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CAPE FEAR RIVER PFAS MASS LOADING ASSESSMENT - FIRST QUARTER 2022 REPORT

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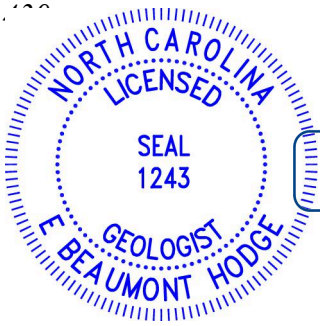

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cfs	cubic feet per second
CFR-TARHEEL	Cape Fear River at Tar Heel Ferry Road Bridge
CO	Consent Order
CO Addendum	Addendum to Consent Order Paragraph 12
DVM	Data Verification Module
FTC	flow through cell
kg	kilograms
mg/s	milligrams per second
m^3	cubic meters
ng/L	nanograms per liter
NCDEQ	North Carolina Department of Environmental Quality
PFAS	pe- and polyfluoroalkyl substances
PFHpA	perfluoroheptanoic acid
Q1	first quarter
Q2	second quarter
Q3	third quarter
Q4	fourth quarter
SOP	standard operating procedure
SWTS	Stormwater Treatment System
USGS	United States Geological Survey

1 INTRODUCTION AND OBJECTIVES

Geosyntec Consultants of NC, P.C. (Geosyntec) has prepared this Cape Fear River PFAS Mass Loading Assessment report for The Chemours Company, FC, LLC (Chemours). Chemours operates the Fayetteville Works facility in Bladen County, North Carolina (the Site, Figure 1). This report provides monitoring and assessment results pursuant to the requirements of Paragraphs 1(a) and 1(b) of the Addendum to Consent Order Paragraph 12 (CO Addendum) and Paragraph 16 of the executed Consent Order (CO) dated 25 February 2019 among the North Carolina Department of Environmental Quality (NCDEQ), Cape Fear River Watch, and Chemours.

The purpose of this report is to describe the first quarter 2022 (Q1 2022) PFAS Mass Loading Assessment of the Cape Fear River based on the findings of surface water, river water, and groundwater samples collected at and surrounding the Site. This is the ninth report prepared since first quarter (Q1) 2020. Data collected were used to assess mass loading of total per- and polyfluoroalkyl substances (PFAS) to the Cape Fear River. Total PFAS is a term used to refer to PFAS detected in the environment for those PFAS compounds listed in Table 1 and analyzed by the Table 3+ standard operating procedure (SOP) analytical method.

One year of monthly sampling of the mass loading model pathways per CO Paragraph 1(b) was completed in December 2021. In Q1 2022, quarterly sample collection of the mass loading model pathways was initiated and will continue for a period of four years (through Q4 2026), as outlined in the *Cape Fear River Mass Loading Calculation Protocol Version 2* (Geosyntec 2020d).

There are two primary objectives for this report:

1. To assess Cape Fear River PFAS mass loads. Specifically:
    a. Mass loads measured in the Cape Fear River.
    b. Mass loads prevented from reaching the Cape Fear River by implemented remedies.
    c. The projected mass load to the Cape Fear River, i.e., the sum of the two quantities above.
2. To assess the relative PFAS loadings from the different PFAS transport pathways to the Cape Fear River during the reporting period[1] using the Mass Loading Model.

The CO Addendum requires sampling the Cape Fear River for PFAS compounds listed in Attachment C of the CO (Cape Fear River Mass Loading Calculation Protocol Version 2, Geosyntec 2020d). Accordingly, this report contains data from January 2022 through March 2022,

[1] One year of monthly sampling of the mass loading model pathways per CO Paragraph 1(b) concluded as of December 2021 as per CO Paragraph 1(b) and the associated protocol document Cape Fear River Mass Loading Calculation Protocol Version 2 (Geosyntec 2020d). Quarterly sampling of these pathways was conducted and will continue until Q4 2026.

and mass loading calculations and reporting are done on the set of PFAS compounds listed in Table 1, i.e., both "Table 3+" and "Attachment C".

The remainder of this report is organized as follows:

- **Scope** – This section describes the sampling programs performed in Q1 2022.
- **PFAS Mass Load to Cape Fear River** – This section describes the assessments of Cape Fear River PFAS Mass Loads.
- **Cape Fear River PFAS Mass Loading Model** – This section describes the assessment of the relative mass loading from the various PFAS transport pathways.
- **Summary** – This section summarizes report findings.

2 SCOPE

The Q1 2022 sampling was completed by Parsons of NC (Parsons) and Geosyntec from January 1st through March 31st, 2022. The scope of the sampling programs is summarized below, and complete descriptions of the field methods can be found in Appendix A.

2.1 Sampling Activities in Q1 2022

Q1 2022 sampling activities included:

1. The Cape Fear River PFAS Mass Load Sampling Program (January 2022 through March 2022) consisted of collecting twice weekly composite samples at Cape Fear River at Tar Heel Ferry Road Bridge (CFR-TARHEEL).
2. The Cape Fear River PFAS Mass Loading Model Sampling Program event (January 2022) which consisted of the following:
    a. Collecting one synoptic round of groundwater elevations from select on and offsite monitoring wells.
    b. Collecting water samples for PFAS from 18 onsite and offsite monitoring wells[2].
    c. Collecting seep, surface water, and river water samples for PFAS.
    d. Measuring flow rates at specified seep and surface water locations.

The Q1 2022 Mass Loading Model Sampling Program events were conducted during dry weather.

Each program is described in further detail below.

2.2 Cape Fear River PFAS Mass Load Sampling Program

The Cape Fear River PFAS Mass Load Sampling Program consists of collecting twice weekly composite samples from the sampling location at CFR-TARHEEL, approximately 7 miles downstream of the Site (Figure 2). This location is situated downstream of the Site such that water from the seeps, onsite groundwater, Outfall 002, Old Outfall 002 and Georgia Branch Creek are well mixed in the river.

Composite samples were collected using an autosampler and were generally composited over 24 hours with aliquots collected at one-hour intervals. Two samples per week were collected and sent for analysis of the PFAS listed in Table 1.

Interruptions to the sampling program may occur due to events such as vandalism, equipment malfunction, or a high river stage, which will flood the platform and necessitates sampler removal.

[2] Bladen-1D is damaged and could not be sampled in Q1 2022. PW-11 could not be sampled in Q1 2022 since it is being pumped as part of the Interim Black Creek Aquifer interim pumping program.

During interruptions, field protocol is to collect a grab sample from the river twice per week at the CFR-TARHEEL location to continue establishing a record of river concentrations over time.

During the reporting period between January 1, 2022 and March 31, 2022, there were no interruptions recorded, resulting in collection of 23 primary composite samples, three field duplicate composite samples, and three grab samples over the reporting period.

The data collected from the PFAS Mass Load Sampling Program were used to estimate PFAS mass loads in the Cape Fear River using concentrations from the CFR-TARHEEL location and flows as reported by the United States Geological Survey (USGS) river gauging station at the W.O. Huske Dam (Figure 2). Details of the sample collection methods, flow measurement methods, and calculation methods were reported in the *Cape Fear River PFAS Mass Loading Calculation Protocol Version 2* (Geosyntec, 2020d). Mass load calculations are provided in Section 3 and sampling results are presented in Appendix A.

2.3 Cape Fear River PFAS Mass Loading Model Sampling Program

The Mass Loading Model Sampling Program for this reporting period consisted of collecting concentration and flow data from the various PFAS transport pathways in January 2022. Environmental media sampled were surface water (seeps, creeks, Old Outfall, Outfall 002, and Cape Fear River) and groundwater. Surface and river water sampling and flow gauging locations for the Q1 2022 event are listed in Table 2 and shown on Figures 3 and 4. Groundwater sampling locations for the Q1 2022 event are shown on Figure 5 and listed in Table 3. Collected samples were evaluated for the PFAS compounds listed in Table 1.

In January 2022, 24-hour composite samples could not be collected at the influent and effluent of the FTC's at Seeps A and C due to issues described in the "Interim Seep Remediation Operation and Maintenance Report #7" (Geosyntec, 2022a). Therefore, the effluent and influent samples collected for the January 2022 Seep Flow Through cell performance monitoring program were used for Seeps A and C mass loading calculations.

The data collected from these Q1 2022 field activities were then incorporated into the Mass Loading Model to estimate PFAS mass discharge from the nine potential transport pathways to the Cape Fear River (Figure 6), as identified in the Conceptual Site Model (Geosyntec, 2019) and discussed in more detail in Section 4.

Details of the sample collection methods, flow measurement methods, and calculation methods were reported in the *Cape Fear River PFAS Mass Loading Calculation Protocol Version 2* (Geosyntec, 2020d). Mass Loading Model results are provided in Section 4.2 and sampling results are presented in Appendix A.

2.4 Laboratory Analyses

Samples were analyzed for PFAS by Table 3+ Laboratory SOP. The focus of this report is on the set of PFAS originating from manufacturing activities at the Site; therefore, results of sampling activities and assessments of mass loading were performed and presented with respect to the PFAS groupings presented in Table 1: (i) Attachment C, (ii) Table 3+ (17 compounds)[3], and (iii) Table 3+ (20 compounds).

For clarity, the text, tables and figures of this report describe the Total Table 3+ (17 compounds), though the report tables also include results for Total Attachment C and Total Table 3+ (20 compounds).

The calculations for Total Attachment C PFAS concentrations include the fluoroether PFAS on the Attachment C list, i.e., excludes perfluoroheptanoic acid (PFHpA). As presented in the Cape Fear River PFAS Mass Loading Assessment – Third Quarter 2020 Report (Geosyntec, 2020e), the presence of PFHpA upstream and offsite are unrelated to the Site. PFHpA is already present in the upstream river from other sources and is therefore excluded from the Attachment C sum. This represents a modification to the *Cape Fear River PFAS Mass Loading Calculation Protocol Version 2* submitted to NCDEQ on November 18, 2020 (Geosyntec, 2020d).

[3] As reported in the *Matrix Interference During Analysis of Table 3+ Compounds* memorandum (Geosyntec, 2020a), matrix interference studies conducted by the analytical laboratory (TestAmerica, Sacramento) have shown that the quantitation of three compounds (R-PSDA, Hydrolyzed PSDA, and R-EVE) is inaccurate due to interferences by the sample matrix in both groundwater and surface water. Total Table 3+ PFAS concentrations are calculated and presented two ways in this report: (i) summing over 17 of the 20 Table 3+ compounds "Total Table 3+ (17 compounds)", i.e., excluding results of R-PSDA, Hydrolyzed PSDA, and R-EVE, and (ii) summing over 20 of the Table 3+ compounds "Total Table 3+ (20 compounds)"

3 PFAS MASS LOAD TO CAPE FEAR RIVER

This section presents results of the Cape Fear River PFAS mass loads for the Q1 2022 reporting period of January 2022 through March 31, 2022. Specifically, this section discusses three types of mass loads defined in Equation 1.

Equation 1: Total PFAS Mass Load

$$M_{CFR} = m_{CFR} + m_{Remedies}$$

where,

M_{CFR} = is the Projected Mass Load of PFAS compounds in the Cape Fear River, including the mass load prevented from reaching the Cape Fear River by implemented remedies, measured in kilograms (kg).

m_{CFR} = is the Actual In-River Mass Load estimated using PFAS concentrations in samples taken in the Cape Fear River downstream of the Site where the river is well mixed and using measured river flow volumes.

$m_{Remedies}$ = is the Captured Mass Load prevented from reaching the Cape Fear River by remedies implemented by Chemours.

Remedies that have been implemented by Chemours through Q1 2022[4] include:

- Old Outfall 002 treatment system (October 1, 2020)
- Seep C FTC (December 16, 2020)
- Seep A FTC (April 28, 2021)
- Seep B FTC (June 8, 2021)
- Seep D FTC (June 24, 2021)
- Outfall 002 Stormwater Treatment System (SWTS; June 30, 2021)[5]

These remedies prevent PFAS mass loads from reaching the Cape Fear River and were quantified in the $m_{Remedies}$ term of Equation 1. The specific methodology for estimating the prevented mass per remedy was developed on a per remedy basis and details of these calculations are provided in

[4] There have been numerous other interim and permanent actions taken to limit PFAS reaching the Cape Fear River prior to Q1 2022, i.e., air abatement measures (installation of the thermal oxidizer and carbon beds, etc.), grouting of the terracotta pipe, sediment removal from onsite channels, among others, and these may not be reflected in the captured mass load calculations but should be considered in the overall assessment of PFAS reductions.

[5] Diversion sumps in the conveyance network surrounding the Monomers/IXM area capture stormwater flows that would otherwise flow to Outfall 002 and transfers the stormwater to the SWTS for treatment. The diversion sumps and SWTS are designed to convey and then treat stormwater from storm events up to 1-inch over 24-hours. Further details on the SWTS are provided in the Stormwater Treatment System Capture and Removal Efficiency Report (Geosyntec, 2021a).

the *Cape Fear River PFAS Mass Loading Calculation Protocol Version 2* (Geosyntec, 2020d). The goal of these calculations is to estimate the Total PFAS mass diverted from reaching the Cape Fear River by the remedy that would have otherwise reached the Cape Fear River.

3.1 Q1 2022 Total PFAS Mass Load

During the Q1 2022 reporting period, the in-river Total Table 3+ mass load measured at CFR-TARHEEL was 33.1 kg and the Total Table 3+ mass load prevented from reaching the Cape Fear River was 37.9 kg. The installation of remedies at Old Outfall 002, at Seeps A, B, C, and D, and Outfall 002 (Table 4) resulted in the prevented Total Table 3+ load. The sum of these two loads, the in-river and remedy reduction load, was 70.9 kg, representing the projected total PFAS mass load towards the Cape Fear River.

The total measured and estimated in-river mass load (33.1 kg) was based on the 46 mass loading estimation intervals presented in Table 5A. The total measured and estimated mass load captured by remedies implemented by Chemours (37.9 kg) was based on the concentrations in samples collected at the influent and effluent stilling basins (as reported in Appendix A) and measured flows at the Old Outfall 002 treatment system, the Seep A, B, C, and D FTCs, and the SWTS (Tables 5B to 5G).

For the Old Outfall 002 treatment system, a total of 9.8 kg of PFAS was captured and prevented from reaching the Cape Fear River with a total treated flow of 250,000 cubic meters (m^3) (Table 5B). The captured mass varied among the Seeps and ranged from 1.3 kg (Seep C) to 17 kg (Seep B). This range in captured mass loads can be attributed to the differences in influent flows and concentrations among the Seeps. Specifically, for the Seep A FTC, a total of 5.8 kg was captured and prevented from reaching the Cape Fear River with a total flow of 38,779 m^3 (Table 5C). For the Seep B FTC, a total of 17 kg was captured and prevented from reaching the Cape Fear River with a total flow of 79,403 m^3 (Table 5D). For the Seep C FTC, a total of 1.3 kg was captured and prevented from reaching the Cape Fear River with a total flow 14,768 m^3 (Table 5E). For the Seep D FTC, a total of 4.0 kg was captured and prevented from reaching the Cape Fear River with a total flow of 44,350 m^3 (Table 5F).

The SWTS captures PFAS originating from Stormwater in the Monomers/IXM area that would otherwise flow to Outfall 002 during storm events. When stormwater is being treated at the SWTS, HFPO-DA, PFMOAA, and PMPA concentrations are measured in the SWTS influent and effluent flows. The captured total mass of HFPO-DA, PFMOAA, and PMPA during storm events between January 1, 2022 and March 31, 2022 was 0.33 kg. This estimate was based on mass loading estimates for 21 individual treatment events between January 1, 2022 and March 31, 2022 with a total treated flow of 7,544 m^3 (Table 5G). This captured total mass represents a minimum mass of PFAS captured by the SWTS during Q1 2022, since the samples collected are only analyzed for the three indicator compounds HFPO-DA, PFMOAA, and PMPA and not the full Table 3+ analyte list.

