U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF FEDERAL AND STATE MATERIALS AND ENVIRONMENTAL MANAGEMENT PROGRAMS

DIVISION OF WASTE MANAGEMENT AND ENVIRONMENTAL PROTECTION

ENVIRONMENTAL ASSESSMENT FOR THE RENEWAL OF U.S. NUCLEAR REGULATORY COMMISSION LICENSE NO. SNM–1097 FOR GLOBAL NUCLEAR FUEL–AMERICAS, WILMINGTON FUEL FABRICATION FACILITY

DOCKET NO. 70-1113

May 14, 2009

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ACRONYMS/ABBREVIATIONS

ADT	average daily traffic
ALARA	as low as is reasonably achievable
CAMA	Coastal Area Management Act
DART	days away, restricted, or job transfer
DCP	dry conversion process
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
FCO	Fuel Components Operation
FMO	Fuel Manufacturing Operation
FMOX	Fuels Manufacturing Operation Expansion
GNF–A	Global Nuclear Fuel–Americas
HF	hydrofluoric acid
ISA	Integrated Safety Analysis
LLRW	low-level radioactive waste
NAAQS	National Ambient Air Quality Standards
NCDENR	North Carolina Department of Environment and Natural Resources
NCDWQ	North Carolina Division of Water Quality
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
TEDE	total effective dose equivalent
USGS	U.S. Geological Survey
WMPO	Wilmington Metropolitan Planning Organization

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1.0 INTRODUCTION

1.1 Background

By letter dated April 2, 2007 (GNF–A, 2007a), Global Nuclear Fuel–Americas (GNF–A) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew material license SNM–1097 for its nuclear fuel fabrication facility located near Wilmington, North Carolina. Under SNM–1097, GNF–A is authorized to receive and possess nuclear materials at the GNF–A site to fabricate and assemble nuclear fuel components under the provisions of 10 CFR Part 70, Domestic Licensing of Special Nuclear Material. Material license SNM–1097 was initially issued to GNF–A in 1969. GNF–A last renewed the license in 1997 for a 10-year period. GNF–A filed the current renewal application more than 30 days prior to the June 30, 2007, license expiration date. In accordance with 10 CFR 70.38, the existing license will not expire until NRC makes a final determination on the renewal application. GNF–A is requesting a 40-year license renewal. In 2006, the Commission approved the NRC staff recommendation to implement maximum terms of 40 years for license renewals for facilities such as fuel fabrication facilities regulated under 10 CFR Part 70, Subpart H (Vietti-Cook, 2006).

This environmental assessment was prepared in accordance with NRC regulations in 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions; applicable NRC guidance from NUREG–1748, Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs (NRC, 2003); and other relevant National Environmental Policy Act-implementing regulations, including Council on Environmental Quality regulations (40 CFR Parts 1500–1508). The NRC staff is also performing a detailed safety review of the GNF–A license renewal request to assess compliance with 10 CFR Part 70 requirements. The results of the detailed safety review will be documented in a separate safety evaluation report.

GNF–A submitted a supplement to the environmental report (GNF–A, 2007b) as part of its renewal application. Other information contained in this environmental assessment was obtained in part from the Application for Renewal of SNM–1097 (GNF–A, 2007c). Additional references are listed in Section 8.0 of this environmental assessment.

1.2 Need for the Proposed Action

GNF–A is one of several facilities that manufactures fuel assemblies for commercial nuclear power reactors. It is in the national interest that nuclear fuel assembly production should continue at a rate that would meet current and anticipated future demand for electricity generated by nuclear power reactors. GNF–A plans to continue to be a commercial nuclear fuel supplier and seeks renewal of special nuclear material license SNM–1097 to support that endeavor.

1.3 The Proposed Action

GNF–A has submitted an application for license renewal that would allow the fuel fabrication facility located in Wilmington, North Carolina, to continue operations for an additional 40 years. The current license authorizes GNF–A to receive, possess, use, and transfer special nuclear material at the GNF–A facility in accordance with the requirements of 10 CFR Part 70. Under the Proposed Action, no major upgrades or refurbishment activities are planned in connection with the renewal application (GNF–A, 2007a). However, it is expected that several additional facilities will be built during the license renewal period that will have cumulative impacts associated with the Proposed Action. In particular, a laser enrichment facility is planned to be built that may share resources with GNF–A. The impacts of the laser enrichment facility are discussed as part of the evaluation of cumulative impacts associated with the Proposed Action. Facility activities are described in Section 2.0. Should GNF–A decide to revise its operations, the revisions would be addressed through a license amendment request and the NRC staff would conduct safety and environmental reviews at that time.

1.4 Alternative to the Proposed Action: No-Action Alternative

The No-Action Alternative is for GNF–A to cease manufacturing nuclear fuel at the Wilmington facility because of a denied license renewal. If NRC does not renew license SNM–1097, licensed activities at the GNF–A facility would cease and decommissioning activities would begin.

2.0 DESCRIPTION OF SITE AND ACTIVITIES

2.1 Site Description

The GNF–A facility is located on a 673-ha [1,664-acre] site in an unincorporated part of northwestern New Hanover County approximately 10 km [6 mi] north of the City of Wilmington, North Carolina (Figure 1). This is the southeastern portion of North Carolina and the GNF–A facility is approximately 16 km [10 mi] west and 42.5 km [26.4 mi] north of the Atlantic Ocean (due to curvature of the coastline in the area), 80 km [50 mi] northeast of the South Carolina border, and 260 km [160 mi] south of the Virginia border. As shown in Figure 1, Wilmington Bypass I-140 borders about 914 m [3,000 ft] of the southern site boundary. North Carolina Highway 133, also known as Castle Hayne Road, borders most of the east side of the site. About 9.7 ha [24 acres] of the site resides on the east side of Castle Hayne Road (Highway 133). The area east of Castle Hayne Road contains a truck parking lot and a small recreational park for GNF–A employee use. Immediately north of GNF–A is a 1,647-ha [4,069-acre] parcel owned by Hilton Properties and known as the Sledge Forest. Undeveloped forestlands are located along much of the southern border of the site. The Northeast Cape Fear River borders the site's west side. The source of this river is located 160 km [100 mi] north in Wayne County, and the river empties into the main fork of the Cape Fear River 10 km [6.4 mi] south of GNF–A. Prince George Creek, one of the largest tributaries of the river, is located about 8 km [5 mi] north of GNF–A.

About 19 percent or 122 ha [302 acres] of the site are developed (GNF–A, 2008a). The developed area is located in the eastern portion of the site and consists of five major facilities that are described in Section 2.2 of this report. Activities regulated under NRC material license SNM–1097 are conducted at only one of these facilities. A power line corridor occupies about 1 percent or 6.5 ha [16 acres] of the site. A network of service roads connects the various onsite facilities, and several unpaved roads provide access to selected areas in the

undeveloped portion of the site. The terrain around the site consists of heavily timbered tracts of land on gentle rolling topography with rivers and creeks adjoined by swamps or marshlands. A 73.7-ha [182-acre] tract of land in the southwest portion of the GNF–A site is classified as swamp forest, which is a palustrine, forested, needleleaf, saturated, partly drained wetland.

