EXHIBIT GLE-023

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

Paul S. Ryerson, Chairman
Dr. James F. Jackson
Dr. Michael O. Garcia

In the Matter of	)	Docket No. 70-7016-ML
GE-HITACHI GLOBAL LASER ENRICHMENT LLC	)	ASLB No. 10-901-03-ML-BD01
(GLE Commercial Facility)	)	June 22, 2012

GE-HITACHI GLOBAL LASER ENRICHMENT'S PREFILED TESTIMONY ON TOPIC 6 (ENVIRONMENTAL MONITORING PROGRAM)

I. INTRODUCTION

Q1. Please state your full names.

A1. My name is Joseph Alexander [JA]. I am a Senior Geologist and Project Director for RTI International in Research Triangle Park, North Carolina.

My name is Kimberly Y. Matthews [KM]. I am an Environmental Scientist for RTI International in Research Triangle Park, North Carolina.

My name is Andrew D. Stahl [AS]. I am a Senior Research Geologist for RTI International in Research Triangle Park, North Carolina.

My name is Julie A. Olivier [JO]. I am the Licensing and Regulatory Affairs Manager for the Global Laser Enrichment (GLE) project in Wilmington, North Carolina.

Q2. Please summarize your educational background and experience.

A2. [**JA**] I am Joseph Alexander. I have a B.S. degree in Geology from East Carolina University and a Masters degree in Geology, with a concentration in Hydrogeology and Engineering Geology, from Northern Arizona University. I am also licensed as a professional geologist in North Carolina and Georgia. In the course of my 40-year career, I have been involved in numerous remediation evaluation, site-selection, and hydrogeologic characterization projects, including leading the multidisciplinary environmental assessment team that assisted with the development of the Environmental Report (ER) for GE-Hitachi's (GEH) GLE proposed uranium enrichment facility (the Proposed GLE Facility).

For the majority of my career, I have worked for RTI International in various capacities. As a Senior Research Hydrogeologist for RTI, I led various groundwater contamination assessments, focusing on the development and implementation of, among other things, compliance monitoring programs. In addition, I provided technical oversight of integrated programs associated with hydrogeology, remedial technology, and geochemistry. Since 2003, my responsibilities as Senior Geologist and Project Director at RTI have principally involved leading large multidisciplinary teams. Some of these projects, in addition to the environmental assessment and site selection process for the GLE project, involved shallow-soil remedial efforts, site characterizations, and rapid response evaluations following the earthquake and tsunami at the Fukushima Daiichi Nuclear Power Plant.

[**KM**] I am Kimberly Y. Matthews. I have a B.A. degree in Biology from Wittenberg University and a Masters degree in Natural Resources, with a concentration in Watershed Hydrology, from North Carolina State University. Before joining RTI International in 2006, I worked as a Water Quality Monitoring Technician for the City of Greensboro, North Carolina,

where I conducted, among other things, maintenance inspections of on-site stormwater best management practices and water quality and biological sampling of surface waters. I also worked in the private sector as a biologist in charge of analyzing and preparing natural resource technical reports, National Environmental Protection Act (NEPA) documents, and Clean Water Act (CWA) permits.

As an Environmental Scientist for RTI, I have supported water quality and ecological projects involving investigations of streams and wetlands, and prepared environmental impact reports. More recently, my responsibilities have involved managing projects associated with wetlands assessments, ecosystem-based management of coastal lands, and quality assurance of field data collection efforts. For the GLE project, I was the primary author of the ER Sections regarding the existing surface water and ecological environmental settings and potential impacts on surface water from the Proposed GLE Facility.

[**AS**] I am Andrew D. Stahl. I have a B.S. degree in Geology from State University of New York at Binghamton and a Masters degree in Geology, with a hydrogeology focus, from The Pennsylvania State University. I am also licensed as a professional geologist in North Carolina and am certified as a Professional Geologist by the American Institute of Professional Geologists.

In my nearly 30-year career, I have worked in many different capacities as a geologist and hydrogeologist. I have managed and performed numerous groundwater and soil contamination investigations, remediation, and groundwater supply projects. These projects typically involved consulting on compliance with environmental regulations relating to soil, water, and waste issues. I have also led a groundwater resource assessment that included the development of a detailed characterization report for evaluating a site as part of the Global

Nuclear Energy Partnership. In addition, I have designed numerous statistical sampling plans and have wide-ranging experience with, and understanding of, the fate and transport of contaminants in both the vadose zone and the saturated zone. With respect to my participation in the GLE project, I was responsible for various aspects of the ER, including project scoping, technical coordination, and senior management-level review.

[**JO**] I am Julie A. Olivier. I have a B.S. degree in Chemistry from the University of New Orleans and a Masters degree in Environmental Science and Engineering from Virginia Polytechnic Institute and State University (Virginia Tech). In addition, I have completed post-graduate doctoral courses in Environmental Systems Engineering at Clemson University. During my career in the nuclear industry, I have held various technical, project management and licensing positions. I was employed by the U.S. Nuclear Regulatory Commission (NRC) for over eight years (1999 to 2007). During my NRC tenure, I was a project manager for various fuel fabrication, enrichment, and other facilities, with duties ranging from the lead technical reviewer for licensing actions involving chemical safety, to the lead environmental reviewer responsible for ensuring compliance with the NEPA. My responsibilities also included reviewing and inspecting various commitment tracking systems at commercial power reactors, fuel fabrication facilities, and uranium enrichment facilities. Since 2007, I have worked at GEH, holding positions within the GLE project as the Senior Licensing Professional and the Licensing and Regulatory Affairs Manager, which is my current position.

[**All**] Full copies of our *curriculum vitae* are attached to this testimony as Appendices A-D.

Q3. Briefly describe the materials that you reviewed in the preparation of this testimony.

A3. [**All**] We reviewed GLE's ER, along with numerous documents associated with the development of GLE's ER. Our prefiled testimony is based largely on various sections from GLE's ER. For example, our testimony related to air pathways is referenced in ER Sections 3.6 and 4.6, surface water is referenced in ER Sections 3.4 and 4.4, including wastewater in Sections 3.12 and 4.13, and groundwater is referenced in ER Sections 3.4 and 4.4. Our testimony has also been based on ER Chapter 6.0, Environmental Measurements and Monitoring Programs. In addition, we have reviewed aspects of the ER for Global Nuclear Fuels–America's (GNF-A) operational fuel fabrication facility also located at GE's Wilmington, North Carolina site (Wilmington Site or Site), ER Supplements, and GNF-A monitoring procedures established for their Environmental Monitoring Program.

Q4. What is the purpose of your testimony?

A4. [**All**] The purpose of our testimony is to respond to Topic 6, "Environmental Monitoring Program," specifically Subparts A and C, one of six prefiled testimony topic areas identified by the NRC's Atomic Safety and Licensing Board (Board) in its May 16, 2012 Memorandum and Order (May 16 Order). Our testimony addresses the three key environmental pathways (i.e., air, surface water, and groundwater) of GLE's Environmental Monitoring Program. In particular, we: (1) provide an overview of the three key environmental media pathways as discussed in GLE's ER, including how radiological and non-radiological, hazardous effluent and emission releases will be monitored, managed, and tracked; and (2) explain how GLE plans to correct problems if results are near or out of compliance with relevant environmental requirements. Our testimony does not address Subpart B from the Board's May 16 Order, which is addressed by the NRC Staff in their prefiled testimony.

Q5. Could you please provide a summary of your overall conclusions?

A5. [**All**] Yes. Our testimony reviews the atmospheric, surface water, and groundwater environmental settings in the region of the Proposed GLE Facility and explains the monitoring activities associated with the relevant pathways in these settings. Data collected as a result of these monitoring efforts will be managed and tracked according to comprehensive Records Management and Quality Assurance (QA) programs. GLE will ensure ongoing compliance with environmental requirements by establishing internal actions that will be set at specific levels in order to indicate when action, such as an investigation, is necessary. In the event GLE exceeds an internal action level or regulatory requirement, GLE will enter a corrective action request into its Corrective Action Program (CAP), conduct an investigation, and implement plans to correct the issue.

Q6. Please describe how your testimony is organized.

A6. [**All**] The testimony begins in Section II with a brief background on GLE's Environmental Monitoring Program. Section III reviews the key pathways (i.e., air, surface water, and groundwater pathways) discussed in GLE's Environmental Monitoring Program by summarizing the prevailing environmental setting for each key pathway, along with GLE's plans for monitoring for releases of radiological and non-radiological effluents and emissions. This section also discusses how GLE plans to manage and track the data collected as a result of these monitoring efforts. Finally, Section IV explains how GLE intends to use the monitoring results to establish initial action levels, and should the monitoring results indicate that GLE has exceeded the level or is near or out of compliance, its plan to initiate corrective actions.

II. BACKGROUND ON GLE'S ENVIRONMENTAL MONITORING PROGRAM

Q7. Please provide a brief overview of the relevant regulatory requirements and guidance associated with the implementation of an environmental monitoring program.

A7. [**All**] Under the NRC's radiation protection regulations in 10 CFR Part 20 (Standards for Protection Against Radiation), licensees are required to perform the measurements and monitoring necessary to demonstrate compliance with these regulations and to demonstrate that the amount of radioactive material present in effluents from the Proposed GLE Facility is kept As Low As Reasonably Achievable (ALARA). Additionally, under 10 CFR § 70.59 (Effluent Monitoring Reporting Requirements (Domestic Licensing of Special Nuclear Material)), the NRC requires licensees to submit semiannual reports specifying the quantities of the principal radionuclides released to unrestricted areas, along with other information needed to estimate the annual radiation dose to the public from radioactive effluent discharges. The NRC has also issued Regulatory Guide 4.15, *Quality Assurance for Radiological Monitoring Programs (Normal Operations) – Effluent Streams and the Environment* (1979) and Regulatory Guide 4.16, *Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluent from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants* (1985). These guides, along with local, State and Federal regulatory requirements discussed in the GLE Environmental Monitoring Program, focus on ensuring that concentrations of radiological and hazardous materials in effluents and emissions released to the environment are adequately controlled.

Q8. What is the primary purpose of GLE's Environmental Monitoring Program?

A8. [**All**] The primary purpose of an environmental monitoring program is to have adequate systems in place to detect emissions that occur at or below regulatory limits so that appropriate corrective actions can be implemented. GLE's Environmental Monitoring Program will achieve this objective by monitoring at the points of release (i.e., source-point monitoring). Airborne emissions will be sampled in the exhaust stack and liquids will be sampled at the

outfalls. The validity of the source-point monitoring program will be verified by additional measurements performed farther away from the release points. For example, ambient air and surface waters will be monitored farther away along the air and surface water pathways, respectively, and groundwater will be sampled along the perimeter of the Proposed GLE Facility in three vertical zones. Similarly, to evaluate whether changes are needed in systems or practices to achieve ALARA effluent goals, trends in the gaseous emissions and liquid effluent monitoring data are reviewed annually by a multidisciplinary team, the Wilmington Safety Review Committee. Figure 6-1 is a location map showing the perimeters of the Wilmington Site, GLE Study Area, and Proposed GLE Facility.

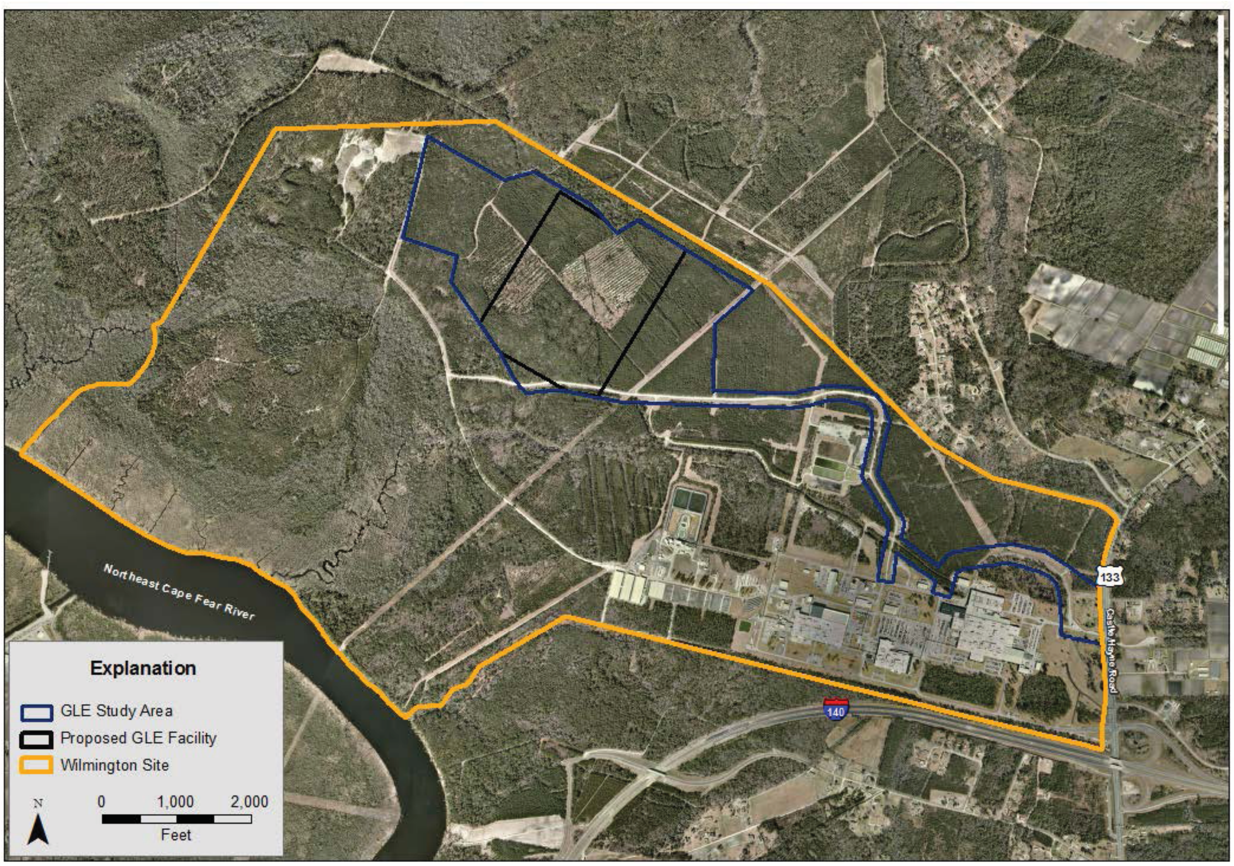

Figure 6-1. Location of the Proposed GLE Facility.

