potentiometric surface) at Plant 3 due to bulkheading is not known with certainty, but based on bulkheading completed at Plant 6, it expected to be several feet. This is not expected to adversely impact groundwater flow. Shallow monitoring wells will be installed in the former plating area and near property boundaries during future PFAS delineations efforts. These monitoring wells will be used to monitor changes in water level and PFAS concentration trends. This monitoring will be integrated into the existing Interim Groundwater Monitoring Program (IGMP).

4 CONTINGENCY

Blocking of the East and West Mains by installation of concrete monoliths is considered a reliable method of preventing discharge of PFAS-impacted water at the property outfall. This measure will eliminate discharges PFAS-impacted groundwater to surface water through the storm sewer and pipe bedding. Should confirmatory water quality samples return PFAS exceedances discharging from the P3-MH-NE manhole, additional characterization, bulkheading, and/or corrective measures will be considered.

5 SCHEDULE

Implementation will be initiated after all necessary approvals of this Work Plan are obtained. At this time the identified approvals needed are from MDEQ and the City of Lansing. The first step in implementing this Work is to procure a contractor, which could take up to two months after Work Plan approval. After contractor selection a schedule for field implementation will be determined. Field implementation is targeted to be completed in 2018.

6 REFERENCES

Arcadis. 2011a. Quality Assurance Project Plan – Lansing Plants 2, 3, and 6, Industrial Land, Lansing, Michigan. August 2011.

Arcadis 2017a. Plant 3 PFAS CSM and Potential Corrective Measures. January 28.

Arcadis 2017b. Site Specific Health and Safety Plan. RACER Trust, Lansing Plants 2, 3, and 6. April

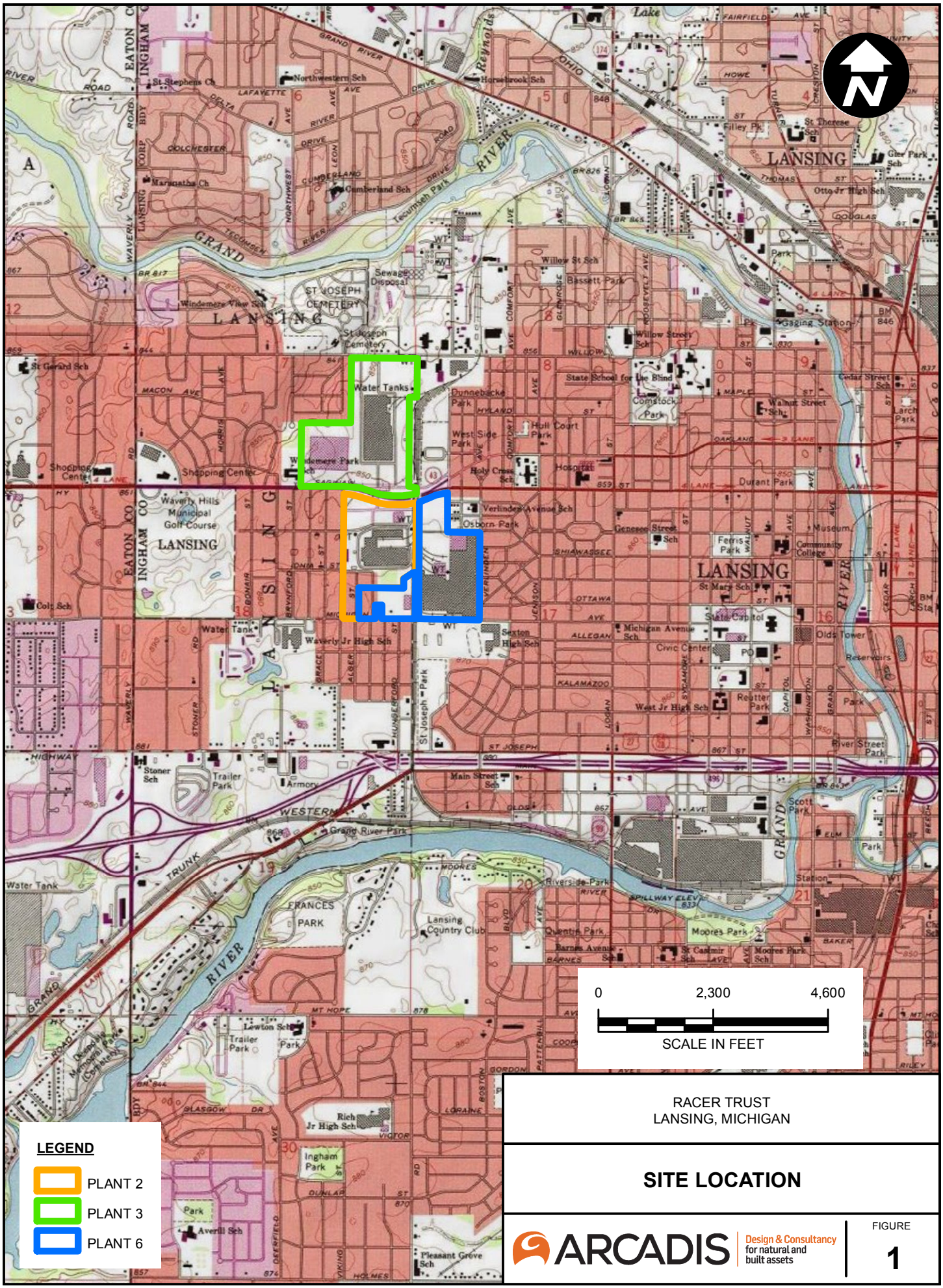
Arcadis 2017c. Revised Interim Groundwater Monitoring Work Plan, RACER Trust Plants 2, 3, & 6, Lansing, Michigan. January 30.

Arcadis, 2017d. Poly- and Perfluorinated Alkyl Substance (PFAS) Field Sampling Guidance. April 27

Interim Measures Work Plan: Plant 3 Storm Sewer Bulkheading

Lansing Industrial Land – Lansing, Michigan

FIGURES



RACER TRUST
LANSING, MICHIGAN

SITE LOCATION

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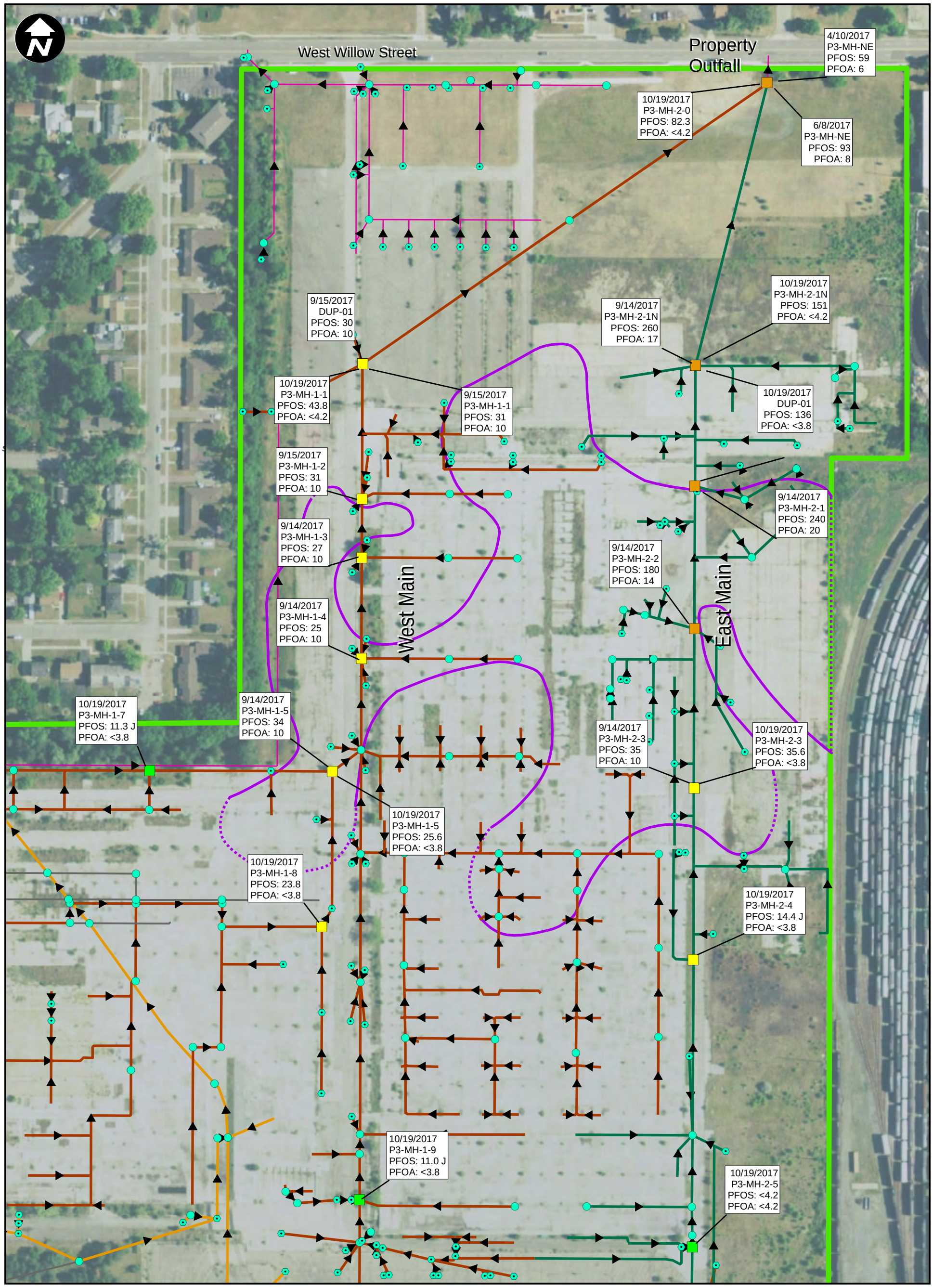
FIGURE
1

