



Geosyntec Consultants of NC, PC

CHARACTERIZATION OF PFAS IN PROCESS AND NON-PROCESS WASTEWATER AND STORMWATER

Quarterly Report #1

Prepared for

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ACRONYMS AND ABBREVIATIONS

COC – Chain of Custody
DEQ – The North Carolina Department of Environmental Quality
DFSA – Difluoro-sulfo-acetic acid
DO – Dissolved oxygen
DQO – data quality objectives
DVM – Data Verification Module
EIM – Environmental Information Management
EPA – Environmental Protection Agency
HDPE – High Density Polyethylene
HFPO-DA – Hexafluoropropylene oxide dimer acid
mg/L – Milligrams per liter
mL – Milliliter
MMF – Difluoromalonic acid
MS – Matrix spike
MSD – Matrix spike duplicates
MTP – Perfluoro-2-methoxypropanoic acid
mV – Millivolts
ng/L – Nanograms per liter
NTU – Nephelometric turbidity units
ORP – Oxidation/Reduction Potential
PFAS – Per- and polyfluoroalkyl substances
PFMOAA – 2,2-difluoro-2-(trifluoromethoxy) acetic acid
PFO5DA – Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid
PPF Acid – Pentafluoropentonic acid
QA/QC – Quality assurance/ quality control
RPD – Relative percent difference
SC – Specific conductance
SOP – Standard Operating Procedure
TestAmerica – TestAmerica Sacramento
WWTP – Wastewater treatment plant
°C – Degrees Celsius
μmho - micromhos

“I certify that I am personally familiar with the information contained in this submittal, including any and all supporting documents accompanying this report, and that the material and information contained herein is, to the best of my knowledge and belief, true, accurate and complete.”



July 31, 2019



Adrienne Nemura, North Carolina Licensed Professional Engineer 038141

Geosyntec Consultants of NC, PC is licensed to practice engineering in North Carolina. The certification number (Firm's License Number) is C-3500.

Geosyntec Consultants of NC, PC is licensed to practice geology in North Carolina. The certification number (Firm's License Number) is C-295.

1. INTRODUCTION

This report was prepared by Geosyntec Consultants of NC, P.C. (Geosyntec) for The Chemours Company FC, LLC (Chemours) to provide a quarterly update on the identification and concentrations of per- and polyfluoroalkyl substances (“PFAS”) in process wastewater, non-process wastewater, and stormwater at the Chemours Fayetteville Works, North Carolina site (the Facility, Figure 1). This report is prepared pursuant to Paragraph 11(c) in the executed Consent Order entered February 25, 2019 between Chemours and the North Carolina Department of Environmental Quality (DEQ) with the Cape Fear River Watch as intervenor.

The objective of this report and subsequent quarterly reports, as stated in the PFAS Characterization Sampling Plan (Geosyntec, 2019), is to characterize the concentrations of PFAS in the raw water intake, process wastewater, non-process wastewater, and stormwater, including water that is discharged through Outfall 002.

1.1 Background

Chemours submitted an Updated PFAS Characterization Sampling Plan (the Plan) to DEQ on May 6, 2019 (Geosyntec, 2019) based on comments received on the draft plan submitted on December 30, 2018. On June 19, 2019, DEQ provided written approval of the Plan to Chemours.

1.2 Activities Completed in Quarter 2 2019

This is the first quarterly report for this program. The activity period for this quarterly report includes April, May and June 2019. Table 1 provides a summary of the proposed sample locations for wastewater samples to be collected at the Facility. In this reporting period, process wastewater and non-process wastewater samples were collected for the first bimonthly PFAS characterization sampling event on April 24, 2019 (the April 2019 event). These samples were collected as outlined in the PFAS Characterization Sampling Plan (Geosyntec, 2019) and to address requirements specified in Paragraph 11(b) in the executed Consent Order.

In this reporting period, process wastewater and non-process wastewater samples were also collected for the second bimonthly PFAS characterization sampling event on June 27, 2019 (the June 2019 event). While there was a suitable storm event on June 5, 2019, the project team elected to collect a set of 24 stormwater grab samples for total and dissolved PFAS concentrations to support a Consent Order Paragraph 12 deliverable

assessing stormwater contributions to PFAS concentrations at Outfall 002. After the June 5, 2019 rainfall event, there were no suitable subsequent storm events in June to meet the stormwater sampling criteria, so stormwater locations with no water were not sampled. Data for both the June 5, 2019 grab sampling event and the June 27, 2019 bimonthly sampling event are both pending. The June 5, 2019 data will be reported in the Paragraph 12 submission and the June 27, 2019 bimonthly sampling data will be reported in the next quarterly report.

Four supplementary sampling activities, based on initial observations from the April sampling event, were also conducted in 2019 Quarter 2. Data from these activities are pending and will be reported in the next quarterly report. These activities are described in Section 4.2

1.3 Report Organization

The remainder of this document is organized as follows:

- **Section 2 – Methods:** this section describes the methods employed for sample collection and analysis;
- **Section 3 – Results and Observations:** this section describes the PFAS concentrations in investigative samples and quality control samples;
- **Section 4 – Sampling Program Status:** this section describes planned sampling activities and supplemental sampling activities that support PFAS characterization at the facility;
- **Section 5 – Summary and Recommendations:** this section summarizes activities conducted, observations of results, recommended supplemental sampling activities, and any recommended changes to the sampling plan.
- **Section 6 – References:** this section lists the documents referenced in the report.

2. METHODS

This section describes the methods implemented for data reporting in this 2019 Quarter 2 report. Activities conducted in Quarter 2, where data is not yet available for reporting, will be described in future reports alongside data for these activities.

2.1 Sample Locations

Proposed sample locations outlined in the PFAS Characterization Sampling Plan (Geosyntec, 2019) to meet the requirements of Paragraph 11(b) of the executed Consent Order are described in Table 1 and shown in Figure 2. Twenty-three (23) investigative samples were collected in the April 2019 event, and are described in Table 2. Some locations identified in the PFAS Characterization Sampling Plan (Locations 2, 3, 4, 5, 11, 12 and 13; Geosyntec, 2019) were not sampled this quarter. These locations were dry during the sampling event; there was no precipitation in the 72 hours leading up to sample collection. As specified in the PFAS Characterization Sampling Plan (Geosyntec, 2019), sample collection will be conducted bimonthly, and if there are no suitable storm events, locations with water will still be sampled.

2.2 Field Methods

2.2.1 General Field Methods

All equipment was inspected by the field program supervisor and calibrated daily prior to use in the field according to the manufacturer's recommendations. Field parameters were measured with a water quality meter prior to sample collection and then recorded. Field parameters include the following:

- pH;
- Temperature (degrees Celsius; °C);
- Specific conductance [SC] (micromhos, µmho);
- Dissolved oxygen [DO] (milligrams per liter; mg/L);
- Oxidation/Reduction Potential [ORP] (millivolts; mV);
- Turbidity (nephelometric turbidity units, NTU);
- Color; and
- Odor.

Samples were collected in 250 milliliter (mL) high density polyethylene (HDPE) bottles with a wide-mouth screw-cap. Sample bottles were filled and caps were securely fastened

after sample collection. Each sample was labelled with a unique sample identification number, date, time and location of sampling, and the initials of the individual collecting the sample. A field notebook was used to record information regarding additional items such as quality assurance/ quality control (QA/QC), sample identifications, color, odor, turbidity, and other field parameters.

2.2.2 Decontamination Methods

Sample containers were new and used only once for each sample. Disposable equipment (e.g., gloves, tubing, etc.) was not reused, therefore; these items did not require decontamination.

All non-dedicated or non-disposable sampling equipment (i.e., the autosampler reservoir and dip rod) was decontaminated immediately before sample collection in the following manner:

- De-ionized water rinse;
- Scrub with de-ionized water containing non-phosphate detergent (i.e., Alconox®); and
- De-ionized water rinse.

If there was a delay between decontamination and sample collection, decontaminated sampling equipment was covered with PFAS-free plastic until it was ready for use.

2.2.3 Grab Sampling Methods

Grab samples were collected during the April 2019 event from locations where temporal variability over the course of one day was not expected. These locations include non-process wastewater and process wastewater samples and are identified in Table 2 and shown on Figure 2. Location 7B was also collected as a grab sample during the April 2019 event due to limited autosampler availability. All grab samples were collected by directly filling the HDPE bottle with sample. Prior to grab sample collection, field parameters were measured using a flow through cell for all grab sample locations except Chemours Process Water samples at Locations 16, 17A, and 17B. These locations were not accessible by the sampling team and samples were collected by facility staff who were not equipped with field instruments.

2.2.4 Temporal Composite Sampling Methods

Temporal composite samples were collected during the April 2019 event from locations where variability was expected to potentially be significant within a short time frame (e.g., one day). These locations, identified in Table 2 and shown on Figure 2, include those within the Facility drainage ditches and the intake and outfall locations, since these locations can have highly variable dissolved and suspended constituent loads over short time periods. Temporal composite samples were collected using a dedicated Teledyne 6712C autosampler equipped with a rain gauge, HDPE tubing, silicon tubing, and an HDPE sample reservoir. Field parameters were measured twice for temporal composite samples: once during composite sampling (collected directly from the water stream), and once after composite sampling (collected from the autosampler reservoir). At each location, autosamplers integrated water over a four-hour sample collection period.

2.2.5 Sample Shipping, Chain of Custody, and Holding Times

Upon sample collection, each labelled, containerized sample was placed into a heavy plastic bag inside an insulated sample cooler with ice. Prior to shipment of the samples to the laboratory, a chain of custody (COC) form was completed by the field sample custodian. Sample locations, sample identification numbers, description of samples, number of samples collected, and specific laboratory analyses to be performed on the samples were recorded on the COC form. The COC was signed by the field personnel relinquishing the samples to the courier and was signed by the laboratory upon receipt of the cooler.

2.2.6 Field QA/QC Samples

The following field QA/QC samples were collected and analyzed along with the April 2019 investigative samples:

- Two blind field duplicates;
- Three equipment blanks for the dip rod, peristaltic pump, and autosampler;
- One field blank; and
- One trip blank.

2.2.7 Documentation

The project field team kept a daily record of field activities during the execution of field work including sampling notes and observations, instrument calibration records, measured field parameters, sample COC, and shipping records.

2.3 Laboratory Methods

2.3.1 Analytical Methods

Samples were analyzed for PFAS by the following methods:

- Table 3+ Laboratory Standard Operating Procedure (SOP); and
- EPA Method 537 Mod (Laboratory SOP).

PFAS reported under each of these methods are listed in Table 3.

2.3.2 Laboratory and Field QA/QC

Field sampling and laboratory analyses were performed in accordance with the PFAS Characterization Sampling Plan (Geosyntec, 2019). Samples were collected by the field team and shipped to TestAmerica Sacramento (TestAmerica) under COC. Laboratory analyses were performed within the guidelines specified by the laboratory SOPs. The collection frequency of field duplicates, matrix spike / matrix spike duplicates (MS/MSD), trip blanks, and equipment blanks was in accordance with the PFAS Characterization Sampling Plan (Geosyntec, 2019).

3. RESULTS AND OBSERVATIONS

3.1 Data Quality

All data were reviewed using the Data Verification Module (DVM) within the LocusTM Environmental Information Management (EIM) system, which is a commercial software program used to manage data. Following the DVM process, a manual review of the data was conducted. The DVM and the manual review results were combined in a data review narrative report for each set of sample results which were consistent with Stage 2b of the EPA Guidance for Labelling Externally Validated Laboratory Analytical Data for Superfund Use (EPA-540-R-08-005 2009). The narrative report summarizes which samples were qualified (if any), the specific reasons for the qualification, and any potential bias in reported results. The data usability, in view of the project's data quality objectives (DQOs), was assessed and the data were entered into the EIM system.

