DNREC Study of PFAS in the Coastal Plain of Delaware - Field Sampling Plan

Final v2.1

December 10, 2025

Prepared for:

The United States Environmental Protection Agency- Region 3

Superfund and Emergency Management Division

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Philadelphia, PA 19103

TITLE AND APPROVAL PAGE

Field Sampling Plan (FSP)

DNREC Study of PFAS in the Coastal Plain of Delaware

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1.0 Introduction

The Delaware Department of Natural Resources and Environmental Control (DNREC) – Remediation Section (RS) has prepared this Field Sampling Plan (FSP) to the United States Environmental Protection Agency (EPA) in support of using Pre-Remedial Program (Preliminary Assessment and Site Inspection or PA/SI) grant funds to conduct a focused evaluation of PFAS at select locations within the Delaware Coastal Plain Physiographic Province.

In addition, data quality objectives, quality control acceptance criteria, and corrective actions will be implemented in accordance with the May 2021 DNREC-RS Quality Assurance Program Plan (QAPrP). The QAPrP is found as a companion document to this FSP. The following proposed Scope of Work is based upon our understanding of the project. FSP implementation and schedule are subject to funding availability and site access. This FSP has been developed to be consistent with the criteria required for the safe evaluation of these facilities.

1.1 Purpose

The project is intended to determine whether per-and polyfluoroalkyl substances (PFAS), are present and are migrating within the environment at various locations in the Coastal Plain of Delaware. This will be accomplished by collecting and evaluating environmental samples across multiple different media at 11 locations referred to as sub-facilities. The project is not intended to be a detailed nature and extent of PFAS or risk assessment. The purpose of this FSP is to document the sampling and analysis plan for the project, to describe the sampling procedures, and to report the findings of the evaluation.

Based on the conclusions drawn in the Combined Site Inspection Report, the EPA and DNREC will decide whether the sub-facilities within the greater project should undergo further evaluation, be further investigated, or be added to the state priority listing under Delaware's Hazardous Substances Cleanup Act (HSCA). The data can also be used to further the knowledge of

PFAS within the greater Coastal Plain. The project is divided into 11 sub-facilities, all located throughout the Coastal Plain of Delaware. The individual locations of each sub-facility are presented in **Figure 1**. Locations were selected based on an internal priority listing and provide coverage in all three counties of Delaware.

The Atlantic Coastal Plain Physiographic Province consists of silt, sand, and gravel sediments that have eroded from the Appalachian Piedmont and Mountains. The plain ranges in thickness from nil at the Fall Line to over 10,000 feet along the coast (Plank, M.O. and Schenck, W.S., 1998). The first water bearing aquifer within the Coastal Plain is referred to as the Columbia Aquifer (Andres, 1991). The data and information collected for this study will focus on the upper units of the Columbia Aquifer, approximately 60 to 100 feet below ground surface (ft bgs). The majority of groundwater utilized for consumption purposes lies within the Columbia Aquifer.

1.2 Objectives

The main objective of this project is to identify media potentially affected by PFAS within the Coastal Plain Province of Delaware. Since nearly the entire population living within the Province relies on groundwater for drinking water, locating and addressing potential PFAS sources, sinks, and affected pathways is critical to protecting the drinking water supply. The multi-media sampling approach will also look into other potential pathways affecting the environment. Since this project will also evaluate private drinking water supplies, the mitigation of any private well with a detection of certain PFAS over the maximum contaminant level (MCL) will directly help protect the drinking water pathway. These data will also be evaluated by comparing to existing EPA Regional Screening Levels and HSCA screening levels to make recommendations about whether an individual sub-facility will require further action such as additional assessment, remediation, or removal actions.

1.3 Overview

From 2020 to 2022, DNREC completed a state-wide assessment of PFAS as outlined in the Emerging Contaminants Sampling Work Plan Focusing of PFAS (DNREC, 2020). The sampling results are summarized in a Persistent Pollutants Sampling Report, Focusing on PFAS (DNREC, 2023a). These data collected from the public drinking water assessment was prioritized to address detections of PFAS that served the most at-risk communities including systems near large communities or housing developments who obtain drinking water from private domestic wells.

In 2022, DNREC completed a statewide surface water assessment by collecting over 90 samples from major and minor watersheds within the state (DNREC, 2024a). The surface water assessment identified certain watersheds that would require additional evaluation based on both the total concentration of PFAS detected within the stream or the PFAS contaminant signature was unique. Two sub-facilities were selected for this study based on surface water data.

DNREC-RS placed certain areas in the vicinity of a PFAS detection on a priority list using factors such as, total and regulated PFAS concentration detected in the public well, number of persons served by the system, number of private domestic wells in the vicinity, and the likelihood of potential sources nearby. Additionally, the surface water study was also evaluated to select locations for this study.

1.4 Project Team

An organizational chart for the FSP activities is presented in **Table 1** below. The organizational chart details both DNREC personnel and contractor roles and responsibilities for the project life cycle.

Table 1 FSP Organization Chart		
Contact	Responsibility	Phone Number
Michael Penzone DNREC-RS	DNREC-RS / Project Manager	(302) 395-2649
Amy Bryson DNREC-RS	DNREC-RS / Site Assessment Grant Manager	(302) 395-2600
Laura Lucas DNREC-RS	DNREC-RS / QA/QC Manager	(302) 395-2600
Stephanie Gordon DNREC-RS	DNREC-RS /Field Sampling Coordination	(302) 395-2600
Connor Baker and Emilee Brooks DNREC-RS	DNREC Field Staff Responsible for Sampling operations and sampling QC	(302) 395-2600
HSCA-approved Laboratory Services (Kristyn Tempe)	Laboratory Contact Eurofins TestAmerica (Direct through DNREC)	(732) 593-2538
Contractor for Field Work	Contracted Field Services-To Be Determined	

2.0 Project Description

The project is divided into 11 sub-facilities, all located throughout the Coastal Plain of Delaware. The individual locations of each sub-facility are presented in **Figure 1**. Locations were selected based on an internal priority listing and providing coverage in all three counties of Delaware.

The Atlantic Coastal Plain Physiographic Province consists of silt, sand, and gravel sediments that have eroded from the Appalachian Piedmont and Mountains. The plain ranges in thickness from nil at the Fall Line to over 10,000 feet along the coast (Plank, M.O. and Schenck, W.S., 1998). The first water bearing aquifer within the Coastal Plain is referred to as the Columbia Aquifer (Andres, 1991). The data and information collected for this study will focus on the upper units of the Columbia Aquifer, approximately 60 to 100 feet below ground surface (ft bgs). The majority of groundwater utilized for consumption purposes lies within the Columbia Aquifer.

2.1 Sub-Facilities Selection

The description and overview of sampling for each sub-facility are detailed below. None of the proposed soil boring and monitoring well locations are presented on the figures. The exact soil boring and monitoring well locations will be selected based on the following criteria: general groundwater flow direction based on published resources, proximity of initial PFAS detection at the sub-facility, and property access.

2.1.1 Cowgills Corner PFAS

The sub-facility is located at the corner of White Oak Road and Bayside Drive (Route 9) northeast of the City of Dover, Kent County, Delaware. The area consists mainly of agricultural fields with a small residential neighborhood not serviced by public water. There are four (4) public supply wells for the City of Dover along White Oak Road. These wells have detectable concentrations of PFAS. There are surface water bodies in the area. The suspected source of PFAS in the supply wells is the possible application of PFAS-containing biosolids in the farm fields. The topography

of the area is flat with drainage primarily flowing toward the Herring Branch. The sub-facility is depicted in **Figure 2** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, the location of existing irrigation well samples for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.2 Holland Glade PFAS

The sub-facility is located along Holland Glade Road immediately west of the City of Rehoboth Beach and the Town of Henlopen Acres, Sussex County, Delaware. The area consists of a mixture of medium and high-density residential and commercial properties, with wooded tracts of recreational land. One residential neighborhood within the sub-facility is not serviced by public water. There are four (4) public supply wells for the City of Rehoboth Beach immediately behind the commercial development along Coastal Highway. There are also over 12 public supply wells within the Town of Henlopen Acres east of the Lewes and Rehoboth Canal. All of these wells have detectable concentrations of PFAS. There are surface water bodies in the area including the canal. The suspected source of PFAS in the supply wells are the spray fields in the area, the historic agricultural fields, and the commercial development along Coastal Highway. The topography of the area is flat with drainage primarily flowing toward the Beaverdam Branch and the Lewes and Rehoboth Canal. The sub-facility is depicted in **Figure 3** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, the location of existing irrigation well samples for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.3 Long Branch PFAS

The sub-facility is located along Old County Road southwest of Glasgow, New Castle County, Delaware. The area consists mainly of low-density residential neighborhoods with an wooded area in which the Long Branch Creek flows. Drinking water supply is a mix of public water and private wells.

The detection of PFAS was discovered in the Long Branch Creek near the Maryland border during the statewide surface water study. There are surface water bodies in the area. The suspected source of PFAS in the Long Branch are a National Priority List (NPL) site Harvey & Knotts Drum Site (DE-0040) and the HSCA Glasgow Site (DE-0056) both of which contained drums of various wastes. These former unregulated disposal areas could have potentially contained PFAS or PFAS-containing materials. The topography of the area is relatively flat with drainage primarily flowing toward the Long Branch Creek and flowing to the Chesapeake Bay. The sub-facility is depicted in **Figure 4** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the locations of existing observation and existing monitoring well samples for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.4 Chapel Branch PFAS

The sub-facility is located along Woodland Road southwest of the City of Seaford, Sussex County, Delaware. The area consists mainly of low-density residential lots with an wooded area in which the Chapel Branch flows. The former DuPont Seaford Polymer Plant and landfill (DE-0021) is located east of the area. Drinking water supply is a mix of public water and private wells. The detection of PFAS was discovered in the Nanticoke River. There are surface water bodies in the area. The suspected source of PFAS is the landfill and former Polymer plant. The topography of the area is relatively flat with drainage primarily flowing toward the Nanticoke River and flowing to the Chesapeake Bay. The sub-facility is depicted in **Figure 5** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, and surface water bodies targeted for aqueous and sediment sampling.

2.1.5 Stevenson PFAS

The sub-facility is located along Stevenson Lane in the southeast portion of the Town of Georgetown, Sussex County, Delaware. The area consists

mainly of low to medium-density residential neighborhoods, the Town's former sewage treatment facility, agricultural fields and an airport further to the east, and a public park (Layton Park). The drinking water supply in the area is public water, and no active private domestic wells are nearby. The detection of PFAS was discovered in one of the Town's public drinking water well located within Layton Park. There are surface water bodies in the area. The suspected sources of PFAS within the wells are the sewage treatment facility (DE-0224) and the application of biosolids in the agricultural fields. The topography of the area is relatively flat with drainage primarily flowing toward the Eli Walls Ditch. The sub-facility is depicted in **Figure 6** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, the locations of existing observation and existing monitoring well samples for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.6 Savannah Road PFAS

The sub-facility is located at the intersection of Savannah Road and Donovans Road in the City of Lewes, Sussex County, Delaware. The area consists mainly of medium-density residential neighborhoods with some commercial areas and Cape Henlopen High School. Drinking water supply is a mix of public water and private wells. The detection of PFAS was discovered in two public water systems in the area. (Donovan Smith Mobile Home Park and the City of Lewes well field.) There are surface water bodies in the area. The suspected source of PFAS is undetermined but may be linked to past agricultural fields in the area. The topography of the area is relatively flat with drainage primarily flowing toward the Ebenezer Branch and Canary Creek. The sub-facility is depicted in **Figure 7** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, the locations of existing observation wells for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.7 Washington Street PFAS

The sub-facility is located at the intersection of Washington Street and Wilson Street in the Town of Laurel, Sussex County, Delaware. The area consists mainly of medium to high-density residential neighborhoods with some commercial areas and North Laurel Elementary School. Drinking water supply is a mix of public water and private wells. The detection of PFAS was discovered in the Town of Laurel's public wells located near the elementary school. There are surface water bodies in the area. The suspected source of PFAS is a fertilizer plant located to the west (DE-0225). The topography of the area is relatively flat with drainage primarily flowing toward the Broad Creek and flowing to the Chesapeake Bay. The sub-facility is depicted in **Figure 8** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, the locations of existing observation and monitoring wells for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.8 Iron Branch PFAS

The sub-facility is located along Iron branch Road southeast of Millsboro, Sussex County, Delaware. The area consists mainly of medium to high-density residential neighborhoods with two large industrial centers located to the west. Drinking water supply is a mix of public water and private wells. The detection of PFAS was discovered in two public water systems located on the east side of Iron Branch Road. There are surface water bodies in the area. The suspected source of PFAS are the two industrial plants to the west (DE-0042 and DE-1555). The topography of the area is relatively flat with drainage primarily flowing toward the Indian River. The sub-facility is depicted in **Figure 9** with proposed areas for soil sampling and proposed areas for the installation of monitoring wells, the area targeted for the collection of private domestic well samples, the locations of existing observation and monitoring wells for sampling, and surface water bodies targeted for aqueous and sediment sampling.