CITY: KNOXVILLE DIV: ENV DB: A.SMITH PIC: PM: TM: TR: PROJECT NUMBER: COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Docs\Phase 2 RFI Report Figs\FIG 1 - SITE LOCATION.mxd PLOTTED: 5/20/2016 10:51:21 AM BY: dolexa



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C:\Users\DStockard\Documents\Racers lansing\Storm_sewer\GIS\Plant3_StormSewer_Investigation_MH_sample_results_rev4.mxd PLOTTED: 3/7/2018 10:45:20 AM BY: DStockard

DOES NOT EXCEED PFOS Rule 57 HNV, NON-DW NOR DW CRITERIA
EXCEEDS PFOS Rules 57 HNV, NON-DW CRITERIA
EXCEEDS PFOS Rule 57 HNV, NON-DW, AND DW CRITERIA
PFOS 12ppt CONTOUR INFERRED
PFOS 12ppt CONTOUR

STRUCTURE TYPE
MANHOLE
CATCH BASIN
PLANT 3

DRAINAGE NETWORKS
ABANDONED
OTHER
COUNTY MAIN
EAST MAIN
WEST MAIN

DRAFT

NOTES:
ALL PIPE LOCATIONS ARE APPROXIMATE
DRAINAGE NETWORKS DISPLAY PRIMARY LATERALS AND ALL INTERCEPTORS

ALL CONCENTRATIONS ARE EXPRESSED IN ng/L
2016 PFOS Proposed MDEQ Rule 57 Human Non-Cancer Value for Surface Water from a Non-Drinking Water Source: 12
2016 PFOA MDEQ Rule 57 Human Non-Cancer Screening Value for Surface Water from a Non-Drinking Water Source: 12,000
2018 PFOS/PFOA Combined MDEQ Part 201 DW Criteria: 70

DW: DRINKING WATER NDW: NON-DRINKING WATER
ng/L: NANOGRAMS PER LITER ND: NOT DETECTED

0 200 400
SCALE IN FEET

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LANSING, MICHIGAN

Plant 3 Storm Sewer Sampling Results

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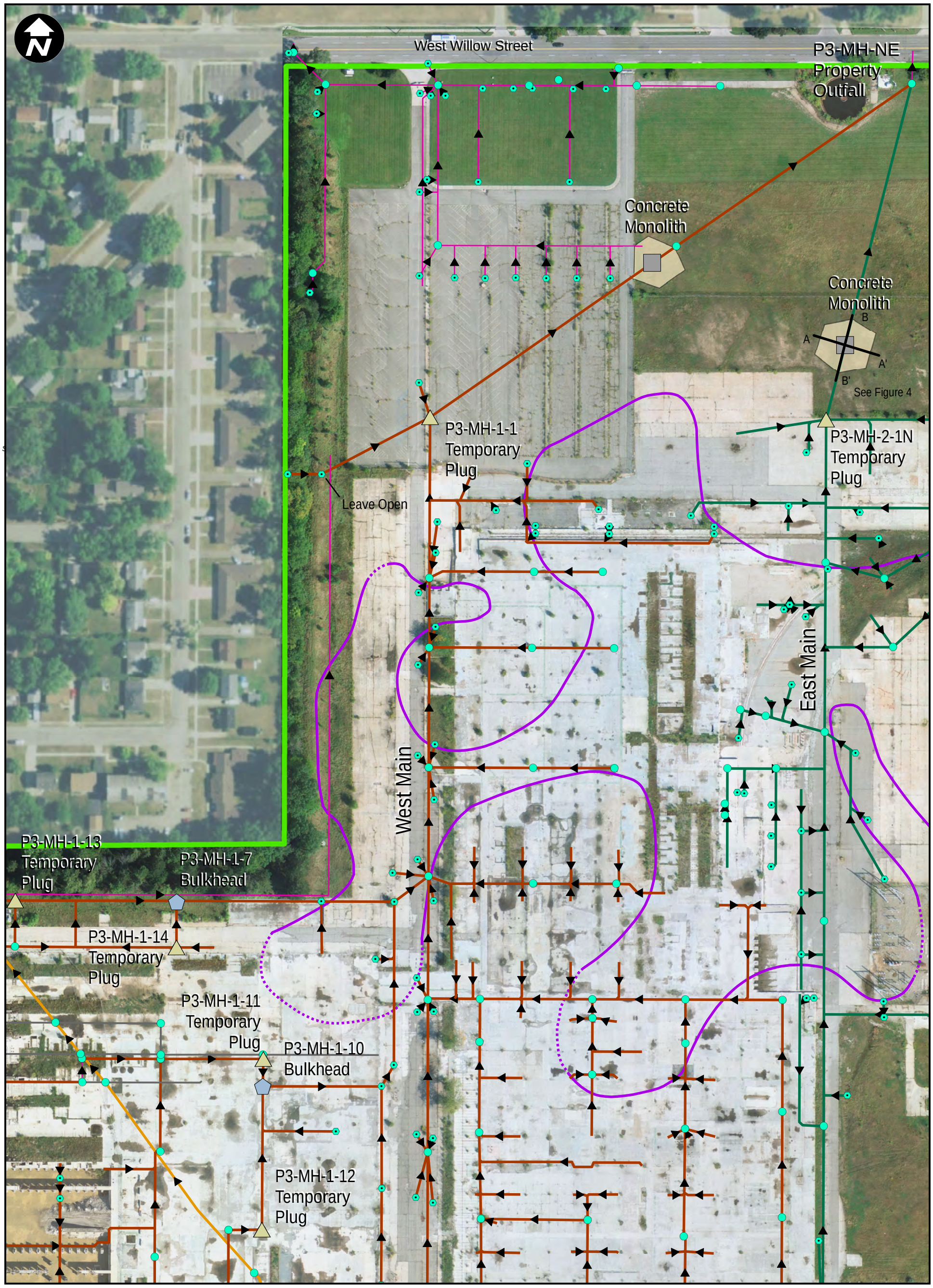
FIGURE
2



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MODIFICATION TYPE
- CONCRETE MONOLITH
- BULKHEAD
- TEMPORARY PLUG

- APPROXIMATE EXCAVATION BOUNDARIES
- PFOS 12ppt CONTOUR INFERRED
- PFOS 12ppt CONTOUR

STRUCTURE TYPE
- MANHOLE
- CATCH BASIN
- PLANT 3

DRAINAGE NETWORKS
- ABANDONED
- OTHER
- COUNTY MAIN
- EAST MAIN
- WEST MAIN

NOTES:
ALL PIPE LOCATIONS ARE APPROXIMATE
DRAINAGE NETWORKS DISPLAY PRIMARY LATERALS AND ALL INTERCEPTORS
ARROWS DENOTE FLOW DIRECTION