The data were evaluated by the DVM against the following data usability checks:

- Hold time criteria;
- Field and laboratory blank contamination;
- Completeness of QA/QC samples;
- MS/MSD recoveries and the relative percent differences (RPDs) between these spikes;
- Laboratory control sample/control sample duplicate recoveries and the RPD between these spikes;
- Surrogate spike recoveries for organic analyses; and
- RPD between field duplicate sample pairs.

The manual review includes instrument-related QC results for calibration standards, blanks, and recoveries. The data review process (DVM plus manual review) applied the following data evaluation qualifiers to analysis results, as warranted:

- J – Analyte present. Reported value may not be accurate or precise;
- UJ – Analyte not detected. Reporting limit may not be accurate or precise; and
- B – Analyte detected in a blank sample. Reported value may have high bias.

The data review process described above was performed for all laboratory chemical analysis data generated for the sampling events. The DQOs were met for the analytical

results for accuracy and precision. The data collected are believed to be complete, representative, and comparable.

3.1.1 Data Management and Reporting

Chemours's Analytical Data Quality Management team currently uses the EIM system for management of analytical data, xyz Site coordinate data, and field parameter data. Validation and qualification of data are performed by AECOM who maintains the EIM system for the Chemours Fayetteville Site. A whitebook consisting of the data review narrative and the laboratory analytical report produced by AECOM summarizes the findings of the DVM and manual review process.

3.1.2 QA/QC Samples

PFAS concentrations for all field QA/QC samples in the April 2019 event are reported in Table 4. The following observations were noted for the QA/QC samples:

- The RPD for all field duplicate pairs was less than 30% for all PFAS, or less than 50% for PFAS detected within a factor of five of the associated reporting limits. No qualification was required.
- No PFAS were detected above the associated reporting limits in the equipment blanks with the exception of 2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol in each of the equipment blanks collected in the April 2019 event (780 to 850 nanograms per liter [ng/L], J qualified). This compound was detected in one associated sample collected at Location 7B (900 ng/L J). This result was J-qualified instead of being B-qualified due to low bias in the associated MS. All other associated investigative samples were non-detected at the associated reporting limits for this compound, so no further qualification was required.
- No PFAS were detected above the associated reporting limits in the April 2019 Trip Blank.

3.2 Results – April 2019 Event

PFAS concentrations for all sample locations in the April 2019 event are reported in Table 4. Figure 3A presents Hexafluoropropylene oxide dimer acid (HFPO-DA) and 2,2-difluoro-2-(trifluoromethoxy) acetic acid (PFMOAA) concentrations for locations in the April 2019 event that reach Outfall 002. Figure 3B presents HFPO-DA and PFMOAA

concentrations for locations in the April 2019 event where all water is shipped offsite for disposal. Table 5 provides the total daily precipitation, for Quarter 2, in the area of the Facility. Reporting limits listed in Table 4, Figure 3A, and Figure 3B are analytical reporting limits set by the laboratories.

Field parameter data are provided in Appendix A. Appendix B includes a letter from Chemours to DEQ dated June 18, 2019 along with supporting technical summaries from TestAmerica and Lancaster. The letter describes why Difluoro-sulfo-acetic acid [DFSA], Difluoromalonic acid [MMF], Perfluoro-2-methoxypropanoic acid [MTP], and Pentafluoropentanoic acid [PPF Acid] were removed from the Table 3+ list of analytes. While these four compounds are included in the TestAmerica analytical reports, they are not included in the evaluation for this Quarterly Report since their data are not considered accurate or reliable using the currently available analytical methods. The TestAmerica analytical reports and the data review narrative whitebook are provided in Appendix C.

3.3 Reporting Limits

Several PFAS shown in Table 4 were not detected but with elevated reporting limits. The laboratories are going to re-run these samples for reanalysis of Table 3+ compounds at low-level analysis to achieve lower reporting limits. All re-issued results will be provided in subsequent quarterly reports.

3.4 Observations – April 2019 Event

The following observations were made for PFAS concentrations in the April 2019 event:

- Nine PFAS were detected in the sample collected at Location 1, the intake water from the Cape Fear River, including HFPO-DA at 14 ng/L. These minimum concentrations are observed in all other locations that derive water from the intake water.
- The highest PFAS concentrations at the Facility were reported in samples collected at Locations 16, 17A, and 17B (Figure 3B). These locations are process wastewater that is taken offsite for disposal. Process wastewater at these sample locations does not reach Outfall 002.
- Samples from non-process wastewater locations (6A, 6B, 24A, 24B, and 24C) contained low levels of HFPO-DA (ranging from 13 to 41 ng/L) and non-detect values below the 210 ng/L reporting limit for PFMOAA. As noted above, these

will be re-analyzed at lower detection limits. All HFPO-DA concentrations for Chemours non-process wastewater samples were within 5 ng/L of the intake water at Location 1 (Figure 3A).

- The sample collected from Location 23A, the manhole on the Terra Cotta pipe (Figure 3A), was reported to have concentrations of HFPO-DA at 270 ng/L and PFMOAA at 1,300 ng/L. Supplemental sampling activity A listed in Section 4.2 was conducted to assess this observation in more detail.
- PFMOAA was not detected in the sample collected at Location 22, the influent to the wastewater treatment plant (WWTP), above the reporting limit of 210 ng/L, while at Location 8, the effluent to the WWTP, PFMOAA was detected at 1,200 ng/L (J) (Figure 3A). Supplemental sampling activity A in Section 4.2 was conducted to assess this observation in more detail.
- The highest non-process wastewater-related HFPO-DA concentration during the April 2019 event was in the sample collected at Location 10 (320 ng/L), a Chemours Monomers IXM Stormwater Discharge area. This section of the channel receives stormwater from roof drainage and has sediment present in the drainage ditch (Figure 3A). Supplemental sampling activities B and C listed in Section 4.2 were conducted to assess this observation in more detail.
- The sample collected at Location 20 (Outfall 002) had detectable concentration of HFPO-DA (61 ng/L) and was not detected above the reporting limit (210 ng/L) for PFMOAA (Figure 3A). The Location 20 HFPO-DA concentration (61 ng/L) was higher than the samples collected at the two streams of water that combined to form the total flow at Location 20: Location 7B, Open Channel after the WWTP (21 ng/L), and Location 15, Cooling Water Channel water before it joins the open channel to Outfall 002 (34 ng/L). The drainage pathways from the DuPont areas had no observed flow during this dry event. Supplemental sampling activity D in Section 4.2 was conducted to assess this observation in more detail.
- Other PFAS concentrations were typically non-detect or detected at similar values to the intake water at Location 1 in samples collected at all locations in the April 2019 event, with the following general exceptions (Table 4):

- 2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol was detected in the sample collected at Location 7B (900 ng/L J). This analyte was detected at similar concentrations in the associated equipment blanks.
- The water samples collected at Locations 8, 10, and 23A each had several PFAS detects greater than Location 1, the intake (Table 4). Chemours is conducting supplemental sampling activities described later in Section 0 to assess these detections.

4. SAMPLING PROGRAM STATUS

A description of ongoing supplemental sampling activities and recommendations for updates to the sampling plan are provided below.

4.1 Activities Planned for Next Quarter

As described in the PFAS Characterization Sampling Plan (Geosyntec, 2019), PFAS characterization samples will be collected from the Facility on a bimonthly basis. The June 27, 2019 sampling event data are pending and will be reported in the next quarterly report. The next sampling event will occur during the first suitable storm event in August 2019. If there are no suitable storm events in the month of August, sampling will proceed and samples will be collected from locations that contain water reaching Outfall 002. The next quarterly report will be submitted in October 2019 and will provide results for any Paragraph 11(b) samples described in Table 1 available at the time of reporting.

4.2 Supplemental Sampling Activities in Progress

Chemours has embarked on several sampling activities that will help support PFAS characterization at the Facility. The activities were conducted based on a review of the April 2019 event data. The purpose, scope, and data for these sampling activities will be included as supplementary sampling summaries attached to future quarterly reports. The supplemental sampling events conducted in 2019 Quarter 2 are described below:

- A. WWTP sample event: 24-hour composite samples were collected at Locations 1, 8, 22, and 23A, as well as two locations upstream of 23A, one containing water from Kuraray SentryGlas® to the north, and one containing water from the Kuraray laboratory to the west. These samples will help inform PFAS detections upstream and downstream of the WWTP.
- B. Soil grain size sample event: Exposed soils throughout the Facility were collected and analyzed for PFAS and grainsize analysis to evaluate the potential contribution of soil erosion and transport to PFAS detections at Outfall 002.
- C. Cooling water channel and open channel sediment sampling: Samples of sediment from the cooling water channel and the open channel to the outfall were sampled to evaluate the potential for desorption from these sediments to contribute to observed PFAS concentrations.

- D. Open channel to Outfall 002 sample event: Four additional samples were collected to assess the potential that perched groundwater in the area near the open channel to Outfall 002 may infiltrate into the channel or sump of Outfall 002 and result in increases to PFAS concentrations.

5. SUMMARY AND RECOMMENDATIONS

Pursuant to Consent Order Paragraph 11(c), Chemours conducted bimonthly characterization sampling activities in 2019 Quarter 2 and these results are presented in this report.

Below is a list of planned and supplemental activities conducted that will be reported pending receipt of data:

- June 2019, Paragraph 11(c) bimonthly sampling conducted in June 2019 – to be reported in 2019 Quarter 3 report;
- Supplemental WWTP connected locations sample event conducted in July 2019;
- Supplemental soil and soil grainsize sample event conducted in July 2019;
- Supplemental cooling water channel and open channel to Outfall 002 sediment sample event conducted in July 2019; and
- Supplemental Open Channel to Outfall 002 sample event conducted in May 2019.

The results presented from the April 2019 event indicate that the intake water has PFAS and as this water is distributed widely throughout the facility, all water samples analyzed at the Facility contained PFAS. The highest concentration of PFAS were in Chemours process water samples which are containerized and disposed of offsite. Sample locations with water potentially contributing to PFAS observed at Outfall 002 were identified and supplemental sampling activities were recommended to further assess the relative contributions of these sample locations to the mass of PFAS in Outfall 002.

5.1 Recommendations

Based on the observations from the April 2019 event, four supplemental sampling activities were recommended to Chemours and conducted in 2019 Quarter 2. The results of these supplemental sampling activities will be reported upon receipt of the data.

Additionally, samples collected and analyzed from Locations 16, 17A, and 17B exhibited elevated PFAS concentrations, as expected for Chemours process wastewaters that are taken offsite for disposal. The process wastewater at these locations does not enter the site drainage system, nor does it reach Outfall 002. Based on the present characterization

and nature of these locations and pursuant to Paragraph 11(d), future Paragraph 11(c) sample collection is not planned at these locations as part of Paragraph 11(c) sampling and reporting activities.

6. REFERENCES

Environmental Protection Agency (EPA), 2009. Guidance for Labelling Externally Validated Laboratory Analytical Data for Superfund Use. Office of Solid Waste and Emergency Response. OSWER No. 9200.1-85, EPA-540-R-08-005

Geosyntec, 2019. PFAS Characterization Sampling Plan. May, 2019.

Parsons, 2019. Southeast Perched Zone Investigation Report. March, 2019.