The in-river Total PFAS mass discharge calculated from samples collected in Q1 2022 are provided in Table 6, while those from previous quarters are presented in Appendix B. For Q1 2022, the Total Table 3+ mass discharge among samples with detected Total Table 3+ PFAS concentrations ranged from 0.32 milligrams per second (mg/s) (CFR-TARHEEL-24-021822) to 9.9 mg/s (CFR-TARHEEL-24-010322), with the median mass discharge being 2.4 mg/s.

The plots of Total Table 3+ concentrations over time are presented in Figure 7 and indicate that, generally, concentrations in the Cape Fear River are inversely correlated to river flow rate. That is, concentrations were higher when flow rates were lowest, while concentrations were lower when river flow rates were higher.

The plots of Total Table 3+ mass discharge since the beginning of the sampling program (March 28, 2020) are shown on Figure 8. Over this timeframe, the range of mass discharge across all samples with detected concentrations of Table 3+ PFAS was 0.32 mg/s (CFR-TARHEEL-24-021822) to 50.8 mg/s (CFR-TARHEEL-20-111220), though the mass discharges are typically between 1 and 20 mg/s with approximately 94% of the data falling within this range. Figure 8 shows that the measured mass discharges at CFR-TARHEEL in Q1 2022 and Q4 2021 are lower than previous results, particularly when compared to mass discharges before the seep FTC remedies were operational.

3.2 Measured Mass at Bladen Bluffs, Tar Heel Ferry Road Bridge and Kings Bluff Intake Canal

The Total Table 3+ concentrations and mass discharge values from the Q1 2022 event are shown in the table below. Total Table 3+ concentrations at the three downstream river locations ranged from 16 nanograms per liter (ng/L) (CFR-TARHEEL and CFR-BLADEN) to 24 ng/L (CFR-KINGS). The CFR-TARHEEL and CFR-BLADEN locations are located within 2 miles of each other and consequently often have similar sample results. Meanwhile, the CFR-KINGS location is located further away (i.e., 48 miles from the CFR-TARHEEL location). As per the *Cape Fear River Mass Loading Calculation Protocol Version 2* (Geosyntec 2020d), CFR-KINGS was sampled two days after CFR-TARHEEL and CFR-BLADEN to account for travel time between these two locations and CFR-KINGS.

As per the *Cape Fear River Mass Loading Calculation Protocol Version 2* (Geosyntec 2020d), flows reported at W.O. Huske Dam (Station #2105500) are adjusted for travel time and used in the calculation of mass discharge for CFR-TARHEEL and CFR-BLADEN. Flows reported at Cape Fear Lock and Dam #1 (Station #2105769) are used in the calculation of mass discharge for Kings Bluff.

The Total Table 3+ mass discharge ranged from 3.0 mg/s (CFR-TARHEEL and CFR-BLADEN) to 3.6 mg/s (CFR-KINGS). In Q1 2022, there is inherent variability associated with river sample collection due to changing flow rates, precipitation near the Site and along the course of the river, sample collection location, and grab sampling methods, which often leads to variability in the

PFAS mass discharge at these three locations. In Q1 2022, the mass discharge across the three downstream river locations was relatively consistent. The mass discharge at the downstream river locations was also consistently lower in Q1 2022 and Q4 2021 than in previous assessments, which may reflect the reduced mass discharge from the Site due to implemented remedies described in Section 3.

Sample Location	Sample Collection Month	Sample Collection Date	Flow Rate (cfs)	Total Table 3+	
				Concentration (ng/L)	Mass Discharge (mg/s)
CFR-BLADEN	January 2022	1/26/2022	6,560	16	3.0
CFR-TARHEEL		1/26/2022	6,560	16	3.0
CFR-KINGS		1/28/2022	5,350	24	3.6

4 CAPE FEAR RIVER PFAS MASS LOADING MODEL

Where Section 3 presented the Total Table 3+ PFAS mass load in the Cape Fear River, this section presents the estimation of mass discharge from the identified PFAS transport pathways using the mass loading model and an assessment of the relative contributions by pathway. The following subsections describe the transport pathways and the results of the Mass Loading Model assessment, including the sensitivity and the limitations of the Mass Loading Model.

4.1 PFAS Mass Loading Model Pathways

The nine potential pathways representing compartments to the PFAS Mass Loading Model are briefly described below and described in more detail in the *Cape Fear River PFAS Mass Loading Calculation Protocol Version 2* (Geosyntec, 2020d). The following pathways were identified as potential contributors of PFAS to the river PFAS concentrations:

- **Transport Pathway 1**: Upstream Cape Fear River and Groundwater – This pathway is comprised of contributions from non-Chemours related PFAS sources on the Cape Fear River and tributaries upstream of the Site, and upstream offsite groundwater with PFAS present from aerial deposition.
- **Transport Pathway 2**: Willis Creek – Groundwater and stormwater discharge and aerial deposition to Willis Creek and then to the Cape Fear River.
- **Transport Pathway 3**: Direct aerial deposition of PFAS on the Cape Fear River (see Appendix F for further details).
- **Transport Pathway 4**: Outfall 002 – Comprised of (i) water drawn from the Cape Fear River and used as non-contact cooling water, (ii) treated non-Chemours process water, (iii) Site stormwater, (iv) steam condensate, and (v) power neutralization discharge, which are then discharged through Outfall 002.
- **Transport Pathway 5**: Onsite Groundwater – Direct upwelling of onsite groundwater to the Cape Fear River from the Black Creek Aquifer (see Appendix E for further details).
- **Transport Pathway 6**: Seeps – Onsite groundwater seeps A, B, C and D and offsite Lock and Dam Seep above the Cape Fear River water level on the bluff face from the facility that discharge into the Cape Fear River.
- **Transport Pathway 7**: Old Outfall 002 – Groundwater discharge to Old Outfall 002 and stormwater runoff that flows into the Cape Fear River.
- **Transport Pathway 8**: Adjacent and Downstream Offsite Groundwater – Offsite groundwater adjacent and downstream of the Site upwelling to the Cape Fear River (see *Cape Fear River PFAS Mass Loading Calculation Protocol Version 2* [Geosyntec, 2020d] for further details).

- **Transport Pathway 9**: Georgia Branch Creek – Groundwater, stormwater discharge and aerial deposition to Georgia Branch Creek and then to the Cape Fear River.

For the Q1 2022 Mass Loading Model assessments, data sources used as model inputs for each potential pathway are described in Table 7. These data sources included flow measurements, water levels and analytical results from the Q1 2022 sampling event (as discussed in Appendix A) and supplemental data provided in Appendices B, E, and F.

4.2 Mass Loading Model Results

The Total PFAS mass discharges are summarized in Tables 8A and 8B. Analyte-specific mass discharges estimated from the Mass Loading Model are provided in Appendix B. A comparison of relative contributions per pathway for the Q1 2022 MLM assessments is provided in Table 9.

4.2.1 Reductions in Modeled Mass Discharge

The model estimated "Before Remedies" and "After Remedies" Total PFAS mass discharge values from the Q1 2022 event are provided in Tables 8A and 8B, respectively. The reduction in Total Table 3+ mass discharges after remedies, calculated as the difference between the Total Table 3+ mass discharges after remedies and the Total Table 3+ mass discharges before remedies, is summarized in the table below. Additionally, the operation of the Old Outfall 002 treatment system and Seep A, B, C, and D FTCs, were effective at reducing the Total Table 3+ mass discharge by 5.8 mg/s. More specifically, the reduction of mass discharge was 1.1 mg/s at Old Outfall 002; 1.7 mg/s at Seep A; 2.2 mg/s at Seep B, 0.19 mg/s at Seep C; and 0.55 mg/s at Seep D.

Pathway	After Remedies Reduction in Model-Estimated Total Table 3+ Mass Discharge (mg/s)[1]
	January 2022
Mass Discharge Reduction from Remedies	5.8
Old Outfall 002	1.1
Seep A	1.7
Seep B	2.2
Seep C	0.19
Seep D	0.55
Outfall 002[2]	--

1 - The after remedies reduction in Total Table 3+ mass discharges is the amount prevented from reaching the Cape Fear River due to the implemented remedies, calculated as the difference between the Total Table 3+ mass discharges after remedies and the Total Table 3+ mass discharges before remedies.

2 - The SWTS treats stormwater flows captured in the conveyance network surrounding the Monomers/IXM area that would otherwise flow to Outfall 002. There was no stormwater flow being treated by the SWTS during the January 2022 sampling event (January 26-27, 2022). Over the duration of Q1 when stormwater was flowing to the SWTS, it removed 99% or greater of HFPO-DA, PFMOAA, and PMPA from the influent flow.

Overall, the mass discharge reductions have increased in Q3 2021 through Q1 2022 compared to Q2 2021, since all four Seep FTCs and the SWTS became operational prior to Q3 2021. As discussed in Section 3.1, the four seep FTCs have been capturing and reducing the overall PFAS mass entering the Cape Fear River during Q1 2022.

4.2.2 Relative Contributions by Pathway

The relative contributions per pathway for the Q1 2022 MLM assessments is provided in Table 9. The most significant pathways before remediation occurs (i.e., upstream of the remedies) continue to be the Seeps (approximately 36%) and Onsite Groundwater (approximately 50 to 51%) for January 2022, which is consistent with previous events (Geosyntec, 2020b; Geosyntec, 2020c; Geosyntec, 2020e; Geosyntec, 2021c; Geosyntec, 2021d; Geosyntec, 2021e; Geosyntec, 2021f; Geosyntec, 2022b).

In previous assessments Old Outfall 002 and the Seeps were significant contributors to the total mass discharge. The implementation of the Old Outfall 002 treatment system has reduced the overall loading from Old Outfall 002 to less than 1% of the Total Table 3+ mass load reaching the Cape Fear River (Table 9). The implementation of the Seeps FTCs has also reduced the overall loading from the Seeps from 36% to approximately 4% of the Total Table 3+ mass load reaching the Cape Fear River (Table 9).

4.3 Mass Loading Model Sensitivities

As described in previous Cape Fear River PFAS Mass Loading Assessment reports (Geosyntec, 2020b; Geosyntec, 2020c; Geosyntec, 2020e; Geosyntec, 2021c; Geosyntec, 2021d; Geosyntec 2021e; Geosyntec, 2021f; Geosyntec, 2022b), the Mass Loading Model is a suitable tool to evaluate which PFAS transport pathways are significant contributors of mass to the Cape Fear River.

4.3.1 Variability in Input Parameters

The Mass Loading Model assessments provide PFAS mass discharge estimates and relative proportions of loadings for a 'snapshot' in time. While controlling for temporal variability, the model-based mass discharge estimates contain some level of uncertainty due to the inherent variability and measurement error in the input parameters, e.g., flow, concentrations, etc. To better understand the sensitivity of the model to the various pathway-specific input parameters, the uncertainties associated with the input parameters were used to conduct a sensitivity analysis in the Q1 2020 report (Geosyntec, 2020b), and the model sensitivity is being evaluated as site conditions change.

The ongoing sensitivity analysis has indicated that there are input parameters that are currently overestimating the mass loading to the river, including Segment 8 of the onsite groundwater term (Transport Pathway 5, see Appendix E). Additional wells being installed as part of the Performance Monitoring Plan (PMP) should improve the resolution on Segment 8 and reduce the uncertainty in the groundwater term.

5 SUMMARY

Two sampling programs were conducted in Q1 2022:

- The PFAS Mass Load Sampling program consisting of 23 composite samples and 3 grab samples collected at the Tar Heel Ferry Road Bridge. The analytical results of these samples were used to calculate the in-river PFAS mass loads in the Cape Fear River during the reporting period and to calculate the Baseline Mass Load.
- The PFAS Mass Loading Model Sampling program collected 45 water samples from the PFAS transport pathways and receptors (seeps, creeks, Old Outfall, Outfall 002, groundwater and Cape Fear River) and paired water flow measurements and estimates. These data were used to assess the relative loadings per transport pathway to the Cape Fear River using the PFAS Mass Loading Model for a sampling event in January 2022.

The Cape Fear River PFAS Mass Load assessment at CFR-TARHEEL estimated the Total PFAS that was either discharged or prevented from being discharged to the Cape Fear River over the load assessment period of January 1, 2022 through March 31, 2022. Over this period, 33.1 kg was the in-river Total Table 3+ mass load measured at CFR-TARHEEL and 37.9 kg was the Total Table 3+ mass load prevented from reaching the Cape Fear River due to the installation of remedies at Old Outfall 002, at Seeps A, B, C, and D, and at Outfall 002. In the last three quarters (i.e., Q1 2022, Q4 2021 and Q3 2021), the measured in-river mass load has been lower than the captured mass load.

The PFAS Mass Loading Model estimated “Before Remedies” and “After Remedies” mass discharge estimates from the PFAS transport pathways between January 26 to 28, 2022. Over this period, the implementation of remedies at the Old Outfall 002 and Seeps A, B, C, and D resulted in reductions of model-estimated mass discharges of about 5.8 mg/s. These reductions represent the estimate of reductions for a single mass loading event and are similar to model-estimated reductions reported in Q4 2022 (Geosyntec, 2022b).

In terms of relative contributions, the pathways with the largest PFAS mass discharges continue to be the Seeps (Transport Pathway 6) and Onsite Groundwater (Transport Pathway 5). Previous assessments (Geosyntec: 2020b; 2020c; 2020e; 2021c; 2021d; 2021e) indicated that Old Outfall 002 (Pathway 7) was also a contributor, where the Old Outfall 002 Before Remedies Load in Q1 2022 contributed between 6% and 10% of the potential Total Table 3+ mass load reaching the Cape Fear River. Implementation of the Old Outfall 002 treatment system has reduced this potential loading to less than 1% of the Total Table 3+ mass load reaching the Cape Fear River. The Seeps Before Remedies Load in Q1 2022 contributed approximately 36% of the potential Total Table 3+ mass load reaching the Cape Fear River. Remedy implementation at Seeps A, B, C, and D has reduced this potential loading to approximately 4% of the Total Table 3+ mass load reaching the Cape Fear River.

The intent of the Mass Loading Model is to estimate Table 3+ PFAS loading to the Cape Fear River over time and to evaluate changes in the loading that are the result of remedy implementation. Over the course of the Mass Loading Model evaluations, decreases have been observed in the in-river mass loads, as well as corresponding increases in the mass removed by the remedies. The remedy reduction mass loads are expected to increase following implementation of additional remedies onsite.

Quarterly sample collection was initiated in January 2022 and will continue for a period of four years (through Q4 2026), as outlined in the *Cape Fear River Mass Loading Calculation Protocol Version 2* (Geosyntec 2020d), as one year of monthly sampling of the mass loading model pathways per CO Paragraph 1(b) was completed in December 2021. Assessment of PFAS mass loads will continue in future sampling events, including evaluation of reductions in mass loads from the model pathways due to the implemented remedies and calculations of measured mass loads at CFR-TARHEEL.