Surface water on the site includes three unnamed streams and three small ephemeral or transient ponds. Two of the unnamed streams are located in the swamp forest community in the western portion of the site and drain to the Northeast Cape Fear River. GNF–A treated liquid effluent is discharged into one of these streams. This effluent channel was originally a natural creek known as Brickyard Creek, which was enlarged during initial site development. The two creeks flow through the swamp forest and marsh onsite. These two tributaries to the Northeast Cape Fear River are classified as freshwater streams with the lower reaches tidally influenced by the river. The third stream located on the eastern side of the facility drains north to Prince George Creek. This tributary to the Prince George Creek is classified as a freshwater stream and is not tidally influenced within the facility boundary.

Two primary aquifers are beneath the GNF–A site: the shallow or water table aquifer and the deep or principal aquifer that lies below the shallow aquifer. The shallow aquifer typically starts 1.5–6.1 m [5–20 ft] below the land surface, while the principal aquifer typically starts 9–12 m [30–40 ft] below the land surface and extends to a depth of 15–27 m [50–90 ft] below the ground (GNF–A, 2007b). The principal aquifer, also known as the Peedee Aquifer, lies within the Peedee and Castle Hayne Formations. In the eastern or developed portion of the site, the two aquifers are generally separated by a confining layer of silt and clay that is approximately 1.5–4.6 m [5–15 ft] thick (General Electric Nuclear Energy, 1989). In areas where this confining layer is thin or absent, the principal aquifer is considered semi confined. The shallow aquifer discharges primarily into streams and drainage canals, but it also percolates into underlying aquifers. GNF–A site wells produce process water and potable water from the Peedee Aquifer. GNF–A does not use water from the surficial or “shallow” aquifer (GNF–A, 2008b).

Groundwater within the Peedee aquifer flows north and west and discharges to the Northeast Cape Fear River. Groundwater flow in the shallow aquifer may be influenced by the effluent stream channel (GNF–A, 2007b). In the eastern or developed part of the site, the shallow aquifer flows generally from the north and the south toward the effluent stream. In the western part of the site, the groundwater flows directly toward the Northeast Cape Fear River. The water from the effluent stream either discharges into the Northeast Cape Fear River to the west or percolates into the principal aquifer where a ditch penetrates through the confining layer.

Potable and process water for GNF–A operations obtained from the principal or deep aquifer provides GNF–A water needed for its systems operations. By pumping the aquifer for process water, GNF–A induces some hydraulic control over the aquifer by hindering groundwater flow away from the site. The average annual withdrawal is about 2,300,000 L/day [600,000 gal/day] (GNF–A, 2008a).

As depicted on the U.S. Department of the Interior National Wetland Inventory Map, numerous wetland areas are located on the property (U.S. Fish and Wildlife Service, 2007). The largest wetland area on the site is classified as a swamp forest. Other wetland areas are classified as palustrine, scrub-shrub, needle-leaved, evergreen/broadleaved, deciduous, saturated or temporally flooded, palustrine unconsolidated bottom, mud, permanently flooded, and impounded (U.S. Fish and Wildlife Service, 2007). Wetland jurisdiction is divided between the U.S. Army Corps of Engineers and the state. Wetland areas located within the 100-year floodplain and on tributaries fall under the jurisdiction of the U.S. Army Corps of Engineers and

are protected under Section 404 of the Clean Water Act (U.S. Environmental Protection Agency, 2009). Other isolated wetlands onsite fall under state jurisdiction. In addition to the identified jurisdictional wetlands onsite, several man-made areas classified as palustrine, unconsolidated bottom, artificially flood, artificial substrate and scrub-shrub broadleaf, deciduous, seasonally flooded, and diked/impound wetlands appear on the site. These are the ephemeral ponds referenced previously in this section.

In the eastern part of the GNF–A site, where plant facilities are located, soils have poorly drained to well-drained characteristics and consist of fine sandy loam, loamy fine sand, and fine sand on the surface (General Electric Nuclear Energy, 1989). The subsoil consists of sandy clay loam, clay, fine sandy loam, sandy loam, and clay loam. In the western part of the site adjacent to the Cape Fear River, the soils drain poorly and consist of a muck (decomposed organic matter intermixed with silt), loam, or sandy loam surface layer and a muck or sand subsoil.

The GNF–A site includes a wide diversity of natural and man-made habitats. Swamps and upland vegetation onsite have allowed numerous communities to develop. Human-affected communities include old fields, borrow pits, ditch areas, operational areas, and an area that has been planted with slash pine *(Pinus elliotrii),* a nonnative species. The remaining communities onsite are natural and are composed of species native to the region. These include upland pine-hardwood forest, longleaf pine-turkey oak-wire grass complex, pine-shrub wire grass savannah, pond pine pocosin, swamp forest, marsh, open water, and woodland pond. These habitats contain a diverse collection of plant and animal species (General Electric Nuclear Energy, 1989).

The dominant large mammal onsite is the white-tailed deer, which has been estimated to have a general population of up to 1 deer per 6.1 ha [15 acres] of land. Population density may increase locally when the populations move from open grazing and grassy herbaceous areas to the oak-dominated forested areas in the fall and winter. Because of the wide diversity of habitats in the area, the site is occupied by several resident and transitory bird species during the year. Aquatic biota on facility property occurs in three areas: streams, swamp forest, and marshes. Tidal variations in dissolved oxygen and salinity may affect habitat suitability for some species (General Electric Nuclear Energy, 1989).

Industrial operations over the past 40 years at GNF–A have impacted groundwater in several specific locations. These areas of concern have been well documented and are being monitored and/or remediated by programs that have been established in coordination with governing regulatory agencies, including the North Carolina Department of Environment and Natural Resources (NCDENR).