2.1.9 Zoar Road PFAS

The sub-facility is located at the intersection of Zoar Road and Cedar Lane southeast of Georgetown, Sussex County, Delaware. The area consists mainly of medium to light-density residential neighborhoods with agricultural fields. Drinking water supply is a mix of public water and private wells. The detection of PFAS was discovered in a public water system located at the intersection. There are surface water bodies in the area. The suspected source of PFAS is biosolid applications to surrounding agricultural fields. The topography of the area is relatively flat with drainage primarily flowing toward the Gills Branch and Stockley Branch. The sub-facility is depicted in **Figure 10** with the area targeted for the collection of private domestic well samples, the locations of existing irrigation wells for sampling, and surface water bodies targeted for aqueous and sediment sampling. The area is not currently targeted for soil and monitoring well sampling.

2.1.10 Skeeter Neck PFAS

The sub-facility is located at the intersection of Skeeter Neck Road and Front Street, Little Heaven, Kent County, Delaware. The area consists mainly of medium to high-density residential neighborhoods with limited commercial areas and agricultural fields. Drinking water supply is a mix of public water and private wells. The detection of PFAS was discovered in an agricultural observation well along Skeeter Neck Road and subsequently became a state-led investigation (DE-1829). There are surface water bodies in the area. The suspected source of PFAS is biosolid applications to surrounding agricultural fields and potentially on-lot private septic systems. The topography of the area is relatively flat with drainage primarily flowing toward the Murderkill River. The sub-facility is depicted in **Figure 11** with proposed areas for soil sampling, collection of private domestic well samples irrigation well samples, and observation well samples, the installation of dedicated monitoring wells, and surface water bodies targeted for aqueous and sediment sampling.

2.1.11 Forrest Avenue PFAS

The sub-facility is located at the intersection of Forrest Avenue (Route 8) and Cahoon Branch Road west of the City of Dover, Kent County, Delaware. The area consists mainly of low density residential, a commercial property (Byler's Store), agricultural fields, and forested areas. Drinking water is manly supplied via private wells with the lone commercial property serving as a public water source. The detection of PFAS was discovered at the public water system (DE-1794). There are surface water bodies in the area. The suspected source of PFAS is undetermined but could be a combination of biosolids applications in agricultural fields and on-lot private septic systems. The topography of the area is relatively flat with drainage primarily flowing toward the Cahoon Branch. The sub-facility is depicted in **Figure 12** with proposed areas for soil sampling, installation of monitoring wells, and surface water bodies targeted for aqueous and sediment sampling.

2.2 Data Quality Objectives

DNREC-RS will follow established DNREC Data Quality Objectives (DQOs) for investigations listed in the DNREC-RS Quality Assurance Program Plan (QAPrP) for all the PFAS samples collected. The analytical method for all PFAS analyses will be EPA Method 1633A. The data collected will be evaluated in conjunction with previous PFAS data collected at each sub facility to make further evaluations about the PFAS contamination in each media.

All laboratory analytical results will be evaluated by comparing results to HSCA Screening Levels (DNREC, October 2024) and EPA Regional Screening Levels (EPA, November 2024), which are presented in Worksheet #15 (from EPA's Uniform Federal Policy for Quality Assurance Project Plans) included as **Attachment A**. If contaminants of potential concern are not detected above the HSCA Screening Levels, then no further action is required at the sub-facility. If one or more contaminants are found above their respective HSCA Screening Level and/or EPA RSL, then recommendations for further

action such as additional assessment, remediation, or removal will be evaluated at each sub-facility.

Analytical results from private wells will also be evaluated by comparing results to MCLs (also shown in Worksheet #15). If one or more contaminants are found above their respective MCLs, then recommendations for further action such as additional assessment, remediation, or removal will also be evaluated. For private well supplies, a determination will be made to provide treatment to affected well owners and to move the routine sampling of the well into DNREC's private well program for PFAS.

During this initial study, PFAS analytical results will only be compared to screening levels and not background levels. However, if further evaluation is needed at any sub-facility, then background levels will be assessed at that time to determine if the sub-facility is a significant contributor of contamination (3x background levels) and may warrant placement on the NPL.

2.3 Conceptual Site Model

The State of Delaware has been collecting aqueous PFAS samples within the Coastal Plain since 2019. Based on the data set collected to date, the upper part of the surficial Columbia Aquifer is affected by PFAS, however not uniformly. The lower portions (below 60 feet bgs) of the Columbia Aquifer often see higher concentrations than the upper portion (above 60 feet bgs). The confined aquifers below the Columbia Aquifer within the Coastal Plain are not as affected by PFAS. While PFAS has been detected in the Fredrica Aquifer (Dover Air Force Base), the magnitude of the concentrations is lower than what is routinely observed in the Columbia Aquifer, and the number of wells with detections is also lower.

Delaware's PFAS Policy for Sampling and Evaluating PFAS in Soil, Groundwater, and Surface Water (2023b), recognizes three groups of PFAS sources; primary, secondary, and tertiary. Primary sources are known facilities that manufactured or applied PFAS as a part of their production or

within their processes. Secondary sources are facilities that handled, used, processed, or concentrated PFAS. Tertiary sources are known sinks, applicators, or unintended receptors of PFAS. Table 2 below outlines which type of potential PFAS source is located at each sub-facility.

Table 2 Potential Source Identification Chart			
Sub Facility	Primary Source	Secondary Source	Tertiary Source
Cowgills Corner PFAS (Dover)			X
Holland Glade PFAS (Rehoboth Beach /Henlopen Acres)		X	X
Long Branch PFAS (Glasgow)		X	
Chapel Branch PFAS (Seaford)	X	X	
Stevenson PFAS (Georgetown)		X	X
Savannah Road PFAS (Lewes)		X	X
Washington Street PFAS (Laurel)		X	X
Iron Branch PFAS (Millsboro)		X	X
Zoar Road PFAS (Georgetown)			X
Skeeter Neck PFAS (DE-1829)			X
Forrest Ave PFAS (DE-1794)			X

Tertiary Sources have also been referred to be DNREC-RS as “non-point source interference”. This concept recognizes that if a primary or secondary source is being evaluated at a facility, there could be competing inputs of PFAS from non-point sources. This concept is often explained to citizens whose private domestic wells are being sampled for PFAS. While we are evaluating or investigating a point PFAS release, the contamination in their private well may not necessarily be from the target of the investigation. We communicate the possibility of other “unknown” or “potential” sources of PFAS.

The collection of these data within the larger study will assist DNREC-RS with improving source determination and site characterization of PFAS. As our understanding of the nature and signature of the PFAS within the environment improves, the ability to distinguish PFAS sources will as well. This concept will enable DNREC (and others) to better deploy resources to areas where active, on-going, or large-scale PFAS spills or releases are occurring or have occurred in the past.

The data collection will also help DNREC- Division of Water, the Delaware Department of Health and Social Services (DHSS), and the Delaware Department of Agriculture (DDA) assist private well owners, public water system operators, and agricultural resources to deploy mitigation efforts for the use of any PFAS affected well. The collection of soil and sediment data will also be used to evaluate source removal as a remedy and DNREC-Division of Watershed Stewardship with their efforts to protect the surface waters of Delaware.

3.0 Scope of Work

The sampling locations are based on a review of the limited data collected for each sub-facility, surface waters, and both public and private water supplies. This scope of work has been developed in coordination with EPA to identify the presence of possible sources of PFAS that have affected each sub-facility. The data and information will be used to determine future work within the Coastal Plain and at each sub-facility. DNREC-RS will contract

with an approved consultant under State Contract #NAT-20374 to perform the FSP. The contractor will develop, and DNREC-RS will maintain a health and safety program and compile a Site-Specific HASP (see **Section 4.0**) conforming to the best management practices for the hazardous materials suspected to be present.

In the event a sample location is required to be relocated due to accessibility issues, obstructions, or buried utilities, the contractor will provide a rationale to DNREC-RS Project Manager who will provide approval for alternative location(s). In addition, DNREC-RS personnel will be onsite during the sampling activities to provide oversight to the contractor. The new sample locations will be as close as possible to the original location. The utility mark-out and ground penetrating radar (GPR) scan will be inclusive of areas to best select new sampling or monitoring locations.

Samples collected in support of this FSP will be sent to the selected contracted HSCA-approved laboratory under proper chain of custody. The selected contractor will coordinate with the lab with concurrence and oversight from DNREC-RS for all laboratory orders, deliveries, and communications. All private well sampling coordination will only be completed by DNREC and DHSS staff.

Every sub-facility will also include an ambient or background sample in all the media sampled including soil, groundwater, surface water, and sediment. The locations of the ambient samples will be identified during the final phase of sampling locations and presented in reporting to the EPA.

3.1 Soil Evaluation

The selected consultant will sub-contract a Delaware licensed drilling company to advance all soil borings in support of this project and FSP. The number of borings for each sub-facility will be determined by the contractor with final approval from the DNREC-RS Project Manager. At each sampling location, a shallow soil sample will be collected from depths of 0 to 2 (ft bgs) and at least one (1) deep soil sample (greater than 2 ft bgs) will be collected based on lithological descriptions. The targeted location of the 2nd soil

sample will be approximately 0.5 feet above the water table within the vadose zone. Any additional deep soil samples within the saturated zone will target fine-grained soils with a higher propensity for matrix diffusion of PFAS (ITRC, 2023). The soil borings are not expected to be advanced past 30 ft bgs. The selected contractor will provide oversight for all drilling activities and will log soils using the Unified Soil Classification System (USCS) for key features such as color, grain size, moisture content, presence and description of fill material, and any other relevant observations. All soil samples will be collected in accordance with DNREC SOPs for shallow (2021c) and deep soil sampling (2021b).

3.1.1 Utility Mark-out and GPR

Prior to the initiation of drilling activities, the Delaware Miss Utility service will be contacted to mark existing utilities. In addition, prior to the subsurface investigation, a GPR geophysical survey will be completed and will scan the proposed drilling locations for underground utilities and other unknown potential anomalies. Additionally, the GPR survey will be used to survey each sub-facility for possible unknown underground anomalies that may be present in connection with any historic operations which could present an environmental concern.

3.1.2 Permits

The Delaware-licensed drilling subcontractor will secure well permits with DNREC Water Supply Section Division of Water Resources prior to subsurface drilling activities.

3.1.3 Soil Sampling

No less than eight (8) and no more than 16 soil boring locations will be advanced at each sub-facility. The advancement method, number, location, and name of each soil boring will be determined by DNREC's contractor and approved in consultation with the DNREC-RS Project Manager. Each soil sample will be collected in laboratory-supplied bottle ware. Additionally, the appropriate number of trip blanks, field blanks, equipment blanks, and duplicates samples, will be collected for Quality Assurance/Quality Control

(QA/QC) purposes pursuant with DNREC Standard Operating Procedures. Please refer to **Section 3.8** for details about QA/QC sampling.

All remaining soil spoils will be placed back into each respective borehole and topped off with bentonite chips and completed at the surface with appropriate material (i.e., soil or gravel) dependent on sample location.

3.1.4 Soil Sample Analysis

Laboratory analysis will be completed in accordance with DNREC's Standard Operating Procedures for Chemical Analytical Programs (SOPCAP *Rev. Oct 2023*)[1]. The soil samples will be analyzed for PFAS using EPA Method 1633A.

3.2 Groundwater Evaluation

Groundwater will be investigated by installing, developing, and sampling three (3) shallow monitoring wells and one (1) deeper monitoring well at each sub-facility in accordance with DNREC SOPs for *Groundwater Monitoring Well Installation and Development* (2024b).

3.2.1 Use of Existing Wells and Survey

DNREC-RS will make attempts to sample the following types of existing permitted wells (private wells are omitted). The number and types of these wells are found in **Table 3** below.