6 REFERENCES

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Geosyntec consultants

Geosyntec Consultants of NC, P.C.
NC License No.: C-3500 and C-295

Tables

TABLE 1
PFAS ANALYTE LIST
Chemours Fayetteville Works, North Carolina

Common Name[1]	PFAS Grouping			Chemical Name	CASN	Chemical Formula
	Attachment C	Table 3+ (17 compounds)	Table 3+ (20 compounds)			
HFPO-DA[2]	✓	✓	✓	Hexafluoropropylene oxide dimer acid	13252-13-6	C6HF11O3
PEPA	✓	✓	✓	Perfluoro-2-ethoxypropionic acid	267239-61-2	C5HF9O3
PFECA-G	✓	✓	✓	Perfluoro-4-isopropoxybutanoic acid	801212-59-9	C12H9F9O3S
PFMOAA	✓	✓	✓	Perfluoro-2-methoxyacetic acid	674-13-5	C3HF5O3
PFO2HxA	✓	✓	✓	Perfluoro-3,5-dioxahexanoic acid	39492-88-1	C4HF7O4
PFO3OA	✓	✓	✓	Perfluoro-3,5,7-trioxaoctanoic acid	39492-89-2	C5HF9O5
PFO4DA	✓	✓	✓	Perfluoro-3,5,7,9-tetraoxadecanoic acid	39492-90-5	C6HF11O6
PMPA	✓	✓	✓	Perfluoro-2-methoxypropionic acid	13140-29-9	C4HF7O3
Hydro-EVE Acid	--	✓	✓	2,2,3,3-tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-[(1,2,2,2-tetrafluoroethyl)oxy]propan-2-yl}oxy)propionic acid	773804-62-9	C8H2F14O4
EVE Acid	--	✓	✓	2,2,3,3-tetrafluoro-3-({1,1,1,2,3,3-hexafluoro-3-[(1,2,2-trifluoroethenyl)oxy]propan-2-yl}oxy)propionic acid	69087-46-3	C8HF13O4
PFECA B	--	✓	✓	Perfluoro-3,6-dioxaheptanoic acid	151772-58-6	C5HF9O4
R-EVE	--	--	✓	Pentanoic acid, 4-(2-carboxy-1,1,2,2-tetrafluoroethoxy)-2,2,3,3,4,5,5,5-octafluoro-	2416366-22-6	C8H2F12O5
PFO5DA	✓	✓	✓	Perfluoro-3,5,7,9,11-pentaoxadodecanoic acid	39492-91-6	C7HF13O7
R-PSDA	--	--	✓	Pentanoic acid, 2,2,3,3,4,5,5,5-octafluoro-4-(1,1,2,2-tetrafluoro-2-sulfoethoxy)-	2416366-18-0	C7H2F12O6S
R-PSDCA	--	✓	✓	Ethanesulfonic acid, 1,1,2,2-tetrafluoro-2-[1,2,2,3,3-pentafluoro-1-(trifluoromethyl)propoxy]-	2416366-21-5	C6H2F12O4S
Hydrolyzed PSDA	--	--	✓	Acetic acid, 2-fluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2-tetrafluoro-2-sulfoethoxy)propoxy]-	2416366-19-1	C7H3F11O7S
NVHOS	--	✓	✓	1,1,2,2,4,5,5,5-heptafluoro-3-oxapentanesulfonic acid; or 2-(1,2,2,2-ethoxy)tetrafluoroethanesulfonic acid; or 1-(1,1,2,2-tetrafluoro-2-sulfoethoxy)-1,2,2,2-tetafluoroethane	801209-99-4	C4H2F8O4S
PES	--	✓	✓	Perfluoro-2-ethoxyethanesulfonic acid	113507-82-7	C4HF9O4S
PS Acid	✓	✓	✓	Ethanesulfonic acid, 2-[1-[difluoro[(1,2,2-trifluoroethenyl)oxy]methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoro-	29311-67-9	C7HF13O5S
Hydro-PS Acid	✓	✓	✓	Ethanesulfonic acid, 2-[1-[difluoro(1,2,2,2-tetrafluoroethoxy)methyl]-1,2,2,2-tetrafluoroethoxy]-1,1,2,2-tetrafluoro-	749836-20-2	C7H2F14O5S
PFHpA[2]	✓	--	--	Perfluoroheptanoic acid	375-85-9	C7HF13O2

Notes:
1 - Analyzed under analytical method Table 3+ Lab SOP.
2 - HFPO-DA and PFHpA can be analyzed under methods Table 3+ SOP and EPA Method 537 Mod.
EPA - Environmental Protection Agency
PFAS - Per- and Polyfluoroalkyl substances
SOP - Standard Operating Procedure

TABLE 2
SURFACE WATER SAMPLE COLLECTION AND FLOW MEASUREMENT SUMMARY
Chemours Fayetteville Works, North Carolina

Pathway / Location	Location ID	Location Description	January 2022	
			Sample Collection Method[1]	Flow Measurement Method[2]
Upstream River Water and Groundwater[3]	CFR-RM-76	Cape Fear River Mile 76	Grab	USGS Data
Willis Creek	WC-1	Mouth of Willis Creek	24-hour composite	Marsh-McBirney Flow
Intake River Water at Facility	INTAKE AT FACILITY	Water Drawn Through the Intake Sampled at the Power Area at the Site	24-hour composite	Facility DMRs
Outfall 002	Outfall 002	Outfall 002 in open channel	21-hour composite[4]	Facility DMRs
Stormwater Treatment System	STS DISCHARGE	Monomers/IXM Stormwater Treatment System Effluent	--[5]	--[5]
Seep A	SEEP-A-EFF	Effluent Basin of Seep A FTC	11-day composite[6]	--[7]
Seep B	SEEP-B-EFF	Effluent Basin of Seep B FTC	24-hour composite	FTC[8]
Seep C	SEEP-C-EFF	Effluent Basin of Seep C FTC	11-day composite[9]	Flume
Seep D	SEEP-D-EFF	Effluent Basin of Seep D FTC	24-hour composite	Flume
Lock and Dam Seep	LOCK-DAM SEEP	Southside of the boat ramp at the Lock and Dam Seep	Grab	Bucket and timer
Lock and Dam North	LOCK-DAM-NORTH	Northside of the boat ramp at the Lock and Dam Seep	--[10]	--[10]
Old Outfall 002	OLDOF-1	Mouth of Old Outfall 002	19-hour composite[11]	Marsh-McBirney Flow
Georgia Branch Creek	GBC-1	Mouth of Georgia Branch Creek	Grab	Marsh-McBirney Flow
Tar Heel Ferry Road Bridge[3]	CFR-TARHEEL	Cape Fear River at Tar Heel Ferry Road Bridge	Grab	USGS Data
Bladen Bluffs[3]	CFR-BLADEN	Cape Fear River at Bladen Bluffs	Grab	USGS Data
Kings Bluffs[12]	CFR-KINGS	Cape Fear River at Kings Bluff Raw Water	Grab	USGS Data

Notes:

1 - Samples analyzed for PFAS by EPA Method 537 Mod and Table 3+ Lab SOP.

2 - Estimated flow results are included in Appendix A Table A3. Supplemented flow measurement data are included in Appendix B.

3 - USGS data measurements were recorded from the USGS flow gauging station at the W.O. Huske Dam, ID 02105500 (USGS, 2022).

4 - The ISCO experienced an error and did not collect sample for the final three hours.

5 - No sample was collected and flow was not measured at the Stormwater Treatment System because there was no flow at that location during the sampling event.

6 - The 11-day composite sample from the Seep FTC Sampling event was used instead because there was maintenance occurring at Seep A during the 24-hour composite sampling.

7 - Instantaneous flows were estimated using median wet weather flows measured at the Seep A flume during Q1 2020 (Geosyntec, 2021b) because there were flume damage and channel blockage at Seep A from a 4-inch rainfall.

8 - The flows from Seep B FTC were used instead because the flume was flooded from high river levels during the sampling event.

9 - The 11-day composite sample from the Seep Flow Through Cell Sampling event was used instead because the Seep C FTC was clogged during the 24-hour composite sampling.

10 - A sample was not collected and flow was not measured at Lock and Dam Seep North since the location was flooded during the sampling event.

11 - The ISCO experienced an error and did not collect sample for the final five hours.

12 - Flow rate measured at USGS gauging station #02105769 located at Lock #1 near Kelly used to estimate flow rate at Kings Bluff.

-- - not measured

DMRs - Discharge Monitoring Reports

EPA - Environmental Protection Agency

USGS - United States Geological Survey

FTC - Flow-through cell

PFAS - per- and polyfluoroalkyl substances

ISCO - In situ Chemical Oxidation

TABLE 3

Geosyntec Consultants of NC, P.C.

GROUNDWATER MONITORING WELL SAMPLE COLLECTION AND WATER LEVEL MEASUREMENT SUMMARY

Chemours Fayetteville Works, North Carolina

Area	Water Bearing Unit[1]	Well ID	Adjacent Surface Water Feature	January 2022	
				Sample Collection Date	Synoptic Water Level Date
Onsite	Floodplain	LTW-01	Cape Fear River	1/25/2022	1/6/2022
Onsite	Black Creek	LTW-02	Cape Fear River	1/25/2022	1/6/2022
Onsite	Floodplain	LTW-03	Cape Fear River	1/25/2022	1/6/2022
Onsite	Floodplain	LTW-04	Cape Fear River	1/18/2022	1/6/2022
Onsite	Black Creek	LTW-05	Cape Fear River	1/18/2022	1/6/2022
Onsite	Surficial	PIW-1D	Cape Fear River / Willis Creek	1/24/2022	1/6/2022
Onsite	Floodplain	PIW-1S	Cape Fear River / Willis Creek	1/24/2022	1/6/2022
Onsite	Black Creek	PIW-3D	Cape Fear River	1/25/2022	1/6/2022
Onsite	Black Creek	PIW-7D	Cape Fear River	1/18/2022	1/6/2022
Onsite	Floodplain	PIW-7S	Cape Fear River	1/18/2022	1/6/2022
Onsite	Surficial	PW-04	Old Outfall	1/25/2022	1/6/2022
Onsite	Surficial	PW-06	Georgia Branch Creek	1/13/2022	1/6/2022
Onsite	Surficial	PW-07	Georgia Branch Creek	1/27/2022	1/6/2022
Onsite	Black Creek	PW-09	Willis Creek	1/7/2022	1/6/2022
Onsite	Black Creek	PW-11[2]	Old Outfall	--[2]	1/6/2022
Onsite	Black Creek	PZ-22	Cape Fear River	1/18/2022	1/6/2022
Onsite	Surficial	SMW-10	Willis Creek	1/7/2022	1/6/2022
Onsite	Surficial	SMW-11	Willis Creek	1/13/2022	1/6/2022
Onsite	Black Creek	SMW-12	Willis Creek	1/24/2022	1/6/2022
Offsite	Black Creek	Bladen-1D[3]	Georgia Branch Creek	--[3]	1/6/2022

Notes:

1 - Water Bearing Unit - refers to the primary aquifer unit where the well screen is estimated to be located.

2 - PW-11 could not be sampled in Q1 2022 because it was being pumped as part of the Black Creek interim pumping program.

3 - Bladen-1D is damaged and could not be sampled in Q1 2022.

-- - Sample not collected

TABLE 4
SUMMARY OF CALCULATED TOTAL MASS LOAD IN THE CAPE FEAR RIVER
Chemours Fayetteville Works, North Carolina

Reporting Period[1]	Reporting Period Details				Total Attachment C[2]		
	Start Date	End Date	Days	River volume (m^3)	Projected Load to Cape Fear River (kg)[4]	Remedy Reduction Loads (kg)[5]	Measured Load in Cape Fear River (kg)[6]
2021-Q2	3/31/21 23:01	7/1/21 23:01	92	701,860,000	118.5	43.3	75.1
2021-Q3	7/1/21 23:01	9/30/21 23:01	91	590,440,000	96.7	58.0	38.7
2021-Q4	9/30/21 23:01	12/30/21 23:01	91	275,300,000	61.1	43.9	17.2
2022-Q1	12/30/21 23:01	3/31/22 23:01	91	1,442,100,000	68.6	37.5	31.1

Notes:

1 - Calculated total mass loads by compound and time interval are provided in Tables 5A though 5G for 2022 Q1 and in Appendix B for previous reporting periods.

2 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include Perfluoroheptanoic acid (PFHpA), R-PSDA, Hydrolyzed PSDA, and R-EVE.

4 - Projected load to the Cape Fear River represents baseline load that would reach the Cape Fear River in the absence of any remedies. This is calculated as the total of the measured load in the Cape Fear River and the calculated remedy reduction load.

5 - Calculated remedy reduction loads represent the total load that was prevented from reaching the Cape Fear River. This is calculated as the total load from Old Outfall 002, Seeps A to D and the Stormwater Treatment System.

6 - Measured load in Cape Fear River represent loads measured in the Cape Fear River at the CFR-TARHEEL sampling location downstream of the Site.

kg - kilograms
m^3 - cubic meters

TABLE 4

SUMMARY OF CALCULATED TOTAL MASS LOAD IN THE CAPE FEAR RIVER

Chemours Fayetteville Works, North Carolina

Reporting Period[1]	Reporting Period Details				Total Table 3+ (17 Compounds)[3]		
	Start Date	End Date	Days	River volume (m^3)	Projected Load to Cape Fear River (kg)[4]	Remedy Reduction Loads (kg)[5]	Measured Load in Cape Fear River (kg)[6]
2021-Q2	3/31/21 23:01	7/1/21 23:01	92	701,860,000	121.1	43.9	77.2
2021-Q3	7/1/21 23:01	9/30/21 23:01	91	590,440,000	99.4	58.8	40.6
2021-Q4	9/30/21 23:01	12/30/21 23:01	91	275,300,000	63.5	44.7	18.7
2022-Q1	12/30/21 23:01	3/31/22 23:01	91	1,442,100,000	70.9	37.9	33.1

Notes:

1 - Calculated total mass loads by compound and time interval are provided in Tables 5A though 5G for 2022 Q1 and in Appendix B for previous reporting periods.

2 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include Perfluoroheptanoic acid (PFHpA), R-PSDA, Hydrolyzed PSDA, and R-EVE.

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6 - Measured load in Cape Fear River represent loads measured in the Cape Fear River at the CFR-TARHEEL sampling location downstream of the Site.

kg - kilograms

m^3 - cubic meters

TABLE 4
SUMMARY OF CALCULATED TOTAL MASS LOAD IN THE CAPE FEAR RIVER
Chemours Fayetteville Works, North Carolina

Reporting Period[1]	Reporting Period Details				Total Table 3+ (20 Compounds)		
	Start Date	End Date	Days	River volume (m^3)	Projected Load to Cape Fear River (kg)[4]	Remedy Reduction Loads (kg)[5]	Measured Load in Cape Fear River (kg)[6]
2021-Q2	3/31/21 23:01	7/1/21 23:01	92	701,860,000	152.6	46.8	105.8
2021-Q3	7/1/21 23:01	9/30/21 23:01	91	590,440,000	112.3	63.6	48.7
2021-Q4	9/30/21 23:01	12/30/21 23:01	91	275,300,000	72.2	50.1	22.1
2022-Q1	12/30/21 23:01	3/31/22 23:01	91	1,442,100,000	81.9	41.9	40.0

Notes:

1 - Calculated total mass loads by compound and time interval are provided in Tables 5A though 5G for 2022 Q1 and in Appendix B for previous reporting periods.

2 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include Perfluoroheptanoic acid (PFHpA), R-PSDA, Hydrolyzed PSDA, and R-EVE.

4 - Projected load to the Cape Fear River represents baseline load that would reach the Cape Fear River in the absence of any remedies. This is calculated as the total of the measured load in the Cape Fear River and the calculated remedy reduction load.

5 - Calculated remedy reduction loads represent the total load that was prevented from reaching the Cape Fear River. This is calculated as the total load from Old Outfall 002, Seeps A to D and the Stormwater Treatment System.

