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ASSESSMENT OF THE CHEMICAL AND SPATIAL DISTRIBUTION OF PFAS IN THE CAPE FEAR RIVER

Prepared for

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TABLE OF CONTENTS

TABLE OF CONTENTS, CONTINUED

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES, CONTINUED

LIST OF APPENDICES

LIST OF ACRONYMS

%	percent
°C	degrees Celsius
CFR	Cape Fear River
CFPUA	Cape Fear River Public Authorities
cfs	cubic feet per second
DO	Dissolved oxygen
DQO	Data Quality Objective
DVM	Data Verification Module
EIM	Environmental Information Management
ft	feet
ft/s	feet per second
ft^2	squared feet
ft^3/s	cubic feet per second
GAC	Granular activated carbon
GPS	global positioning system
HDPE	High density poly-ethylene
HFPO-DA	hexafluoropropylene oxide dimer acid; dimer acid
LCS	laboratory control sample
LCSD	laboratory control sample duplicate

LIST OF ACRONYMS, CONTINUED

LTW	long-term wells
m	meters
MCL	maximum contaminant limit
MDL	method detection limit
mg/L	milligrams per liter
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
mV	millivolts
NC	North Carolina
NC DWR	North Carolina Division of Water Resources
NCDEQ	North Carolina Department of Environmental Quality
ng/L	nanograms per liter
NTU	nephelometric turbidity units
PFAS	perfluoroalkyl substances
PFBA	perflourobutanoic acid
PFCA	perfluorocarboxylic acids
PFSA	perfluorosulfonic acids
PFECA	perfluoroalkyl ether carboxylic acids
PFESA	perfluoroalkyl ether sulfonic acids
PHFxS	perflourohexanesulfanoic acid
PFMOAA	Perfluoro-1-methoxyacetic acid
PFO2HxA	Perfluoro(3,5-dioxahexanoic) acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PQL	Practical quantitation limit
PWC	Public Works Commission
QA	Quality assurance
QC	quality control
QTOF-MS	quadrupole time of flight mass spectrometry
RL	reporting limit
RPD	relative percent differences
SOP	Standard Operation Protocol
SC	Specific conductance
SW	Surface water

LIST OF ACRONYMS, CONTINUED

TTHM	total trihalomethanes
UCMR3	Third Unregulated Contaminant Monitoring Rule
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
µohm	microohms

EXECUTIVE SUMMARY

Cape Fear River water contains certain contaminants, including per- and polyfluorinated alkyl substances (PFAS), some of which are associated with the Chemours Fayetteville Works Site (the Site). Between September 2017 and June 2018 Chemours performed three sampling programs to assess the spatial and chemical distribution of PFAS in the Cape Fear River, which included 35 different compounds in five groupings:

PFAS Grouping	Example Compound
PFCAs – perfluorocarboxylic acids	PFOA – perfluorooctanecarboxylic acid
PFSAs – perfluorosulfonic acids	PFOS – perfluorooctanesulfonic acid
HFPO-DA – Hexafluoropropylene oxide dimer acid[1]	(also known as C3-Dimer Acid or GenX)
PFECAs – Perfluoroethercarboxylic acids	PFMOAA – Perfluoro-1-methoxyacetic acid
PFESAs – Perfluoroethersulfonic acids	Nafion Byproduct #1

1 – HFPO-DA is one compound and is a PFECA. For clarity and comparison to available health goal information it is grouped by itself.

Two of the sampling programs were focused on the general proximity of the Site and are referred to as "Local Programs". The Local Programs included samples to enable a detailed characterization of PFAS distribution in the Cape Fear River directly upstream, adjacent to, and downstream of the Site, in groundwater from five (5) wells on-Site nearest to the Cape Fear River, and from creeks and outfall discharges to the Cape Fear River. The third program, the "Regional Program", included samples to enable a characterization of PFAS distribution along the extent of the Cape Fear River from the start of the Cape Fear River at the confluence of the Deep and Haw Rivers to 132 miles downstream at Kings Bluff Intake Canal. This is where Cape Fear Public Utility Authority (CFPUA) draws water to supply the City of Wilmington along with Pender and Brunswick Counties.

All three programs showed PFCAs and PFSAs were present in the Cape Fear River at similar concentrations upstream and downstream of the Chemours Site indicating that the Chemours Site did not contribute to Cape Fear River PFCA or PFSA concentrations. Conversely, HFPO-DA, PFECAs and PFESAs were detected in the Cape Fear River only adjacent to and downstream from the Site, indicating these compounds were associated with the Site. Of PFAS compounds analyzed, approximately half of the total mass detected at Kings Bluff Intake Canal on 6 June 2018 appear to be associated with the Chemours Site (i.e., 76J‡[1] nanograms per liter (ng/L) of a total of 144.7 ng/L). The remaining 68.7 ng/L were PFCAs and PFSAs associated with non-Chemours sources throughout the Cape Fear River Watershed and primarily upstream of the Site.

Chemours has and is continuing to take action to reduce PFAS migration from the Site to the Cape Fear River. On 21 June 2017, Chemours diverted process wastewater away from Site Outfall 002, after which HFPO-DA concentrations in water drawn from or near Kings Bluff Intake Canal has dropped from 1,100 ng/L to 11 ng/L. Chemours continues to extract Site groundwater containing PFAS and is lining Site ditches to reduce infiltration of water that transports PFAS to the Cape Fear River. Chemours is in discussions with the State about designing a system to capture and treat groundwater leaving the perched and surficial aquifers and entering the Old Outfall 002. These measures have significantly and will further reduce contributions of Site-related PFAS to the Cape Fear River.

Chemours is planning a fourth monitoring program to evaluate water quality in the Cape Fear River. This program will use specialized analytical capabilities to measure the concentrations of additional PFAS compounds potentially present that have not been included in the laboratory methods conducted to date. Chemours continues to work with North Carolina State agencies to comply with regulations, guidance and policies.

[1] Value is reported below the statistical method detection limit. More detail provided in sections 3.3 and 5.4.

1 INTRODUCTION AND OBJECTIVES

This report was prepared by Geosyntec Consultants of NC, P.C. (Geosyntec) for Chemours Company FC, LLC (Chemours) to document the results of sampling and analysis programs. The programs assessed the chemical and spatial distribution of per- and polyfluorinated substances (PFAS) in the Cape Fear River to identify which PFAS compounds are attributable to the Chemours Fayetteville Works Site (the Site), and to assess reductions in Cape Fear River PFAS concentrations based on Chemours remedial actions.

The assessment is based on publicly available data and data from three surface water sampling programs conducted by Chemours between September 2017 and June 2018. The sampling programs are separated into two categories.

- Two "Local Programs" conducted in September 2017 (Parsons, 2017a) and May 2018 in close proximity to the Chemours Fayetteville Works Site (the Site) in Bladen and Cumberland Counties, North Carolina; and
- One "Regional Program" conducted in June 2018 encompassing the length of the Cape Fear River from its start, where the Deep and Haw rivers meet, to 132 miles downstream at Kings Bluff Intake Canal where the City of Wilmington, NC and the Counties of Pender and Brunswick draw water.

The remainder of this report contains the following sections:

- Section 2: Cape Fear River Background
- Section 3: PFAS and Analytical Methods
- Section 4: Local and Regional Programs Overview
- Section 5: Local and Regional Programs Scope and Methods
- Section 6: Results
- Section 7: Local and Regional River Program
- Section 8: CFPUA Cape Fear River PFAS Data Comparison
- Section 9: Chemours Actions and HFPO-DA Reductions
- Section 10: Summary and Next Steps
- Section 11: References

2 CAPE FEAR RIVER BACKGROUND

The Cape Fear River and its entire Watershed are located in the state of North Carolina (Figure 1). The Cape Fear River drains 9,164 square mi and empties into the Atlantic Ocean near the city of Wilmington, North Carolina. The Site (Figure 2) is adjacent to the Cape Fear River and draws water from the Cape Fear River and returns over 95% of this water via Site Outfall 002 after being used as non-contact cooling water.

The Cape Fear River is also a water source for multiple communities. Fayetteville Public Works Commission (Fayetteville PWC) draws water up-stream of the Site to supply the City of Fayetteville. The Cape Fear Public Utility Authority (CFPUA) draws water downstream of the Site at Kings Bluff Intake Canal to supply the City of Wilmington along with Pender and Brunswick Counties.

Drinking water sourced from the Cape Fear River by both Fayetteville PWC and CFPUA is known to contain certain chemicals including 1,4-dioxane, trihalomethanes associated with bromide content in raw river water, pharmaceuticals, personal care products and endocrine disrupting chemicals, and PFAS. The following subsections describe measured concentrations of these compounds in Cape Fear River water. Supporting documentation are provided in Appendix A.

2.1 1,4-Dioxane

1,4-dioxane is a water-soluble solvent listed in the United States Environmental Protection Agency (US EPA) Third Unregulated Contaminant Monitoring Rule (UCMR3). UCMR3, the third amendment to the 1996 Safe Drinking Water Act, was intended to develop monitoring data to provide a basis for potential future regulatory actions to protect public health.

In North Carolina the human health criterion for 1,4-dioxane is the US EPA drinking water health advisory value, 350 nanograms per liter (ng/L). 1,4-dioxane has been detected in finished drinking water as reported in 2017 annual water quality reports from both Fayetteville PWC and CFPUA (Fayetteville PWC, 2018; CFPUA, 2018). The range of concentrations reported from each utility is reported below:

- 410 to 4,200 ng/L 1,4-dioxane during 2017 at Fayetteville PWC; and
- 180 ng/L 1,4-dioxane on a sampling date in June 2017 at CFPUA.

The North Carolina Division of Water Resources, (NC DWR) has also studied the presence of 1,4-dioxane in the Cape Fear River watershed (NC DWR, 2017a). Across the Watershed between 2014 and 2016 the highest detected 1,4-dioxane concentration in all the 193 collected samples was 1,030,000 ng/L in the Haw River before Reedy Fork. In the Cape Fear River the highest detected concentration was 1,000 ng/L in the 17 samples collected between 2014 and 2016 at Lock and Dam Number 1 near Kings Bluff Intake Canal where CFPUA draws water. The NC DWR is continuing to evaluate 1,4-dioxane concentrations in surface water bodies in an 18-month long statewide investigation initiated in 2017 (NC DWR, 2017b).

2.2 Trihalomethanes and Bromide

Trihalomethanes are a group of disinfection byproducts, which are common in disinfected water supplies and regulated under the 1996 Safe Drinking Water Act. Treating surface water for drinking often involves chlorination for disinfection which leads to the unintended formation of disinfection byproducts. Elevated trihalomethane concentrations have been observed in North Carolina, especially where elevated concentrations of bromide and dissolved organic matter are present in source waters (Greune, 2014). The maximum contaminant limit (MCL) for total trihalomethanes (TTHM) is 80,000 ng/L. TTHM is calculated by summing the detected concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform. The following concentration ranges of TTHM have been detected in finished drinking water as reported in 2017 annual water quality reports from both Fayetteville PWC and CFPUA (Fayetteville PWC, 2018; CFPUA, 2018). The range of concentrations reported from each utility is reported below:

- 17,000 to 74,000 ng/L TTHM during 2017 at Fayetteville PWC; and
- 18,900 to 64,600 ng/L TTHM during 2017 at CFPUA.

NC DWR is evaluating bromide concentrations in surface water bodies statewide in the same program outlined above for 1,4-dioxane (NC DWR, 2017b).

2.3 Pharmaceuticals, Personal Care Products and Endocrine Disrupting Chemicals

Pharmaceuticals, personal care products and endocrine disrupting chemicals include unused medications, excreted medications and hormones, some cosmetic and therapeutic products, and manufacturing wastes and byproducts (Caliman and Gavrilescu, 2009; Snyder et al., 2003). These compounds are often found in discharges from wastewater treatment plants and can subsequently be present in surface water bodies down-stream of urban centers.

Between 2017 and 2018, CFPUA conducted a pilot-scale treatment study to evaluate options for treating emerging contaminants (Black and Veatch, 2018). As part of this effort Cape Fear River water was analyzed for four compounds falling under the categorization of pharmaceuticals, personal care products and endocrine disrupting chemicals. The compounds analyzed, and the detected concentrations are shown below:

- Sucralose, an artificial sweetener at 900 ng/L;
- Acesulfame-K, an artificial sweetener at 30 ng/L;
- Tris(chloropropyl) phosphate, a flame retardant at 65 ng/L; and
- Cotinine, a tobacco/nicotine metabolism product at 3 ng/L.

The pilot scale treatability study showed effective removal of these compounds from influent Cape Fear River concentrations by granular activated carbon.

2.4 PFAS

PFAS are fluorinated compounds with special chemical properties which has led to their widespread use in many industrial and residential applications including stain resistant textile treatments, fire-fighting foams and paper coatings. Six PFAS[2] have been listed in UCMR3. PFAS have been detected throughout the Cape Fear River Watershed. Key studies of PFAS in the Cape Fear River and their findings are described below:

- *Nakayama et al., 2007. A paper published in the Environmental Science and Technology Journal.* Samples were collected throughout the entire Cape Fear River Watershed, including the Deep River which receives water from High Point area and rural forest and farming areas, the Haw River which receives water from Greensboro and Durham areas, and the Little River which receives water from Fort Bragg and surrounding rural and forested areas. Samples collected from the rivers were analyzed for selected perfluorocarboxylic acids (PFCAs), including perfluorooctanoic acid (PFOA), and perfluorosulfonic acids (PFSAs), including perfluorosulfonic acid (PFOS). PFAS were detected at all reported sampling locations in the four rivers. Total analyzed and detected PFAS concentrations in the Cape Fear River upstream of the Site ranged from 189 to 227 ng/L from samples collected in the spring of 2006; concentrations were not reported downstream of the Site.

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[2] The six listed PFAS in UCMR3 are: PFOS, PFOA, perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), perfluorobutanesulfonic acid (PFBS) – all PFCAs and PFSAs. https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule

- *Lindstrom et al., 2015. A presentation delivered to the NC AWWA-WEA Conference.* Samples were collected from surface water bodies in the Cape Fear River Watershed and analyzed for selected PFCAs and PFSAs. Results presented in the presentation showed PFOS and PFOA were detected in streams flowing into the Cane Creek Reservoir which is part of the Haw River Watershed and flows into the Cape Fear River. PFOS and PFOA were detected at concentrations ranging from 65 to 1,020 ng/L. The authors suggested that detections of PFOS and PFOA in the creeks flowing into the reservoir may have been associated with sewage sludge (i.e., biosolids) from wastewater treatment plants that was applied to nearby fields.

- *Sun et al., 2016. A letter published in Environmental Science and Technology Letters.* Samples were collected from the Haw River and the Cape Fear River at locations both upstream and downstream of the Site. Samples were analyzed for PFCAs, PFSAs and perfluoroalkyl ether carboxylic acids (PFECAs). PFECAs compounds include hexafluoropropylene oxide dimer acid (HFPO-DA also referred to as C3-Dimer Acid or GenX). PFCAs and PFSAs were detected in the Cape Fear River upstream and downstream of the Site. PFECAs, including HFPO-DA, were non-detect upstream of the Site, but were detected downstream of the Site.

- *Black and Veatch, 2018. A report prepared for CFPUA.* Samples of raw river water and pilot study influent were collected at the CFPUA Sweeney water treatment plant during a pilot study to evaluate treatment approaches for PFAS and other emerging contaminants. Raw water was sourced from the Cape Fear River at Kings Bluff Intake Canal. Samples were analyzed for PFCAs, PFSAs, HFPO-DA, PFECAs, and perfluoroalkyl ether sulfonic acids (PFESAs). All compound types were detected in collected samples. The reported concentrations for PFECAs and PFESAs may potentially have data quality issues as discussed in Section 8.

Chemours conducted the sampling programs presented in the remainder of this report to further characterize the nature, location, and extent of PFAS in the Cape Fear River.

3 PFAS AND ANALYTICAL METHODS

This section presents the analytical methods used to analyze for PFAS in collected samples, and a description of the PFAS types reported. For the two Local and one Regional Programs described in this report, three analytical methods were employed to analyze for a total of 35 individual PFAS compounds. The three methods are listed below, with analytes analyzed listed in Table 1 and chemical structures shown in Appendix B.

- EPA Method 537 Mod – PFCAs, PFSAs, Others (All 3 Programs)
- EPA Method 8321 Mod – HFPO-DA (All 3 Programs)
- Table 3 Lab SOP – PFECAs and PFESAs – (2018 Local and Regional Programs)

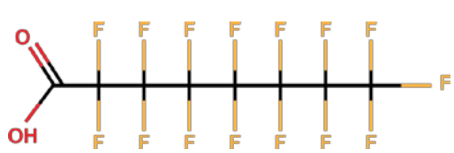
The methods and analytes analyzed are described in the following subsections.

3.1 EPA Method 537 Mod & Analytes

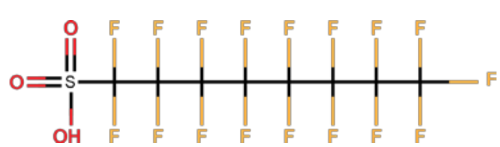
EPA Method 537 Mod is the standard method for analyzing PFAS in water by contract laboratories. It was employed in all three river programs to analyze samples for the presence of PFCAs, PFSAs and other compounds such as fluorotelomer sulfonates and perfluorosulfanomides. The full list of compounds evaluated by EPA Method 537 Mod is presented in Table 1. In all three programs data from EPA Method 537 Mod were reported to the practical quantitation limit (PQL), typically 2 ng/L.

The most commonly known PFCA is PFOA. The most commonly known PFSA is PFOS. Both PFOA and PFOS are molecules consisting of eight carbon atoms. At the end of PFOA is a carboxylic acid group where the final carbon atom in the chain is bonded to two oxygen atoms. At the end of PFOS is a sulfur atom bonded to three oxygen atoms. Other PFCAs and PFSAs have shorter or longer carbon atoms. The molecular structure of both PFOA and PFSA are shown below for reference.

PFCA: PFOA



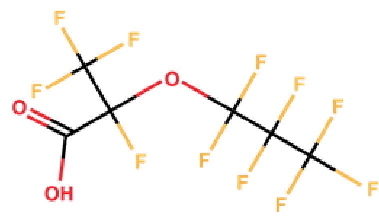
PFSA: PFOS



3.2 EPA Method 8321 Mod & Analytes

EPA Method 8321 Mod was used to analyze for HPFO-DA (i.e., GenX). It was applied in all three river programs to analyze and quantitate samples for HFPO-DA. In all three programs data from EPA Method 8321 Mod were reported to the PQL, typically 4 to 10 ng/L. The molecular structure of HFPO-DA is shown below for reference.

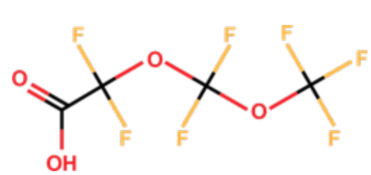
HFPO-DA



3.3 Table 3 Lab SOP & Analytes

Table 3 Lab SOP is a method recently developed by Chemours and implemented at TestAmerica Laboratories, Inc. (TestAmerica) and Eurofins Lancaster Laboratories Environmental (Lancaster Labs). The Table 3 SOP method was developed to measure concentrations of specific PFECAs and PFESAs detected at the Site. Structurally PFECAs and PFESAs are similar to PFCAs and PFSAs, except they also include ether bonds. The compounds analyzed by the Table 3 SOP are listed in Table 1. The molecular structures for a representative PFECA and PFESA are shown below.

PFECA:
Perfluoro-1-methoxyacetic acid (PFMOAA)



PFESA:
PFESA BP2

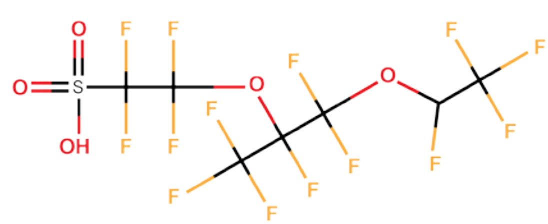


Table 3 SOP data presented here were reported by TestAmerica. For these data the Practical Quantification Limit (PQL) for the Table 3 Lab SOP currently is 200 ng/L and the reported statistical method detection limits (MDLs) for individual Table 3

compounds ranges from 88 to 120 ng/L[3]. The CFPUA pilot study data, discussed in Section 2.4 (Black and Veatch, 2018), reported Table 3 compound concentrations as low as 0.3 ng/L, which is far below what are known achievable PQL and MDLs, and therefore, are likely not accurate and should be qualified as estimated values, at best.

Standard practice is to report data to the PQL and to append data qualifiers to any data reported below the MDL using a J flag (e.g. 5J ng/L). Rarely are data reported to levels below the MDL. Data below the MDL are subject to much greater errors in concentration estimates and may potentially include false positive detections – i.e. incorrectly interpreting instrumentation noise as an actual detection.

In this report data for Table 3 SOP compounds were reported below the MDL for the May 2018 Local and June 2018 Regional Programs. This decision was made to facilitate comparison to the CFPUA data. These data were reported to concentrations as low as a chromatographic signal-to-noise ratio of 3:1. This increases the risk of bias and variability in the lower numbers. Values reported below the MDL are indicated by appending a J‡ flag to the data (e.g. 1.9J‡ ng/L).

The analytical laboratory reports supporting results reported in this report are provided in Appendix C. The CFPUA data reported by Black and Veatch (2018) did not include Level IV (4) laboratory reports, so there are some details of the analyses that remain uncertain, as described further in Section 8.

3.3.1 Provision of Table 3 Reference Standards to Laboratories

Analysis of Table 3 PFECA and PFESA compounds is a recent and developing analytical method. Chemours has prepared and shared with researchers and commercial laboratories standard mixtures with known concentrations of Table 3 compounds, with a goal of facilitating accurate analyses of these compounds. Recipients of Table 3 compounds standards along with the month in by which they received the complete set of Table 3 reference standards are listed below:

- Lancaster Labs – January 2018
- Mark Strynar, EPA National Exposure Research Laboratory – April 2018

[3] Above the PQL concentrations of compounds can be quantified. Between the PQL and the MDL concentrations are estimated, but compounds can be positively identified as being present. Any detections reported below the MDL are estimated and at low concentrations (e.g. a few nanograms per liter) may potentially be instrumentation noise instead identification of the compound.

- Scott Sivertsen, EPA Region 4 – April 2018
- TestAmerica – April 2018
- GEL Laboratories – May 2018
- Prof. Detlef Knappe, North Carolina State University, Raleigh – May 2018
- Prof. Mei Sun, University North Carolina, Charlotte – June 2018

The date by which full sets of standards were shared with different parties is relevant to the accuracy of sample results and a discussion of CFPUA and GEL Laboratories PFAS data is provided in Section 8.

4 LOCAL AND REGIONAL PROGRAMS OVERVIEW

This section presents an overview of the scope of the Local and Regional Programs. The detailed scope and methods performed for the Local and Regional Program in 2018 follows in Section 5.

The September 2017 Local Program was developed by Parsons of North Carolina Inc., (Parsons). The May 2018 Local and June 2018 Regional Programs were developed by Geosyntec. Field effort for all three programs was completed by Parsons.

4.1 Local Programs Overview

The Local River Programs were designed to provide a detailed assessment of PFAS in the Cape Fear River near the Site. In both September 2017 and May 2018 Programs, samples were collected at 9 sampling transects starting 10 miles upstream of the Site and ending 5 miles downstream of the Site as shown in Figure 3 and Figure 4. Four samples were collected at each sampling transect to assess the lateral and vertical concentration distributions as shown in Figure 5.

The Local Programs also collected samples from following locations:

- An Excess River Water sample (in the May 2018 Program only) to assess PFAS concentrations in Cape Fear River water drawn by the Site;
- A Site Outfall 002 sample to assess PFAS concentrations in water being released back to the Cape Fear River;
- LTW Groundwater wells adjacent Site to assess PFAS concentrations in on-Site groundwater nearest the Cape Fear River; and
- Three nearby tributaries (Willis Creek, Georgia Branch Creek and the Old Outfall channel) to assess PFAS concentrations in water from these tributaries which flow into the Cape Fear River.

Additionally, measurements of the three nearby tributaries were made in the May 2018 program to estimate the volumetric water discharge rates (i.e., cubic feet per second [cfs] of flow).

The 2017 Local Program was conducted between 26 and 27 September 2017, with samples analyzed for PFCAs, PFSAs and HFPO-DA. The 2018 Local Program was conducted between 9 and 10 May 2018, with samples analyzed for PFCAs, PFSAs, HFPO-DA, PFECAs and PFESAs. The sampling locations and collection dates for the programs are listed in Table 2. The locations for the September 2017 Local Program are shown in the *Cape Fear River Surface Water Sampling Memorandum* (Parsons, 2017b) provided in Attachment C.

4.2 Regional Program Overview

The Regional Program was designed to provide an assessment of the spatial and chemical distribution of PFAS along the length of the Cape Fear River. Samples were collected from the start of the Cape Fear River where the Deep and Haw Rivers meet to 132 miles downstream of the Site at Kings Bluff Intake Canal at 8-mile intervals. Samples were also collected near the ends of the Deep and Haw Rivers just before their confluence and from the Little River 2.8 miles upstream of where it joins the Cape Fear River (near River Mile 36).

Samples were collected from either a boat, shore or a bridge. All samples were collected from as close as practical to the middle of the deepest portion of the main flowing river channel (referred to as the thalweg), as shown in Figure 5, which is typically the most well-mixed part of the river. The sampling locations for the Regional Program are shown on Figure 6, and the collection dates and collection locations are listed in Table 3.

5 LOCAL AND REGIONAL PROGRAMS SCOPE AND METHODS

This section presents methods common to both the May 2018 Local and June 2018 Regional Programs, and scope and methods specific to each program. The scope, methods and results of the September 2017 Local Program were previously reported in the *Cape Fear River Surface Water Sampling Memorandum* (Parsons, 2017a) provided in Appendix D. Presentation of the results of these programs follows in Section 6.

5.1 Common Methods

The following sub-sections present methods common to both the May 2018 Local and June 2018 Regional Programs. Sampling methods are described in detail in the *Cape Fear River Surface Water Sampling Plan* (Parsons, 2017b) and the *Additional Investigation Work Plan* (Parsons, 2017c).

5.1.1 General Field Procedures

All equipment was inspected by Parson's Site Supervisor and calibrated daily prior to use in the field according to the manufacturer's recommended guidelines. Calibration information was recorded in a field logbook. Field parameters were measured with a Horiba water quality meter prior to sample collection and 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.

All sampling equipment was decontaminated between sample locations in the following manner:

- Tap water rinse;
- Scrub with tap water containing non-phosphate detergent (i.e., Alconox®);
- Tap water rinse;

- De-ionized water rinse; and
- Air dry.

After decontamination, field equipment was used at the next sampling location. Disposable equipment (e.g. gloves, tubing, etc.) was not reused. New sample containers were used for each sample.

5.1.2 Surface Water Sampling

Surface water samples were collected using a peristaltic pump and new dedicated high-density polyethylene (HDPE) tubing and dedicated silicone tubing for the pump head at each location. The tubing was lowered to the specified sampling depth below the water surface using an anchor weight and the tubing fastened to point upwards. Surface water was pumped directly from submerged tubing through the pump head to a flow-through cell until turbidity measurements were below 20 nephelometric turbidity units (NTU) and all other field parameters (pH, temperature, SC, DO, ORP) were stabilized within ±10% over a five-minute interval. Field parameter data are provided in Appendix E. Once water passing through the pump head and the readings from the flow-through cell showed stable values, the cell was disconnected, the tubing cut to provide a new, clean end and grab samples were collected from the discharge of the peristaltic pump in new 250 milliliters (mL) HDPE bottles. Two bottles were collected for each analysis method at each location. Samples were shipped on ice to TestAmerica Denver and Sacramento. Laboratory reports, which include chains of custody for these samples are provided in Appendix C.

5.1.3 Groundwater Sampling

Groundwater samples were collected using low-flow sampling techniques. Water was collected using a peristaltic pump and new, dedicated HDPE tubing and dedicated silicone tubing for the pump head at each well. Groundwater was pumped directly from submerged tubing through the pump head to a flow-through cell until turbidity measurements were below 20 nephelometric turbidity units (NTU) and all other field parameters (pH, temperature, SC, DO, ORP) were stabilized within ±10% over a five-minute interval. Field parameter data are provided in Appendix E. Once water passing through the pump head and then flow-through cell showed stable field screening readings, the cell was disconnected, the tubing cut to provide a new, clean end and grab samples were collected from the discharge of the peristaltic pump in new 250 mL HDPE bottles. Two bottles were collected per analysis method per location. Samples were shipped on ice to TestAmerica Denver and Sacramento. Laboratory reports, which include chains of custody for these samples are provided in Appendix C.

