AECOM
4051 Ogletown Road
Newark
DE, 19713
USA
aecom.com

Project name:
Montague Site

Project ref:
Chemours: 507756
AECOM: 60494178

To:
Ronda Blayer, MDEQ
Dale Bridgford, MDEQ

CC:
Sathya Yalvigi, Chemours
Craig A. Bartlett, Chemours

From:
George E. Gregory III, AECOM

Date:
August 8, 2018

Memo

Subject: Proposed Groundwater Sampling for Per- and Polyfluoroalkyl Substances (PFAS)
Chemours Montague, Montague, Michigan

Background

In an April 5, 2018 email to AECOM and The Chemours Company (Chemours), the Michigan Department of Environmental Quality (MDEQ) noted that per- and polyfluoroalkyl substances (PFAS) have become an emerging constituent of concern. The email further noted that Part 201 of the Michigan Natural Resources and Environmental Protection Act, 1994 PA 451 had been amended effective January 10, 2018 to provide drinking water criteria for perfluorooctanoic acid (PFOA) [CAS # 335-67-1] and perfluorooctanesulfonic acid (PFOS) [CAS # 1763-23-1]. MDEQ recommended that Chemours develop a plan to perform sampling of groundwater and water from the NPDES discharge prior to discharge at Lake Michigan and analysis of the samples for PFOA and PFOS.

AECOM and Chemours developed and presented a conceptual sampling plan during a site meeting on May 16, 2018. Based on that discussion, this document provides the details for the sampling program.

Purpose

The purpose of this sampling program is to determine if PFOA and/or PFOS are present in groundwater or the NPDES discharge to Lake Michigan. In the event that a detection is found, additional work would be planned and reviewed by MDEQ.

Scope of Work

Because the purpose of the sampling is to confirm that the site has not released PFOA and /or PFOS to groundwater, monitoring wells have been selected that are nearest to the former waste units. Wells proposed for the sampling are shown on Figure 1 and are listed below:

- BP-008-060: The well is a “background” well that is hydraulically upgradient of the Bury Pit Landfill and the former site manufacturing areas.
- BP-001-070: The well is hydraulically downgradient of the Bury Pit Landfill.
- MW-250-054: The well is hydraulically downgradient of the Pierson Creek Landfill.
- MW-224-060: The well is hydraulically downgradient of the Northeast Landfill.

- MW-204-040: The well is hydraulically downgradient of the former Surface Impoundment.
- NL-005-055: The well is hydraulically downgradient of the North Landfill.
- IW-09-140: The well is an interceptor well that is hydraulically downgradient of the Lime Pile.
- MW-213-062: The well is hydraulically downgradient and downwind of the former Freon Manufacturing Area.
- Outfall: The well is the NPDES Outfall, which will be sampled from the same sampling port as is used during the monthly NPDES sampling..

In addition, site water (provided by an on-site water well) is used for decontamination of pumps and equipment and may itself present a potential source, therefore, site water will also be sampled during the event.

Sampling Procedures

There are very significant issues with PFAS sampling due to the potential presence of these compounds in many commercial products, including in sampling and decontamination equipment. Prior to conducting PFAS sampling, our sampling teams will attend a training course and review a guidance document[1] to make our samplers aware of the products that are known to have tested positive for PFAS compounds as well as identifying products which are appropriate to use in the sampling environment. For this sampling event, the team will order consumable and rental equipment that minimizes the chances of false positive detections.

Well Sampling Procedures

Sampling at the site wells is typically done using low-flow purge methods; however; a three-well volume purge better limits the potential for well materials and sampling equipment to influence results. For this reason, monitoring wells will be sampled using a three-well volume purge. Operating wells, the NPDES Outfall, and the site water supply will not require a three-well volume purge.

Sample Collection

For all sampling media, wash hands prior to commencing the sampling event and wear clean powderless nitrile gloves prior to handling sample containers and equipment. Keep the sample bottle sealed at all times and only open during sample collection. Do not put the sample bottle cap or lid down during sample collection and replace the lid or cap as soon as the sample has been collected. Field filtration will not be performed.

Collect samples in the following order:

1. Site water supply (from tap)
2. BP-008-060 (well)
3. BP-001-070 (well)
4. MW-250-054 (well)
5. MW-224-060 (well)
6. MW-204-040 (well)
7. NL-005-055 (well)
8. MW-213-062 (well)
9. IW-09-140 (from tap)
10. Outfall (from tap)

Change powderless nitrile gloves prior to the following activities:

- Insertion of anything into a monitoring well (e.g., water quality meter, pump, tubing, bailer, etc.)
- Insertion/connection of tubing into the sampling pump
- Completion of monitoring well purging, prior to sample collection
- Handling of any QA/QC samples including field blanks and equipment blanks

[1] *Per- and Polyfluoroalkyl Substances (PFAS) Sampling Guidance*, AECOM Global PFAS Practice, April 2017, Version 2: June 2018.