6 - Measured load in Cape Fear River represent loads measured in the Cape Fear River at the CFR-TARHEEL sampling location downstream of the Site.

kg - kilograms
m^3 - cubic meters

TABLE 5A
CAPE FEAR RIVER PFAS MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details				Calculated Mass Load [2] (kg)																						
Interval ID	Start Time [1]	End Time [1]	Total River Flow (m^3)	HFPO-DA	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	PFHpA	Total Attachment C[3]	Total Table 3+ (17 Compounds)[4]	Total Table 3+ (20 Compounds)
2022_1_Q1	12/30/21 23:01	1/2/22 0:01	6,663,350	0.071	0.15	0.083	0.019	0	0	0.10	0	0	0	0.016	0.030	0	0.022	0	0	0	0	0	0	0.026	0.4	0.4	0.5
2022_2_Q1	1/2/22 0:01	1/2/22 23:01	4,747,631	0.044	0.076	0.052	0.013	0	0	0.07	0	0	0	0	0.016	0	0.015	0	0	0	0	0	0	0.016	0.3	0.3	0.3
2022_3_Q1	1/2/22 23:01	1/3/22 23:01	8,548,998	0.18	0.24	0.17	0.045	0	0	0.18	0	0	0	0.053	0.12	0	0.035	0	0	0	0	0	0	0.029	0.8	0.8	1.0
2022_4_Q1	1/3/22 23:01	1/11/22 0:01	204,788,058	2.6	3.9	2.6	0.54	0	0	2.2	0	0	0	0.92	1.8	0	0.42	0	0	0	0	0	0	0.75	12	12	15
2022_5_Q1	1/11/22 0:01	1/11/22 23:01	12,376,614	0.053	0.12	0.064	0	0	0	0	0	0	0	0.03	0.041	0	0	0	0	0	0	0	0	0.048	0.2	0.2	0.3
2022_6_Q1	1/11/22 23:01	1/13/22 0:01	17,190,506	0.069	0.086	0.085	0	0	0	0	0	0	0	0.04	0.047	0	0	0	0	0	0	0	0	0.069	0.2	0.2	0.3
2022_7_Q1	1/13/22 0:01	1/13/22 23:01	14,486,276	0.054	0	0.068	0	0	0	0	0	0	0	0.03	0.032	0	0	0	0	0	0	0	0	0.059	0.1	0.1	0.2
2022_8_Q1	1/13/22 23:01	1/19/22 0:01	61,867,779	0.22	0.16	0.24	0	0	0	0	0	0	0	0.15	0.15	0	0	0	0	0	0	0	0	0.26	0.6	0.6	0.9
2022_9_Q1	1/19/22 0:01	1/19/22 23:01	17,235,105	0.059	0.087	0.062	0	0	0	0	0	0	0	0.04	0.022	0	0	0	0	0	0	0	0	0.072	0.2	0.2	0.3
2022_10_Q1	1/19/22 23:01	1/20/22 14:01	10,391,575	0.030	0.053	0.032	0	0	0	0	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0.037	0.1	0.1	0.1
2022_11_Q1	1/20/22 14:01	1/25/22 0:01	80,800,706	0.29	0.21	0.27	0	0	0	0	0	0	0	0.11	0	0	0	0	0	0	0	0	0	0.30	0.8	0.8	0.9
2022_12_Q1	1/25/22 0:01	1/25/22 23:01	16,923,167	0.071	0	0.063	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.064	0.1	0.1	0.1
2022_13_Q1	1/25/22 23:01	1/26/22 12:54	9,641,037	0.040	0.033	0.043	0	0	0	0	0	0	0	0	0.014	0	0.010	0	0	0	0	0	0	0.039	0.1	0.1	0.1
2022_14_Q1	1/26/22 12:54	1/27/22 11:54	14,657,536	0.062	0.10	0.076	0	0	0	0	0	0	0	0	0.044	0	0.031	0	0	0	0	0	0	0.063	0.2	0.3	0.3
2022_15_Q1	1/27/22 11:54	1/28/22 0:01	6,759,429	0.030	0.050	0.034	0	0	0	0.034	0	0	0	0	0.010	0	0.007	0	0	0	0	0	0	0.028	0.1	0.2	0.2
2022_16_Q1	1/28/22 0:01	1/28/22 23:01	10,674,715	0.051	0.085	0.053	0	0	0	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0.043	0.3	0.3	0.3
2022_17_Q1	1/28/22 23:01	1/31/22 0:01	14,213,075	0.081	0.15	0.086	0	0	0	0.16	0	0	0	0	0.021	0	0.020	0	0	0	0	0	0	0.062	0.5	0.5	0.5
2022_18_Q1	1/31/22 0:01	1/31/22 23:01	5,886,053	0.039	0.077	0.042	0	0	0	0.077	0	0	0	0	0.017	0	0.016	0	0	0	0	0	0	0.028	0.2	0.3	0.3
2022_19_Q1	1/31/22 23:01	2/3/22 0:01	11,973,184	0.089	0.19	0.11	0.022	0	0	0.17	0	0	0	0	0.040	0	0.033	0	0	0	0	0	0	0.051	0.6	0.6	0.7
2022_20_Q1	2/3/22 0:01	2/3/22 23:01	5,202,286	0.043	0.10	0.057	0.019	0	0	0.078	0	0	0	0	0.020	0	0.014	0	0	0	0	0	0	0.020	0.3	0.3	0.3
2022_21_Q1	2/3/22 23:01	2/7/22 0:01	19,595,286	0.12	0.27	0.15	0.036	0	0	0.26	0	0	0	0	0.058	0	0.066	0	0	0	0	0	0	0.083	0.9	0.9	1.0
2022_22_Q1	2/7/22 0:01	2/7/22 23:01	9,708,063	0.042	0.089	0.048	0	0	0	0.11	0	0	0	0.01	0.022	0	0.038	0	0	0	0	0	0	0.046	0.3	0.3	0.4
2022_23_Q1	2/7/22 23:01	2/11/22 0:01	49,173,875	0.19	0.36	0.21	0	0	0	0.30	0	0	0	0	0.052	0	0.098	0	0	0	0	0	0	0.22	1.1	1.2	1.2
2022_24_Q1	2/11/22 0:01	2/11/22 23:01	12,978,828	0.047	0.071	0.047	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.055	0.2	0.2	0.2
2022_25_Q1	2/11/22 23:01	2/14/22 0:01	15,094,861	0.067	0.10	0.082	0	0	0	0.083	0	0	0	0	0.017	0	0.025	0	0	0	0	0	0	0.058	0.3	0.4	0.4
2022_26_Q1	2/14/22 0:01	2/14/22 23:01	5,535,377	0.029	0.043	0.040	0	0	0	0.061	0	0	0	0	0.013	0	0.018	0	0	0	0	0	0	0.019	0.2	0.2	0.2
2022_27_Q1	2/14/22 23:01	2/18/22 0:01	15,776,844	0.042	0.061	0.10	0	0	0	0.087	0	0	0	0	0.018	0	0.026	0	0	0	0	0	0	0.028	0.3	0.3	0.3
2022_28_Q1	2/18/22 0:01	2/18/22 23:01	4,735,143	0	0	0.027	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03	0.03	0.03
2022_29_Q1	2/18/22 23:01	2/26/22 0:01	33,417,928	0	0	0.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.057	0.2	0.2	0.2
2022_30_Q1	2/26/22 0:01	2/26/22 23:01	6,174,035	0	0	0.043	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.021	0.04	0.04	0.04
2022_31_Q1	2/26/22 23:01	2/27/22 23:01	9,199,889	0	0	0.035	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.029	0.03	0.03	0.03
2022_32_Q1	2/27/22 23:01	2/28/22 23:01	10,643,878	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022_33_Q1	2/28/22 23:01	3/3/22 0:01	24,555,718	0.036	0	0.05	0	0	0	0	0	0	0	0.15	0.025	0	0.063	0	0	0.058	0	0	0	0.059	0.1	0.1	0.4
2022_34_Q1	3/3/22 0:01	3/3/22 23:01	10,699,436	0.031	0	0.04	0	0	0	0	0	0	0	0.13	0.021	0	0.055	0	0	0.050	0	0	0	0.051	0.1	0.1	0.3
2022_35_Q1	3/3/22 23:01	3/7/22 0:01	16,598,996	0.081	0.091	0.10	0.017	0	0	0	0	0	0	0.19	0.041	0	0.090	0	0	0.079	0	0	0	0.080	0.3	0.4	0.7
2022_36_Q1	3/7/22 0:01	3/7/22 23:01	3,841,633	0.026	0.042	0.032	0.008	0	0	0	0	0	0	0.04	0.011	0	0.022	0	0	0.018	0	0	0	0.018	0.1	0.1	0.2
2022_37_Q1	3/7/22 23:01	3/10/22 23:01	12,345,522	0.089	0.15	0.12	0.030	0	0	0.13	0	0	0	0.12	0.044	0	0.087	0	0	0.066	0	0	0	0.055	0.5	0.6	0.8
2022_38_Q1	3/10/22 23:01	3/17/22 12:30	205,183,587	0.93	1.2	1.2	0.236	0	0	1.0	0	0	0	1.0	0.36	0	0.698	0	0	0.53	0	0	0	0.81	4.7	5.4	7.3
2022_39_Q1	3/17/22 12:30	3/18/22 9:00	39,619,233	0.042	0	0.052	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0.1	0.1	0.1
2022_40_Q1	3/18/22 9:00	3/22/22 9:10	206,215,736	0.36	0.92	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.67	1.8	1.8	1.8
2022_41_Q1	3/22/22 9:10	3/23/22 8:10	23,996,574	0.084	0.21	0.11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.072	0.4	0.4	0.4
2022_42_Q1	3/23/22 8:10	3/24/22 13:05	25,746,385	0.084	0.16	0.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.079	0.3	0.3	0.3
2022_43_Q1	3/24/22 13:05	3/29/22 0:01	101,425,847	0.27	0.32	0.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.35	0.9	0.9	0.9

TABLE 5A
CAPE FEAR RIVER PFAS MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details				Calculated Mass Load [2] (kg)																						
Interval ID	**Start Time [1]**	**End Time [1]**	**Total River Flow (m^3)**	HFPO-DA	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	PFHpA	**Total Attachment C[3]**	**Total Table 3+ (17 Compounds)[4]**	**Total Table 3+ (20 Compounds)**
2022_44_Q1	3/29/22 0:01	3/29/22 23:01	18,757,589	0.043	0.058	0.049	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.073	0.2	0.2	0.2
2022_45_Q1	3/29/22 23:01	3/31/22 0:01	14,136,874	0.037	0.047	0.042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.053	0.1	0.1	0.1
2022_46_Q1	3/31/22 0:01	3/31/22 23:01	11,889,083	0.034	0.042	0.040	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.043	0.1	0.1	0.1
Q1 2022 Total	**12/30/21 23:01**	**3/31/22 23:01**	***1,442,073,301***	***6.9***	***10***	***8.0***	***1.0***	***0***	***0***	***5.2***	***0***	***0***	***0***	***3.1***	***3.1***	***0***	***1.9***	***0***	***0***	***0.80***	***0***	***0***	***0***	***5.2***	***31.1***	***33.1***	***40.0***

Notes

1 - Start and end times are adjusted based on sampling times ± one hour to account for the total flow of the Cape Fear River.

2 - The calculated mass load is a product of weighted concentration and total river flow. Refer to the Cape Fear River PFAS Mass Loading Calculation Protocol Version 2 (Geosyntec, 2020d) for more details.

3 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).

4 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

Where mass loads are equal to 0 kg, the compound was not detected above the reporting limit.

kg - kilogram

m^3 - cubic meter

TABLE 5B
OLD OUTFALL 002 CAPTURED MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details					Calculated Captured Mass Load (kg)[1]																				
Interval ID	Start Time	End Time	Duration (hours)	Total Flow (m^3)	HFPO-DA	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)
OF003_2022_1_Q1	1/1/22 0:00	1/31/22 23:59	744	90,000	0.46	1.3	0.60	0.19	0.077	0.037	0.26	0.11	0.040	0.022	0	0.085	0.00060	0.023	0.0019	0.012	0.015	0	0	0	3.1	3.2	3.3
OF003_2022_2_Q1	2/1/22 0:00	2/28/22 23:59	672	80,000	0.37	1.8	0.57	0.16	0.068	0.034	0.17	0.093	0.035	0.019	0.033	0.11	0.00053	0.020	0.0016	0.010	0.016	0	0	0	3.3	3.3	3.5
OF003_2022_3_Q1	3/1/22 0:00	3/31/22 23:59	744	80,000	0.48	1.6	0.59	0.17	0.078	0.041	0.16	0	0.043	0.022	0.033	0.12	0	0	0	0	0.023	0	0	0	3.2	3.2	3.4
		Total	**250,000**	**1.3**	**4.7**	**1.8**	**0.51**	**0.22**	**0.11**	**0.6**	**0.21**	**0.12**	**0.062**	**0.067**	**0.32**	**0.0011**	**0.044**	**0.0035**	**0.022**	**0.054**	**0**	**0**	**0**	**9.7**	**9.8**	**10**

Notes:

1 - The calculated captured mass load is a product of the concentration difference in the influent and the effluent samples and total flow at the influent for the sampling interval, see Appendix B for more details.

2 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

Where mass loads are equal to 0 kg, the compound was not detected above the reporting limit.

OF003 - Outfall 003, i.e., Old Outfall 002 treatment system

kg - kilogram

m^3 - cubic meter

TABLE 5C
SEEP A FLOW THROUGH CELL CAPTURED MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details					Calculated Captured Mass Load (kg)[1]																					
Interval ID	Start Time	End Time	Duration (hours)	Total Flow (m^3)	Hfpo Dimer Acid	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)
SeepA_2022_1_Q1	1/1/22 0:00	1/8/22 23:01	191	1,554	0.03	0.1	0.05	0.02	0.01	0.006	0.02	0.009	0.003	0.002	0.003	0.03	0.0001	0.002	0.0004	0.002	0.001	0	0	0	0.3	0.3	0.3
SeepA_2022_2_Q1	1/8/22 23:02	1/15/22 23:01	168	3,970	0.10	0.3	0.1	0.05	0.03	0.01	0.06	0.02	0.006	0.005	0.009	0.1	0.0002	0.004	0.001	0.006	0.004	0	0	0	0.7	0.7	0.8
SeepA_2022_3_Q1	1/15/22 23:02	1/31/22 20:00	381	8,123	0.16	0.4	0.2	0.07	0.04	0.02	0.07	0.03	0.01	0.006	0.0004	0.04	0.0002	0.006	0.002	0.008	0.0005	0	0	0	1.0	1.0	1.1
SeepA_2022_4_Q1	1/31/22 20:01	2/20/22 15:00	475	9,498	0.19	0.6	0.3	0.1	0.06	0.03	0.1	0.05	0.007	0.01	0.02	0.2	0.0009	0.010	0.001	0.01	0.009	0	0	0	1.6	1.6	1.8
SeepA_2022_5_Q1	2/20/22 15:01	2/23/22 17:00	74	1,714	0.03	0.1	0.06	0.02	0.01	0.006	0.02	0.009	0.001	0.002	0.004	0.04	0.0002	0.002	0.0002	0.003	0.001	0	0	0	0.3	0.3	0.3
SeepA_2022_6_Q1	2/23/22 17:01	2/24/22 17:00	24	280	0.01	0.02	0.01	0.004	0.003	0.001	0.004	0.002	0.0001	0.0004	0.0009	0.01	0.00003	0.0003	0.00002	0.0004	0.0004	0	0	0	0.05	0.05	0.06
SeepA_2022_7_Q1	2/24/22 17:01	2/25/22 17:00	24	198	0.004	0.01	0.007	0.002	0.002	0.0008	0.003	0.001	0.0001	0.0002	0.0005	0.006	0.00002	0.0002	0.00001	0.0003	0.0002	0	0	0	0.03	0.03	0.04
SeepA_2022_8_Q1	2/25/22 17:01	3/14/22 4:00	395	6,581	0.1	0.3	0.2	0.06	0.03	0.02	0.06	0.02	0.01	0.006	0.01	0.1	0.0002	0.005	0.002	0.007	0.005	0	0	0	0.8	0.8	0.9
SeepA_2022_9_Q1	3/14/22 4:01	3/26/22 19:00	303	4,547	0.09	0.3	0.1	0.05	0.03	0.01	0.05	0.02	0.008	0.005	0	0.07	0	0.005	0.001	0.005	0	0	0	0	0.7	0.7	0.8
SeepA_2022_10_Q1	3/26/22 19:01	3/31/22 23:59	125	2,313	0.05	0.1	0.09	0.03	0.02	0.01	0.03	0.01	0.002	0.003	0.005	0.05	0	0.003	0.0002	0.003	0.002	0	0	0	0.4	0.4	0.5
		Total		**38,779**	**0.8**	**2.3**	**1.2**	**0.4**	**0.2**	**0.1**	**0.5**	**0.2**	**0.05**	**0.04**	**0.05**	**0.7**	**0.002**	**0.04**	**0.007**	**0.05**	**0.02**	**0**	**0**	**0**	**5.8**	**5.8**	**6.6**

Notes:

1 - The calculated captured mass load is a product of the concentration difference in the influent and the effluent samples and total flow recorded at the influent for the sampling interval, see Appendix B for more details.