5.2 May 2018 Local River Program

The May 2018 Local Program was completed by Parsons according to the *Additional Cape Fear River Surface Water Sampling Plan* (Geosyntec, 2018a), provided in Appendix D. Sampling locations are shown on Figure 3 and Figure 4 and listed in Table 2. Compounds evaluated as part of this program are listed in Table 1. Samples were collected at following locations as part of the May 2018 Local Program:

- 9 surface water sample locations along the Cape Fear River, each with 4 samples collected across a transect (CFR-01 to CFR-09);
- 5 groundwater sample locations from the LTW wells adjacent to the Cape Fear River (LTW-01 to LTW-05);
- 1 sample of water drawn from the Cape Fear River by the Site prior to use on-Site primarily as cooling water (Excess River Water);
- 1 sample location from Outfall 002 which is water used on-Site and released back to the Cape Fear River;
- 1 surface water sample and 1 flow gauging location in Willis Creek, a tributary of the Cape Fear River (SW-WC-03);
- 1 surface water sample and 1 flow gauging location in Georgia Branch Creek, a tributary of the Cape Fear River (SW-GB-2);
- 1 surface water sample location and 1 flow gauging location in the Old Outfall channel, a tributary of the Cape Fear River (SW-002OLD-01); and
- 6 quality assurance/quality control (QA/QC) samples (see Section 2.1.8).

The following sub-sections describe sample timing, sample locations and collection methods, sampling details for each portion of the program and QA/QC samples.

5.2.1 Timing and Precipitation

The May 2018 Program was completed between 9 and 10 May 2018. There was no rainfall during this sampling event. The last recorded rainfall prior to the sampling event was 0.83-inches of precipitation[4] four days prior on 5 May 2018.

5.2.2 Cape Fear River Sampling

At each Cape Fear River sampling transect, four samples were collected as shown on Figure 5 and described below:

- West Sample – located 25% of the distance across the channel from the west shore at a depth of 1-ft below water surface. This location was closest to the Site because the Site is on the west side of the Cape Fear River.
- Center Top Sample – located in the middle of the channel at depth of 1-ft below surface.
- Center Middle Sample – located in the middle of the channel, halfway between surface and river bottom.
- East – located 25% of the distance across the channel from the east shore at a depth of 1-ft below surface.

Samples were collected from a boat carrying the boat driver, sampling crew, sample coolers, sampling equipment and other associated materials. Samples were collected according to methods described in Section 5.1.2.

5.2.3 Groundwater Sampling (LTW Wells)

The LTW groundwater wells sampled are shown on Figure 3 and Figure 4. Wells were sampled using low-flow sampling methods described in Section 5.1.3.

5.2.4 Excess River Water Sampling

The Site draws water from the Cape Fear River for on-Site purposes (e.g., non-contact cooling water). Not all water drawn from the Cape Fear River is used by the Site. This unused water is released to the Site Drainage network where it then flows back to the Cape Fear River. The water sampled at the point where the drawn Cape Fear River

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[4] Precipitation data used in this report are from the USGS W.O. Huske station at the W.O. Huske Dam (Figure 1 and 2) located 0.5-miles from the river-Site boundary.

water is released to the Site drainage network (Figure 4) is referred to as the Excess River Water sample. This water represents Cape Fear River Water used at Site before it has come in-contact with Site equipment or the Site drainage network.

A composite Excess River Water sample was collected in five equal volume samples (500 mL each) at 8:10 AM, 9:51 AM, 12:02 PM, 1:56 PM, and 4:04 PM on 9 May 2018. Samples were collected by placing an HDPE bottle under the pipe discharging the Excess River Water then compositing the samples in a decontaminated stainless-steel pot. The composited water was transferred into sample bottles.

5.2.5 Outfall 002 Sampling

A one-day composite sample was collected from Outfall 002 using a Hach SD900 composite sampler. The composite sampler collected water continuously at constant flow rate from Outfall 002 into an HDPE water collection chamber. A portion of this water was transferred from the composite sampler collection chamber into two, 250 mL HDPE sampling bottles per analysis method. The sample compositing interval was from 8:42 AM on 8 May 2018 to 7:00 AM on 9 May 2018.

5.2.6 Nearby Tributaries Sampling

Nearby tributary surface water samples were collected from the middle of each tributary channel using the methods described in Section 5.1.2. Samples were collected at locations shown on Figure 3 and Figure 4 and listed below:

- SW-WC-03 for Willis Creek;
- SW-GB-02 for Georgia Branch Creek; and
- SW-002OLD-01, near the discharge point of the Old Outfall channel to the Cape Fear River.

5.2.7 Nearby Tributaries Flow Measurements

Nearby tributary volumetric water flow rates were calculated for each tributary using tributary flow rate and tributary cross-sectional area measurements. Measurements were taken at Willis Creek (SW-WC-04), Georgia Branch Creek (SW-GB-04), and the Old Outfall Channel (SW-002OLD-01) on 9 May 2018 at locations shown on Figure 3 and Figure 4. All measurements were performed where the tributary passed through a culvert. Specific measurements made were:

a) point velocity measurements made using a Marsh McBirney Flow Mate Model 2000 portable flow meter; and

b) the cross-sectional area of the stream measured using a survey tape.

Volumetric Discharge Calculations

Each tributary's discharge was calculated using the Mean Section Method (Rantz, 1982). In this method, the tributary cross-section is divided into cells by the number of measurement points. Discharge values were calculated for each cell and summed to obtain the total stream discharge. The discharge, Q (cubic feet per second; ft^3/s), is calculated by multiplying the area between two vertical measurement points, A_i (square feet; ft^2) by the average stream velocity, $\bar{v}$ (feet per second; ft/s) as shown below:

$$Q = \sum A_i \bar{v} \qquad \textbf{Equation 1}$$

$$Q = \sum A_i \left(\frac{v_i + v_{i+1}}{2}\right) \qquad \textbf{Equation 2}$$

The calculations assume a trapezoidal shape area for each cell. The only exception to this are the edge cells in the Old Outfall channel since the flow gauging was performed at a culvert where the cross-section is circular. In this instance, the area of the edge cells were calculated as triangles rather than trapezoids. Using the depth measurements of the water surface and the tributary bottom from the reference measuring point above at the top of the culvert, the water column depth, d_i (feet; ft), was calculated. The discharge was then calculated using the water column depths and the width of the cell, Δx (ft):

$$Q = \sum \frac{\Delta x(d_i + d_{i+1})}{2} \left(\frac{v_i + v_{i+1}}{2}\right) \qquad \textbf{Equation 3}$$

Appendix F provides the tables presenting these calculations, a conceptual schematic of how flow was gauged, and photographs of the three flow gauging locations.

5.2.8 QA/QC samples

The following six QA/QC samples were collected during the May 2018 Program:

- 2 equipment blanks;
- 1 field blank;
- 2 field duplicates from Cape Fear River (CFR-04 East and CFR-07 West); and
- 1 field duplicate from Willis Creek.

5.3 June 2018 Regional Program

The June 2018 Regional Program was completed by Parsons according to the *Addendum to Additional Cape Fear River Surface Water Sampling Plan* (Geosyntec, 2018b), provided in Appendix D. Sampling locations are shown on Figure 6, and locations are listed in Table 3 along with analytical methods. The compounds evaluated by this program are listed in Table 1. Samples were collected at following locations as part of the June 2018 Program:

- 1 surface water sampling location from the Deep River;
- 1 surface water sampling location from the Haw River;
- 1 surface water sampling location from the Little River;
- 16 surface water sampling locations from the Cape Fear River; and
- 5 QA/QC samples.

The following sub-sections describe sample timing, sample locations and collection methods, sampling details for each portion of the program and QA/QC samples.

5.3.1 Timing and Precipitation

The Regional Program sampling occurred on 5, 6, and 8 June 2018. There was no rainfall measured at W.O. Huske Dam near the Site over the sampling period. The last recorded rainfall prior to the sampling event was 0.13-inches of precipitation on 3 June 2018. The cumulative rainfall over the preceding 5-day period at the W.O. Huske Dam near the Site was 0.13-inches of precipitation[5].

5.3.2 Sample Locations and Collection Methods

The sampling team accessed sampling locations from either a boat, shore or a bridge. Samples were collected from a boat unless a boat launch point was not available, and/or the location was obstructed by rapids. Samples were collected using either peristaltic pump or an HDPE groundwater well sampling bailer. The sample location and collection method used is shown in Table 3 for each location.

[5] Precipitation data used in this report are from the USGS W.O. Huske station at the W.O. Huske Dam (Figure 1 and 2) located 0.5-miles from the southerly river-Site boundary.

All samples collected from a boat used a peristaltic pump sample collection method. Samples were collected at half the total water depth at the thalweg of the rivers (Figure 5). Samples collected from shore using the peristaltic pump method were collected by throwing the dedicated tubing for each location that was attached to an anchor into the flowing section of the river channel. The samples were then collected according to methods described in Section 5.1.2.

Two samples were collected using new, dedicated HDPE groundwater sample collection bailers: i) the Little River sample which was collected from a bridge; and ii) the sample at River Mile 44 which was collected from shore. The bailers were lowered from the bridge and thrown from shore into the river. This water was then transferred into sample bottles. The process was repeated until enough water had been collected to completely fill all sample bottles. Field parameters were recorded for each sampling location.

5.3.3 Deep River and Haw River Sampling

A sample was collected from each of the Deep and Haw Rivers from a boat on 5 June 2018 using a peristaltic pump. Each sample was collected 500 feet upstream of the confluence in the respective source rivers.

5.3.4 Little River Sampling

One sample was collected from the Little River using a new, dedicated HDPE bailer sampler on 8 June 2018 from the bridge crossing the Little River on NC-217 (Mill Rd.) just north of Linden, North Carolina. The sampling location was 2.8 miles upstream in the Little River from where it meets the Cape Fear River.

5.3.5 Cape Fear River Miles 12, 20, 28 and 44 Sampling

Samples at Cape Fear River Miles 12, 20, 28 and 44 were collected on 8 June 2018 from shore due to boat access issues and the presence of rapids in the Cape Fear River. Location River Mile 36, specified in the Addendum Workplan, was not sampled because it was not accessible; there were no publicly available access points in this reach of the Cape Fear River, and the Cape Fear River was impassable from boat launch points due to rapids. Samples at River Miles 12, 20 and 28 were sampled using a peristaltic pump, and River Mile 44 was sampled using an HDPE groundwater well bailer sampler.

5.3.6 Cape Fear River Miles 4 and 52 to 132 Sampling

Samples at River Miles 4, 52 to 60 were collected from a boat on 5 June 2018. Samples at River Miles 68 to 132 were collected from a boat on 6 June 2018. All samples were collected using a peristaltic pump.

5.3.7 QA/QC Samples

The following five QA/QC samples were collected during the June 2018 Regional Program:

- 4 equipment blanks; and
- 1 field duplicate from River Mile 52.

5.4 Data Quality & Reporting

The following section describes the data quality and reporting activities conducted for data reported from the May 2018 Local Program and the June 2018 Regional Program and includes a description of the QA/QC procedures conducted for the sampling activities and a description of the data management and reporting.

Quality Assurance/Quality Control
Field sampling and laboratory analyses were performed in accordance with the Work Plans prepared by Geosyntec and Parsons discussed in Section 4 and 5.1. The May 2018 Local Program and June 2018 Regional Program samples were collected by the field team and shipped to TestAmerica Denver and Sacramento. Laboratory analyses were executed within the guidelines specified by the laboratory SOPs including the collection frequency of field duplicates, matrix spikes (MS) / matrix spike duplicates (MSD), trip blanks and equipment blanks. TestAmerica analytical reports are included in Appendix C.

All data were reviewed using the Data Verification Module (DVM) within the Locus™ Environmental Information Management (EIM) system, which is a commercial software program used to verify that data quality objectives (DQOs) are met. The DVM is a review process used to assist with the determination of data usability. Following the DVM process, a manual review is performed.

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

- Hold time criteria;
- Laboratory blank contamination;

- Completeness of QA/QC samples;
- Matrix spikes (MS)/matrix spike duplicates (MSD) recoveries and the relative percent differences (RPDs) between these spikes;
- Laboratory control sample (LCS)/control sample duplicate (LCSD) recoveries and the RPD between these spikes;
- Surrogate spike recoveries for organic analyses; and
- RPD between field duplicate sample pairs.

The DVM review process was followed by a manual review of the instrument-related QC results for calibration standards, blanks, and recoveries to evaluate the overall review process to be consistent with Stage 2b of the U.S. EPA Guidance for Labelling Externally Validated Laboratory Analytical Data for Superfund Use (EPA-540-R-08-005 2009).

The data review process (DVM plus manual review) applied the following data evaluation qualifiers to analysis results, as warranted:

- U – Not detected, associated value is the reporting limit (RL). The PQL is used as the RL in data presented in this report.
- J – Analyte present. Reported value may not be accurate or precise; and
- J‡ – Analyte present at a concentration below the reported Table 3 SOP statistical MDL (method detection limit) and an instrumentation signal to noise ratio of 3:1.

The DVM and the manual review are combined in a data review narrative report for each set of sample results. This narrative, summarizing which samples were qualified (if any), the specific reasons for the qualification, and any potential bias in reported results, is entered into the EIM system.

The data review process described above was performed for all of the 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.

Data Management & 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 is produced by AECOM summarize the findings of the DVM and review process.

Laboratory analytical data were compiled by Geosyntec into a relational database management system using Microsoft© Access™. Analytical data uploaded into the database were verified using an automated routine set up in Microsoft© Access™ that confirms data completeness and accuracy with respect to the EIM uploads.

6 RESULTS

This section presents the results of data collection activities, including flow data from nearby tributaries and the Cape Fear River (Section 6.1), data quality assessments for the May 2018 Local and June 2018 Regional Programs (Section 6.2 and 6.33, respectively) and the PFAS results for the Local and Regional Programs (Sections 6.4 and 6.5, respectively). Interpretation of the results follows Section 7.

6.1 Nearby Tributaries and Cape Fear River Flow Data

Volumetric water flowrate calculations for nearby tributaries Willis Creek, Georgia Branch Creek and the Old Outfall channel are presented in Appendix F summarized in the inset table below for the three programs.

Water Body	Programs & Flow Rates (cfs)		
	Sept. 2017	May 2018	June 2018
Willis Creek	5.93	4.05	--
Old Outfall Channel	0.95	1.12	--
Georgia Branch Creek	0.32	0.32	--
Cape Fear River at W.O. Huske Dam	787 - 859	2,060 - 3,090	768 - 2,490

6.1.1 Regional Program Cape Fear River Travel Times

Travel times from the start of the Cape Fear River to Kings Bluff Intake Canal during for the June 2018 Regional Program were calculated to be between 10 and 20 days, which is longer than the 4-day duration of the June 2018 Regional Program. This estimate is supported by Cape Fear River flow velocity measurements reported in a USGS study that ranged from 8 to 16 miles/day between 2008 to 2010 (Weaver and McSwain, 2013). This corresponds to travel times in the range of 8 to 16 days from the start of the Cape Fear River to River Mile 132.

6.2 May 2018 Local Program Data Validation and Data Quality

The data collected during the May 2018 sampling event were considered usable. The whitebooks (laboratory reports and data verification; see Section 5.4) are documented in Appendix C. The following qualifiers were applied:

- For fifteen (15) sample locations along the Cape Fear River, Georgia Branch Creek and Willis Creek (FAY-D-CFR-05-C-.3-050918, FAY-D-CFR-06-C-.3-

050918, FAY-D-CFR-07-B-.3-051018, FAY-D-CFR-07-B-5-051018, FAY-D-CFR-07-C-.3-051018, FAY-D-CFR-08-A-.3-051018, FAY-D-CFR-08-B-.3-051018, FAY-D-CFR-08-B-8-051018, FAY-D-CFR-08-C-.3-051018, FAY-D-CFR-09-A-.3-051018, FAY-D-CFR-09-B-.3-051018, FAY-D-CFR-09-B-9.5-051018, FAY-D-CFR-09-C-.3-051018, FAY-SW-GEORGIABRANCH-2-051018, and FAY-SW-WC-03-050918) a J‡ qualifier was applied to the results for the detected Table 3 compounds, indicating the results were detected below the reported statistical MDL.

- For two (2) sample locations FAY-D-CFR-07-A-.3-051018, FAY-SW-WC-03-050918 the results were U-qualified at the analyte's reporting limit. Therefore, the F1 qualifier was removed and no further qualification was deemed necessary.

6.3 June 2018 Regional Program Data Validation and Data Quality

The data collected during the June 2018 sampling event were considered usable. The laboratory reports and data verification are documented in Appendix C. The following qualifiers were applied:

- For Eight (8) sample locations along the Cape Fear River, and Little River (CFR-MILE-84-8-060618, CFR-MILE-92-7-060618, CFR-MILE-100-7.5-060618, CFR-MILE-108-9.1-060618, CFR-MILE-116-12.5-060618, CFR-MILE-124-9.5-060618, CFR-MILE-132-9-060618, and LITTLE-RIVER-END-3-060818) a J‡ qualifier was applied to the results for the detected Table 3 compounds, indicating the results were detected below the reported statistical MDL.
- For three (3) sample locations DEEP-RIVER-END-7-060518, CFR-MILE-4-6.3-060518, CFR-MILE-52-8.5-060518 the results were U-qualified at the analyte's reporting limit. Therefore, the F1 qualifier was removed and no further qualification was deemed necessary.

6.4 September 2017 and May 2018 Local Program Results

This sub-section describes the results of the September 2017 and May 2018 Local Programs. Measured PFAS concentrations are provided in Table 4, the number of detections for individual compounds in each program are summarized in Table 5, and the data for both Local Program events are plotted in Figure 7 through Figure 11. Regional Program results follow in Section 6.5.

Figure 7 through Figure 11 plot measured concentrations as a function of distance along the Cape Fear River for three PFAS groupings: (a) PFCAs and PFSAs, (b) HPFO-DA and (c) PFECAs and PFESAs. Each figure contains two plots: 1) a top plot presenting data from the four points in each sampling transect, and 2) a bottom plot presenting an average concentration of Cape Fear River water concentrations from the four points in each transect and data from the tributaries, Outfall 002, and the LTW Wells. The y-axes on each plot display the detected concentrations in ng/L, which are shown in a linear scale for the top plots to show detail, and a logarithmic scale for the bottom plots to accommodate the range in concentrations detected. The x-axes of each plot display the location of each sample measured as a linear distance from the start of the Cape Fear River. Vertical lines indicate where the Site boundary meets the Cape Fear River at its upstream (River Mile 75.3) and downstream (River Mile 76.4) limits, and where the W.O. Huske Dam is located (River Mile 76.6).

6.4.1 PFCA and PFSA Local Programs Results

PFCAs and PFSAs were detected at similar concentrations upstream and downstream of the Site in the September 2017 and May 2018 Programs as presented in Table 4 and summarized in the inset table below. PFCA and PFSA concentrations were detected at similar concentrations in Excess River Water (cooling water drawn from the River) and Outfall 002 (discharge of cooling water to the River) samples for the May 2018 Program. Excess River Water samples was not collected in the September 2017 program; therefore, the same comparison could not be made. PFCAs and PFSAs were also detected in the LTW wells and nearby tributaries of the Cape Fear River (Table 4, Table 5).

Grouping	2017 Average (ng/L)		2018 Average (ng/L)		2018 Data (ng/L)	
	Upstream	Downstream	Upstream	Downstream	Outfall 002	Excess River Water
PFCA	202	189	94	90	88	89
PFSA	33	31	24	23	23	20

Upstream – transects CFR-01 to CFR-03; i.e., River Miles 66 to 75.3
Downstream – transect CFR-09; i.e., River Mile 80.6

Detected PFCA and PFSA concentration were lower in May 2018 than in September 2017. The May 2018 concentrations of PFCA and PFSA at River Mile 80.6 (i.e., sampling location CFR-09) were 90 and 23 ng/L, respectively compared to the September 2017 concentrations of 189 and 31 ng/L, respectively; a 1.5 to 2 times difference between the two programs. The flow rate in the River was 787 to 859 cfs in September 2017 and 2,060 to 3,090 cfs in May 2018; a 2 to 3 times difference between the two programs. Between September and May, flow volumes increased and concentrations decreased by partially off-setting amounts.

The most commonly detected PFCAs in both the September 2017 and May 2018 Local Programs were the 4 to 8 carbon chain long PFCAs (see Table 5). In the September 2017 Program, PFOA (8-carbon) was detected in all 43 samples analyzed. In the May 2018 Program, the 4 to 7 carbon chain long PFCAs (perfluorobutanoic acid [PFBA] to perfluoroheptanoic acid [PFHpA]) were detected in all 50 samples analyzed. The most commonly detected PFSA in both the September 2017 and May 2018 Local Programs was PFOS, which was detected in 98% (42 of 43) samples in the September 2017 Program and in 88% (44 of 50) samples in the May 2018 Program.

6.4.2 HFPO-DA Local Programs Results

HFPO-DA was not detected in samples located upstream of the Site but was frequently detected in samples downstream of the Site in the September 2017 and May 2018 Local Programs as shown in Table 4 and summarized in the inset table below. HFPO-DA detections began adjacent to the Site at CFR-05 (River Mile 76) in the September 2017 Program and CFR-04 (River Mile 75.7) in the May 2018 Program. In both programs, the first detection occurred at a West sampling location, the location closest to the shore where the Site is located. HFPO-DA concentrations approach uniform values across the transect in the most downstream sampling transect of the Local Program (CFR-09 at River Mile 80.6), indicating the Cape Fear River passing the Site becomes well-mixed by this point.

Grouping	2017 Average (ng/L)		2018 Average (ng/L)		2018 Data (ng/L)	
	Upstream	Downstream	Upstream	Downstream	Excess River Water	Outfall 002
HFPO-DA	ND (10U)*	39	ND (4U)*	18	12	45

*ND – not detected above the reporting limit, 10 and 4 ng/L
Upstream – transects CFR-01 to CFR-03; i.e., River Miles 66 to 75.3
Downstream – transect CFR-09; i.e., River Mile 80.6

Site water drawn from the river (i.e., the Excess River Water sample), had an HFPO-DA detection of 12 ng/L. Site water released back to the river at Outfall 002 had an HFPO-DA concentration of 45 ng/L. HFPO-DA was also detected in the nearby tributaries and LTW wells.

HFPO-DA concentrations were lower in May 2018 than in September 2017. The May 2018 concentration at River Mile 80.6 (i.e., CFR-09) was 18 ng/L compared to the September 2017 concentration of 39 ng/L, a 2.1 times difference between the two programs. As described in the previous subsection, flow volumes increased and concentrations decreased between September 2017 and May 2018 by partially off-setting amounts.

The HFPO-DA detection frequency for samples collected upstream of the Site was 0% (0 of 12 samples) for both programs. Adjacent to the Site, the detection frequency was 31% and 38% for the 2017 and 2018 Local Programs, respectively (4 and 5 detections in 13 samples). Downstream of the Site, the detection frequency was 100% and 92% for the 2017 and 2018 programs, respectively (12 of 12 and 12 of 13 samples). HFPO-DA was also detected in Outfall 002, all tributaries and the LTW Wells.

6.4.3 PFECA and PFESA Local Program Results

For the Local Programs, PFECAs and PFESAs were only analyzed in the May 2018 Program. Data were reported to a signal-to-noise ratio of 3:1 and therefore the results are not accurate and may have significant variability and bias. See Sections 3.3, 5.4, 6.2, and 6.3 for more detail.

PFECAs and PFESAs were not detected in samples located upstream of the Site but were frequently detected downstream of the Site as shown in Table 4 and summarized in the inset table below. Detections began at CFR-05 (i.e., River Mile 76) at a West sampling location, closest to the shore where the Site is located. PFESA compounds were only detected at CFR-05 West and CFR-06 West and were not detected in all other samples. PFECA concentrations started to approach uniform values across the transect in the most downstream sampling transect (CFR-09 at River Mile 80.6).

Grouping	2018 Average (ng/L)		2018 Data (ng/L)	
	Upstream	Downstream	Outfall 002	Excess River Water
PFECA	ND*	78J‡	ND*	507
PFESA	ND*	ND*	ND*	44J‡

*ND – PFECAs/PFESA not detected above signal to noise ratio of 3:1
Upstream – transects CFR-01 to CFR-03; i.e., River Miles 66 to 75.3
Downstream – transect CFR-09; i.e., River Mile 80.6

In the May 2018 Local Program, the Excess River Water samples contained no detectable PFECAs and PFESAs, although both were detected in the Outfall 002 sample at 507 and 44J‡ ng/L respectively. PFECAs and PFESAs were also detected in the nearby tributaries and LTW wells.

Perfluoro(3,5-dioxahexanoic) acid (PFO2HxA) was the most commonly detected PFECA with a detection frequency of 50% (25 of 50 samples) followed by PFMOAA at 40% (20 of 50 samples). The most commonly detected PFESA was PFESA BP 2 with a detection frequency of 26% (13 of 50 samples).

For samples collected upstream of the Site, the detection frequency of PFECAs and PFESAs was 0% (0 of 12 samples) and adjacent Site the detection frequency was 15% (2 of 13 samples). Downstream of the Site, the detection frequency was 92% (12 of 13 samples) for PFECAs and 0% for PFESAs (0 of 13 samples). PFECAs and PFESAs were also detected in all Outfall 002, tributaries and the LTW Wells samples. Both PFECAs and PFECAs were not detected in the Excess River Water sample.

6.5 June 2018 Regional Program Results

This sub-section describes the results of the June 2018 Regional Program. Analytical results are provided in Table 4, and the number of detections for individual compound are summarized in Table 5. Figure 12 plots the detected PFAS concentrations along the Cape Fear River on a stacked bar chart. Each color series represents one of the PFAS groupings (PFCAs, PFSAs, HFPO-DA, PFECAs and PFESAs). The y-axis represents concentration in ng/L, and for each sample, the total concentration of all PFAS compounds is represented by the height of all the colored bar sections stacked on top of each other. The x-axis represents the sampling locations in 8-mile intervals ordered sequentially from the start of the Cape Fear River to King Bluff Intake Canal 132 miles downstream. Key locations are annotated on the plot where the Cape Fear River passes through Fayetteville, NC and by the Site. Figure 13 to Figure 15 plots show pie charts overlaid on a map of the Cape Fear River, where the size of each wedge is proportional to the sum of detected concentrations of chemicals within each group, and the radius of the pie is linearly proportional to the total PFAS concentration. Figure 13 shows the entire extent of the sampling program while Figure 14 and Figure 15 provide detailed insets.

6.5.1 PFCA and PFSA Regional Program Results

PFCAs and PFSAs were detected upstream and downstream of the Site and in all other rivers sampled (Deep, Haw and Little Rivers). The highest total PFCA concentrations was in the Haw River sample at 173 ng/L and the highest total PFSA concentration was in the Little River sample at 44 ng/L.

The most commonly detected PFCAs in the June 2018 Regional Program were the 4 to 8 carbon chain long PFCAs; PFBA to PFOA (Table 5). The most commonly detected PFSAs were perfluorohexanesulfanoic acid (PFHxS) and PFOS (Table 5). The PFCAs and PFSAs detection frequency was 100% in the Regional Program (20 of 20 samples).

6.5.2 HFPO-DA Regional Program Results

HFPO-DA was not detected in Cape Fear River samples upstream of the Site or in the Deep, Haw or Little Rivers. HFPO-DA was frequently detected in samples downstream of the Site. The highest measured HFPO-DA concentration (17 ng/L) was in the first sample downstream of the Site at River Mile 84.

The detection frequency upstream of Site was 0% (0 of 10 samples), and 0% in other rivers (0 of 3 samples). Downstream of Site, the detection frequency was 71% (5 of 7 samples). HFPO-DA was not-detected in two of seven samples downstream of Site, which were located toward the downstream extents of the program at River Miles 116 and 132.

6.5.3 PFECA and PFESA Regional Program Results

PFECAs and PFESAs were not detected in Cape Fear River samples upstream of the Site but they were detected in samples downstream of the Site. The highest concentration of total PFECA and PFESAs was 101J‡ ng/L at River Mile 84, the first sample collected downstream of the Site.