- After the handling of any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel
- Decontamination of reusable sampling equipment (see below for procedures).

Use the following steps to collect PFAS samples, remembering to change powderless nitrile gloves as stated above:

1. Collect water-level measurement data to determine the volume of water to purge.
2. Purge well volume three times through the flow-through cell.
3. Reduce flow to approximately 150 milliliters per minute. Collect groundwater parameters, then disconnect from the flow-through cell and collect samples.
4. During sampling, minimize water turbulence to avoid potential volatilization of some PFAS [e.g., fluorotelomer alcohols (FTOHs)] from aqueous solution; this could include adjusting discharge rates prior to sampling and inclining the sample bottleneck during filling of the bottle. Ensure that the rim of the bottle does not come into direct contact with the equipment or sample port.
5. Ensure that the bottle lids remains on the bottle until immediately prior to sample collection and replace it on the sample bottle after sample collection. This will minimize potential loss of some PFAS (e.g., FTOHs) through volatilization and the potential for cross-contamination from other sources. The bottle cap must remain in the other hand of the sampler until replaced on the bottle. PFAS sample bottles will not be rinsed during sampling.
6. Place cap on bottle and label bottle using ballpoint pen if not using prelabeled sample bottles.
7. Bag sample using Ziploc bags, or similar style bags, and place in cooler with wet ice (not blue or chemical ice).
8. Allow the system to drain thoroughly prior to disassembly and equipment decontamination.

Sampling of Site Water Supply, NPDES Outfall, and IW-09-140 Taps

Use the following steps when sampling treatment systems for PFAS.

1. Wash hands and don a new pair of powderless nitrile gloves for each sample being collected.
2. Prepare the sampling port for sampling by removing the aerator and/or tubing on the port if needed.
3. Turn the water on full flow for approximately 1 minute to remove stagnant water that maybe in the sample port.
4. After the minute has elapsed, reduce the flow of water to a low flow. For low flow, the stream of water should be no more than the size of a pencil. For some treatment system sampling ports, this reducing of the flow may not be possible.
5. Hold the Polyproplene or high-density polyethylene (HDPE) sampling bottle by the body. Avoid touching or handling the bottle by the neck and mouth.
6. Fill the bottle up to the neck, making sure not to overflow the bottle. The Teflon-free bottle cap must remain on the bottle until immediately prior to sample collection and must be immediately replaced on the sample bottle after sample collection. This will minimize potential loss of some PFAS (e.g., FTOHs) through volatilization. The bottle cap must remain in the other hand of the sampler, until replaced on the bottle. PFAS sample bottles will not be rinsed during sampling.
7. Label bottle using ballpoint pen
8. Bag sample using Ziploc bags, or similar style bags, and place in cooler with wet ice (not blue or chemical ice).

Sampling Equipment Decontamination

Where possible, PFAS-free disposable equipment will be used. However, pumps and flow-through cells will be re-used, and this equipment will require decontamination between uses.

For decontaminating submersible pumps, water-level measurement devices, and other groundwater sampling equipment, use the following procedures:

- Prior to use, ensure that all equipment used for decontamination does not contain parts that may be sources of PFAS cross-contamination.

  Note that a sample from the site water supply is planned because that water is used for decontamination water.
- Rinse equipment with site potable water (which is planned for testing) and scrub equipment using a polyethylene or PVC plastic brush to get rid of particulates.
- Use Alconox, Citranox, or Liquinox for equipment decontamination. Do not use Decon 90.
- Rinse equipment three times using distilled water.
- To minimize equipment decontamination, use PFAS-free disposable equipment wherever possible. Examples of disposable equipment include the following: HDPE and silicon tubing.

Quality Assurance/Quality Control

Because of the possibility of cross-contamination to influence PFAS results, the following QA/QC samples are included in this work plan.

Site Water Supply

Although not technically a “blank,” the sample being collected from the site water supply is intended to confirm that water used for decontamination of pumps does not itself contain PFAS constituents.

Blanks

The use of blanks should be considered to evaluate the composition or suitable nature of equipment and supplies used during PFAS sampling, and to assess the possibility of cross-contamination during sampling, transport, and storage of samples.