DRAFT

0 200 400
SCALE IN FEET

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LANSING, MICHIGAN

Site Layout for Plant 3
Storm Sewer Modifications

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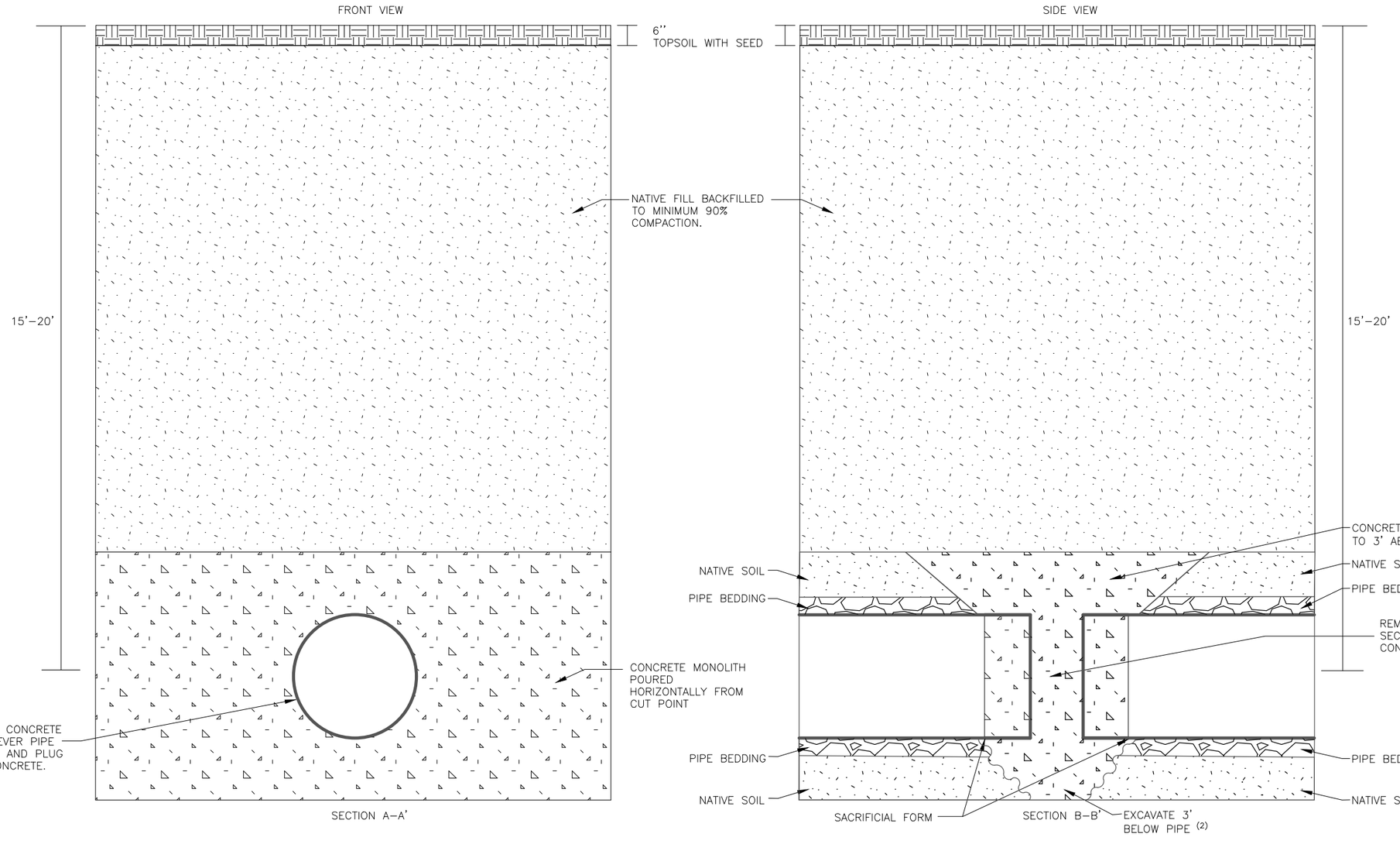
FIGURE
3



NOTES
1. DRAWING IS NOT TO SCALE
2. HEIGHT OF MONOLITH ABOVE AND BELOW PIPE WILL BE BASED ON OBSERVED THICKNESS OF PIPE BEDDING.

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CONCRETE MONOLITH DETAILS

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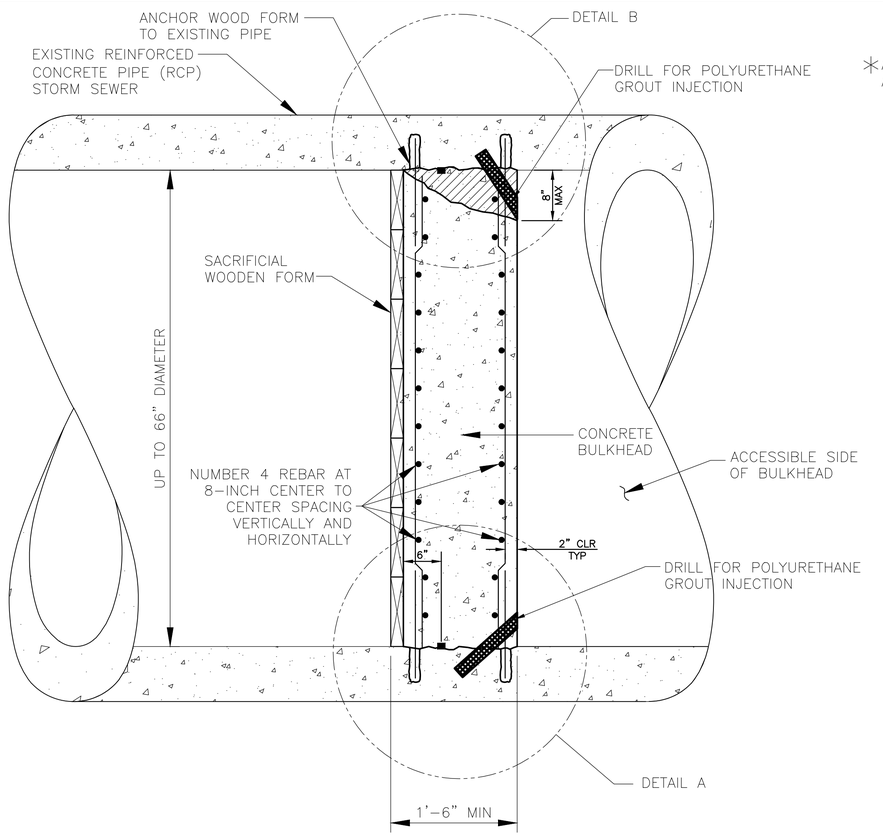
FIGURE
4



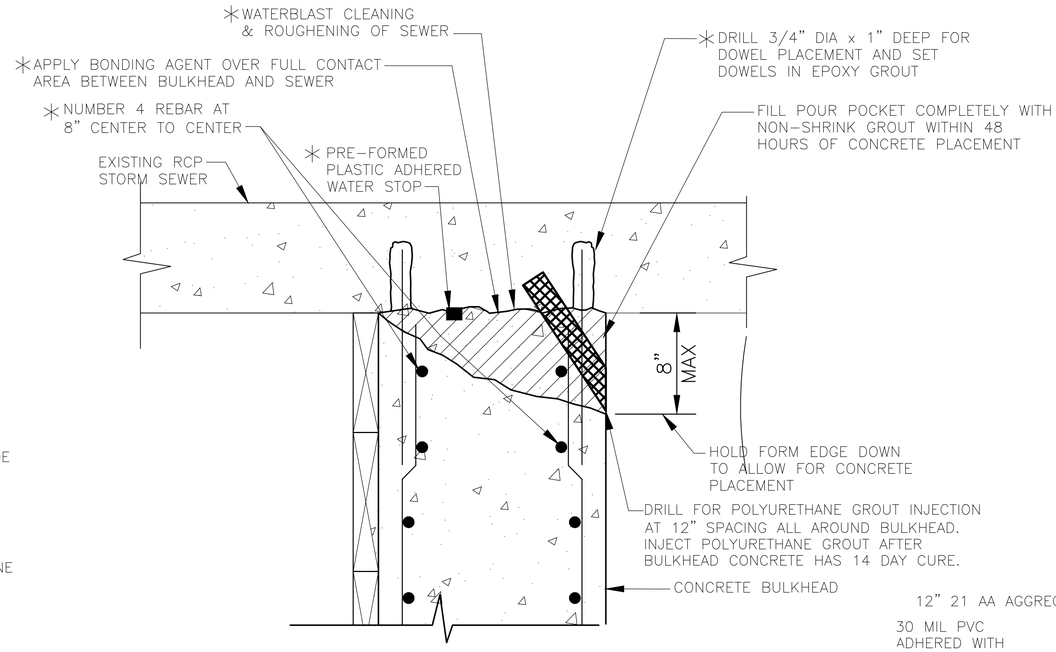
NOTES:

1. CONTRACTOR MUST STOP ALL PIPE FLOW IN ORDER TO CLEAN AND PREPARE SEWER FOR BONDING AGENT. MAINTAIN ZERO FLOW UNTIL CONCRETE HAS 28 DAY CURE..
2. ASSUMES PIPE IS CONCRETE. IF PIPE MATERIAL IS DIFFERENT OR IN UNACCEPTABLE CONDITION, CONTACT ENGINEER.

✳ FULL CIRCUMFERENCE OF BULKHEAD.