[1] https://documents.dnrec.delaware.gov/dwhs/remediation/SOPs/SOP-for-HSCA-CAP.pdf

Table 3 Approximate Number of Existing to be Sampled				
Sub Facility	Public Wells	Irrigation Wells	Observation Wells	Monitoring Wells
Cowgills Corner PFAS	4	1	4	0
Holland Glade PFAS	23	2	2	0
Long Branch PFAS	2	0	2	8
Chapel Branch PFAS	1	0	0	0
Stevenson PFAS	2	0	1	3
Savannah Road PFAS	7	0	1	0
Washington Street PFAS	5	0	0	3
Iron Branch PFAS	2	0	4	5*
Zoar Road PFAS	1	0	0	0
Skeeter Neck PFAS (DE-1829)	4	2	0	0
Forrest Ave PFAS (DE-1794)	1	0	0	0

*- There are 20 monitoring wells at the 29984 Pinnacle Way HSCA site, only 5 will be sampled

The locations for irrigation and observation wells are plotted on each sub-facility's Figure. The location of existing monitoring wells is also indicated on the respective sub-facility's Figure (Washington Street PFAS and Iron Branch PFAS). Only the number of public wells is indicated with the locations not disclosed in this report. The monitoring wells and soil boring locations installed in support of this project will be surveyed in order to establish relative groundwater elevation and groundwater flow direction. A Delaware licensed surveyor will survey the sample locations and reference North American Vertical Datum of 1988 (NAVD 88) in feet (ft) and horizontal control in (ft) and referenced to the Delaware State Plane Coordinate System, N.A.D. 1983.

3.2.2 Monitoring Well Installation and Development

The monitoring wells will be constructed in previously completed soil borings by installing a 2-inch, inner diameter, pre-packed well, with at least 10 feet of screen (0.010 slot) via direct-push or hollow stem auger drilling equipment. A supplemental sand pack will be poured into the open portion of the well annulus around and above the pre-packed screen to the extent necessary to install an adequate bentonite and concrete seal. The well finish of a stick-up or flush mount manhole will be a sub-facility specific determination based on field conditions. The final depth of the shallow wells will be determined by field conditions and the depth of the surrounding permitted wells at each sub-facility. The monitored zone of the shallow wells will be the upper portion of the Columbia Aquifer. No well is expected to exceed 50 feet bgs.

The one (1) deep well will extend into the lower portion of the Columbia Aquifer. No well will extend into a confined aquifer. The deeper well will be double cased to prevent migration of any upper aquifer water into the semi-confined area. The exact depth will be dependent on the following conditions and surrounding information:

- The depths of the surrounding permitted wells in the lower aquifer,
- The lithology encountered during advancement of the well,

    - No well will be installed in fine-grained (silt or clay) layers
- No deeper well should extend greater than 90 feet bgs.

The monitoring wells will be developed using applicable DNREC SOPs to the extent feasible by pumping and surging groundwater using a submersible pump until field parameters are stabilized and the discharge is relatively clear and free of visible sediments. Groundwater purged from monitoring wells for well development will be run through granulated activated carbon filter and discharged to ground surface. Before and after well development is completed at each sub-facility, a post treatment QA/QC shall be collected from the carbon unit treating development water. This data will be used to evaluate if the carbon filter is effectively removing any potential PFAS from the discharge water.

3.2.3 Groundwater Sampling

Approximately one (1) week following development of the wells at each sub-facility, groundwater samples will be collected from each monitoring well. After development, a Hydrasleeve passive sampler shall be placed in each well. After one (1) week, the Hydrasleeve will be retrieved to collect a grab groundwater sample. Prior to collecting a sample, a water quality meter will be placed in the well to record general water quality parameters including:

- Dissolved oxygen (DO)
- Oxidation-Reduction Potential (ORP)
- pH
- Temperature
- Specific Conductivity (SC)

For every 20th groundwater sample, a larger capacity Hydrasleeve (also called a SuperSleeve) will be used to collect a field duplicate sample. One (1) equipment blank will be collected by running PFAS-free water over a Hydrasleeve for QA/QC. Each sub-facility will have four (4) wells for a total of 44 wells across the entire project area. It is expected that at least three (3) field duplicates and equipment blanks will be collected during groundwater sampling. Additionally, one trip blank and one field blank will

be collected for QA/QC purposes for each day of sampling. All PFAS samples will be collected directly into the laboratory supplied HDPE containers. All groundwater samples will be collected in accordance with DNREC SOPs for *Groundwater Sampling and Faucet Delivery* (2024c). Any extra water contained in the used Hydrasleeve can be returned to the monitoring well.

The sampling of other wells listed in **Section 3.2.1** will require coordination with the DNREC-RS project manager and field personnel. If these wells are sampled during the same mobilization as the project's groundwater monitoring wells, the QA/QC samples for trip and field blanks can be submitted together. If the samples are from observation or existing monitoring wells, the contractor's field sampling team shall make every effort to sample using passive means to avoid or reduce the amount of investigation derived waste (IDW). The collection of duplicate samples for the existing well sampling will be separate from the dedicated monitoring well sampling. A duplicate and equipment blank will also be required for every 20th sample collected from all other previously installed wells.

A total of two (2) rounds of groundwater samples will be collected from all of the groundwater monitoring wells in support of this FSP. Since there is no direct access to public and irrigation wells, samples from these wells will be collected in accordance with DNREC SOPs for *Groundwater Sampling and Faucet Delivery.*

3.2.4 Groundwater Sample Analysis

Laboratory analysis will be completed in accordance with SOPCAP. The groundwater samples will be analyzed for PFAS using EPA Method 1633A.

3.3 Surface Water Evaluation

The number of surface water samples will be determined by the number and reach of any stream and the number of ponds located within each sub-facility. For streams, at least three (3) locations will be selected from each stream within the sub-facility. For pond locations, at least one (1) sample will

be collected. All surface water samples will be collected in laboratory-supplied sample containers. All surface water samples will be collected in accordance with DNREC SOPs for *Surface Water Sampling* (2021d).

3.3.1 Surface Water Sample Analysis

Laboratory analysis will be completed in accordance with SOPCAP. The surface water samples will be analyzed for PFAS using EPA Method 1633A.

3.4 Sediment Evaluation

One (1) sediment sample will be collected at each corresponding surface water location. The sediment samples will be collected in laboratory-supplied sample containers containing appropriate preservatives where applicable. All sediment samples will be collected in accordance with DNREC SOPs for *Sediment Sampling* (2021a).

3.4.1 Sediment Sample Analysis

Laboratory analysis will be completed in accordance with SOPCAP. The sediment samples will be analyzed for PFAS using EPA Method 1633A.

3.5 Private Well Sampling

DNREC-RS and DHSS personnel will collect all private domestic well samples. The State of Delaware has established a procedure for communication, deployment, collection, and notification of residents with a private well. This procedure ensures that all residents are notified, that consistent communication is conveyed to the residents, and if mitigation is required, that the homeowner is made aware that they can enter into the State of Delaware Private Well Program for filtration and continued monitoring. **Table 4** below details the approximate number and type of private wells that are believed to exist at each sub-facility. The types of well include the following: Private Domestic Well (PDW) which are wells to supply a home with water; Agricultural Well (AGW) which are wells to supply non-potable water for domestic use; and Miscellaneous Public Wells (MPW) which are wells supplying water to commercial businesses and are not regulated under Safe Drinking Water Act.

Table 4 Approximate Number of Private Wells to be Sampled			
Sub Facility	Private Domestic Wells (PDW)	Agricultural Wells (AGW)	Miscellaneous Public Well (MPW)
Cowgills Corner PFAS	18	0	0
Holland Glade PFAS	60	10	2
Long Branch PFAS	12	2	0
Chapel Branch PFAS	25	3	2
Stevenson PFAS	0	1	0
Savannah Road PFAS	34	6	10
Washington Street PFAS	28	10	0
Iron Branch PFAS	52	0	0
Zoar Road PFAS	46	3	0
Skeeter Neck PFAS (DE-1829)	40	1	0
Forrest Ave PFAS (DE-1794)	N/A	0	3

Note: Forrest Avenue's residential wells are already sampled under the Private Well Program.

Samples from the private wells will be sampled in accordance with DNREC SOPs for *Groundwater Sampling and Faucet Delivery.* DNREC-RS and DHSS field staff are responsible for maintaining proper chain-of-custody protocol

for analytical laboratory analysis by the HSCA-approved laboratory. All private well samples will be analyzed via EPA Method 1633A. The analytical data for certain private well samples will be used to make decisions about any potential mitigation.

3.6 Decontamination Procedures

Decontamination of non-dedicated sampling tools (e.g., macro-core sampling shoe and barrel) will be conducted after each sample boring and will include tap water and an approved detergent wash, tap water rinse, and deionized or distilled water rinse, followed by air drying. Disposable sampling equipment (e.g., latex gloves) will be collected and disposed of properly. Any decontamination water will be containerized to be treated along with any development water.

3.7 Investigation Derived Waste (IDW)

It is a goal of this project not to produce excessive amounts of IDW during the execution of the FSP. Soils that do not exhibit obvious signs of contamination that cannot be returned to the borehole may be placed on the ground next to the boring. Soils that exhibit obvious signs of contamination during advancement and any soil cuttings produced during the installation of monitoring wells will be containerized during drilling and placed in drums or other suitable container for off-site disposal. It is anticipated that some soil cuttings will require disposal. Any soil drums shall be removed and disposed of in a timely manner.

All water pumped during development will be run through carbon filter as stated in **Section 3.2.2**. The sampling of groundwater wells should not produce purge water to be filtered or containerized for disposal without DNREC-RS project manager's permission.

3.8 Quality Assurance and Quality Control

Field sampling and sample handling will adhere to the procedures as specified in the above refenced QAPrP, SOPCAP, and as described in this FSP. Sampling equipment will be decontaminated between sampling

locations using procedures outlined in the Quality Assurance Project Plan. Sterile disposable sampling equipment, such as disposable Hydrasleeves and soil scoops, will be used where applicable.

The QA/QC sample program also requires that samples be collected to evaluate the quality of field sampling practices and equipment decontamination practices. The following samples will be collected during the sampling period:

- One (1) duplicate sample per matrix, per 20 samples, (soil, groundwater from project monitoring wells, groundwater from existing wells, surface water, sediment, private wells).
- One (1) Equipment blank of the Hydrasleeves per 20 samples.
- One (1) field blank and one (1) trip blank will be collected for analysis per day of field sampling.
- One (1) Temperature blank (1 per cooler)

All selected soil, sediment, surface water, and groundwater samples will be submitted to the HSCA-approved laboratory and analyzed in accordance with HSCA laboratory protocols and procedures, as applicable, using EPA Method 1633A.

3.9 Combined Site Inspection Report

Upon completion of subsurface investigation and sampling activities at sub-facilities, the selected contractor will produce a Combined Site Inspection Report. This report will include a presentation of background information, physical setting, complete documentation of the FSP field work, nature of the PFAS in the media sampled, conclusions, and recommendations, as required by DNREC and EPA. If contaminants of potential concern (COPCs) are identified at any sub-facility, further evaluation and delineation of those areas will be necessary. A draft version of the report will be submitted to DNREC and EPA for their review and comment. Subsequently, the contractor will incorporate comments from DNREC and EPA into the Combined Site Inspection Report.

4.0 Project Health and Safety Plan

A Site-specific HASP will be developed for the project by the selected contractor. Major elements of the HASP include:

- Sub-facility descriptions including availability of resources such as roads, water supply, electricity, and directions to the closest medical facility.
- Description of the known hazards and evaluation of the risks associated with the activities.
- Listing of key personnel and alternates responsible for site safety, response operations, and for protection of public health.
- Description of levels of protection to be worn by personnel in work area.
- Establishment of procedures to control site access.
- Description of decontamination procedures for personnel and equipment.
- Establishment of site emergency procedures.
- Emergency medical care for injuries and toxicological problems.
- Description of requirements for an environmental surveillance program.
- Establishment of procedures for protecting workers from weather-related problems.

The HASP will be consistent with:

- NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985).
- EPA Order 1440.1 Respiratory Protection.
- EPA Order 1440.3- Health and Safety Requirements for Employees engaged in Field Activities.
- Facility Contingency Plans.
- EPA Standard Operating Safety Guide.
- OSHA regulations in 29 CFR 1910 and 1926.

5.0 Project Schedule

DNREC-RS has established a project schedule for the execution of this FSP. The schedule establishes a timeframe for completion of each activity and is included below. Once the sampling, analysis, and data evaluation have been completed, the draft report will be prepared. The project schedule is subject to change pending funding availability and site access.