Tables

TABLE 1
PARAGRAPH 11(b) PROPOSED SAMPLE LOCATION SUMMARY
Chemours Fayetteville Works, North Carolina

Sample Number	Sample Location Description	Sampling Method	Sample Category			
			Intake/ Outfall	Process water	Non-process wastewater	Stormwater
1	Discharge point of excess river water (i.e., water drawn from the Cape Fear River, but not used as process water or NCCW) to characterize background levels of PFAS	Temporal Composite	Intake			
2	Kuraray northern leased area stormwater discharge	Temporal Composite				✓
3	Chemours PPA area stormwater discharge	Temporal Composite				✓
4	Combined stormwater discharge from Kuraray northern leased area and Chemours PPA area	Temporal Composite				✓
5	Kuraray southern leased area stormwater	Temporal Composite				✓
6A	Kuraray southern leased area NCCW discharge - Vacuum Condenser	Grab			✓	
6B	Kuraray southern leased area NCCW discharge - Resins Area	Grab			✓	
7A	Combined stormwater and NCCW discharge from western portion of the Facility	Temporal Composite			✓	✓
7B	Combined stormwater and NCCW discharge from western portion of the Facility and treated discharge from WWTP	Temporal Composite		✓	✓	✓
8	Outfall 001 treated non-Chemours process wastewater discharge to open channel to Outfall 002	Temporal Composite		✓	✓	
9	Chemours Monomers IXM NCCW and stormwater discharge including stormwater from Vinyl Ethers South and Vinyl Ethers North	Temporal Composite			✓	✓
10	Chemours Monomers IXM area stormwater discharge	Temporal Composite				✓
11	Stormwater discharge from portion of grassy field to north of decommissioned Chemours Teflon area.	Temporal Composite				✓
12	DuPont area southern drainage ditch stormwater discharge and NCCW	Temporal Composite			✓	✓
13	DuPont area northern drainage ditch stormwater discharge and NCCW	Temporal Composite			✓	✓
14	DuPont area southeast stormwater and NCCW discharge	Temporal Composite			✓	✓
15	Combined stormwater and NCCW discharge from eastern portion of the Facility	Temporal Composite			✓	✓
16	Chemours Monomers IXM Area combined process wastewater	Grab		✓		
17A	Chemours PPA Area waste acid trailer	Grab		✓		
17B	Chemours PPA Area waste rinse water trailer	Grab		✓		
18	Kuraray process wastewater	Grab		✓		
19A	DuPont process wastewater, Plant 1	Grab		✓		
19B	DuPont process wastewater, Plant 2	Grab		✓		
20	Outfall 002 pipe to Cape Fear River upstream of sump	Temporal Composite	Outfall			
21A	Sediment Basin South	Grab			✓	✓
21B	Sediment Basin North	Grab			✓	✓
22	WWTP combined influent	Grab		✓	✓	
23A	Kuraray northern leased area combined process wastewater and NCCW; manhole on Terra Cotta Pipe	Grab		✓	✓	
23B	Kuraray laboratory process wastewater	Grab		✓		
24A	Chemours Monomers IXM Vinyl Ethers South NCCW	Grab			✓	
24B	Chemours Monomers IXM Line 3 and Line 4 Extruder NCCW	Grab			✓	
24C	Chemours Monomers IXM Water Return Header NCCW	Grab			✓	

Notes

Sample numbers refer to locations identified in Figure 2.
Temporal composite samples to be integrated over 4 hours.
IXM - ion exchange membrane
NCCW - non-contact cooling water
PFAS - per- and polyfluoroalkyl substances
PPA - polymer processing aid
WWTP - Wastewater treatment plant

TABLE 2
IMPLEMENTED SAMPLE LOCATION SUMMARY
Chemours Fayetteville Works, North Carolina

Sample Number	Sample Location Description	Sampling Method	Sample Category				Sample Collected					
			Intake/ Outfall	Process water	Non-process wastewater	Stormwater	2019			2020		
							Q2	Q3	Q4	Q1	Q2	Q3
1	Discharge point of excess river water (i.e., water drawn from the Cape Fear River, but not used as process water or NCCW) to characterize background levels of PFAS	Temporal Composite	Intake				✓					
2	Kuraray northern leased area stormwater discharge	Temporal Composite				✓	--					
3	Chemours PPA area stormwater discharge	Temporal Composite				✓	--					
4	Combined stormwater discharge from Kuraray northern leased area and Chemours PPA area	Temporal Composite				✓	--					
5	Kuraray southern leased area stormwater	Temporal Composite				✓	--					
6A	Kuraray southern leased area NCCW discharge - Vacuum Condenser	Grab			✓		✓					
6B	Kuraray southern leased area NCCW discharge - Resins Area	Grab			✓		✓					
7A	Combined stormwater and NCCW discharge from western portion of the Facility	Temporal Composite			✓	✓	✓					
7B	Combined stormwater and NCCW discharge from western portion of the Facility and treated discharge from WWTP	Grab*		✓	✓	✓	✓					
8	Outfall 001 treated non-Chemours process wastewater discharge to open channel to Outfall 002	Temporal Composite		✓	✓		✓					
9	Chemours Monomers IXM NCCW and stormwater discharge including stormwater from Vinyl Ethers South and Vinyl Ethers North	Temporal Composite			✓	✓	✓					
10	Chemours Monomers IXM area stormwater discharge	Temporal Composite				✓	✓					
11	Stormwater discharge from portion of grassy field to north of decommissioned Chemours Teflon area.	Temporal Composite				✓	--					
12	DuPont area southern drainage ditch stormwater discharge and NCCW	Temporal Composite			✓	✓	--					
13	DuPont area northern drainage ditch stormwater discharge and NCCW	Temporal Composite			✓	✓	--					
14	DuPont area southeast stormwater and NCCW discharge	Temporal Composite			✓	✓	✓					
15	Combined stormwater and NCCW discharge from eastern portion of the Facility	Temporal Composite			✓	✓	✓					
16	Chemours Monomers IXM Area combined process wastewater	Grab		✓			✓					
17A	Chemours PPA Area waste acid trailer	Grab		✓			✓					
17B	Chemours PPA Area waste rinse water trailer	Grab		✓			✓					
18	Kuraray process wastewater	Grab		✓			✓					
19A	DuPont process wastewater, Plant 1	Grab		✓			✓					
19B	DuPont process wastewater, Plant 2	Grab		✓			✓					
20	Outfall 002 pipe to Cape Fear River upstream of sump	Temporal Composite	Outfall				✓					
21A	Sediment Basin South	Grab			✓	✓	✓					
21B	Sediment Basin North	Grab			✓	✓	--					
22	WWTP combined influent	Grab		✓	✓		✓					
23A	Kuraray northern leased area combined process wastewater and NCCW; manhole on Terra Cotta Pipe	Grab		✓	✓		✓					
23B	Kuraray laboratory process wastewater	Grab		✓			--					
24A	Chemours Monomers IXM Vinyl Ethers South NCCW	Grab			✓		✓					
24B	Chemours Monomers IXM Line 3 and Line 4 Extruder NCCW	Grab			✓		✓					
24C	Chemours Monomers IXM Water Return Header NCCW	Grab			✓		✓					

Notes

Samples collected 24 April 2019.

Sample numbers refer to locations identified in Figure 2.

Temporal composite samples were integrated over 4 hours.

Locations 2, 3, 4, 5, 11, 12, and 13 were not sampled in 2019 Quarter 2 (Q2) because they were dry.

Location 21B was not sampled in Q1 because this sediment pond was not in use at the time of sampling.

Location 23B was added to the Sampling Plan after the April 2019 event. A sample was not collected.

-- sample not collected

* - Location 7B was collected as a grab sample for the first event due to limited autosampler availability. This location will be collected as a temporal composite sample for future sampling events.

IXM - ion exchange membrane

NCCW - non-contact cooling water

PFAS - per- and polyfluoroalkyl substances

PPA - polymer processing aid

WWTP - Wastewater treatment plant

TABLE 3
PFAS AND ASSOCIATED ANALYTICAL METHODS
Chemours Fayetteville Works, North Carolina

Geosyntec Consultants of NC P.C.

Analytical Method	Common Name	Chemical Name	CASN	Chemical Formula
Table 3+ Lab SOP	HFPO-DA*	Hexafluoropropylene oxide dimer acid	13252-13-6	C6HF11O3
	PEPA	Perfluoroethoxypropyl carboxylic acid	267239-61-2	C5HF9O3
	PFECA-G	Perfluoro-4-isopropoxybutanoic acid	801212-59-9	C12H9F9O3S
	PFMOAA	Perfluoro-2-methoxyacetic acid	674-13-5	C3HF5O3
	PFO2HxA	Perfluoro(3,5-dioxahexanoic) acid	39492-88-1	C4HF7O4
	PFO3OA	Perfluoro(3,5,7-trioxaoctanoic) acid	39492-89-2	C5HF9O5
	PFO4DA	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	39492-90-5	C6HF11O6
	PMPA	Perfluoromethoxypropyl carboxylic acid	13140-29-9	C4HF7O3
	Hydro-EVE Acid	Perfluoroethoxyspropanoic acid	773804-62-9	C8H2F14O4
	EVE Acid	Perfluoroethoxypropionic acid	69087-46-3	C8HF13O4
	PFECA B	Perfluoro-3,6-dioxaheptanoic acid	151772-58-6	C5HF9O4
	R-EVE	R-EVE	N/A	C8H2F12O5
	PFO5DA	Perfluoro-3,5,7,9,11-pentaoxadodecanoic acid	39492-91-6	C7HF13O7
	Byproduct 4	Byproduct 4	N/A	C7H2F12O6S
	Byproduct 5	Byproduct 5	N/A	C7H3F11O7S
	Byproduct 6	Byproduct 6	N/A	C6H2F12O4S
	NVHOS	Perfluoroethoxysulfonic acid	1132933-86-8	C4H2F8O4S
	PES	Perfluoroethoxyethanesulfonic acid	113507-82-7	C4HF9O4S
	PFESA-BP1	Byproduct 1	29311-67-9	C7HF13O5S
	PFESA-BP2	Byproduct 2	749836-20-2	C7H2F14O5S
EPA Method 537 Mod	PFBA	Perfluorobutanoic acid	375-22-4	C4HF7O2
	PFDA	Perfluorodecanoic acid	335-76-2	C10HF19O2
	PFDoA	Perfluorododecanoic acid	307-55-1	C12HF23O2
	PFHpA	Perfluoroheptanoic acid	375-85-9	C7HF13O2
	PFNA	Perfluorononanoic acid	375-95-1	C9HF17O2
	PFOA	Perfluorooctanoic acid	335-67-1	C8HF15O2
	PFHxA	Perfluorohexanoic acid	307-24-4	C6HF11O2
	PFPeA	Perfluoropentanoic acid	2706-90-3	C5HF9O2
	PFTeA	Perfluorotetradecanoic acid	376-06-7	C14HF27O2
	PFTriA	Perfluorotridecanoic acid	72629-94-8	C13HF25O2
	PFUnA	Perfluoroundecanoic acid	2058-94-8	C11HF21O2
	PFBS	Perfluorobutanesulfonic acid	375-73-5	C4HF9SO
	PFDS	Perfluorodecanesulfonic acid	335-77-3	C10HF21O3S
	PFHpS	Perfluoroheptanesulfonic acid	375-92-8	C7HF15O3S
	PFHxS	Perfluorohexanesulfonic acid	355-46-4	C6HF13SO3
	PFNS	Perfluorononanesulfonic acid	68259-12-1	C9HF19O3S
	PFOS	Perfluorooctanesulfonic acid	1763-23-1	C8HF17SO3
	PFPeS	Perfluoropentanesulfonic acid	2706-91-4	C5HF11O3S
	10:2 FTS	10:2-fluorotelomersulfonic acid	120226-60-0	C12H5F21O3
	4:2 FTS	4:2 fluorotelomersulfonic acid	757124-72-4	C6H5F9O3S
	6:2 FTS	6:2 fluorotelomersulfonic acid	27619-97-2	C8H5F13SO3
	8:2 FTS	8:2 fluorotelomersulfonic acid	39108-34-4	C10H5F17O3S
	NEtFOSAA	NEtFOSAA	2991-50-6	C12H8F17NO4S
	NEtPFOSA	NEtPFOSA	4151-50-2	C10H6F17NO2S
	NEtPFOSAE	NEtPFOSAE	1691-99-2	C12H10F17NO3S
	NMeFOSAA	NMeFOSAA	2355-31-9	C11H6F17NO4S
	NMePFOSA	NMePFOSA	31506-32-8	C9H4F17NO2S
	NMePFOSAE	NMePFOSAE	24448-09-7	C11H8F17NO3S
	PFDOS	Perfluorododecanesulfonic acid	79780-39-5	C12HF25O3S
	PFHxDA	Perfluorohexadecanoic acid	67905-19-5	C16HF31O2
	PFODA	Perfluorooctadecanoic acid	16517-11-6	C18HF35O2
	PFOSA	Perfluorooctanesulfonamide	754-91-6	C8H2F17NO2S