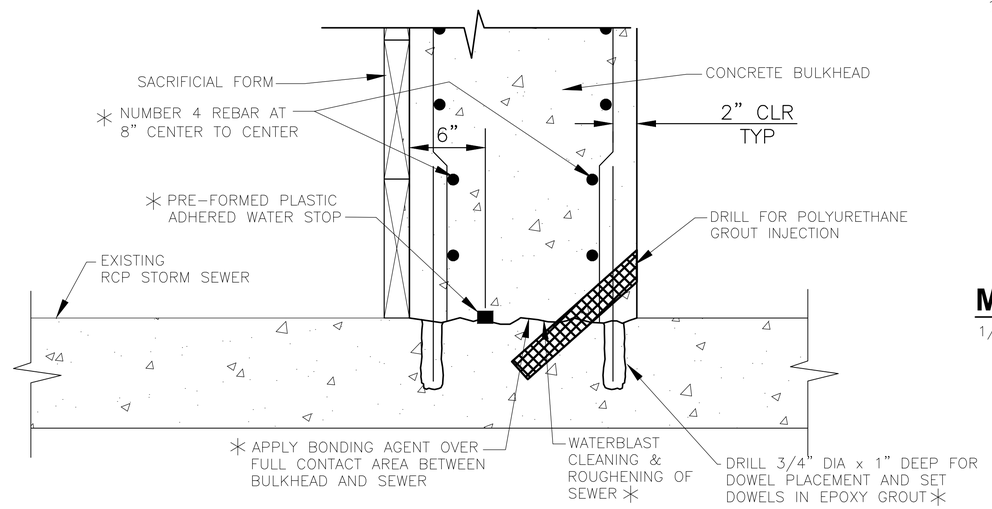
TYPICAL BULKHEAD SECTION FOR UP TO 66" PIPE

1/2" = 1'-0"



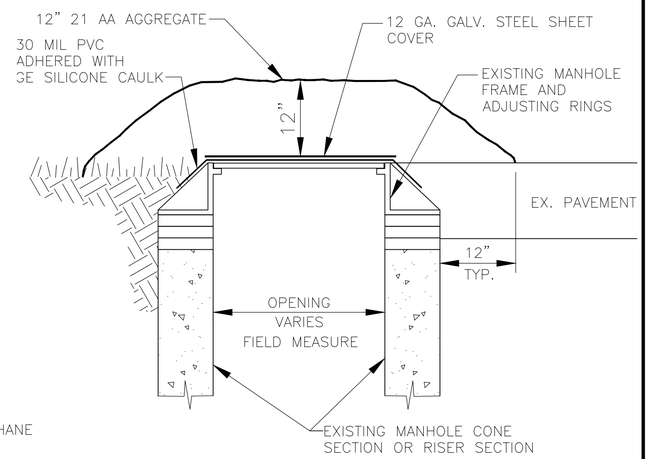
DETAIL B

1" = 1'-0"



DETAIL A

1" = 1'-0"



PROPOSED

MANHOLE CAP DETAIL "A"

1/2" = 1'-0"

CITY: DIV/GROUP: DB: A.SANCHEZ LD: PIC: PM: R.CHRISTENSEN TM: LYR:ON=*;OFF=*REF*
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X-RC-LP236-PFASIMWP-BDR-C-LD

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REUSED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name		
Professional Engineer's No.		
State: MI	Date Signed	Project Mgr.: R.CHRISTENSEN
Designed by: R.CHRISTENSEN	Drawn by: A.SANCHEZ	Checked by

ARCADIS Design & Consultancy for natural and built assets
ARCADIS OF MICHIGAN, LLC.

RACER TRUST • INDUSTRIAL LAND, LANSING, MICHIGAN

RCP BULKHEAD SECTION AND MANHOLE CAP DETAILS

ARCADIS Project No.: B0064479.2018.01202

Date: MARCH 2018

ARCADIS
28550 CABOT DRIVE
SUITE 500
NOVI, MICHIGAN 48377
TEL. 248.994.2240

5

DESIGN AND CODE INFORMATION

1. ALL CONSTRUCTION SHALL CONFORM TO 2009 INTERNATIONAL BUILDING CODE, MICHIGAN EDITION.

2. VERIFY EXISTING CONDITIONS AND DIMENSIONS AND NOTIFY ENGINEER OF ANY CONDITIONS WHICH DO NOT COMPLY WITH PLANS AND SPECIFICATIONS.

3. SHOP DRAWINGS WILL NOT BE REVIEWED BY THE DESIGNER UNTIL AFTER THE GENERAL CONTRACTOR HAS THOROUGHLY REVIEWED THE SHOP DRAWINGS, VERIFIED EXISTING CONDITIONS, AND COORDINATED THE SHOP DRAWINGS WITH OTHER AFFECTED TRADES. SUBMIT FOUR COPIES OF REVIEWED SHOP DRAWINGS FOR ENGINEER'S REVIEW. ONLY THREE SETS OF MARKED UP SHOP DRAWINGS SHALL BE RETURNED BY THE DESIGNER. REPRODUCTION OF STRUCTURAL DRAWINGS FOR SHOP DRAWINGS IS NOT PERMITTED.

4. DO NOT SCALE STRUCTURAL DRAWINGS.

5. LIVE LOADS:
   BULKHEAD DESIGN IS BASED ON 15ft HEAD.

6. SPECIAL INSPECTIONS:
   THIS WORK IS EXEMPT FROM SPECIAL INSPECTIONS BECAUSE "WORK IS OF MINOR NATURE" PER IBC 2009 SECTION 1704.1 EXCEPTION 1.

GENERAL NOTES:

1. EPOXY ADHESIVE FOR DOWELS:

   MANUFACTURERS:
   HILTI CORPORATION, HIT–RE 500 SD.
   OR AS APPROVED.

   A. INJECTABLE TWO–COMPONENT EPOXY ADHESIVE.

   B. DEFORMED REINFORCING BAR.

   C. ADHESIVE ANCHORAGE SYSTEM SHALL BE SEISMIC QUALIFIED PER IBC 2009.

   D. ADHESIVE ANCHORAGE SYSTEM SHALL MEET REQUIREMENTS OF ASTM C881–90, TYPE N, GRADE 2 AND 3, CLASS A, B, C
   EXCEPT GEL TIMES.

2. BONDING AGENT: 3 COMPONENT, SOLVENT FREE WATER–BASED EPOXY RESIN WITH PORTLAND CEMENT, SIKA CORP., SIKA ARMATEC 110 EPOCEM, OR AS APPROVED.

3. NON_SHRINK GROUT: PRE–MIXED COMPOUND CONSISTING OF NON_METALLIC AGGREGATE, CEMENT, WATER–REDUCING AND PLASTICIZING AGENTS; CAPABLE OF DEVELOPING A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI IN 28 DAYS; BASF MASTERFLOW 713 PLUS, OR AS APPROVED.

4. PREFORMED PLASTIC ADHESIVE WATERSTOP (PPAWS): FEDERAL SPECIFICATION SS–SS–210A; SINGLE– COMPONENT, SELF–SEALING PLASTIC ADHESIVE TYPE, EXTRUDED ROPE FORM BETWEEN TWO PROTECTIVE SILICONE TREATED PAPERS, 1 INCH SQUARE CROSS SECTION, 1 INCH LAP SPLICE, FURNISH WITH PRIMER; SYNKO–FLEX PRODUCTS SYNKO–FLEX, OR AS APPROVED.

5. FORM MATERIALS

   FORMS FOR FINISH CONCRETE: PLYWOOD, METAL, METAL–FRAMED PLYWOOD FACED, OR OTHER ACCEPTABLE PANEL–TYPE MATERIALS, TO PROVIDE CONTINUOUS, STRAIGHT, SMOOTH, SURFACES. FURNISH IN LARGEST PRACTICABLE SIZES TO MINIMIZE NUMBER OF FORM MARKS. SEAL FORM TIE HOLES TO WATERTIGHT CONDITION.

6. FIELD QUALITY CONTROL

   TESTS OF CONCRETE SLUMP, AIR CONTENT AND STRENGTH WILL BE MADE AT THE DIRECTION OF ENGINEER. SAMPLES FOR STRENGTH SHOULD BE TAKEN AS NEAR AS PRACTICAL TO THE POINT OF PLACEMENT INTO THE FORMWORK OR AT A LOCATION WHICH CLOSELY MATCHES THE HANDLING CONDITIONS WHEN THE CONCRETE IS PLACED IN THE FORMS. PRIOR TO THE ADDITION OF A MID OR HIGH RANGE WATER REDUCER, A SLUMP TEST MAY BE MADE FROM A SAMPLE TAKEN FROM THE VERY FIRST CONCRETE OUT OF THE LOAD.