Project Timeline:

Finalize FSP	December 2025
Send FSP out for bid	January 2026
Select Contractor	March 2026
Coordination Period	April-June 2026
Geophysical Investigation / Utility mark-Out	July 2026
Soil Sampling & Monitor Well Installation	July-September 2026
Misc. Public Well and Public Water Sampling	July-October 2026
Private Domestic Well Sampling	July-October 2026
Sediment and Surface Water Sampling	September 2026
First Round Groundwater Sampling	September 2026
Second Round Groundwater Sampling	December 2026
Draft Combined Site Inspection Report	March 2027
Final Report to EPA	June 2027

6.0 References

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Attachment A

Worksheet #15 Screening Limits and Laboratory-Specific Detection/Quantitation Limits

Matrix: Groundwater and Surface Water

Analytical Method: EPA 1633A

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ng/L)	HSCA Screening Level/Project Action Limit* (ng/L)	MCL (ng/L)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ng/L)	Method Detection Limit (MDL) (ng/L)
Perfluorobutanoic acid (PFBA)	375-22-4	1800	1800	NA	HSCA SL	2.83	0.71
Perfluoropentanoic acid (PFPeA)	2706-90-3	NA	NA	NA	MDL	1.42	0.35
Perfluorohexanoic acid (PFHxA)	307-24-4	990	610	NA	HSCA SL	1.42	0.35
Perfluoroheptanoic acid (PFHpA)	375-85-9	NA	NA	NA	MDL	1.42	0.35
Perfluorooctanoic acid (PFOA)	335-67-1	0.0027	0.0027	4	MDL	1.42	0.35
Perfluorononanoic acid (PFNA)	375-95-1	5.9	5.9	10	HSCA SL	1.42	0.35
Perfluorodecanoic acid (PFDA)	335-76-2	0.004	NA	NA	MDL	1.42	0.35
Perfluoroundecanoic acid (PFUnA)	2058-94-8	600	600	NA	HSCA SL	1.42	0.35
Perfluorododecanoic acid (PFDoA)	307-55-1	100	100	NA	HSCA SL	1.42	0.39

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ng/L)	HSCA Screening Level/Project Action Limit* (ng/L)	MCL (ng/L)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ng/L)	Method Detection Limit (MDL) (ng/L)
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	NA	NA	NA	MDL	1.42	0.41
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	2000	2000	NA	HSCA SL	1.42	0.57
Perfluorobutanesulfonic acid (PFBS)	375-73-5	600	600	NA	HSCA SL	1.42	0.38
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	NA	NA	NA	MDL	1.42	0.35
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	39	10	10	HSCA SL	1.42	0.35
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	NA	NA	NA	MDL	1.42	0.35
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.2	0.2	4	MDL	1.42	0.35
Perfluorononanesulfonic acid (PFNS)	474511-07-4	NA	NA	NA	MDL	1.42	0.35
Perfluorodecanesulfonic acid (PFDS)	335-77-3	NA	NA	NA	MDL	1.42	0.35
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	NA	NA	NA	MDL	1.42	0.38
4:2 FTS	757124-72-4	NA	NA	NA	MDL	2.83	0.71
6:2 FTS	27619-97-2	NA	NA	NA	MDL	2.83	0.71

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ng/L)	HSCA Screening Level/Project Action Limit* (ng/L)	MCL (ng/L)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ng/L)	Method Detection Limit (MDL) (ng/L)
8:2 FTS	39108-34-4	NA	NA	NA	MDL	2.83	0.71
Perfluorooctanesulfonamide (PFOSA)	754-91-6	NA	NA	NA	MDL	1.42	0.35
NMeFOSA	31506-32-8	NA	NA	NA	MDL	1.42	0.35
NEtFOSA	4151-50-2	NA	NA	NA	MDL	1.42	0.35
NMeFOSAA	2355-31-9	NA	NA	NA	MDL	1.42	0.35
NEtFOSAA	2991-50-6	NA	NA	NA	MDL	1.42	0.35
NMeFOSE	24448-09-7	NA	NA	NA	MDL	7.08	1.77
NEtFOSE	1691-99-2	NA	NA	NA	MDL	7.08	1.77
HFPO-DA (GenX)	13252-13-6	1.5	1.5	10	HSCA SL	1.06	0.28
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NA	NA	NA	MDL	1.42	0.35
PFMPA	377-73-1	NA	NA	NA	MDL	1.42	0.35
PFMBA	863090-89-5	NA	NA	NA	MDL	1.42	0.35

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ng/L)	HSCA Screening Level/Project Action Limit* (ng/L)	MCL (ng/L)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ng/L)	Method Detection Limit (MDL) (ng/L)
NFDHA	151772-58-6	NA	NA	NA	MDL	1.42	0.51
9Cl-PF3ONS	756426-58-1	NA	NA	NA	MDL	1.42	0.41
11Cl-PF3OUdS	763051-92-9	NA	NA	NA	MDL	1.42	0.35
PFEESA	113507-82-7	NA	NA	NA	MDL	1.42	0.35
3:3 FTCA	356-02-5	NA	NA	NA	MDL	2.83	0.71
5:3 FTCA	914637-49-3	NA	NA	NA	MDL	7.08	1.77
7:3 FTCA	812-70-4	NA	NA	NA	MDL	7.08	1.77

MCL – Maximum Contaminant Level (April 2024)
MDL – method detection limit
NA – not available
ng/L – nanograms per liter

*Project Action Limits (PALs) are defined as follows:
1) EPA RSL – EPA Tapwater Regional Screening Level (RSL), Target Risk = 1E-06 & Target Hazard Quotient = 0.1 (November 2024); and
2) Delaware's Hazardous Substance Cleanup Act (HSCA) Groundwater Screening Level (SL) for Human Health (October 2024)

Eurofins Sacramento Laboratory provided RLs and MDLs.

Worksheet #15 Screening Limits and Laboratory-Specific Detection/Quantitation Limits

Matrix: Soil and Sediment

Analytical Method: EPA 1633A

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ug/kg)	HSCA Screening Level/Project Action Limit* (ug/kg)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ug/kg)	Method Detection Limit (MDL) (ug/kg)
Perfluorobutanoic acid (PFBA)	375-22-4	7800	7800	HSCA SL	0.400	0.100
Perfluoropentanoic acid (PFPeA)	2706-90-3	NA	NA	MDL	0.200	0.0500
Perfluorohexanoic acid (PFHxA)	307-24-4	3200	3200	HSCA SL	0.200	0.0500
Perfluoroheptanoic acid (PFHpA)	375-85-9	NA	NA	MDL	0.200	0.0500
Perfluorooctanoic acid (PFOA)	335-67-1	0.019	0.019	MDL	0.200	0.0620
Perfluorononanoic acid (PFNA)	375-95-1	19	19	HSCA SL	0.200	0.0500
Perfluorodecanoic acid (PFDA)	335-76-2	0.013	NA	MDL	0.200	0.0500
Perfluoroundecanoic acid (PFUnA)	2058-94-8	1900	1900	HSCA SL	0.200	0.0500
Perfluorododecanoic acid (PFDoA)	307-55-1	320	320	HSCA SL	0.200	0.0500

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ug/kg)	HSCA Screening Level/Project Action Limit* (ug/kg)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ug/kg)	Method Detection Limit (MDL) (ug/kg)
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	NA	NA	MDL	0.200	0.0500
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	6300	6300	HSCA SL	0.200	0.0580
Perfluorobutanesulfonic acid (PFBS)	375-73-5	1900	1900	HSCA SL	0.200	0.0670
Perfluoropentanesulfonic acid (PFPeS)	2706-91-4	NA	NA	MDL	0.200	0.0500
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	130	130	HSCA SL	0.200	0.0500
Perfluoroheptanesulfonic acid (PFHpS)	375-92-8	NA	NA	HSCA SL	0.200	0.0500
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.63	0.63	HSCA SL	0.200	0.0500
Perfluorononanesulfonic acid (PFNS)	474511-07-4	NA	NA	MDL	0.200	0.0500
Perfluorodecanesulfonic acid (PFDS)	335-77-3	NA	NA	MDL	0.200	0.0500
Perfluorododecanesulfonic acid (PFDoS)	79780-39-5	NA	NA	MDL	0.200	0.0500
4:2 FTS	757124-72-4	NA	NA	MDL	0.400	0.100
6:2 FTS	27619-97-2	NA	NA	MDL	0.400	0.100

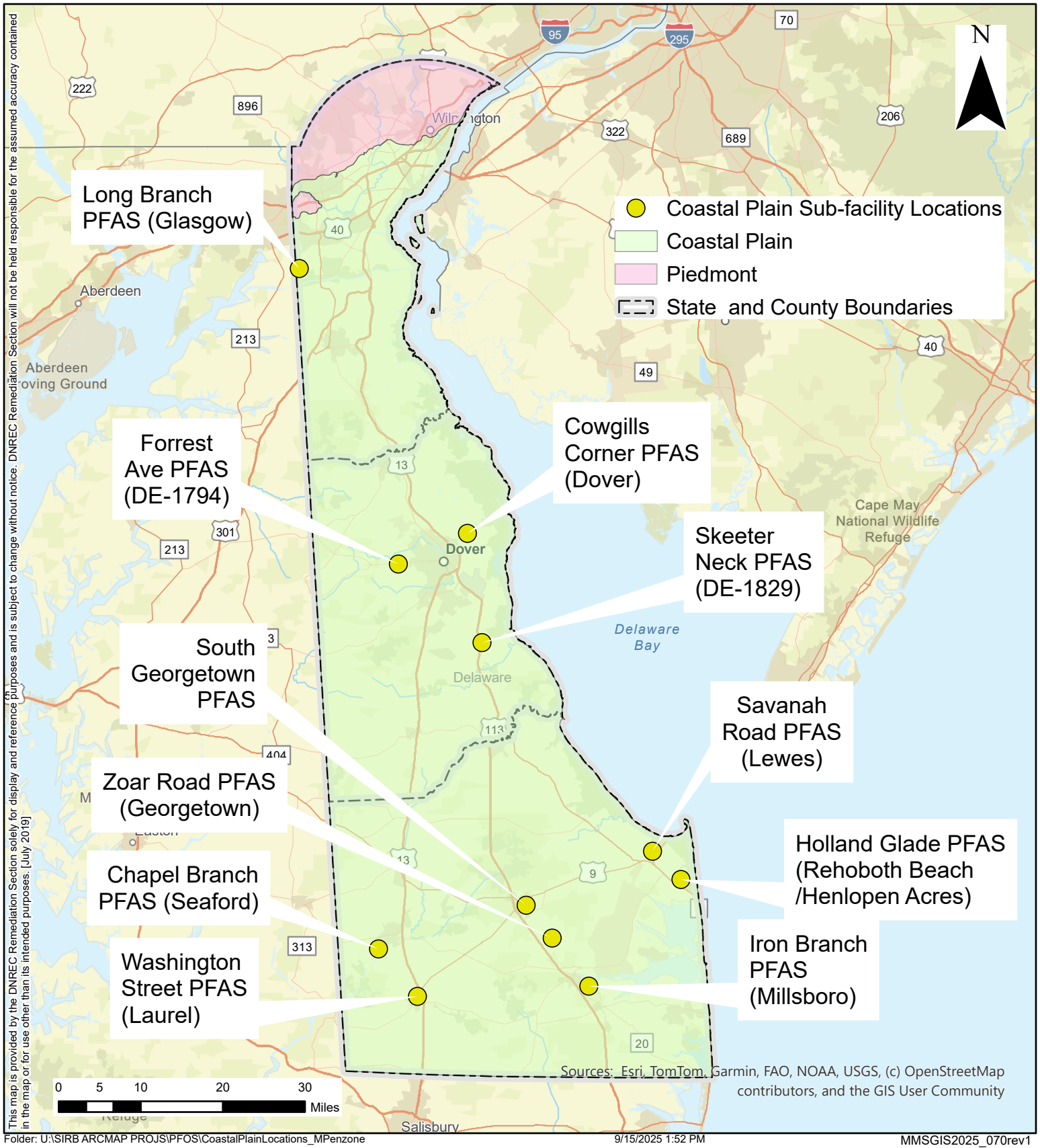
Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ug/kg)	HSCA Screening Level/Project Action Limit* (ug/kg)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ug/kg)	Method Detection Limit (MDL) (ug/kg)
8:2 FTS	39108-34-4	NA	NA	MDL	0.400	0.100
Perfluorooctanesulfonamide (PFOSA)	754-91-6	NA	NA	MDL	0.200	0.0630
NMeFOSA	31506-32-8	NA	NA	MDL	0.200	0.0500
NEtFOSA	4151-50-2	NA	NA	MDL	0.200	0.0500
NMeFOSAA	2355-31-9	NA	NA	MDL	0.200	0.0500
NEtFOSAA	2991-50-6	NA	NA	MDL	0.200	0.0500
NMeFOSE	24448-09-7	NA	NA	MDL	1.00	0.250
NEtFOSE	1691-99-2	NA	NA	MDL	1.00	0.250
HFPO-DA (GenX)	13252-13-6	23	23	HSCA SL	0.200	0.0500
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	NA	NA	MDL	0.200	0.0500
PFMPA	377-73-1	NA	NA	MDL	0.200	0.0500
PFMBA	863090-89-5	NA	NA	MDL	0.200	0.0500

Analyte	CAS #	EPA Regional Screening Level/Project Action Limit* (ug/kg)	HSCA Screening Level/Project Action Limit* (ug/kg)	Project Quantitation Limit Goal	Laboratory Quantitation Limit (Reporting Limit) (ug/kg)	Method Detection Limit (MDL) (ug/kg)
NFDHA	151772-58-6	NA	NA	MDL	0.200	0.0620
9Cl-PF3ONS	756426-58-1	NA	NA	MDL	0.200	0.0500
11Cl-PF3OUdS	763051-92-9	NA	NA	MDL	0.200	0.0750
PFEESA	113507-82-7	NA	NA	MDL	0.200	0.0500
3:3 FTCA	356-02-5	NA	NA	MDL	0.400	0.100
5:3 FTCA	914637-49-3	NA	NA	MDL	1.00	0.250
7:3 FTCA	812-70-4	NA	NA	MDL	1.00	0.250

MDL – method detection limit
NA – not available
ug/kg – micrograms per kilogram

*Project Action Limits (PALs) are defined as follows:
1) EPA RSL – EPA Residential Soil Regional Screening Level (RSL), Target Risk = 1E-06 & Target Hazard Quotient = 0.1 (November 2024); and
2) Delaware's Hazardous Substance Cleanup Act (HSCA) Soil Screening Level (SL) for Human Health (October 2024)

Eurofins Sacramento Laboratory provided RLs and MDLs.