Notes:

*Depending on the laboratory, HFPO-DA may also appear on the EPA Method 537 Mod analyte list

EPA - Environmental Protection Agency

PFAS - per- and polyfluoroalkyl substances

SOP - Standard Operating Procedure

Location ID	1	6A	6B	7A	7B
Field Sample ID	DSTW-LOC1-042419	DSTW-LOC6A-042419	DSTW-LOC6B-042419	DSTW-LOC7A-042419	DSTW-LOC7B-042419
Date Sampled	04/24/2019	04/24/2019	04/24/2019	04/24/2019	04/24/2019
QA/QC	--	--	--	--	--
Table 3+ Lab SOP (ng/L)					
PEPA	<47	<47	<47	<47	<47
PFECA-G	<41	<41	<41	<41	<41
PFMOAA	<210 UJ	<210	<210	<210 UJ	<210
PFO2HxA	<81	<81	<81	<81	<81
PFO3OA	<58	<58	<58	<58	<58
PFO4DA	<79	<79	<79	<79	<79
PMPA	<570	<570	<570	<570	<570
Hydro-EVE Acid	<28	<28	<28	<28	<28
EVE Acid	<24	<24	<24	<24	<24
PFECA B	<60	<60	<60	<60	<60
R-EVE	<70	<70	<70	<70	<70
PFO5DA	<34	<34	<34	<34	<34
Byproduct 4	<160	<160	<160	<160	<160
Byproduct 5	<58	<58	<58	<58	<58
Byproduct 6	<15	<15	<15	<15	<15
NVHOS	<54	<54	<54	<54	<54
PES	<46	<46	<46	<46	<46
PFESA-BP1	<27	<27	<27	<27	<27
PFESA-BP2	<30	<30	<30	<30	<30
EPA Method 537 Mod (ng/L)					
HFPO-DA	14	13	41	14	21
Perfluorobutanoic Acid	7.1	7.6	7.1	7	5.2
Perfluorodecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorododecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptanoic Acid	7	7.4	7.4	7.4	7
Perfluorononanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanoic acid	8.1	8.6	9.3	8.8	7.9
Perfluorohexanoic Acid	9.2	9.2	9.3	8.3	8.2
Perfluoropentanoic Acid	7	7.4	7.2	6.5	7.2
Perfluorotetradecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorotridecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroundecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorobutane Sulfonic Acid	2.3	2.4	2.3	2.3	2.3
Perfluorodecane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptane sulfonic acid (PFHpS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexane Sulfonic Acid	3.3	3.7	3.6	3.4	3.5
Perfluorononanesulfonic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanesulfonic acid	12	14	14	14	14
Perfluoropentane sulfonic acid (PFPeS)	<2.0	<2.0	<2.0	<2.0	<2.0
10:2 Fluorotelomer sulfonate	<2.0	<2.0	<2.0	<2.0	<2.0
8:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
6:2 Fluorotelomer sulfonate	<20	<20	<20	<20	<20
4:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
N-ethyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-ethylperfluoro-1-octanesulfonamide	<37	<37 UJ	<37 UJ	<37	<37 UJ
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	<60	<60	<60	<60	900 J
N-methyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-methyl perfluoro-1-octanesulfonamide	<35	<35 UJ	<35 UJ	<35	<35
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	<110	<110	<110	<110	<110
Perfluorododecane sulfonic acid (PFDoS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexadecanoic acid (PFHxDA)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctadecanoic acid	<2.0	<2.0	<2.0	2	<2.0
Perfluorooctane Sulfonamide	<2.0	<2.0	<2.0	<2.0	<2.0
ADONA	<2.1	<2.1	<2.1	<2.1	<2.1
NaDONA	<2.1	<2.1	<2.1	<2.1	<2.1
F-53B Major	<2.0	<2.0	<2.0	<2.0	<2.0
F-53B Minor	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

Bold - Analyte detected above associated reporting limit

EPA - Environmental Protection Agency

J - Analyte detected. Reported value may not be accurate or precise

ng/L - nanograms per liter

QA/QC - Quality assurance/ quality control

SOP - standard operating procedure

UJ – Analyte not detected. Reporting limit may not be accurate or precise.

-- - No data reported

< - Analyte not detected above associated reporting limit.

Location ID	8	9	10	14	15
Field Sample ID	DSTW-LOC8-042419	DSTW-LOC9-042419	DSTW-LOC10-042419	DSTW-LOC14-042419	DSTW-LOC15-042419
Date Sampled	04/24/2019	04/24/2019	04/24/2019	04/24/2019	04/24/2019
QA/QC	--	--	--	--	--
Table 3+ Lab SOP (ng/L)					
PEPA	<47	<47	47	<47	<47
PFECA-G	<41	<41	<41	<41	<41
PFMOAA	1,200 J	<210 UJ	<210 UJ	<210 UJ	<210 UJ
PFO2HxA	480	<81	94	<81	<81
PFO3OA	150	<58	<58	<58	<58
PFO4DA	<79	<79	<79	<79	<79
PMPA	<570	<570	570	<570	<570
Hydro-EVE Acid	<28	<28	<28	<28	<28
EVE Acid	<24	<24	<24	<24	<24
PFECA B	<60	<60	<60	<60	<60
R-EVE	<70	<70	70	<70 UJ	<70
PFO5DA	51	<34	<34	<34	34
Byproduct 4	<160	<160	<160	<160 UJ	<160
Byproduct 5	690	<58	92	<58 UJ	<58
Byproduct 6	<15	<15	<15	<15	<15
NVHOS	<54	<54	<54	<54	<54
PES	<46	<46	<46	<46	<46
PFESA-BP1	<27	<27	84	<27	<27
PFESA-BP2	240	<30	<30	<30	<30
EPA Method 537 Mod (ng/L)					
HFPO-DA	120	29	320	12	34
Perfluorobutanoic Acid	5.7	6.9	10	4.7	6.5
Perfluorodecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorododecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptanoic Acid	3.7	7.5	8.4	3.1	7.5
Perfluorononanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanoic acid	8.2	8.9	10	5.8	8.5
Perfluorohexanoic Acid	4.9	9	9.3	4.4	7.9
Perfluoropentanoic Acid	4.2	8.6	17	3.8	8.2
Perfluorotetradecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorotridecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroundecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorobutane Sulfonic Acid	2.4	2.2	2.1	<2.0	2.3
Perfluorodecane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptane sulfonic acid (PFHpS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexane Sulfonic Acid	3.1	3.3	3.5	3	3.5
Perfluorononanesulfonic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanesulfonic acid	<2.0	14	12	11	14
Perfluoropentane sulfonic acid (PFPeS)	<2.0	<2.0	<2.0	<2.0	<2.0
10:2 Fluorotelomer sulfonate	<2.0	<2.0	<2.0	<2.0	<2.0
8:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
6:2 Fluorotelomer sulfonate	<20	<20	<20	<20	<20
4:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
N-ethyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-ethylperfluoro-1-octanesulfonamide	<37	<37	<37	<37	<37
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	<60	<60	<60	<60	<60
N-methyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-methyl perfluoro-1-octanesulfonamide	<35	<35	<35	<35	<35
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	<110	<110	<110	<110	<110
Perfluorododecane sulfonic acid (PFDoS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexadecanoic acid (PFHxDA)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctadecanoic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctane Sulfonamide	<2.0	<2.0	<2.0	<2.0	<2.0
ADONA	<2.1	<2.1	<2.1	<2.1	<2.1
NaDONA	<2.1	<2.1	<2.1	<2.1	<2.1
F-53B Major	<2.0	<2.0	<2.0	<2.0	<2.0
F-53B Minor	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

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ng/L - nanograms per liter

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-- - No data reported

< - Analyte not detected above associated reporting limit.

Location ID	16	17A	17B	18	19A
Field Sample ID	DSTW-LOC16-042419	DSTW-LOC17A-042419	DSTW-LOC17B-042419	DSTW-LOC18-042419	DSTW-LOC19A-042419
Date Sampled	04/24/2019	04/24/2019	04/24/2019	04/24/2019	04/24/2019
QA/QC	--	--	--	--	--
Table 3+ Lab SOP (ng/L)					
PEPA	<35,000	110,000	47,000	<47	<47
PFECA-G	<31,000	<41,000	<41,000	<41	<41
PFMOAA	160,000	<210,000	1,770,000	<210	<210
PFO2HxA	133,000	<81,000	<81,000	<81	<81
PFO3OA	44,000	<58,000	<58,000	<58	<58
PFO4DA	<59,000	<79,000	<79,000	<79	<79
PMPA	539,000	<570,000	<570,000	<570	<570
Hydro-EVE Acid	95,000	<28,000	<28,000	<28	<28
EVE Acid	787,000	<24,000	<24,000	<24	<24
PFECA B	<45,000	<60,000	<60,000	<60	<60
R-EVE	1,590,000	<70,000	<70,000	<70	<70
PFO5DA	<25,000	<34,000	<34,000	<34	<34
Byproduct 4	2,410,000	<160,000	<160,000	<160	<160
Byproduct 5	330,000	<58,000	<58,000	<58	<58
Byproduct 6	54,000	<15,000	<15,000	<15	<15
NVHOS	259,000	<54,000	<54,000	<54	<54
PES	<34,000	<46,000	<46,000	<46	<46
PFESA-BP1	1,445,000	<27,000	<27,000	<27	<27
PFESA-BP2	248,000	<30,000	<30,000	<30	<30
EPA Method 537 Mod (ng/L)					
HFPO-DA	2,100,000	860,000,000	550,000,000	59	30 J
Perfluorobutanoic Acid	30,000	<4,400,000	<8,800	5.3	4.3 J
Perfluorodecanoic Acid	240	<3,900,000	28,000	<2.0	<2.0 UJ
Perfluorododecanoic Acid	<51	<6,900,000	<14,000	<2.0	<2.0 UJ
Perfluoroheptanoic Acid	13,000	<3,100,000	<6,300	3	<2.0 UJ
Perfluorononanoic Acid	7,500	<3,400,000	<6,800	<2.0	<2.0 UJ
Perfluorooctanoic acid	440	<11,000,000	1,800,000	6.7	2.6 J
Perfluorohexanoic Acid	1,700	<7,300,000	<15,000	4.3	<2.0 UJ
Perfluoropentanoic Acid	53,000	<6,100,000	<12,000	3.7	2.6 J
Perfluorotetradecanoic Acid	<27	<3,600,000	<7,300	<2.0	<2.0 UJ
Perfluorotridecanoic Acid	300	<16,000,000	<33,000	<2.0	<2.0 UJ
Perfluoroundecanoic Acid	1,900	<14,000,000	<28,000	<2.0	<2.0 UJ
Perfluorobutane Sulfonic Acid	<18	<2,500,000	<5,000	<2.0	<2.0 UJ
Perfluorodecane Sulfonic Acid	<29	<4,000,000	<8,000	<2.0	<2.0 UJ
Perfluoroheptane sulfonic acid (PFHpS)	<18	<2,400,000	<4,800	<2.0	<2.0 UJ
Perfluorohexane Sulfonic Acid	<16	4,100,000	<4,300	2.1	<2.0 UJ
Perfluorononanesulfonic acid	<15	<2,000,000	<4,000	<2.0	<2.0 UJ
Perfluorooctanesulfonic acid	<50	<6,800,000	<14,000	7.3	<2.0 UJ
Perfluoropentane sulfonic acid (PFPeS)	<28	<3,800,000	<7,500	<2.0	<2.0 UJ
10:2 Fluorotelomer sulfonate	170	<2,400,000	<4,800	<2.0	<2.0
8:2 Fluorotelomersulfonic acid	<480	<65,000,000	<130,000	<20	<20
6:2 Fluorotelomer sulfonate	<370	<25,000,000	<50,000	<20	<20 UJ
4:2 Fluorotelomersulfonic acid	<370	<25,000,000	<50,000	<20	<20
N-ethyl perfluorooctane sulfonamidoacetic acid	<180	<24,000,000	<48,000	<20	<20
N-ethylperfluoro-1-octanesulfonamide	<28,000	<37,000	<37,000	<37 UJ	<37 UJ
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	<45,000	<60,000	<60,000	<60	<60
N-methyl perfluorooctane sulfonamidoacetic acid	<290	<39,000,000	<78,000	<20	<20
N-methyl perfluoro-1-octanesulfonamide	<26,000	<35,000	<35,000	<35 UJ	<35 UJ
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	<82,000	<110,000	<110,000	<110	<110
Perfluorododecane sulfonic acid (PFDoS)	<41	<5,600,000	<11,000	<2.0	<2.0 UJ
Perfluorohexadecanoic acid (PFHxDA)	<82	<11,000,000	<22,000	<2.0	<2.0 UJ
Perfluorooctadecanoic acid	<42	<5,800,000	<12,000	<2.0	<2.0 UJ
Perfluorooctane Sulfonamide	<32	<4,400,000	<8,800	<2.0	<2.0 UJ
ADONA	<18	<2,400,000	<4,800	<2.1	<2.1 UJ
NaDONA	<18	<2,400,000	<4,800	<2.1	<2.1 UJ
F-53B Major	900	<3,000,000	<6,000	<2.0	<2.0 UJ
F-53B Minor	<29	<4,000,000	<8,000	<2.0	<2.0 UJ