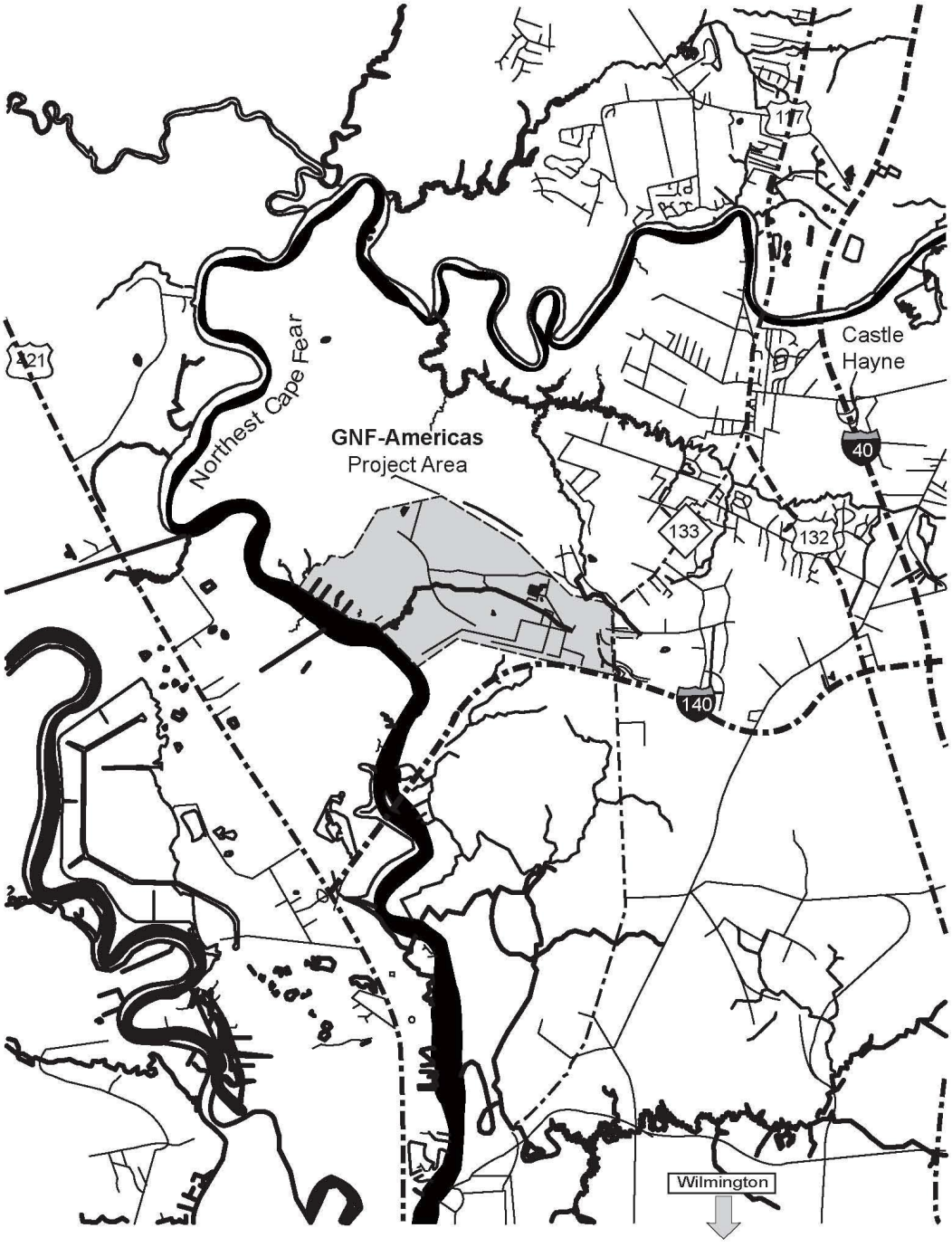

Figure 1. Geographical Location of GNF–A (Modified From GNF–A, 2007b)

2.2 Current Facility Use

The primary function of the GNF–A facility is to fabricate nuclear fuel assemblies containing low-enrichment (i.e., low concentrations of fissionable U-235) uranium oxide fuel for use in commercial light-water-cooled nuclear power reactors. GNF–A also produces intermediate fuel components. Fuel fabrication is one part of the nuclear fuel cycle, as depicted in Figure 2. The role of GNF–A in the nuclear fuel cycle is outlined by the dashed box.

The GNF–A site contains the following main facilities: (i) the Aviation facility, which is not part of the nuclear fuel fabrication operation; (ii) the General Electric Services Components Operation facility, where non-radioactive reactor components are manufactured; (iii) the Fuel Components Operation (FCO) facility, where non-radioactive components for reactor fuel assemblies are manufactured; (iv) the Wilmington Field Services Center, where equipment used at reactor sites, some of which may be radiologically contaminated, is cleaned and refurbished; and (v) the Fuel Manufacturing Operation (FMO) complex. The activities NRC regulates under license SNM–1097 are conducted in the FMO complex. The North Carolina Division of Radiation Protection regulates the Wilmington Field Services Center. The fuels complex consists of the FMO buildings, the Dry Conversion Process (DCP) building, and various supporting facilities.