The detection frequency of PFESAs and PFECAs upstream of the Site in the Cape Fear River was 0% (0 of 10 samples). The detection frequency of PFECAs and PFESAs downstream of the Site was 100% and 14% respectively (7 and 1 detection in 7 samples). The detection frequency of PFECAs and PFESAs in other rivers was 0% and 33%, respectively (0 and 1 detection in 3 samples); PFESA BP2 was detected in the Little River at 5.8J‡ ng/L. PFO2HxA and PFMOAA were the only detected PFECAs. PFESA BP2 was the only detected PFESA.

7 LOCAL AND REGIONAL RIVER PROGRAM INTERPRETATION

This section presents interpretation from the Local and Regional Programs conducted in 2017 and 2018. A comparison of Regional Program data to CFPUA data follows in Section 8 and then an examination of Cape Fear River PFAS reductions follows in Section 9. The interpretations in this section are detailed in the following sub-sections:

- PFAS Chemical and Spatial Distributions;
- Sources of PFAS Detected at Kings Bluff Intake Canal.

7.1 PFAS Chemical and Spatial Distributions

This sub-section presents interpretations about the chemical and spatial distribution of PFAS in the Cape Fear River:

- PFAS constituents of various groups were detected throughout the entire Cape Fear Watershed, both upstream and downstream of the Site based on investigations performed by EPA and academic researchers (Section 2.4) and data in this report (Table 4, Figure 7, Figure 12, Figure 13).
- PFCAs and PFSAs detected in the Cape Fear River are associated with other sources in the watershed, primarily located upstream of the Site.
    - In the Local Programs, PFCA and PFSA concentrations in Cape Fear River samples do not increase from sample locations upstream to downstream of the Site. The Local programs provide high resolution spatial data (Table 4, Figure 7, Figure 8, Figure 12, Figure 13). Although PFCAs and PFSAs are detected in both groundwater adjacent the river and in the Old Outfall, their contributions did not lead to detectable increases in concentrations in the Cape Fear River.
    - In the Regional Program, PFCAs did increase slightly (from 64.8 ng/L to 69 ng/L) past Site, but were not related to the Site based on the following:

      First, PFCA concentrations increased in the Cape Fear River leading up to the Site (i.e., from 57.9 to 64.8 ng/L between River Miles 68 and 76), suggesting the increases were part of other, more regional inputs to the Cape Fear River.

Second, concentrations of individual PFCA compounds increased past Site by very small amounts (between 0.6 and 1.6 ng/L), which are well within laboratory analytical variability.

Third, increases in PFCA concentrations in the River were not correlated to the distribution of PFCAs present in Site groundwater or in the Old Outfall. Perfluoropentanoic acid (PFPeA) is the PFCA compound with the highest concentration detected in the LTW well and Old Outfall samples from the May 2018 Local Program. PFPeA was detected at 2 to more than 1000 times the concentration of the other PFCAs. But, in the Regional River samples PFPeA concentrations immediately upstream (Mile 76) and downstream (Mile 84) of the Site were identical at 17 ng/L demonstrating no increase in PFCA concentrations in the river related to the Site during the Regional Program.

Location	PFCA Concentration (ng/L)	PFCA Change Between Sample Locations (ng/L)	PFPeA Concentration (ng/L)
River Mile 68 - upstream site	57.9	--	15
River Mile 76 - just upstream Site	64.8	6.9	17
River Mile 84 - downstream Site	69	4.2	17

- o PFSAs in the Regional Program were also not related to the Site. Total PFSA concentrations upstream of the Site (River Mile 76) to downstream of the Site (River Mile 84) decreased from 21 ng/L to 20.1 ng/L.

- HFPO-DA, PFECAs and PFESAs are related to the Site. In the Cape Fear River these compounds are only detected adjacent and downstream of the Site (Table 4, Figure 9, Figure 10, Figure 11, Figure 12, Figure 13).
- Approximately half (68.7 ng/L of 144.7 ng/L) of the sum of all detected PFAS concentrations in the June 2018 Regional Program sample collected at River Mile 132 (i.e., Kings Bluff Intake Canal) were PFCAs and PFSAs from Watershed sources (not Site-related). The other half of the sum of all detected PFAS concentration (76J‡ ng/L) were from two Site-related PFECA compounds PFMOAA and PFO2HxA; HFPO-DA was not detected at River Mile 132. This observation is examined in more detail in Section 7.2.

- More than half of the individual PFAS compounds detected in the Cape Fear River were associated with Watershed sources as summarized below and presented in Table 4:

  May 2018 Local Program
  - 10 compounds were detected associated with Watershed sources;
  - 7 compounds were detected associated with the Site;

Watershed Associated May 2018 Local Program Detected PFAS	Site Associated May 2018 Local Program Detected PFAS
PFBA	HFPO-DA
PFPeA	PFMOAA
PFHxA	PFO2HxA
PFHpA	PFO3OA
PFOA	PMPA
PFNA	PFESA BP 1
PFDA	PFESA BP 2
PFBS	
PFHxS	
PFOS	

  June 2018 Regional Program
  - 10 compounds were detected associated with Watershed sources;
  - 4 compounds were detected associated with the Site;

Watershed Associated June 2018 Regional Program Detected PFAS	Site Associated June 2018 Regional Program Detected PFAS
PFBA	HFPO-DA
PFPeA	PFMOAA
PFHxA	PFO2HxA
PFHpA	PFESA BP 2
PFOA	
PFNA	
PFDA	
PFBS	
PFHxS	
PFOS	

- The Regional Program samples are most representative of water drawn by downstream users, particularly CFPUA, since samples were collected in the Cape Fear River at Kings Bluff Intake Canal. In the Regional Program only 4 of the 14 detected PFAS were associated with the Site. September 2017 Program data are not listed here because PFECAs and PFESAs were not analyzed.
- HFPO-DA remains 2 to 14 times below the North Carolina Department of Health and Human Services' (NCDDHS) interim health goal of 140 ng/L (NCDEQ and NCDDHS, 2018) in all samples collected and analyzed in 2018 by Chemours (Table 4, Figure 10, Figure 12, Figure 13). Further, for all samples collected in June 2018 downstream of the Site HFPO-DA was 8.2 to 14 times below the health goal of 140 ng/L and was non-detect below the PQL of 10 ng/L at two locations.

7.2 Sources of PFAS at Kings Bluff Intake Canal

This sub-section examines the sources and distribution of PFAS at Kings Bluff Intake Canal, the water source for CFPUA and the city of Wilmington, NC. Approximately half the total detected PFAS concentration at Kings Bluff Intake Canal were from Watershed sources and the other half from the Site in the sample collected during the June 2018 Regional Program. The distribution between these two sources is highlighted in Figure 15 and Figure 16. Figure 15 shows on an inset map the PFAS mass distribution pie charts at River Miles 124 and 132 and Figure 16 plots the two pie charts for these River Miles along with contextualizing information. River Mile 132 was selected for these plots because it is at Kings Bluff Intake Canal. River Mile 124, 8 miles upstream of Kings Bluff Intake Canal, was selected because it is the last location where HFPO-DA was detected in the Cape Fear River (HFPO-DA was not detected at River Mile 132). The black outline on each pie chart in Figure 16 identifies the PFAS component associated with the Site; i.e., HFPO-DA, PFECAs and PFESAs. The PFAS concentration associated with Watershed sources and with the Site are then listed below each pie chart. The inset table below also lists these PFAS concentrations showing that approximately half the PFAS detected were from Watershed sources.

Cape Fear River Mile	Total PFAS (ng/L)	From Chemours Site (ng/L)	From Watershed Sources (ng/L)
124	133.9	73J‡	60.9
132	144.7	76J‡	68.7

8 CFPUA CAPE FEAR RIVER PFAS DATA COMPARISON

This section presents a comparison of June 2018 Regional Program PFAS data and CFPUA reported PFAS data from the treatment pilot study. CFPUA commissioned a pilot study to assess treatment technologies for removing PFAS and other emerging impacts to water quality (Black and Veatch, 2018). The pilot study was conducted at CFPUA Sweeney over late 2017 and early 2018. As part of the study Cape Fear River influent water (i.e., raw water) was assessed for PFAS concentrations by GEL Laboratories. These CFPUA data are reproduced here in Table 4 and are plotted alongside June 2018 Regional Program data in Figure 18. The samples were collected and analyzed between November 2017 and March 2018 by GEL Laboratories. These analyses were conducted before GEL Laboratories received Table 3 standards from Chemours in May 2018.

The June 2018 Regional Program data are compared against the CFPUA-GEL Laboratories in Figure 18 since the Regional Program data are most similar to the CFPUA data set. Both sets of analyses have Cape Fear River samples collected at River Mile 132. Interpretation from this comparison include:

- The Regional Program and CFPUA data show good agreement for PFCA, PFSA and HFPO-DA measured concentrations and detections. For both data sets these results were obtained using standard and long-established laboratory methods.
- The Regional Program and CFPUA data sets do not show good agreement for Table 3 SOP compounds (i.e., PFECAs and PFESAs). The range of detected values from the CFPUA data set is significantly larger than that observed in the Regional Program data.
- The CFPUA data set reports more Table 3 SOP compounds (i.e., PFECAs and PFESAs) detected than the Regional Program data set.
- The discrepancies between the two data sets may be associated with potential data quality issues in the CFPUA-GEL Laboratories data. Specifically, Chemours developed and shared Table 3 standards with GEL Labs in May 2018. Therefore, the analyses conducted by GEL Labs on Table 3 compounds prior to May 2018 were not conducted using the standards provided by Chemours. Additionally, to date Chemours has requested but not been provided with Level IV (4) laboratory reports from GEL Laboratories, which would be required to perform a more detailed assessment of data quality, such as assessing whether GEL Labs did have appropriate standards and methods to accurately report Table 3 SOP compound data, or if the data have significant data quality issues.

9 CHEMOURS ACTIONS AND HFPO-DA REDUCTIONS

This section presents Chemours actions and an evaluation of HFPO-DA reductions in the Cape Fear River. Since June 2017, Chemours has and continues to take action to reduce PFAS concentrations in the Cape Fear River. The bar graph in Figure 17 plots the concentration of HFPO-DA in the Cape Fear River at Kings Bluff Intake on 22 June 2017 and the HFPO-DA concentrations at River Miles 124 and 132 on 6 June 2018. These data, also expressed in the inset table below, show a 100 times HFPO-DA concentration reduction in the Cape Fear River at Kings Bluff Intake Canal / River Mile 132 between 2017 and 2018 (1,100 ng/L to 11 and not detected at 10U ng/L).

Location	Date	HFPO-DA (ng/L)	Data Source and Laboratory
CFPUA Sweeney (River Mile 132)	22 June 2017	1,100	NCDEQ; Test America
River Mile 124	6 June 2018	11	Chemours; Test America
River Mile 132	6 June 2018	ND, 10U	Chemours; Test America

The reductions shown above are associated with action taken by Chemours. On 21 June 2017, Chemours diverted process wastewater discharge away from Site Outfall 002 (Chemours, 2017). The sample on 22 June 2017 at CFPUA Sweeney represent pre-diversion Cape Fear River conditions, it takes river water approximately 5 to 10 or more days to reach River Mile 132 at Kings Bluff Intake Canal where CFPUA draws water. The samples in June 2018 represent post-diversion conditions.

Chemours continues to take action towards lowering the near-term and long-term flux and concentrations of PFAS in the Cape Fear River and the environment as summarized in the inset table below:

Abatement Action	Implemented	Underway	In Design
Waste Water Diversion	✓		
Targeted Site Groundwater Extraction	✓	✓	
Cooling Channel Lining		✓	
Sediment Ponds Lining		✓	
Enhanced Site Groundwater Extraction			✓
Old Outfall Water Treatment			✓
Residential Carbon Treatment Systems	✓	✓	
Process Air and Water Emissions Abatement	✓	✓	✓

10 SUMMARY AND NEXT STEPS

Chemours conducted three sampling programs between September 2017 and June 2018 to assess the distribution of PFAS in the Cape Fear River. All three programs showed PFCAs (e.g. PFOA) and PFSAs (e.g. PFOS) were present throughout the Watershed and were not from the Chemours Site. The programs showed HFPO-DA (i.e. GenX), PFECAs and PFESAs were associated with the Site.

Approximately half the detected PFAS concentrations (68.7 of 144.7 ng/L) Kings Bluff Intake Canal (i.e., River Mile 132) were associated with Watershed sources. The other half (76J‡ ng/L) were associated with the Chemours Site.

Chemours has taken action to reduce PFAS in the Cape Fear River. At the time Chemours diverted wastewater on-Site from Outfall 002 on 21 June 2017 HFPO-DA concentrations in water CFPUA collected from the river was 1,100 ng/L. On 6 June 2018, 8-miles upstream from where CFPUA collects river water HFPO-DA was detected at 11 ng/L. At Kings Bluff Intake Canal (River Mile 132), HFPO-DA was not detected (10U ng/L).

Last, measured HFPO-DA concentrations in the Cape Fear River remain below the NCDHHS health goal of 140 ng/L for all Chemours collected samples in 2018.

10.1 <u>Next Steps</u>

Chemours will be performing a fourth Cape Fear River sampling program to evaluate the potential presence of additional PFAS in the Cape Fear River. The analytical list used in the three programs was based on standard PFAS methods and methods developed in partnership with Chemours and commercial laboratories to analyze for compounds known to be associated with the Site or present in the Cape Fear River from other sources. This fourth program will collect samples from selected locations of interest from the first three programs. These samples will be analyzed using a combination of commercial analytical methods and Chemours in-house capabilities to assess for the potential presence of other PFAS. Chemours will submit a workplan to NCDEQ describing this sampling program.

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TABLES

TABLE 1
SAMPLING PROGRAMS ANALYTES, LABORATORIES AND METHODS
Chemours Fayetteville Works, North Carolina

Compound Group	Name	Abbreviation	Carbon Atoms	CAS Number	Laboratory	Method	Sampling Bottles	Programs Analyzed	Reported To[1]
Other	Hexafluoropropylene oxide dimer acid	HFPO-DA	6	2062-98-8	TestAmerica Denver	EPA 8321 Mod	2x250-mL HDPE	All Local & Regional	PQL
Perfluoroalkyl carboxylic acids (PFCAs)	Perfluorobutanoic acid	PFBA	4	375-22-4	TestAmerica Sacramento	EPA 537 PFAS Compounds	2x250-mL HDPE	All Local & Regional	PQL
	Perfluoropentanoic acid	PFPeA	5	2706-90-3					
	Perfluorohexanoic acid	PFHxA	6	307-24-4					
	Perfluoroheptanoic acid	PFHpA	7	375-85-9					
	Perfluorooctanoic acid	PFOA	8	335-67-1					
	Perfluorononanoic acid	PFNA	9	375-95-1					
	Perfluorodecanoic acid	PFDA	10	335-76-2					
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8					
	Perfluorododecanoic acid	PFDoA	12	307-55-1					
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8					
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7					
Perfluoroalkyl sulfonic acids (PFSAs)	Perfluorobutanesulfonic acid	PFBS	4	375-73-5					
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4					
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4					
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8					
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1					
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1					
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3					
Other	N-methyl perfluorooctane sulfonamidoacetic acid	N-MEFOSAA	11	2991-50-6					
	N-ethyl perfluorooctane sulfonamidoacetic acid	N-EtFOSAA	12	2355-31-9					
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4					
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2					
	Perfluorooctanesulfonamide	PFOSA	8	754-91-6					
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4					
Perfluoroalkyl ether carboxylic acids (PFECAs)	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	TestAmerica Sacramento	Table 3 Lab SOP	2x250-mL HDPE	2018 Local & Regional	Signal to Noise Ratio of 3:1
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1					
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2					
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5					
	Perfluoro(3,5,7,9,11-pentaoxatridecanoic) acid	PFO5DA	7	39492-91-6					
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic acid	PMPA	4	13140-29-9					
	2,3,3,3-Tetrafluoro-2-(perfluoroethoxy)propanoic acid	PEPA	5	267239-61-2					
	Perfluoroether alkyl carbonic acid – G	PFECA-G	7	174767-10-3					
Perfluoroalkyl ether sulfonic acids (PFESAs)	Nafion Byproduct #1	PFESA BP 1	7	29311-67-9					
	Nafion Byproduct #2	PFESA BP 2	7	749836-20-2					

Acronyms

HDPE - high density polyethylene
mL - milliliters
PQL - practical quantitation limit
SOP - standard operating procedure
Nafion Byproduct #1: Perfluoro-3,6-dioxa-4-methyl-7-octene-1-sulfonic acid
Nafion Byproduct #2: 2-[1-[difluoro(1,2,2,2-tetrafluoroethoxy)methyl] -1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoro-Ethanesulfanoic acid

Notes

1 - Results from EPA 537 and EPA 8321 were reported to the practical quantitation limit. Results from Table 3 SOP were reported to a signal to noise ratio of 3:1, much lower than the PQL.

TABLE 2
SEPTEMBER 2017 AND MAY 2018 LOCAL PROGRAM LOCATIONS
Chemours Fayetteville Works, North Carolina

SAMPLING LOCATION	LOCATION	COLLECTION DATE		SAMPLE TYPE
		2017	2018	
CFR-01 - West, Center Top, Center Middle, East	Up-River from Site	9/26/2017	5/9/2018	Sample
CFR-02 - West, Center Top, Center Middle, East	Up-River from Site	9/26/2017	5/9/2018	Sample
CFR-03 - West, Center Top, Center Middle, East	River Adjacent Site	9/26/2017	5/9/2018	Sample
CFR-04 - West, Center Top, Center Middle, East	River Adjacent Site	9/26/2017	5/9/2018	Sample
CFR-05 - West, Center Top, Center Middle, East	River Adjacent Site	9/26/2017	5/9/2018	Sample
CFR-06 - West, Center Top, Center Middle, East	River Adjacent Site	9/26/2017	5/9/2018	Sample
CFR-07 - West, Center Top, Center Middle, East	Down-River from Site	9/27/2017[1]	5/10/2018	Sample
CFR-08 - West, Center Top, Center Middle, East	Down-River from Site	9/27/2017	5/10/2018	Sample
CFR-09 - West, Center Top, Center Middle, East	Down-River from Site	9/27/2017	5/10/2018	Sample
CFR-04 - East-Dup	Duplicate River Sample	--	5/9/2018	QA/QC
CFR-04 - Center Middle-Dup	Duplicate River Sample	9/26/2017	--	QA/QC
CFR-07 - West-Dup	Duplicate River Sample	--	5/10/2018	QA/QC
Equipment Blank	River Sampling Equipment Rinsate	--	5/9/2018	QA/QC
Field Blank	Sampling Trip Blank	--	5/9/2018	QA/QC
SW-WC-01	Willis Creek	9/27/2017	--	Sample
SW-WC-02	Willis Creek	9/27/2017	--	Sample
SW-WC-03	Willis Creek Mouth	9/27/2017	5/9/2018	Sample
SW-WC-03	Duplicate Willis Creek Mouth	--	5/9/2018	QA/QC
SW-GB-1	Georgia Branch Creek Mouth	9/27/2017	--	Sample
SW-GB-2	Georgia Branch Creek Mouth	9/27/2017	5/10/2018	Sample
Old Outfall	Old Outfall Mouth	--	5/10/2018	Sample
Outfall 002	Outfall 002	9/11/2017[2]	5/9/2018	Sample
Excess River Water	Site River Intake Water	--	5/9/2018	Sample
LTW-01	On Site Groundwater at River	--	5/9/2018	Sample
LTW-02	On Site Groundwater at River	--	5/9/2018	Sample
LTW-03	On Site Groundwater at River	--	5/9/2018	Sample
LTW-04	On Site Groundwater at River	--	5/10/2018	Sample
LTW-05	On Site Groundwater at River	--	5/10/2018	Sample
LTW-01-Dup	Duplicate Groundwater Sample	--	5/9/2018	QA/QC
Equipment Blank	Groundwater Sampling Equipment Rinsate	--	5/10/2018	QA/QC

Acronyms

-- - not sampled

Dup - duplicate

QA/QC - quality assurance / quality control

Notes

[1] CFR-07 East sample was collected on 9/26/2017.

[2] Outfall 002 sample was collected separate from the 2017 River Sampling Program.

- Each CFR river sampling location represents a transect; each transect consists of 4 locations.

TABLE 3
JUNE 2018 REGIONAL PROGRAM LOCATIONS
Chemours Fayetteville Works, North Carolina

SAMPLING LOCATION	SAMPLER LOCATION & SAMPLE COLLECTION METHOD	SAMPLE COLLECTION DATE	SAMPLE TYPE	METHODS ANALYZED		
				EPA Method 8321	EPA Method 537	Table 3 Lab SOP
Deep River[1]	Boat & Peristaltic Pump	6/5/2018	Sample	Yes	Yes	Yes
Haw River[1]	Boat & Peristaltic Pump	6/5/2018	Sample	Yes	Yes	Yes
Little River	Bridge & Bailer	6/8/2018	Sample	Yes	Yes	Yes
Mile-4	Boat & Peristaltic Pump	6/5/2018	Sample	Yes	Yes	Yes
Mile-12	Shore & Peristaltic Pump	6/8/2018	Sample	Yes	Yes	Yes
Mile-20	Shore & Peristaltic Pump	6/8/2018	Sample	Yes	Yes	Yes
Mile-28	Shore & Peristaltic Pump	6/8/2018	Sample	Yes	Yes	Yes
Mile-44	Shore & Bailer	6/8/2018	Sample	Yes	Yes	Yes
Mile-52	Boat & Peristaltic Pump	6/5/2018	Sample	Yes	Yes	Yes
Mile-60	Boat & Peristaltic Pump	6/5/2018	Sample	Yes	Yes	Yes
Mile-68	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-76	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-84	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-92	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-100	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-108	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-116	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-124	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-132	Boat & Peristaltic Pump	6/6/2018	Sample	Yes	Yes	Yes
Mile-52-Dup	Boat & Peristaltic Pump	6/5/2018	QA/QC	Yes	Yes	Yes
Daily Rinsate	Described in workplan	6/5/2018	QA/QC	Yes	Yes	Yes
Daily Rinsate	Described in workplan	6/6/2018	QA/QC	Yes	Yes	Yes
Daily Rinsate	Described in workplan	6/8/2018	QA/QC	Yes	Yes	Yes
Daily Rinsate	Described in workplan	6/8/2018	QA/QC	Yes	Yes	Yes

Acronyms and notes

[1] Samples were collected 500-feet up-river of where the Deep and Haw Rivers meet to form the Cape Fear River.