Q9. With respect to release points, can you summarize the environmental sampling locations that will be used?

A9. [**All**] Yes. A summary of the GLE Environmental Monitoring Program sampling locations for the various environmental media is provided in Table 6-1. These environmental monitoring locations are in addition to several other locations currently monitored by GNF-A. Table 6-2 presents a summary of the GLE Environmental Monitoring Program for the air, surface water, and groundwater environmental pathways. This table lists the sample types, analytical parameters, and monitoring frequency for each of the environmental media associated with these pathways.

Table 6-1. GLE Environmental Monitoring Program Sampling Locations

Medium	Sample Locations	Reference Maps
Air Pathway		
Air	Main GLE process building stack	Figure 6-2
	Proposed GLE Facility controlled access area fenceline, Site boundary point of highest potential impact, and ambient (background)	Figure 6-2
Soil	4 locations	Figure 6-3
Surface Water Pathway		
Treated process wastewater effluent	Current monitoring at NPDES Outfall 001	Figure 6-6
Treated sanitary wastewater effluent	Current monitoring at NPDES Outfall 002	Figure 6-6
Stormwater	UF_6 storage pads area holding pond	Within GLE Facility controlled access area, before stormwater is released to wet detention basin (draft basin location shown on Figure 6-7).
Surface Water Bodies	Effluent channel location at the Site dam and Northeast Cape Fear River locations upstream and downstream of the Site	Figure 6-5
Sediment	Downstream of NPDES Outfall 001 and downstream of the site dam.	Figure 6-8
Groundwater Pathway		
Groundwater	21 monitoring wells	Figure 6-12

NPDES = National Pollutant Discharge Elimination Systems
UF_6 = uranium hexafluoride

Table 6-2. Summary of GLE Environmental Monitoring Program

Medium / Locations	Sample Type	Analyte/Parameter	Frequency[a]
Air Pathway			
Main GLE process building stack exhaust gasses	▪ Continuous air particulate filter	▪ Gross alpha activity ▪ Fluoride	▪ Weekly
Ambient air / fenceline, property line, background	▪ Continuous air particulate filter	▪ Gross alpha activity ▪ Uranium isotopes	▪ Weekly
Soil / 4 locations	▪ Shallow soil grab sample	▪ Total uranium	▪ Semi-annual
Surface Water Pathway			
Treated process wastewater effluent / Outfall 001	▪ Continuous proportional sample of liquid effluent	▪ Total uranium ▪ Gross alpha/beta activities ▪ Technetium-99 ▪ Non-radiological parameters per NPDES permit	▪ Daily composite ▪ Weekly composite ▪ Quarterly composite ▪ Specified in NPDES permit
Treated sanitary wastewater effluent / Outfall 002	▪ Continuous proportional sample of liquid effluent	▪ Non-radiological parameters per NPDES permit	▪ Specified in NPDES permit
Stormwater / holding pond	▪ Stormwater grab sample	▪ Gross alpha/beta activities ▪ Total uranium ▪ Fluoride	▪ Before water is discharged to wet detention basin
Surface water bodies	▪ Surface water grab sample	▪ Gross alpha/beta activities ▪ Total uranium ▪ LCFRP physical, chemical, and biological monitoring	▪ Monthly
Sediment / downstream of Outfall 001	▪ Sediment grab sample	▪ Total uranium	▪ Semi-annual
Groundwater Pathway			
Groundwater	▪ Grab sample after typical 3-well purge	▪ Total uranium ▪ Gross alpha/beta activities – Only if total uranium concentration in previous sample >0.02 mg/L ▪ Fluoride	▪ Quarterly

[a] Initial monitoring frequencies may be evaluated and adjusted.
LCFRP = Lower Cape Fear River Program
NPDES = National Pollutant Discharge Elimination Systems

Q10. What monitoring and validation procedures will GLE utilize?

A10. [**All**] GLE Environmental Monitoring Program sampling, analytical, and reporting procedures will be conducted in accordance with industry-accepted methods and instrumentation, as well as with the requirements of GLE's QA Program. Specific processes and controls which implement the provisions of the GLE QA program, including Quality Control (QC) practices, will be delineated in approved procedures. Additionally, in order to ensure analytical procedures are properly employed, employees involved in implementing the Environmental Monitoring Program will be trained on these procedures.

GLE's QA Program and implementing procedures will ensure, among other things: the collection of representative samples; use of appropriate sampling methods and equipment; proper locations for sampling points; and proper handling, storage, transport, and analyses of samples. In addition, the QA Program will require that sampling equipment, such as airflow meters, are properly maintained and calibrated at regular intervals. Instrument maintenance and calibration specifications will be appropriate to the given instrumentation, in accordance with the manufacturers' recommendations. The GLE QA Program will also require functional testing and routine checks to demonstrate that monitoring and measurement instruments are calibrated, maintained, and operated in accordance with the manufacturers' specifications and recommendations.

The GLE Environmental, Health, and Safety (EHS) organization will ensure that on-site and contract laboratories performing analytical services participate in third-party laboratory inter-comparison programs appropriate to the media and analytes being measured. The GLE EHS organization will require that laboratories employ analytical procedures that are certified by either the National Environmental Laboratory Accreditation Program, or an equivalent state

laboratory accreditation agency. The GLE QA Program will also require that these laboratories use established standards, such as those provided by the National Institute of Standards and Technology.

GLE's QA Program will require validation of the results of field and laboratory services performed for the GLE Environmental Monitoring Program. QC procedures specified by the standard analytical methods used by the laboratories performing environmental analyses are key elements of the validation process. Subsequent data validation reviews will also be performed, and procedures for these QA reviews will be in conformance with standard industry practices, such as those specified by the Environmental Protection Agency (EPA).

Q11. Will GLE monitor for radiological releases into the environment?

A11. [**All**] Yes. Radiological releases to environmental media could occur from the Proposed GLE Facility during activities associated with operation of the laser enrichment process, such as the connection and disconnection of uranium hexafluoride (UF_6) cylinders to process equipment and equipment maintenance activities. During facility operation, GLE, as part of its Environmental Monitoring Program, will perform radiological monitoring of the air, surface water, and groundwater pathways, including the environmental media associated with these pathways as listed on Tables 6-1 and 6-2.

Q12. Similarly, during operation, how does GLE plan to conduct non-radiological monitoring of potentially hazardous effluents and emissions?

A12. [**All**] The GLE Environmental Monitoring Program also involves measurement of non-radiological parameters. The non-radiological parameter of primary interest is fluoride, due to the potential for release of hydrogen fluoride (HF). During operations, HF, an air toxic, could be released to the atmosphere from the Proposed GLE Facility. This non-radiological

hazardous substance also could be released to surface waters or groundwater from wastewater discharges and/or from stormwater runoff.

Four general types of monitoring will be performed to ensure safety of the workers, public, and environment. First, stack monitoring for fluoride will be conducted in accordance with the North Carolina Division of Air Quality (NC DAQ) air quality permit requirements. Second, treated process and sanitary wastewater effluents and the receiving surface waters will be sampled and monitored to ensure that the levels specified in the National Pollutant Discharge Elimination System (NPDES) discharge permit are not exceeded. Third, stormwater runoff will be monitored, as specified in the NPDES stormwater permit, to ensure that runoff is appropriately managed. Fourth, groundwater quality and levels will be monitored to detect abnormal or adverse conditions.

Q13. Did the experiences from implementing GNF-A's Environmental Monitoring Program factor into the development of the GLE program?

A13. [**All**] Yes. Because the Proposed GLE Facility will be located on the Wilmington Site, the GLE Environmental Monitoring Program considers past experience and data obtained during the implementation of the GNF-A Environmental Monitoring Program. The GNF-A Environmental Monitoring Program is a mature program that has been approved by state agencies and the NRC. Procedures from the existing GNF-A Environmental Monitoring Program will be replicated, as appropriate, as the basis for establishing the GLE Environmental Monitoring Program. In certain circumstances (e.g., monitoring at NPDES wastewater outfalls), GLE may utilize data generated from GNF-A's Environmental Monitoring Program.

Q14. What will be the organizational structure of the GLE Environmental Monitoring Program?

A14. [**JO**] The GLE Environmental Monitoring Program will be implemented by the GLE EHS organization. The GLE EHS Manager will report to the GLE Facility Manager and

has responsibility for directing activities to ensure that the Proposed GLE Facility complies with applicable rules, regulations, and codes. The GLE EHS organization will provide independent oversight of operations.

Q15. Will the GLE Environmental Monitoring Program be modified over time?

A15. [**JO**] Yes. The GLE Environmental Monitoring Program will be revised, as appropriate, to maintain its effectiveness as changes are noted, such as those related to: 1) operations; 2) receipt of updated vendor information; 3) removal of materials; and 4) regulatory agency permits and other authorizations.

III. KEY ELEMENTS OF GLE'S ENVIRONMENTAL MONITORING PROGRAM

A. Air Pathway

1. Overview of Atmospheric Setting

Q16. Please provide a brief summary of the prevailing atmospheric conditions in the region of the Proposed GLE Facility.

A16. [**AS**] The weather in North Carolina is primarily influenced by the position of the jet stream, its associated polar front, which is usually positioned to the north of the state, and a large subtropical area of high pressure called the Bermuda high. The Bermuda high is considered a semi-permanent atmospheric feature that is centered over Bermuda in the summer months and recedes eastward during the winter months.

During the summer, the jet stream is situated well to the north of the Carolinas near the United States–Canada border, and the polar front, which separates tropical from polar air, is situated in the northern United States. The Bermuda high is most often centered over Bermuda and, on occasion, asserts a more direct influence in North Carolina by moving westward into the Coastal Plain of the Carolinas. During the winter, the jet stream usually dips down well into the east-central United States, bringing the polar front into a position to directly influence weather in

the Carolinas. The Bermuda high recedes eastward during the winter, thus exerting a weaker influence on the weather in North Carolina.

Summers in North Carolina are usually hot and humid due to dominant southwest winds, which bring warm, moist maritime tropical air to the area. This predominant wind direction is strongly influenced by the Bermuda high. Cumulus clouds and eventual afternoon thunderstorms are common during the summer months. However, during summers, when the Bermuda high has moved westward, drought conditions become common. Under such conditions, droughts may occur, because high pressure sitting over North Carolina stabilizes the atmosphere and suppresses precipitation and thunderstorm activity. In addition, the position of the Bermuda high blocks occasional, weak low-pressure systems that have the potential to cause rain as the system travels along a prevailing westerly wind flow.

On an annual basis, the wind direction at Wilmington International Airport is predominantly southwesterly. In contrast, the predominant wind direction during the fall and winter is often northerly, due largely to the influence of invading polar air masses and changes in global circulation. The annual prevailing wind speed at the airport is 9 knots (kts).

Q17. How was atmospheric data collected in order to assess the Wilmington Site?

A17. [**AS**] Meteorological and atmospheric data was collected at Wilmington International Airport to assess conditions at the Wilmington Site. The airport is located approximately four miles southeast of the Wilmington Site, and information collected at this location is considered accurate for characterizing weather conditions at the Proposed GLE Facility. The elevation of the airport is 32 feet (ft) Mean Sea Level (MSL). Wind speed was measured by an anemometer height of 32 ft, 10 inches above ground level.