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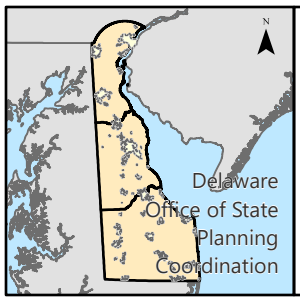
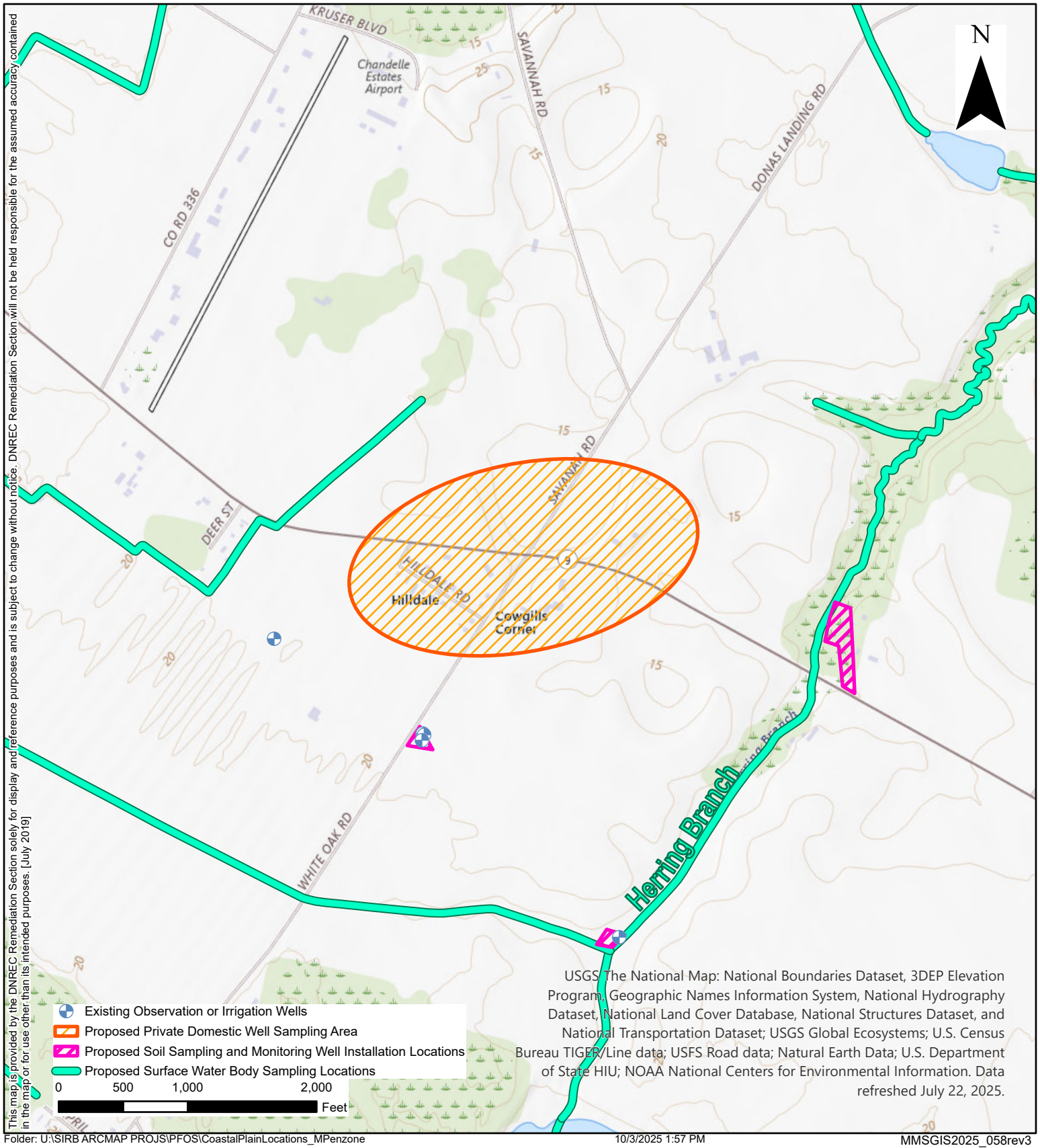


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Physiographic Provinces [Delaware Geological Survey]

1:995,000 1 inch equals 15.7 miles

FIGURE 1
COASTAL PLAIN PFAS STUDY
SUB-FACILITY
LOCATION MAP
STATEWIDE, DELAWARE



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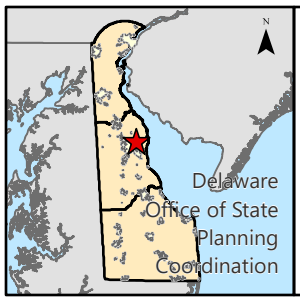
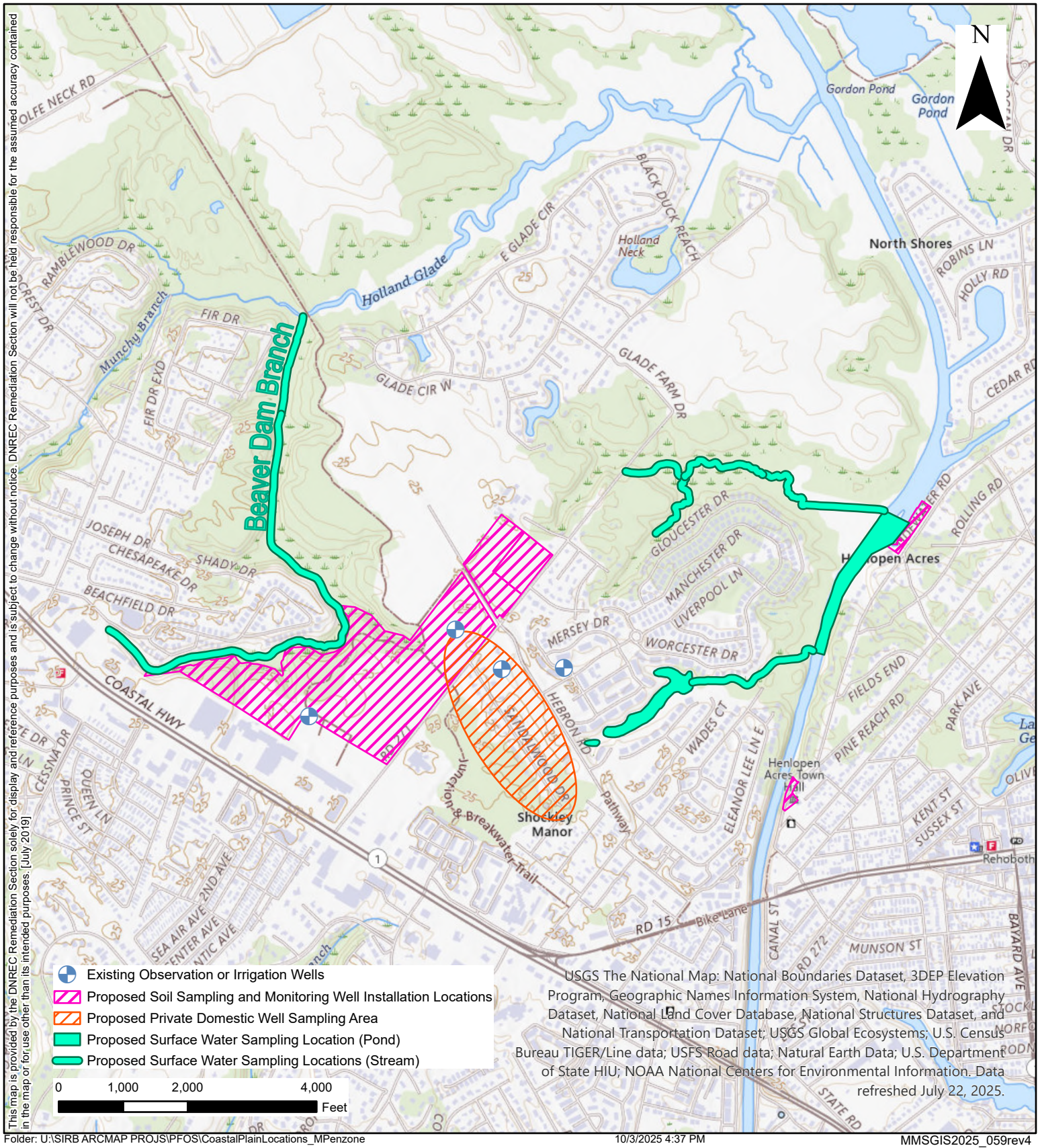


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:12,000 1 inch equals 1,000 feet