Dup - duplicate

QA/QC - quality assurance / quality control

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					CFPUA 2017 & 2018					Chemours Local Program September 2017											
				Sample ID	Filter Influent Flume	TFC Prior UV	TFC Prior UV	Column Influent	Column Influent	Fay-D-CFR-01-A-.3-092617	Fay-D-CFR-01-B-.3-092617	Fay-D-CFR-01-B-8.5-092617	Fay-D-CFR-01-C-.3-092617	Fay-D-CFR-02-A-.3-092617	Fay-D-CFR-02-B-.3-092617	Fay-D-CFR-02-B-6.5-092617	Fay-D-CFR-02-C-.3-092617	Fay-D-CFR-03-A-0.3-092617	Fay-D-CFR-03-B-0.3-092617	Fay-D-CFR-03-B-10.5-092617	Fay-D-CFR-03-C-0.3-092617
				Sample Location	CFPUA	CFPUA	CFPUA	CFPUA	CFPUA	CFR-01 West	CFR-01 Center Top	CFR-01 Center Middle	CFR-01 East	CFR-02 West	CFR-02 Center Top	CFR-02 Center Middle	CFR-02 East	CFR-03 West	CFR-03 Center Top	CFR-03 Center Middle	CFR-03 East
				River Distance (miles)[1,2]	NA	NA	NA	NA	NA	66.0	66.0	66.0	66.0	70.8	70.8	70.8	70.8	75.3	75.3	75.3	75.3
				Sample Matrix	WT	WT	WT	WT	WT	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	11/7/2017	11/7/2017	12/19/2017	1/16/2018	3/13/2018	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017
Compound Group	**Parameter Name**	**Parameter Abbreviation**	**Carbon Atoms**	**CAS Number**	Concentrations (ng/L)					Concentrations (ng/L)											
Perfluoroalkyl carboxylic acid (PFCA) ***EPA 537 Mod***	Perfluorobutanoic acid	PFBA	4	375-22-4	23	24.3	18.9	18	10	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	55.6	58.7	51.7	43	22	59	59	60	58	59	58	56	57	53	51	53	54
	Perfluorohexanoic acid	PFHxA	6	307-24-4	61.5	65.2	51.3	53	29	64	69	68	68	65	64	66	65	61	60	60	60
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	42.6	42.3	33	37	21	47	47	46	48	47	45	45	46	41	42	43	44
	Perfluorooctanoic acid	PFOA	8	335-67-1	23.3	23.7	16.4	16	11	26	25	25	27	27	26	25	25	24	24	24	24
	Perfluorononanoic acid	PFNA	9	375-95-1	5.21	6.52	3.29	3	2.1	6.1	5.8	6.2	6.1	6.2	5.9	5.6	5.8	5.7	5.8	5.8	5.6
	Perfluorodecanoic acid	PFDA	10	335-76-2	4.68	5.91	3.02	2.4	0.684 U	5.1	5.2	4.9	5.2	5	4.6	4.7	4.8	4.7	4.5	4.6	4.2
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	0.631 U	0.871 J	0.579 U	0.638 U	0.638 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	0.631 U	0.738 U	0.579 U	0.579 U	0.579 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	0.631 U	0.738 U	0.579 U	0.702 U	0.702 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	0.631 U	0.738 U	0.579 U	0.702 U	0.702 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) ***EPA 537 Mod***	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	6.31	5.9	6.84	4.9	3.4	5.8	5.7	5.7	5.8	5.9	5.8	5.8	5.6	6.6	5.4	5.6	5.6
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	1.34 J	1.32 J	1.49 J	0.579 U	0.579 U	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	9.19	9.34	11.1	7.8	5.5	8.8	9.3	9.6	9.4	9.2	9.8	9	9.3	9.2	8.8	9.2	9.1
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	0.631 U	0.738 U	0.579 U	0.579 U	0.579 U	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	20.2	21.4	17.6	11	12	18	18	18	18	18	18	18	18	18	17	17	17
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	0.669 U	0.738 U	0.614 U	0.614 U	0.614 U	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	0.631 U	0.738 U	0.579 U	0.579 U	0.579 U	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids ***EPA 537 Mod***	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	1.26 U	1.48 U	1.16 U	1.16 U	1.16 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	1.26 U	1.48 U	1.16 U	1.16 U	1.16 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other ***EPA 537 Mod***	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	0.631 U	0.738 U	0.579 U	0.579 U	0.579 U	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	0.631 U	0.738 U	0.579 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	0.631 U	0.738 U	1.69	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	1.26 U	1.48 U	1.16 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid ***EPA 8321 Mod***	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	28.3	29	29.6	44	20	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Perfluoroalkyl ether carboxylic acids (PFECAs) ***Table 3 SOP***	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	0.442 X	0.792 X	0.332 X	2900 J	890 J	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	23.8 X	88.4 X	19.6 X	98 J	58 J	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	12.1 X	71.7 X	11.7 X	22 J	23 J	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	4.25 X	32.3 X	4.92 X	7.9 J	13 J	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	ND[4]	ND[4]	8.34 X	ND[4]	ND[4]	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	1.74 X	2.13 X	1.28 X	ND[4]	ND[4]	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	ND	ND	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) ***Table 3 SOP***	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	ND[4]	ND[4]	0.514 X	ND[4]	ND[4]	--	--	--	--	--	--	--	--	--	--	--	--
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	4.2 X	22.6 X	6.75 X	20 J	12 J	--	--	--	--	--	--	--	--	--	--	--	--
Totals	Total PFCAs - EPA 537 Mod				216	228	178	172	95	207	211	210	212	209	204	202	204	189	187	190	192
	Total PFSAs - EPA 537 Mod				37	38	37	24	21	33	33	33	33	33	34	33	33	34	31	32	32
	Total all other EPA 537 Mod				ND	ND	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				253	265	216	196	116	240	244	243	246	242	237	235	237	223	219	222	224
	HFPO-DA - EPA 8321 Mod				28	29	30	44	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFECAs - Table 3 SOP				42	195	46	3028	984	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFESAs - Table 3 SOP				4.2	23	7.3	20	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all Table 3 SOP				47	218	53	3048	996	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours Local Program September 2017																
				Sample ID	Fay-D-CFR-04-A-0.3-092617	Fay-D-CFR-04-B-0.3-092617	Fay-D-CFR-04-B-0.3-D-092617	Fay-D-CFR-04-B-10.5-092617	Fay-D-CFR-04-C-0.3-092617	Fay-D-CFR-05-A-0.3-092617	Fay-D-CFR-05-B-0.3-092617	Fay-D-CFR-05-B-8-092617	Fay-D-CFR-05-C-0.3-092617	Fay-D-CFR-06-A-0.3-092617	Fay-D-CFR-06-B-0.3-092617	Fay-D-CFR-06-B-9-092617	Fay-D-CFR-06-C-0.3-092617	Fay-D-CFR-07-A-.3-092717	Fay-D-CFR-07-B-.3-092717	Fay-D-CFR-07-B-4.0-092717	Fay-D-CFR-07-C-.3-092717
				Sample Location	CFR-04 West	CFR-04 Center Top	CFR-04 Center Top	CFR-04 Center Middle	CFR-04 East	CFR-05 West	CFR-05 Center Top	CFR-05 Center Middle	CFR-05 East	CFR-06 West	CFR-06 Center Top	CFR-06 Center Middle	CFR-06 East	CFR-07 West	CFR-07 Center Top	CFR-07 Center Middle	CFR-07 East
				River Distance (miles)[1,2]	75.7	75.7	75.7	75.7	75.7	76.0	76.0	76.0	76.0	76.3	76.3	76.3	76.3	76.8	76.8	76.8	76.8
				Sample Matrix	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/26/2017	9/27/2017	9/27/2017	9/27/2017	9/26/2017
Compound Group	**Parameter Name**	**Parameter Abbreviation**	**Carbon Atoms**	**CAS Number**	Concentrations (ng/L)																
Perfluoroalkyl carboxylic acid (PFCA) ***EPA 537 Mod***	Perfluorobutanoic acid	PFBA	4	375-22-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	54	54	53	51	54	57	52	58	53	53	57	54	52	58	57	56	57
	Perfluorohexanoic acid	PFHxA	6	307-24-4	60	59	62	59	60	61	62	61	58	59	62	59	59	62	63	62	61
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	43	42	41	43	42	43	42	41	42	42	44	44	44	44	43	43	44
	Perfluorooctanoic acid	PFOA	8	335-67-1	24	25	24	25	24	25	24	24	24	24	24	26	23	24	24	25	24
	Perfluorononanoic acid	PFNA	9	375-95-1	5.7	5.4	5.6	6.1	5.6	6	5.7	5.6	5.6	5.3	5.5	5.7	5.4	5.9	5.7	6.6	5.4
	Perfluorodecanoic acid	PFDA	10	335-76-2	4.4	4.6	4.2	4.8	4.6	4.5	4.5	4.8	4.3	4.1	4.3	4.4	4.6	8	3.9	4.6	4.4
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U,*	2 U,*	2 U,*	2.3	2 U,*	2 U	2 U	2 U	2 U	2 U,*	2 U,*	2 U,*	2 U,*	2 U	2 U	2 U	2 U,*
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) ***EPA 537 Mod***	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	5.6	5.3	5.6	5.4	5.4	5.2	5.6	6.3	5.3	5.1	5.3	5.4	5.5	5.6	5.5	5.8	5.7
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	8.9	9.2	8.9	9.1	8.8	8.7	8.8	9	8.8	8.8	9.4	8.8	9	9.1	9.1	9.1	9
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	17	18	17	18	18	17	17	17	17	17	18	18	18	22	17	17	17
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids ***EPA 537 Mod***	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other ***EPA 537 Mod***	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid ***EPA 8321 Mod***	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	10 U	10 U	10 U	10 U	10 U	160	10 U	10 U	10 U	43	43	12	10 U	54	28	27	25
Perfluoroalkyl ether carboxylic acids (PFECAs) ***Table 3 SOP***	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) ***Table 3 SOP***	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Totals	Total PFCAs - EPA 537 Mod				191	190	190	191	190	197	190	194	187	187	197	193	188	202	197	197	196
	Total PFSAs - EPA 537 Mod				32	33	32	33	32	31	31	32	31	31	33	32	33	37	32	32	32
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				223	223	221	224	222	227	222	227	218	218	230	225	221	239	228	229	228
	HFPO-DA - EPA 8321 Mod				ND	ND	ND	ND	ND	160	ND	ND	ND	43	43	12	ND	54	28	27	25
	Total PFECAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFESAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours Local Program September 2017																
Sample ID					Fay-D-CFR-08-A-.3-092717	Fay-D-CFR-08-B-.3-092717	Fay-D-CFR-08-B-5.0-092717	Fay-D-CFR-08-C-.3-092717	Fay-D-CFR-09-A-.3-092717	Fay-D-CFR-09-B-.3-092717	Fay-D-CFR-09-B-7.5-092717	Fay-D-CFR-09-C-.3-092717	Fay-SW-georgiabranch1-092717	Fay-SW-georgiabranch2-092717	Fay-SW-WC-01	Fay-SW-WC-02	Fay-SW-WC-03	GW0817-LTW-01	GW0817-LTW-01-D	GW0817-LTW-02	GW0817-LTW-03
Sample Location					CFR-08 West	CFR-08 Center Top	CFR-08 Center Middle	CFR-08 East	CFR-09 West	CFR-09 Center Top	CFR-09 Center Middle	CFR-09 East	Georgia Branch Creek	Georgia Branch Creek	Willis Creek	Willis Creek	Willis Creek	LTW-01	LTW-01	LTW-02	LTW-03
River Distance (miles)[1,2]					78.2	78.2	78.2	78.2	80.6	80.6	80.6	80.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sample Matrix					SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-CR	SW-CR	SW-CR	SW-CR	SW-CR	GW	GW	GW	GW
Data Type					Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
Sample Date (mm/dd/yyyy)					9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	9/27/2017	8/3/2017	8/3/2017	8/2/2017	8/1/2017
Compound Group	Parameter Name	Parameter Abbreviation	Carbon Atoms	CAS Number	Concentrations (ng/L)																
Perfluoroalkyl carboxylic acid (PFCA) *EPA 537 Mod*	Perfluorobutanoic acid	PFBA	4	375-22-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	55	53	54	56	55	55	53	52	13	11	8.1	8.7	12	290	290	240	730
	Perfluorohexanoic acid	PFHxA	6	307-24-4	58	61	62	61	60	60	61	60	3.4	3.3	2.7	2.7	3.5	32	31	11	14
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	43	42	42	44	42	41	41	42	3.9	2.7	2 U	2 U	2.5	60	60	14	19
	Perfluorooctanoic acid	PFOA	8	335-67-1	24	24	24	25	24	24	24	23	8.8	2.8	2.9	3.5	7.6	85	84	2 U	2 U
	Perfluorononanoic acid	PFNA	9	375-95-1	5.6	5.6	5.8	5.3	5.7	5.8	5.5	5.3	2 U	2 U	2 U	2 U	2 U	4.2	3.7	2 U	2 U
	Perfluorodecanoic acid	PFDA	10	335-76-2	4.3	4.7	4.3	4.9	4.5	4.4	4.3	4.4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U,*	2 U,*	2 U,*	2 U,*	2 U,*	2.1	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) *EPA 537 Mod*	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	5.5	5.5	5.4	5.4	5	5.5	5.4	5.3	2 U	2 U	2.7	2.8	2.7	4.1	4.1	2 U	2 U
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	9.4	8.8	9.2	8.8	8.6	8.9	8.9	8.9	2 U	2 U	2.5	2.4	2.2	14	14	2 U	2 U
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	17	17	17	18	16	17	16	18	7	2 U	3.3	3.2	3.1	30 H	31 H	2 U	2 U
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids *EPA 537 Mod*	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other *EPA 537 Mod*	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid *EPA 8321 Mod*	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	52	24	42	29	39	42	36	40	690	540	230	310	450	32000	32000	9700	11000
Perfluoroalkyl ether carboxylic acids (PFECAs) *Table 3 SOP*	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) *Table 3 SOP*	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Totals	Total PFCAs - EPA 537 Mod				190	190	192	196	191	190	189	187	29	20	14	15	26	473	469	265	763
	Total PFSAs - EPA 537 Mod				32	31	32	32	30	31	30	32	7	ND	9	8	8	48	49	ND	ND
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				222	222	224	228	221	222	219	219	36	20	22	23	34	521	518	265	763
	HFPO-DA - EPA 8321 Mod				52	24	42	29	39	42	36	40	690	540	230	310	450	32000	32000	9700	11000
	Total PFECAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFESAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours September 2017			Chemours Local Program May 2018													
				Sample ID	GW0817-LTW-04	GW0817-LTW-05	002-091117	FAY-D-CFR-01-A-.3-050918	FAY-D-CFR-01-B-.3-050918	FAY-D-CFR-01-B-8.5-050918	FAY-D-CFR-01-C-.3-050918	FAY-D-CFR-02-A-.3-050918	FAY-D-CFR-02-B-.3-050918	FAY-D-CFR-02-B-9-050918	FAY-D-CFR-02-C-.3-050918	FAY-D-CFR-03-A-.3-050918	FAY-D-CFR-03-B-.3-050918	FAY-D-CFR-03-B-10.5-050918	FAY-D-CFR-03-C-.3-050918	FAY-D-CFR-04-A-.3-050918	FAY-D-CFR-04-A-.3-050918-D
				Sample Location	LTW-04	LTW-05	Outfall 002	CFR-01 East	CFR-01 Center Top	CFR-01 Center Middle	CFR-01 West	CFR-02 East	CFR-02 Center Top	CFR-02 Center Middle	CFR-02 West	CFR-03 East	CFR-03 Center Top	CFR-03 Center Middle	CFR-03 West	CFR-04 East	CFR-04 East
				River Distance (miles)[1,2]	NA	NA	NA	66.0	66.0	66.0	66.0	70.8	70.8	70.8	70.8	75.3	75.3	75.3	75.3	75.7	75.7
				Sample Matrix	GW	GW	Other	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	8/3/2017	8/2/2017	9/11/2017	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018
Compound Group	Parameter Name	Parameter Abbreviation	Carbon Atoms	CAS Number	Concentrations (ng/L)			Concentrations (ng/L)													
Perfluoroalkyl carboxylic acid (PFCA) *EPA 537 Mod*	Perfluorobutanoic acid	PFBA	4	375-22-4	--	--	--	11	10	10	10	9.5	10	10	10	9.7	9.7	10	11	10	10
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	1500	3100	--	21	21	21	20	20	20	21	21	21	20	20	21	21	20
	Perfluorohexanoic acid	PFHxA	6	307-24-4	42	170	--	28	27	28	27	26	28	29	25	25	27	27	26	26	28
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	76	660	--	20	19	20	19	20	19	19	21	20	19	18	20	20	20
	Perfluorooctanoic acid	PFOA	8	335-67-1	6.5	3.2	15	12	12	13	12	11	11	12	12	12	12	12	12	12	12
	Perfluorononanoic acid	PFNA	9	375-95-1	2 U	2 U	--	2.3	2.5	2.5	2.5	2.4	2.4	2.6	2.5	2.3	2.2	2.3	2.5	2.3	2.4
	Perfluorodecanoic acid	PFDA	10	335-76-2	2 U	2 U	--	2.3	2.3	2.2	2.4	2	2.3	2	2.1	2.4	2.6	2.4	2.4	2.3	2.6
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) *EPA 537 Mod*	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	2 U	2 U	--	3.7	4	3.9	3.6	3.6	3.3	3.7	3.5	3.4	3.3	3.3	3.4	3.5	3.4
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	2 U	2 U	--	5.3	5.4	5.7	5.4	5.5	5.5	5.6	5.5	5.3	5.6	5.6	5.4	5.6	5.5
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	2 U,H	2 U	12	15	14	15	14	14	14	15	15	15	16	15	15	16	16
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids *EPA 537 Mod*	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other *EPA 537 Mod*	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	--	--	--	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	--	--	--	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid *EPA 8321 Mod*	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	19000	50000 J	64 J	4 U	4 U	4 U	10 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Perfluoroalkyl ether carboxylic acids (PFECAs) *Table 3 SOP*	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	--	--	--	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	--	--	--	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	--	--	--	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	--	--	--	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	--	--	--	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	--	--	--	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	--	--	--	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	--	--	--	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) *Table 3 SOP*	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	--	--	--	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	--	--	--	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U
Totals	Total PFCAs - EPA 537 Mod				1625	3933	15	97	94	97	93	91	93	96	94	92	93	92	95	94	95
	Total PFSAs - EPA 537 Mod				ND	ND	12	24	23	25	23	23	23	24	24	24	25	24	24	25	25
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				1625	3933	27	121	117	121	116	114	116	120	118	116	117	116	119	119	120
	HFPO-DA - EPA 8321 Mod				19000	50000	64	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFECAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFESAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours Local Program May 2018																
				Sample ID	FAY-D-CFR-04-B-.3-050918	FAY-D-CFR-04-B-11.5-050918	FAY-D-CFR-04-C-.3-050918	FAY-D-CFR-05-A-.3-050918	FAY-D-CFR-05-B-.3-050918	FAY-D-CFR-05-B-10.25-050918	FAY-D-CFR-05-C-.3-050918	FAY-D-CFR-06-A-.3-050918	FAY-D-CFR-06-B-.3-050918	FAY-D-CFR-06-B-11-050918	FAY-D-CFR-06-C-.3-050918	FAY-D-CFR-07-A-.3-051018	FAY-D-CFR-07-B-.3-051018	FAY-D-CFR-07-B-5-051018	FAY-D-CFR-07-C-.3-051018	FAY-D-CFR-07-C-.3-051018-D	FAY-D-CFR-08-A-.3-051018
				Sample Location	CFR-04 Center Top	CFR-04 Center Middle	CFR-04 West	CFR-05 East	CFR-05 Center Top	CFR-05 Center Middle	CFR-05 West	CFR-06 East	CFR-06 Center Top	CFR-06 Center Middle	CFR-06 West	CFR-07 East	CFR-07 Center Top	CFR-07 Center Middle	CFR-07 West	CFR-07 West	CFR-08 East
				River Distance (miles)[1,2]	75.7	75.7	75.7	76.0	76.0	76.0	76.0	76.3	76.3	76.3	76.3	76.8	76.8	76.8	76.8	76.8	78.2
				Sample Matrix	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018
Compound Group	**Parameter Name**	**Parameter Abbreviation**	**Carbon Atoms**	**CAS Number**	Concentrations (ng/L)																
Perfluoroalkyl carboxylic acid (PFCA) ***EPA 537 Mod***	Perfluorobutanoic acid	PFBA	4	375-22-4	10	9.8	9.9	9.8	11	9.7	9.7	9.3	9.7	9.7	10	10	10	10	10	9.1	10
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	20	21	21	21	22	20	21	21	21	21	22	21	21	21	22	21	22
	Perfluorohexanoic acid	PFHxA	6	307-24-4	27	27	25	26	30	26	26	27	26	27	27	27	26	27	27	27	27
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	19	20	18	20	21	19	20	19	19	20	19	20	20	19	19	19	19
	Perfluorooctanoic acid	PFOA	8	335-67-1	12	12	12	11	13	11	12	12	11	12	12	12	12	12	11	11	12
	Perfluorononanoic acid	PFNA	9	375-95-1	2.6	2.4	2.5	2.3	2.6	2.3	2.4	2.5	2.4	2.6	2.4	2.4	2.3	2.3	2.4	2.3	2.3
	Perfluorodecanoic acid	PFDA	10	335-76-2	2.3	2.5	2.3	2.1	2.6	2.1	2.3	2.1	2.1	2.4	2.3	2.2	2.5	2.3	2.1	2.1	2.2
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) ***EPA 537 Mod***	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	3.6	3.4	3.3	3.6	3.9	3.7	3.4	3.6	3.5	3.3	3.7	3.6	3.5	3.5	3.7	3.5	3.6
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	5.7	5.8	5.6	5.3	6.1	5.3	5.2	5.2	5	5.4	5.1	5.4	5.4	5.4	5.4	5.4	5.5
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	16	16	16	14	16	15	14	14	15	15	18	15	14	15	15	14	15
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids ***EPA 537 Mod***	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other ***EPA 537 Mod***	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid ***EPA 8321 Mod***	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	4 U	4	4 U	4 U	7.4	4 U	49	4 U	5.5	4 U	35	10 U	11	12	19	19	16
Perfluoroalkyl ether carboxylic acids (PFECAs) ***Table 3 SOP***	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	95 U	95 U	95 U	95 U	95 U	95 U	130 J	95 U	95 U	95 U	160 J	95 U	95 U	12 J‡	67 J‡	65 J‡	95 U
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	92 U	92 U	92 U	92 U	92 U	92 U	72 J‡	92 U	92 U	92 U	56 J‡	92 U	10 J‡	12 J‡	23 J‡	27 J‡	16 J‡
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	88 U	88 U	88 U	88 U	88 U	88 U	25 J‡	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	84 U	97 U	97 U	97 U	97 U	97 U	97 U
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	84 U	84 U	84 U	84 U	84 U	84 U	33 J‡	84 U	84 U	84 U	24 J‡	84 U	6.8 J‡	8.1 J‡	7.7 J‡	5 J‡	84 U
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) ***Table 3 SOP***	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	120 U	120 U	120 U	120 U	120 U	120 U	9.7 J‡	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	95 U	95 U	95 U	95 U	95 U	95 U	2.7 J‡	95 U	95 U	95 U	5.1 J‡	95 U	95 U	95 U	95 U	95 U	95 U
Totals	Total PFCAs - EPA 537 Mod				93	95	91	92	102	90	93	93	91	95	95	95	94	94	94	92	95
	Total PFSAs - EPA 537 Mod				25	25	25	23	26	24	23	23	24	24	27	24	23	24	24	23	24
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				118	120	116	115	128	114	116	116	115	118	122	119	117	118	118	114	119
	HFPO-DA - EPA 8321 Mod				ND	4	ND	ND	7.4	ND	49	ND	5.5	ND	35	ND	11	12	19	19	16
	Total PFECAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	260	ND	ND	ND	240	ND	16.8 J‡	32.1 J‡	97.7 J‡	97 J‡	16 J‡
	Total PFESAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	12.4 J‡	ND	ND	ND	5.1 J‡	ND	ND	ND	ND	ND	ND
	Total all Table 3 SOP				ND	ND	ND	ND	ND	ND	272	ND	ND	ND	245	ND	16.8 J‡	32.1 J‡	97.7 J‡	97 J‡	16 J‡

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours Local Program May 2018																
				Sample ID	FAY-D-CFR-08 B-.3-051018	FAY-D-CFR-08 B-8-051018	FAY-D-CFR-08 C-.3-051018	FAY-D-CFR-09 A-.3-051018	FAY-D-CFR-09 B-.3-051018	FAY-D-CFR-09 B-9.5-051018	FAY-D-CFR-09 C-.3-051018	FAY-D-LTW-01-050918	FAY-D-LTW-01-D-050918	FAY-D-LTW-02-050918	FAY-D-LTW-03-050918	FAY-D-LTW-04-051018	FAY-D-LTW-05-051018	FAY-SW-GEORGIABRANCH-2-051018	FAY-SW-WC-03-050918	FAY-SW-WC-03-050918-D	FAY-SW-OLD002-01-051018
				Sample Location	CFR-08 Center Top	CFR-08 Center Middle	CFR-08 West	CFR-09 East	CFR-09 Center Top	CFR-09 Center Middle	CFR-09 West	LTW-01	LTW-01	LTW-02	LTW-03	LTW-04	LTW-05	Georgia Branch Creek	Willis Creek	Willis Creek	Historic Outfall
				River Distance (miles)[1,2]	78.2	78.2	78.2	80.6	80.6	80.6	80.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Sample Matrix	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	GW	GW	GW	GW	GW	GW	SW-CR	SW-CR	SW-CR	Other
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/9/2018	5/9/2018	5/10/2018	5/10/2018	5/10/2018	5/9/2018	5/9/2018	5/10/2018
Compound Group	Parameter Name	Parameter Abbreviation	Carbon Atoms	CAS Number	Concentrations (ng/L)																
Perfluoroalkyl carboxylic acid (PFCA) *EPA 537 Mod*	Perfluorobutanoic acid	PFBA	4	375-22-4	9.9	10	11	9.6	10	10	9.5	180	180	62	150	590	470	9	8.6	8.4	100
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	22	21	22	20	21	20	20	340	370	250	760	1900	3600	8.5	11	12	220
	Perfluorohexanoic acid	PFHxA	6	307-24-4	27	28	27	25	26	26	26	29	27	8.2	13	51	140	2.8	3	3	20
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	18	19	20	19	18	19	19	52	53	11	17	93	540	2	2.4	2.2	33
	Perfluorooctanoic acid	PFOA	8	335-67-1	12	12	11	11	12	11	12	66	61	2 U	2 U	8.1	2.8	2	8.1	7.2	32
	Perfluorononanoic acid	PFNA	9	375-95-1	2.3	2.5	2.5	2.4	2.4	2.4	2.2	2.5	2.3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	8.5
	Perfluorodecanoic acid	PFDA	10	335-76-2	2.2	2.1	2.3	2.1	2 U	2	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) *EPA 537 Mod*	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	3.4	3.5	3.6	3.4	3.5	3.4	3.4	3.3	3.1	2 U	2 U	2 U	2 U	2 U	2.1	2.1	2 U
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	5.3	5.6	5.4	5.3	5.1	5.2	5	8.7	7.6	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	15	15	15	15	14	15	14	20	18	2 U	2 U	2 U	2 U	2 U	2.3	2 U	2 U
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids *EPA 537 Mod*	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other *EPA 537 Mod*	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid *EPA 8321 Mod*	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	19	26	20	17	20	16	19	30000	26000	9400	7400	21000	10000	520	590	560	8000
Perfluoroalkyl ether carboxylic acids (PFECAs) *Table 3 SOP*	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	97 J	95 U	95 U	72 J‡	67 J‡	95 U	73 J‡	32000	34000	31000	140000	110000	250000	120 J	1900	1900	86000
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	26 J‡	25 J‡	31 J‡	22 J‡	20 J‡	27 J‡	22 J‡	31000	31000	14000	33000	35000	79000	360	730	730	21000
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	88 U	88 U	88 U	88 U	88 U	88 U	88 U	6600	6700	2800	5200	6500	32000	48 J‡	130 J	140	5400
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	97 U	97 U	97 U	97 U	97 U	97 U	97 U	1700	1600	180 J	160 J	760	3000	97 U	17 J‡	97 U	1500
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	110 U	110 U	110 U	110 U	110 U	110 U	110 U	380	310	110 U	110 U	30 J‡	110 U	110 U	110 U	110 U	620
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	96 U	96 U	96 U	96 U	96 U	96 U	96 U	42 J‡	96 U	96 U	96 U	96 U	3.1 J‡	96 U	96 U	96 U	96 U
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	6.5 J‡	6.6 J‡	6.7 J‡	84 U	84 U	84 U	7 J‡	31000	31000	5700	8900	25000	7900	990	930	930	6500
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	100 U	100 U	100 U	100 U	100 U	100 U	100 U	11000	11000	1700	2500	9400 J	650	310	220	220	2000
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) *Table 3 SOP*	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	120 U	120 U	120 U	120 U	120 U	120 U	120 U	40 J‡	120 U	120 U	120 U	18 J‡	120 U	120 U	120 U	120 U	97 J‡
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	95 U	95 U	95 U	95 U	95 U	95 U	95 U	430	390	16 J‡	18 J‡	200	270	19 J‡	12 J‡	13 J	260
Totals	Total PFCAs - EPA 537 Mod				93	95	96	89	89	90	91	670	693	331	940	2642	4753	24	33	33	414
	Total PFSAs - EPA 537 Mod				24	24	24	24	23	24	22	32	29	ND	ND	ND	ND	ND	4.4	2.1	ND
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				117	119	120	113	112	114	113	702	722	331	940	2642	4753	24	38	35	414
	HFPO-DA - EPA 8321 Mod				19	26	20	17	20	16	19	30000	26000	9400	7400	21000	10000	520	590	560	8000
	Total PFECAs - Table 3 SOP				130	31.6 J‡	37.7 J‡	94 J‡	87 J‡	27 J‡	102 J‡	113722	115610	55380	189760	186690	372553	1828	3927	3920	123020
	Total PFESAs - Table 3 SOP				ND	ND	ND	ND	ND	ND	ND	470	390	16 J‡	18 J‡	218	270	19 J‡	12 J‡	13 J‡	357
	Total all Table 3 SOP				130	31.6 J‡	37.7 J‡	94 J‡	87 J‡	27 J‡	102 J‡	114192	116000	55396	189778	186908	372823	1847	3939	3933	123377

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours Local Program May 2018					Chemours Regional Program June 2018											
				Sample ID	FAY-SW-002-1-050918	FAY-D-EB-050918	FAY-D-EB-051018	FAY-D-FB-050918	FAY-D-XRIV-H2O-050918	CFR-MILE-4-6.3-060518	CFR-MILE-12-3-060818	CFR-MILE-20-3-060818	CFR-MILE-28-3-060818	CFR-MILE-44-3-060818	CFR-MILE-52-8.5-060518	CFR-DUP-1-060518	CFR-MILE-60-6.4-060518	CFR-MILE-68-9.1-060618	CFR-MILE-76-9.5-060618	CFR-MILE-84-8-060618	CFR-MILE-92-7-060618
				Sample Location	Outfall 002	Equipment Blank	Equipment Blank	Field Blank	Excess River Water	Mile 4	Mile 12	Mile 20	Mile 28	Mile 44	Mile 52	Mile 52	Mile 60	Mile 68	Mile 76	Mile 84	Mile 92
				River Distance (miles)[1,2]	NA	NA	NA	NA	NA	4	12	20	28	44	52	52	60	68	76	84	92
				Sample Matrix	Other	Other	Other	Other	Other	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	5/9/2018	5/9/2018	5/10/2018	5/9/2018	5/9/2018	6/5/2018	6/8/2018	6/8/2018	6/8/2018	6/8/2018	6/5/2018	6/5/2018	6/5/2018	6/6/2018	6/6/2018	6/6/2018	6/6/2018
Compound Group	Parameter Name	Parameter Abbreviation	Carbon Atoms	CAS Number	Concentrations (ng/L)					Concentrations (ng/L)											
Perfluoroalkyl carboxylic acid (PFCA) *EPA 537 Mod*	Perfluorobutanoic acid	PFBA	4	375-22-4	7.6	2 U	2 U	2 U	6.6	11	11	11	10	10	8.2	8.2	7.9	8.5	8.8	9.4	9.1
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	21	2 U	2 U	2 U	20	24	22	23	22	24	16	15	16	15	17	17	16
	Perfluorohexanoic acid	PFHxA	6	307-24-4	27	2 U	2 U	2 U	27	31	30	28	27	24	18	18	17	17	19	20	18
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	19	2 U	2 U	2 U	18	20	21	18	16	14	12	11	11	10	12	13	11
	Perfluorooctanoic acid	PFOA	8	335-67-1	12	2 U	2 U	2 U	12	12	11	11	11	9.9	7.9	7.8	6.9	7.4	8	9.6	8.6
	Perfluorononanoic acid	PFNA	9	375-95-1	2.1	2 U	2 U	2 U	2.4	2.6	2.2	2.2	2.2	2.3	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanoic acid	PFDA	10	335-76-2	2 U	2 U	2 U	2 U	2.2	2.2	2.2	2.4	2 U	2	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) *EPA 537 Mod*	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	3.4	2 U	2 U	2 U	3.6	3.3	3.1	3.3	3.6	3.7	3.1	2.9	3	3.1	3.1	3.2	3.3
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	4.9	2 U	2 U	2 U	5	4.2	4.4	4.2	3.9	5.6	4.5	4.5	4.9	4.7	4.9	4.9	4.7
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	12	2 U	2 U	2 U	14	16	15	15	13	16	12	12	12	12	13	12	12
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids *EPA 537 Mod*	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other *EPA 537 Mod*	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid *EPA 8321 Mod*	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	45	10 U	10 U	4 U	12	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	17	15
Perfluoroalkyl ether carboxylic acids (PFECAs) *Table 3 SOP*	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	340	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	80 J‡	61 J‡
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	97 J	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	92 U	21 J‡	20 J‡
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	37 J‡	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	22 J‡	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	11 J‡	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) *Table 3 SOP*	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	12 J‡	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	32 J‡	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U	95 U
Totals	Total PFCAs - EPA 537 Mod				89	ND	ND	ND	88	103	99	96	88	86	62	60	59	58	65	69	63
	Total PFSAs - EPA 537 Mod				20	ND	ND	ND	23	24	23	23	21	25	20	19	20	20	21	20	20
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				109	ND	ND	ND	111	126	122	118	109	112	82	79	79	78	86	89	83
	HFPO-DA - EPA 8321 Mod				45	ND	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17	15
	Total PFECAs - Table 3 SOP				507	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	101 J‡	81 J‡
	Total PFESAs - Table 3 SOP				44 J‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all Table 3 SOP				551	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	101 J‡	81 J‡