2. Air Monitoring

Q18. What is the primary source of radiological air emissions? Please describe sampling methods used to monitor these emissions.

A18. [**AS**] The primary source of radiological air emissions from the Proposed GLE Facility will be short-term releases of uranium that could potentially occur inside the main GLE operations building during activities associated with the enrichment process, such as the connection and disconnection of UF_6 cylinders to process equipment and equipment maintenance activities. These radionuclide releases will be contained within the main GLE operations building process areas, and vented through the building's high-efficiency, multi-stage emissions control system.

Three types of sampling methods will be used to monitor for potential airborne radiological emissions from the Proposed GLE Facility: 1) sampling of the vent stack exhaust gas from the main GLE operations building emissions control system; 2) sampling of the ambient air at selected locations at and outside the fenceline of the Proposed GLE Facility; and 3) sampling of the soil at selected locations on and off the Wilmington Site to assess for ground surface deposition.

Q19. How will radiological air emissions be monitored at the main GLE operations building emissions control system vent stack?

A19. [**AS**] Exhaust gas vented to the atmosphere from the main GLE operations building emissions control system will be sampled continuously to measure radioactivity of the exhaust gas vented to the atmosphere. The collection filter in the system will be removed on a daily basis during initial operation and analyzed for gross alpha activity. The frequency of filter removal and analysis will eventually decrease to weekly if the results during normal operations are shown to be consistently within regulatory requirements.

Q20. How will radiological air emissions be monitored at the ambient air sampling sites?

A20. [**AS**] Ambient air levels of radiological emissions will be monitored by placing 11 samplers around the Proposed GLE Facility to measure gross alpha activity and concentrations of uranium isotopes (Figure 6-2). The samplers will be located based on the predominant wind directions, as shown by the long-term wind rose displayed in Figure 6-2. The wind rose is based on 17 years of Integrated Surface Hourly Observation data (1990–2006) from the Wilmington International Airport. Use of this long period of data tends to reduce the effect of any individual years having unusual wind conditions.

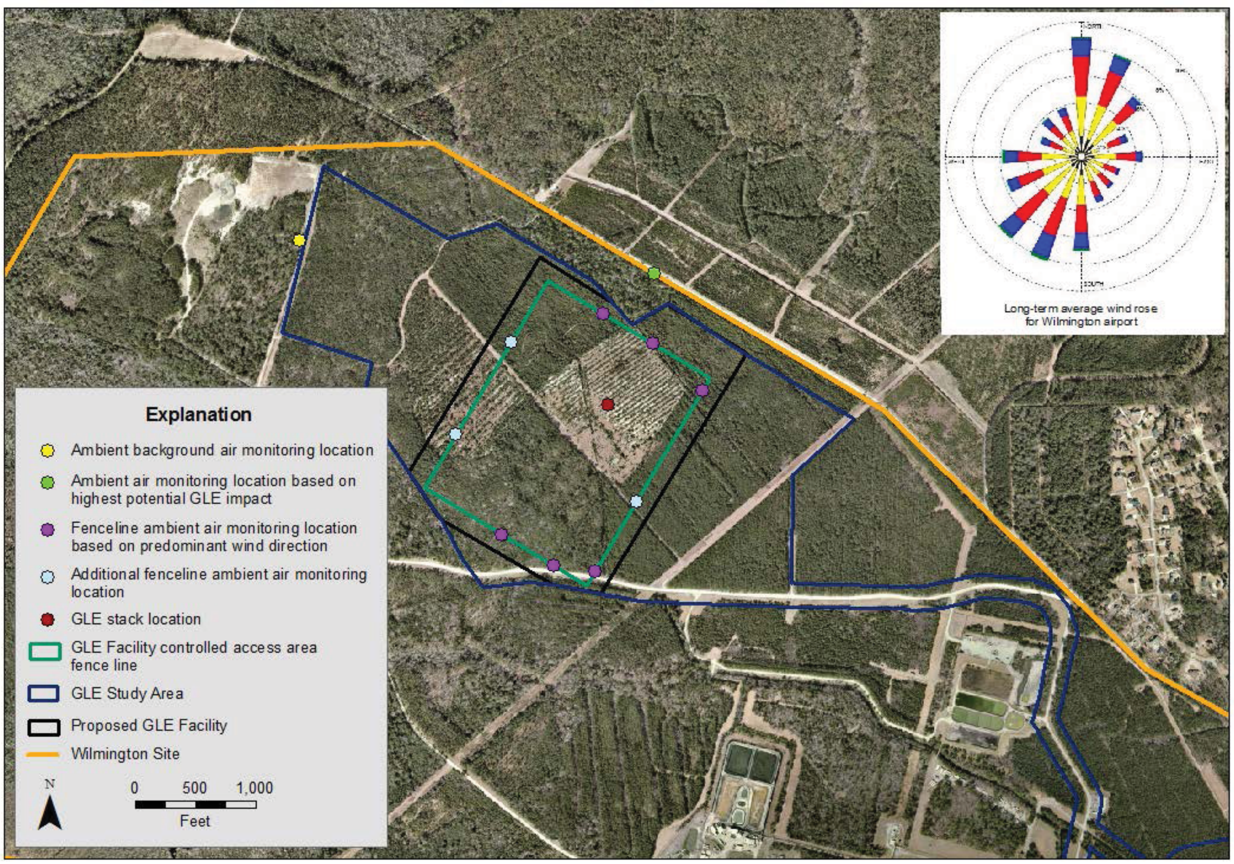

Figure 6-2. GLE air monitoring locations and wind rose.

Nine samplers will be placed around the controlled access area fenceline of the Proposed GLE Facility. Three samplers will be distributed across the controlled access area fenceline

ranging from the north through the northeast quadrant. These samplers will be placed to monitor predominant winds ranging from southwesterly to southerly.

Three additional samplers will be distributed along the controlled access area fenceline ranging from the south to the southwest of the stack. These samplers will be placed in order to monitor radiological air emissions during the high incidence of winds ranging from northerly to northeasterly winds. An additional sampler will be placed at the fenceline to the east of the UF_6 storage pads, and two additional samplers will be placed at the fenceline on the western side of the Proposed GLE Facility.

One sampler will also be placed at a fenceline location representing the highest potential offsite point of impact from the main GLE operations building stack, predicted by air dispersion modeling, which utilized the U.S. Department of Energy's (DOE) XOQDOQ model.

Finally, for the purpose of background ambient air monitoring, one sampler will be placed approximately 0.5 miles to the west-northwest of the main GLE operations building stack. This location was chosen because southeasterly winds are fairly uncommon based on an examination of a long-term wind rose. Therefore, radiological air emission releases from the main GLE operations building stack should have little influence on air concentrations at this ambient air monitoring location.

Q21. How will the potential deposition of radiological air emissions be monitored at the soil sampling sites?

A21. [**AS**] Soil sampling and analysis will be performed to assess for deposition of airborne radionuclides onto the ground in the vicinity of the Proposed GLE Facility. The current GNF-A radiological soil monitoring program analyzes samples from a number of locations on and off the Wilmington Site. Soil samples will continue to be collected on a semi-annual basis from these areas, plus two additional pairs of locations shown on Figure 6-3. These locations

were established considering the proposed location of the main GLE operations building stack and the prevailing wind directions. The soil samples will be collected using decontaminated hand-sampling tools from the upper four inches of soil and will be analyzed for uranium concentrations.

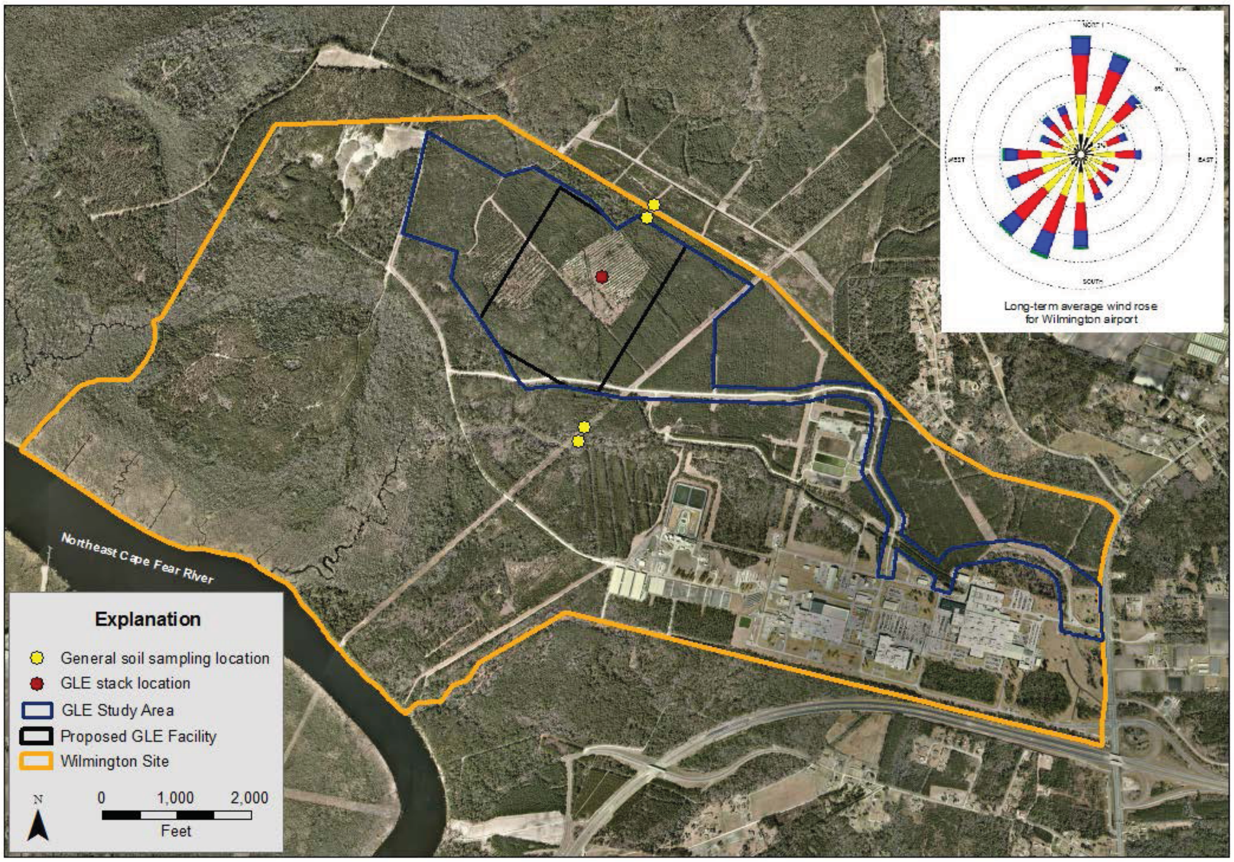

Figure 6-3. GLE soil monitoring locations.

In order to establish baseline conditions, semi-annual sampling of soil at the two additional pairs of sampling locations will begin prior to operation of the Proposed GLE Facility, and the monitoring program will continue throughout the operation. In addition, baseline shallow soil uranium concentrations across the Proposed GLE Facility site will be assessed through implementation of a statistically designed sampling program.

Q22. What is the primary source of non-radiological air emissions? Please describe sampling methods used to monitor these emissions.

A22. [**AS**] The primary source of non-radiological air emissions from the Proposed GLE Facility will potentially be the release of small gaseous emissions, which could contain the air toxic HF, associated with operation of the laser enrichment process. Any such gaseous releases will be contained within the main GLE operations building and vented through the building's high-efficiency, multi-stage emissions control system.

The emissions control system vent stack for the main GLE operations building will be sampled continuously to monitor for fluoride emissions to the atmosphere. The collection filter in the stack-sampling system will be a filter paper infused with calcium carbonate or equivalent. During initial start-up of GLE operations, the filter will be removed daily and analyzed for fluoride content. Once initial operation has demonstrated that the results are consistently within the regulatory requirements during normal operations, the filter will be removed weekly and analyzed for fluoride content. The quantity of fluoride emissions vented to the atmosphere through the stack will then be calculated using the analytical results, the corresponding measured exhaust gas volume for the stack, and the associated stack sampler volume. The sample analyses will be conducted in conformance with NC DAQ requirements.

B. Surface Water Pathway

1. Overview of Surface Water Setting

Q23. Please provide a brief summary of the surface water environmental setting in the region of the Proposed GLE Facility.

A23. [**KM**] The Wilmington Site is located within the Northeast Cape Fear River Sub-basin of the Cape Fear River Basin. The Northeast Cape Fear River Sub-basin covers 1,750 mi^2 and portions of seven counties. The headwaters of the Northeast Cape Fear River start near Mt. Olive, North Carolina, in Wayne County and flow in a southerly direction past the Wilmington

Site in New Hanover County. Six miles south of the Site, the Northeast Cape Fear River joins the Cape Fear River to form the Cape Fear River Estuary.