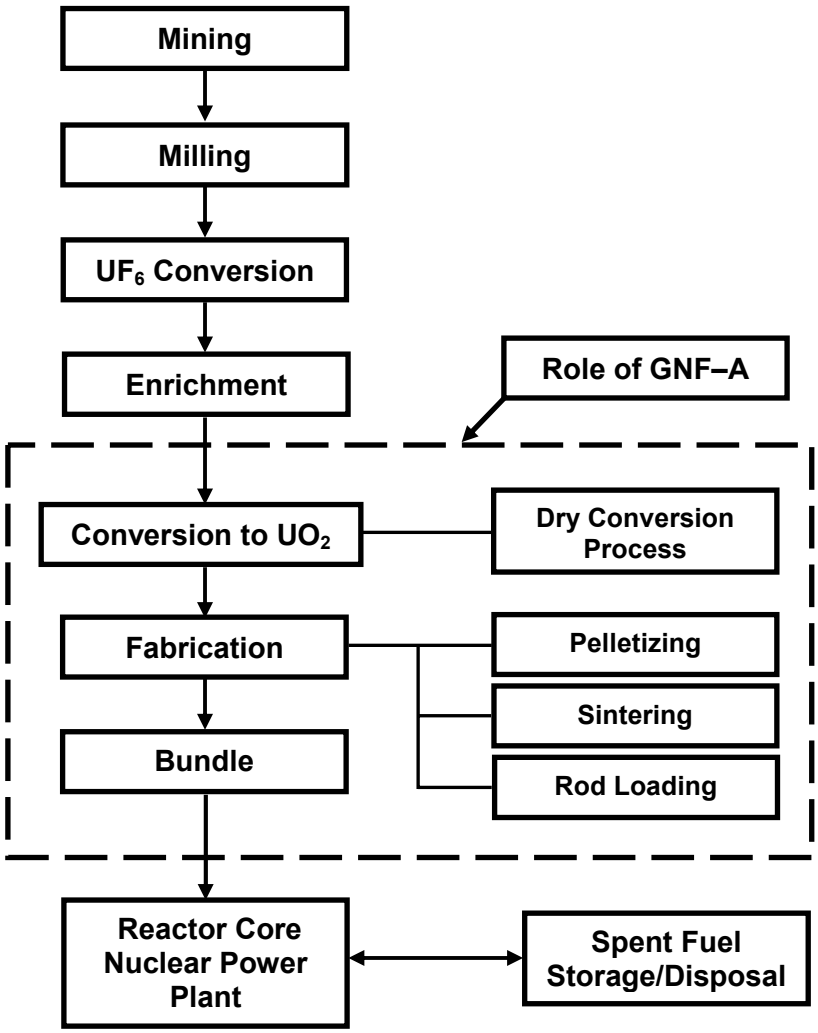

Figure 2. Role of GNF–A in the Nuclear Fuel Cycle

Nuclear fuel assembly production involves chemically converting the compound uranium hexafluoride (UF_6) into a uranium oxide. Prior to 1997, this conversion was performed at GNF–A by the ammonium diuranate process, which uses water and ammonium hydroxide. Since 1997, this conversion has been performed at GNF–A by the DCP, which uses superheated steam. Figure 3 is a schematic of the DCP. In the DCP, the uranium hexafluoride is vaporized and mixed with the steam. The resulting chemical reaction produces uranium oxide powder and hydrofluoric gas. The hydrofluoric gas is removed, condensed, and further processed. The uranium oxide powder is cooled before being sieved and homogenized to remove and reprocess agglomerates. Next, the oxide powders are blended with various uranium-bearing scrap materials and additives to improve the ceramic properties of the fuel. The powder is then granulated, mixed with a binder lubricant, and machine pressed to form ceramic fuel pellets. These pellets are sintered or heated to create the appropriate density, ground to create the appropriate dimensions, and loaded and sealed into metal fuel rods. These rods are assembled into bundles that form the nuclear fuel assemblies. Completed assemblies are temporarily stored onsite prior to shipping to commercial reactors for use as fuel. GNF–A exclusively uses trucks to transport material and products to and from the site. No rail or barge shipping is used. NRC, the U.S. Department of Transportation (DOT), and the state of North Carolina regulate nuclear material shipments from GNF–A. NRC regulation 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities, and onsite inspection govern fuel assembly handling at the NRC-licensed commercial reactors.

The ammonium diuranate process equipment still exists at GNF–A, although it is currently not used. There are no immediate plans to dismantle this area and the systems have been isolated and put in temporary lay-up. This area and some equipment could possibly be used if the current ceramics operation needs to be expanded.

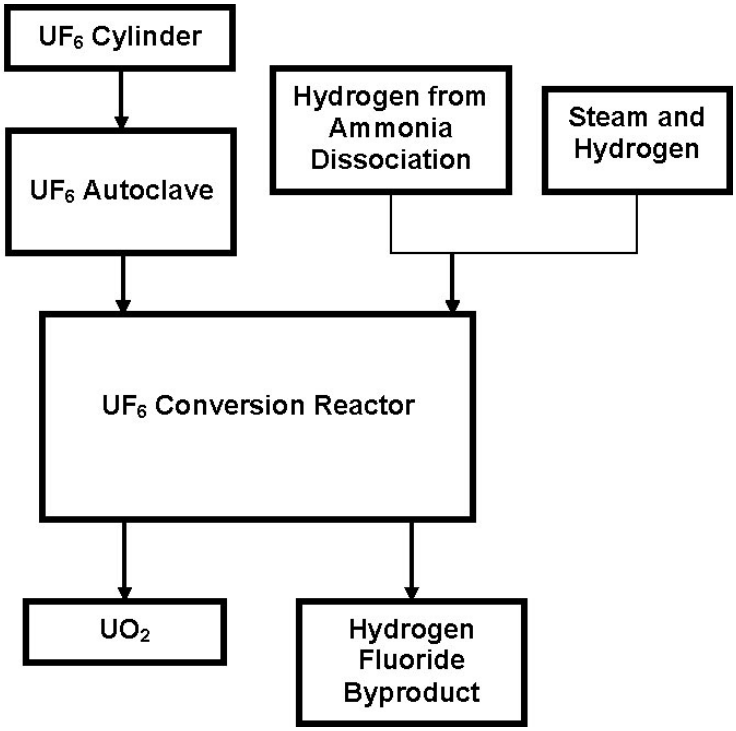

Figure 3. Process Flow Diagram for GNF–A Operations

2.3 Wastes Generated

GNF–A operations produce airborne, liquid, and solid effluents that may contain both radiological and non-radiological contaminants. Solid waste includes obsolete equipment and hardware, used ventilation filters, used personal protective equipment, waste treatment residues/filter cakes, demolition debris, and miscellaneous combustible waste.

The GNF–A complex is classified as a synthetic minor source for non-radiological emissions and is regulated by the NCDENR under two air permits. Air Permit 1756R17 covers the emissions from the FMO complex where nuclear fuel is fabricated and the FCO complex where non-radioactive fuel assembly components are manufactured. Air Permit 1161R19 covers the emissions from the Services Components Operation facility and the Aviation facility. The other facilities within the GNF–A complex do not have air emission sources that require an air permit. Both of the permits are classified as synthetic minor permits.

GNF–A activities produce process and sanitary liquid effluent streams that may contain both radiological and non-radiological contaminants. Process effluents are generated from fuel manufacturing processes whereas sanitary effluents are generated from non-fuel manufacturing facilities, such as the cafeteria and bathrooms. Process liquid effluent streams include low-level radioactive waste (LLRW) from the fuels complex from FMOs and aqueous hydrofluoric acid (HF) solutions from the DCP.

Table 1 contains information on the amount of process and sanitary liquid effluent streams produced at GNF–A from 1995 to 2005. On average for that 11-year timeframe, GNF–A discharged between about 1,750,000 and 2,620,000 L [462,000 and 692,000 gal] of liquid effluent per day. Process wastewater contributed between 94 and 95 percent of the total discharge (GNF–A, 2007b). There are seven individual National Pollutant Discharge Elimination System (NPDES)-permitted facilities in the subbasin where GNF–A is located, and GNF–A contributes half of the total permitted flow for these seven facilities (NCDWQ, 2006).

The DCP produces two types of aqueous streams that contain HF: a high concentration solution (greater than 50 percent) and a low concentration solution (typically 1–2 percent). The concentrated hydrofluoric acid is sold on the chemical market as byproduct, reducing the amount of fluoride wastes produced. In 2007, 440,876 L [116,020 gal] of dilute HF were generated and treated onsite. Dilute HF generated in 2007 averaged 1.2 percent concentration with a range of 0.45–3.0 percent. Eighty-eight percent of the shipments were less than 2 percent HF concentration. The dilute aqueous HF waste stream from the DCP is transferred to the waste treatment facility in approximately 17,000 L [4,500 gal] batches. At the waste treatment facility, the dilute HF is mixed with lime (calcium hydroxide) to form calcium fluoride (CaF_2). The CaF_2 is dewatered, and the solids are collected and included with the other non-combustible LLRWs shipped to the Energy Solutions disposal facility in Clive, Utah. The liquid effluent from the dewatering unit is pH adjusted and combined with the treated radiological waste from the FMO in the aeration basin and final process lagoons. Before the treated wastewater is discharged to the effluent channel, the water is tested at various sample points. If the pH needs to be further adjusted, the water is retained and treated until the proper pH levels are obtained. All GNF–A facilities produce sanitary waste.

Table 1. Information on the Amount of Process and Sanitary Liquid Effluent Generated at Global Nuclear Fuel–Americas From 1995 to 2005*				
Year	Average Sanitary Effluent Volume (L/day)†	Average Process Effluent Volume (L/day)	Percent Sanitary Effluent	Percent Process Effluent
1995	127,598	2,490,000	5	95
1996	131,637	2,270,000	5	95
1997	138,466	2,130,000	6	94
1998	135,570	1,950,000	6	94
1999	106,207	1,740,000	6	94
2000	95,051	1,650,000	5	95
2001	79,895	1,680,000	5	95
2002	82,404	1,670,000	5	95
2003	89,566	1,810,000	5	95
2004	91,626	1,850,000	5	95
2005	97,561	1,910,000	5	95

*Global Nuclear Fuel–Americas. "Site Environmental Report Supplement for the Period 1995–2005." Wilmington, North Carolina: Global Nuclear Fuel–Americas. 2007.
†Volume—To convert L/day to gal/day, multiply by 0.2642.