TABLE 4
Results of Laboratory Analysis of PFAS Concentrations
Chemours Fayetteville Works, North Carolina

Sampling Program					Chemours Regional Program June 2018											
				Sample ID	CFR-MILE-100-7.5-060618	CFR-MILE-108-9.1-060618	CFR-MILE-116-12.5-060618	CFR-MILE-124-9.5-060618	CFR-MILE-132-9-060618	DEEP-RIVER-END-7-060518	HAW-RIVER-END-4-8.4-060518	LITTLE-RIVER-END-3-060818	CFR-DAILY-RINSATE-1-060518	CFR-DAILY-RINSATE-2-060618	CFR-DAILY-RINSATE-3-060818	CFR-DAILY-RINSATE-4-060818
				Sample Location	Mile 100	Mile 108	Mile 116	Mile 124	Mile 132	Deep River	Haw River	Little River	Daily Rinsate	Daily Rinsate	Daily Rinsate	Daily Rinsate
				River Distance (miles)[1,2]	100	108	116	124	132	-0.1	-0.1	35[3]	NA	NA	NA	NA
				Sample Matrix	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	SW-R	Other	Other	Other	Other
				Data Type	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final	Final
				Sample Date (mm/dd/yyyy)	6/6/2018	6/6/2018	6/6/2018	6/6/2018	6/6/2018	6/5/2018	6/5/2018	6/8/2018	6/5/2018	6/6/2018	6/8/2018	6/8/2018
Compound Group	**Parameter Name**	**Parameter Abbreviation**	**Carbon Atoms**	**CAS Number**	Concentrations (ng/L)											
Perfluoroalkyl carboxylic acid (PFCA) *EPA 537 Mod*	Perfluorobutanoic acid	PFBA	4	375-22-4	8.3	7.7	7.6	7.4	7.5	6.6	17	10	2 U	2 U	2 U	2 U
	Perfluoropentanoic acid	PFPeA	5	2706-90-3	16	13	12	11	12	4.2	42	43	2 U	2 U	2 U	2 U
	Perfluorohexanoic acid	PFHxA	6	307-24-4	17	13	13	12	13	4.4	55	8.8	2 U	2 U	2 U	2 U
	Perfluoroheptanoic acid	PFHpA	7	375-85-9	10	8.6	8.1	7.4	8.5	3	33	4.9	2 U	2 U	2 U	2 U
	Perfluorooctanoic acid	PFOA	8	335-67-1	7.3	6.9	6.7	5.8	6.5	3.3	19	5.2	2 U	2 U	2 U	2 U
	Perfluorononanoic acid	PFNA	9	375-95-1	2 U	2 U	2 U	2 U	2 U	2 U	3.4	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanoic acid	PFDA	10	335-76-2	2 U	2 U	2 U	2 U	2 U	2 U	3.6	2 U	2 U	2 U	2 U	2 U
	Perfluoroundecanoic acid	PFUnA	11	2058-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanoic acid	PFDoA	12	307-55-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotridecanoic acid	PFTriA	13	72629-94-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorotetradecanoic acid	PFTeA	14	376-06-7	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorohexadecanoic acid	PFHdA	16	67905-19-5	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluorooctadecanoic acid	PFOd	18	16517-11-6	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl sulfonic acid (PFSA) *EPA 537 Mod*	Perfluorobutanesulfonic acid	PFBS	4	375-73-5	3.1	2.8	2.7	2.5	3.1	2 U	5	6.5	2 U	2 U	2 U	2 U
	Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2.5	2 U	2 U	2 U	2 U
	Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	4.6	4.3	4	3.8	6.1	2	6.7	15	2 U	2 U	2 U	2 U
	Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	11	11	10	11	12	7.3	25	20	2 U	2 U	2 U	2 U
	Perfluorononanesulfonic acid	PFNS	9	68259-12-1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorodecanesulfonic acid	PFDS	10	335-77-3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Perfluorododecanesulfonic acid	PFDoS	12	79780-39-5	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroamide carboxylic and sulfonic acids *EPA 537 Mod*	N-methyl perfluorooctane sulfonamidoacetic acid	NMeFOSAA	11	2355-31-9	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulfonamidoacetic acid	NEtFOSAA	12	2991-50-6	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	N-ethyl perfluorooctane sulphonamidoethanol	NEtPFOSAE	12	1691-99-2	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamidoethanol	NMePFOSAE	11	24448-09-7	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	NMePFOSA	9	31506-32-8	--	--	--	--	--	--	--	--	--	--	--	--
	N-ethyl perfluorooctane sulfonamide	NEtPFOSA	10	4151-50-2	--	--	--	--	--	--	--	--	--	--	--	--
	N-methyl perfluorooctane sulfonamide	N-MeFOSA	9	68555-75-9	--	--	--	--	--	--	--	--	--	--	--	--
Other *EPA 537 Mod*	Perfluorooctane sulfonamide	PFOSA	8	754-91-6	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
	Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	Fluorotelomer sulfonate 10:2	10:2 FTS	12	120226-60-0	--	--	--	--	--	--	--	--	--	--	--	--
	11-chloroeicosafluoro-3-oxanonane-1-sulfonate	F-53B Minor	10	Not Available	--	--	--	--	--	--	--	--	--	--	--	--
	9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	F-53B Major	8	73606-19-6	--	--	--	--	--	--	--	--	--	--	--	--
Dimer acid *EPA 8321 Mod*	Hexafluoropropylene oxide dimer acid	HFPO-DA; GenX	6	2062-98-8	13	10	10 U	11	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Perfluoroalkyl ether carboxylic acids (PFECAs) *Table 3 SOP*	Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	65 J‡	56 J‡	53 J‡	52 J‡	57 J‡	95 U	95 U	95 U	95 U	95 U	95 U	95 U
	Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	17 J‡	15 J‡	16 J‡	10 J‡	19 J‡	92 U	92 U	92 U	92 U	92 U	92 U	92 U
	Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U	88 U
	Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U	97 U
	Perfluoro(3,5,7,9,11-pentaoxadodecanoic) acid	PFO5DA or TAF	7	39492-91-6	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U	110 U
	Perfluoro-3-methoxypropanoic acid	PFMOPrA	4	377-73-1	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoro-4-methoxybutanoic acid	PFMOBA	5	863090-89-5	--	--	--	--	--	--	--	--	--	--	--	--
	Perfluoroether alkyl carbonic acid – G	PFECA G	7	174767-10-3	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U	96 U
	2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic	PMPA	4	13140-29-9	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U	84 U
	4-(2-(phenylsulfonylamino)ethylthio)-2,6-difluorophenoxyacetamide	PEPA	5	267239-61-2	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	Dodecafluoro-3H-4, 8-dioxanonanoate	ADONA	7	958445-44-8	--	--	--	--	--	--	--	--	--	--	--	--
Perfluoroalkyl ether sulfonic acids (PFESAs) *Table 3 SOP*	Nafion byproduct #1	PFESA BP 1	7	29311-67-9	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U	120 U
	Nafion byproduct #2	PFESA BP 2	7	749836-20-2	1.9 J‡	95 U	95 U	95 U	95 U	95 U	95 U	5.8 J‡	95 U	95 U	95 U	95 U
Totals	Total PFCAs - EPA 537 Mod				59	49	47	44	48	22	173	72	ND	ND	ND	ND
	Total PFSAs - EPA 537 Mod				19	18	17	17	21	9	37	44	ND	ND	ND	ND
	Total all other EPA 537 Mod				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total all EPA 537 Mod				77	67	64	61	69	31	210	116	ND	ND	ND	ND
	HFPO-DA - EPA 8321 Mod				13	10	ND	11	ND	ND	ND	ND	ND	ND	ND	ND
	Total PFECAs - Table 3 SOP				82 J‡	71 J‡	69 J‡	62 J‡	76 J‡	ND	ND	ND	ND	ND	ND	ND
	Total PFESAs - Table 3 SOP				1.9 J‡	ND	ND	ND	ND	ND	ND	5.8 J‡	ND	ND	ND	ND
	Total all Table 3 SOP				83.9 J‡	71 J‡	69 J‡	62 J‡	76 J‡	ND	ND	5.8 J‡	ND	ND	ND	ND

Notes:

[1] Start of the Cape Fear River is defined where the Deep and Haw Rivers meet.

[2] Negative distances indicate miles into the Haw River and Deep River.

[3] Sample collected 2.8 miles upstream of the Little and Cape Fear Rivers confluence.

[4] Analysis results were non-detect. Reporting limits were not specified in the laboratory report GEL Laboratories provided CFPUA.

Reported concentration detection.

Qualifiers:

* - Laboratory control sample or control sample duplicate is outside acceptance limits.

‡ - Data are estimated below the MDL. Applied only to Table 3 SOP results.

H - Sample was prepared or analyzed beyond the specified holding time.

J - Estimated concentration.

U - Analyte note detected above reporting limit.

X - Consult case narrative or data summary parge from the CFPUA Pilot Testing Reports.

Acronyms:

-- - compound not analyzed

CAS - Chemical Abstracts Service

CFPUA - Cape Fear Public Utility Authority

CFR - Cape Fear River

GW - groundwater

ID - identifier

MDL - method detection limit

mm/dd/yyyy - month/day/year

NA - not available

ND - non-detect, for these samples no reporting limit was specified

ng/L - nanograms per liter

PFAS - per- and polyfluoroalkyl substances

SW-CR - creek surface water

SW-R - river surface water

TFC - thin film composite

UV - ultraviolet

WT - water treatment plant water

TABLE 5
NUMBER OF DETECTIONS PER COMPOUND PER SAMPLING PROGRAM
Chemours Fayetteville Works, North Carolina

Name	Abbreviation	Carbon Atoms	CAS Number	Local Program September 2017						
				Up-River[2]	Adjacent Site[3]	Diwn-River[4]	Tributaries[5]	Outfall 002	LTW Wells	Program Total[1]
Number of Analyses per Program[1]				**12**	**13**	**12**	**5**	**1**	**NS**	**43**
Perfluoroalkyl carboxylic acids (PFCAs)				**Detections**						
Perfluorobutanoic acid	PFBA	4	375-22-4	NA	NA	NA	NA	NA	NS	NA
Perfluoropentanoic acid	PFPeA	5	2706-90-3	12	13	12	5	1	NS	43
Perfluorohexanoic acid	PFHxA	6	307-24-4	12	13	12	5	1	NS	43
Perfluoroheptanoic acid	PFHpA	7	375-85-9	12	13	12	3	1	NS	41
Perfluorooctanoic acid	PFOA	8	335-67-1	12	13	12	5	1	NS	43
Perfluorononanoic acid	PFNA	9	375-95-1	12	13	12	0	1	NS	38
Perfluorodecanoic acid	PFDA	10	335-76-2	12	13	12	0	0	NS	37
Perfluoroundecanoic acid	PFUnA	11	2058-94-8	0	1	0	0	1	NS	2
Perfluorododecanoic acid	PFDoA	12	307-55-1	0	0	0	0	0	NS	0
Perfluorotridecanoic acid	PFTriA	13	72629-94-8	0	0	0	0	0	NS	0
Perfluorotetradecanoic acid	PFTeA	14	376-06-7	0	0	0	0	0	NS	0
Perfluoroalkyl sulfonic acids (PFSAs)				**Detections**						
Perfluorobutanesulfonic acid	PFBS	4	375-73-5	12	13	12	3	1	NS	41
Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	12	13	12	4	1	NS	42
Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	12	13	12	3	1	NS	41
Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	NA	NA	NA	NA	NA	NS	NA
Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	NA	NA	NA	NA	NA	NS	NA
Perfluorononanesulfonic acid	PFNS	9	68259-12-1	NA	NA	NA	NA	NA	NS	NA
Perfluorodecanesulfonic acid	PFDS	10	335-77-3	NA	NA	NA	NA	NA	NS	NA
Other				**Detections**						
N-methyl perfluorooctane sulfonamidoacetic acid	N-MEFOSAA	11	2991-50-6	0	0	0	0	0	NS	0
N-ethyl perfluorooctane sulfonamidoacetic acid	N-EtFOSAA	12	2355-31-9	0	0	0	0	0	NS	0
Perfluorooctanesulfonamide	PFOSA	8	754-91-6	NA	NA	NA	NA	NA	NS	NA
Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	NA	NA	NA	NA	NA	NS	NA
Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	NA	NA	NA	NA	NA	NS	NA
Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	NA	NA	NA	NA	NA	NS	NA
Hexafluoropropylene oxide dimer acid (HFPO-DA)				**Detections**						
Hexafluoropropylene oxide dimer acid	HFPO-DA	6	2062-98-8	0	4	12	5	1	NS	22
Perfluoroalkyl ether carboxylic acids (PFECAs)				**Detections**						
Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	NA	NA	NA	NA	NA	NS	NA
Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	NA	NA	NA	NA	NA	NS	NA
Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	NA	NA	NA	NA	NA	NS	NA
Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	NA	NA	NA	NA	NA	NS	NA
Perfluoro(3,5,7,9,11-pentaoxatridecanoic) acid	PFO5DA	7	39492-91-6	NA	NA	NA	NA	NA	NS	NA
Perfluoroether alkyl carbonic acid – G	PFECA-G	7	174767-10-3	NA	NA	NA	NA	NA	NS	NA
2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic acid	PMPA	4	13140-29-9	NA	NA	NA	NA	NA	NS	NA
2,3,3,3-Tetrafluoro-2-(perfluoroethoxy)propanoic acid	PEPA	5	267239-61-2	NA	NA	NA	NA	NA	NS	NA
Perfluoroalkyl ether sulfonic acids (PFESAs)				**Detections**						
Nafion Byproduct #1	PFESA BP 1	7	29311-67-9	NA	NA	NA	NA	NA	NS	NA
Nafion Byproduct #2	PFESA BP 2	7	749836-20-2	NA	NA	NA	NA	NA	NS	NA

TABLE 5
NUMBER OF DETECTIONS PER COMPOUND PER SAMPLING PROGRAM
Chemours Fayetteville Works, North Carolina

Name	Abbreviation	Carbon Atoms	CAS Number	Local Program May 2018							
				Up-River[2]	Adjacent Site[3]	Diwn-River[4]	Tribu-taries[5]	Excess R. Water	Outfall 002	LTW Wells	Program Total[1]
Number of Analyses per Program[1]				**12**	**13**	**13**	**4**	**1**	**1**	**6**	**50**
Perfluoroalkyl carboxylic acids (PFCAs)				**Detections**							
Perfluorobutanoic acid	PFBA	4	375-22-4	6	13	13	4	1	1	6	47
Perfluoropentanoic acid	PFPeA	5	2706-90-3	11	13	13	4	1	1	6	52
Perfluorohexanoic acid	PFHxA	6	307-24-4	11	13	13	4	1	1	6	52
Perfluoroheptanoic acid	PFHpA	7	375-85-9	11	13	13	4	1	1	6	52
Perfluorooctanoic acid	PFOA	8	335-67-1	10	13	13	2	1	1	6	49
Perfluorononanoic acid	PFNA	9	375-95-1	7	13	13	2	0	0	6	41
Perfluorodecanoic acid	PFDA	10	335-76-2	6	13	13	0	0	0	5	37
Perfluoroundecanoic acid	PFUnA	11	2058-94-8	0	0	0	0	0	0	0	0
Perfluorododecanoic acid	PFDoA	12	307-55-1	0	0	0	0	0	0	0	0
Perfluorotridecanoic acid	PFTriA	13	72629-94-8	0	0	0	0	0	0	0	0
Perfluorotetradecanoic acid	PFTeA	14	376-06-7	0	0	0	0	0	0	0	0
Perfluoroalkyl sulfonic acids (PFSAs)				**Detections**							
Perfluorobutanesulfonic acid	PFBS	4	375-73-5	7	13	13	2	1	0	6	43
Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	8	13	13	2	0	0	6	43
Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	7	13	13	2	0	0	6	41
Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	0	0	0	0	0	0	0	0
Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	0	0	0	0	0	0	0	0
Perfluorononanesulfonic acid	PFNS	9	68259-12-1	0	0	0	0	0	0	0	0
Perfluorodecanesulfonic acid	PFDS	10	335-77-3	0	0	0	0	0	0	0	0
Other				**Detections**							
N-methyl perfluorooctane sulfonamidoacetic acid	N-MEFOSAA	11	2991-50-6	0	0	0	0	0	0	0	0
N-ethyl perfluorooctane sulfonamidoacetic acid	N-EtFOSAA	12	2355-31-9	0	0	0	0	0	0	0	0
Perfluorooctanesulfonamide	PFOSA	8	754-91-6	0	0	0	0	0	0	0	0
Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	0	0	0	0	0	0	0	0
Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	0	0	0	0	0	0	0	0
Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	0	0	0	0	0	0	0	0
Hexafluoropropylene oxide dimer acid (HFPO-DA)				**Detections**							
Hexafluoropropylene oxide dimer acid	HFPO-DA	6	2062-98-8	6	2	9	4	1	1	6	32
Perfluoroalkyl ether carboxylic acids (PFECAs)				**Detections**							
Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	0	0	6	4	1	1	3	18
Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	0	0	8	4	1	1	6	23
Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	0	0	1	4	1	1	0	10
Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	0	0	0	4	0	1	0	7
Perfluoro(3,5,7,9,11-pentaoxatridecanoic) acid	PFO5DA	7	39492-91-6	0	0	0	2	0	1	0	3
Perfluoroether alkyl carbonic acid – G	PFECA-G	7	174767-10-3	0	0	0	1	0	0	0	2
2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic acid	PMPA	4	13140-29-9	0	0	7	4	1	1	3	19
2,3,3,3-Tetrafluoro-2-(perfluoroethoxy)propanoic acid	PEPA	5	267239-61-2	0	0	0	4	1	1	0	9
Perfluoroalkyl ether sulfonic acids (PFESAs)				**Detections**							
Nafion Byproduct #1	PFESA BP 1	7	29311-67-9	0	0	1	1	0	1	0	3
Nafion Byproduct #2	PFESA BP 2	7	749836-20-2	0	0	2	4	1	1	0	11

TABLE 5
NUMBER OF DETECTIONS PER COMPOUND PER SAMPLING PROGRAM
Chemours Fayetteville Works, North Carolina

Name	Abbreviation	Carbon Atoms	CAS Number	Regional Program June 2018			
				Up-River[2]	Diwn-River[4]	Other Rivers[6]	Program Total[1]
Number of Analyses per Program[1]				**10**	**7**	**3**	**20**
Perfluoroalkyl carboxylic acids (PFCAs)				**Detections**			
Perfluorobutanoic acid	PFBA	4	375-22-4	7	7	3	17
Perfluoropentanoic acid	PFPeA	5	2706-90-3	7	7	3	17
Perfluorohexanoic acid	PFHxA	6	307-24-4	7	7	3	17
Perfluoroheptanoic acid	PFHpA	7	375-85-9	7	7	3	17
Perfluorooctanoic acid	PFOA	8	335-67-1	7	7	3	17
Perfluorononanoic acid	PFNA	9	375-95-1	7	1	0	8
Perfluorodecanoic acid	PFDA	10	335-76-2	4	1	0	5
Perfluoroundecanoic acid	PFUnA	11	2058-94-8	0	0	0	0
Perfluorododecanoic acid	PFDoA	12	307-55-1	0	0	0	0
Perfluorotridecanoic acid	PFTriA	13	72629-94-8	0	0	0	0
Perfluorotetradecanoic acid	PFTeA	14	376-06-7	0	0	0	0
Perfluoroalkyl sulfonic acids (PFSAs)				**Detections**			
Perfluorobutanesulfonic acid	PFBS	4	375-73-5	6	7	3	16
Perfluorooctanesulfonic acid	PFOS	8	1763-23-1	6	7	3	16
Perfluorohexanesulfonic acid	PFHxS	6	355-46-4	6	7	3	16
Perfluoropentanesulfonic acid	PFPeS	5	2706-91-4	0	0	0	0
Perfluoroheptanesulfonic acid	PFHpS	7	375-92-8	0	0	0	0
Perfluorononanesulfonic acid	PFNS	9	68259-12-1	0	0	0	0
Perfluorodecanesulfonic acid	PFDS	10	335-77-3	0	0	0	0
Other				**Detections**			
N-methyl perfluorooctane sulfonamidoacetic acid	N-MEFOSAA	11	2991-50-6	0	0	0	0
N-ethyl perfluorooctane sulfonamidoacetic acid	N-EtFOSAA	12	2355-31-9	0	0	0	0
Perfluorooctanesulfonamide	PFOSA	8	754-91-6	0	0	0	0
Fluorotelomer sulfonate 4:2	4:2 FTS	6	757124-72-4	0	0	0	0
Fluorotelomer sulfonate 6:2	6:2 FTS	8	27619-97-2	0	0	0	0
Fluorotelomer sulfonate 8:2	8:2 FTS	10	39108-34-4	0	0	0	0
Hexafluoropropylene oxide dimer acid (HFPO-DA)				**Detections**			
Hexafluoropropylene oxide dimer acid	HFPO-DA	6	2062-98-8	3	1	3	7
Perfluoroalkyl ether carboxylic acids (PFECAs)				**Detections**			
Perfluoro-1-methoxyacetic acid	PFMOAA	3	674-13-5	2	1	3	6
Perfluoro(3,5-dioxahexanoic) acid	PFO2HxA	4	39492-88-1	2	1	3	6
Perfluoro(3,5,7-trioxaoctanoic) acid	PFO3OA	5	39492-89-2	2	0	0	2
Perfluoro(3,5,7,9-tetraoxadecanoic) acid	PFO4DA	6	39492-90-5	1	0	0	1
Perfluoro(3,5,7,9,11-pentaoxatridecanoic) acid	PFO5DA	7	39492-91-6	1	0	0	1
Perfluoroether alkyl carbonic acid – G	PFECA-G	7	174767-10-3	0	0	0	0
2,3,3,3-Tetrafluoro-2-(trifluoromethoxy)propanoic acid	PMPA	4	13140-29-9	2	0	0	2
2,3,3,3-Tetrafluoro-2-(perfluoroethoxy)propanoic acid	PEPA	5	267239-61-2	2	0	0	2
Perfluoroalkyl ether sulfonic acids (PFESAs)				**Detections**			
Nafion Byproduct #1	PFESA BP 1	7	29311-67-9	2	0	0	2
Nafion Byproduct #2	PFESA BP 2	7	749836-20-2	2	0	1	3

Acronyms

NA - not analyzed

NS - not sampled

Notes

1 - Analyses per program is the count of parent and duplicate samples. Field blank, equipment blank and matrix spike samples are not included in the analyses count.

2 - Up-River in Local Programs are transects CFR-01 to CFR-03. Up-River in Regional program is River Miles 4 to 76.

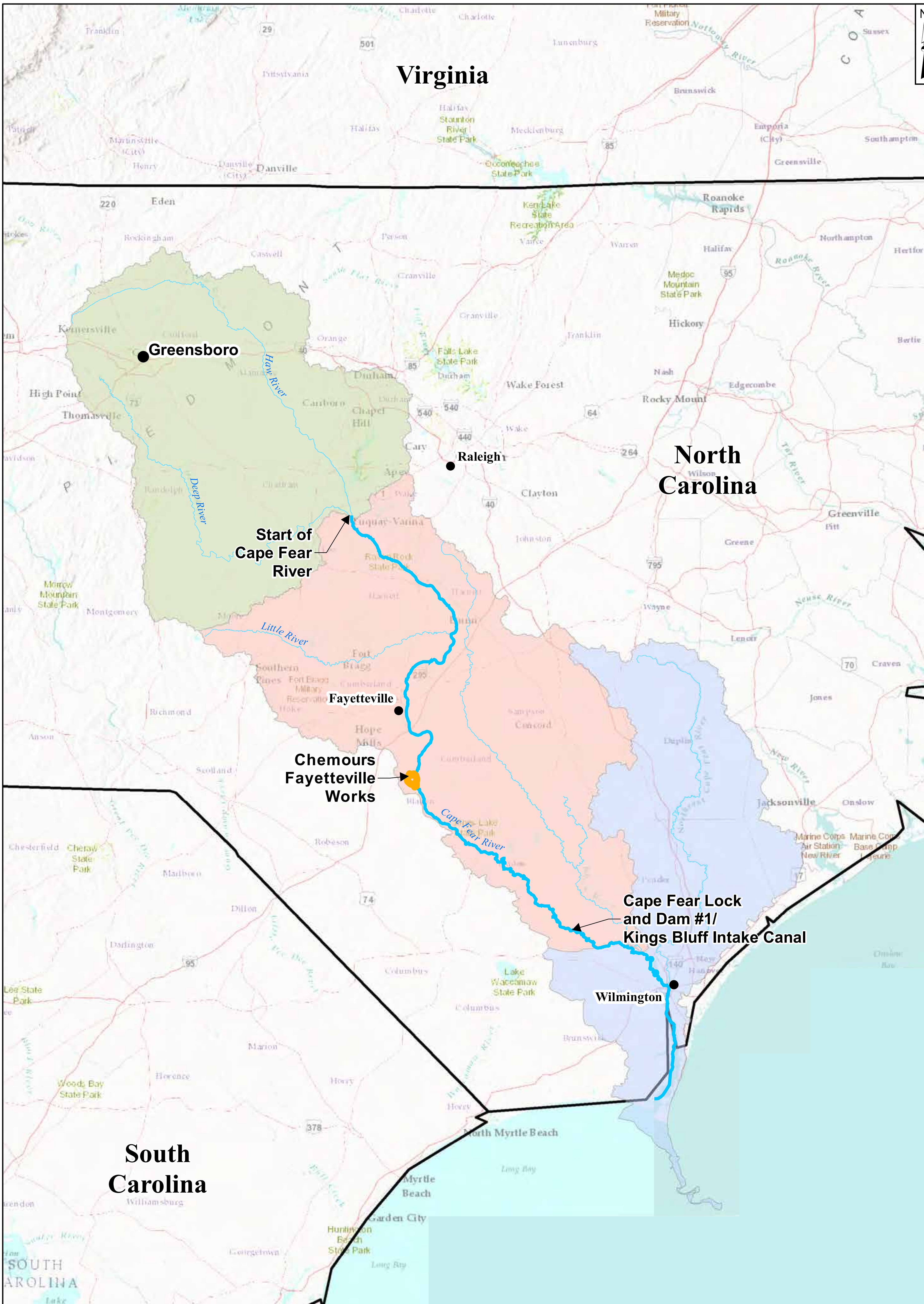
3 - Adjacent Site in Local Programs are transects CFR-04 to CFR-06.

4 - Down-River in Local Programs are transects CFR-07 to CFR-09. Down-River in Regional Program is River Miles 84 to 132.

5 - Tributaries in Local Programs include Willis Creek, Georgia Branch Creek and the Old Outfall.

6 - Other Rivers in the Regional Program include the Deep River, Haw River and Little River, all up-river of the Site.