The Northeast Cape Fear River is the nearest named waterbody to the Wilmington Site and is located along the southwestern property boundary (see Figure 6-4). In the vicinity of the Wilmington Site, the Northeast Cape Fear River is approximately 600- to 1,100-ft wide and has an average flow of 2,070 cubic feet per second (ft^3/s). The water is black, tannic, and brackish, with consistently low pH and depressed dissolved oxygen levels; conditions that are characteristic of a tidally-influenced river in the North Carolina Coastal Plain.

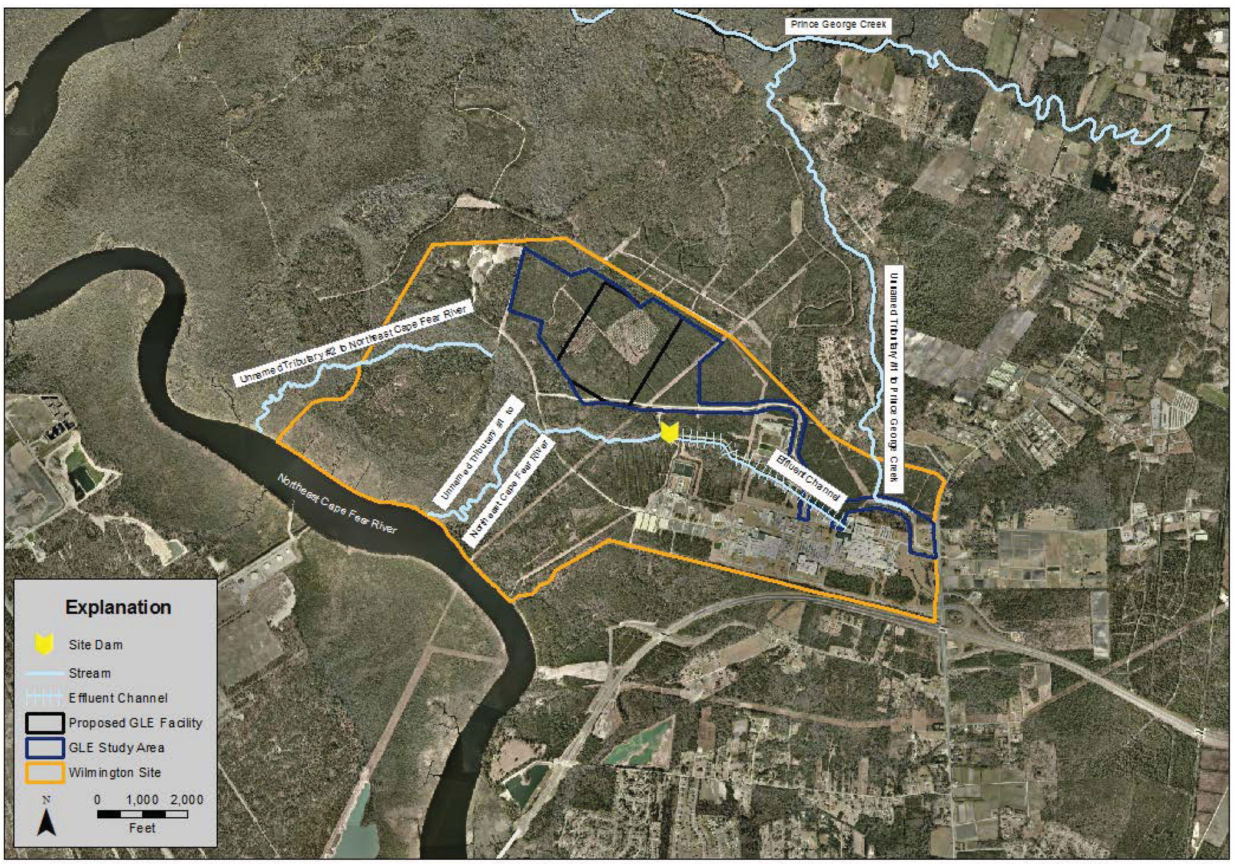

Figure 6-4. Wilmington Site surface waters.

The Wilmington Site is drained by several small streams and an effluent channel (Figure 6-4). The effluent channel begins in the eastern portion of the Wilmington Site and flows west to the site dam and then connects to Unnamed Tributary #1 to the Northeast Cape Fear River. The

site dam marks the approximate boundary between the effluent channel and the natural stream channel. The effluent channel receives stormwater runoff from the developed portion of the Site and treated wastewater effluent. Unnamed Tributary #2 to the Northeast Cape Fear River drains the northwestern portion of the Site. Two unnamed streams flow north from the property to Prince George Creek, a tributary to the Northeast Cape Fear River. Unnamed Tributary #1 to Prince George Creek originates in the eastern portion of the Site and receives site stormwater runoff from parking lots and buildings. Unnamed Tributary #2 to Prince George Creek receives drainage from the largely forested (undeveloped) north-central portion of the Site.

2. Surface Water Monitoring

Q24. How will surface water be monitored for non-radiological effluents? Please also discuss sampling methods used.

A24. [**KM**] Surface water quality (i.e., physical, chemical, and biological parameters) will continue to be monitored on the Wilmington Site in the effluent channel by either GNF-A or GLE, and upstream and downstream of the Site in the Northeast Cape Fear River (Figure 6-5) through the existing partnership with the Lower Cape Fear River Program (LCFRP). The North Carolina Department of the Environment and Natural Resources (NC DENR) Division of Water Quality (DWQ) maintains two monitoring stations along the Northeast Cape Fear River. One is 17 miles upstream of the site and the other is six miles downstream. A third station near the Wilmington Site's south border is monitored by the LCFRP.

GNF-A or GLE field sampling and laboratory analysis of surface water will be conducted in accordance with State of North Carolina approved methodologies and analyses performed by state-certified laboratories. The LCFRP will follow similar methodologies as specified in the Memorandum of Agreement Between the State of North Carolina's Division of Water Quality and the Lower Cape Fear River Program Permittees.

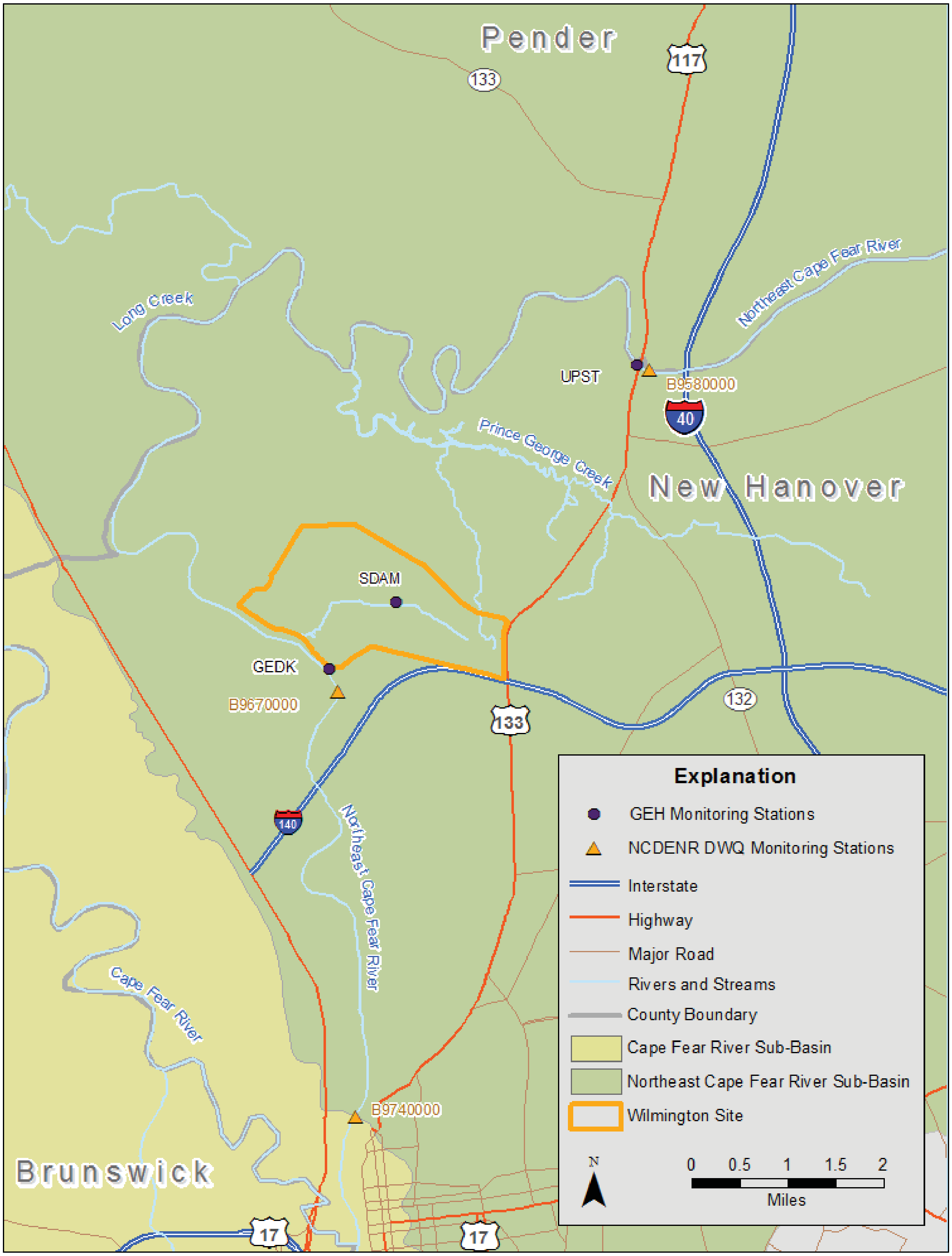

Figure 6-5. Surface water quality monitoring locations.

Q25. How will surface water be monitored for radiological effluents? Please also discuss sampling methods used.

A25. [**KM**] Radiological water quality parameters (i.e., gross alpha, gross beta, and uranium concentrations) will continue to be monitored by either GNF-A or GLE in the effluent channel at the Wilmington Site dam as well as at the Northeast Cape Fear River significantly upstream of the Site, and the Northeast Cape Fear River just downstream of the Wilmington Site (see Figure 6-5). Sampling methods and laboratory analyses of radiological constituents will be performed in accordance with State of North Carolina standard operating procedures and other applicable industry best practices.

Q26. Is surface water used at or downstream of the Wilmington Site as drinking water?

A26. [**KM**] No. All water used at the Wilmington Site for both the potable water system and the process water system is provided through groundwater. In addition, there is no public intake of surface water from the Northeast Cape Fear River downstream of the Wilmington Site.

Q27. Are there other monitoring locations associated with the surface water pathway?

A27. [**KM**] Yes. The monitoring program for the surface water pathways also includes wastewater effluent and stormwater discharge monitoring as specified by applicable state permits, because these sources discharge directly to surface waters. Sediment samples are also included in the surface water pathway because sediment-bound pollutants are a result of transport through surface wastewater and stormwater runoff.

3. <u>Wastewater Effluent Monitoring</u>

Q28. Will wastewater effluent monitoring locations, separate from those used by GNF-A, be needed for the Proposed GLE Facility?

A28. [**JO**] No. Separate wastewater effluent monitoring locations for the Proposed GLE Facility will not be needed, because GLE wastewater effluent discharges will be combined with GNF-A effluent discharges for treatment at the Wilmington Site final process lagoon treatment facility. The lagoon facility will be monitored at existing outfalls in accordance with the Site's NPDES permit issued to GNF-A. Therefore, the GLE Environmental Monitoring Program will utilize the same monitoring locations for wastewater effluent as does the current GNF-A Environmental Monitoring Program.

Q29. How does GLE expect to treat process wastewater effluents?

A29. [**JO**] Radioactive liquid waste treatment at the Proposed GLE Facility will consist of a system to remove uranium and fluoride. Uranium removal will be accomplished through pH adjustment, followed by precipitation and filtration. Fluoride will be removed through the addition of salt to form a solid fluoride precipitate, followed by either filtration or evaporation and removal of the precipitate.

Treated wastewater effluent will be routed to a pump station, which will route the effluent to the existing Wilmington Site final process lagoon facility (see Figure 6-6) for further treatment. From the lagoon, the treated effluent is discharged under GNF-A's NPDES permit to the effluent channel through Outfall 001 (see Figure 6-6). Discharges from the GLE liquid effluent treatment system will be controlled to assure that the uranium and fluoride concentrations in the final process lagoon facility will be in compliance with the concentrations and mass limits stipulated in the NPDES permit, as well as in compliance with 10 CFR §

20.1301 (Dose limits for individual members of the public) and 10 CFR § 20.1302 (Compliance with dose limits for individual members of the public).