FIGURE 2
COASTAL PLAIN PFAS STUDY
COWGILLS CORNER SUB-FACILITY SAMPLING AREAS
KENT COUNTY, DELAWARE



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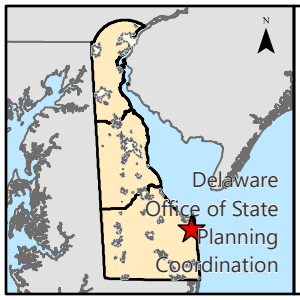
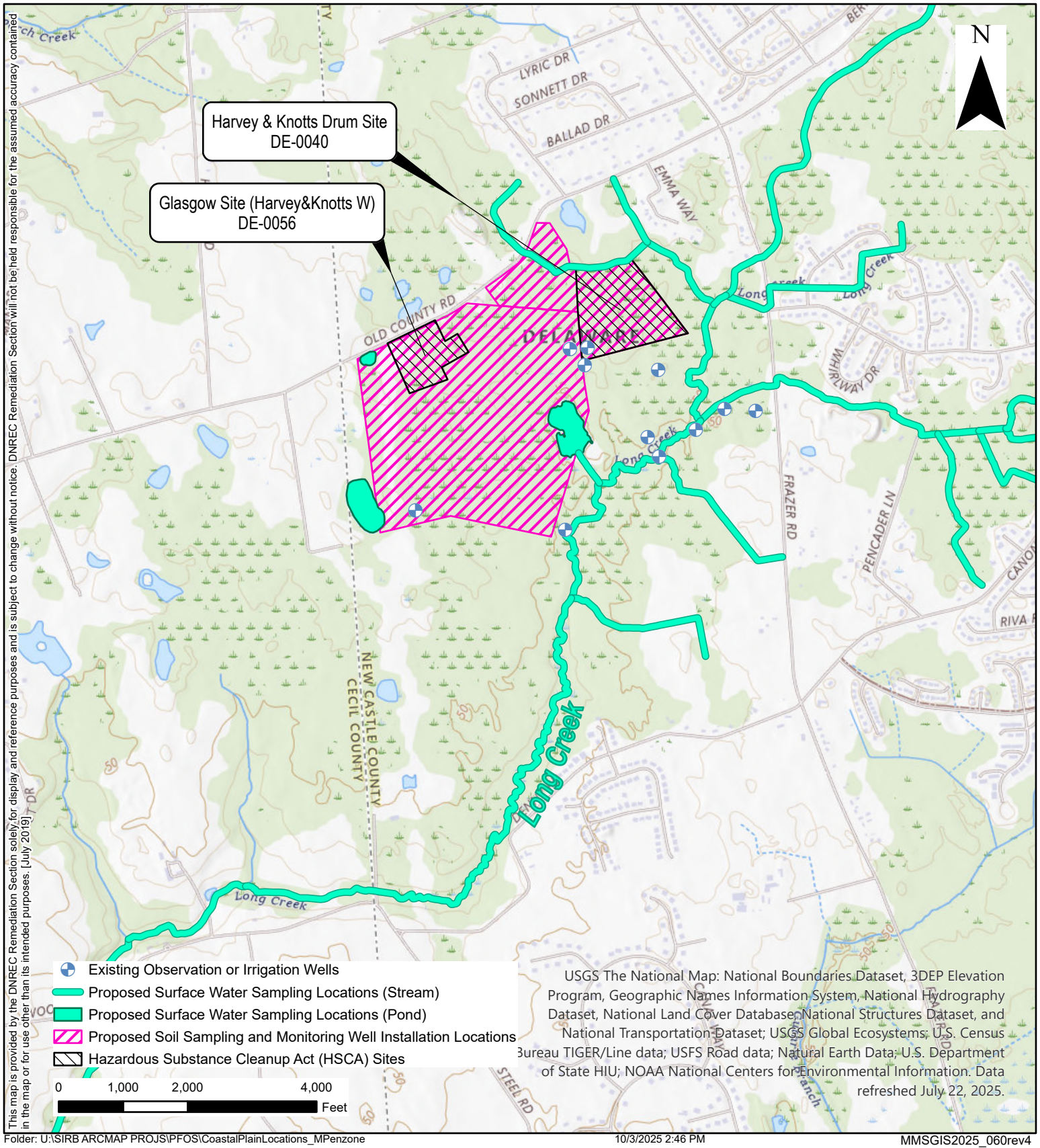


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 3
COASTAL PLAIN PFAS STUDY
HOLLAND GLADE SUB-FACILITY SAMPLING AREAS
SUSSEX COUNTY, DELAWARE



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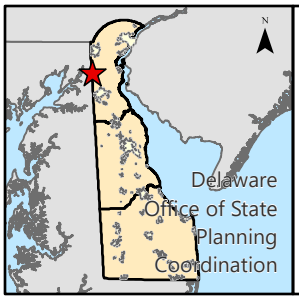
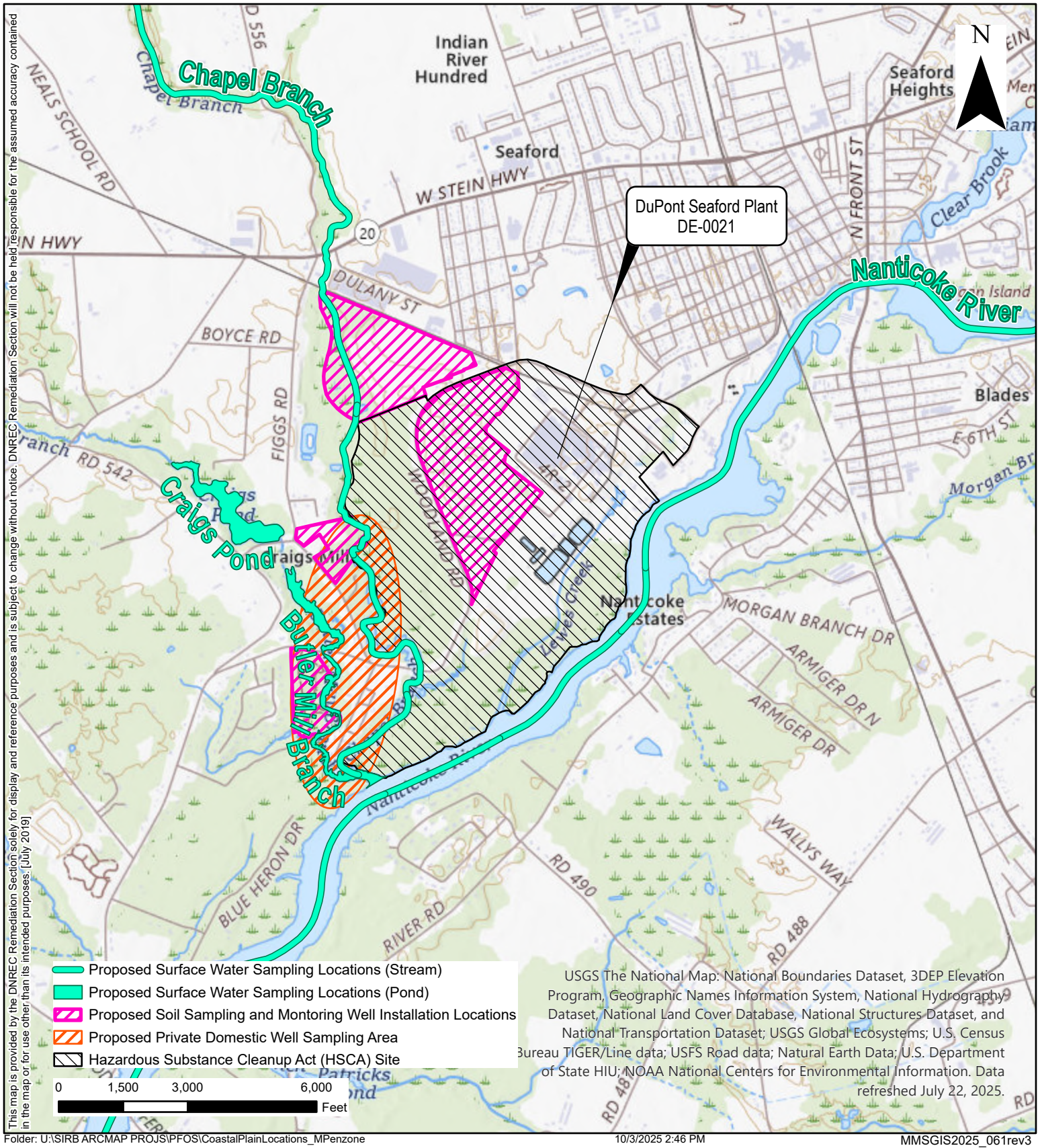


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 4
COASTAL PLAIN PFAS STUDY
LONG BRANCH (GLASGOW) SUB-FACILITY SAMPLING AREAS
NEW CASTLE COUNTY, DELAWARE



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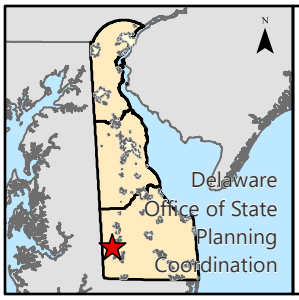
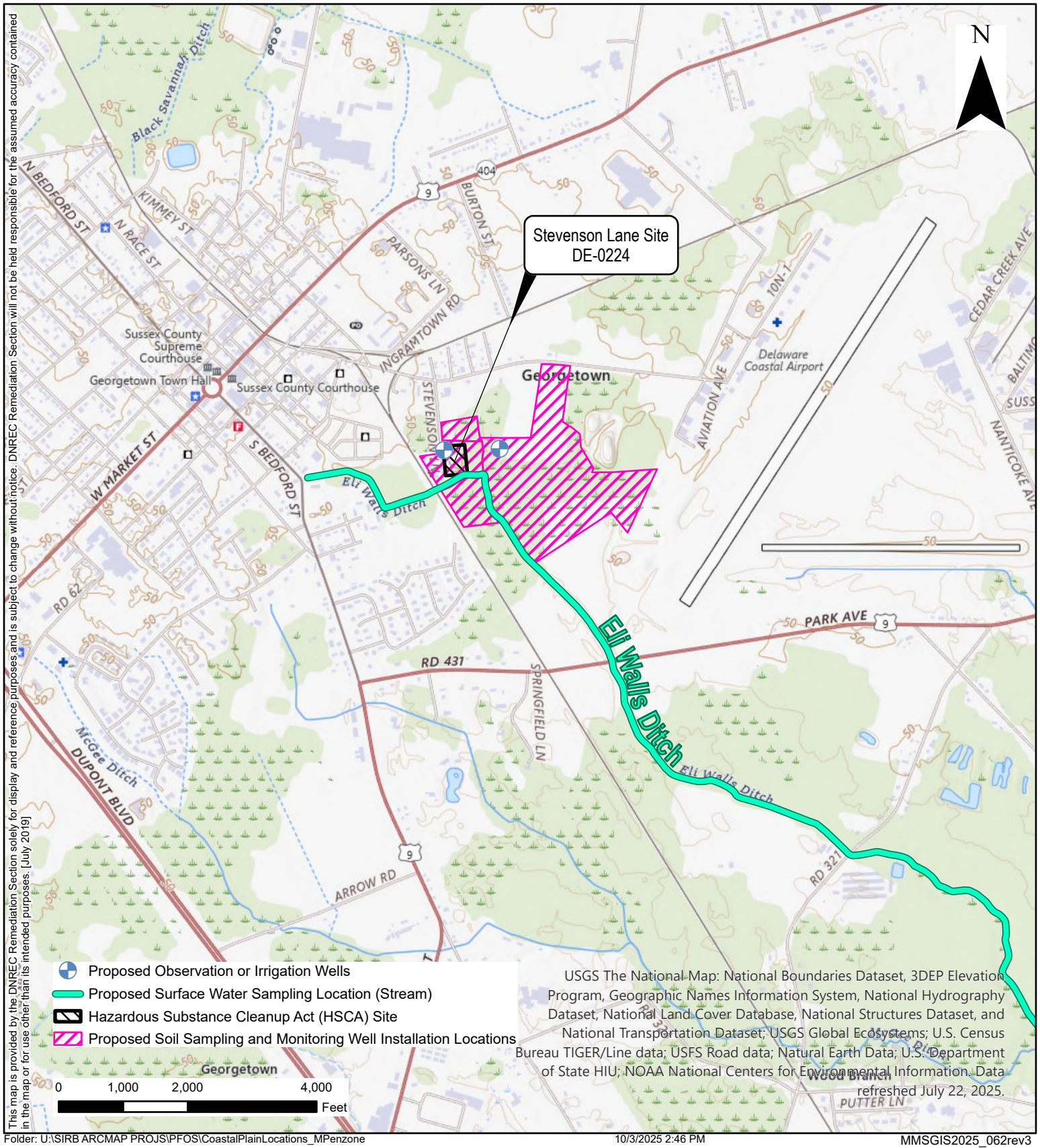


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:36,000 1 inch equals 3,000 feet