- An **equipment blank** will be collected by passing laboratory-certified PFAS-free water over and through disposable or decontaminated field sampling equipment prior to the collection of samples to assess the adequacy of the decontamination process and/or to evaluate potential contamination from the equipment used during sampling.
- A **field blank** will be collected by pouring laboratory-certified PFAS-free water into the sampling container in the field. Field blanks are used to assess contamination from field conditions during sampling.
- A **trip blank** will be provided by the laboratory with the sample bottles and will be kept with the field samples during sampling and shipment. A laboratory-certified PFAS-free water vial will be provided by the laboratory and is transported to the sampling site back to the laboratory and kept sealed during sampling. Typically, a trip blank is only used for volatile compounds, but it may be used for PFAS sampling to assess cross-contamination introduced from the laboratory and during shipping procedures.

Duplicates

- One field duplicate will be collected from well MW-213-062 (the closest to the former Freon Manufacturing Area).
- Matrix spike/matrix spike duplicates will also be collected from MW-213-062.

Sample Shipment

Sample coolers should be packed with the samples and wet ice (not blue or chemical ice which should be avoided as it historically contained PFAS and the presence or absence of PFAS is currently unknown) in a large poly bag that is taped closed. Sample bottles labeled with waterproof labels may be bagged in a food storage bag. The completed and relinquished Chain-of-Custody (CoC) form should be bagged in a food storage bag and taped to the inside of the cooler lid. The cooler should be taped closed with a custody seal and shipped by overnight courier to the appropriately accredited PFAS laboratory.

1. Samples must be chilled during shipment and must not exceed 10°C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10°C when the samples are received at the laboratory.

2. Samples stored in the lab must be held at a temperature of 0° to 6°C, not frozen, until extraction.

3. Water samples must be extracted within 14 days. Extracts must be analyzed within 28 days after extraction. Extracts can be stored at room temperature.

Analytical Program

Samples shipped to the laboratory will need to meet detection limits that are at least at or below the drinking water criteria for PFOA and PFOS. MDEQ noted that the drinking-water criterion for combined PFOA and PFOS is 0.07 micrograms per liter (µg/L which is equivalent to 70 nanograms per liter (ng/L)). The analytical method proposed is 537 Modified. Samples will be sent to Lancaster Laboratories and the project team has confirmed that the laboratory can meet those limits as reporting limits. Table 1 presents the reporting list and method detection limits from the laboratory for method 537 Modified. Sample results will be reported to the limit of quantitation LOQ. Reported concentrations will not be corrected for contaminants found in associated method and field blanks.

Health and Safety

The site-specific Health and Safety Plan (HASP) will be developed to ensure safe conduct of the work.

Based on previous experience, it is expected that all work can be performed in Level D. Generally, at this site, the mosquitos, ticks, and poison ivy are not significantly present. For this reason, Tyvek® coveralls will not be needed for health and safety purposes.

In the event that field conditions differ and additional personal protective equipment (PPE) are needed, the field team will confer with technical staff with experience with PFAS sampling to confirm that modified PPE do not pose a concern.

Waste Management

Investigation-derived waste will be managed in accordance with the existing Project-Specific Waste Management Plan (PSWMP) for groundwater sampling. All PPE is disposed as industrial trash and all purged water and decon water is sent through the site treatment system.

Schedule

The proposed schedule is for the sampling to occur beginning on August 22, 2018. This coincides with the timing agreed to with Ashley McElmurry, who plans to collect a sample of the water discharging to the NPDES Outfall. Based on the number of wells, it is expected to take two field days to complete.

If you have any questions or comments about the technical nature of this scope, please contact me at 832-422-4423. For other questions related to the project, please contact Sathya Yalvigi at 302-773-4291.