Waste generation rates for combustible and noncombustible low-level radioactive, hazardous, nonhazardous, and municipal solid wastes related to fuel manufacturing and supporting activities for 2005–2007 are shown in Table 2. All weights are from the entire GNF–A complex. Note that 99.8 percent of hazardous waste is from Zircaloy fuel rod cladding manufacturing and 50 to 60 percent of nonhazardous waste is generated by the aircraft facility metal recycle process. The higher waste volumes for 2005 and 2006 were due to dredging of the process lagoons. LLRW generation from future fuel manufacturing is expected to remain at current levels based on operational capacity and business projections. Hazardous waste generation dropped significantly in 2007 due to improvements in the fuel rod cladding etch process. Hazardous waste generation rates will be driven by production rates and are expected to increase slowly over time from the 1,100–1,400 metric ton/yr [1,200–1,500 ton/yr] range. Nonhazardous material generation will be largely driven by General Electric Aircraft Engines production rates. The GNF–A contribution to nonhazardous waste is only partially related to production rates and is expected to remain flat or increase very slowly over time. Municipal solid waste generation is proportional to total site population, and increases are expected to be offset by conservation and recycling efforts. Thus, the municipal solid waste stream volume should generally remain stable (GNF–A, 2008a).

Table 2. Historical Waste Generation Rates					
Year	Noncombustible Low-Level Radioactive Waste (m^3)*	Combustible Low-Level Radioactive Waste (m^3)*	Hazardous Waste (metric ton)†	Nonhazardous Waste (metric ton)†	Municipal Solid Waste (metric ton)†
2005	10,373	629	2,420	2,370	1,310
2006	4,560	524	1,195	2,560	1,290
2007	1,705	492	1,170	1,960	1,290

*To convert to ft^3, multiply by 3.53.
†To convert to ton, divide by 0.907.

2.4 Waste Management

GNF–A generates liquid, solid, and airborne wastes. GNF–A activities produce liquid process streams that may contain both radiological and non-radiological contaminants and sanitary liquid effluent streams that may contain non-radiological contaminants. Liquid effluents are treated and sampled prior to discharge to the Northeast Cape Fear River in accordance with NPDES permits and 10 CFR Part 20 requirements.

The GNF–A site has two NPDES permits that are associated with the entire site as described in Section 2.2. NPDES Permit NC0001228 is for the treatment of wastewaters and discharge to the surface waters of North Carolina. Within this permit, process water treatment and sanitary water treatment are handled individually, with each having a separate treatment facility and surface water discharge point. During the preparation of this EA, the GNF–A sanitary water treatment process changed, effective April 1, 2008. GNF–A holds North Carolina Division of Water Quality (NCDWQ) Permit WQ0031317, which authorizes the site to replace the gravity clarifiers with a membrane recycle bioreactor technology waste treatment system. This permit allows treated sanitary wastewater to be recycled and used as direct influent water input to a site cooling tower, replacing up to 133,000 L/day [35,000 gal/day] of process supply water, as needed. Sanitary water that is not recycled as process water will continue to be discharged at the surface water discharge point. The existing sanitary water treatment plant system was modified to incorporate the new technology without disturbing any new land.

As a potential part of the GNF-A site, treated radwaste effluent from the planned laser enrichment facility will be discharged to the GNF-A site final process lagoon facility. Sanitary wastewater from the planned laser enrichment facility will be collected in a sewer system connected to the GNF-A site activated sludge sanitary wastewater treatment plant. The combined estimated quantities of process and sanitary wastewaters would be within the maximum allowable limit allowed under the site's current NPDES permit.

Storm water at the GNF–A site is regulated under NPDES Permit NCS000022. The storm water drainage system currently collects drainage water from the developed areas of the facility and discharges through 16 outfalls. Surface water runoff from the laser enrichment facility would be routed to GNF-A storm water detention ponds before being discharged to receiving waters. Required analytical samples are taken semiannually at Outfalls 9, 13, and 14, which are considered representative sample points in the system. Benchmark sampling requirements and limits for Permit NCS000022 include lead, total recoverable (0.0338 mg/L); oil and grease (30 mg/L); pH (4.3–9); and total suspended solids (100 mg/L).

Regulated LLRW generated at the GNF–A site is containerized and sent to an onsite decontamination facility where it is separated into noncombustible and combustible wastes. Noncombustible LLRW is stored onsite until a sufficient quantity is available to make efficient shipments to the Energy Solutions disposal facility in Clive, Utah. GNF–A does not expect to lose access to its currently available LLRW disposal site in Clive, Utah. Under current operation conditions, the Utah site has a predicted operating lifetime of 25 years without benefit of expansion. The disposal site at Clive, Utah, is licensed by the State of Utah until 2013 (Energy Solutions, 2008).

The radioactive combustible waste is treated at an onsite incinerator. The incinerator processes, on average, 10 waste boxes {1.81 m^3 [64 ft^3]} per week. The ash is either processed through a uranium recovery process or sent to the LLRW disposal site in Clive, Utah.

GNF–A has adequate storage capacity within controlled areas to safely accommodate the current and anticipated volumes of combustible LLRW (GNF–A, 2008a).

Resource Conservation and Recovery Act hazardous wastes are transported offsite by a permitted hauler and taken to a permitted treatment, storage, and disposal facility for recycling, treatment, and disposal. Exceptions are alkaline cleaner, which undergoes elementary neutralization onsite, and used sodium hydroxide, which is taken offsite by a permitted hauler for beneficial reuse (GNF–A, 2008a).

GNF–A facilities discharge airborne effluents to the atmosphere via a number of process stacks. Radiological emissions are regulated by NRC under 10 CFR Part 20 and by the U.S. Environmental Protection Agency (EPA) under 40 CFR Part 20. Process stacks exhausting air that may contain significant concentrations of radioactive materials, as listed in 10 CFR Part 20, are equipped with high-efficiency particulate absolute filters and are continuously sampled for radioactive particulates.

2.5 Monitoring Programs

GNF–A operations create the potential for environmental releases of material into the air, water, and soil. GNF–A conducts effluent and environmental monitoring to evaluate potential health and environmental impacts and monitors compliance with applicable federal and state regulations. Gaseous, liquid, and solid effluents that NRC-licensed activities produce may contain both radiological and non-radiological contaminants. Monitoring is conducted for both radiological material, such as uranium, and non-radiological material, such as fluoride. GNF–A has implemented a radiological protection program at the site designed to maintain exposures as low as is reasonably achievable (ALARA). This program is delineated in procedures and implemented by area managers through engineering controls, training, and staff supervision. GNF–A has a chemical safety program designed to ensure that the radiological and non-radiological hazardous chemicals associated with licensed material activities are handled, used, and disposed of in a manner that minimizes the risk of chemical exposure. GNF–A has a formal configuration management process documented in written plant practices designed to ensure that potential safety, health, and environmental impacts from any facility, process, or equipment design changes are evaluated.