2 - Total Attachment C does not include Perfluorohepthanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

Where mass loads are equal to 0 kg, the compound was not detected above the reporting limit.

kg - kilogram

m^3 - cubic meter

TABLE 5D
SEEP B FLOW THROUGH CELL CAPTURED MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details					Calculated Captured Mass Load (kg)[1]																					
Interval ID	Start Time	End Time	Duration (hours)	Total Flow (m^3)	Hfpo Dimer Acid	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)
SeepB_2022_1_Q1	1/1/22 0:00	1/8/22 23:01	191	4,554	0.1	0.3	0.1	0.03	0.005	0.002	0.1	0.07	0.005	0.004	0.01	0.09	0.0002	0.01	0.005	0.01	0.009	0	0	0	0.7	0.8	0.9
SeepB_2022_2_Q1	1/8/22 23:02	1/15/22 23:01	168	2,769	0.08	0.2	0.08	0.02	0.004	0.0006	0.08	0.04	0.001	0.002	0.009	0.06	0.0001	0.01	0.0009	0.00	0.005	0	0	0	0.5	0.5	0.6
SeepB_2022_3_Q1	1/15/22 23:02	1/31/22 20:00	381	13,242	0.4	1.0	0.3	0.08	0.02	0.003	0.4	0.2	0.012	0.01	0.009	0.1	0.0006	0.02	0.009	0.02	0.007	0	0	0	2.4	2.5	2.6
SeepB_2022_4_Q1	1/31/22 20:01	2/15/22 8:00	348	12,515	0.3	1.1	0.4	0.1	0.02	0.003	0.4	0.2	0.004	0.01	0.04	0.4	0.0005	0.03	0.004	0.02	0.03	0	0	0	2.5	2.5	3.0
SeepB_2022_5_Q1	2/15/22 8:01	3/1/22 8:00	336	15,999	0.4	1.6	0.7	0.2	0.03	0.004	0.5	0.2	0.003	0.01	0.07	0.6	0.0016	0.03	0.002	0.02	0.04	0	0	0	3.5	3.5	4.3
SeepB_2022_6_Q1	3/1/22 8:01	3/14/22 10:00	314	15,853	0.4	1.7	0.6	0.2	0.03	0.003	0.4	0.2	0.008	0.01	0.05	0.4	0.0007	0.03	0.007	0.02	0.03	0	0	0	3.6	3.6	4.3
SeepB_2022_7_Q1	3/14/22 10:01	3/26/22 19:00	297	9,807	0.2	1.3	0.4	0.08	0.02	0	0.2	0.09	0.004	0.007	0.03	0.2	0	0.02	0.003	0.01	0.02	0	0	0	2.3	2.3	2.5
SeepB_2022_8_Q1	3/26/22 19:01	3/31/22 23:59	125	4,664	0.1	0.5	0.2	0.05	0.009	0	0.1	0.06	0.002	0.003	0.01	0.1	0	0.01	0.001	0.006	0.007	0	0	0	1.0	1.0	1.2
		Total		**79,403**	**2.1**	**7.6**	**2.8**	**0.7**	**0.1**	**0.01**	**2.2**	**1.0**	**0.04**	**0.06**	**0.2**	**2.0**	**0.004**	**0.2**	**0.03**	**0.1**	**0.1**	**0**	**0**	**0**	**17**	**17**	**19**

Notes:

1 - The calculated captured mass load is a product of the concentration difference in the influent and the effluent samples and total flow recorded at the influent for the sampling interval, see Appendix B for more details.

2 - Total Attachment C does not include Perfluorohepthanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

Where mass loads are equal to 0 kg, the compound was not detected above the reporting limit.

kg - kilogram

m^3 - cubic meter

TABLE 5E
SEEP C FLOW THROUGH CELL CAPTURED MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details					Calculated Captured Mass Load (kg)[1]																				
Interval ID	Start Time	End Time	Duration (hours)	Total Flow (m^3)	Hfpo Dimer Acid	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)
SeepC_2022_1_Q1	1/1/22 0:00	1/8/22 23:01	191	380	0.005	0.01	0.006	0.002	0.0007	0	0.003	0.0009	0	0.0001	0.0003	0.0002	0	0.0002	0	0.0003	0.0002	0	0	0	0.03	0.03	0.03
SeepC_2022_2_Q1	1/8/22 23:02	1/15/22 23:01	168	1,687	0.03	0.06	0.03	0.009	0.003	0.0002	0.01	0.004	0	0.0005	0.001	0.001	0	0.0009	0	0.002	0.0009	0	0	0	0.1	0.1	0.1
SeepC_2022_3_Q1	1/15/22 23:02	1/31/22 20:00	381	3,543	0.05	0.1	0.05	0.01	0.006	0.0004	0	0.005	0	0.0007	0	0	0	0	0	0.002	0	0	0	0	0.2	0.3	0.3
SeepC_2022_4_Q1	1/31/22 20:01	2/15/22 8:00	348	2,533	0.03	0.09	0.04	0.01	0.004	0	0.02	0.005	0	0.0007	0.001	0.002	0	0.001	0	0.002	0.001	0	0	0	0.2	0.2	0.2
SeepC_2022_5_Q1	2/15/22 8:01	3/1/22 8:00	336	1,291	0.02	0.05	0.03	0.009	0.004	0	0.01	0.004	0	0.0004	0.001	0.002	0.0001	0.0007	0	0.001	0.001	0	0	0	0.1	0.1	0.1
SeepC_2022_6_Q1	3/1/22 8:01	3/14/22 10:00	314	2,946	0.04	0.1	0.05	0.02	0.006	0	0.02	0.006	0	0.0008	0.002	0.003	0	0.002	0	0.003	0.002	0	0	0	0.3	0.3	0.3
SeepC_2022_7_Q1	3/14/22 10:01	3/26/22 19:00	297	1,180	0.02	0.05	0.02	0.006	0.002	0	0.008	0.002	0	0.0004	0.0008	0.0009	0	0.0006	0	0.001	0.0007	0	0	0	0.1	0.1	0.1
SeepC_2022_8_Q1	3/26/22 19:01	3/31/22 23:59	125	1,207	0.02	0.06	0.03	0.009	0.003	0.0001	0.010	0.003	0	0.0004	0.001	0.001	0	0.0008	0	0.001	0.0009	0	0	0	0.1	0.1	0.1
		Total		**14,768**	**0.2**	**0.6**	**0.3**	**0.08**	**0.03**	**0.0006**	**0.08**	**0.03**	**0**	**0.004**	**0.008**	**0.009**	**0.0001**	**0.006**	**0**	**0.01**	**0.007**	**0**	**0**	**0**	**1.2**	**1.3**	**1.3**

Notes:

1 - The calculated captured mass load is a product of the concentration difference in the influent and the effluent samples and total flow recorded at the influent for the sampling interval, see Appendix B for more details.

2 - Total Attachment C does not include Perfluorohepthanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

Where mass loads are equal to 0 kg, the compound was not detected above the reporting limit.

kg - kilogram

m^3 - cubic meter

TABLE 5F
SEEP D FLOW THROUGH CELL CAPTURED MASS LOAD BY COMPOUND AND TIME INTERVAL - Q1 2022
Chemours Fayetteville Works, North Carolina

Interval Details					Calculated Captured Mass Load (kg)[1]																					
Interval ID	Start Time	End Time	Duration (hours)	Total Flow (m^3)	Hfpo Dimer Acid	PFMOAA	PFO2HxA	PFO3OA	PFO4DA	PFO5DA	PMPA	PEPA	PS Acid	Hydro-PS Acid	R-PSDA	Hydrolyzed PSDA	R-PSDCA	NVHOS	EVE Acid	Hydro-EVE Acid	R-EVE	PES	PFECA B	PFECA-G	Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)
SeepD_2022_1_Q1	1/1/22 0:00	1/13/22 12:23	300	8,023	0.1	0.4	0.2	0.05	0.01	0.0008	0.05	0.02	0	0.002	0.006	0.01	0	0.005	0	0.007	0.005	0	0	0	0.8	0.8	0.8
SeepD_2022_2_Q1	1/13/22 12:24	1/31/22 20:00	440	6,016	0.08	0.2	0.1	0.03	0.01	0.0006	0.03	0.01	0	0.001	0.003	0.007	0	0.003	0	0.005	0.002	0	0	0	0.5	0.5	0.5
SeepD_2022_3_Q1	1/31/22 20:01	2/15/22 8:00	348	6,772	0.08	0.3	0.1	0.04	0.01	0.0007	0.04	0.01	0	0.002	0.004	0.01	0	0.004	0	0.006	0.004	0	0	0	0.6	0.6	0.6
SeepD_2022_4_Q1	2/15/22 8:01	3/1/22 8:00	336	6,085	0.08	0.3	0.1	0.04	0.01	0	0.04	0.01	0	0.002	0.006	0.01	0.0004	0.003	0	0.006	0.005	0	0	0	0.6	0.6	0.6
SeepD_2022_5_Q1	3/1/22 8:01	3/14/22 4:00	308	7,234	0.1	0.2	0.1	0.03	0.009	0	0.03	0.01	0	0.001	0.004	0.008	0	0.003	0	0.005	0.005	0	0	0	0.5	0.5	0.6
SeepD_2022_6_Q1	3/14/22 4:01	3/26/22 19:00	303	5,073	0.06	0.2	0.08	0.02	0.008	0.0004	0.03	0.008	0	0.001	0.003	0.007	0	0.003	0	0.004	0.003	0	0	0	0.4	0.4	0.4
SeepD_2022_7_Q1	3/26/22 19:01	3/31/22 23:59	125	5,146	0.07	0.2	0.1	0.03	0.01	0.0006	0.03	0.01	0	0.001	0.004	0.008	0	0.003	0	0.005	0.004	0	0	0	0.5	0.5	0.5
		Total		**44,350**	**0.6**	**1.9**	**0.8**	**0.2**	**0.08**	**0.003**	**0.2**	**0.08**	**0**	**0.01**	**0.03**	**0.07**	**0**	**0.02**	**0**	**0.04**	**0.03**	**0**	**0**	**0**	**3.9**	**4.0**	**4.1**

Notes:

1 - The calculated captured mass load is a product of the concentration difference in the influent and the effluent samples and total flow recorded at the influent for the sampling interval, see Appendix B for more details.

2 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

Where mass loads are equal to 0 kg, the compound was not detected above the reporting limit.

kg - kilogram

m^3 - cubic meter

TABLE 5G
STORMWATER TREATMENT SYSTEM CAPTURED MASS LOAD BY COMPOUND AND DATE - Q1 2022
Chemours Fayetteville Works, North Carolina

Date[1]	Total Flow (m^3)[2]	Calculated Captured Mass Load (kg) [3,4]			
		HFPO-DA	PFMOAA	PMPA	Total of 3 Compounds [5]
1/1/22	234	0.006	1.0E-03	5.9E-04	0.008
1/2/22	236	0.006	1.0E-03	5.9E-04	0.008
1/3/22	596	0.02	2.6E-03	1.5E-03	0.02
1/4/22	747	0.02	3.3E-03	1.9E-03	0.02
1/5/22	257	0.007	7.7E-04	4.9E-04	0.008
1/10/22	382	0.01	1.7E-03	6.5E-04	0.01
1/15/22	176	0.005	7.8E-04	3.0E-04	0.006
1/16/22	484	0.008	1.5E-03	9.2E-04	0.01
1/17/22	554	0.009	1.7E-03	1.1E-03	0.01
1/18/22	637	0.01	2.0E-03	1.2E-03	0.01
1/21/22	316	0.005	9.8E-04	6.0E-04	0.007
1/22/22	262	0.007	1.9E-03	7.6E-04	0.009
2/3/22	418	0.007	1.7E-03	9.2E-04	0.009
2/8/22	495	0.01	3.0E-03	1.4E-03	0.02
2/18/22	139	0.004	6.8E-04	3.5E-04	0.005
3/1/22	340	0.03	2.2E-03	5.4E-04	0.03
3/12/22	484	0.05	3.3E-03	9.7E-04	0.05
3/13/22	485	0.05	3.3E-03	9.7E-04	0.05
3/17/22	125	0.01	8.7E-04	2.5E-04	0.01
3/24/22	131	0.01	9.4E-04	3.1E-04	0.01
3/31/22	42	0.004	3.0E-04	1.0E-04	0.004
Total	**7,544**	**0.28**	**0.04**	**0.02**	**0.33**

Notes:

1 - Listed dates are days when flow was recorded at the Stormwater Treatment System.

2 - Total daily flows were based on the volume recorded via a totalizer at the Stormwater Treatment System effluent.

3 - The calculated captured mass load is a product of the concentration difference in the influent and the effluent samples and total flow at the effluent for the sampling date, see Appendix B for more details.

4 - For days where only flow was recorded, the concentrations from the closest date was used to calculate mass loads.

5 - Only HFPO-DA, PFMOAA and PMPA are recorded at this location. Thus, the total captured mass load presented here is summed over these three compounds only.

TABLE 6
SUMMARY OF TOTAL PFAS MASS DISCHARGE AT TAR HEEL FERRY ROAD BRIDGE - Q1 2022 DATA
Chemours Fayetteville Works, North Carolina