Sincerely,

George E. Gregory III
Senior Geologist/Project Manager
AECOM Corporation

Attachments: Figures, Tables

Tables

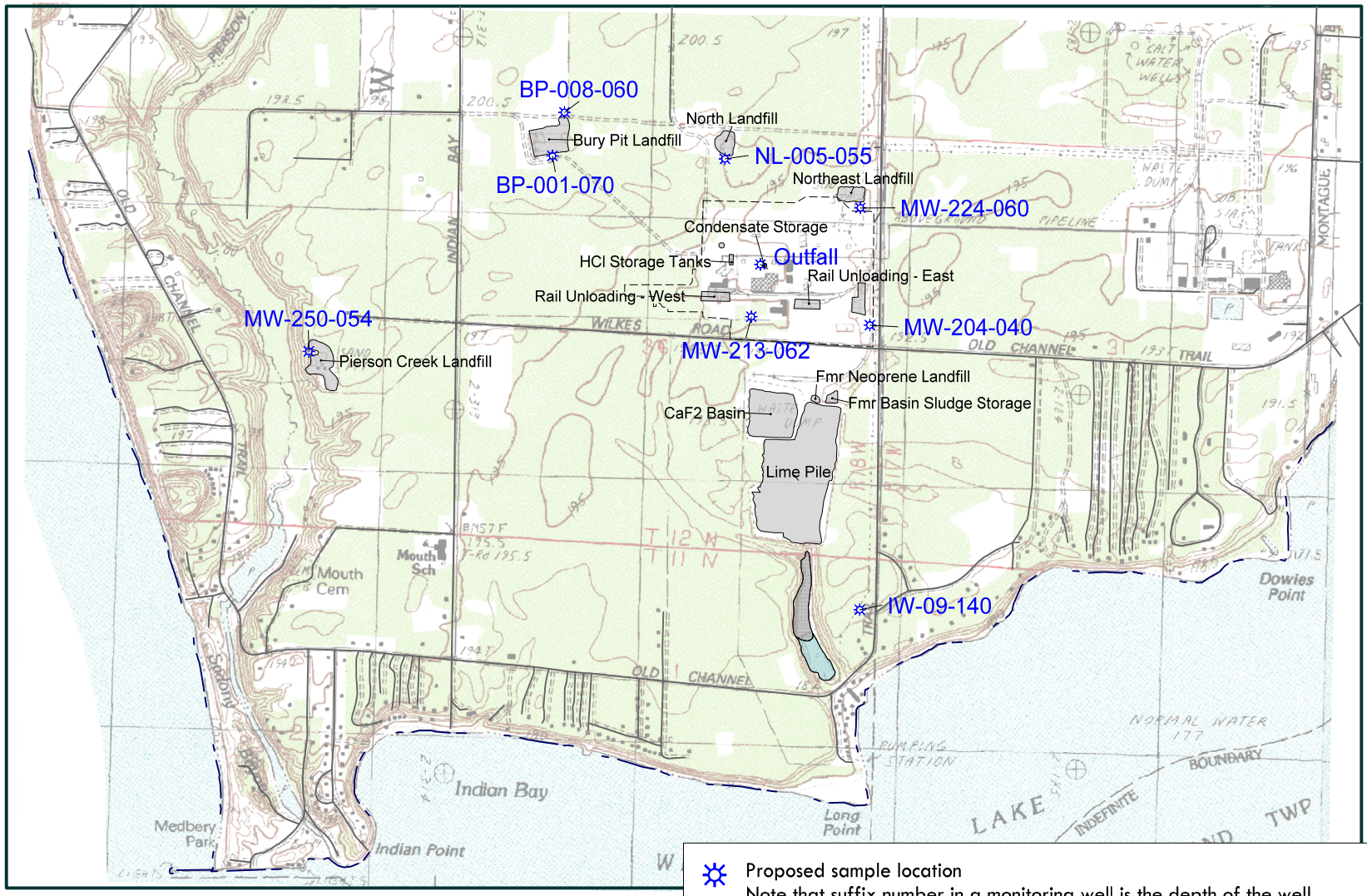
Table 1
Lancaster Laboratories - MDLs and LOQs for PFAS Compounds
2018 PFAS Sampling
Chemours Montague Works
Montague, Michigan