FIGURE 5
COASTAL PLAIN PFAS STUDY
CHAPEL BRANCH (SEAFORD) SUB-FACILITY SAMPLING AREAS



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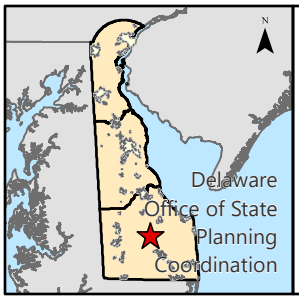
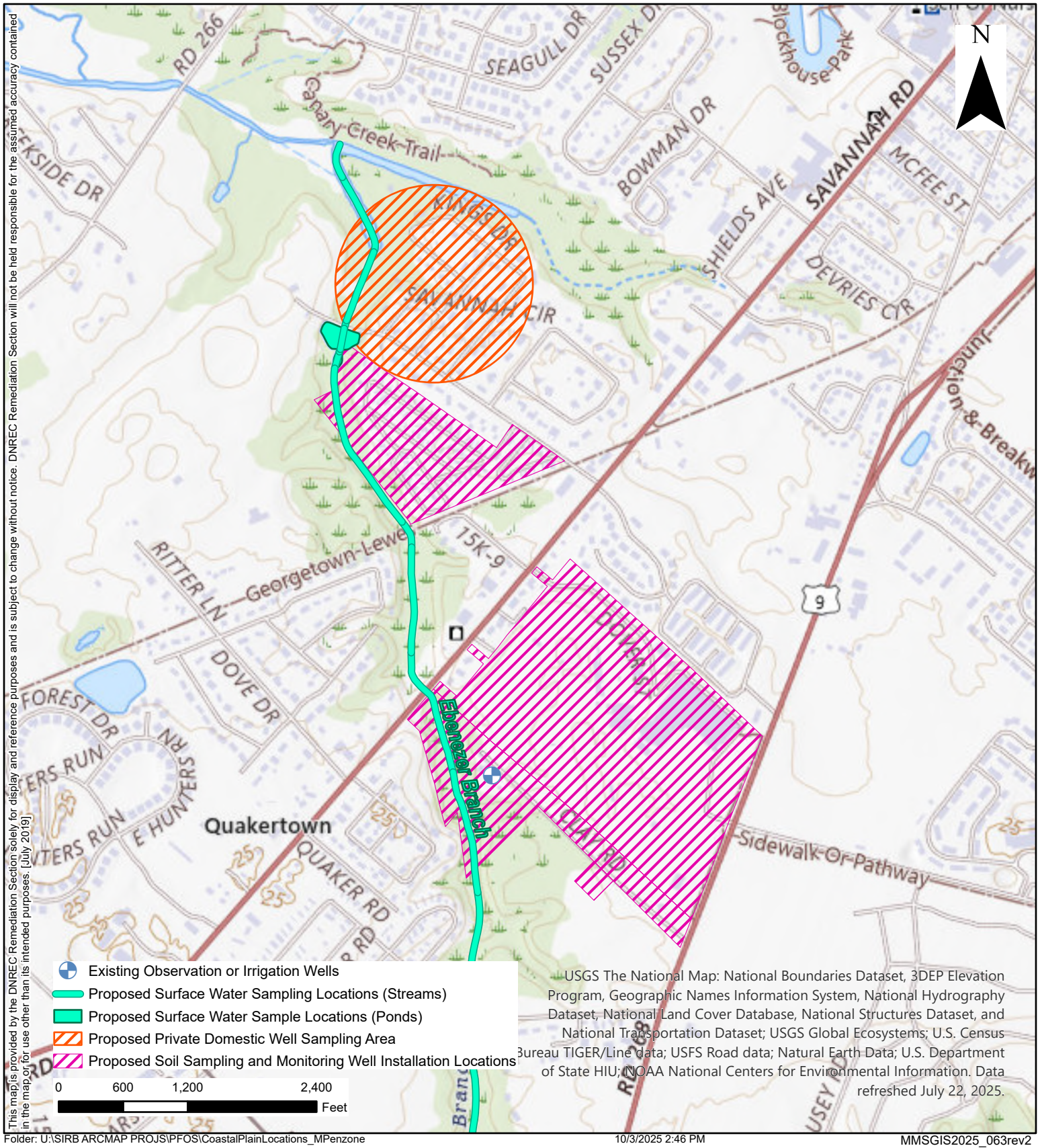


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 6
COASTAL PLAIN PFAS STUDY
STEVENSON PFAS (GEORGETOWN) SUB-FACILITY SAMPLING AREAS



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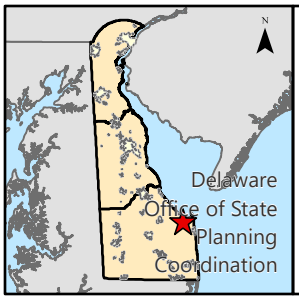
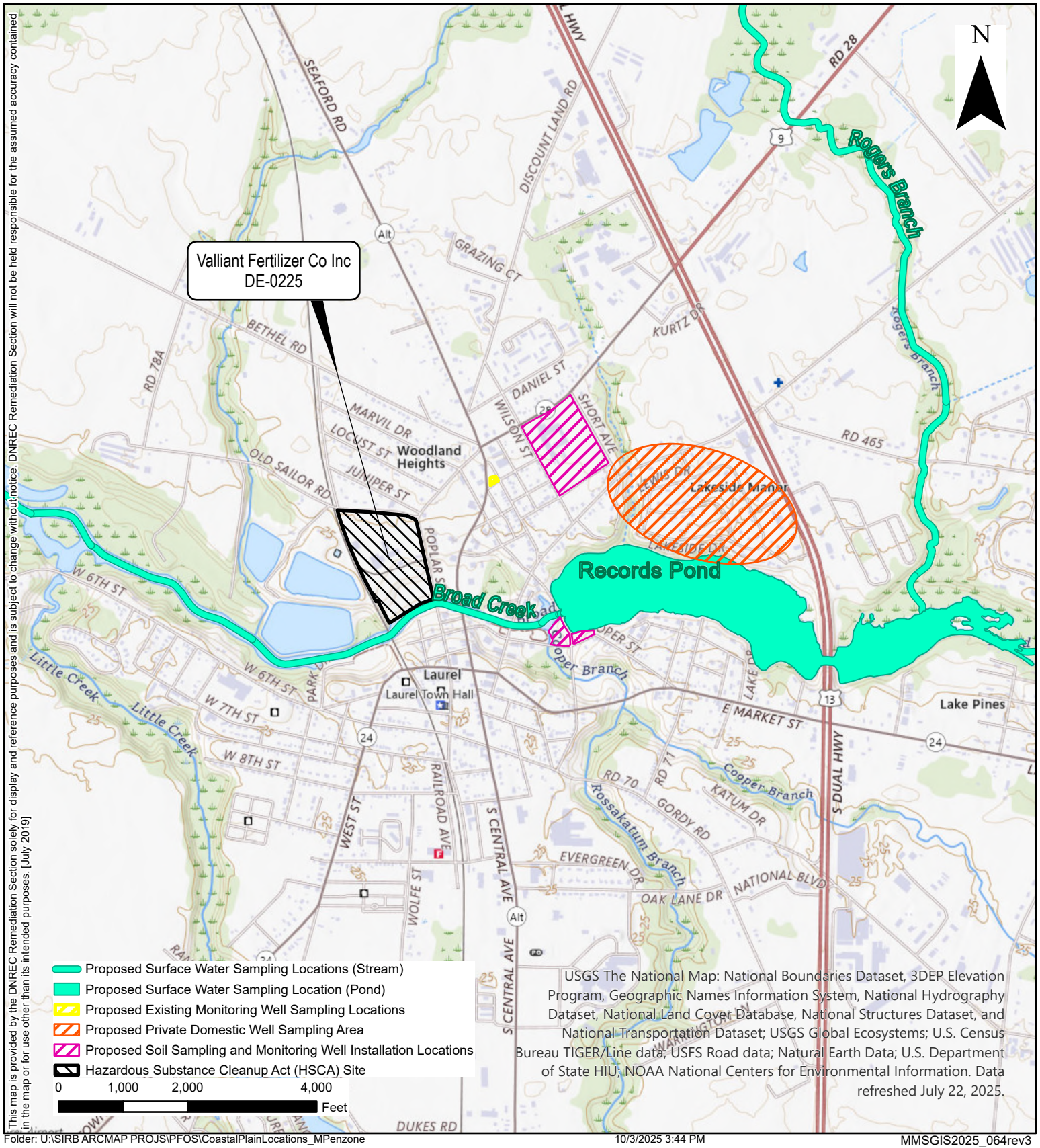


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:14,400 1 inch equals 1,200 feet

FIGURE 7
COASTAL PLAIN PFAS STUDY
SAVANNAH ROAD (LEWES) SUB-FACILITY SAMPLING AREAS
SUSSEX COUNTY, DELAWARE



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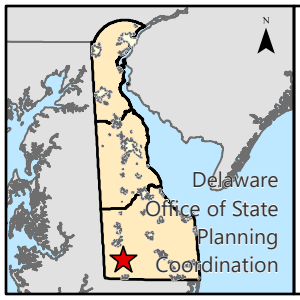
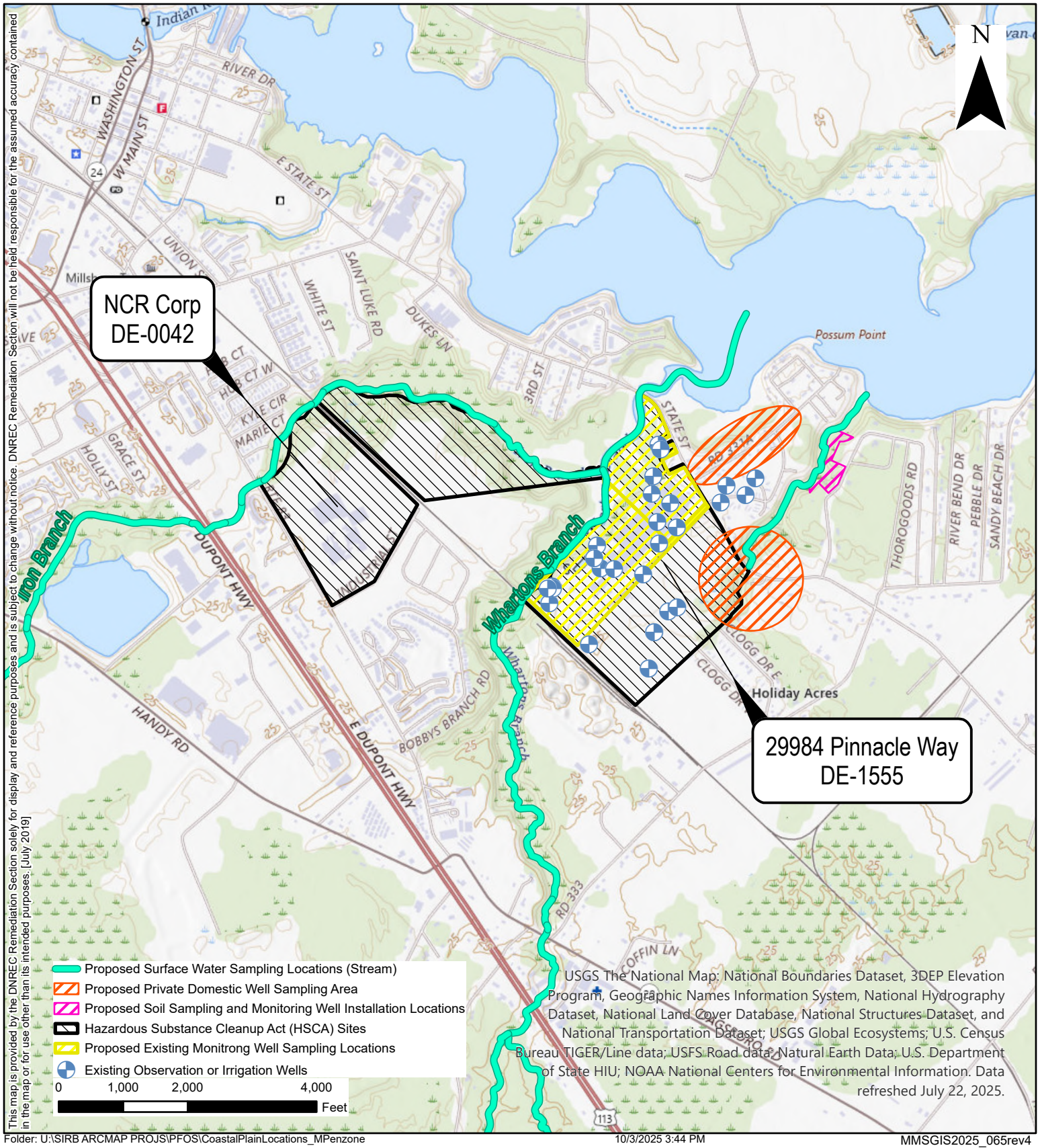


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 8
COASTAL PLAIN PFAS STUDY
WASHINGTON STREET (LAUREL) SUB-FACILITY SAMPLING AREAS
SUSSEX COUNTY, DELAWARE