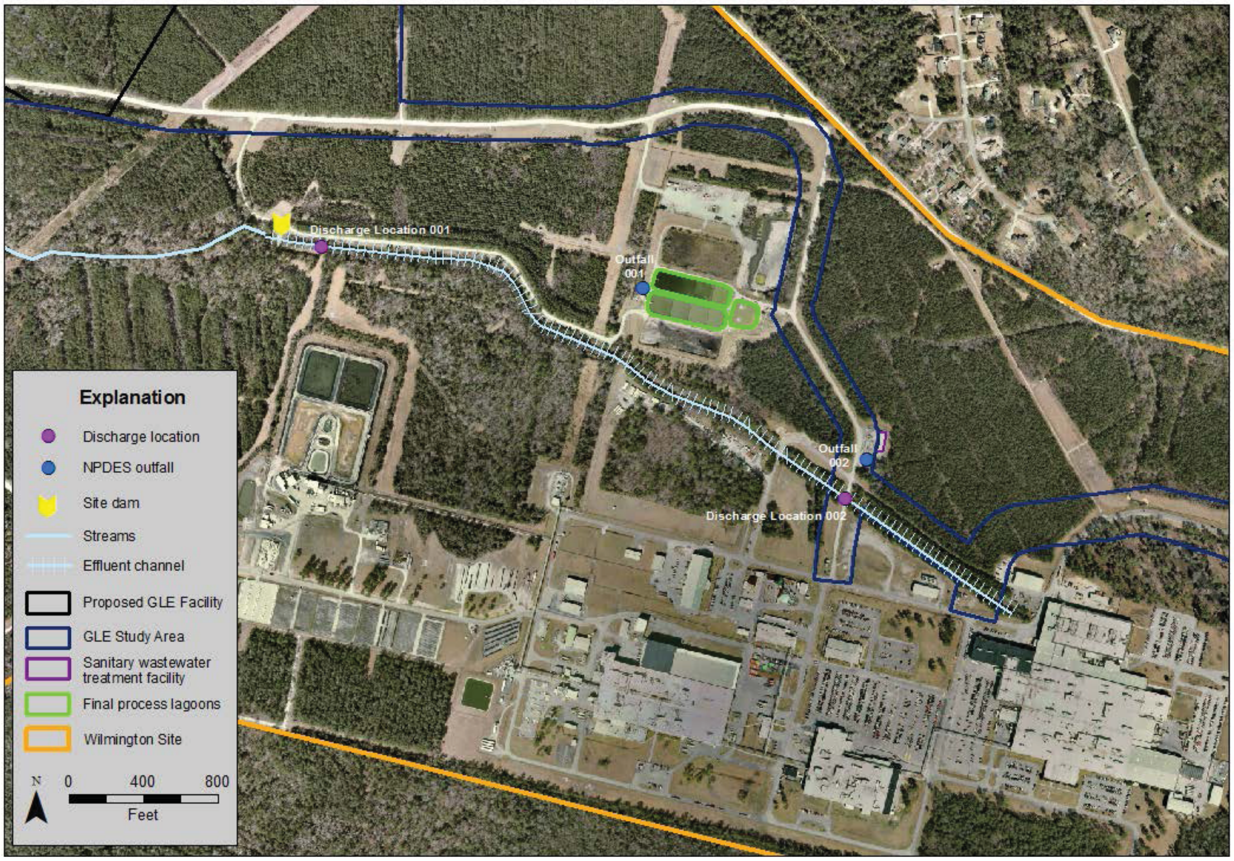

Figure 6-6. Existing wastewater treatment facilities and discharge points at the Wilmington Site.

Q30. How will the treated process wastewater samples be collected?

A30. [**JO/AS**] Continuous proportional samples of the treated process wastewater effluent are collected daily at Outfall 001 (Figure 6-6). The monitoring program will include: daily composite samples for uranium content; weekly composite samples of the daily samples for gross alpha and gross beta activity; and quarterly composites (prepared from the weekly composite samples) for technetium-99. The treated process wastewater effluent is also monitored for various parameters and has NPDES permit limitations on total suspended solids

(TSS), total nitrogen, fluoride, cyanide, pH, metals (i.e., total cadmium, lead, chromium, copper, nickel, silver, zinc), oil and grease, and total toxic organics.

Q31. How does GLE expect to treat sanitary wastewater?

A31. [**JO/AS**] GLE sanitary wastewater will be treated in the existing sanitary wastewater treatment facility, and treated effluent will be used in onsite cooling towers given sufficient demand. When demand is not sufficient, the portion of treated sanitary wastewater effluent not used in the cooling towers will be discharged to surface waters through the existing NPDES Outfall 002 (Figure 6-6) and will be monitored in accordance with the NPDES discharge permit.

4. <u>Stormwater Monitoring</u>

Q32. Can you provide an overview of the Wilmington Site stormwater monitoring?

A32. [**KM**] Yes. The existing Wilmington Site NPDES permit currently has three stormwater monitoring locations: two outfalls discharge to the Northeast Cape Fear River, and one outfall discharges to the Prince George Creek (Figure 6-7). Semiannual sampling is required during a storm event, with analysis for lead, oil and grease, pH, and TSS. The NC DENR may elect to modify this permit upon construction and operation of the Proposed GLE Facility by adding additional Stormwater Discharge Outfall monitoring locations and analytical parameters.

Additionally, stormwater runoff from the UF_6 cylinder storage area will be collected in a holding pond situated within the Proposed GLE Facility controlled access area for monitoring of uranium, gross alpha, gross beta, and fluoride. After monitoring, the stormwater will be released to a stormwater wet detention basin (draft basin location shown on Figure 6-7). The purpose of the holding pond is to detain stormwater from the UF_6 storage area in the event of the release of

uranium on the storage pad. Because releases to the storage pad are not anticipated, treatment of the stormwater will not, therefore, normally take place.

Figure 6-7. Stormwater monitoring locations.

According to the NPDES stormwater permit, analytical monitoring is not required for existing Wilmington Site stormwater wet detention basins. Therefore, no analytical stormwater monitoring is anticipated for the wet detention basin for the Proposed GLE Facility (Figure 6-7). Qualitative monitoring and maintenance inspection will be required by the NPDES permit.

5. <u>Sediment Monitoring</u>

Q33. Please provide an overview of the process for monitoring sediment samples.

A33. [**KM**] Sediment samples are collected semiannually in the effluent channel downstream from NPDES Outfall 001 and further downstream of the site dam at a road crossing before the channel enters the Tidal Swamp as shown in Figure 6-8. These sediment samples are

analyzed for uranium. Because sediment from the Proposed GLE Facility will also flow into these process basins, but will not create new outfalls, the current sediment sampling locations are sufficient.

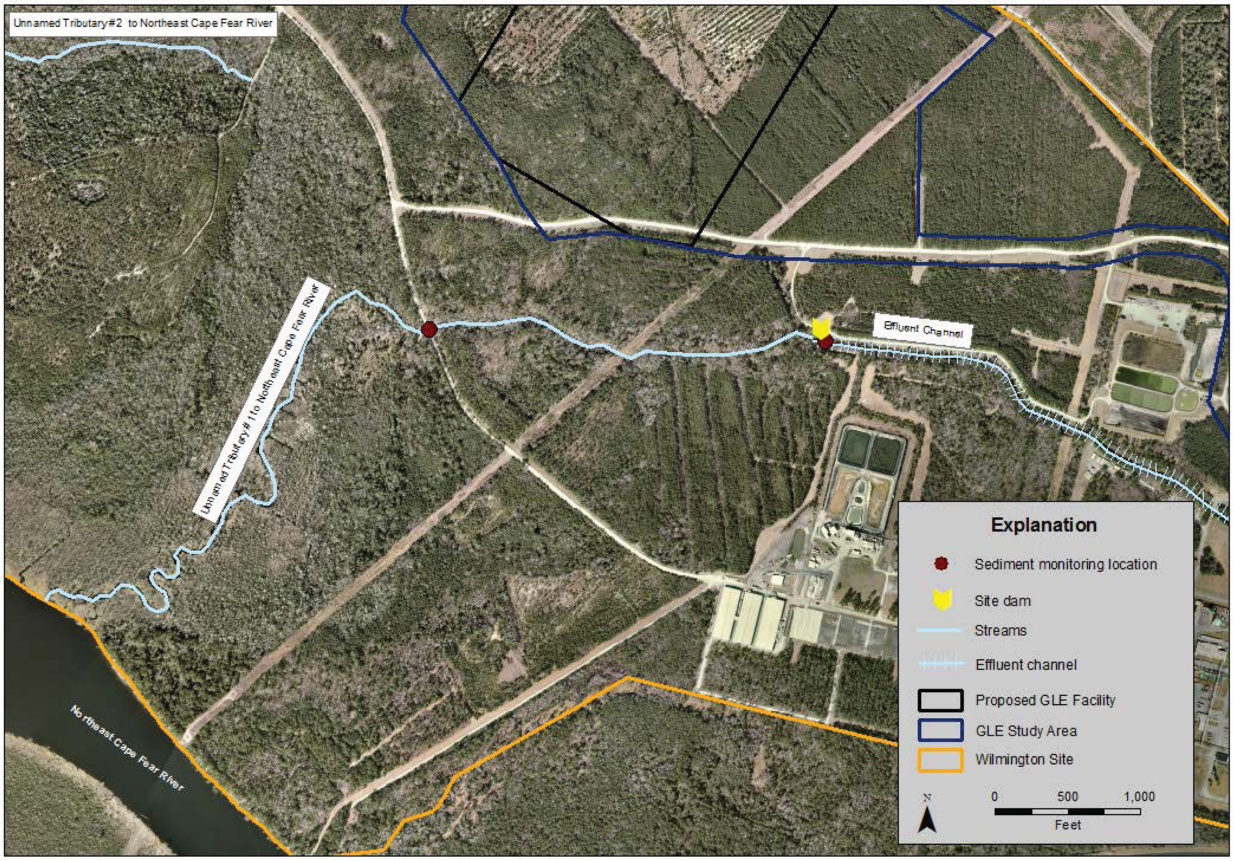

Figure 6-8. Sediment monitoring locations.

C. Groundwater Pathway

1. Overview of Hydrogeologic Setting

Q34. Please provide a brief summary of the hydrogeologic environmental conditions in the region of the Proposed GLE Facility.

A34. [**JA**] The Wilmington Site is within the North Carolina Coastal Plain physiographic province, which extends from the Piedmont physiographic province eastward to the North Carolina coast. The coastal aquifer system is an eastward-dipping and eastward-thickening wedge of depositional sediments and sedimentary rock underlain by an igneous and

metamorphic rock. Six regional aquifers are present in the region surrounding the Wilmington Site, including the Surficial Aquifer, the Castle Hayne Aquifer, the Peedee Aquifer, the Black Creek Aquifer, and the Upper and Lower Cape Fear Aquifers. The aquifers are water-yielding formations that are more permeable than the finer-grained formations (confining units) that are typically above and beneath these coastal aquifers. In most areas, each aquifer is overlain by a less-permeable confining layer, with the exception of the Surficial Aquifer, which is under water table conditions.

Groundwater assessments associated with the existing Wilmington Site facilities have focused on the Surficial Aquifer and the upper portion of the underlying Peedee Aquifer (referred to as the Principal Aquifer because it is the only aquifer that provides water supply for the Site). The Principal Aquifer corresponds to the upper zones of the regional Peedee Aquifer. In the eastern portions of the Site, these two aquifers are typically separated by a less-permeable semiconfining layer. This semiconfining layer pinches out and is thin or absent in the vicinity of the GLE Study Area, so there is no clear differentiation between the Principal and Surficial aquifers in this area (Figure 6-9).

Figure 6-9. Conceptual stratigraphy of the Peedee Sands, Peedee Clay, and surficial alluvial sediments.

Q35. Please provide a brief overview of the Surficial Aquifer.

A35. [**JA**] The Surficial Aquifer includes undifferentiated, stratified deposits generally located between 20 and 50 ft MSL at the Wilmington Site. This aquifer is recharged directly by rainfall, and the water table is generally located relatively near the land surface (approximately averaging 9 ft below ground surface (bgs) with a range from 0 to 20 ft bgs).

The Surficial Aquifer discharges into streams, drainage canals and ditches, and the low-lying swampy areas of the western and northwestern portions of the Wilmington Site (Figure 6-10). In addition, the Surficial Aquifer recharges groundwater into the underlying Principal Aquifer.