Notes:

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ng/L - nanograms per liter

QA/QC - Quality assurance/ quality control

SOP - standard operating procedure

UJ – Analyte not detected. Reporting limit may not be accurate or precise.

-- - No data reported

< - Analyte not detected above associated reporting limit.

Location ID	19B	20	20	21A	22
Field Sample ID	DSTW-LOC19B-042419	DSTW-LOC20-042419	DSTW-LOC20-042419-D	DSTW-LOC21A-042419	DSTW-LOC22-042419
Date Sampled	04/24/2019	04/24/2019	04/24/2019	04/24/2019	04/24/2019
QA/QC	--	--	Blind Field Duplicate	--	--
Table 3+ Lab SOP (ng/L)					
PEPA	<47	<47	<47	<47	<47
PFECA-G	<41	<41	<41	<41	<41
PFMOAA	<210	<210 UJ	<210 UJ	<210	<210
PFO2HxA	<81	<81	<81	<81	<81
PFO3OA	<58	<58	<58	<58	<58
PFO4DA	<79	<79	<79	<79	<79
PMPA	<570	<570	<570	<570	<570
Hydro-EVE Acid	<28	<28	<28	<28	<28
EVE Acid	<24	<24	<24	<24	<24
PFECA B	<60	<60	<60	<60	<60
R-EVE	<70	<70	<70	<70 UJ	<70 UJ
PFO5DA	<34	<34	<34	<34	<34
Byproduct 4	<160	<160	<160	<160	<160
Byproduct 5	<58	<58	<58	<58 UJ	<58 UJ
Byproduct 6	<15	<15	<15	<15	<15
NVHOS	<54	<54	<54	<54	<54
PES	<46	<46	<46	<46	<46
PFESA-BP1	<27	<27	<27	<27	<27
PFESA-BP2	<30	<30	<30	<30	<30
EPA Method 537 Mod (ng/L)					
HFPO-DA	22	61	63	33	170
Perfluorobutanoic Acid	4.4	6.5	5.9	5	<3.5 UJ
Perfluorodecanoic Acid	<2.0	<2.0	<2.0	<2.0	<3.1
Perfluorododecanoic Acid	<2.0	<2.0	<2.0	<2.0	<5.5
Perfluoroheptanoic Acid	2.2	7.1	7	3	7.1
Perfluorononanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.7
Perfluorooctanoic acid	4.9	8.7	8.5	5.6	<8.5
Perfluorohexanoic Acid	3.4	7.8	7.7	4.4	<5.8
Perfluoropentanoic Acid	3.6	6.7	7.6	4.8	20
Perfluorotetradecanoic Acid	<2.0	<2.0	<2.0	<2.0	2.9
Perfluorotridecanoic Acid	<2.0	<2.0	<2.0	<2.0	<13
Perfluoroundecanoic Acid	<2.0	<2.0	<2.0	<2.0	<11
Perfluorobutane Sulfonic Acid	<2.0	2.2	2.2	2	<2.0
Perfluorodecane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<3.2
Perfluoroheptane sulfonic acid (PFHpS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexane Sulfonic Acid	<2.0	3.5	3.5	3	4.5
Perfluorononanesulfonic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanesulfonic acid	3.2	13	13	9.1	<5.4
Perfluoropentane sulfonic acid (PFPeS)	<2.0	<2.0	<2.0	<2.0	<3.0
10:2 Fluorotelomer sulfonate	<2.0	<2.0	<2.0	<2.0	<2.0
8:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<52
6:2 Fluorotelomer sulfonate	<20	<20	<20	<20	<20
4:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
N-ethyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-ethylperfluoro-1-octanesulfonamide	<37 UJ	<37	<37	<37 UJ	<37 UJ
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	<60	<60	<60	<60	<60
N-methyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<31
N-methyl perfluoro-1-octanesulfonamide	<35 UJ	<35	<35	<35 UJ	<35 UJ
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	<110	<110	<110	<110	<110
Perfluorododecane sulfonic acid (PFDoS)	<2.0	<2.0	<2.0	<2.0	<4.5
Perfluorohexadecanoic acid (PFHxDA)	<2.0	<2.0	<2.0	<2.0	<8.9
Perfluorooctadecanoic acid	<2.0	<2.0 UJ	<2.0	<2.0	<4.6
Perfluorooctane Sulfonamide	<2.0	<2.0	<2.0	<2.0	<3.5
ADONA	<2.1	<2.1	<2.1	<2.1	<2.1
NaDONA	<2.1	<2.1	<2.1	<2.1	<2.1
F-53B Major	<2.0	<2.0	<2.0	<2.0	<2.4
F-53B Minor	<2.0	<2.0	<2.0	<2.0	<3.2

Notes:

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Location ID	23A	24A	24A	24B	24C
Field Sample ID	DSTW-LOC23A-042419	DSTW-LOC24A-042419	D	DSTW-LOC24B-042419	DSTW-LOC24C-042419
Date Sampled	04/24/2019	04/24/2019	04/24/2019	04/24/2019	04/24/2019
QA/QC	--	--	Blind Field Duplicate	--	--
Table 3+ Lab SOP (ng/L)					
PEPA	<47	<47	<47	<47	<47
PFECA-G	<41	<41	<41	<41	<41
PFMOAA	1,300	<210	<210	<210 UJ	<210 UJ
PFO2HxA	480	<81	<81	<81	<81
PFO3OA	140	<58	<58	<58	<58
PFO4DA	<79	<79	<79	<79	<79
PMPA	700	<570	<570	<570	<570
Hydro-EVE Acid	32	<28	<28	<28	<28
EVE Acid	65	<24	<24	<24	<24
PFECA B	<60	<60	<60	<60	<60
R-EVE	<70	<70 UJ	<70	<70	<70
PFO5DA	<34	<34	<34	<34	<34
Byproduct 4	180	<160	<160	<160	<160
Byproduct 5	2,200	<58 UJ	<58 UJ	<58	<58
Byproduct 6	<15	<15	<15	<15	<15
NVHOS	<54	<54	<54	<54	<54
PES	<46	<46	<46	<46	<46
PFESA-BP1	2,700	<27	<27	<27	35
PFESA-BP2	140	<30	<30	<30	<30
EPA Method 537 Mod (ng/L)					
HFPO-DA	270	16 J	14	14	19
Perfluorobutanoic Acid	160	6.3	5.8	5.5	4.7
Perfluorodecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorododecanoic Acid	<2.0	<16	<2.0	<2.0	<2.0
Perfluoroheptanoic Acid	3.6	7	7.3	6	5.9
Perfluorononanoic Acid	<2.0	2	<2.0	<2.0	<2.0
Perfluorooctanoic acid	20	9.5	9.7	7.7	7.3
Perfluorohexanoic Acid	6.6	8.5	8.8	8	7
Perfluoropentanoic Acid	13	7	6.7	6.2	6.4
Perfluorotetradecanoic Acid	<2.0	<5.9	<2.0	<2.0	<2.0
Perfluorotridecanoic Acid	<2.0	<14	<2.0	<2.0	<2.0
Perfluoroundecanoic Acid	<2.0	<2	<2.0	<2.0	<2.0
Perfluorobutane Sulfonic Acid	<2.0	2.3	2.3	2.2	2
Perfluorodecane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptane sulfonic acid (PFHpS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexane Sulfonic Acid	2	3.9	3.8	3.3	3.4
Perfluorononanesulfonic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanesulfonic acid	2.9	25	21	12	15
Perfluoropentane sulfonic acid (PFPeS)	<2.0	<2.0	<2.0	<2.0	<2.0
10:2 Fluorotelomer sulfonate	<2.0	<2.0	<2.0	<2.0	<2.0
8:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
6:2 Fluorotelomer sulfonate	<20	<20	<20	<20	<20
4:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
N-ethyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-ethylperfluoro-1-octanesulfonamide	<37	<37 UJ	<37 UJ	<37	<37
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	<60	<60	<60	<60	<60
N-methyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-methyl perfluoro-1-octanesulfonamide	<35	<35 UJ	<35 UJ	<35	<35
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	<110	<110	<110	<110	<110
Perfluorododecane sulfonic acid (PFDoS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexadecanoic acid (PFHxDA)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctadecanoic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctane Sulfonamide	<2.0	<2.0	<2.0	<2.0	<2.0
ADONA	<2.1	<2.1	<2.1	<2.1	<2.1
NaDONA	<2.1	<2.1	<2.1	<2.1	<2.1
F-53B Major	<2.0	<2.0	<2.0	<2.0	<2.0
F-53B Minor	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