GNF–A also maintains an environmental protection program. The North Carolina Radiation Protection Section routinely collects air, surface water, groundwater, soil, sediment, and vegetation samples for analyses at and near the site. Collection frequencies and action levels differ for each sample type. Responses to results that exceed action levels established by GNF–A include internal review, corrective action, and notification of the responsible regulatory agency, if required. The license application (GNF–A, 2007c) details the GNF–A monitoring plan, and the environmental report (GNF–A, 2007b) contains monitoring results for each sample type. Samples collected since the previous license renewal has exceeded the associated action levels infrequently (GNF–A, 2007b).

Air samples undergo non-radiological and radiological analyses. Radiological monitoring at the point of emissions and at six ambient air stations is performed continuously and samples are collected and analyzed weekly. Non-radiological monitoring for fluoride is conducted at the stacks with samples collected on a daily and weekly basis.

GNF–A conducts a variety of water analyses. Liquid effluent at the onsite discharge points undergoes non-radiological and radiological analyses. Radiological monitoring samples are

collected on both a daily and weekly basis. Several non-radiological parameters, including ammonia, fluoride, and nitrates, are monitored with sample collection frequencies ranging from weekly to quarterly. Groundwater obtained from a variety of onsite wells undergoes radiological and non-radiological analyses. Radiological monitoring sampling frequency ranges from monthly to quarterly. Non-radiological monitoring sampling frequency ranges from quarterly to annually. Parameters analyzed include ammonia, fluoride, nitrates, and pH. Surface water monitoring is conducted at the site dam and in the Northeast Cape Fear River upstream and downstream of the GNF–A discharge point. Monitoring at the two Northeast Cape Fear River locations is conducted in coordination with other NPDES permit holders as outlined in a Memorandum of Agreement with NCDWQ (2006). Monitoring sampling frequency ranges from weekly to monthly. Non-radiological parameters analyzed include ammonia, nitrates, and pH.

Sediment and soil samples undergo radiological analyses. Sediment samples are collected annually, and soil samples are collected semiannually. Vegetation samples are collected semiannually and are analyzed for fluoride (GNF–A, 2007b).

2.6 Anticipated Changes to Facilities over the 40-Year Licensing Period

Continuation of efficient and state-of-the-art production operations for another 40 years is expected to be accompanied by ongoing maintenance and, from time to time, major component replacements and/or process upgrades. Major component replacements and/or process upgrades would require an amendment to the license, which could require an environmental review under NEPA. GNF–A currently has no plans for any new processes, operations, or facilities that are directly associated with the license renewal request (GNF–A, 2008a). Only normal maintenance activities to keep the facility safe and functional are anticipated. Larger maintenance activities that may be different or not specified in the currently authorized SNM–1097 license will require coordination with NRC.

There are several onsite planned future construction activities not related to fuel fabrication operations that may impact areas or facilities on the GNF–A site. These activities include the Tooling Development Center, the Global Laser Enrichment Test Loop, and the Commercial Facility (GNF–A, 2008a). In April 2008, Global Laser Enrichment, Inc., a subsidiary of General Electric Hitachi Nuclear Energy, publicly announced its intention to locate its laser enrichment facility at the GNF–A site (General Electric Hitachi Nuclear Energy, 2008). This proposed laser enrichment facility is considered a reasonably foreseeable future action in terms of the GNF–A site and the GNF–A license renewal. The impacts from the laser enrichment facility are specifically addressed for each impact area in Section 4.0.

The Tooling Development Center will be located in the southwestern portion of the Eastern Site Sector. It will consist of five new buildings and will disturb approximately 12 ha [30 acres] of the GNF–A site. The facility will require an estimated 18,900 and 41,600 L/day [5,000 and 11,000 gal/day] of process water and potable water, respectively. Assuming no consumptive losses, the same volumes of process and sanitary wastewaters would be generated for treatment. The existing final process lagoon facility and sanitary waste treatment facility has the capacity to accommodate the anticipated water requirements. No radioactive material will be used in the Tooling Development Center buildings, and no air permits will be required. Approximately 1.2 km [0.75 mi] of new road will be constructed to access the Tooling Development Center (GNF–A, 2008a).

An analysis of reasonably foreseeable future actions was made based on the consideration of anticipated changes and maintenance activities regarding the process facilities and operations

at GNF–A, along with potential changes in production levels and the employee workforce, forecasts of human populations for the state and the three-county (New Hanover, Pender, and Brunswick) study area, and features included in the City of Wilmington's Land Use Plan. Wilmington's Land Use Plan covers the period of 2004 to 2025 and addresses infill, redevelopment, residential areas, environmental resources, historic preservation, neighborhoods, public spaces, recreation, and road corridors and transportation. A joint Wilmington-New Hanover County Coastal Area Management Act (CAMA) Plan was also reviewed. This plan will be periodically updated for new development projects and coastal area environmental protection. Finally, the City's Land Development Code highlights issues such as landscape and buffers, site design, and floodplain considerations (City of Wilmington, 2004). As noted in the Demography and Socioeconomics section (Section 3.2), extensive population growth is expected within the three-county study area over the next 25 years. This growth will be accompanied by new residential, small industrial and commercial developments, along with the necessary infrastructure. A special waterfront development area is also anticipated.

The New Hanover County Planning Department identified four specific reasonably foreseeable future actions. [These actions include (i) a new interstate highway (I-140) along the southern border of GNF–A (within the next 5 to 10 years), (ii) new water and sewer services to be provided to areas across the Northeast Cape Fear River from GNF–A (within 5 years), (iii) a nearby rail line extension to the Raleigh/Durham area (within 10 years), and (iv) a new port area along the coast [within 10 to 20 years (Moore, 2008)]. These infrastructure and development projects will support the anticipated population growth in New Hanover County.[1] In addition, the Cape Fear River Basin-Wide Water Quality Plan included several local stream restoration projects, along with the implementation of Best Management Practices within the subbasin where GNF–A is located. These activities will support current and future activities aimed at reducing environmental stresses on the Cape Fear River (NCDWQ, 2006).

2.7 Decommissioning

NRC will require GNF–A to decontaminate and decommission GNF–A when license SNM–1097 is terminated. At the time of decommissioning, GNF–A will submit a decommissioning plan to the NRC consistent with applicable license termination criteria. NRC will review any decommissioning plan from both a safety and an environmental perspective.