Quarter	Field Sample ID	Collection Date	Hours Composited[1]	Concentrations (ng/L)			Total Volume (ft^3)[4]	Instantaneous Flow Rate (ft^3/s)[5]	Mass Discharge (mg/s)		
				Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)			Total Attachment C[2]	Total Table 3+ (17 compounds)[3]	Total Table 3+ (20 compounds)
2022 Q1	CFR-TARHEEL-24-010222	1/2/22 23:01	24	53	56	60	167,660,000	--	3	3.2	3.4
2022 Q1	CFR-TARHEEL-24-010322	1/3/22 23:01	24	95	99	120	292,270,000	--	9.5	9.9	12
2022 Q1	CFR-TARHEEL-24-011122	1/11/22 23:01	24	20	20	26	437,080,000	--	3	2.9	3.8
2022 Q1	CFR-TARHEEL-24-011322	1/13/22 23:01	24	8.4	8.4	13	511,580,000	--	1.5	1.5	2.2
2022 Q1	CFR-TARHEEL-24-011922	1/19/22 23:01	24	12	12	17	608,650,000	--	2.5	2.4	3.6
2022 Q1	CFR-TARHEEL-24-011922-D	1/19/22 23:01	24	12	12	15	608,650,000	--	2.5	2.6	3
2022 Q1	CFR-TARHEEL-15-012022	1/20/22 14:01	15	11	11	14	340,370,000	--	2.1	2.1	2.7
2022 Q1	CFR-TARHEEL-24-012522	1/25/22 23:01	24	7.9	7.9	7.9	597,640,000	--	1.6	1.6	1.6
2022 Q1	CAP1Q22-CFR-TARHEEL-012622	1/26/22 16:40	0	16	16	19	--	6,530	3	3	3.5
2022 Q1	CAP1Q22-CFR-TARHEEL-24-012722	1/27/22 11:54	24	16	18	21	517,630,000	--	2.8	3.2	3.8
2022 Q1	CFR-TARHEEL-24-012822	1/28/22 23:01	24	28	28	28	376,970,000	--	3.6	3.6	3.6
2022 Q1	CFR-TARHEEL-24-013122	1/31/22 23:01	24	40	43	45	207,860,000	--	2.8	3	3.2
2022 Q1	CFR-TARHEEL-24-020322	2/3/22 23:01	24	57	60	64	183,720,000	--	3.6	3.8	4
2022 Q1	CFR-TARHEEL-24-020722	2/7/22 23:01	24	30	34	36	342,840,000	--	3.5	4	4.2
2022 Q1	CFR-TARHEEL-24-020722-D	2/7/22 23:01	24	30	34	39	342,840,000	--	3.5	4	4.6
2022 Q1	CFR-TARHEEL-24-021122	2/11/22 23:01	24	13	13	13	458,340,000	--	2	2	2
2022 Q1	CFR-TARHEEL-24-021422	2/14/22 23:01	24	31	35	37	195,480,000	--	2.1	2.3	2.5
2022 Q1	CFR-TARHEEL-24-021822	2/18/22 23:01	24	5.6	5.6	5.6	167,220,000	--	0.32	0.32	0.32
2022 Q1	CFR-TARHEEL-24-022622	2/26/22 23:01	24	7	7	7	218,030,000	--	0.52	0.52	0.52
2022 Q1	CFR-TARHEEL-24-022722	2/27/22 23:01	24	3.8	3.8	3.8	311,400,000	--	0.4	0.4	0.4
2022 Q1	CFR-TARHEEL-24-022822	2/28/22 23:01	24	0	0	0	361,320,000	--	0	0	0
2022 Q1	CFR-TARHEEL-24-030322	3/3/22 23:01	24	6.8	12	31	377,850,000	--	0.88	1.5	4
2022 Q1	CFR-TARHEEL-24-030722	3/7/22 23:01	24	28	34	52	135,670,000	--	1.3	1.6	2.4
2022 Q1	CFR-TARHEEL-24-031022	3/10/22 23:01	24	41	48	66	147,190,000	--	2.1	2.4	3.3
2022 Q1	CFR-TARHEEL-24-031022-D	3/10/22 23:01	24	43	50	69	147,190,000	--	2.2	2.5	3.5
2022 Q1	CFR-TARHEEL-031722	3/17/22 12:30	0	4.7	4.7	4.7	--	11,100	1.5	1.5	1.5
2022 Q1	CFR-TARHEEL-031822	3/18/22 9:00	0	0	0	0	--	24,800	0	0	0
2022 Q1	CFR-TARHEEL-24-032322	3/23/22 8:10	24	17	17	17	847,430,000	--	4.9	4.9	4.9
2022 Q1	CFR-TARHEEL-032422	3/24/22 13:05	0	9.4	9.4	9.4	--	7,680	2	2	2
2022 Q1	CFR-TARHEEL-24-032922	3/29/22 23:01	24	8	8	8	662,420,000	--	1.8	1.8	1.8
2022 Q1	CFR-TARHEEL-24-033122	3/31/22 23:01	24	9.8	9.8	9.8	419,860,000	--	1.4	1.4	1.4

Notes:
1 - Samples with a compositing duration of zero (0) hours are grab samples.
2 - Total Attachment C does not include Perfluoroheptanoic acid (PFHpA).
3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.
4 - Total flow volume is determined based on measurements taken over the sample collection period.
5 - For samples with a duration of zero (0) hours, i.e., grab samples, the instantaneous flow rate was used to calculated the mass discharge.

-- - not applicable
ng/L - nanograms per liter
ft^3 - cubic feet
mg/s - milligrams per second
ft^3/s - cubic feet per second

TABLE 7
PFAS MASS LOADING MODEL POTENTIAL PATHWAYS
Chemours Fayetteville Works, North Carolina

Transport Pathway Number	Potential PFAS Transport Pathway	Analytical Data Source for Mass Loading Model[1]	Flow Data Source for Mass Loading Model[1]
1	Upstream River and Groundwater	Measured from Cape Fear River Mile 76 samples collected in January 2022 as reported in Appendix A Table A2.	Measured flow rates from USGS gauging station at W.O. Huske Dam during January 2022 volumetrically adjusted for flow pathways between River Mile 76 and W.O. Huske Dam.[2]
2	Willis Creek	Measured from Willis Creek samples collected in January 2022 as reported in Appendix A Table A2.	Measured flow rates through Marsh-McBirney method during January 2022 as reported in Appendix B.
3	Aerial Deposition on River	Estimated from air deposition modeling[3].	Estimated from air deposition modeling[3].
4	Outfall 002	Measured from Outfall 002 samples collected in January 2022 as reported in Appendix A Table A2.	Measured daily Outfall 002 flow rates recorded in Facility discharge monitoring reports, summarized in Appendix B.
5	Onsite Groundwater	Measured from monitoring well samples collected in January 2022 as reported in Appendix A Table A5.	Estimated as the sum of the mass flux from the Black Creek Aquifer calculated from a transect along the Cape Fear River. Further details and supporting calculations provided in Appendix E.
6	Seeps	Measured from Seeps A, B, C, and D samples, and Lock and Dam Seep samples collected in January 2022 as reported in Appendix A Table A2.	Measured flow rates through flumes for Seeps C and D during January 2022 as reported in Appendix B. Measured flow rates through bucket and timer for Lock and Dam Seep during January 2022 as reported in Appendix B. Surrogate flow data for Seep A was used while the Seep A flume was not operational. Flow-Through Cell data for Seep B was used as flows from the Seep-B flume were beyond the limits of the flume.
7	Old Outfall 002	Measured from Old Outfall 002 samples collected in January 2022 as reported in Appendix A Table A2.	Measured flow rates through Marsh-McBirney method during January 2022 as reported in Appendix B.
8	Adjacent and Downstream Groundwater	Estimated using a scaling factor applied to upstream mass discharge. Refer to Cape Fear River PFAS Mass Loading Calculation Protocol Version 2 (Geosyntec, 2020d) for details.	Estimated using a scaling factor applied to upstream mass discharge. Refer to Cape Fear River PFAS Mass Loading Calculation Protocol Version 2 (Geosyntec, 2020d) for details.
9	Georgia Branch Creek	Measured from Georgia Branch Creek samples collected in January 2022 as reported in Appendix A Table A2.	Measured flow rates through Marsh-McBirney method during January 2022 as reported in Appendix B.

Notes:

1 - Flow and concentration data are multiplied together to estimate the PFAS mass discharge in the Cape Fear River originating from each pathway.

2 - Cape Fear River flow rates measured at USGS gauging station #02105500 located at William O Huske Lock & Dam accessed from https://waterdata.usgs.gov.

3 - ERM, 2018. Modeling Report: HFPO-DA Atmospheric Deposition and Screening Groundwater Effects. 27 April 2018.

TABLE 8A
SUMMARY OF TOTAL PFAS MASS DISCHARGE BY PATHWAY BEFORE REMEDIES
Chemours Fayetteville Works, North Carolina

Pathway	Pathway Name	Total Flow Volume on Sample Date (MG)[1]	Total Attachment C[2]		Total Table 3+ (17 compounds)[3]		Total Table 3+ (20 compounds)	
			Concentration (ng/L)	Mass Loading (mg/s)	Concentration (ng/L)	Mass Loading (mg/s)	Concentration (ng/L)	Mass Loading (mg/s)
1	Upstream River Water and Groundwater[4]	4,250	0	0	0	0	0	0
2	Willis Creek	7.1	1,500	0.47	1,500	0.47	1,600	0.50
3	Aerial Deposition on Water Features	--	--	5.5E-03	--	5.5E-03	--	5.7E-03
4	Outfall 002[5]	14.4	58	3.7E-02	58	0.037	82	0.052
4A	Stormwater Treatment System[6]	--	--	--	--	--	--	--
5	Onsite Groundwater (Lower Bound)[7]	--	--	7.11	--	7.12	--	7.50
	Onsite Groundwater (Upper Bound)[7]	--	--	7.31	--	7.32	--	7.70
6A	Seep A[8]	0.30	160,000	2.12	160,000	2.12	170,000	2.25
6B	Seep B[8]	0.26	180,000	2.08	190,000	2.20	200,000	2.32
6C	Seep C[8]	0.06	71,000	0.19	72,000	0.19	72,000	0.19
6D	Seep D[8]	0.13	100,000	0.55	100,000	0.55	110,000	0.61
6E	Lock and Dam Seep	0.01	130,000	0.08	130,000	0.08	130,000	0.08
6F	Lock and Dam Seep North[9]	--	--	--	--	--	--	--
7	Old Outfall 002[8]	0.82	33,000	1.19	33,000	1.19	33,000	1.19
8	Offsite Adjacent and Downstream Groundwater	--	--	0	--	0	--	0
9	Georgia Branch Creek	3.17	1,400	0.19	1,400	0.19	1,400	0.19
Calculated Total Table 3+ Loading (mg/s) at Tar Heel (Lower Bound)				**14.0**		**14.2**		**14.9**
Calculated Total Table 3+ Loading (mg/s) at Tar Heel (Upper Bound)				**14.2**		**14.4**		**15.1**

Notes:

1 - Total flow volume is determined based on measurements taken over 24-hour sample collection period for all locations except Willis Creek, Lock and Dam Seep, Old Outfall 002, and Georgia Branch Creek. At these locations, the total flow volume was estimated based on the instantaneous flow measurement.

2 - Mass discharge calculations for Total Attachment C does not include Perfluorohepthanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

4 - The volumetric flow rate for upstream river water and groundwater was estimated by subtracting inflows from Willis Creek, upwelling groundwater, seeps to the river, and Outfall 002 and by adding the river water intake from Chemours to the flow rate measurement from the W.O. Huske Dam.

5 - Total PFAS concentrations at the Intake River Water at Facility location are subtracted from Outfall 002 concentrations to compute the mass discharge at Outfall 002.

6 - The stormwater treatment system captures PFAS originating from Stormwater in the Monomers/IXM area that would otherwise flow to Outfall 002 during storm events. During the January Sampling Event there was no stormwater flow to the stormwater treatment system, so there was no mass loading calculated for this location.

7 - Mass Discharge for Onsite Groundwater was determined using calculations described in Appendix E. The lower and upper bounds on the mass discharge were calculated using two different contour elevation differences in the vicinity of the river frontage: a ten-foot elevation difference (between the 40 and 50 ft contours) and a twenty-foot elevation difference (between the 40 and 60 ft contours) as described in Appendix E.

8 - For January 2022, the concentrations from the influent samples collected at the Old Outfall 002 treatment system and Seep A, B, C and D flow-through cell were used to calculate the Before Remedy mass discharge for these pathways.

9 - Lock Dam North was not sampled during the January Sampling event because the seep was under water due the river height.

TABLE 8B
SUMMARY OF TOTAL PFAS MASS DISCHARGE BY PATHWAY AFTER REMEDIES
Chemours Fayetteville Works, North Carolina

Pathway	Pathway Name	Total Flow Volume on Sample Date (MG)[1]	Total Attachment C[2]		Total Table 3+ (17 compounds)[3]		Total Table 3+ (20 compounds)	
			Concentration (ng/L)	Mass Loading (mg/s)	Concentration (ng/L)	Mass Loading (mg/s)	Concentration (ng/L)	Mass Loading (mg/s)
1	Upstream River Water and Groundwater[4]	4,250	0	0	0	0	0	0
2	Willis Creek	7.1	1,500	0.47	1,500	0.47	1,600	0.50
3	Aerial Deposition on Water Features	--	--	5.5E-03	--	5.5E-03	--	5.7E-03
4	Outfall 002[5]	14.4	58	0.04	58	0.04	82	0.05
4A	Stormwater Treatment System[6]	--	--	--	--	--	--	--
5	Onsite Groundwater (Lower Bound)[7]	--	--	7.11	--	7.12	--	7.50
	Onsite Groundwater (Upper Bound)[7]	--	--	7.31	--	7.32	--	7.70
6A	Seep A[8]	0.30	32,000	4.2E-01	33,000	4.4E-01	37,000	4.9E-01
6B	Seep B[8]	0.26	210	2.4E-03	210	2.4E-03	220	2.5E-03
6C	Seep C[8]	0.062	950	2.6E-03	960	2.6E-03	1,000	2.7E-03
6D	Seep D[8]	0.13	3.6	2.0E-05	3.6	2.0E-05	3.6	2.0E-05
6E	Lock and Dam Seep	0.013	130,000	0.08	130,000	0.08	130,000	0.08
6F	Lock and Dam Seep North[9]	--	--	--	--	--	--	--
7	Old Outfall 002[8]	0.93	1,400	0.05	1,400	0.05	1,400	0.05
8	Offsite Adjacent and Downstream Groundwater	--	--	0	--	0	--	0
9	Georgia Branch Creek	2.6	1,400	0.19	1,400	0.19	1,400	0.19
Calculated Total Table 3+ Loading (mg/s) at Tar Heel (Lower Bound)				**8.4**		**8.4**		**8.9**
Calculated Total Table 3+ Loading (mg/s) at Tar Heel (Upper Bound)				**8.6**		**8.6**		**9.1**

Notes:

1 - Total flow volume is determined based on measurements taken over 24-hour sample collection period for all locations except Willis Creek, Lock and Dam Seep, Old Outfall 002, and Georgia Branch Creek. At these locations, the total flow volume was estimated based on the instantaneous flow measurement.

2 - Mass discharge calculations for Total Attachment C does not include Perfluorohepthanoic acid (PFHpA).

3 - Total Table 3+ (17 compounds) does not include PFHpA, R-PSDA, Hydrolyzed PSDA, and R-EVE.

4 - The volumetric flow rate for upstream river water and groundwater was estimated by subtracting inflows from Willis Creek, upwelling groundwater, seeps to the river, and Outfall 002 and by adding the river water intake from Chemours to the flow rate measurement from the W.O. Huske

5 - Total PFAS concentrations at the Intake River Water at Facility location are subtracted from Outfall 002 concentrations to compute the mass discharge at Outfall 002.

6 - The stormwater treatment system treats PFAS originating from Stormwater in the Monomers/IXM area that would otherwise flow to Outfall 002 during storm events. During the January Sampling Event there was no stormwater flow to the stormwater treatment system, so there was no mass loading calculated for this location.

7 - Mass Discharge for Onsite Groundwater was determined using calculations described in Appendix E. The lower and upper bounds on the mass discharge were calculated using two different contour elevation differences in the vicinity of the river frontage: a ten-foot elevation difference (between the 40 and 50 ft contours) and a twenty-foot elevation difference (between the 40 and 60 ft contours) as described in Appendix E.

8 - For January 2022, the concentrations from the Old Outfall 002 sample collected downgradient from the treatment system and effluent samples collected at the effluent basins of the Seep A, B, C and D flow-through cells were used to calculate the After Remedy mass discharge for these pathways.

9 - Lock Dam North was not sampled during the January Sampling event because the seep was under water due the river height.

TABLE 9

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CAPE FEAR RIVER TOTAL TABLE 3+ (17 COMPOUNDS) RELATIVE MASS DISCHARGE PER PATHWAY
Chemours Fayetteville Works, North Carolina

Pathway[1]	January 2022	
	Lower	Upper
[1] Upstream River Water and Groundwater	<1%	<1%
[2] Willis Creek	3%	3%
[3] Aerial Deposition on Water Features	<1%	<1%
[4] Outfall 002	<1%	<1%
Outfall 002 (After Remedies) [2]	-- [2]	-- [2]
[5] Onsite Groundwater	50%	51%
[6] Seeps	36%	36%
Seeps (After Remedies) [3]	*4%*	*4%*
[7] Old Outfall 002	8.4%	8.3%
Old Outfall 002 (After Remedies) [4]	*<1%*	*<1%*
[8] Offsite Adjacent and Downstream Groundwater	<1%	<1%
[9] Georgia Branch Creek	1%	1%

Notes:

< - less than indicated value.

1 - Relative contributions were calculated using the before remedies Total Table 3+ (17 compounds) model-estimated mass discharges (Tables 8A). These relative contributions are presented as a range, which represents the upper and lower bound model estimates. Relative contributions for Total Attachment C and Total Table 3+ (20 compounds) are provided in Appendix B.

2 - T he Stormwater Treatment System captures stormwater flows in the conveyance network surrounding the Monomers/IXM area that would otherwise flow to Outfall 002 during storm events. There was no flow being treated by the Stormwater Treatment System during the January 2022 sampling events.