REINFORCED CONCRETE

1. ALL CONCRETE WORK SHALL CONFORM TO THE "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318–05).

2. REINFORCING STEEL SHALL BE DEFORMED BARS ASTM A–615 (GRADE 60).

3. THE COMPRESSIVE STRENGTH AT 28 DAYS OF ALL CAST IN PLACE CONCRETE SHALL BE 5000 PSI. MINIMUM

4. LAP SPLICES FOR REINFORCING BARS SHALL BE CLASS B IN ACCORDANCE WITH ACI 318–05, UNLESS NOTED OTHERWISE.

5. CLEAR CONCRETE COVER FOR REINFORCING STEEL:
   WALLS 2"

6. CONCRETE MATERIALS AND ADMIXTURES
   CEMENT: ASTM C150, TYPE I NORMAL PORTLAND TYPE.

   FINE AND COARSE AGGREGATES: ASTM C33 (NORMAL WEIGHT AGGREGATE); MATERIALS CONTAINING DELETERIOUS SUBSTANCES (SPALLING CAUSING)
   ARE NOT ACCEPTABLE.

   WATER: CLEAN AND NOT DETRIMENTAL TO CONCRETE.

   AIR ENTRAINMENT: ASTM C260; MASTER BUILDERS (BASF CONSTRUCTION CHEMICALS) MICRO–AIR, OR AS APPROVED.

   CHEMICAL: ASTM C494 TYPE A – WATER–REDUCING, TYPE B RETARDING, TYPE D – WATER–REDUCING AND RETARDING, TYPE F – WATER–REDUCING, HIGH RANGE, TYPE G – WATER–REDUCING, HIGH RANGE AND RETARDING; CONTAINING NO CHLORIDES; MASTER BUILDERS (BASF CONSTRUCTION CHEMICALS), W.R. GRACE, OR AS APPROVED.

   MEMBRANE CURING COMPOUND: ASTM C309, TYPE I–D, CLASS B, CLEAR WITH FUGITIVE DYE WHICH DISAPPEARS APPROXIMATELY 24 HOURS AFTER EXPOSURE TO SUNLIGHT; SPRAY–CURE SAFE CURE CLEAR, EUCLID CHEMICAL COMPANY KUREZ DR, OR AS APPROVED. WET CURING CONCRETE MAY BE SUBSTITUTED FOR CURING COMPOUND.

7. CONCRETE MIX
   CONCRETE PROPORTIONS: COMPLY WITH ACI 301, 4.2.

   PROVIDE CONCRETE TO THE FOLLOWING CRITERIA:
   COMPRESSIVE STRENGTH (7 DAY): 4,000 PSI.
   COMPRESSIVE STRENGTH (28 DAY): 5,000 PSI.
   WATER/CEMENT RATIO (MAXIMUM): 0.40 BY WEIGHT.
   AIR ENTRAINED: NOT APPLICABLE.

   SLUMP (MAXIMUM): 3 INCHES (DUE TO WATER).
   MID OR HIGH RANGE WATER REDUCER:
   ADD AT SITE TO INCREASE SLUMP
   TO 7 INCHES ±1 INCHES.

8. POLYURETHANE GROUT

   INSERT POLYURETHANE GROUT AT PERIMETER SURFACES OF BULKHEADS AND PLUGS.
   SIKA FIX HH HYDROPHILIC, OR EQUAL AS APPROVED BY ENGINEER. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR INJECTION PORTS, MIXING, INJECTION, AND CURING.

CITY: DIV/GROUP: DB: A.SANCHEZ LD: PIC: PM: R.CHRISTENSEN TM: LYR:ON=* OFF=*REF*
C:\Users\alsanchez\OneDrive - ARCADIS\BIM 360 Docs\RACER TRUSTRACER LANSING PLANTS 2,3,&6\PFAS IM WORK PLAN\2018\01-DWG\RC-LP236-PFASIMWP-PLUG & MANHOLE DETAIL.dwg LAYOUT: 5A SAVED: 3/27/2018 4:01 PM ACADVER: 21.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 3/27/2018 4:02 PM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: ----
X-RC-LP236-PFASIMWP-BDR-C-LD

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REUSED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name

Professional Engineer's No.

State	Date Signed	Project Mgr.
MI		R.CHRISTENSEN
Designed by R.CHRISTENSEN	Drawn by A.SANCHEZ	Checked by

ARCADIS Design & Consultancy for natural and built assets

ARCADIS OF MICHIGAN, LLC.

RACER TRUST • INDUSTRIAL LAND, LANSING, MICHIGAN

GENERAL NOTES

ARCADIS Project No.
B0064479.2018.01202

Date
MARCH 2018

ARCADIS
28550 CABOT DRIVE
SUITE 500
NOVI, MICHIGAN 48377
TEL. 248.994.2240

5A

Interim Measures Work Plan: Plant 3 Storm Sewer Bulkheading

Lansing Industrial Land – Lansing, Michigan

TABLES

Table 1
Summary of Plant 3 Storm Sewer Sampling Results
RACER Trust - Plant 3 Industrial Land, Lansing, Michigan

Location ID: Date Collected:	Units	MI GW (DEQ2017) RES DW	MI GW (DEQ2017) GSI	P3-MH-1-1 09/15/17	DUP-01 09/15/17	P3-MH-1-1 10/19/17	P3-MH-1-2 09/15/17	P3-MH-1-3 09/14/17	P3-MH-1-4 09/14/17	P3-MH-1-5 09/14/17	P3-MH-1-5 10/19/17	P3-MH-1-7 10/19/17	P3-MH-1-8 10/19/17	P3-MH-1-9 10/19/17	P3-MH-NE 04/10/17	P3-MH-NE 06/08/17	P3-MH-2-0* 10/19/17
Results																	
Perfluoro-octanesulfonate (PFOS)	ng/l	70	12	**31**	**30**	**43.8**	**31**	**27**	**25**	**34**	**25.6**	**11.3 J**	**23.8**	**11.0 J**	**59**	**93**	**82.3**
Perfluorooctanoic acid (PFOA)	ng/l	70	12,000	10	10	< 4.2	10	10	10	11	< 3.8	< 3.8	< 3.8	< 3.8	6	8	<4.2

Table 1
Summary of Plant 3 Storm Sewer Sampling Results
RACER Trust - Plant 3 Industrial Land, Lansing, Michigan

Location ID: Date Collected:	Units	MI GW (DEQ2017) RES DW	MI GW (DEQ2017) GSI	P3-MH-2-1 09/14/17	P3-MH-1-1N 09/14/17	P3-MH-2-1N 10/19/17	DUP-01 10/19/17	P3-MH-2-2 09/14/17	P3-MH-2-3 09/14/17	P3-MH-2-3 10/19/17	P3-MH-2-4 10/19/17	P3-MH-2-5 10/19/17	EB-01 09/15/17	EB-01 10/19/17
Results														
Perfluoro-octanesulfonate (PFOS)	ng/l	70	12	**240**	**260**	**151**	**136**	**180**	**35**	**35.6**	**14.4 J**	< 4.2	< 2	< 6.3
Perfluorooctanoic acid (PFOA)	ng/l	70	12,000	20	17	< 4.2	< 3.8	14	10	< 3.8	< 3.8	< 4.2	< 0.6	< 6.3

Table 1
Summary of Plant 3 Storm Sewer Sampling Results
RACER Trust - Plant 3 Industrial Land, Lansing, Michigan

Notes:

Border	Exceeds MDEQ Part 201 DW Criteria for PFOS and PFOA combined
Shaded	Exceeds Rule 57 Human Non-Cancer Screening Value for Surface Water from a Non-Drinking Water Source for PFOS or PFOA

ng/L = Nanograms per liter.
NA = Not analyzed.
J = Indicates an estimated value below laboratory reporting limit
< = The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
* P3-MH-NE and P3-MH-2-0 are the same structure

Appendix A

Storm Sewer Sampling Laboratory Results

ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

Report Date: September 22, 2017

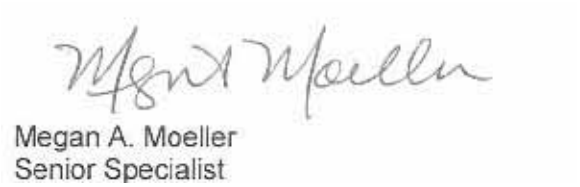
Project: Racer Lansing Plant 3

Account #: 03074
Group Number: 1851324
PO Number: B0064480.2017.01201
State of Sample Origin: MI

Regulatory agencies do not accredit laboratories for all methods, analytes, and matrices. Our current scopes of accreditation can be viewed at http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ . To request copies of prior scopes of accreditation, contact your project manager.