3.0 AFFECTED ENVIRONMENT

3.1 Land Use

The zoning classification for the forest north of the GNF–A site is rural agricultural, which means the land is designated for low-density residential development with an emphasis on farming and open-space preservation. Currently, this parcel of land is used for timber management and as a private hunting area. The area southwest of GNF–A between the Northeast Cape Fear River that borders the site and the main branch of the Cape Fear River is zoned as heavy industrial use. The GNF–A site shares this same designation, which is the least restrictive zoning classification. This classification provides an area for uses that may produce excessive noise, odor, smoke, dust, or other objectionable characteristics. Industrial operations in this area include BASF Corporation, Elementis Chromium facilities, and the L.V. Sutton coal-fired power

[1]Moore, J. "Reasonably Foreseeable Future Actions." Email communication (December 20) to B. Werling, Center for Nuclear Waste Regulatory Analyses. Washington, DC: NRC. 2007.

plant. Residential zoned areas prevail to the south and east of the GNF–A site. Light commercial activities are also located along Castle Hayne Road that borders the eastern side of the main GNF–A property area.

The community of Wrightsboro is located about 4.8 km [3 mi] south of GNF–A. To the northeast along Old Castle Hayne Road are the communities of Skippers Corner, about 3 km [2 mi] away, and Castle Hayne, about 5 km [3 mi] away. The North Carolina State University Horticulture Crops Research Station is located on the opposite side of Castle Hayne Road from GNF–A. Also located across this road are four mobile homes. Three public schools are located within 8 km [5 mi] of GNF–A: Wrightsboro Elementary School, Emma B. Trask Middle School, and Emsley A. Laney High School. Wilmington International Airport is located about 8 km [5 mi] southeast of GNF–A. The New Hanover County Landfill is located about 6 km [4 mi] southwest of GNF–A.

New Hanover is one of 20 North Carolina counties in which the Federal Coastal Zone Management Act applies. This Act sets the framework for states to develop comprehensive programs to balance competing demands on coastal resources and uses (i.e., wildlife, habitat, recreation, and public access) and manage impacts to these resources. North Carolina has developed a state coastal management program. One of the key elements to the North Carolina Coastal Management Program is the CAMA. The CAMA requires local governments within the 20 coastal counties to prepare land use plans that provide for the protection, preservation, orderly development, and management of these coastal areas. The Wilmington–New Hanover County Joint Coastal Area Management Plan was initially developed in 1976, and the latest update was completed in 2006 (City of Wilmington and New Hanover County, 2006).

The CAMA requires permits for development in portions of the county identified as areas of environmental concern. Development includes activities such as dredging or filling coastal wetlands or water and construction of marinas, piers, docks, bulkheads, oceanfront structures, and roads. Areas of Environmental Concern are divided into four categories: (i) estuarine and ocean systems, (ii) the ocean hazard system, (iii) public water supplies, and (iv) natural and cultural resource areas. Areas of Environmental Concern cover almost all coastal waters and about 3 percent of the land in the 20 coastal counties (North Carolina Division of Coastal Management, 2004).

The North Carolina Coastal Management Program is federally approved, and some activities must comply with this program even if they do not require a CAMA permit. One circumstance that invokes this program is if the activity requires a federal license or permit. Program compliance requires a consistency review by the North Carolina Division of Coastal Management to evaluate whether the Proposed Action complies with the enforceable policies of the North Carolina Coastal Management Program. When a federal license or permit is required, the applicant deals directly with the North Carolina Division of Coastal Management to address the consistency issue.

The land classification system is one of the tools used to implement the desired future land uses outlined in the Wilmington–New Hanover CAMA Plan. Conservation areas in New Hanover County are predominantly located along the eastern coastline and the northwestern corner, including in and around the GNF–A site. This land classification provides for management and protection of significant or limited natural resources while protecting the rights of the property owner.

Aquifer resource protection areas in New Hanover County are predominantly located in the northwestern corner of the county, including land in and around the GNF–A site. This land classification protects aquifers from diminished recharge and contamination by inappropriate land uses.

Areas subject to wetland resource area protection in New Hanover County are predominantly located in the northeast, but also occur in the northwest, including land in and around the GNF–A site. This land classification protects from the loss of wetlands to development.

Significant natural heritage areas in New Hanover County are predominantly located in the northwestern corner of the county, including land in and around the GNF–A site. These areas are designated by the NCDENR under the Natural Heritage Program (NCDWQ, 2006). This program identifies terrestrial and aquatic sites that have particular biodiversity significance due to the presence of rare species, rare or high-quality natural communities, or other important ecological features. Designation under this program does not convey protection of the species. This land classification protects the land from habitat loss or fragmentation.

3.2 Transportation

Transportation is a key contributor to the quality of life and economic viability of every community. The Wilmington region is anticipating significant population and employment growth. The Wilmington Metropolitan Planning Organization (WMPO) has developed a Long Range Transportation Plan that is intended to meet the future travel demand of people and goods within the Wilmington urban area (WMPO, 2005). The Long Range Transportation Plan covers a 25-year period and describes proposed transportation improvement projects, goals, and objectives to improve overall travel within the Wilmington region. More than one route exists to commute to the GNF–A site (Figure 1). The most reasonable transit routes are Interstate I-40, Interstate I-140, Castle Hayne Road (North Carolina Highway 133), and Holly Shelter Road.

The southeastern part of the GNF–A site is located adjacent to the junction of I-140 and Castle Hayne Road (Figure 1). Access to the GNF–A site for all vehicular traffic is from Castle Hayne Road. North of the I-140 junction, Castle Hayne Road is a four-lane road that continues for approximately 0.8 km [0.5 mi] before narrowing to two lanes (GNF–A, 2008a). Castle Hayne Road is classified as an urban minor arterial north of I-140 and at entrances to the GNF–A site, and as an urban principal arterial south of I-140 (WMPO, 2005).

A major route for traffic approaching the GNF–A site is I-40 (Figure 1). The segment of I-140 from I-40 to Castle Hayne Road was opened to traffic in August 2005 and is now the most common route used for vehicular traffic to the GNF–A site. Alternatively, vehicles approaching the site from the north can access the site by exiting off I-40 at the Holly Shelter Road exit and traveling south on Castle Hayne Road. From the downtown district of Wilmington and the port area to the south, the site can be accessed by traveling north on Castle Hayne Road.

The WMPO monitors over 700 locations in the Wilmington region with automatic traffic counting devices to analyze traffic trends and help predict future traffic volumes. Table 3 contains available WMPO average daily traffic (ADT) count information for locations north and south of the GNF–A site on Castle Hayne Road and on Holly Shelter Road between I-40 and Castle Hayne Road. The ADT represents the average number of vehicles counted for two or three consecutive weekdays for each particular location. The ADT counts in Table 3 include the approximately 2,100 workers who commute to and from the site daily and the vehicular traffic to

and from the site that supports various site operations. Traffic counts north and south of the GNF–A site on Castle Hayne Road do not show a significant change between 2004 and 2005.