3 - The Seeps (After Remedies) relative contributions for January 2022 were calculated using the After Remedies model-estimated mass discharges at Seeps A to D, Lock and Dam Seep (Tables 8B).

4 - The Old Outfall 002 (After Remedies) relative contributions for January 2022 were calculated using the After Remedies model-estimated mass discharges at Old Outfall 002 (Tables 8B).

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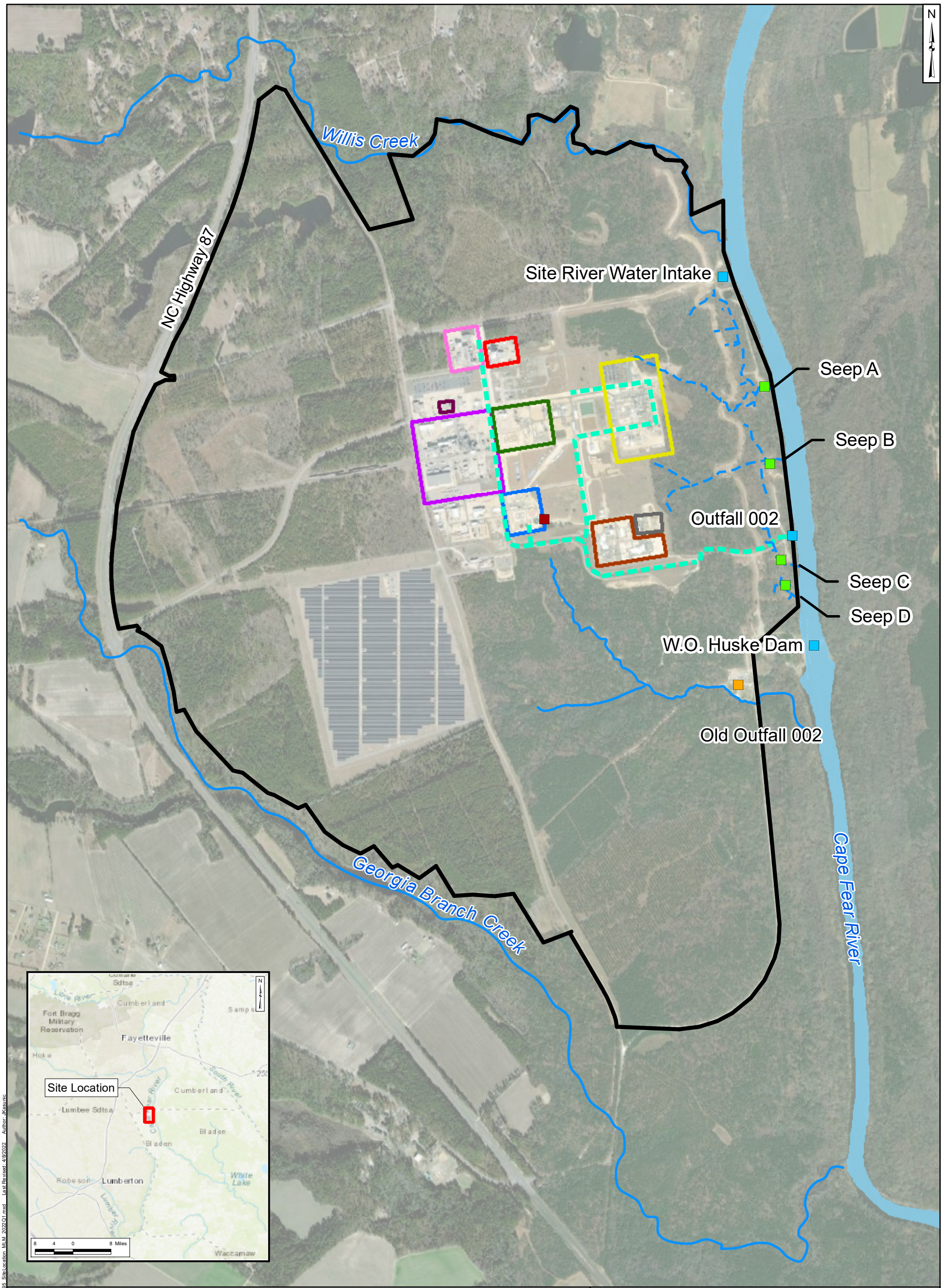
Figures



Legend

- Flow-Through Cell
- Old Outfall 002 Treatment System
- Stormwater Treatment System
- Site Features
- Site Boundary
- Nearby Tributary
- Observed Seep (Natural Drainage)
- Site Conveyance Network

Areas at Site

- Chemours Monomers IXM
- Chemours Polymer Processing Aid Area
- DuPont Polyvinyl Fluoride Leased Area
- Former DuPont PMDF Area
- Kuraray SentryGlas® Leased Area
- Kuraray Trosifol® Leased Area
- Wastewater Treatment Plant
- Power - Filtered and Demineralized Water Production
- Kuraray Laboratory

Notes:
1. The outline of Cape Fear River is approximate and is based on open data from ArcGIS Online and North Carolina Department of Environmental Quality Online GIS (MajorHydro shapefile).
2. Basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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

1,000 500 0 1,000 Feet

Site Location Map

Chemours Fayetteville Works, North Carolina

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Figure 1

Path: P:\PR\Projects\TR0795\Database and GIS\GIS\Baseline Monitoring\Workplan\TR0795_Site Location_MLM_2022Q1.mxd Last Revised: 4/8/2022 Author: JKasunic

Virginia

North Carolina

South Carolina

Greensboro

Raleigh

Fayetteville

Wilmington

Haw River

Deep River

Little River

Cape Fear River

Start of Cape Fear River

Chemours Fayetteville Works

Tar Heel Ferry Road Bridge

W.O. Huske Dam

Bladen Bluffs Intake

Kings Bluff Intake Canal

Legend

- Chemours Fayetteville Works
- Upper Basin
- Middle Basin
- Lower Basin

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

20 10 0 20 Miles

Cape Fear River Watershed and Downstream Drinking Water Intakes

Chemours Fayetteville Works, North Carolina

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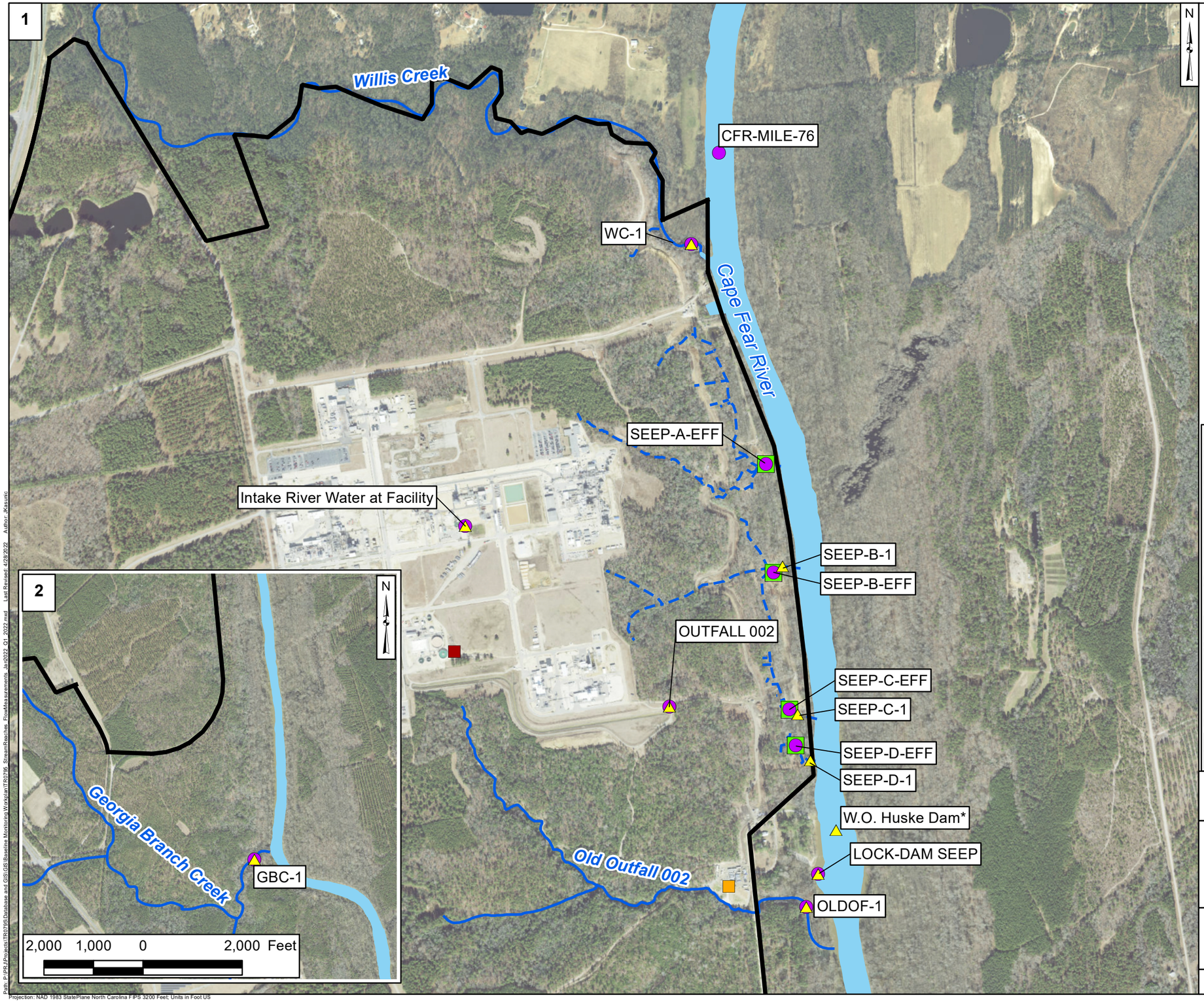
Figure 2

Path: P:\PR\Projects\TR0795\Database and GIS\GIS\Baseline Monitoring Workplan\TR0795_Cape Fear River Watershed and Downstream Intakes.mxd; JKasunic; 04/08/2022

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



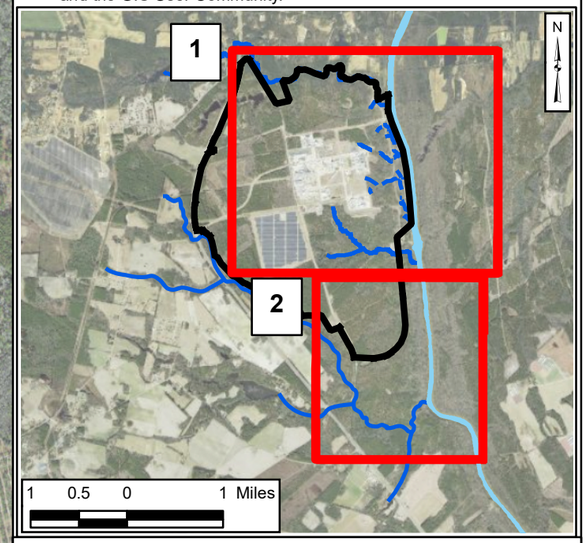
Legend

- Flow Measurement Location
- Sample Location
- Flow-Through Cell
- Old Outfall 002 Treatment System
- Stormwater Treatment System
- Observed Seep
- Nearby Tributary
- Site Boundary

Notes:

* - Flow measurement was taken at W.O. Huske Dam - USGS

1. Flows at Seeps C and D were measured using a flume.
2. Flows at Old Outfall 002, Willis Creek, and Georgia Branch Creek were measured using flow velocity method.
3. Flow-Through Cell flow data were used for Seep B.
4. Flow at Lock and Dam Seep was measured using a sample bottle and timer.
5. Flow at Seep A could not be measured during Q1 2022. At this location, flows were estimated using flow data measured at Seep A during Q1 2020.
6. Results of estimated flow at these locations are provided in Table A3.
7. The outline of Cape Fear River is approximate and is based on open data from ArcGIS Online and North Carolina Department of Environmental Quality Online GIS.
8. Basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.



1,000 500 0 1,000 Feet

Sample and Flow Measurement Locations - January 2022

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Figure 3

Path: P:\PRJ\Projects\TR0795\Database and GIS\GIS\Baseline Monitoring\Workplan\TR0795_StreamReaches_FlowMeasurements_Jan2022_Q1_2022.mxd Last Revised: 4/28/2022 Author: JKasunic

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

1

CFR-MILE-76

CFR-BLADEN

CFR-TARHEEL

N

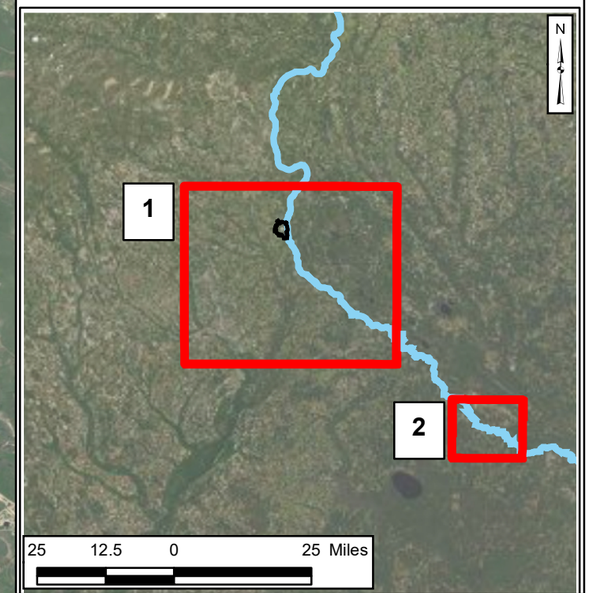
Legend

Sample Location

Site Boundary

Cape Fear River

Notes:
1. The outline of Cape Fear River is approximate and is based on open data from ArcGIS Online and North Carolina Department of Environmental Quality Online GIS.
2. Basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.