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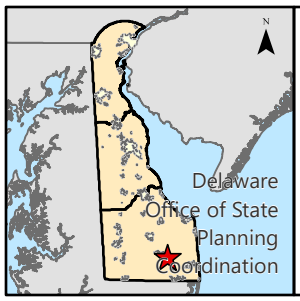
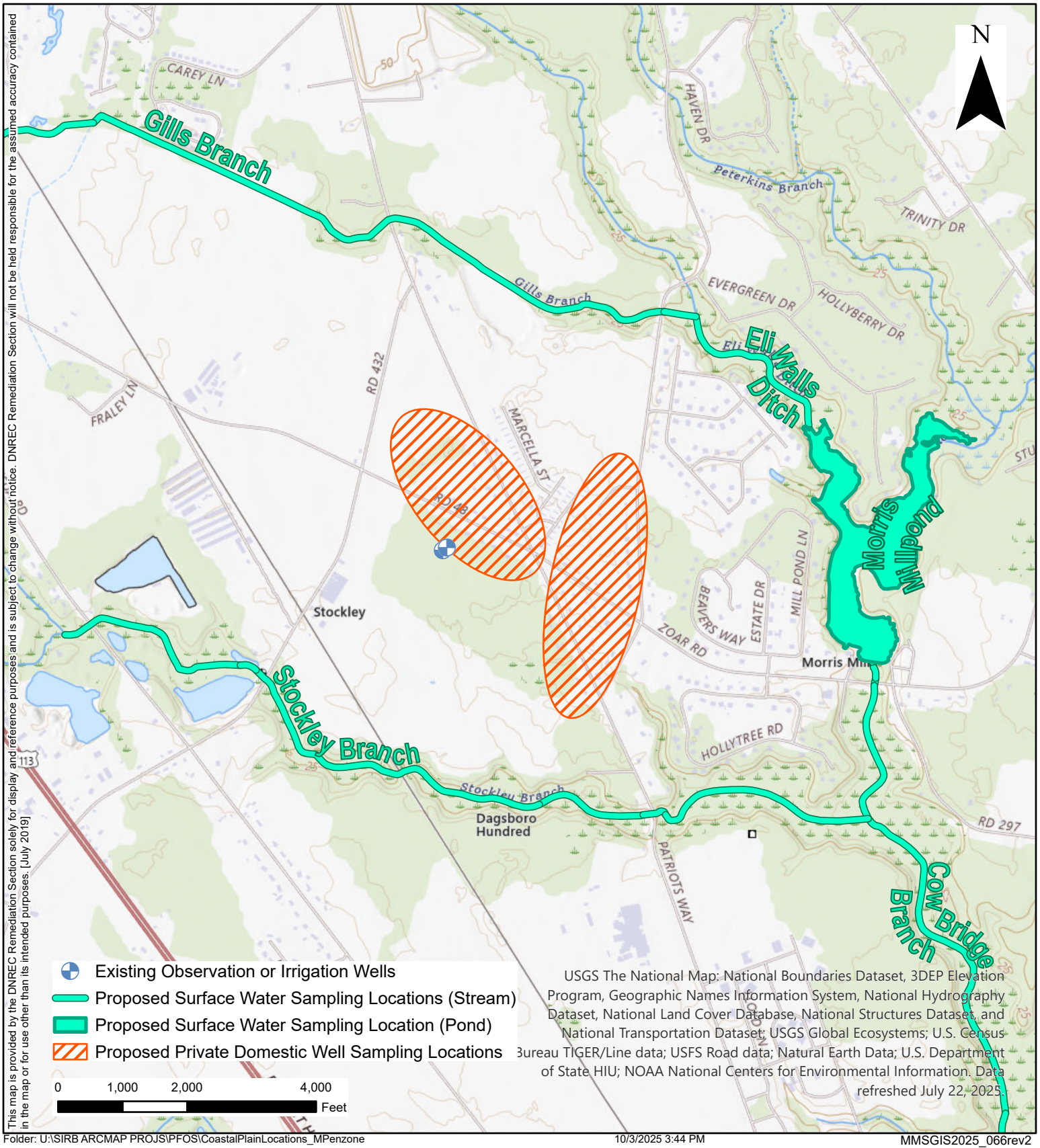


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 9
COASTAL PLAIN PFAS STUDY
IRON BRANCH (MILLSBORO) SUB-FACILITY SAMPLING AREAS
SUSSEX COUNTY, DELAWARE



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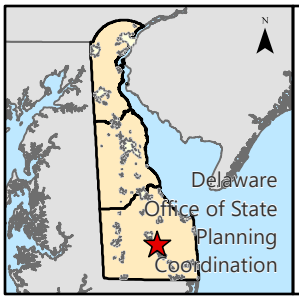
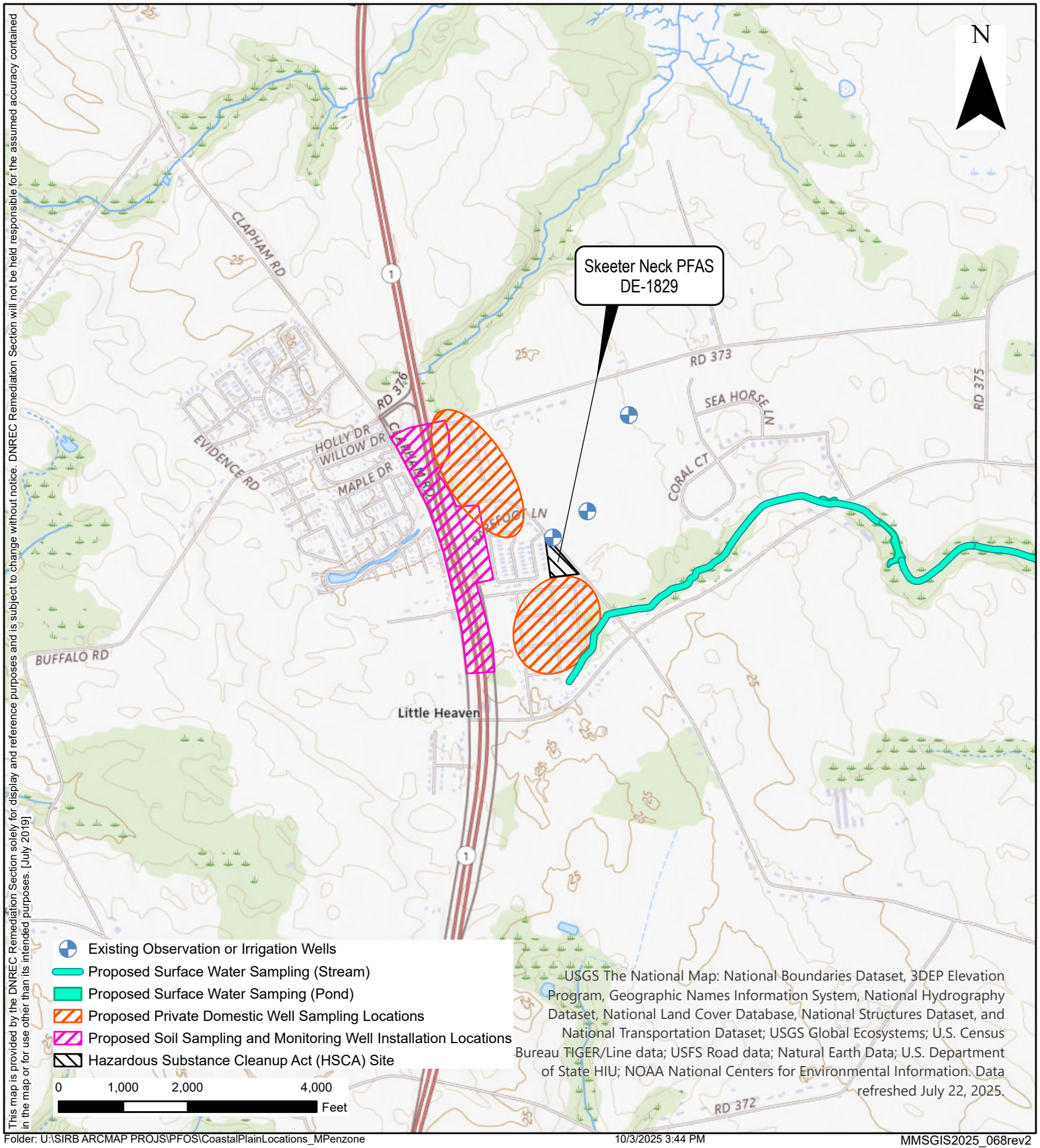


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 10
COASTAL PLAIN PFAS STUDY
ZOAR ROAD (GEORGETOWN) SUB-FACILITY SAMPLING AREAS
SUSSEX COUNTY, DELAWARE



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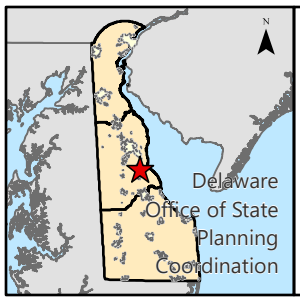
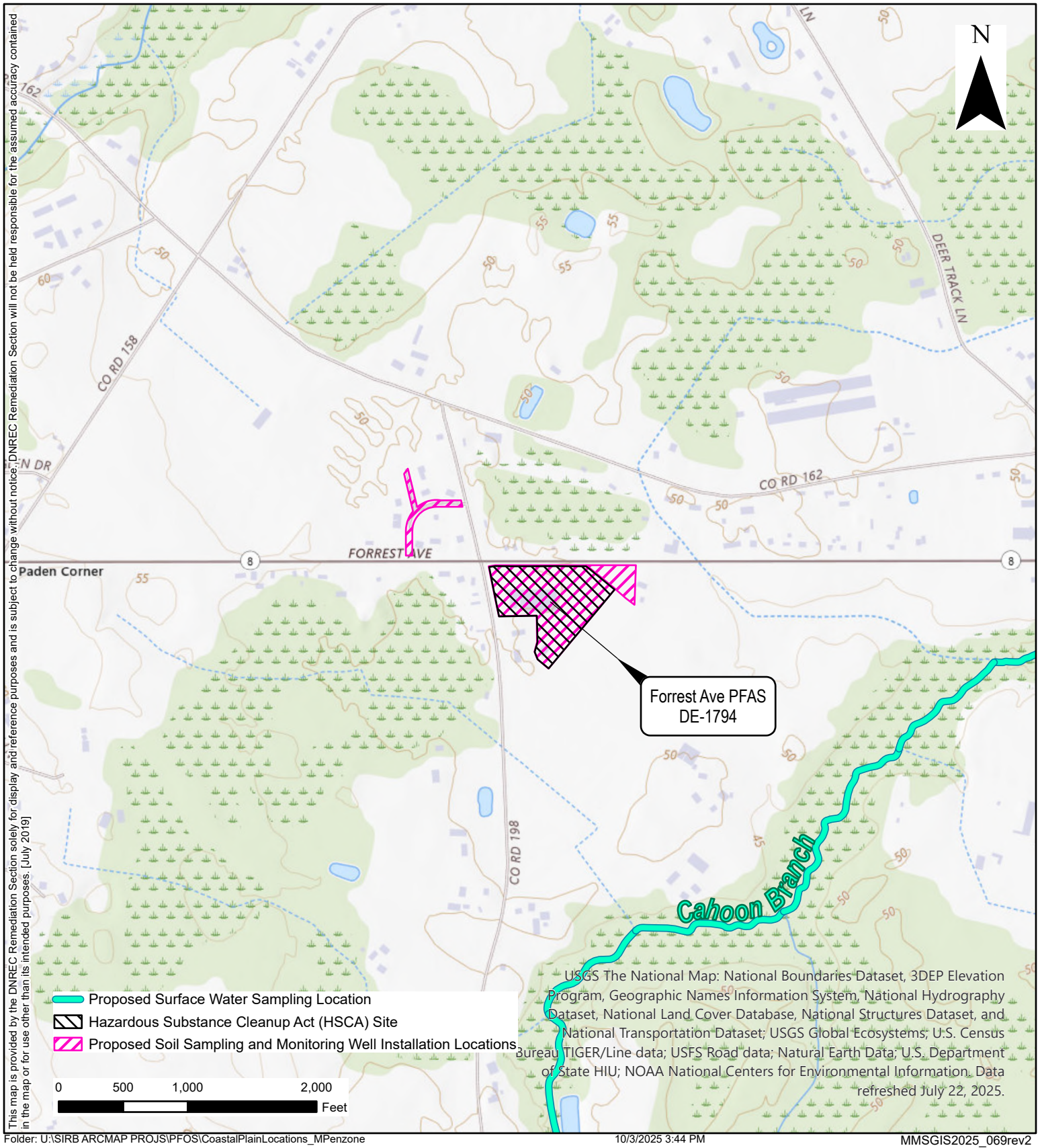


Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:24,000 1 inch equals 2,000 feet

FIGURE 11
COASTAL PLAIN PFAS STUDY
SKEETER NECK (DE-1829) SUB-FACILITY SAMPLING AREAS
KENT COUNTY, DELAWARE



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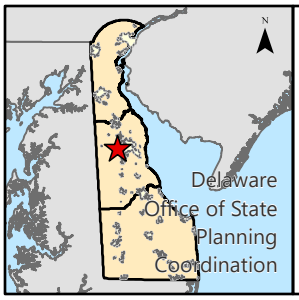

Sources: Sub-facilities and Proposed Sampling Areas [DNREC]; Flowlines and Ponds [USGS National Hydrography Dataset]; HSCA Sites [DNREC]; Non-Public Wells [DNREC]

1:12,000 1 inch equals 1,000 feet

FIGURE 12
COASTAL PLAIN PFAS STUDY
FORREST AVENUE (DE-1794)
SUB-FACILITY SAMPLING AREAS
KENT COUNTY, DELAWARE