Electronic Copy To Arcadis Attn: Alex Villhauer

Respectfully Submitted,



Megan A. Moeller
Senior Specialist

(717) 556-7261

SAMPLE INFORMATION

Client Sample Description	Collection Information	ELLE#
P3-MH-2-3_090142017 Grab Water	09/14/2017 09:40	9213053
P3-MH-2-2_090142017 Grab Water	09/14/2017 11:35	9213054
P3-MH-2-1_090142017 Grab Water	09/14/2017 12:05	9213055
P3-MH-1-5_090142017 Grab Water	09/14/2017 14:30	9213056
P3-MH-1-4_090142017 Grab Water	09/14/2017 15:00	9213057
P3-MH-1-3_090142017 Grab Water	09/14/2017 16:20	9213058
P3-MH-1-1N_090142017 Grab Water	09/14/2017 17:15	9213059
P3-MH-1-2_090152017 Grab Water	09/15/2017 09:00	9213060
P3-MH-1-1_090152017 Grab Water	09/15/2017 09:50	9213061
DUP01_0901152017 Grab Water	09/15/2017 09:50	9213062
EQUIP_BLANK__090152017 Grab Water	09/15/2017 09:30	9213063

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

Project Name: Racer Lansing Plant 3
LL Group #: 1851324

General Comments:

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client. The compliance signature is located on the cover page of the Analysis Reports.

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below. Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are included in this data set

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

For dual column analyses, the surrogate (for multi-surrogate tests, at least one surrogate) must be within the acceptance limits on at least one of the two columns.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

EPA 537 Version 1.1 Modified, Misc. Organics

Batch #: 17260002 (Sample number(s): 9213053-9213063 UNSPK: 9213053)

The recovery(ies) for the following analyte(s) in the MS were below the acceptance window: Perfluoro-octanesulfonate

Sample Description: P3-MH-2-3_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213053
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 09:40 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		ng/l	ng/l	ng/l	
10954	Perfluoro-octanesulfonate	1763-23-1	35	2	6	1
10954	Perfluorooctanoic acid	335-67-1	10	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 03:59	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-2-2_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213054
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 11:35 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	180	2	6	1
10954	Perfluorooctanoic acid	335-67-1	14	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 04:20	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-2-1_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213055
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 12:05 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	240	2	6	1
10954	Perfluorooctanoic acid	335-67-1	20	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 04:40	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-1-5_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213056
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 14:30 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	34	2	6	1
10954	Perfluorooctanoic acid	335-67-1	11	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 05:01	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-1-4_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213057
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 15:00 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	25	2	6	1
10954	Perfluorooctanoic acid	335-67-1	10	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 05:21	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-1-3_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213058
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 16:20 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	27	2	6	1
10954	Perfluorooctanoic acid	335-67-1	10	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 06:23	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-1-1N_090142017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213059
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/14/2017 17:15 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		ng/l	ng/l	ng/l	
10954	Perfluoro-octanesulfonate	1763-23-1	260	2	6	1
10954	Perfluorooctanoic acid	335-67-1	17	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 06:43	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-1-2_090152017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213060
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/15/2017 09:00 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	31	2	6	1
10954	Perfluorooctanoic acid	335-67-1	10	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 07:04	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: P3-MH-1-1_090152017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213061
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/15/2017 09:50 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	31	2	6	1
10954	Perfluorooctanoic acid	335-67-1	10	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 07:24	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: DUP01_0901152017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213062
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/15/2017 09:50 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		**ng/l**	**ng/l**	**ng/l**	
10954	Perfluoro-octanesulfonate	1763-23-1	30	2	6	1
10954	Perfluorooctanoic acid	335-67-1	10	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 07:45	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Sample Description: EQUIP_BLANK__090152017 Grab Water
RACER Lansing Plant 3

ELLE Sample # WW 9213063
ELLE Group # 1851324
Account # 03074

Project Name: Racer Lansing Plant 3

Collected: 09/15/2017 09:30 by DS

Submitted: 09/16/2017 09:45
Reported: 09/22/2017 09:45

ARCADIS U.S., Inc.
630 Plaza Drive
Suite 600
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
Misc. Organics	**EPA 537 Version 1.1 Modified**		ng/l	ng/l	ng/l	
10954	Perfluoro-octanesulfonate	1763-23-1	N.D.	2	6	1
10954	Perfluorooctanoic acid	335-67-1	N.D.	0.6	2	1

Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10954	PFOA/PFOS Water	EPA 537 Version 1.1 Modified	1	17260002	09/20/2017 08:06	Devon M Whooley	1
14091	PFAS Water Prep	EPA 537 Version 1.1 Modified	1	17260002	09/18/2017 15:05	Danielle D McCully	1

*=This limit was used in the evaluation of the final result

Quality Control Summary

Client Name: ARCADIS U.S., Inc. Group Number: 1851324
Reported: 09/22/2017 09:45

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL**	LOQ
	ng/l	ng/l	ng/l
Batch number: 17260002	Sample number(s): 9213053-9213063		
Perfluoro-octanesulfonate	N.D.	2	6
Perfluorooctanoic acid	N.D.	0.6	2

LCS/LCSD

Analysis Name	LCS Spike Added ng/l	LCS Conc ng/l	LCSD Spike Added ng/l	LCSD Conc ng/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 17260002	Sample number(s): 9213053-9213063								
Perfluoro-octanesulfonate	13	12.97	13	11.75	100	90	70-130	10	30
Perfluorooctanoic acid	13.6	15.01	13.6	14.29	110	105	70-130	5	30

MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc ng/l	MS Spike Added ng/l	MS Conc ng/l	MSD Spike Added ng/l	MSD Conc ng/l	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 17260002	Sample number(s): 9213053-9213063 UNSPK: 9213053									
Perfluoro-octanesulfonate	34.87	13	42.86			61*		70-130		
Perfluorooctanoic acid	9.99	13.6	23.3			98		70-130		

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.
P###### is indicative of a Background or Unspiked sample that is batch matrix QC and was not performed using a sample from this submission group.

Quality Control Summary

Client Name: ARCADIS U.S., Inc. Group Number: 1851324
Reported: 09/22/2017 09:45

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report. For dual column analyses, the surrogate (at least one surrogate for multi-surrogate tests) must be within the acceptance limits on at least one of the two columns.

Analysis Name: PFOA/PFOS Water
Batch number: 17260002

	13C8-PFOA	13C8-PFOS
9213053	81	81
9213054	73	83
9213055	80	91
9213056	83	86
9213057	84	95
9213058	93	98
9213059	78	87
9213060	70	75
9213061	80	79
9213062	77	92
9213063	104	87
Blank	90	86
LCS	86	91
LCSD	96	83
MS	75	90
Limits:	43-112	43-115

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.
P###### is indicative of a Background or Unspiked sample that is batch matrix QC and was not performed using a sample from this submission group.

Environmental Analysis Request/Chain of Custody

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Acct. # 03074 Group # 1851324 Sample # 921305 3-63

COC # 554645

Client Information

Client: Arcadis	Acct. #:
Project Name/#: B0064480.2017.01201	PWSID #:
Project Manager: Randy Christensen	P.O. #: B0061480.2017.01201
Sampler: Daniel Stockard	Quote #:
State where samples were collected: RACER Lansing	For Compliance: Yes ☐ No ☑

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water ☐ Potable ☐ Ground ☐ NPDES ☑ Surface ☐ | Other: ____

Analysis Requested

Preservation and Filtration Codes

For Lab Use Only

FSC: ____

SCR#: ____

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	0	PFAS-Modified 537
P3-MH-2-3-09142017	9/14/17	9:40	X		2	2	2
P3-MH-2-2-09142017		11:35	X		2	2	2
P3-MH-2-1-09142017		12:05	X		2	2	2
P3-MH-1-5-09142017		1430	X		2	2	2
P3-MH-1-4-09142017		1500	X		2	2	2
P3-MH-1-3-09142017		1620	X		2	2	2
P3-MH-2-IN-09142017		1715	X		2	2	2
P3-MH-1-2-09152017	9/15/17	9:00	X		2	2	2
P3-MH-1-1-09152017	9/15/17	9:50	X		2	2	2
DUP-01-09152017	9/15/17	9:50	X		2	2	2

Turnaround Time (TAT) Requested (please circle)

(Standard) Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Date results are needed: 9/22/17

alex.willhauer@arcadis.com

E-mail address: andrew.lorenz@arcadis.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Daniel Stockard/Arcadis	9/15/17	12:00			
			Kelly Newman	09/16/17	09:45

EDD Required? Yes (No)

If yes, format: ____

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:

UPS ____ FedEx X Other ____

Temperature upon receipt 5.3 °C

Environmental Analysis Request/Chain of Custody

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Acct. # 1051324 Group # 080074 (BKD 09/16/17) 080074 Sample # 921305 3-63

COC # 554644

Client Information

Client: Arcadis	Acct. #: —
Project Name/#: B006448O, 2017.01201	PWSID #: —
Project Manager: Randy Christensen	P.O. #: B006448O.2017.01201
Sampler: Daniel Stockard	Quote #: —
State where samples were collected: RACER Lansing	For Compliance: Yes ☐ No ☑

Matrix

Soil ☐ Sediment ☐ Tissue ☐ | Water: Potable ☐ Ground ☐ NPDES ☐ Surface ☑ | Other: ____