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ng/L - nanograms per liter

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Location ID	EQBLK	EQBLK	EQBLK	FBLK	TBLK
Field Sample ID	DSTW-EB-01-042419	DSTW-EB-02-042419	DSTW-EB-03-042419	DSTW-FB-042419	DSTW-TB-042519
Date Sampled	04/24/2019	04/24/2019	04/24/2019	04/24/2019	04/25/2019
QA/QC	Equipment Blank - Dip Rod	Equipment Blank - Peristaltic Pump	Equipment Blank - Autosampler	Field Blank	Trip Blank
Table 3+ Lab SOP (ng/L)					
PEPA	<47	<47	<47	<47	<47
PFECA-G	<41	<41	<41	<41	<41
PFMOAA	<210	<210	<210	<210 UJ	<210
PFO2HxA	<81	<81	<81	<81	<81
PFO3OA	<58	<58	<58	<58	<58
PFO4DA	<79	<79	<79	<79	<79
PMPA	<570	<570	<570	<570	<570
Hydro-EVE Acid	<28	<28	<28	<28	<28
EVE Acid	<24	<24	<24	<24	<24
PFECA B	<60	<60	<60	<60	<60
R-EVE	<70	<70	<70	<70	<70
PFO5DA	<34	<34	<34	<34	<34
Byproduct 4	<160	<160	<160	<160	<160
Byproduct 5	<58	<58	<58	<58	<58
Byproduct 6	<15	<15	<15	<15	<15
NVHOS	<54	<54	<54	<54	<54
PES	<46	<46	<46	<46	<46
PFESA-BP1	<27	<27	<27	<27	<27
PFESA-BP2	<30	<30	<30	<30	<30
EPA Method 537 Mod (ng/L)					
HFPO-DA	<4.0	<4.0	<4.0	<4.0	<4.0
Perfluorobutanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorodecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorododecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorononanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanoic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoropentanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorotetradecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorotridecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroundecanoic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorobutane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorodecane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoroheptane sulfonic acid (PFHpS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexane Sulfonic Acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorononanesulfonic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctanesulfonic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluoropentane sulfonic acid (PFPeS)	<2.0	<2.0	<2.0	<2.0	<2.0
10:2 Fluorotelomer sulfonate	<2.0	<2.0	<2.0	<2.0	<2.0
8:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
6:2 Fluorotelomer sulfonate	<20	<20	<20	<20	<20
4:2 Fluorotelomersulfonic acid	<20	<20	<20	<20	<20
N-ethyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-ethylperfluoro-1-octanesulfonamide	<37 UJ	<37 UJ	<37	<37	<37
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	820 J	850 J	780 J	<60	<60
N-methyl perfluorooctane sulfonamidoacetic acid	<20	<20	<20	<20	<20
N-methyl perfluoro-1-octanesulfonamide	<35	<35	<35	<35	<35
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	<110	<110	<110	<110	<110
Perfluorododecane sulfonic acid (PFDoS)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorohexadecanoic acid (PFHxDA)	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctadecanoic acid	<2.0	<2.0	<2.0	<2.0	<2.0
Perfluorooctane Sulfonamide	<2.0	<2.0	<2.0	<2.0	<2.0
ADONA	<2.1	<2.1	<2.1	<2.1	<2.1
NaDONA	<2.1	<2.1	<2.1	<2.1	<2.1
F-53B Major	<2.0	<2.0	<2.0	<2.0	<2.0
F-53B Minor	<2.0	<2.0	<2.0	<2.0	<2.0

Notes:

Bold - Analyte detected above associated reporting limit

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ng/L - nanograms per liter

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TABLE 5
TOTAL DAILY PRECIPITATION -
2019 QUARTER 2
Chemours Fayetteville Works, North Carolina

Geosyntec Consultants of NC P.C.

Date	Total Precipitation (inches)
4/1/2019	--
4/2/2019	1.0
4/3/2019	--
4/4/2019	--
4/5/2019	1.0
4/6/2019	--
4/7/2019	--
4/8/2019	--
4/9/2019	0.03
4/10/2019	--
4/11/2019	--
4/12/2019	1.1
4/13/2019	1.2
4/14/2019	0.23
4/15/2019	--
4/16/2019	--
4/17/2019	--
4/18/2019	--
4/19/2019	0.48
4/20/2019	--
4/21/2019	--
4/22/2019	--
4/23/2019	--
4/24/2019	--
4/25/2019	--
4/26/2019	0.05
4/27/2019	--
4/28/2019	--
4/29/2019	--
4/30/2019	--
5/1/2019	--
5/2/2019	--
5/3/2019	--
5/4/2019	0.16
5/5/2019	0.39
5/6/2019	--
5/7/2019	--
5/8/2019	--
5/9/2019	--
5/10/2019	--
5/11/2019	--
5/12/2019	0.13
5/13/2019	--
5/14/2019	--
5/15/2019	--
5/16/2019	--
5/17/2019	--

TABLE 5
TOTAL DAILY PRECIPITATION -
2019 QUARTER 2
Chemours Fayetteville Works, North Carolina

Geosyntec Consultants of NC P.C.

Date	Total Precipitation (inches)
5/18/2019	--
5/19/2019	--
5/20/2019	0.24
5/21/2019	--
5/22/2019	--
5/23/2019	--
5/24/2019	--
5/25/2019	--
5/26/2019	--
5/27/2019	--
5/28/2019	--
5/29/2019	--
5/30/2019	--
5/31/2019	0.1
6/1/2019	--
6/2/2019	--
6/3/2019	--
6/4/2019	--
6/5/2019	0.8
6/6/2019	--
6/7/2019	--
6/8/2019	--
6/9/2019	2.2
6/10/2019	0.8
6/11/2019	0.1
6/12/2019	0.4
6/13/2019	--
6/14/2019	--
6/15/2019	--
6/16/2019	--
6/17/2019	--
6/18/2019	--
6/19/2019	--
6/20/2019	0.1
6/21/2019	--
6/22/2019	0.2
6/23/2019	--
6/24/2019	--
6/25/2019	--
6/26/2019	--
6/27/2019	--
6/28/2019	--
6/29/2019	--
6/30/2019	--

Notes:

Precipitation data obtained from USGS rain gauge at
W.O. Huske Dam.

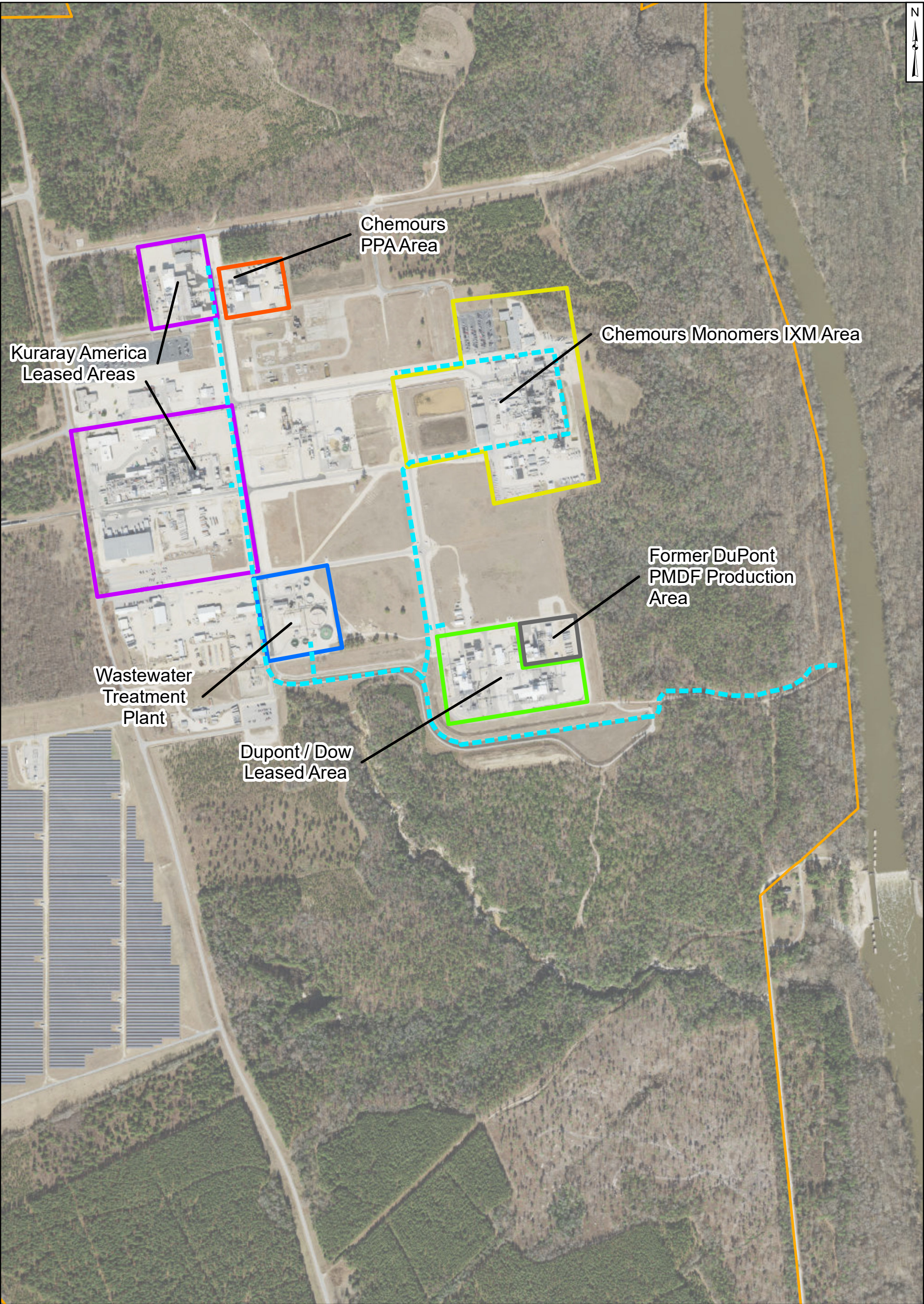
USGS - United States Geological Survey

-- - below USGS measurement threshold

72 hour period prior to sample collection date

Sample collection date

Figures



Legend

- Drainage Network
- Site Boundary

Areas at Site

- Chemours Monomers Ion Exchange Membrane (IXM) Area
- Chemours Polymer Processing Aid (PPA) Area
- Dupont / Dow Leased Area
- Former DuPont PMDF Production Area
- Kuraray America Leased Areas
- Wastewater Treatment Plant

Notes:
BasemapSource: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Site Location

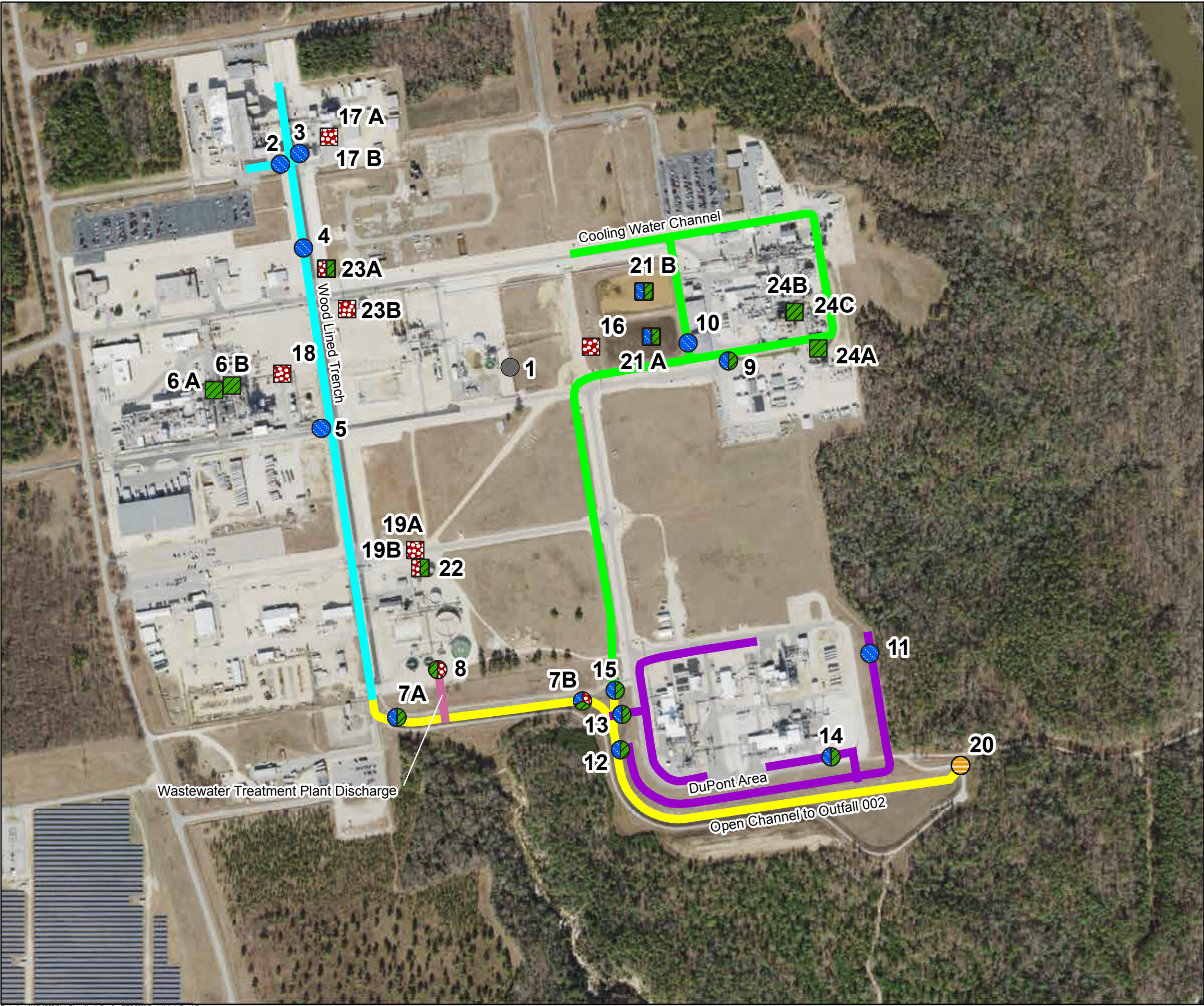
Chemours Fayetteville Works, North Carolina