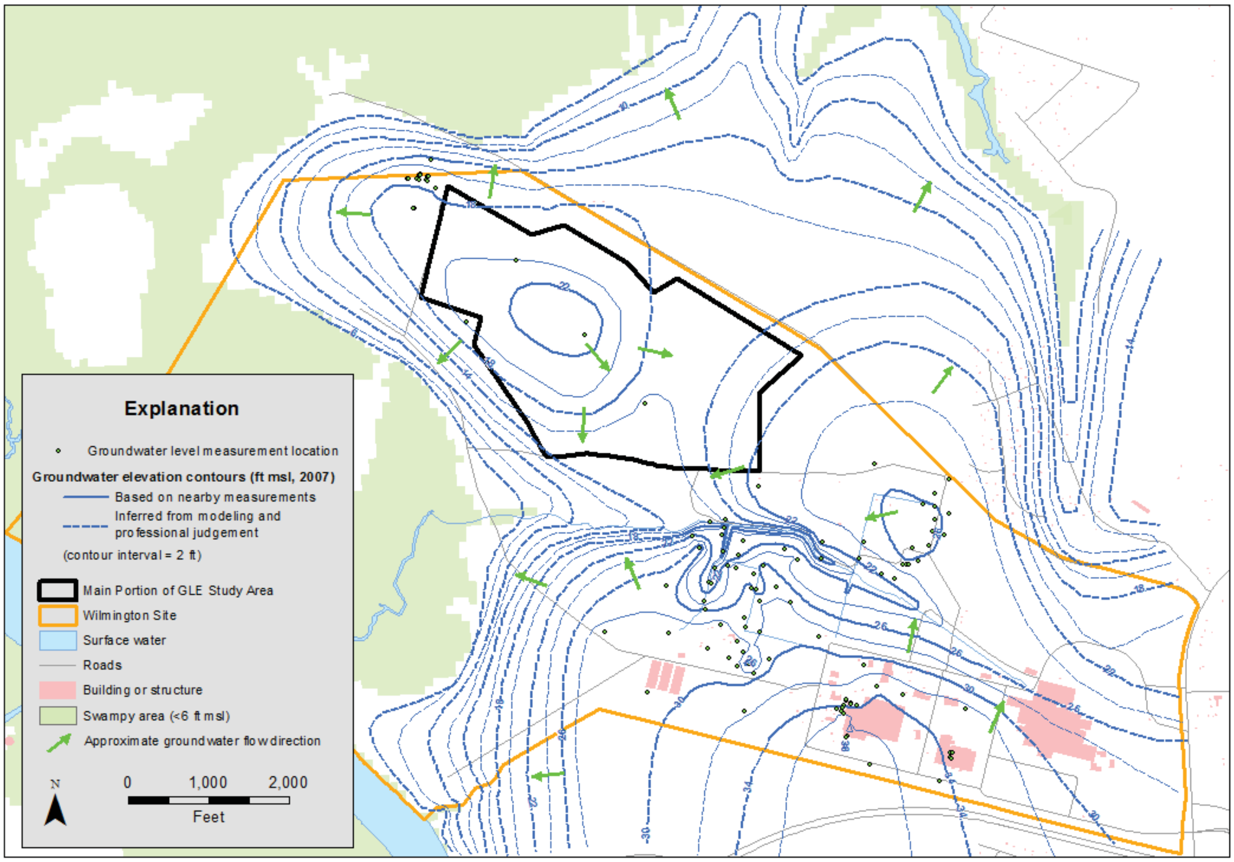

Figure 6-10. Surficial Aquifer groundwater elevation contours (2007).

A groundwater elevation mound in the GLE Study Area occurs due to the topographic high of the Study Area and to the surrounding hydrogeologic boundaries, including swampy discharge areas on nearly three sides and the effluent channel to the south (Figure 6-10).

Q36. Please provide a brief overview of the semiconfining layer.

A36. [**JA**] The relatively less-permeable Peedee clay layer underlies much of the Surficial Aquifer and acts as a semiconfining layer for the Principal Aquifer (Figure 6-9). The thickness of the semiconfining layer is variable, and is not present in all areas of the Wilmington Site. Where present and sufficiently below the water table, the Peedee clay layer hydraulically separates the Surficial Aquifer and Principal Aquifer (i.e., acts as a semiconfining layer). Based on Site investigations performed in the GLE Study Area in 1980 and 2007, the marine Peedee clay present in the eastern portion of the Site transitions to an alluvial clay across the north-

central portion of the Site, and the position of this alluvial clay generally is at or above the water table, thereby rendering it ineffective as a semiconfining layer. Previous Site investigations performed in the northwestern portion of the Site revealed an absence of either of these clay layers. Figure 6-9 depicts the approximate western extent of the semiconfining layer and its thickness across the Site (labeled as the Peedee Clay in the figure).

Q37. Please provide a brief overview of the Principal Aquifer.

A37. [**JA**] The Principal Aquifer at the Wilmington Site refers to the upper zones of the Peedee Aquifer, a deposit that includes greenish-gray to dark-gray silt and sand interbedded with semiconsolidated calcareous sandstone and limestone. The upper portion of the Principal Aquifer is generally more permeable and contains more sand than the lower zones that have been investigated beneath the Site. Figure 6-11 shows the Principal Aquifer water levels measured across the Wilmington Site in March 2007. As this figure indicates, groundwater flows from upland areas toward the surrounding hydrogeologic boundaries, including streams, the Northeast Cape Fear River, and the low-lying swampy areas west and north of the Wilmington Site. In addition, groundwater is drawn to GNF-A Facility pumping wells, as indicated by the areas of depressed groundwater levels around certain pumping wells in Figure 6-11. The pumping wells on the Site provide process water and groundwater remediation for the existing facility. Site potable water supply is provided by three wells just east of the Site and Castle Hayne Road. The primary input of groundwater to the Principal Aquifer system is recharge from leakage through the overlying semiconfining layer and from direct seepage of rainwater in areas where the semiconfining layer is absent, such as in the vicinity of the GLE Study Area.

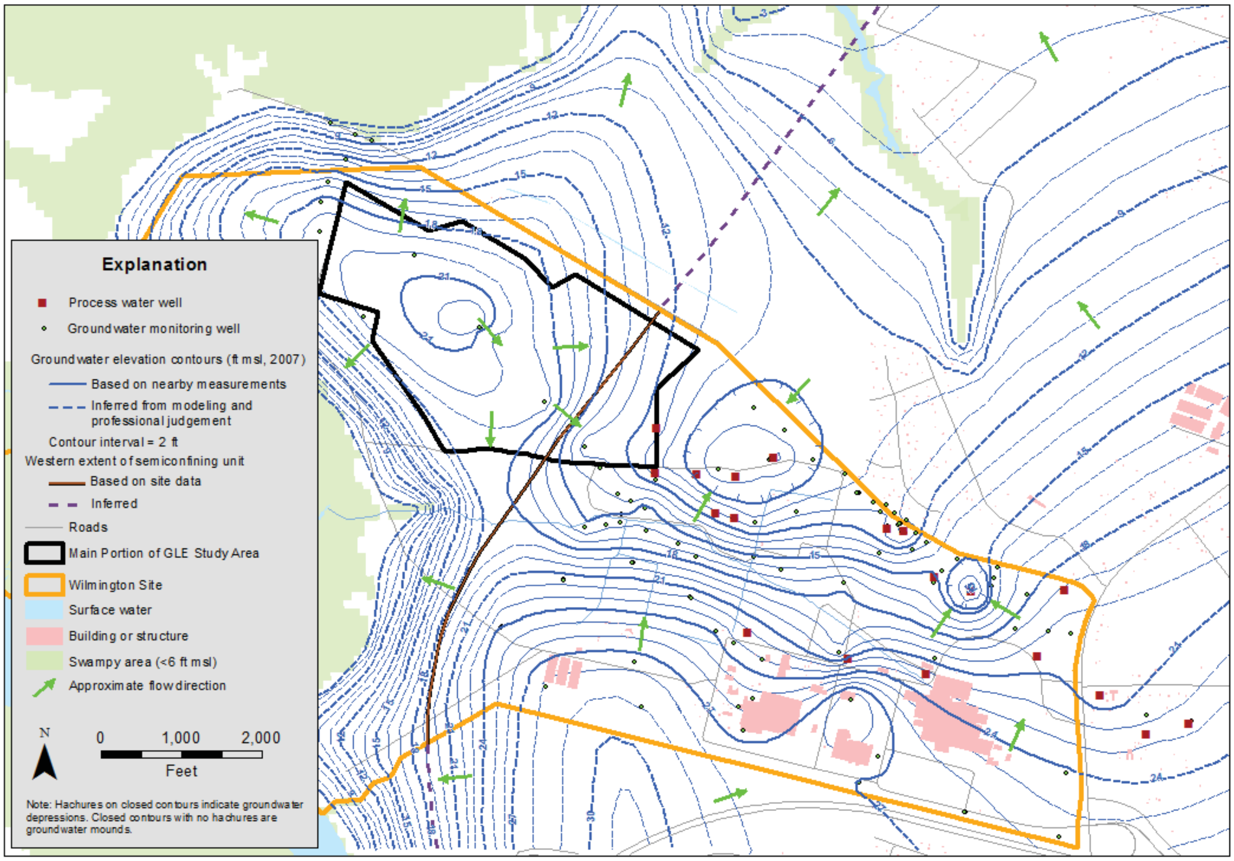

Figure 6-11. Principal Aquifer groundwater elevation contours (2007).

2. Groundwater Monitoring

Q38. Where will groundwater be monitored?

A38. [**JA/AS**] The current GNF-A groundwater monitoring program includes analysis of samples from a large number of wells across the Wilmington Site. Thirteen additional monitoring wells will be constructed around the Proposed GLE Facility as shown in Figure 6-12. These wells and the eight existing wells within the GLE Study Area will be added to the sampling protocol as part of the GLE Environmental Monitoring Program. These 21 wells will be positioned in seven clusters, with three wells installed at different depths per cluster. Wells with an A-suffix identification will be the shallowest wells, completed at or just below the water table. Wells with B- and C-suffix identifications will be progressively deeper wells. These well

locations, shown on Figure 6-12, are west of the western extent of the less-permeable clay semiconfining layer previously described.

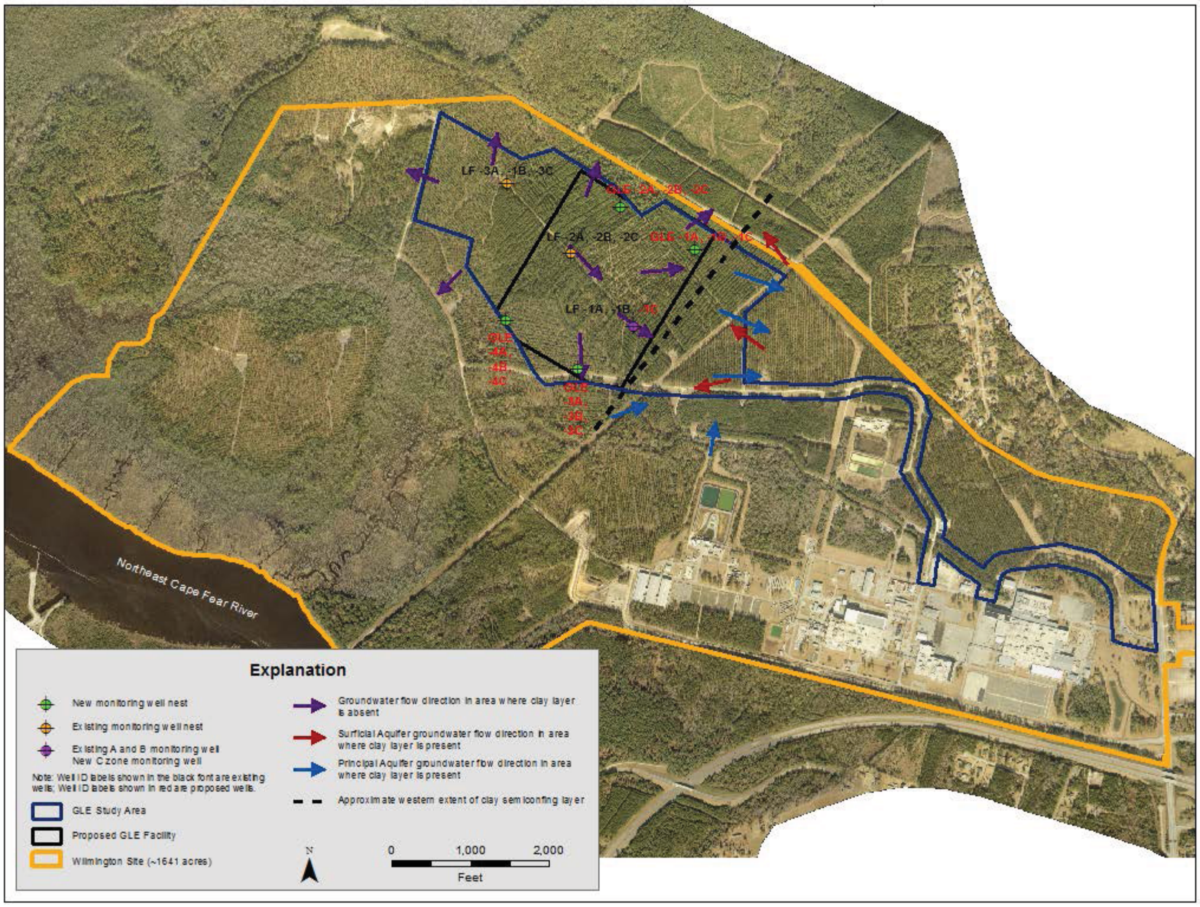

Figure 6-12. GLE Study Area groundwater flow directions and monitoring locations.