Analysis Requested

Preservation and Filtration Codes

Sample Identification	Collected Date	Collected Time	Grab	Composite	Total # of Containers	0	DRO-Modified 537
(2) EQUIP_BLANK-09152017	9/15/17	930	X		2	2	

For Lab Use Only

FSC: ____

SCR#: 211022

Preservation Codes

H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 P=H_3PO_4
F=Field Filtered O=Other

Remarks

Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Date results are needed: 9/22/17

E-mail address: alex.villhauer@arcadis.com, andrew.lorenz@arcadis.com

Data Package Options (circle if required)

Type I (EPA Level 3 Equivalent/non-CLP) | Type VI (Raw Data Only)

Type III (Reduced non-CLP) | NJ DKQP | TX TRRP-13

NYSDEC Category A or B | MA MCP | CT RCP

Relinquished by	Date	Time	Received by	Date	Time
Chelsia West	9/16/17	10:18			
Daniel Stockard Arcadis	9/15/17	12:00			
			Kelly Degryse	09/16/17	09:45

EDD Required? Yes No

If yes, format: ____

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx X Other ____

Temperature upon receipt 5.3 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 194679

Group Number(s): 1851324

Client: Arcadis

Delivery and Receipt Information

Delivery Method:	Fed Ex	Arrival Timestamp:	09/16/2017 9:45
Number of Packages:	1	Number of Projects:	1

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	No
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Kelly Deguzman (12627) at 13:17 on 09/16/2017

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	32170023	5.1	IR	Wet	N	Loose/Bag	N

Sample Date/Time Discrepancy Details

Sample ID on COC	Date/Time on Label	Comments
P3-MH-2-1_090417	9/14/2017 12:10	

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mg**	milligram(s)
C	degrees Celsius	**mL**	milliliter(s)
cfu	colony forming units	**MPN**	Most Probable Number
CP Units	cobalt-chloroplatinate units	**N.D.**	non-detect
F	degrees Fahrenheit	**ng**	nanogram(s)
g	gram(s)	**NTU**	nephelometric turbidity units
IU	International Units	**pg/L**	picogram/liter
kg	kilogram(s)	**RL**	Reporting Limit
L	liter(s)	**TNTC**	Too Numerous To Count
lb.	pound(s)	**µg**	microgram(s)
m3	cubic meter(s)	**µL**	microliter(s)
meq	milliequivalents	**umhos/cm**	micromhos/cm

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.
Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

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Automated Report

Technical Report for

Arcadis

Racer Lansing PFAS Delineation; Lansing, MI

B0064480.2017.01201

SGS Accutest Job Number: FA48620

Sampling Date: 10/19/17

Report to:

Arcadis
300 S Washington Sq Suite 315
Lansing, MI 48933
alex.villhauer@arcadis.com

ATTN: Alex Villhauer

Total number of pages in report: **25**

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

Caitlin Brice, M.S.
General Manager

Client Service contact: Andrea Colby 407-425-6700

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

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Table of Contents

Sample Summary

Arcadis

Job No: FA48620

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064480.2017.01201

Sample Number	Collected Date	Time	By	Received	Matrix Code	Matrix Type	Client Sample ID
FA48620-1	10/19/17	09:30	SD	10/20/17	AQ	Water	P3-MH-1-7_101917
FA48620-2	10/19/17	09:50	SD	10/20/17	AQ	Water	P3-MH-1-8_101917
FA48620-3	10/19/17	10:15	SD	10/20/17	AQ	Water	P3-MH-1-9_101917
FA48620-4	10/19/17	11:20	SD	10/20/17	AQ	Water	P3-MH-2-5_101917
FA48620-5	10/19/17	11:35	SD	10/20/17	AQ	Water	P3-MH-2-4_101917
FA48620-6	10/19/17	11:55	SD	10/20/17	AQ	Water	P3-MH-2-3_101917
FA48620-7	10/19/17	12:20	SD	10/20/17	AQ	Water	P3-MH-1-5_101917
FA48620-8	10/19/17	12:40	SD	10/20/17	AQ	Water	P3-MH-1-1_101917
FA48620-9	10/19/17	13:00	SD	10/20/17	AQ	Water	P3-MH-2-0_101917
FA48620-10	10/19/17	13:25	SD	10/20/17	AQ	Water	P3-MH-2-1N_101917
FA48620-11	10/19/17	13:35	SD	10/20/17	AQ	Equipment Blank	EB-01_101917
FA48620-12	10/19/17	00:00	SD	10/20/17	AQ	Water	DUP-01_101917

Summary of Hits

Job Number: FA48620
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 10/19/17

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
FA48620-1	**P3-MH-1-7_101917**					
Perfluorooctanesulfonic acid		0.0113 J	0.015	0.0038	ug/l	EPA 537 MOD
FA48620-2	**P3-MH-1-8_101917**					
Perfluorooctanesulfonic acid		0.0238	0.015	0.0038	ug/l	EPA 537 MOD
FA48620-3	**P3-MH-1-9_101917**					
Perfluorooctanesulfonic acid		0.0110 J	0.015	0.0038	ug/l	EPA 537 MOD
FA48620-4	**P3-MH-2-5_101917**					
No hits reported in this sample.						
FA48620-5	**P3-MH-2-4_101917**					
Perfluorooctanesulfonic acid		0.0144 J	0.015	0.0038	ug/l	EPA 537 MOD
FA48620-6	**P3-MH-2-3_101917**					
Perfluorooctanesulfonic acid		0.0356	0.015	0.0038	ug/l	EPA 537 MOD
FA48620-7	**P3-MH-1-5_101917**					
Perfluorooctanesulfonic acid		0.0256	0.015	0.0038	ug/l	EPA 537 MOD
FA48620-8	**P3-MH-1-1_101917**					
Perfluorooctanesulfonic acid		0.0438	0.017	0.0042	ug/l	EPA 537 MOD
FA48620-9	**P3-MH-2-0_101917**					
Perfluorooctanesulfonic acid		0.0823	0.017	0.0042	ug/l	EPA 537 MOD
FA48620-10	**P3-MH-2-1N_101917**					
Perfluorooctanesulfonic acid		0.151	0.017	0.0042	ug/l	EPA 537 MOD
FA48620-11	**EB-01_101917**					
No hits reported in this sample.						

Summary of Hits

Job Number: FA48620
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 10/19/17

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
FA48620-12	DUP-01_101917					
Perfluorooctanesulfonic acid		0.136	0.015	0.0038	ug/l	EPA 537 MOD

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	P3-MH-1-7_101917		
Lab Sample ID:	FA48620-1	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40598.D	1	11/07/17 02:57	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0113	0.015	0.0038	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	84%		61-134%
	13C2-PFDA	108%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-1-8_101917		
Lab Sample ID:	FA48620-2	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40599.D	1	11/07/17 03:15	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0238	0.015	0.0038	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	103%		61-134%
	13C2-PFDA	125%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-1-9_101917		
Lab Sample ID:	FA48620-3	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40600.D	1	11/07/17 03:33	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0110	0.015	0.0038	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	93%		61-134%
	13C2-PFDA	111%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-2-5_101917		
Lab Sample ID:	FA48620-4	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40494.D	1	11/04/17 07:14	NAF	11/02/17 09:00	OP67469	SQ1005
Run #2							

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.017	0.0042	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	ND	0.017	0.0042	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	114%		61-134%
	13C2-PFDA	127%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-2-4_101917		
Lab Sample ID:	FA48620-5	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40601.D	1	11/07/17 03:51	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0144	0.015	0.0038	ug/l	J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	96%		61-134%
	13C2-PFDA	127%		62-128%

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

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

Report of Analysis

Client Sample ID:	P3-MH-2-3_101917		
Lab Sample ID:	FA48620-6	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40602.D	1	11/07/17 04:08	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0356	0.015	0.0038	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	93%		61-134%
	13C2-PFDA	128%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-1-5_101917		
Lab Sample ID:	FA48620-7	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40603.D	1	11/07/17 04:26	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0256	0.015	0.0038	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	89%		61-134%
	13C2-PFDA	110%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-1-1_101917		
Lab Sample ID:	FA48620-8	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40604.D	1	11/07/17 04:44	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.017	0.0042	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0438	0.017	0.0042	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	91%		61-134%
	13C2-PFDA	119%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-2-0_101917		
Lab Sample ID:	FA48620-9	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40605.D	1	11/07/17 05:02	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.017	0.0042	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.0823	0.017	0.0042	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	92%		61-134%
	13C2-PFDA	117%		62-128%

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

Report of Analysis

Client Sample ID:	P3-MH-2-1N_101917		
Lab Sample ID:	FA48620-10	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40606.D	1	11/07/17 05:20	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.017	0.0042	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.151	0.017	0.0042	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	90%		61-134%
	13C2-PFDA	116%		62-128%