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

Raleigh

July 2019

Figure
1



Legend

○

Temporal Composite Sample

□

Grab Sample

Sample Location Category

Outfall

Intake

Process wastewater

Non-process wastewater

Stormwater

Discharge Areas

Wood Lined Trench

Wastewater Treatment Plant Discharge

Cooling Water Channel

Open Channel to Outfall 002

DuPont Area



500 250 0 500 Feet

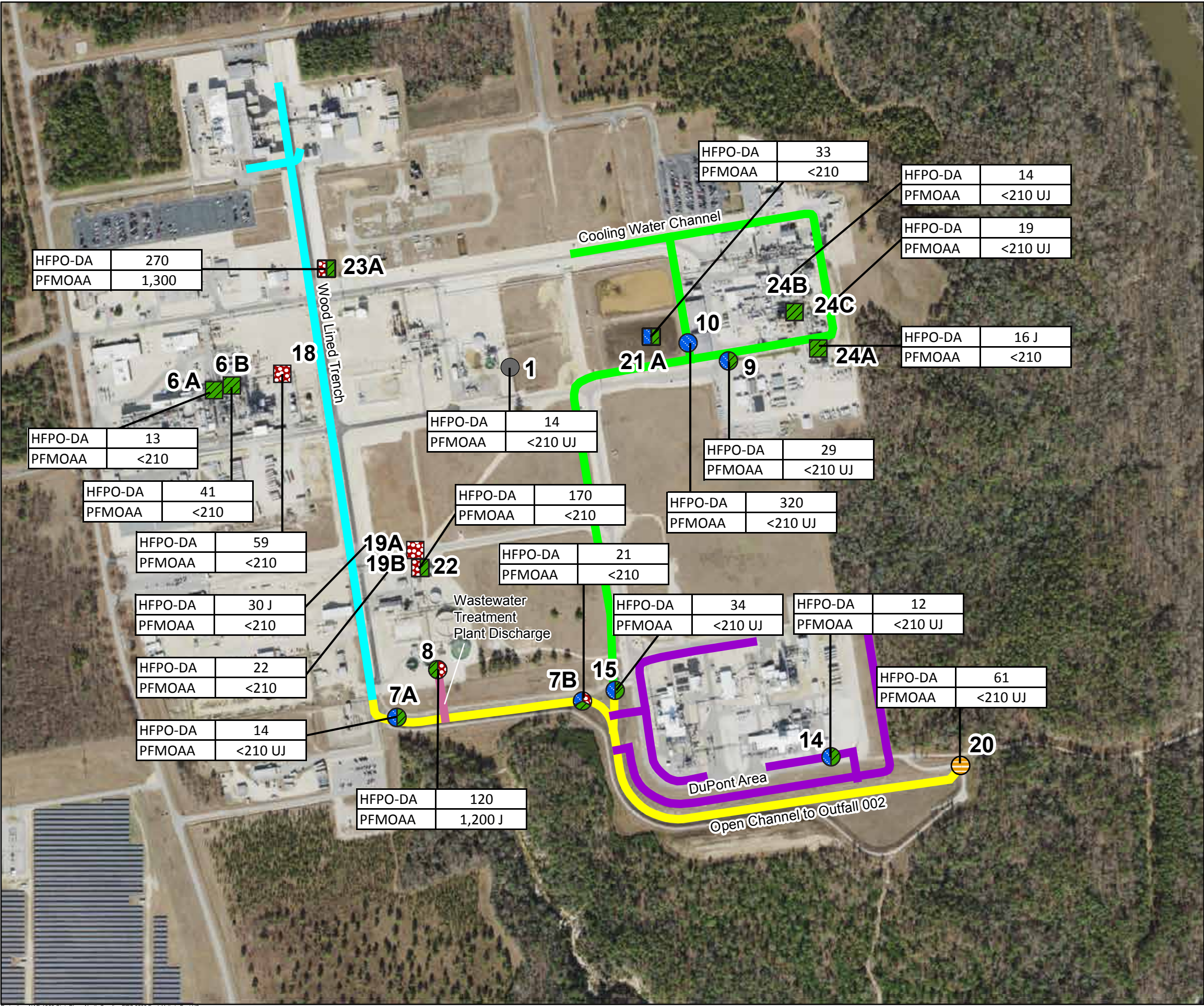
Paragraph 11(b) Sample Locations
Chemours Fayetteville Works, North Carolina

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

Raleigh

July 2019

Projection: NAD 1983 StatePlane North Carolina FIPS 3200 Feet; Units in Foot US



Legend

○ Temporal Composite Sample

□ Grab Sample

Sample Location Category

Outfall

Intake

Process wastewater

Non-process wastewater

Stormwater

Discharge Areas

Wood Lined Trench

Wastewater Treatment Plant Discharge

Cooling Water Channel

Open Channel to Outfall 002

DuPont Area

Notes:

Samples collected 24 April 2019

All concentrations are in nanograms per liter

Location 20 collected from channel upstream of sump

Temporal composite samples collected over 4 hour interval

J – estimated value

UJ - Estimated reporting limit

500 250 0 500 Feet

**HFPO-DA and PFMOAA Concentrations -
Locations that Reach Outfall 002
April 2019 Event**

Chemours Fayetteville Works, North Carolina

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

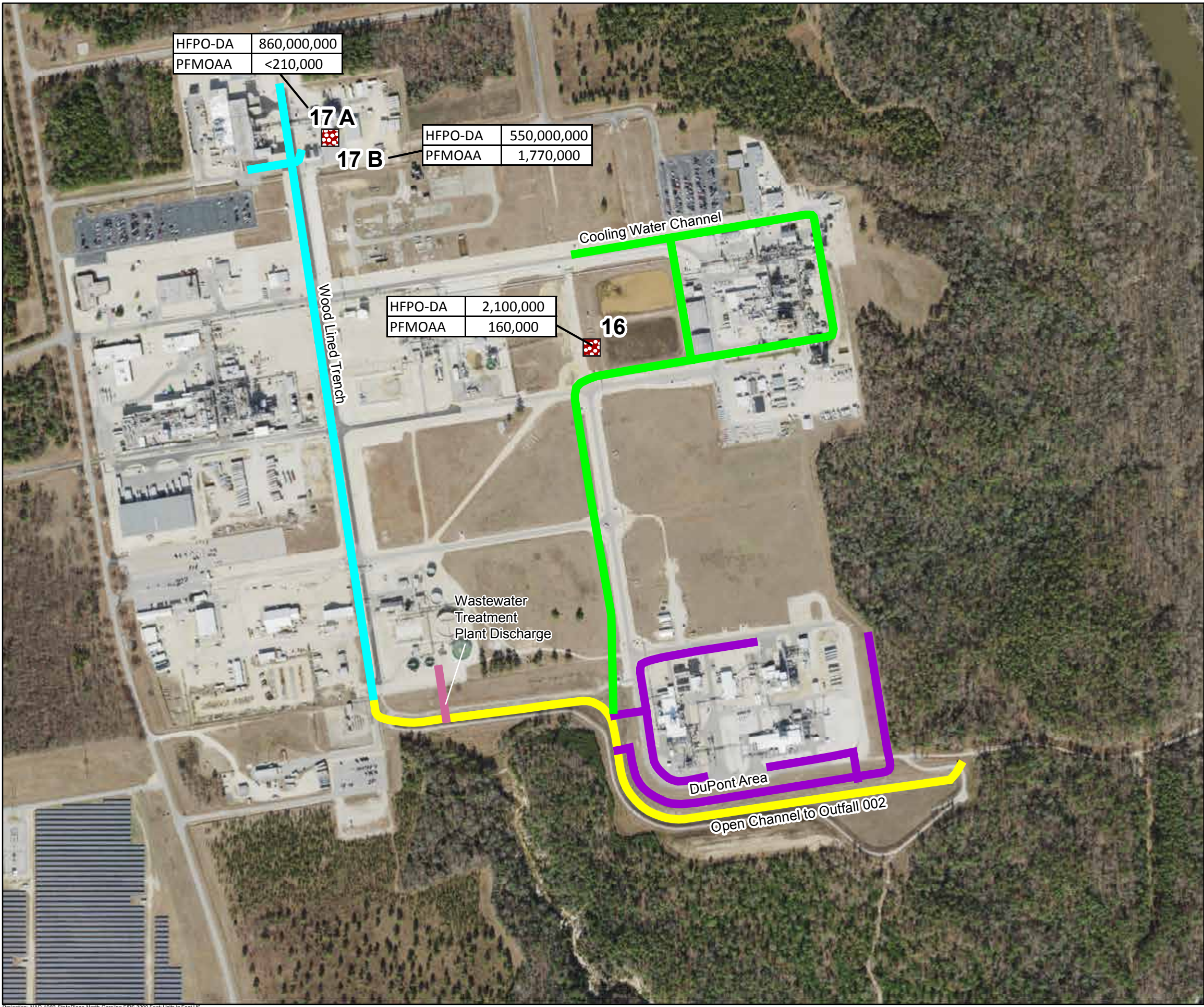
Raleigh

July 2019

Figure

3A

Projection: NAD 1983 StatePlane North Carolina FIPS 3200 Feet; Units in Foot US



Legend

Grab Sample

Process wastewater

Discharge Areas

Wood Lined Trench

Wastewater Treatment Plant Discharge

Cooling Water Channel

Open Channel to Outfall 002

DuPont Area

Notes:

Samples collected 24 April 2019

All concentrations are in nanograms per liter

5002500500 Feet

HFPO-DA and PFMOAA Concentrations -
Locations for Offsite Disposal -
April 2019 Event

Chemours Fayetteville Works, North Carolina

Geosyntec
Consultants of NC, PC
NC License No.: C-3500

RaleighJuly 2019

Figure

3B

Projection: NAD 1983 StatePlane North Carolina FPS 3200 Feet; Units in Foot US

Appendix A: Field Parameters

31 July 2019

APPENDIX A: FIELD PARAMETERS

Field parameters recorded during the April 2019 event are provided in Table A1 and Table A2 for grab samples and temporal composite samples, respectively. Field parameters were measured using a Horiba U-52 model. The water quality meter was calibrated at the start of every sampling day.

For grab samples, field parameters were measured once prior to sampling using a flow through cell. For temporal composite samples, field parameters were measured twice using a flow through cell: once during composite sampling (collected directly from the water stream), and once after composite sampling (collected from the autosampler reservoir).