FIGURES



Legend

- Chemours Fayetteville Works
- Cape Fear River
- Upper Basin
- Middle Basin
- Lower Basin

20 10 0 20 Miles

Cape Fear River and Watershed

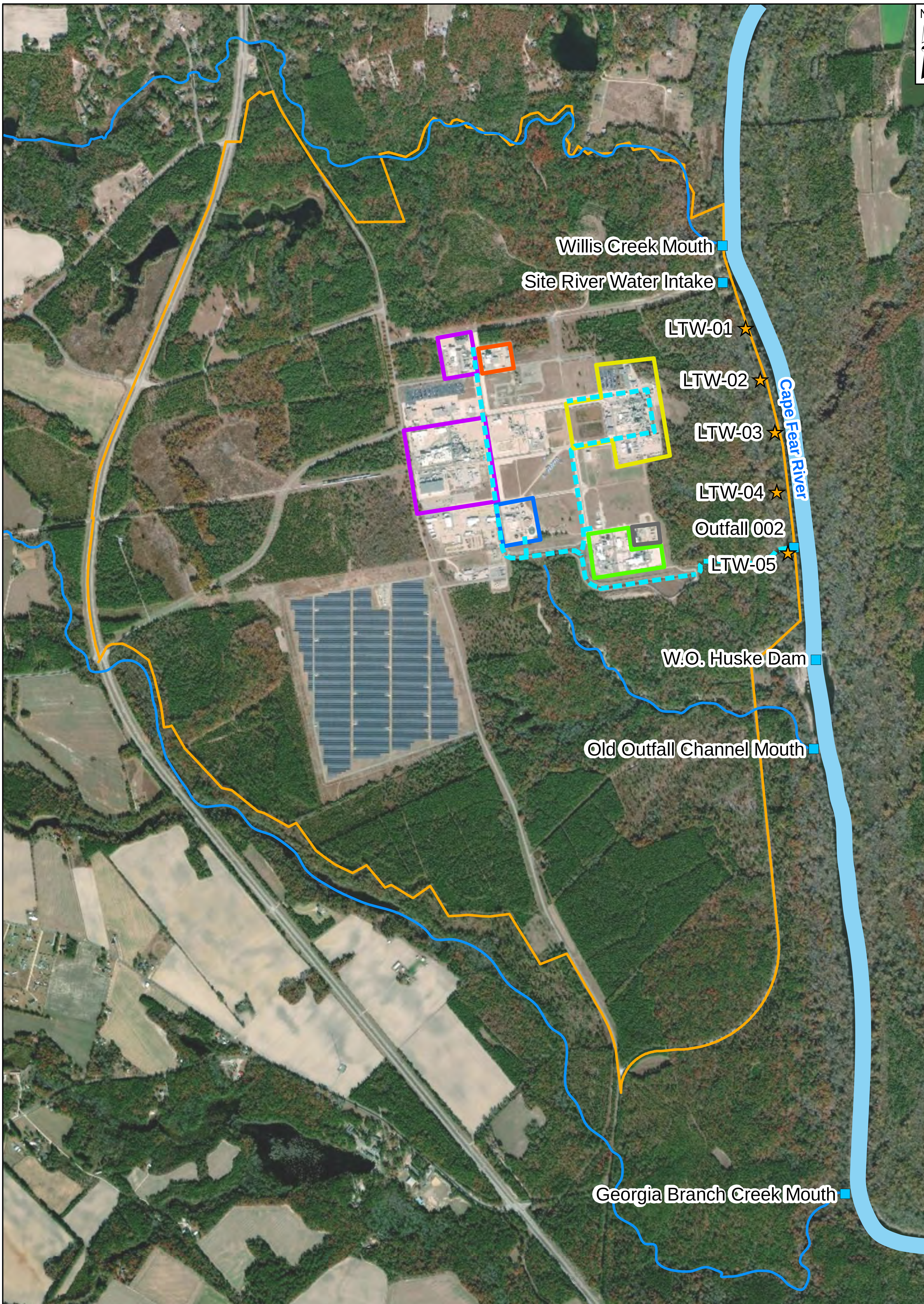
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure 1

Raleigh | September 2018

Notes:
Basemap sources: Esri, Garmin, USGS, NPS (World Terrain Reference); Esri, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community (World Hillshade)



Legend

- LTW - Long Term Wells
- Site Features
- Cape Fear River
- Nearby Tributaries
- Drainage Network
- Site Boundary

Areas at Site

- Chemours Monomers IXM
- Chemours PPA
- Dupont / Dow Leased
- Former Teflon Production
- Kuraray America Leased
- Wastewater Treatment Plant

0.25 0.125 0 0.25 Miles

Chemours Site Features

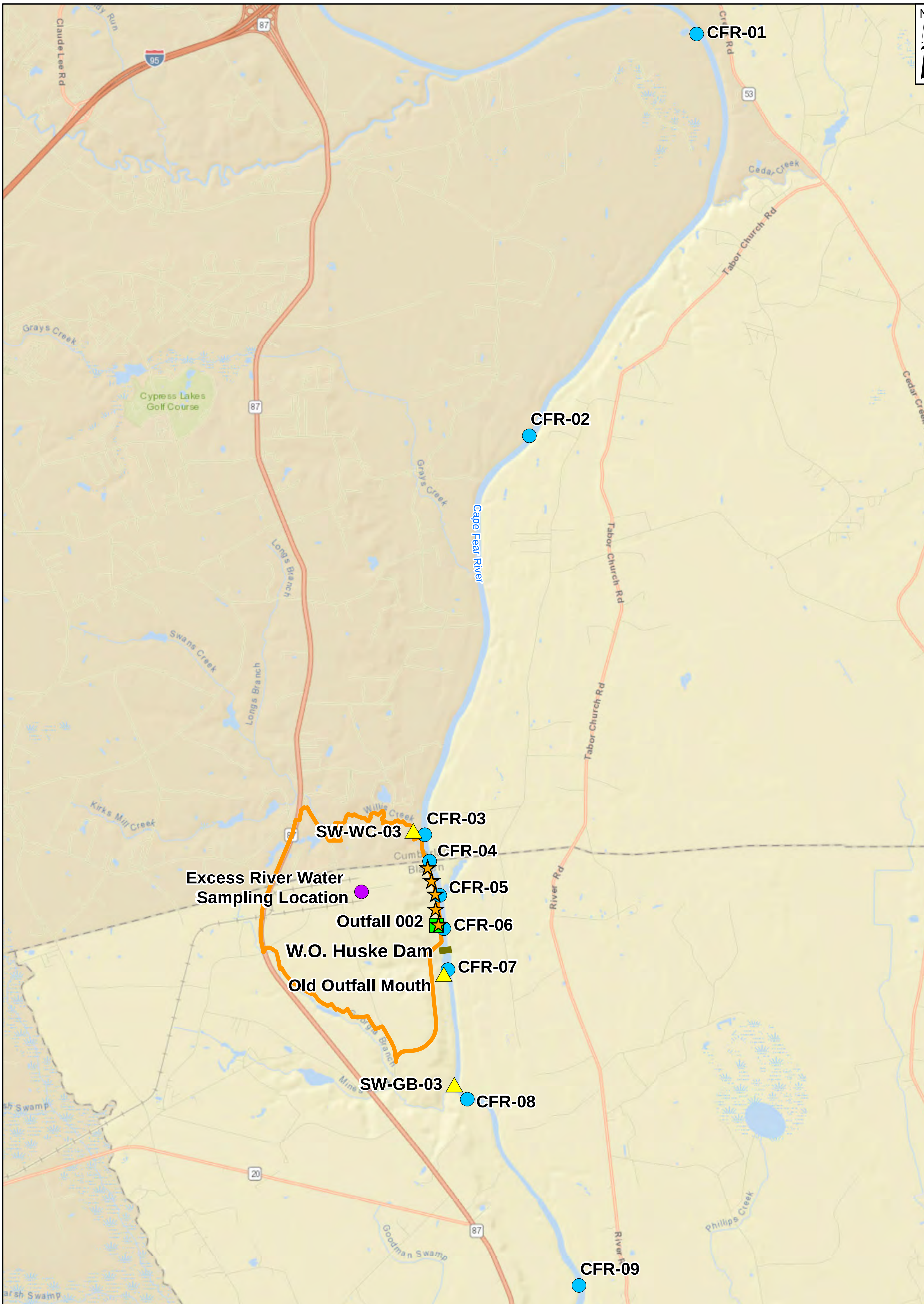
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure **2**

Raleigh | September 2018

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



Legend
- LTW - Long Term Wells
- Excess River Water Sampling Location
- CFR - Cape Fear River Sampling Transects
- Tributaries - Willis Creek, Georgia Branch Creek and Old Outfall
- Outfall 002
- Site Boundary

1 0.5 0 1 Miles

May 2018 Local Program Locations

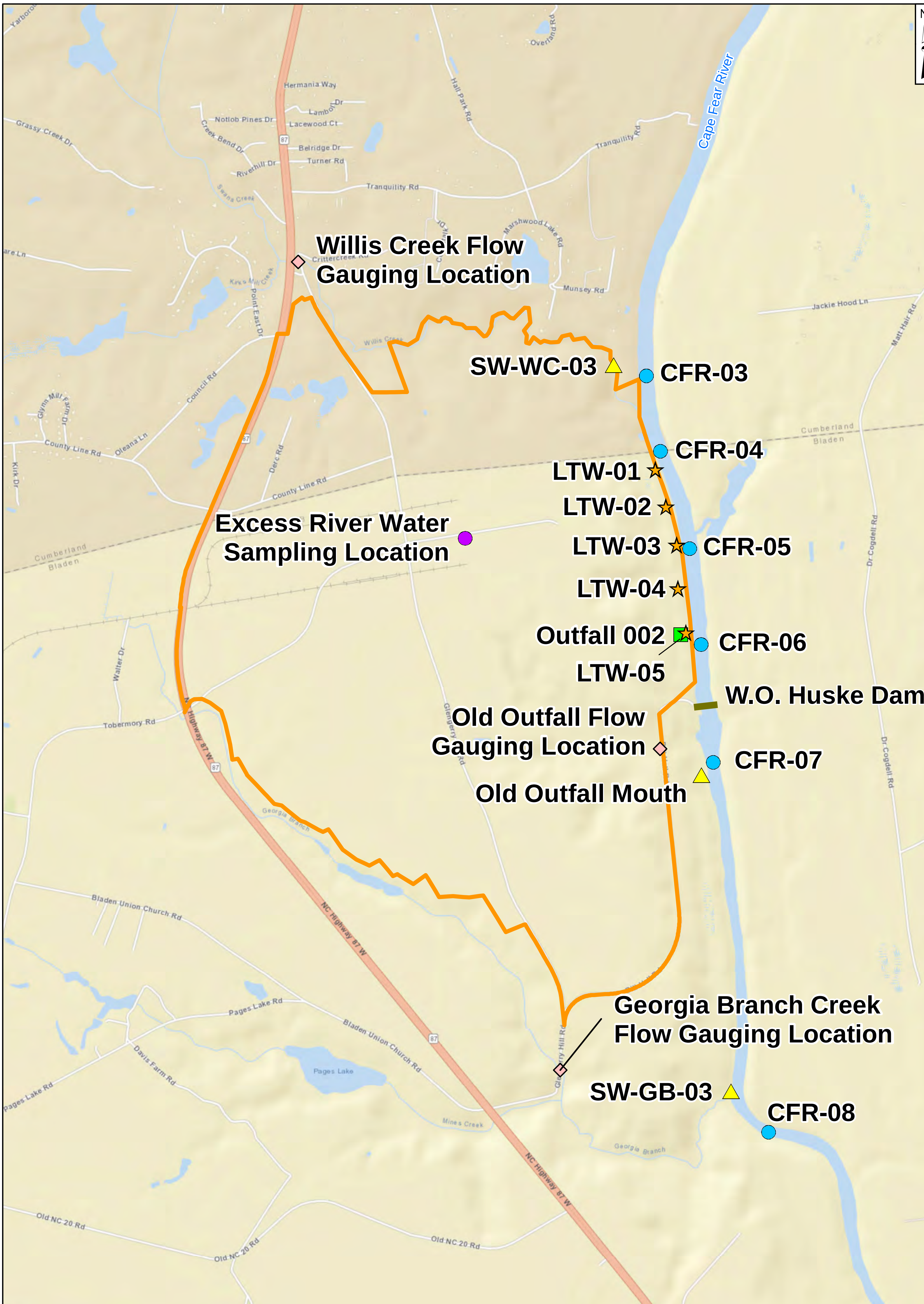
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Raleigh | September 2018

Figure 3

Notes:
Basemap sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community



Legend

- Flow Gauging Location
- LTW - Long Term Wells
- Excess River Water Sampling Location
- CFR - Cape Fear River Sampling Transects
- Tributaries - Willis Creek, Georgia Branch Creek and Old Outfall
- Outfall 002
- Site Boundary

Notes:
Basemap sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

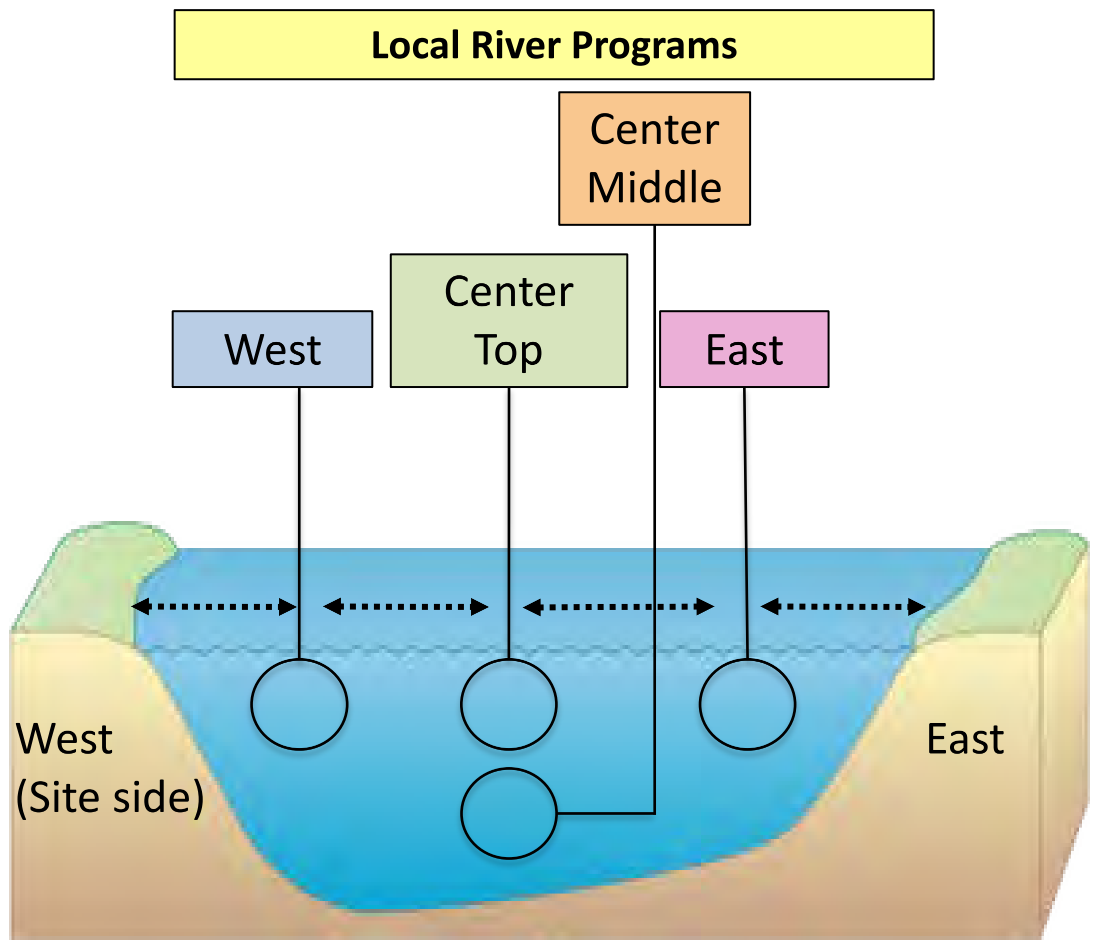
0.5 0.25 0 0.5 Miles

Detailed Inset of
May 2018 Local Program Locations
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

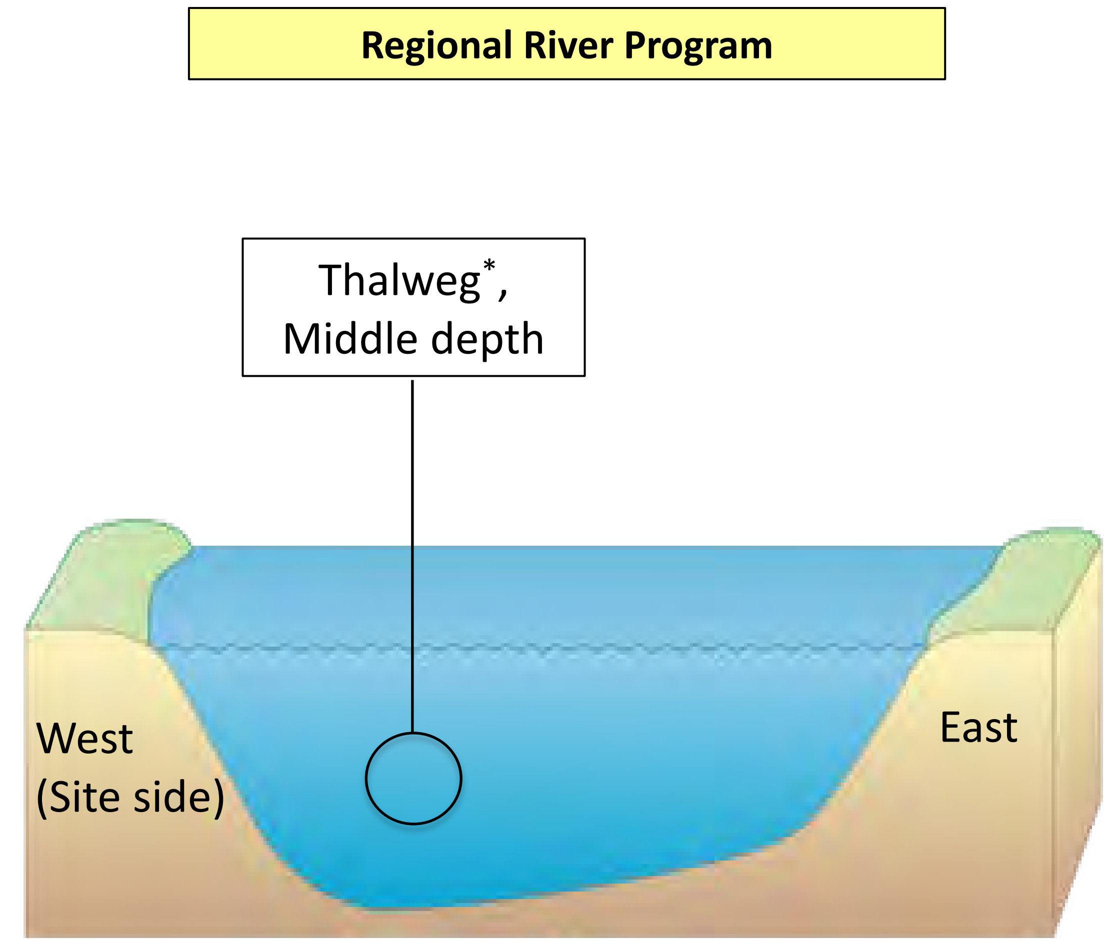
Raleigh | September 2018

Figure
4



25 % of river width

Sampling Location Selection Rationale:
Assess how concentrations differ across cross-section, particularly close to Site



*Thalweg: Deepest part of the channel cross section

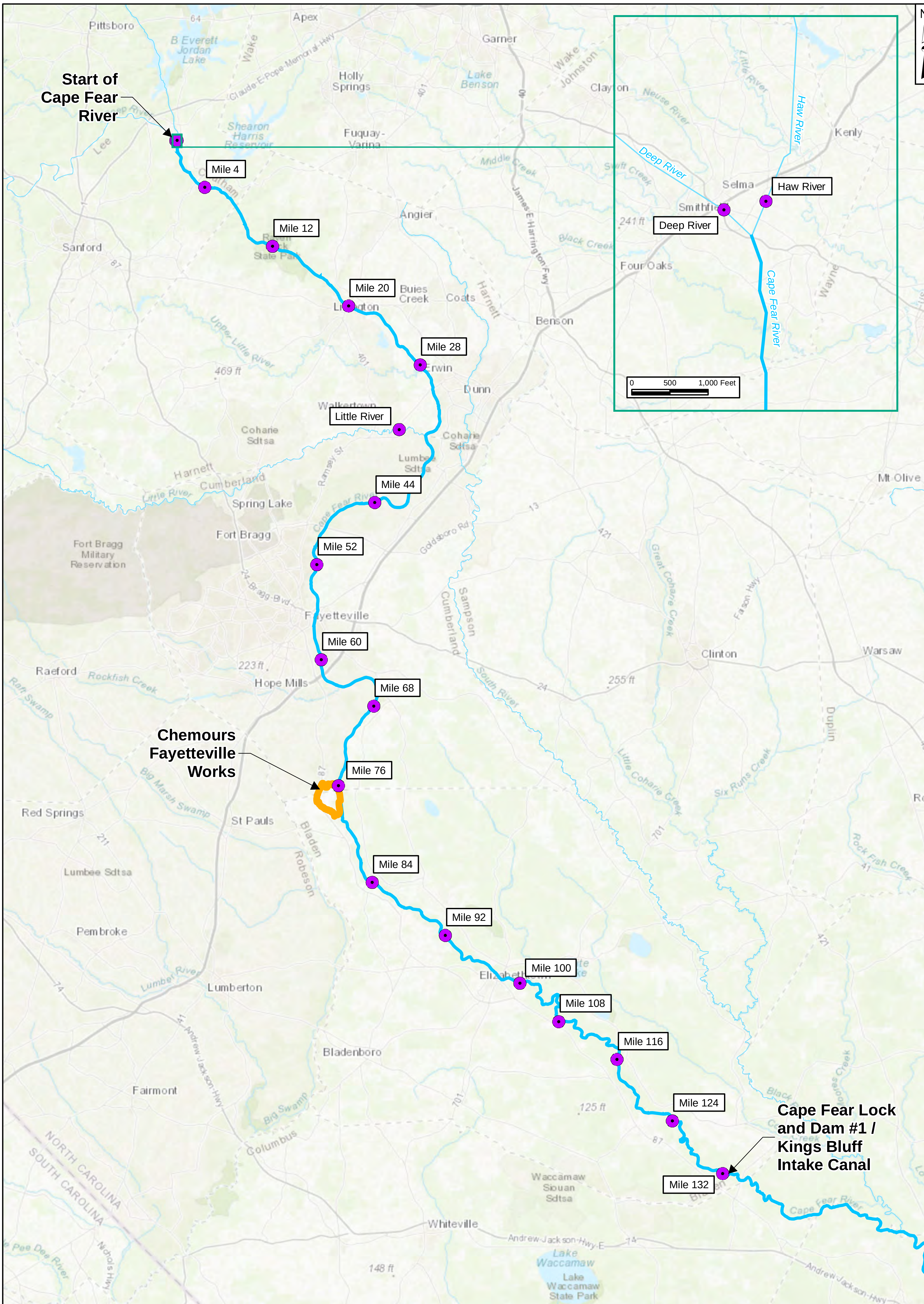
Sampling Location Selection Rationale:
Assess how concentrations vary along the length of the river. The majority of flow occurs at the thalweg, which is typically the most mixed part of river and expected to be representative of average concentrations.

River Sampling Diagram
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Raleigh | September 2018

Figure 5



Legend

- Sampling Locations
- Chemours Fayetteville Works
- Cape Fear River

Notes:
Basemap sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

8 4 0 8 Miles

June 2018 Regional Program Locations

Chemours Fayetteville Works, North Carolina

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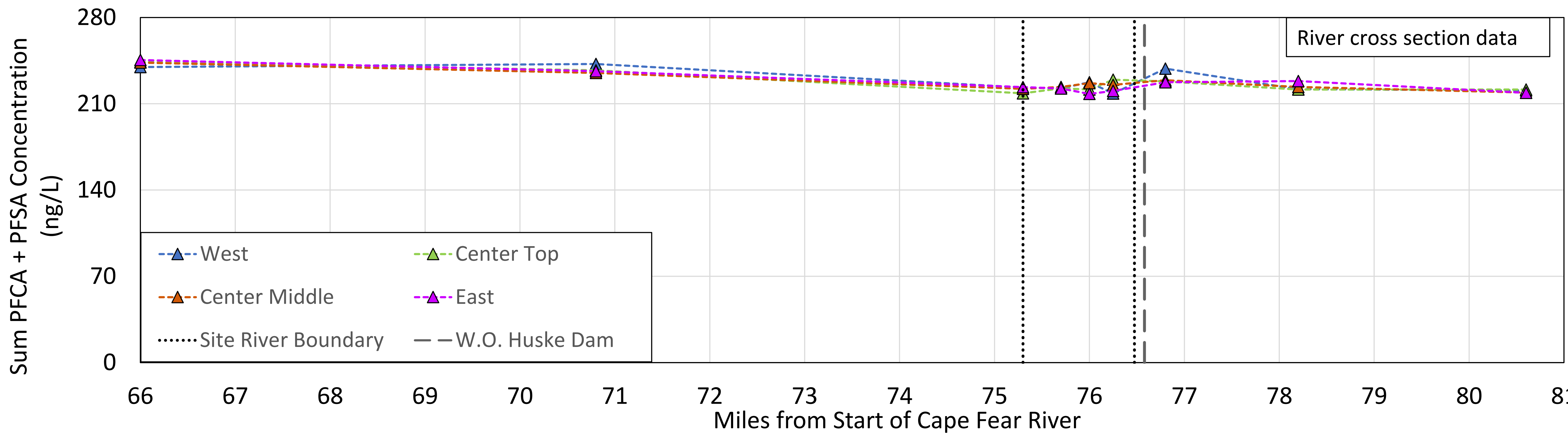
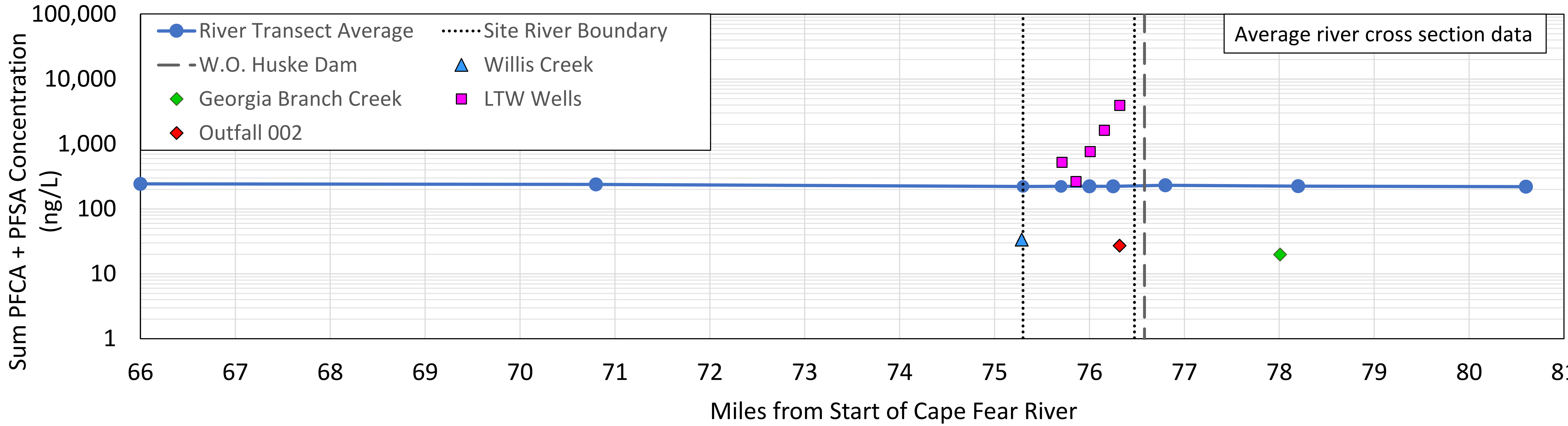
Figure 6

Raleigh | September 2018

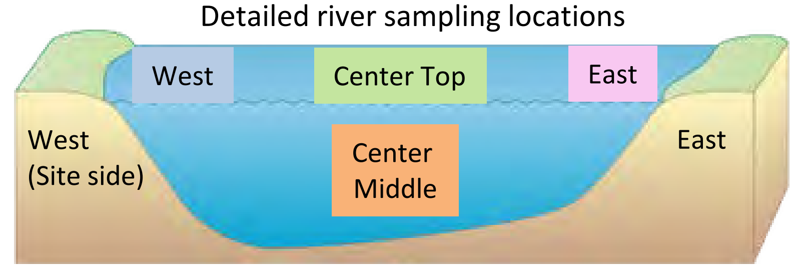




Acronyms:
PFCA: Perfluoroalkyl Carboxylic Acid
PFSA: Perfluoroalkyl Sulfonic Acid
ng/L: Nanograms per Liter