Q39. How were these well-cluster locations selected?

A39. [**JA/AS**] The seven well-cluster locations were selected on the basis of the groundwater flow directions discussed above. Existing well-cluster LF-2 (see Figure 6-12) is situated near the high point of the groundwater mound mapped within the GLE Study Area. These wells will be positioned near and slightly upgradient of the main GLE operations building, based on the groundwater elevation contours shown on Figure 6-11. Should the high point of the groundwater mound shift slightly to the east, the LF-2 well cluster will be directly downgradient of the main GLE operations building, and existing well cluster LF-3 will be positioned to

monitor conditions farther downgradient. The remaining five well clusters (proposed new well-clusters GLE-1 through GLE-4, existing wells LF-1A and LF-1B, and proposed new well LF-1C) are positioned as shown on Figure 6-12 to provide monitoring coverage around the perimeter of the Proposed GLE Facility in downgradient directions.

Q40. How will samples be collected and analyzed?

A40. [**JA/AS**] Initially, samples will be collected quarterly from the 21 proposed GLE monitoring network wells, prior to commencement of Proposed GLE Facility operation to further establish baseline groundwater conditions. The monitoring frequency for each well will be reviewed and potentially adjusted after a sufficient dataset is developed to perform statistically valid trend analyses. Procedures will be developed for purging of at least three well volumes before collecting samples using dedicated sampling equipment or other industry accepted practices.

The groundwater samples will be analyzed for uranium and fluoride. If analytical results for uranium exceed GLE's established threshold limit of 0.02 parts per million (ppm), then the subsequent quarterly sample from that well will also be analyzed for gross alpha activity and gross beta activity.

D. Environmental Data Management and Tracking

Q41. How will the GLE Environmental Monitoring Program data be managed?

A41. [**JO**] Section 11.7.1 of the GLE LA describes the records management program that GLE will implement. As part of this program, the GLE Environmental Monitoring Program data will be managed and tracked as part of a QA program established and implemented according to Regulatory Guide 4.15, *Quality Assurance For Radiological Monitoring Programs (Inception Through Normal Operations To License Termination) —Effluent Streams And The*

Environment. The GLE QA Program requires procedures for reviewing, approving, handling, identifying, retention, retrieval, and maintenance of QA records. These records will include the results of tests and inspections required by applicable codes and standards and any other required QA documentation. These records will be maintained at locations where they can be reviewed and audited to establish that the required quality has been assured.

Q42. Please explain how GLE plans to store the data generated from its environmental monitoring activities.

A42. [**JO**] GLE will store records from its environmental monitoring activities in a program-specific relational computer database (e.g., MS Access, SQL Server, or Oracle software). Computer storage of records will be done in a manner to preclude inadvertent loss and to ensure accurate and timely retrieval of data. GLE will also utilize a dual-facility records storage process that uses an electronic data management system and stores backup tapes in a fireproof safe in a separate location from the data management system.

Environmental Monitoring Program analytical data generated by an on-site laboratory will be transferred directly to the program-specific relational database from the laboratory information management system software or other system. To the extent available, analytical data generated by off-site contract laboratories will be transmitted to GLE as electronic data deliverables that will be imported into the relational database, thus precluding the possibility of manual transcription errors. Regardless of the originating laboratory and means of data importing, QA checks will be performed to verify accurate data storage by comparing the relational database contents to the originating laboratory analytical reports. Additional QA and QC reviews and audits of laboratory and field procedures and analytical results will be required by the GLE QA Program.

Q43. How will GLE track the stored data generated from environmental monitoring activities?

A43. [**JO**] GLE will track the stored data generated from environmental monitoring activities by using modules created for the relational database. These modules will enable GLE to periodically determine whether its Environmental Monitoring Program is being implemented in order to ensure, among other things, sampling completeness. For example, database modules will determine whether samples have been collected from monitoring locations according to the committed frequencies and whether valid analytical results and other monitoring records for each required sample have been stored in the database. Database modules will also enable GLE to perform efficient, timely reviews of monitoring results to identify conditions that require further review or action.

Q44. Please summarize your testimony from Section III.

A44. [**All**] Our testimony provided a review of the key elements of GLE's Environmental Monitoring Program. This included a discussion of the atmospheric, surface water, and groundwater environmental settings in the region of the Proposed GLE Facility. In addition, we explained GLE's monitoring plans for each of the environmental media associated with these pathways. Finally, we discussed how GLE plans to manage and track the data collected as a result of these monitoring efforts. As discussed in the next section, GLE will use the monitoring results to establish preset thresholds, and should the results indicate that GLE is near or out of compliance, its plan to initiate corrective actions.

IV. APPLICATION OF MONITORING PROGRAM RESULTS

Q45. How does GLE plan to ensure ongoing compliance with environmental requirements?

A45. [**JO/AS**] GLE plans to ensure ongoing compliance with relevant environmental requirements by establishing internal action levels. The internal action levels for environmental

measurements (e.g., effluents, emissions, and other measurements) will be the concentration of an analyte that indicates some action needs to be taken, such as an investigation, or if the level is high enough, shutting down operations. Internal action levels also provide guidance for ensuring compliance within 10 CFR Part 20 limits and other regulatory requirements. For monitored environmental parameters, internal action levels will be specified in approved written procedures according to the type of sample and the specific analysis.

For most aspects of the GLE Environmental Monitoring Program, internal action levels will be established to identify potential off-standard conditions. Internal action levels typically are lower than the pertinent regulatory (e.g., North Carolina groundwater standards, 10 CFR Part 20) or permit action levels (e.g., NPDES, air permit). This provides GLE with a margin of safety, as internal reviews (e.g., investigations, trend identification) and adjustments to operations or procedures are implemented in advance of exceeding regulatory or permit action level requirements. Internal action levels are established considering applicable guidelines, regulations, best professional judgment, minimum detection limits and historical data. Some of the specific criteria GLE may rely upon in order to develop internal action levels include: (1) contaminant fate and transport modeling; (2) Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) procedures; and (3) fractions of applicable regulatory and guidance limits. Internal action levels can be adjusted as necessary based on license criteria, provisions in the written environmental monitoring instructions, and updates to regulatory requirements and guidance.

Q46. How does GLE plan to correct problems if monitoring results indicate that GLE is near or out of compliance with applicable environmental requirements?

A46. [**JO**] In the event a monitoring result exceeds an internal action level or a regulatory requirement, GLE will enter a corrective action request into GLE's CAP and possibly

shutdown the affected process equipment. GLE's CAP was established to ensure that a broad range of conditions, including near or out of compliances, are detected, reported, and resolved appropriately in order to improve performance.

Q47. Can you provide a brief overview of GLE's CAP?

A47. [**JO**] Yes. GLE's CAP is essentially a repository designed to capture various conditions that may be precursors to more significant issues, possibly involving noncompliances with commitments or other regulatory requirements. The CAP encompasses condition reporting, investigation, analysis, corrective action, preventive action, trend analysis, and reviews. Approved written policies, plans, and procedures specify requirements for documenting conditions adverse to quality including identification, classification, appropriate notifications, and corrective actions taken. In addition, follow-up actions to verify implementation of corrective actions and trending are required for noncompliances with requirements. The CAP also allows for continuous improvement through entry and resolution of new requirements and commitments, as discussed in more detail in GLE's prefiled testimony on Topic 4 (Tracking and Implementation of Applicant Commitments).

Q48. As part of GLE's CAP, will an investigation be conducted in order to determine the cause of the incident?

A48. [**JO**] Yes. An investigation of the incident will begin by determining whether to initiate immediate or longer-term remedial actions. In making this determination, the investigation will account for the type and amount of material that was discharged. GLE will perform investigations to ensure the conditions are understood, and appropriate corrective actions are identified and implemented to prevent recurrence. Such investigations will typically begin by assessing the incident that exceeded the internal action level or regulatory requirement, and potentially conducting a re-sampling and analysis. The investigation will then involve

careful scrutiny of the nature and timing of processes and other activities in various Wilmington Site operations to isolate the incident. Additional internal and external factors, such as the timing of weather events also will factor into the investigation. The objectives of the investigation are to establish the validity of the data related to the incident, develop and implement corrective action plans to address the event in order to prevent reoccurrence, and report to the appropriate regulatory authorities.

V. CONCLUSION

Q49. Please summarize your overall conclusions regarding Topic 6.

A49. [**All**] Our testimony reviews the atmospheric, surface water, and groundwater environmental settings in the region of the Proposed GLE Facility and explains the monitoring activities associated with these pathways. Data collected as a result of these monitoring efforts will be managed and tracked according to comprehensive Records Management and QA Programs. GLE will ensure ongoing compliance with environmental requirements by establishing internal action levels that are set in order to indicate when action, such as an investigation, is necessary. In the event GLE exceeds an internal action level or regulatory requirement, GLE will enter a corrective action request into its CAP, conduct an investigation, and implement plans to correct the issue.

Q50. Does this conclude your testimony?

A50. [**All**] Yes.

Q51. In accordance with 28 U.S.C. § 1746, do you state under penalty of perjury that the foregoing testimony is true and correct?

A51. [**All**] Yes.

Executed in accord with 10 C.F.R. § 2.304(d)
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MS, Geology (concentration in Hydrogeology/Engineering Geology), Northern Arizona University (1974)
BS, Geology, East Carolina University (1972)

Professional Registration
Professional Geologist, State of North Carolina, No. 1314 (1994 to date)
Professional Geologist, State of Georgia, No. 559 (1979 to date)
Professional Geologist, State of Tennessee, No. 3696 (1995-2001)
Professional Geologist, State of Delaware, No. 403 (1988-2000)

Professional Experience

<u>RTI International, Research Triangle Park, NC (1984 to present)</u>

Senior Geologist and Project Director (2003 to present)

- Directed rapid-response project following the impacts of the March 11, 2011 earthquake and tsunami on the Fukushima Daiichi Power Plant. Project included deployment and maintenance of a comprehensive radiological database, GIS mapping, and evaluation. Served as member of client's Radiological Oversight Committee and worked with health physicists to help address numerous questions that ensued in the first two months following the event. The database used for this project is being leveraged by the U.S. nuclear industry for other applications.
- Directed a large multidisciplinary environmental assessment team to develop a comprehensive environmental report in support of a license application for a uranium enrichment project (Global Laser Enrichment). Report was prepared in compliance with guidelines established by the Nuclear Regulatory Commission (NRC) and the National Environmental Policy Act (NEPA). Project included a robust site-selection process employing a multi-criteria decision analysis approach.
- Directed a multidisciplinary team to prepare a site characterization report for evaluation of a site in Illinois by the U.S. Department of Energy (DOE) as part of the Global Nuclear Energy Partnership (GNEP).
- Directed a large multidisciplinary team in a fast-paced, shallow-soil remedial project to achieve a "no further action" (NFA) letter for a commercial client in California. A related groundwater remedial evaluation project included four concurrent pilot tests to determine

whether density-driven convection was a technically viable and cost-effective in-situ remedial technology for controlling contamination near source areas in a complicated pattern of alluvial sediments.

- Provided senior technical reviews of draft environmental reports (including hydrogeology, geology, and seismology) for proposed Nuclear Power Plant complex in the UAE for the Environment Agency – Abu Dhabi, UAE.

Research Director, RTI Center for Geosciences (2001-2003)

- Directed integrated programs in hydrogeology, remedial technology, geochemistry, geographic information systems (GIS), 3-D scientific visualization, brownfields redevelopment, and economic development.

Senior Program Director/Manager, RTI Geosciences Department (1996-2001)

- Provided technical oversight to hydrogeology, remedial technology, geochemistry, GIS, brownfields redevelopment, economic development, and smart growth programs.
- Served as Project Supervisor for contamination assessments and corrective action plans.
- Led brownfields redevelopment forums, training programs, and community outreach.

Senior Research Hydrogeologist/Manager, RTI Geosciences Department (1984-1996)

- Led DOE research project that included the laboratory formulation of latex polymers for a novel in-situ barrier to remediate contaminated groundwater.
- Led groundwater contamination assessments (enriched uranium and volatile organic compounds), compliance monitoring programs, and remediation implementations for commercial clients.
- Served as Project Leader for groundwater contamination studies at U.S. Air Force bases under the Department of Defense's (DoD's) Installation Restoration Program.
- Served as Project Leader on a work assignment with EPA's Office of Solid Waste (OSW) to provide technical support to resolve hydrogeologic issues for siting guidelines.

<u>Law Environmental Waste Management Program, Marietta GA (1979-1984)</u>
Senior Hydrogeologist

- Conducted aquifer tests and dispersion testing for hydraulic characterization of contaminated sites at DOE's Y-12 facility.
- Conducted groundwater contamination evaluations of landfills, land treatment areas, spill sites, underground storage tanks, waste pits, ponds, and lagoons.
- Designed and implemented recovery, containment, and monitoring systems to remediate petroleum products released in a variety of hydrogeological settings.
- Led environmental surveys.