Recorded field parameter data are generally in line with expectations for the sample locations, with the following exceptions:

- pH at Location 23A, Kuraray SentryGlas® process water and non-contact cooling water flowing to the wastewater treatment plant (WWTP), had the lowest measured pH at 3.51. The treated effluent pH from the WWTP at location 8 was between 8 and 8.5.
- pH at Location 22, the combined influent to the WWTP, had the highest measured pH at 11.1. The treated effluent pH from the WWTP at location 8 was between 8 and 8.5.
- Initial dissolved oxygen (DO) collected from the water streams at Locations 10 (Cooling Water Channel stormwater ditch) and 15 (combined Cooling Water Channel flow to Open Channel to Outfall 002) were elevated at 25.7 milligrams per liter [mg/l] and 29.0 mg/L, respectively. These values are above 100% saturation and potentially represent instrumental error. In each case, the DO reading collected from the autosampler reservoir after sample collection was less than 10 mg/L. The DO readings of water taken directly from Location 20, the Outfall 002, was 12.1 mg/L.

TABLE A1
GRAB SAMPLE FIELD PARAMETERS
Chemours Fayetteville Works, North Carolina

Geosyntec Consultants of NC P.C.

Location	pH	Temperature (°C)	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)
6A	7.92	20.52	0.061	9.05	380	150
6B	7.75	20.01	0.055	9.13	490	70
7B	N/A	N/A	N/A	N/A	N/A	N/A
16	N/A	N/A	N/A	N/A	N/A	N/A
17A	N/A	N/A	N/A	N/A	N/A	N/A
17B	N/A	N/A	N/A	N/A	N/A	N/A
18	6.18	23.42	0.074	6.97	150	31
19A	6.35	34.45	0.053	6.85	170	630
19B	7.18	23.11	0.16	10.8	170	5.9
21A	7.77	24.88	0.088	10.1	160	3.0
22	11.1	26.81	0.31	6.51	-14	110
23A	3.51	21.86	0.22	8.72	300	1.1
24A	9.81	23.33	0.058	11.3	330	62
24B	8.10	23.42	0.088	11.2	170	0.7
24C	8.49	27.33	0.093	6.48	170	2.2

Notes:

°C - degrees Celsius

mg/L - milligrams per liter

mS/cm - milliSiemens per centimeter

mV - millivolt

N/A - no data reported

NTU - nephelometric turbidity units

ORP - oxidation reduction potential

TABLE A2
TEMPORAL COMPOSITE SAMPLE FIELD PARAMETERS
Chemours Fayetteville Works, North Carolina

Geosyntec Consultants of NC P.C.

Location	pH		Temperature (°C)		Specific Conductivity (mS/cm)		Dissolved Oxygen (mg/L)		ORP (mV)		Turbidity (NTU)	
	Initial Reading	Final Reading	Initial Reading	Final Reading	Initial Reading	Final Reading	Initial Reading	Final Reading	Initial Reading	Final Reading	Initial Reading	Final Reading
1	8.00	7.64	25.19	19.15	0.064	0.053	16.3	7.16	470	200	100	57
7A	7.65	8.20	20.98	21.89	0.071	0.056	11.3	13.6	350	100	55	58
8	8.08	8.22	26.39	23.23	1.7	0.95	8.08	7.33	32	150	24	2.7
9	7.81	7.78	27.46	22.41	0.074	0.057	9.90	6.06	240	160	100	59
10	7.45	8.23	27.62	22.16	0.097	0.069	25.7	6.94	230	130	77	310
14	8.89	8.05	27.59	23.06	0.16	0.09	12.9	6.91	45	200	3.1	1.2
15	8.04	7.33	28.76	21.76	0.027	0.061	29.0	6.24	37	220	210	48
20	8.82	7.43	25.60	22.11	0.11	0.087	12.1	7.14	43	210	230	46

Notes:

Initial reading collected at the start of sampling directly from the water stream.

Final reading collected after sampling was complete, from autosampler reservoir.

°C - degrees Celsius

mg/L - milligrams per liter

mS/cm - milliSiemens per centimeter

mV - millivolt

NTU - nephelometric turbidity units

ORP - oxidation reduction potential

Appendix B: June 18, 2019 Letter re.
Laboratory Analyses for MTP, MMF, DFSA,
and PPF Acid, and Supporting Technical
Summaries from TestAmerica and Lancaster

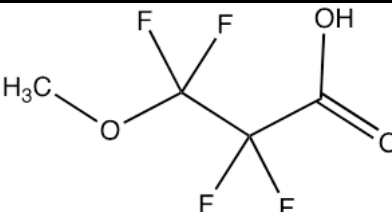
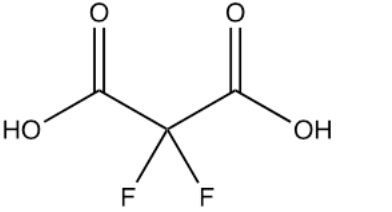
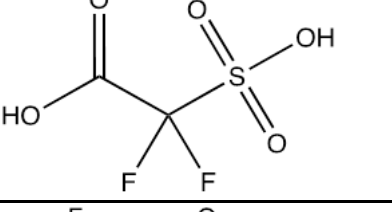
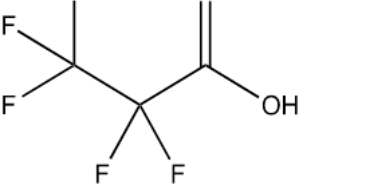
June 18, 2019

Linda Culpepper
Interim Director, Division of Water Resources
1611 Mail Service Center
Raleigh, NC 27699-1611
linda.culpepper@ncdenr.gov

Re: Laboratory Analyses for MTP, MMF, DFSA, and PPF Acid

Dear Ms. Culpepper,

I am writing to follow up on our June 10 letter and June 12 conference call with DEQ in regard to the four PFAS compounds shown below:

Acronym	Name	Molecular Formula	CASN	Chemical Structure
MTP	Perfluoro-2-methoxypropanoic acid	CH ₃ -O-CF ₂ -CF ₂ -COOH	93449-21-9	
MMF	Difluoromalonic acid	HOOC-CF ₂ -COOH	1514-85-8	
DFSA	Difluoro-sulfoacetic acid	HOOC-CF ₂ -SO ₃ H	422-67-3	
PPF Acid	Perfluoropropionic acid	CF ₃ -CF ₂ -COOH	422-64-0	

As we noted in our letter and discussed on our conference call, the laboratory analytical methods for these four compounds are new and not refined (and previously did not exist), and the resulting data quantifications are not accurate. Our external testing laboratories, Eurofins Lancaster Laboratories (“Lancaster”) and TestAmerica, have prepared summaries of the technical issues they have encountered, and these summaries are enclosed.

Accordingly, to prevent the collection and dissemination of inaccurate and misleading data, we have instructed Lancaster and TestAmerica to stop analyzing and reporting for these four compounds under their current laboratory analytical methods (referred to as “Table 3+”). We will continue to work with these labs on analytical method development and finding an appropriate testing methodology for these four compounds, and we will keep you apprised of our progress.

Please let me know if you have any questions.

Sincerely,



Brian D. Long
Plant Manager
Chemours – Fayetteville Works

Enclosures

Lancaster Technical Summary

TestAmerica Technical Summary

Cc:

Sheila Holman, DEQ

William F. Lane, DEQ

Francisco Benzoni, NC DOJ

Michael Abraczinskas, DAQ

Michael Scott, DWM

David C. Shelton, Chemours

John F. Savarese, WLRK

Kemp Burdette, CFRW

Geoff Gisler, SELC

MEMORANDUM

Date: 6/14/2019

To: Dr. Lam Leung, Chemours

CC: Mike Aucoin, AECOM

From: Eric Redman, Director of Technical Services

Subject: LC/MS/MS Method Performance for DFSA, MMF, MTP, and PPF Acid

This technical memorandum addresses questions regarding observed variability in the determination of 4 analytes (DFSA, MMF, MTP, and PPF Acid) by Eurofins TestAmerica's current LC/MS/MS methodology known as the 'Table 3+' analytical method.

DFSA, MMF, MTP, and PPF Acid are very small molecules by LC/MS/MS standards, consisting of just one or two fully fluorinated carbons with one or two terminal acidic moieties (carboxylic and/or sulfonic).

The size, structure, and highly polar nature of these molecules create a variety of technical challenges for LC/MS analysis. Due to the size and structure of DFSA, MMF, MTP, and PPF Acid there are relatively few characteristic mass fragments or mass transitions that can be used to identify them in the LC/MS/MS methodology, and the identification elements that exist are not unique to DFSA, MMF, MTP, and PPF Acid. These analytes are therefore prone to a large range of chemical interferences that can adversely impact the performance of the analytical method.

The small and highly polar nature of DFSA, MMF, MTP, and PPF Acid also means that these analytes are not easily retained under the usual LC/MS/MS chromatographic conditions. Poor retention in turn means that these analytes cannot be chromatographically separated or resolved from physical or chemical interferences, and are therefore more susceptible to adverse impacts from these co-eluting interferences. These can be manifest as discreet interferences that mimic the MS/MS response of DFSA, MMF, MTP, and PPF Acid and either obscure their presence (false negatives) or impart a positive bias (false positives). Additionally, non-discreet or bulk interferences such as dissolved solids, high ionic content, and naturally occurring organic and ionic compounds (humic acid or NOM) can create severe ion suppression and enhancement effects in the LC/MS/MS analysis. DFSA and MMF are further prone to variable impacts from ionic substances (including pH differences) due to their unusual di-acidic character.

The combination of multiple properties that can adversely impact analytical performance means that current 'Table 3+' analytical procedures will generate variable and potentially unreliable results for DFSA, MMF, MTP, and PPF Acid in samples. Analytical performance for DFSA, MMF, MTP, and PPF Acid has been demonstrated to be reliable in the absence of matrix interferences, but a growing body of empirical evidence including sample duplicate and matrix spike results indicates that matrix effects have a significant adverse impact in field samples.

From: Charles Neslund <CharlesNeslund@eurofinsUS.com>
Sent: Monday, June 10, 2019 2:49 PM
To: Leung, Lam-Wing H
Subject: ⚠ Performance of Selected Table 3+ Analytes
Attachments: ATT00001.txt

External email. Confirm links and attachments before opening.

Lam,

As we have discussed several times over the last several weeks, there are 4 compounds within the list of Table 3+ analytes that have proven to be very problematic for analysis under the conditions of the Table 3+ method. Those 4 compounds are;

- a. DFSA - CAS #422-67-3
- b. MMF – CAS #1514-85-8
- c. MTP – CAS #93449-21-9
- d. PPF Acid – CAS #422-64-0

The challenges that are presented by these 4 compounds under the analysis conditions of the Table 3+ are several.

- a. Chromatographically, DFSA and MMF are not retained well and in fact elute essentially in the void volume of the column and column introduction system. MTP and PPF acid elute a little past the void volume but not by very much. The reason this is important is that due to the short carbon chain length of the compounds, the range of options for product ion masses and transition ion masses to monitor for detection is limited. Therefore, without good chromatographic separation, the mass spectrometer struggles to differentiate these compounds from background. This then has a direct impact on the sensitivity that one is able to achieve and has as a direct impact on the ruggedness of the analysis.
- b. In attempts to improve the chromatography to improve detection of these compounds, we have adjusted the mobile phase composition so that upon injection of sample, the mobile phase is essentially 100% water. This has the effect of causing chromatography columns with a C18 functionality to collapse which negatively impacts the chromatography of all of the other Table 3+ compounds, while only marginally improving the performance of these 4 compounds. If and when we have tried to change to a column chemistry that might be more accommodating of high aqueous content, then the performance of the other Table 3+ compounds is significantly impacted.

In summary, it would be our suggestion to develop a technique that uses a completely separate separation and analysis for these 4 compounds so that more reliable detection and analysis can be performed.

Regards,
Chuck

Charles Neslund
Scientific Officer

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