Notes:
Non-detects were assigned a value of zero for calculation of averages

Detailed river sampling locations

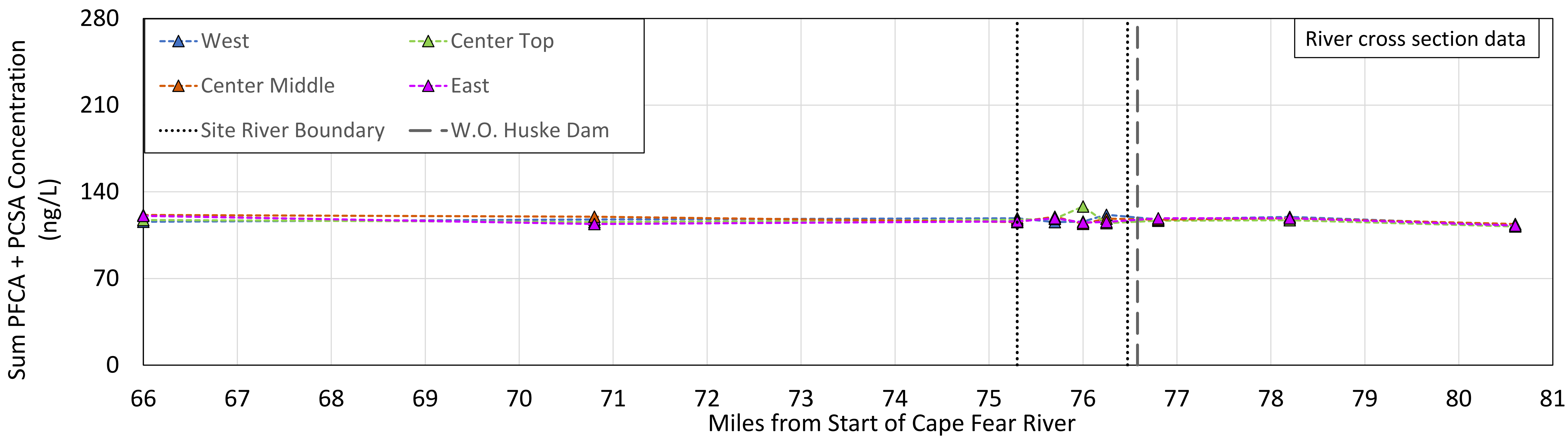


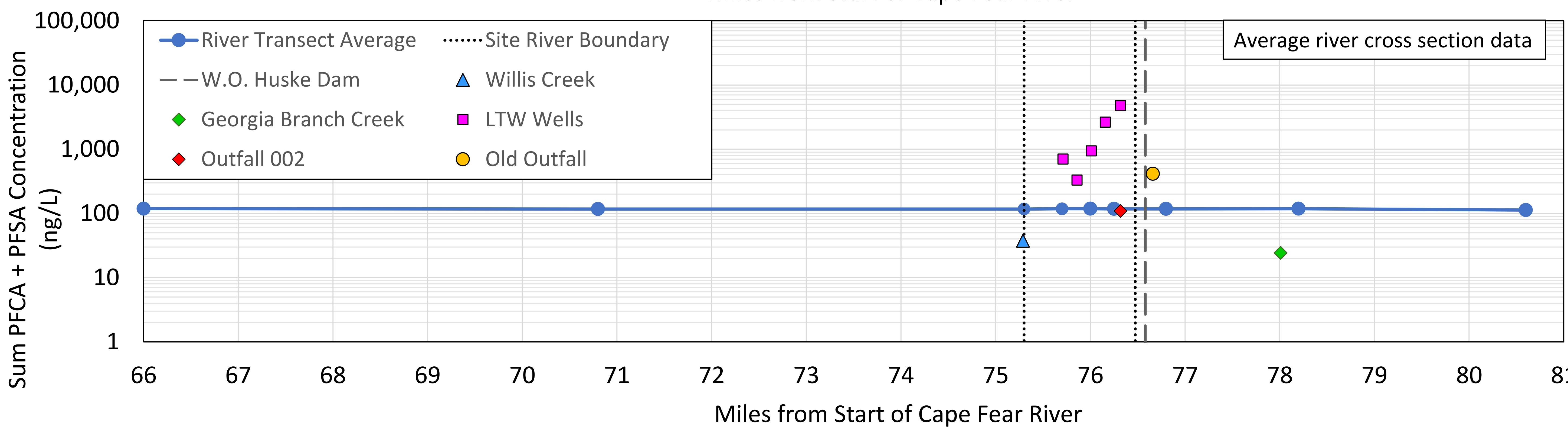
September 2017 Local Program
PFCA and PFSA Plots
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Raleigh | September 2018

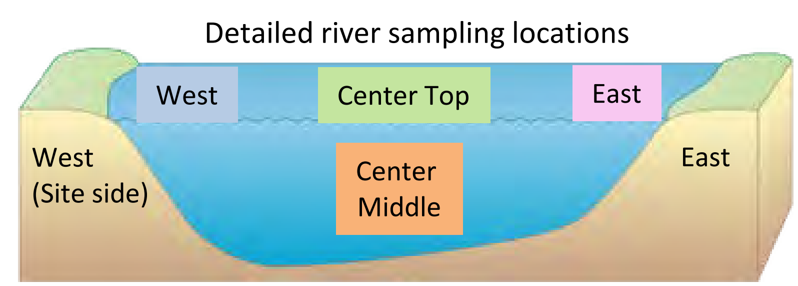
Figure 7





Acronyms:
PFCA: Perfluoroalkyl Carboxylic Acid
PFSA: Perfluoroalkyl Sulfonic Acid
ng/L: Nanograms per Liter

Notes:
Non-detects were assigned a value of zero for calculation of averages



May 2018 Local Program
PFCA and PFSA Plots
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure 8

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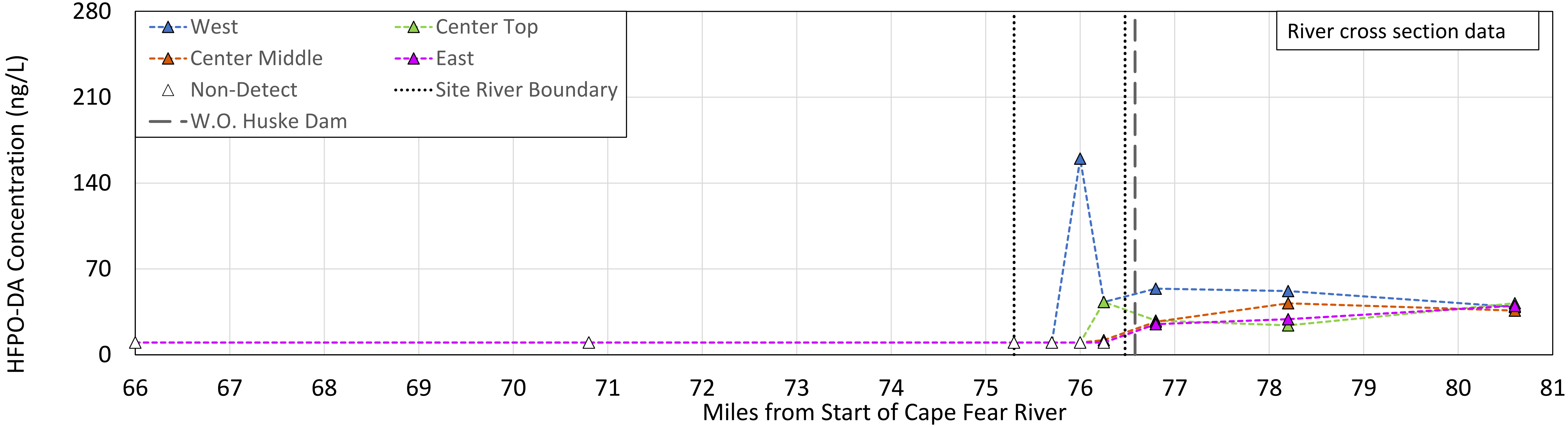
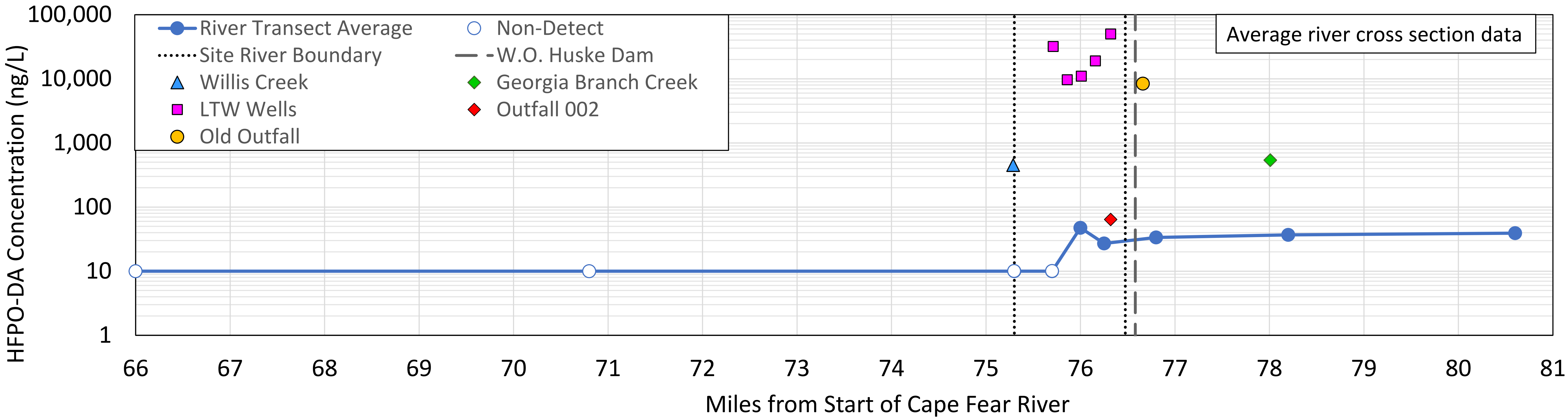
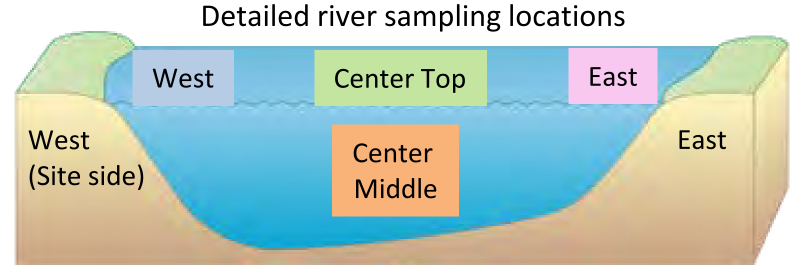




Acronyms:
HFPO-DA: Hexafluoropropylene Oxide Dimer Acid
(C3-Dimer Acid; GenX)
ng/L: Nanograms per Liter

Detailed river sampling locations

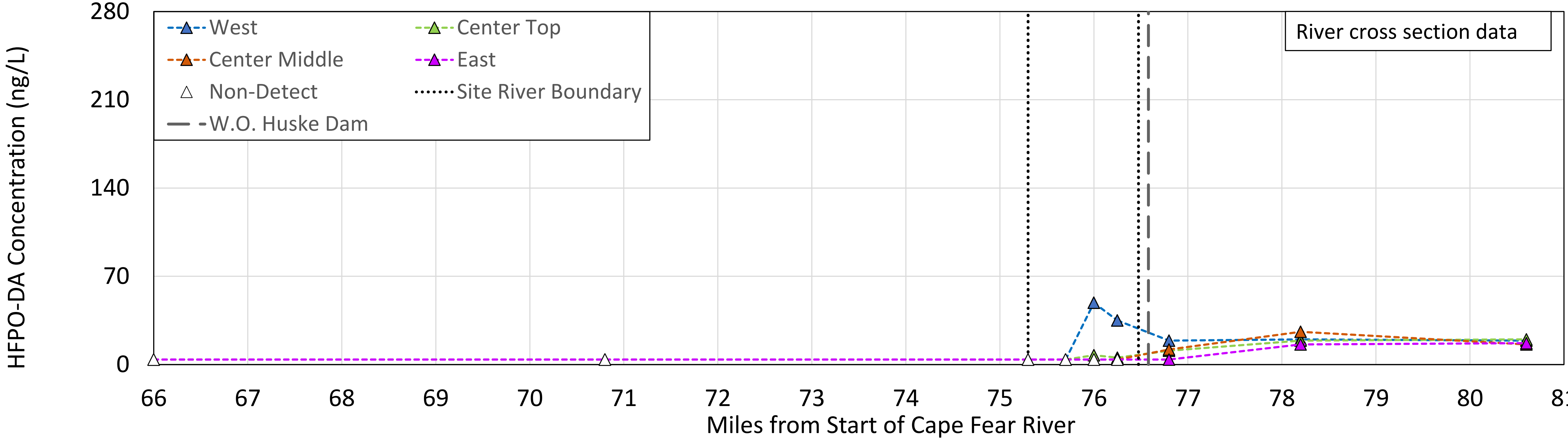


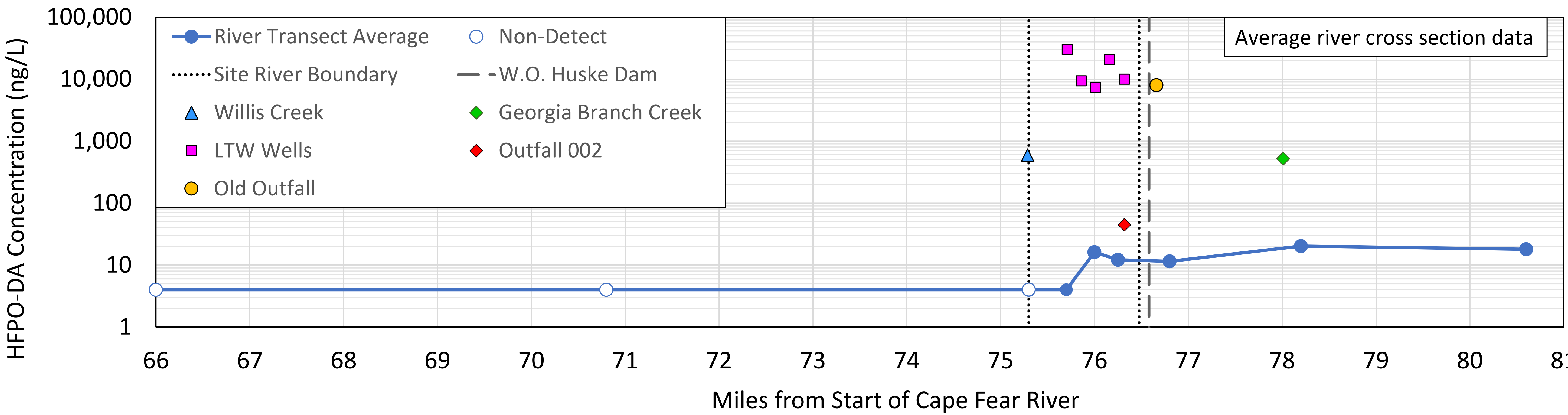
September 2017 Local Program
HFPO-DA Plots
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

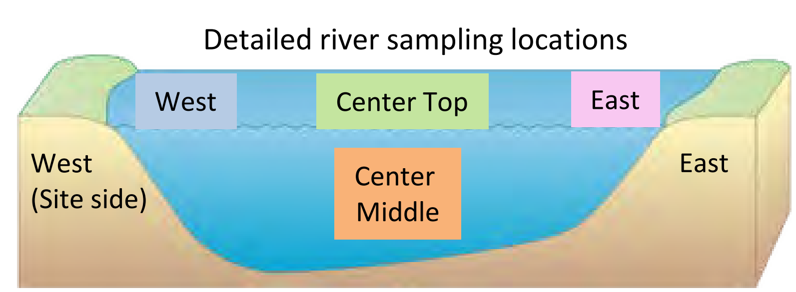
Figure **9**

Raleigh | September 2018





Acronyms:
HFPO-DA: Hexafluoropropylene Oxide Dimer Acid (C3-Dimer Acid; GenX)
ng/L: Nanograms per Liter

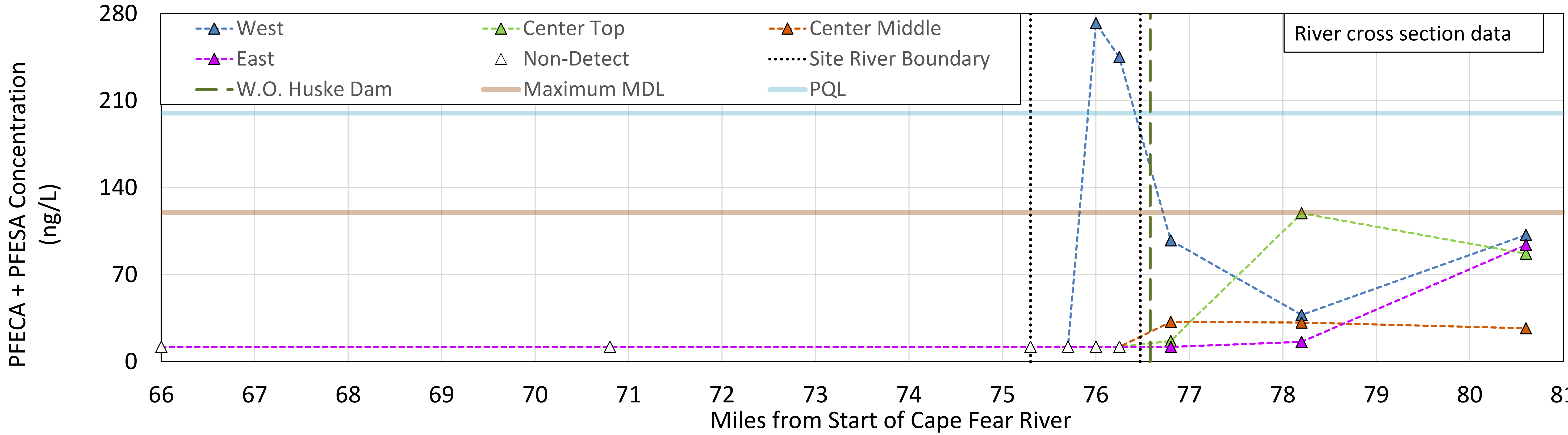


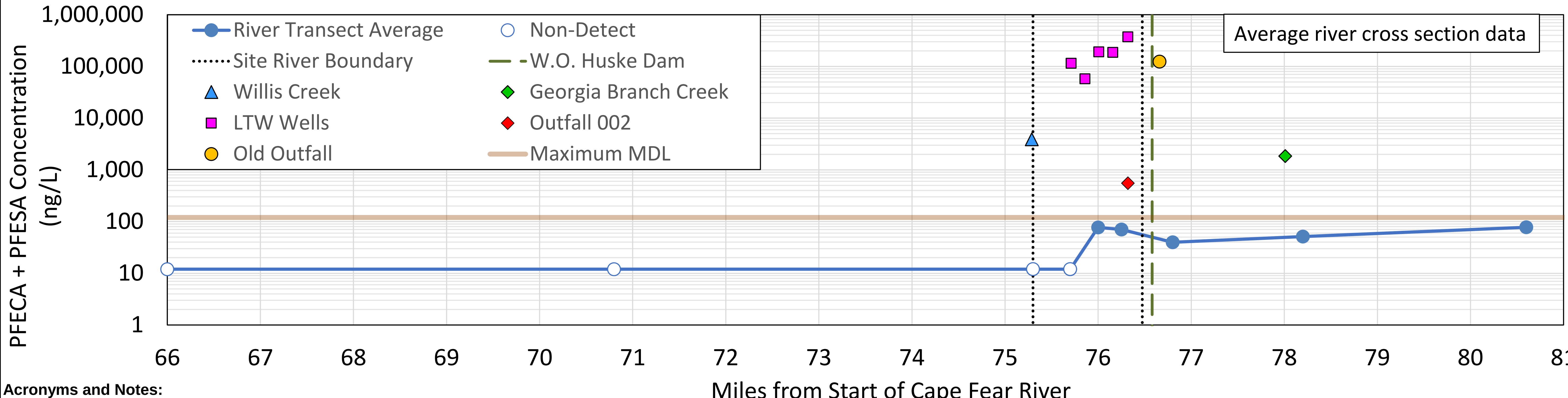
May 2018 Local Program
HFPO-DA Plots
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure **10**

Raleigh | September 2018





Acronyms and Notes:

PFECA: Perfluoroalkyl Ether Carboxylic Acid

PFESA: Perfluoroalkyl Ether Sulfonic Acid

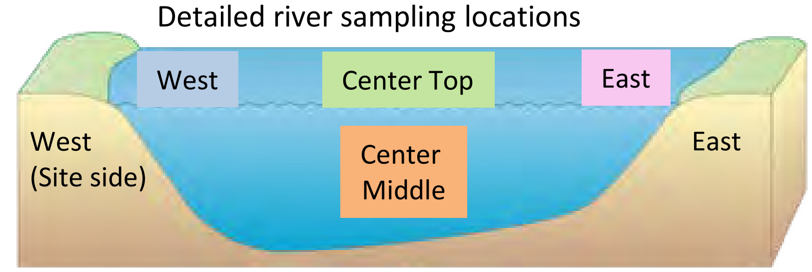
PQL: Pratical quantitation limit, (200 ng/L for all Table 3 compounds)

ng/L: Nanograms per Liter

MDL: Minimum detection limit

- Maximum MDL,120-ng/L, is the statistical MDL for PFESA BP 1, the highest Table 3 MDL.
- Non-detect data are plotted at 12-ng/L, the lowest detected PFMOAA concentration.

Detailed river sampling locations

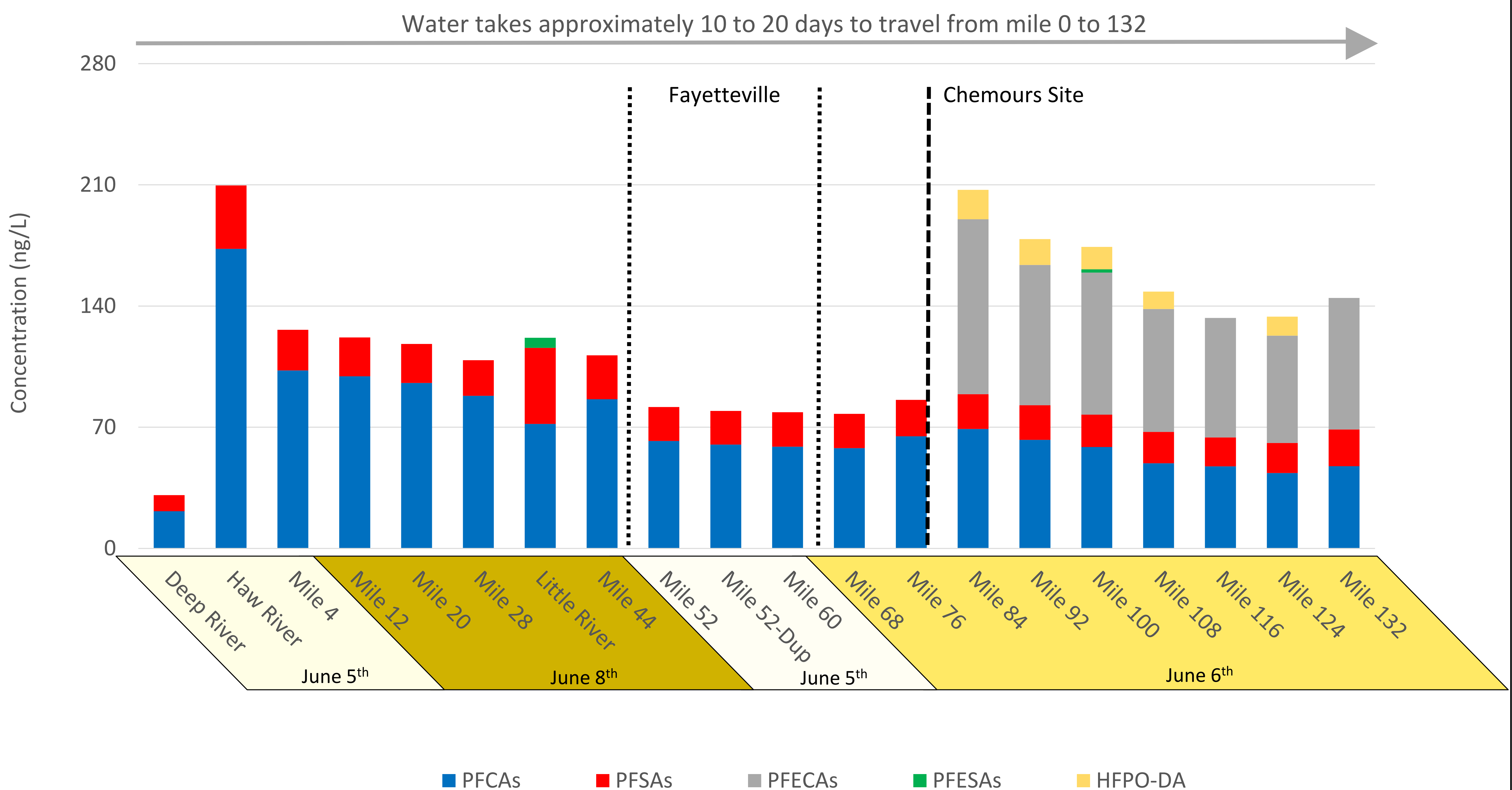


May 2018 Local Program
PFECA and PFESA Plots
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure **11**

Raleigh | September 2018



Acronyms and Notes:
Dup - Duplicate
PFCA: Perfluoroalkyl Carboxylic Acid
PFSA: Perfluoroalkyl Sulfonic Acid
PFECA: Perfluoroalkyl Ether Carboxylic Acid
PFESA: Perfluoroalkyl Ether Sulfonic Acid
HFPO-DA: Hexafluoropropylene Oxide Dimer Acid (C3-Dimer Acid; GenX)
ng/L: Nanograms per Liter

Sample Collection Date:

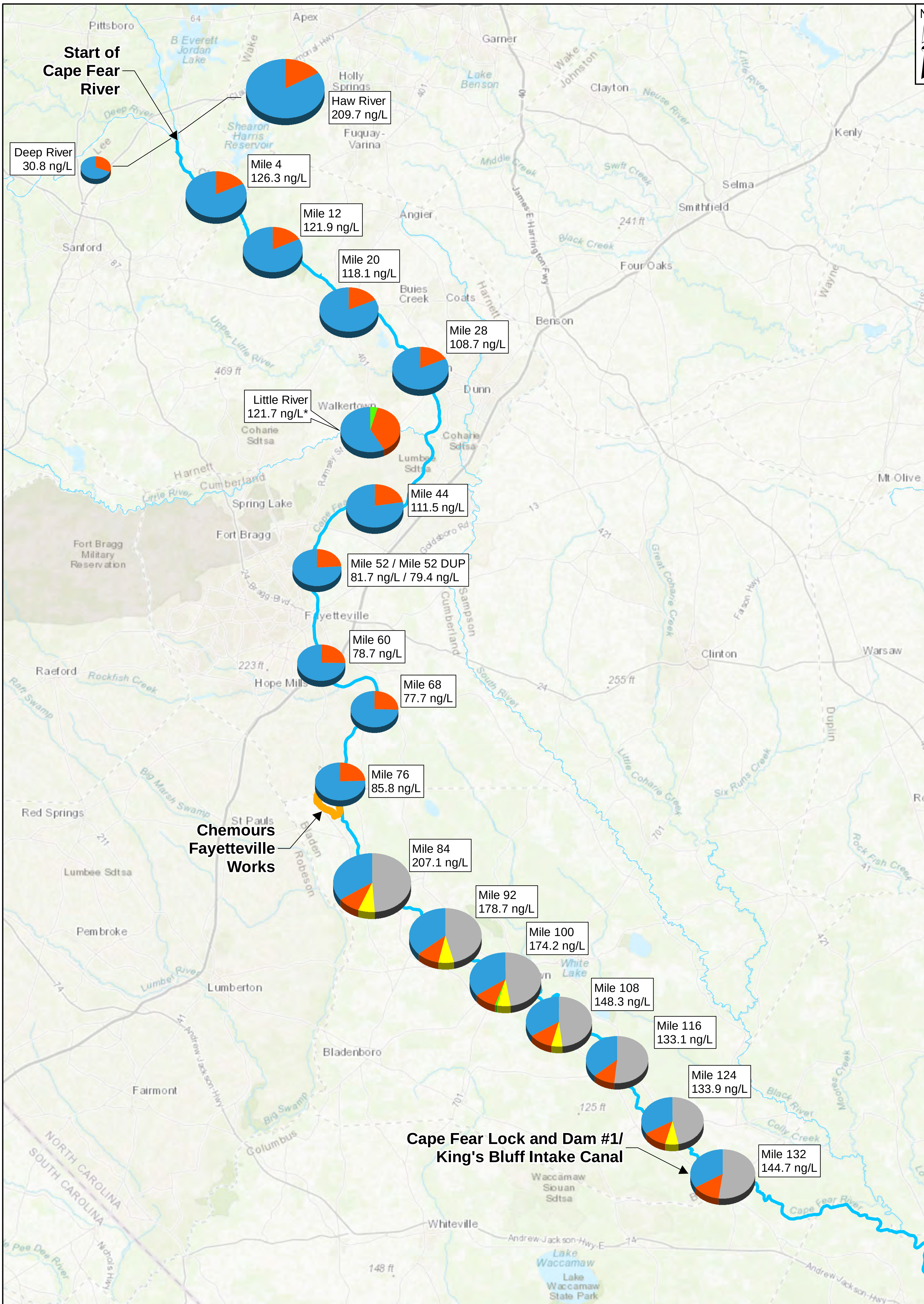
June 5th 2018
June 6th 2018
June 8th 2018

Cape Fear River PFAS Bar Chart
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure **12**

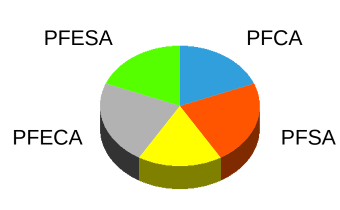
Raleigh | September 2018



Legend

Chemours Fayetteville Works

Cape Fear River



Mile 4 — Sample Location
126.3 ng/L — Total PFAS Concentration

Notes:
* - Sample was collected on Little River
ng/L - nanograms per liter
Pie chart areas are scaled to total detected PFAS concentration at each location.
Topographic map provided by Esri Basemaps.