2 - Downstream

CFR-KINGS

N

2 1 0 2 Miles

2 1 0 2 Miles

Cape Fear River Sample Locations - Q1 2022

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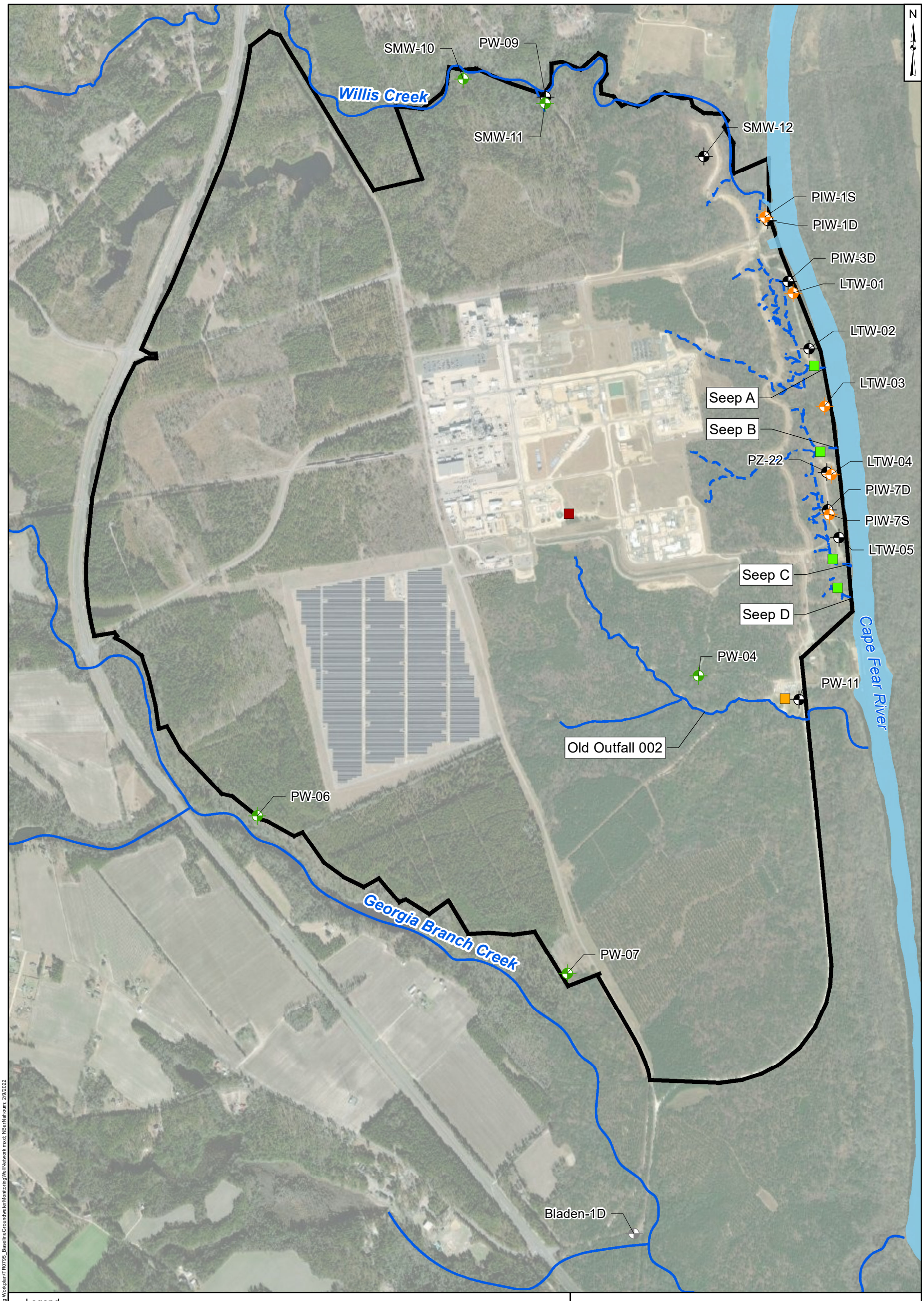
Figure 4

Path: \\gusiph-d1\data\PRJProjects\TR0795\Database and GIS\GIS\Baseline Monitoring Workplan\TR0795_CapeFearRiverSampleLocations_Q12022.mxd Last Revised: 4/8/2022 Author: JKesuric

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



Legend

- Surficial Aquifer
- Floodplain Deposits
- Black Creek Aquifer
- Damaged
- Flow-Through Cell
- Old Outfall 002 Treatment System
- Stormwater Treatment System
- Observed Seep
- Nearby Tributary
- Site Boundary

Notes:
1. Due to the scale of the map, pairs of wells that are in close proximity have been offset for visibility. Therefore, the placement of these wells on this map do not reflect their true geographic coordinates.
2. The outline of Cape Fear River is approximate and is based on open data from ArcGIS Online and North Carolina Department of Environmental Quality Online GIS.
3. Basemap source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

1,000 500 0 1,000 Feet

Groundwater Wells for Mass Loading Assessment

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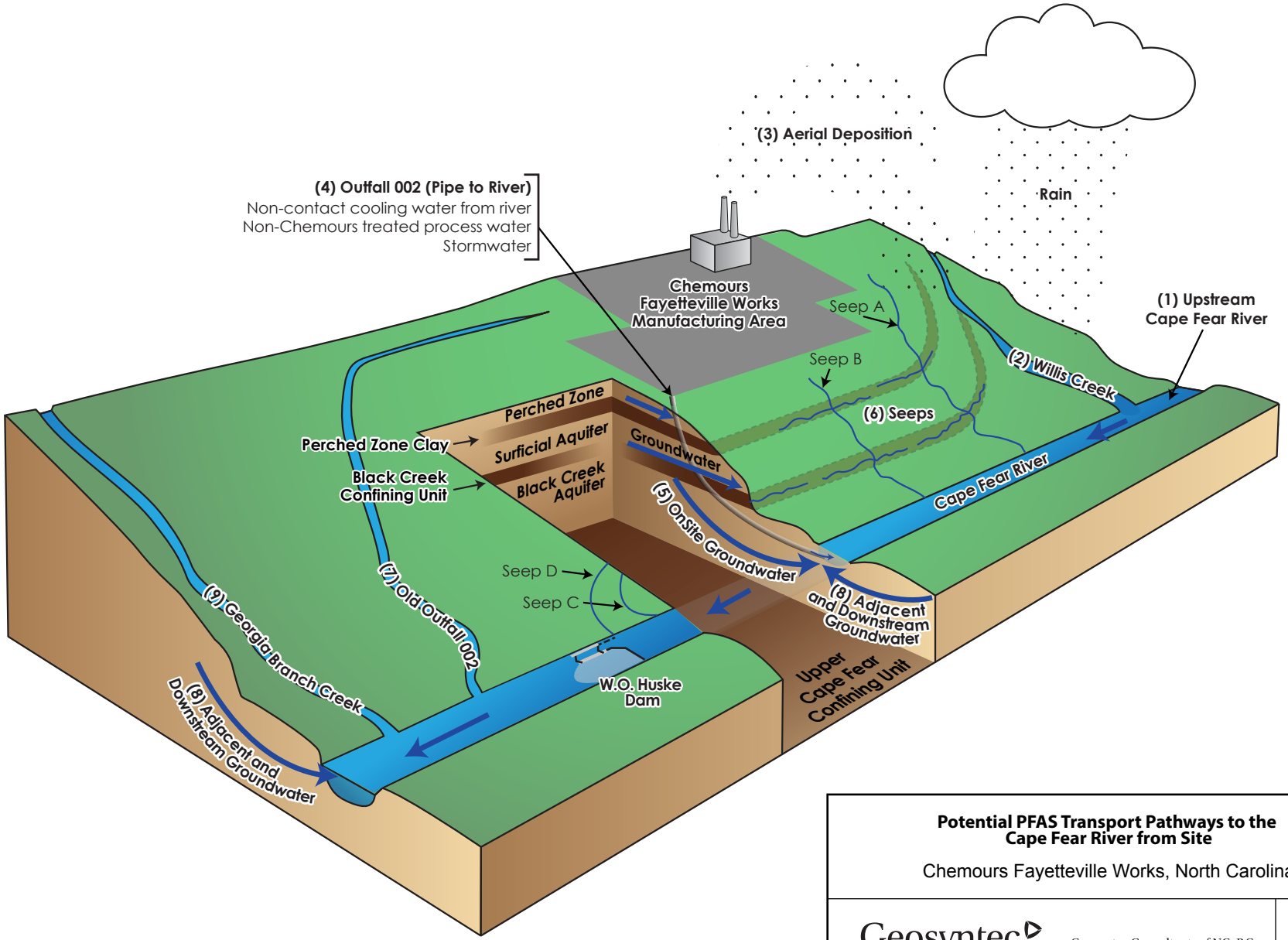
Figure 5

Path: \\guelph-01\data\PRJ\Projects\TR0795\Database and GIS\GIS\Baseline Monitoring Workplan\TR0795_BaselineGroundwaterMonitoringWellNetwork.mxd; NBarNahoum; 2/9/2022

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



Note: Image is conceptual and is not to scale

Potential PFAS Transport Pathways to the Cape Fear River from Site

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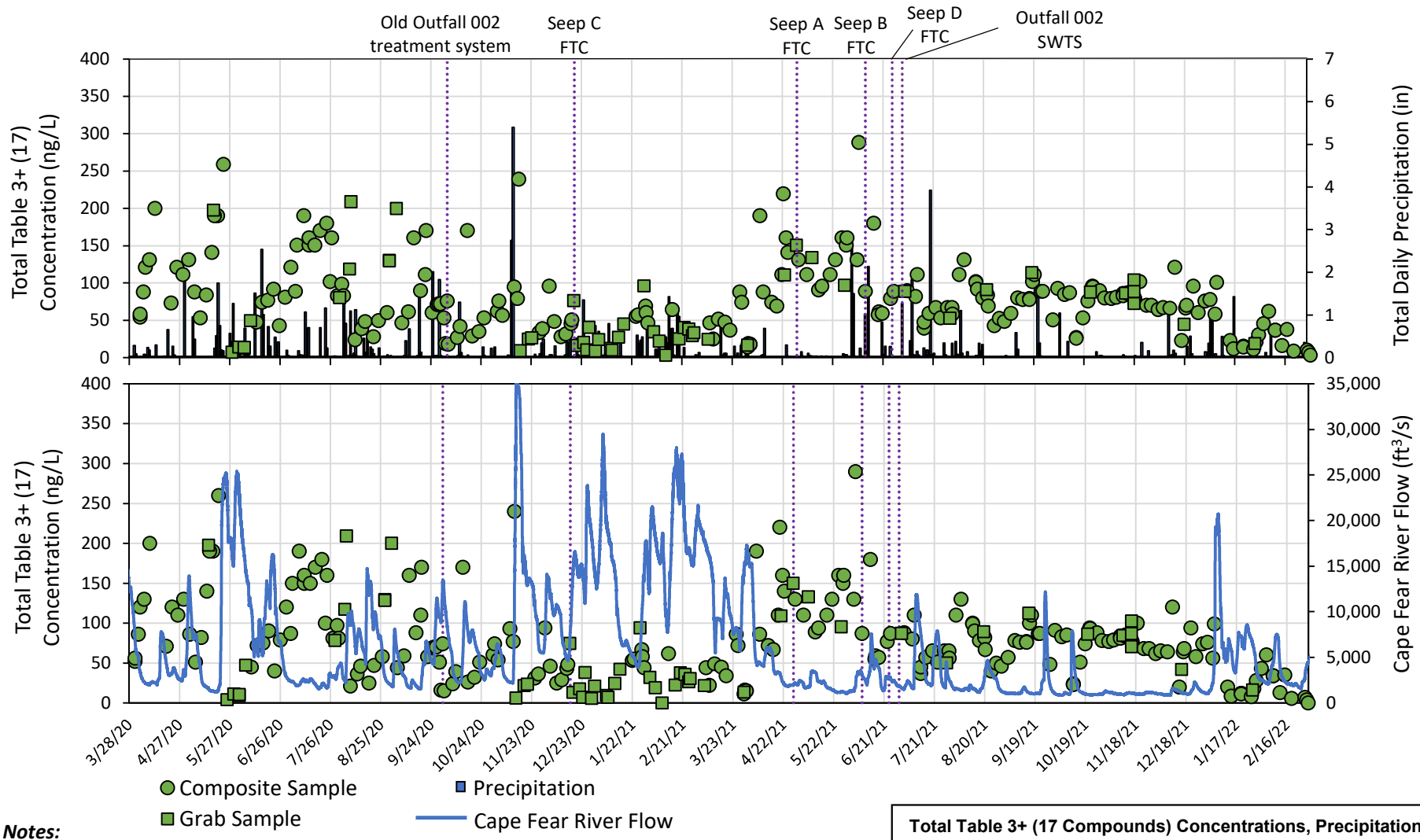
Figure 6

Data/PRJ/Projects/TR0795/Database and GIS/Illustrator/3D CSM Illustration/ConceptualSiteModel_Dec2020.ai



Notes:

-PFAS concentrations calculated by summing over Attachment C compounds and Table 3+ (20 compounds) are provided in Appendix A.

-Precipitation data are from the USGS monitoring site at the W.O. Huske Dam.

Abbrevations:

in - inches
ng/L - nanograms per liter
ft^3/s - cubic feet per second
FTC - flow through cell
SWTS - stormwater treatment system

Total Table 3+ (17 Compounds) Concentrations, Precipitation and Daily Flow at Tar Heel Ferry Road Bridge

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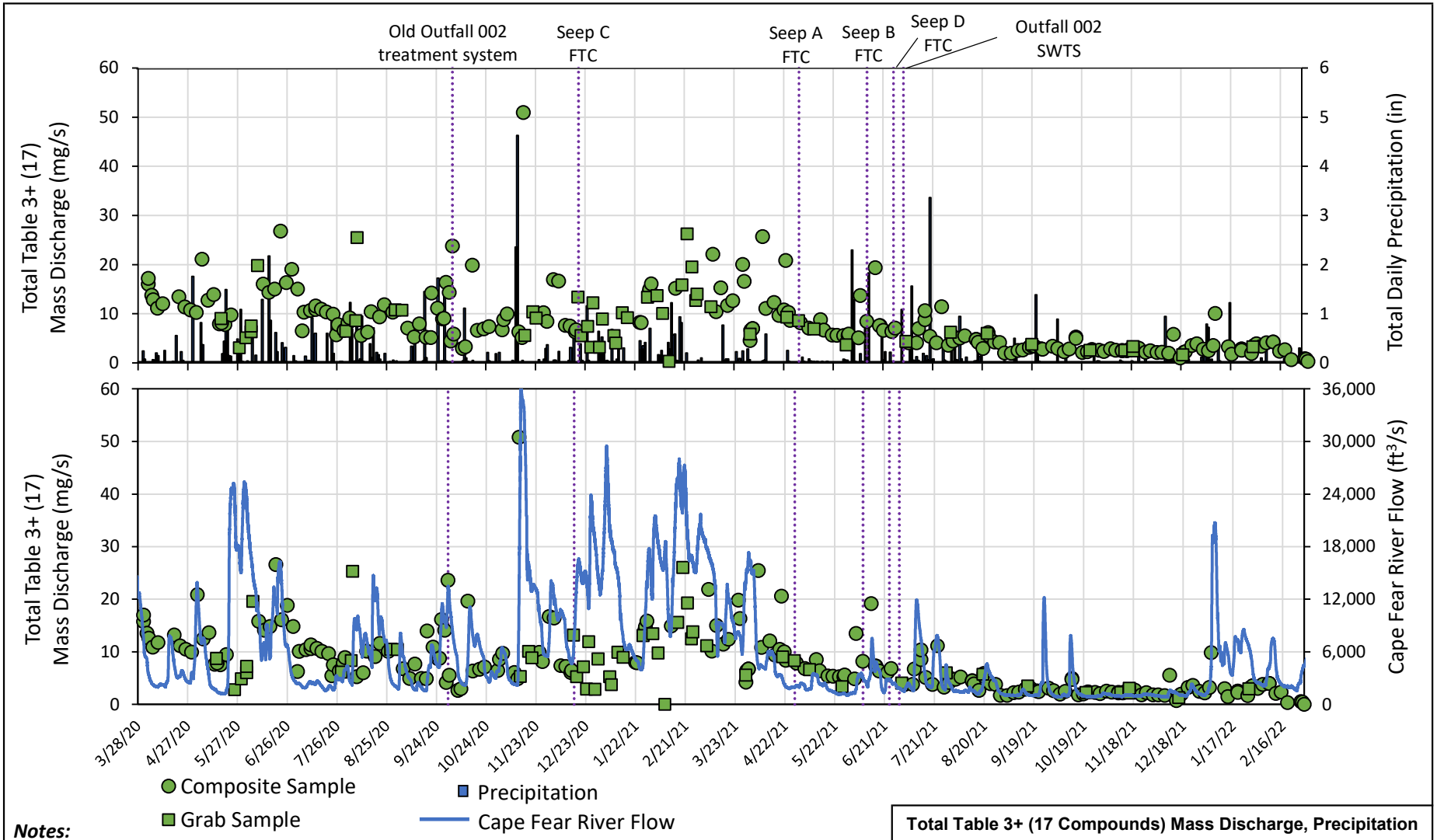
Figure 7



Notes:

-Total PFAS mass discharges calculated by summing over Attachment C compounds and Table 3+ (20 compounds) are provided in Table 6 and Appendix B.

-Precipitation data are from the USGS monitoring site at the W.O. Huske Dam.

Abbrevations:

in - inches

mg/s - milligrams per second

ft^3/s - cubic feet per second

FTC - flow through cell

SWTS - stormwater treatment system

Total Table 3+ (17 Compounds) Mass Discharge, Precipitation and Daily Flow at Tar Heel Ferry Road Bridge

Chemours Fayetteville Works, North Carolina

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Figure **8**