PFAS Compounds			Water Samples			Solid Samples			Michigan DEQ
Compound	CAS Number	Method	MDL	LOQ	Units	MDL	LOQ	Units	List of 24
10:2-fluorotelomersulfonate	120226-60-0	EPA 537 Version 1.1 Modified	3	9	ng/l	1	3	ng/g	
4:2 fluorotelomersulfonate	757124-72-4	EPA 537 Version 1.1 Modified	1	3	ng/l	1	3	ng/g	X
6:2 fluorotelomersulfonate	27619-97-2	EPA 537 Version 1.1 Modified	1	2	ng/l	0.6	2	ng/g	X
8:2 fluorotelomersulfonate	39108-34-4	EPA 537 Version 1.1 Modified	2	6	ng/l	0.6	2	ng/g	X
NEtFOSAA	2991-50-6	EPA 537 Version 1.1 Modified	1	3	ng/l	0.5	2	ng/g	X
NEtPFOSA	4151-50-2	EPA 537 Version 1.1 Modified	3	9	ng/l	0.5	2	ng/g	
NEtPFOSAE	1691-99-2	EPA 537 Version 1.1 Modified	1.2	3	ng/l	0.5	2	ng/g	
NMeFOSAA	2355-31-9	EPA 537 Version 1.1 Modified	1	3	ng/l	0.5	2	ng/g	X
NMePFOSA	31506-32-8	EPA 537 Version 1.1 Modified	3	9	ng/l	0.5	2	ng/g	
NMePFOSAE	24448-09-7	EPA 537 Version 1.1 Modified	1	3	ng/l	0.5	2	ng/g	
Perfluoro-octanesulfonate	1763-23-1	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.3	0.9	ng/g	X
Perfluorobutanesulfonate	375-73-5	EPA 537 Version 1.1 Modified	0.3	1	ng/l	0.2	0.6	ng/g	X
Perfluorobutanoic acid	375-22-4	EPA 537 Version 1.1 Modified	2	6	ng/l	0.2	0.6	ng/g	X
Perfluorodecanesulfonate	335-77-3	EPA 537 Version 1.1 Modified	0.6	2	ng/l	0.3	1	ng/g	X
Perfluorodecanoic acid	335-76-2	EPA 537 Version 1.1 Modified	0.9	2	ng/l	0.2	0.6	ng/g	X
Perfluorododecanesulfonate	79780-39-5	EPA 537 Version 1.1 Modified	0.3	1	ng/l	0.3	0.9	ng/g	
Perfluorododecanoic acid	307-55-1	EPA 537 Version 1.1 Modified	0.5	2	ng/l	0.2	0.6	ng/g	X
Perfluoroheptanesulfonate	375-92-8	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.2	0.6	ng/g	X
Perfluoroheptanoic acid	375-85-9	EPA 537 Version 1.1 Modified	0.4	1	ng/l	0.2	0.6	ng/g	X
Perfluorohexadecanoic acid	67905-19-5	EPA 537 Version 1.1 Modified	0.3	1	ng/l	0.2	0.6	ng/g	
Perfluorohexanesulfonate	355-46-4	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.2	0.6	ng/g	X
Perfluorohexanoic acid	307-24-4	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.2	0.6	ng/g	X
Perfluorononanesulfonate	474511-07-4	EPA 537 Version 1.1 Modified	0.6	2	ng/l	0.2	0.6	ng/g	X
Perfluorononanoic acid	375-95-1	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.2	0.6	ng/g	X
Perfluorooctadecanoic acid	16517-11-6	EPA 537 Version 1.1 Modified	0.5	2	ng/l	0.2	0.6	ng/g	
Perfluorooctanesulfonamide	754-91-6	EPA 537 Version 1.1 Modified	0.5	3	ng/l	0.2	0.6	ng/g	X
Perfluorooctanoic acid	335-67-1	EPA 537 Version 1.1 Modified	0.3	1	ng/l	0.2	0.6	ng/g	X
Perfluoropentanesulfonate	2706-91-4	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.2	0.6	ng/g	X
Perfluoropentanoic acid	2706-90-3	EPA 537 Version 1.1 Modified	2	6	ng/l	0.2	0.6	ng/g	X
Perfluorotetradecanoic acid	376-06-7	EPA 537 Version 1.1 Modified	0.3	1	ng/l	0.2	0.6	ng/g	X
Perfluorotridecanoic acid	72629-94-8	EPA 537 Version 1.1 Modified	0.4	1	ng/l	0.2	0.6	ng/g	X
Perfluoroundecanoic acid	2058-94-8	EPA 537 Version 1.1 Modified	0.4	2	ng/l	0.2	0.6	ng/g	X

PFEACS Compounds			Water Samples			Solid Samples		
Compound	CAS Number	Method	MDL	LOQ	Units	MDL	LOQ	Units
11Cl-PF3OUdS	83329-89-9	SW-846 8321B	0.3	1	ng/l	0.2	0.6	ng/g
9Cl-PF3ONS	73606-19-6	SW-846 8321B	0.3	1	ng/l	0.2	0.6	ng/g
HFPODA	13252-13-6	SW-846 8321B	0.3	1	ng/l	0.2	0.6	ng/g
NaDONA	958445-44-8	SW-846 8321B	0.3	1	ng/l	0.2	0.6	ng/g

Reporting limits and statistical QC windows are evaluated periodically and are subject to change.

Figures



AECOM
Sabre Building, Suite 300
4051 Ogletown Road
Newark, DE 19713

TITLE:

Proposed Sample Locations for PFASs
Chemours Montague Site
Montague, Michigan

DWN:	APPD:
GEG	
CHKD:	REV:
DTL	
DATE:	
08/08/2018	

PROJECT NO: 60561815

FIGURE NO: 1