8 4 0 8 Miles

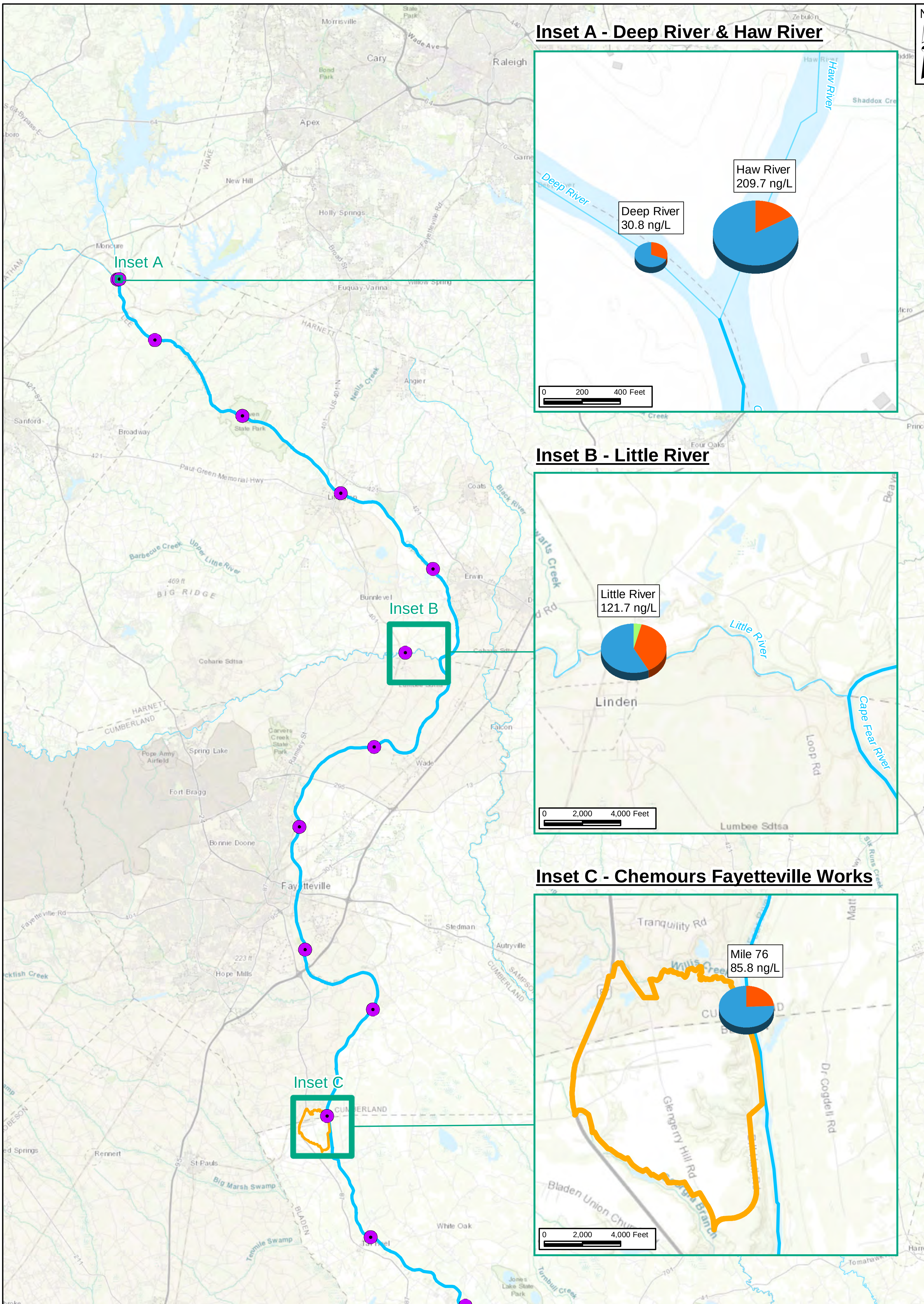
Cape Fear River
PFAS Pie Charts Map

Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Raleigh | September 2018

Figure **13**



Legend

Sampling Location

Chemours Fayetteville Works

Cape Fear River

PFESA PFCA PFECA PFSA HFPO-DA

Mile 4
126.3 ng/L

Sample Location

Total PFAS Concentration

Notes:
* - Sample was collected on Little River
ng/L - nanograms per liter
Pie chart areas are scaled to total detected PFAS concentration at each location.
Topographic map provided by Esri Basemaps.

8 4 0 8 Miles

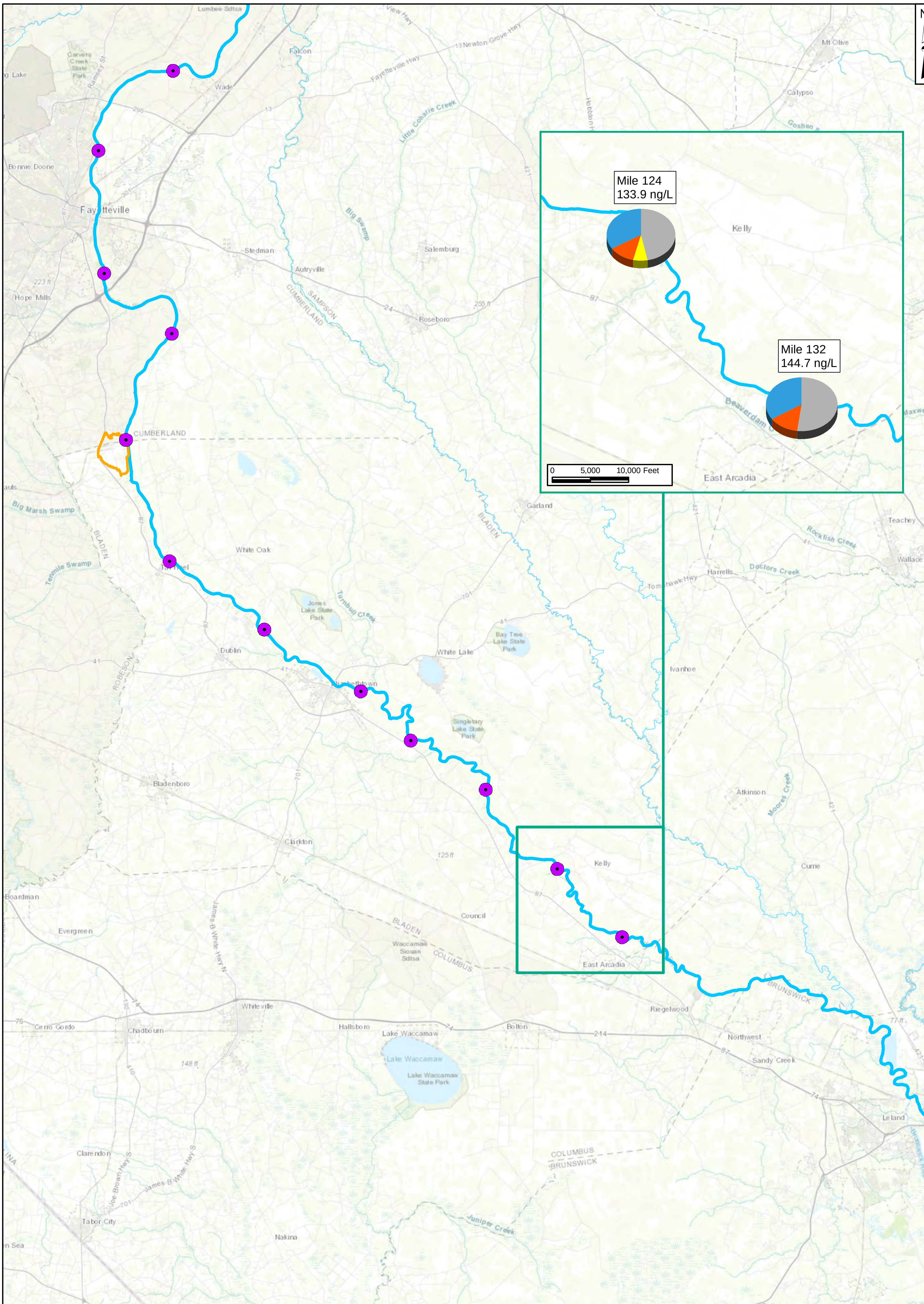
Cape Fear River
PFAS Pie Charts Map Insets

Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Raleigh | September 2018

Figure
14

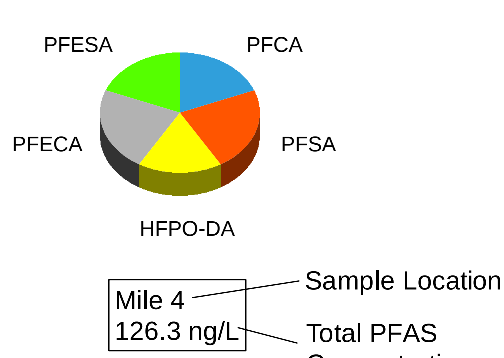


Legend

Sampling Location

Chemours Fayetteville Works

Cape Fear River



Notes:
ng/L - nanograms per liter
Pie chart areas are scaled to total detected PFAS concentration at each location.
Topographic map provided by Esri Basemaps.

8 4 0 8 Miles

Cape Fear River PFAS Pie Charts Map
Miles 124 to 132 Inset

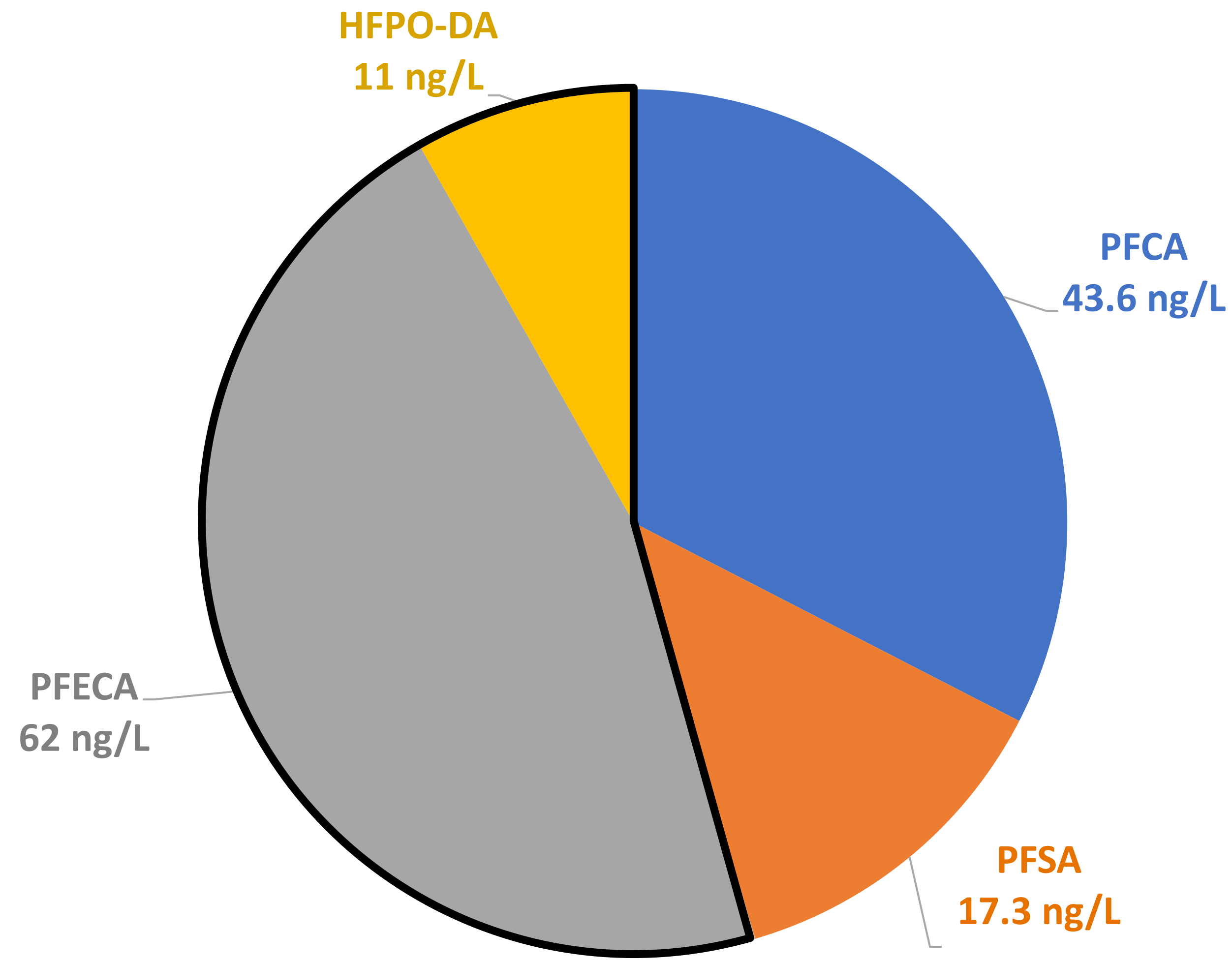
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Raleigh | September 2018

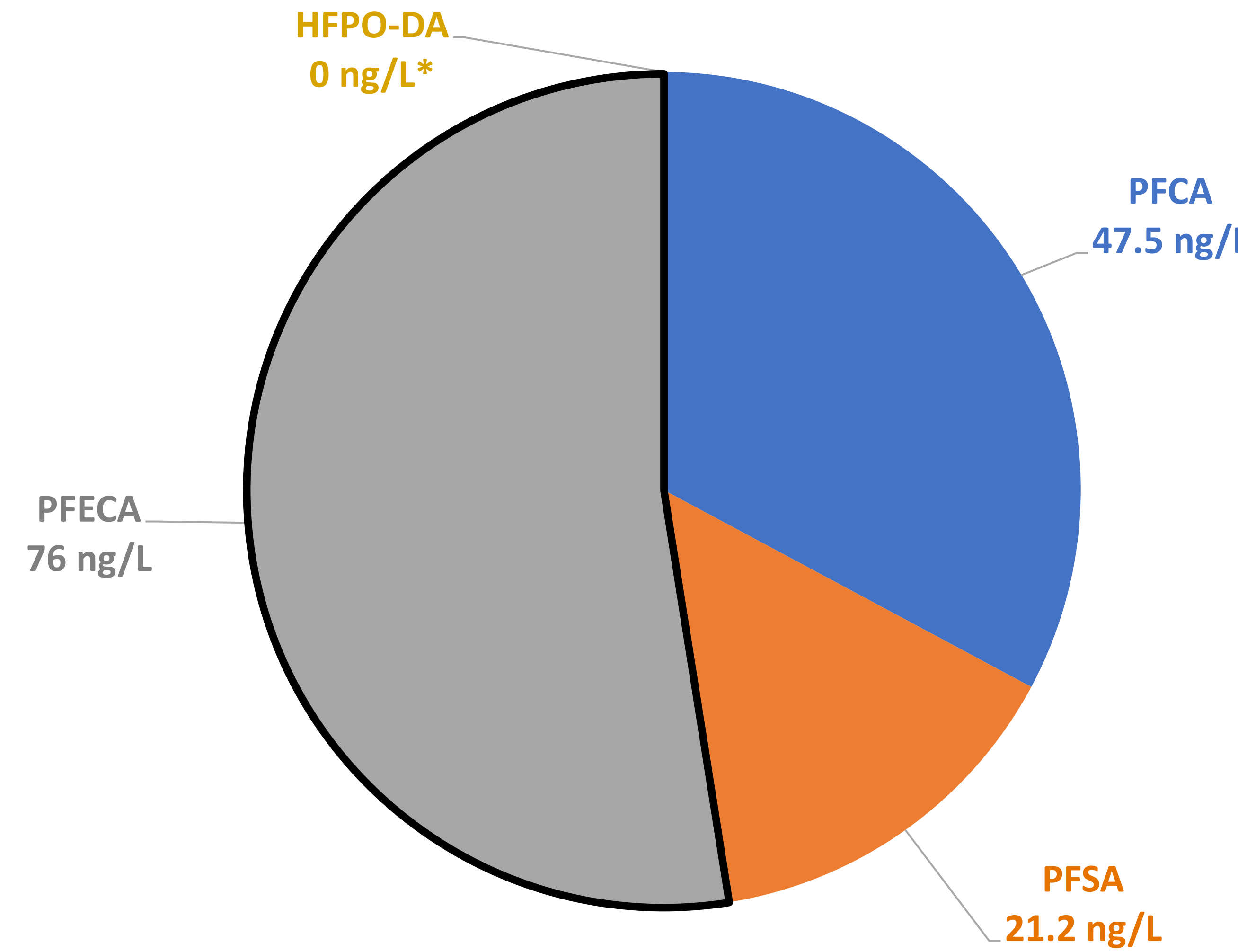
Figure **15**

Location: River Mile 124
Date: 6 June 2018
Distance: 47 miles down river of Site



Site Related ***73 ng/L*** : ***60.9 ng/L*** Watershed
Measured Total: 133.9 ng/L

Location: River Mile 132
Date: 6 June 2018
Distance: 55 miles down river of Site



Site Related ***76 ng/L*** : ***68.7 ng/L*** Watershed
Measured Total: 144.7 ng/L

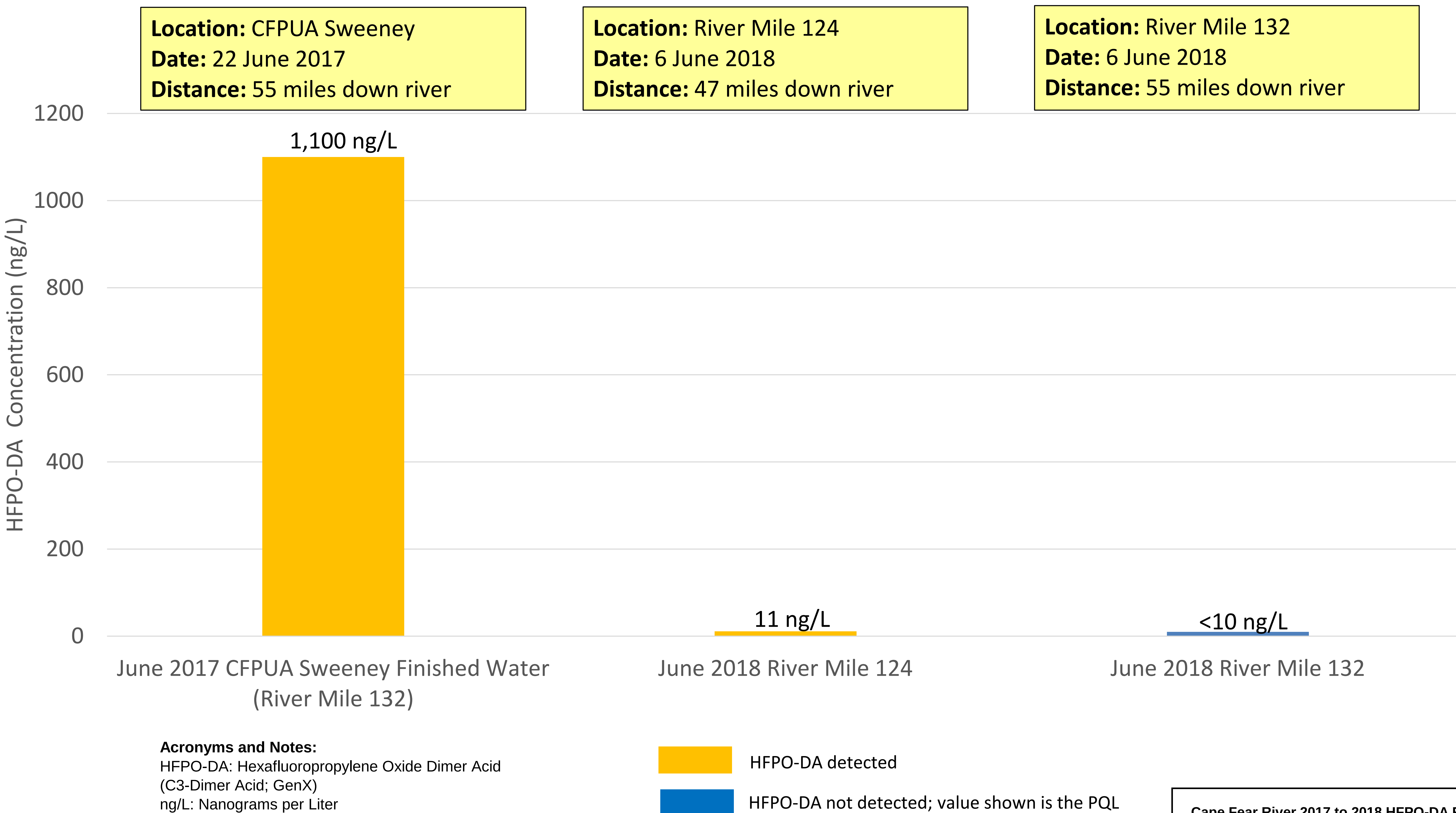
Acronyms:
PFCA: Perfluoroalkyl Carboxylic Acid
PFSA: Perfluoroalkyl Sulfonic Acid
PFECA: Perfluoroalkyl Ether Carboxylic Acid
PFESA: Perfluoroalkyl Ether Sulfonic Acid
HFPO-DA: Hexafluoropropylene Oxide Dimer Acid
(C3-Dimer Acid; GenX)
ng/L: Nanograms per Liter

Site related compounds

* Non-detect above Practical Quantitation Limit, 10 ng/L

Pie charts represent fraction of detected PFAS compounds that are associated with the Chemours Site versus other sources in the watershed

PFAS Pie Charts: **Chemours Site and Watershed Sources** Chemours Fayetteville Works, North Carolina		
Geosyntec consultants		Figure **16**
Raleigh	September 2018	



Acronyms and Notes:
HFPO-DA: Hexafluoropropylene Oxide Dimer Acid (C3-Dimer Acid; GenX)
ng/L: Nanograms per Liter
PQL - Practical Quantitation Limit

2017 CFPUA data were NCDEQ reported HFPO-DA concentrations (https://www.ncwater.org/basins/Cape_Fear/GenXDataspreadsheet.pdf)

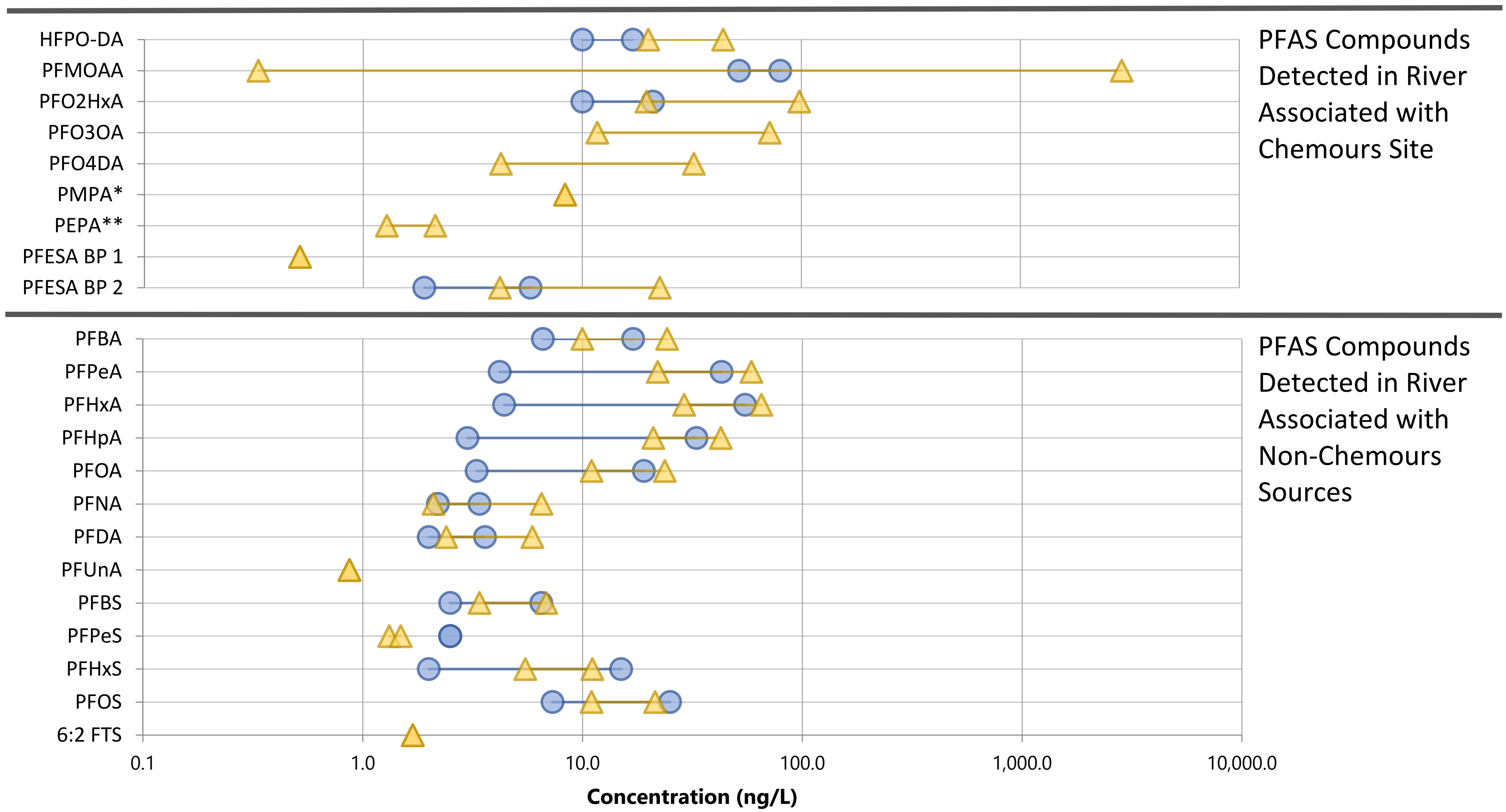
CFPUA water is drawn from the Cape Fear River at Kings Bluff Intake Canal located 132 miles from the start of the river, or 55 miles down river from the Chemours Site.

Cape Fear River 2017 to 2018 HFPO-DA Reductions
Chemours Fayetteville Works, North Carolina

Geosyntec consultants

Figure 17

Raleigh | September 2018



Legend:

- Chemours detected PFAS compound range

- CFPUA detected PFAS compound range

Notes:

ng/L - nanograms per liter

* CFPUA reported PFMOPrA, which is an isomer of PMPA

** CFPUA reported PFMOBA, which is an isomer of PEPA

- CFPUA data are from CFPUA Pilot Study (Black and Veatch, 2018)
- Chemours data are from the June 2018 Whole River Sampling Program (Geosyntec, 2018)
- Where no Chemours data are plotted for a compound the compound was analyzed and all sample results were non-detect.

Cape Fear River **Regional Program and CFPUA Data** Chemours Fayetteville Works, North Carolina		
Geosyntec consultants		Figure **18**
Raleigh	September 2018	