<u>Soil & Material Engineers, Raleigh NC (1977-1979)</u>

Engineering Geologist/Hydrogeologist

- Managed a variety of hydrogeological, geotechnical, and engineering geology projects.
- Evaluated contaminated groundwater sites and designed and implemented remedial systems.

<u>Law Engineering, Water Resources Department, Marietta, GA (1974-1977)</u>

Staff Hydrogeologist

- Prepared the groundwater geology sections of Preliminary Safety Analysis Reports (PSAR) for proposed nuclear power and fuel reprocessing plants. PSAR writing assignments included regional and site geology, groundwater use conditions, aquifer delineations, well inventories, groundwater flow and quality, and transport of potential nuclear releases under accident scenarios. Worked closely with a team of other geologists, seismologists, geotechnical engineers, environmental scientists, and ecologists responsible for other key elements of the PSAR-siting studies.
- Conducted feasibility studies for groundwater supplies and evaporation-percolation ponds, and groundwater investigations for pollution control facilities and coal-gasification plants. Conducted geophysical and seismic studies.

<u>Department of Geology, Northern Arizona University, Flagstaff, AZ (1972-1974)</u>

Graduate Teaching Assistant

- Instructed courses and led related field trips for engineering geology, physical geology, and physical science laboratory courses.

- Worked part time for a registered hydrogeologist conducting aquifer tests in municipal well fields, performing geologic mapping, and conducting geomagnetic investigations in northern Arizona.

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Education

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BA, Biology, Wittenberg University (1996)

Professional Experience

RTI International, Research Triangle Park, NC (2006 to present)

Research Environmental Scientist 2 (2008 to present)

- Provides technical oversight on the development of the data management system created for DoD-funded research program and provides quality control on uploaded data. Conducted a literature review to assess the impacts of military training on the various ecosystems and in combination with real-time use data and spatial data determined an index of military training impacts.
- Coordinated project to predict the geographic location of isolated wetlands in the coastal plain of North and South Carolina. Evaluated existing geodata and remote sensing imagery to develop the initial population frame and provided expertise on the ranking candidate wetlands. Provided quality assurance on field data collection efforts and made recommendations for model improvements.
- Managed project that created a workgroup for state wetland scientist for in EPA Region 4 (Southeast US). Designed and maintained website, facilitated web-based training opportunities, provided field-based training, and promoted communication among participants.
- Managed various projects for EPA to conduct sampling of impaired for water quality, habitat, and macroinvertebrate conditions and determine cause of impairment to streams and wetlands.

Research Environmental Scientist 1 (2006 to 2008).

- Provides support for water quality and ecological projects involving investigations of streams, wetlands, and terrestrial resources, conducting water quality assessments, and preparing environmental impact reports.
- Provides technical over site for multi-year DoD-funded research program at Camp Lejeune including reviewing research results, submitting quarterly and annual reports, and organizing meetings. Facilitated preparation of Strategic Plan, Monitoring Plan, and Research Plan.

- Conduct literature review and assessment of military training impacts as well as ecosystem indicators of nitrogen and sulfur oxide deposition.
- Provide technical knowledge relating to the stormwater quality, protected species, and monitoring and research methods for natural resources assessment.

Arcadis Geraghty & Miller of Raleigh, NC. (2002-2006)

Biologist

- Conducted wetland and stream delineations, surveyed for federally and state listed protected species and performed natural community classifications for federal, state, and local agencies throughout North Carolina.
- Prepared natural resource technical reports, NEPA documents, and CWA Section 401/404 permits.
- Analyzed hydrologic, benthic, and water quality data for various projects and conducted feasibility studies and monitoring of stream and wetland mitigation projects.
- Managed projects, including client negotiations, scoping, budgeting, and invoicing. Participated in concurrence and public involvement meetings for transportation projects.

City of Greensboro, Greensboro, NC. (1996-2000)

Water Quality Monitoring Technician

- Sampled and analyzed water from stormwater runoff, streams, and lakes during varying weather conditions to determine ambient water quality and pollutant loading.
- Implemented benthic invertebrate sampling program to assess instream water quality across the City.
- Assisted in developing a Water Quality Index to visually display and interpret water quality data for public use and developed a biological monitoring program.
- Conducted maintenance inspections of on-site stormwater best management practices (BMPs) and conducted comparative studies for the removal efficiencies of selected BMPs.

Andrew Stahl
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Education
MS, Geology (hydrogeology emphasis), Pennsylvania State University, 1990.
BS, Geology, State University of New York at Binghamton, 1983.
Continuing Education: Course in Environmental/Resources Regulations Concepts, Arizona State University, 1994.

Professional Registration
Professional Geologist, State of North Carolina, No. 1650 (1998 to date)
Certified Professional Geologist, American Institute of Professional Geologists, No. 9070 (1993 to date)
Professional Geologist, State of South Carolina, No. 2224 (2000-2001)
Professional Geologist, State of Arizona, No. 28255 (1994-2000)

Professional Experience

RTI International, Research Triangle Park, NC (1998 to present)

Senior Research Geologist 1 (2002 to date)

- For a rapid-response project following the impacts of the March 11, 2011 earthquake and tsunami on the Fukushima Daiichi Power Plant, played a key role in identifying and evaluating radiological data sources, identifying appropriate units and terms for the data streams, and reconciling data issues and other staff inquiries. The database used for this project is being leveraged by the U.S. nuclear industry for other applications.
- Served as Assistant Project Manager for preparation of a comprehensive NEPA-compliant Environmental Report, a key component of a license application for a uranium enrichment project (Global Laser Enrichment). Responsibilities included project scoping and management, technical coordination, and performing senior report review for numerous environmental disciplines.
- Led the groundwater resource assessment for a detailed characterization report for evaluation of a site in Illinois by the U.S. Department of Energy as part of the Global Nuclear Energy Partnership. Prepared for and participated in a well-attended public meeting in Illinois at the conclusion of the project.
- For a commercial client in California, conducted an Environmental Site Assessment of a 1,600-acre property. Of the 140 developed acres, site features include one active and

three inactive nuclear reactors and laboratories specially designed for handling highly radioactive materials.

- Served as the Data Management Process Manager for a large, complex, fast-track brownfields redevelopment, interim remedial measures project in California. The existing industrial facility was demolished, approximately 95,000 cubic yards of contaminated soil were excavated and removed from the site, and a no-further-action letter for shallow soil was awarded by the regulatory agency. More than 4,800 soil samples were analyzed by 11 subcontracted analytical laboratories, and the resultant 171,300 analytical results and hundreds of maps produced using GIS were made available near real-time to the client and other stakeholders using Geode™, RTI's Web-based data querying and mapping tool.
- For a commercial client in Illinois following the September 11, 2001 attacks, evaluated the adequacy of existing environmental safeguards at a nuclear facility and identified the potential environmental consequences of theoretical terrorist attacks. Identified potential contaminant transport pathways and human and environmental receptors associated with the theoretical attacks.

Research Hydrogeologist 3 (2000 to 2002) and Research Hydrogeologist 2 (1998 to 2000)

- Managed the Hydrogeologic Assessments Program within RTI's Center for Geosciences (2000 to 2002).
- Managed development and implementation of Web-based environmental data management systems.
- Designed and implemented project work plans, sampling and analysis plans, and quality assurance project plans for groundwater and soil contamination investigations and remediation and prepared technical reports and presentations for regulatory approval.
- Provided consultation on waste delineation, characterization, and removal/remediation. Implemented innovative project strategies by integrating geologic, hydrogeologic, geochemistry, GIS, 3-D visualization, modeling, risk evaluation, and regulatory evaluation disciplines.

<u>Dames & Moore, Phoenix, AZ (1993-1997)</u>
Senior/Project Hydrogeologist

- Performed and managed groundwater and soil contamination investigations and remediation, groundwater supply projects, and risk assessments; prepared work plans and sampling and analysis plans.
- Prepared closure plans for RCRA hazardous waste facilities.
- Prepared Arizona aquifer protection permit applications, including hydrogeologic studies, monitoring plans, contingency plans, and closure plans.
- Provided regulatory compliance consultation relating to soil, water, and waste issues.
- Directly supervised six junior- and mid-level professional staff.

Nittany Geoscience, Inc., State College, PA (1987-1993)

Hydrogeologist

- Performed water-supply investigations that resulted in the development, evaluation, and monitoring of several high-capacity municipal well fields.
- Performed and managed groundwater and soil contamination investigations, including a multiyear RCRA Facility Investigation at a pharmaceutical manufacturing facility.

Bucek & Ebaugh Hydrogeologists, Boalsburg, PA (1986-1987)

Hydrogeologic Consultant

- Managed a groundwater contaminant recovery, treatment, and monitoring program at a pharmaceutical manufacturing facility in central Pennsylvania.
- Performed hydrogeologic characterization and assessment projects at various industrial facilities in Pennsylvania, Georgia, and Puerto Rico.

Department of Geosciences, Pennsylvania State University, University Park, PA (1983-1986)

Research and Teaching Assistant

- Conducted several research projects relating to mine drainage issues. Assisted in numerous other field and laboratory hydrogeologic projects.
- Prepared and administered homework problem sets for Introduction to Hydrogeology course. Laboratory instructor for introductory geology courses.

Broome County Environmental Management Council and Environmental Health Departments, Binghamton, NY (1983)

Intern

- Collected, analyzed, and mapped bedrock overburden characteristics, municipal and private well water quality data, and point-source pollution data.

Julie Olivier
Global Laser Enrichment
Wilmington, NC 28401
(910) 819-4799
Julie.Olivier@GE.com

EDUCATION

1992, BS Chemistry, University of New Orleans
1993, MS Environmental Science and Engineering, Virginia Tech
Post-Graduate Doctoral Courses, Environmental Systems Engineering, Clemson University

PROFESSIONAL EXPERIENCE

Global Laser Enrichment, Wilmington NC
Licensing and Regulatory Affairs Manager (4/10 to Present)

- Responsible for managing the Federal, State, and Local government interactions
- Responsible for obtaining a license from the Nuclear Regulatory Commission to construct and operate the commercial laser enrichment facility
- Technical lead for environmental issues

Senior Licensing Professional (10/07 to 4/10)

- Technical lead for preparing and submitting the Global Laser Enrichment License Application to the Nuclear Regulatory Commission
- Author of chemical safety, environmental protection, decommissioning, management measures, and administration chapters of the License Application
- Interface between design and safety analysis teams

Nuclear Regulatory Commission, Rockville, MD
Senior Project Manager (10/6 to 10/07)

- Project Manager for Category I fuel fabrication facility
- Project Manager for gas centrifuge facility
- Acted as the Section Chief from 08/01/05 to 10/14/05
- Senior environmental reviewer, which includes preparation of documentation (e.g., Environmental Assessments, Categorical Exclusions) to ensure compliance with the National Environmental Policy Act (NEPA)
- Senior analyst for evaluations involving decommissioning of fuel conversion and fabrication facilities
- Senior technical reviewer for licensing actions involving chemical safety
- Prepared budget for the branch to be used in strategic planning

Special Assistant to the Chairman for Materials and Security (10/05 to 10/06)

- Reviewed and evaluated Commission papers, and provided recommendations to the Chairman regarding technical and policy decisions

- Prepared Congressional correspondence from the Chairman regarding security and nuclear materials issues.
- Represented the Chairman in meetings with staff and industry

Project Manager (5/99 to 10/05)

- Project manager for four fuel fabrication facilities
- Lead environmental reviewer for the fuel manufacturing section, which included preparation of documentation (Environmental Assessments, Categorical Exclusions) to ensure compliance with the National Environmental Policy Act (NEPA)
- Lead analyst for evaluations involving decommissioning of fuel conversion and fabrication facilities
- Technical reviewer for licensing actions involving chemical safety

Dames and Moore, Orchard Park, NY

Engineering Specialist (4/97 to 4/99)

- Technical lead for field laboratory chemical analyses performed on soil and water samples for a chemical landfill remediation project at the U.S. Department of Energy's Brookhaven National Laboratory
- Project manager and lead author of the multi-volume West Valley Safety Analysis Reports, the primary document required by the Department of Energy to ensure safe operation and deactivation of nuclear facilities
- Lead analyst for all safety evaluations involving chemical reactions including the use of acids to clean out underground radioactive waste tanks, and the generation of oxides of nitrogen gases in process test facilities
- Authored extensive documentation including hazards assessments, facility deactivation plans, process safety requirements, procedural checklists, and position papers to demonstrate compliance with Department of Energy regulations and to ensure the safety of client activities
- Provided engineering calculations and technical guidance for Department of Energy contractors to ensure compliance with state emissions laws and reportable quantities of hazardous chemicals