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

Report of Analysis

Client Sample ID:	EB-01_101917		
Lab Sample ID:	FA48620-11	**Date Sampled:**	10/19/17
Matrix:	AQ - Equipment Blank	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40503.D	1	11/04/17 10:03	NAF	11/02/17 09:00	OP67469	SQ1005
Run #2							

	Initial Volume	Final Volume
Run #1	80.0 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.025	0.0063	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	ND	0.025	0.0063	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	120%		61-134%
	13C2-PFDA	124%		62-128%

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

Report of Analysis

Client Sample ID:	DUP-01_101917		
Lab Sample ID:	FA48620-12	**Date Sampled:**	10/19/17
Matrix:	AQ - Water	**Date Received:**	10/20/17
Method:	EPA 537 MOD EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	Q40607.D	1	11/07/17 05:37	NAF	11/02/17 09:00	OP67469	SQ1006
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
PERFLUOROALKYLSULFONATES						
1763-23-1	Perfluorooctanesulfonic acid	0.136	0.015	0.0038	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	13C2-PFHxA	93%		61-134%
	13C2-PFDA	119%		62-128%

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

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody

FA48620

SGS ACCUTEST

SGS Accutest Southeast Chain of Custody

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

SGS ACCUTEST JOB # : FA48620 PAGE 1 OF 1

SGS Accutest Quote # | SKIFF #

Client / Reporting Information

Company Name: Arcadis
Address: 28550 Cabot Dr. Suite 500
City: Novi State: MI Zip: 48377
Project Contact: Alex Villhauer Email: Alex.Villhauer@arcadis.com
Phone #: 248-994-2240
Sampler(s) Name(s) (Printed)
Sampler 1: Sam Dunne Sampler 2:

Project Information

Project Name:
Street
City Lansing State MI
Project # B006448O.2017.01201
Fax # 248-994-2241
Client Purchase Order #

Analytical Information

PFOS/PFOA modified Method 537

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL- Sludge
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid

SGS Accutest Sample #	Field ID / Point of Collection	COLLECTION DATE	TIME	SAMPLED BY:	MATRIX	TOTAL # OF BOTTLES	OTHER	NONE	HCl	NaOH	HNO3	H2SO4	NAOH+ZNAC	DI WATER	MEOH	PFOS/PFOA modified Method 537	LAB USE ONLY
1	P3-MH-1-7_101917	10/19/17	0930	S.D	WW	2		X								X	
2	P3-MH-1-8_101917	10/19/17	0950	S.D	WW	2		X								X	
3	P3-MH-2-9_101917	10/19/17	1015	S.D	WW	2		X								X	
4	P3-MH-2-5_101917	10/19/17	1120	S.D	WW	2		X								X	
5	P3-MH-2-4_101917	10/19/17	1135	S.D	WW	2		X								X	
6	P3-MH-2-3_101917	10/19/17	1155	S.D	WW	2		X								X	
7	P3-MH-1-5_101917	10/19/17	1220	S.D	WW	2		X								X	
8	P3-MH-1-1_101917	10/19/17	1240	S.D	WW	2		X								X	
9	P3-MH-2-0_101917	10/19/17	1300	S.D	WW	2		X								X	
10	P3-MH-2-1N_101917	10/19/17	1325	S.D	WW	2		X								X	
11	EB-01-101917	10/19/17	1335	S.D	WW	2		X								X	
12	DUP-01-101917	10/19/17	—	S.D	WW	2		X								X	

Turnaround Time (Business days)

10 Day (Business) Approved By: / Date:
7 Day
5 Day
3 Day *RUSH*
2 Day *RUSH*
1 Day *RUSH*
Other
Rush T/A Data Available VIA Email or Lablink

Data Deliverable Information

- [ ] COMMERCIAL "A" (RESULTS ONLY)
- [ ] COMMERCIAL "B" (RESULTS PLUS QC)
- [ ] REDT1 (EPA LEVEL 3)
- [ ] FULLT1 (EPA LEVEL 4)
- [ ] EDD'S

Comments / Remarks

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation
1	Sam Dunne Arcadis	10/19/17 1580	2 FedEx	3 FedEx		4 10/20/17 9:00
5	Relinquished by/Affiliation	Date Time:	6 Received By/Affiliation	7 Relinquished By/Affiliation	Date Time:	8 Received By/Affiliation

Lab Use Only : Cooler Temperature (s) Celsius (corrected): 4.6

http://www.sgs.com/en/terms-and-conditions
Effective Date 04/24/2017

SGS COC Florida new art 5 2 17.xls rev 042417 SI

4.1 4

FA48620: Chain of Custody
Page 1 of 2

SGS Accutest Sample Receipt Summary

Job Number: FA48620 **Client:** ARCADIS **Project:** B0064480,2017.01201

Date / Time Received: 10/20/2017 9:00:00 AM **Delivery Method:** fed ex **Airbill #'s:** 812012028756

Therm ID: IR 1; **Therm CF:** -0.2; **# of Coolers:** 1

Cooler Temps (Raw Measured) °C: Cooler 1: (4.8);

Cooler Temps (Corrected) °C: Cooler 1: (4.6);

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

Trip Blank Information	Y	or	N	N/A
1. Trip Blank present / cooler	☐		☐	☑
2. Trip Blank listed on COC	☐		☐	☑
	W	**or**	**S**	**N/A**
3. Type Of TB Received	☐		☐	☑

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

Misc. Information

Number of Encores: 25-Gram _____ 5-Gram _____ Number of 5035 Field Kits: _____ Number of Lab Filtered Metals: _____

Test Strip Lot #s: pH 0-3 230315 pH 10-12 219813A Other: (Specify) _____ _____

Residual Chlorine Test Strip Lot #: _____

Comments

SM001
Rev. Date 05/24/17

Technician: coryr Date: 10/20/2017 9:00:00 A Reviewer: _____ Date: _____

FA48620: Chain of Custody
Page 2 of 2

MS Semi-volatiles

5

QC Data Summaries

Includes the following where applicable:

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

Method Blank Summary

Job Number: FA48620
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP67469-MB	Q40479.D	1	11/04/17	NAF	11/02/17	OP67469	SQ1005

The QC reported here applies to the following samples: **Method:** EPA 537 MOD

FA48620-1, FA48620-2, FA48620-3, FA48620-4, FA48620-5, FA48620-6, FA48620-7, FA48620-8, FA48620-9, FA48620-10, FA48620-11, FA48620-12

CAS No.	Compound	Result	RL	MDL	Units	Q
335-67-1	Perfluorooctanoic acid	ND	0.015	0.0038	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.015	0.0038	ug/l	

CAS No.	Surrogate Recoveries		Limits
	13C2-PFHxA	120%	61-134%
	13C2-PFDA	128%	62-128%

Blank Spike Summary

Job Number: FA48620
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP67469-BS	Q40478.D	1	11/04/17	NAF	11/02/17	OP67469	SQ1005

The QC reported here applies to the following samples: **Method:** EPA 537 MOD

FA48620-1, FA48620-2, FA48620-3, FA48620-4, FA48620-5, FA48620-6, FA48620-7, FA48620-8, FA48620-9, FA48620-10, FA48620-11, FA48620-12

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
335-67-1	Perfluorooctanoic acid	0.154	0.176	114	74-137
1763-23-1	Perfluorooctanesulfonic acid	0.154	0.170	110	70-134

CAS No.	Surrogate Recoveries	BSP	Limits
	13C2-PFHxA	115%	61-134%
	13C2-PFDA	116%	62-128%

* = Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: FA48620
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP67469-MS	Q40481.D	1	11/04/17	NAF	11/03/17	OP67469	SQ1005
OP67469-MSD	Q40482.D	1	11/04/17	NAF	11/03/17	OP67469	SQ1005
FA48649-15	Q40595.D	1	11/07/17	NAF	11/02/17	OP67469	SQ1006

The QC reported here applies to the following samples: **Method:** EPA 537 MOD

FA48620-1, FA48620-2, FA48620-3, FA48620-4, FA48620-5, FA48620-6, FA48620-7, FA48620-8, FA48620-9, FA48620-10, FA48620-11, FA48620-12

CAS No.	Compound	FA48649-15 ug/l	Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
335-67-1	Perfluorooctanoic acid	0.0159	J	0.154	0.181	107	0.154	0.168	99	7	74-137/30
1763-23-1	Perfluorooctanesulfonic acid	0.017	U	0.154	0.158	103	0.154	0.151	98	5	70-134/30

CAS No.	Surrogate Recoveries	MS	MSD	FA48649-15	Limits
	13C2-PFHxA	114%	113%	97%	61-134%
	13C2-PFDA	117%	117%	109%	62-128%
	d5-EtFOSAA			109%	57-135%

* = Outside of Control Limits.

Arcadis of Michigan, LLC

28550 Cabot Drive

Suite 500

Novi, Michigan 48377

Tel 248 994 2240

Fax 248 994 2241

www.arcadis.com