Table 3. Average Daily Traffic (ADT) for Locations Around the Global Nuclear Fuel–Americas Site

Location	Month/Year	ADT
Holly Shelter Road between I-40 and Castle Hayne Road	June 2004* April 2005† November 2006‡	13,759 12,063 8,535
Castle Hayne Road north of GNF–A site (near intersection with Sondey Road)	May 2004* April 2005†	13,419 13,775
Castle Hayne Road north of GNF–A site (south of junction with North College Road)	June 2004* April 2005†	13,739 12,877
Castle Hayne Road south of GNF–A site (near intersection with N. Kerr Avenue)	August 2004* April 2005†	23,218 22,163

*Wilmington Metropolitan Planning Organization (WMPO). "2004 Wilmington Metropolitan Planning Organization Traffic Count and Accident Report." Wilmington, North Carolina: WMPO. 2004.

†WMPO. "2005 Wilmington Metropolitan Planning Organization Traffic Count and Accident Report." Wilmington, North Carolina: WMPO. 2005.

‡WMPO. "2006 Traffic Count Report." Wilmington, North Carolina: WMPO. 2006.

Currently, no WMPO traffic count data for Castle Hayne Road are available to determine changes in traffic volume as a result of the opening of the I-140 segment from I-40 to Castle Hayne Road in August 2005. However, WMPO ADT data for 2006 on Holly Shelter Road is available and indicates a decrease in road usage that is likely a result of the opening of the I-140 segment.

Access onto the GNF–A site from Castle Hayne Road is through one of two gated entrances. The South Gate entrance is located directly across Castle Hayne Road from the I-140 westbound off ramp. The North Gate entrance is located about 0.4 km [0.25 mi] north of the South Gate. Truck deliveries are directed to enter through the North Gate entrance. GNF–A uses trucks exclusively (no rail or barge) to support all site operations and transport products, supplies, and wastes to and from the site (GNF–A, 2008a).

About 300 million hazardous material shipments occur nationwide each year (DOT, 1998). One percent of this total involves shipment of radioactive materials. Transports to and from GNF–A involve a significantly smaller percentage (less than 50 shipments per year) of this amount. GNF–A relies on a private hauler to transport its nuclear products and wastes. The hauler ensures compliance with requirements for packaging, labeling, driver qualifications, routing, and emergency preparedness.

3.3 Demography and Socioeconomics

Demography and socioeconomics include the three-county region of New Hanover, Brunswick, and Pender because most GNF–A workers would reside in these counties. GNF–A is located in New Hanover County. The adjacent county to the north is Pender County, with GNF–A about 4.8–6.4 km [3–4 mi] south of the county line. Brunswick County lies to the west and south of New Hanover County. The Brunswick County line is more than 16 km [10 mi] from GNF–A. Primary attention will be given to New Hanover County, which is the county that contains GNF–A, although for most topics, all three counties will be discussed.

Table 4 contains population data, and Table 5 contains population densities for North Carolina and the three-county area where GNF–A is located. The largest population center near GNF–A is Wilmington in New Hanover County. For Wilmington, the 1990 census, 2000 census, and 2003 population estimate (2006 was not available) totaled 55,530, followed by 75,838, and 91,137, respectively (U.S. Census Bureau, 2007). These data show a consistent population growth (36.6 percent from 1990 to 2000 and 20.2 percent from 2000 to 2003).

Table 4. Population Data for North Carolina and the Three-County Area

	2000*	2006 (Estimate)*	2030 (Projection)†
North Carolina	8,049,313	8,856,505 (10%) ‡	12,274,000 (52.5%)
New Hanover County	160,307	182,591 (13.9%)	271,030 (69.1%)
Pender County	41,082	48,630 (18.4%)	78,466 (91.0%)
Brunswick County	73,143	94,945 (29.8%)	164,133 (124.4%)
Three-County Area	274,532	326,166 (18.8%)	513,629 (87.1%)

*U.S. Census Bureau. "American Fact Finder and Other Databases." 2007. <http://www.census.gov> (November 19, 2007).
†North Carolina State Demographics. "Various Databases." 2007. <http://demog.state.nc.us/> (February 7, 2008).
‡Percentages in parentheses represent the population change from the previous time period.

Table 5. Population Densities for North Carolina and the Three-County Area*

	2000 Population	Size (km^2)†	Density (People/km^2)‡
North Carolina	8,049,313	136,413	59
New Hanover County	160,307	515	311
Pender County	41,082	2,256	18
Brunswick County	73,143	2,214	33

*U.S. Census Bureau. "American Fact Finder and Other Databases." 2007. <http://www.census.gov> (November 19, 2007).
†Size—To convert square kilometers to square miles, divides by 2.59.
‡Density—To convert people/square kilometer to people/square mile, multiply by 2.59.

The minority (nonwhite) population of the three-county study area ranged from 14.6 to 22.0 percent based on 2005 estimates, with the breakdown by county being 18.8, 22.0, and 14.6 percent for New Hanover, Pender, and Brunswick Counties, respectively (U.S. Census Bureau, 2007). For the state of North Carolina, the minority (nonwhite) population was 25.9 percent based on a 2005 estimate. The minority (nonwhite) population in Wilmington, based on the 2000 census, was 29.4 percent (no estimate was available for 2003). African-American persons and persons of Hispanic or Latino origin comprise the two largest portions of the nonwhite populations, with the African-American population being the largest.

Based on the 2000 census, and projected to 2004, the median household income for the United States was $44,334 and 12.7 percent of the population was below the poverty level (U.S. Census Bureau, 2007). For the state of North Carolina, the 2004 median household income was $40,863 (92.2 percent of the median for the entire United States) and 13.8 percent of the population was below the poverty level. Comparable 2004 statistics for New Hanover County indicate a median household income of $41,579 (1.8 percent above the comparable state level) with 13.9 percent below the poverty level.

According to the 2000 census, the state of North Carolina had 3,523,944 housing units. The 2000 data for New Hanover County indicated 79,616 housing units. The number of housing units estimated for 2005 totaled 3,940,554 for the state (11.8 percent higher than the 2000 census number) and 92,685 for New Hanover County (16.4 percent higher than the comparable 2000 census number). A total of 57 census blocks within 8 km [5 mi] of the GNF–A facility are located in Pender County, and 3 census blocks are located in Brunswick County. The total populations of these blocks in Pender and Brunswick counties are 3,305 and 36 persons, respectively. According to data from the 2000 census, the total combined population of the census blocks within 8 km [5 mi] of the GNF–A facility is 16,338 persons and 6,244 households (GNF–A, 2008a).

The labor force (population of those 16 years and older) totaled 40,250 in 2000 and 48,405 in 2006 (U.S. Census Bureau, 2007). In this case, the 2006 labor force was 20.3 percent higher than it was in 2000. For New Hanover County, the 2006 labor force averaged 103,840 and the unemployment rate averaged 3.7 percent (North Carolina Employment Security Commission, 2006). For Pender County in 2006, the labor force averaged 23,210, with an average unemployment rate of 4.2 percent. Comparable 2006 data for Brunswick County were 45,420 with an unemployment rate of 4.5. The average 2006 unemployment rate for the state was 4.8 percent.

The major employers in New Hanover County (as of September 2006) included 10 entities with over 1,000 employees. Examples of these employers include the New Hanover Regional Medical Center, the County School System, the University of North Carolina at Wilmington, and the county government (North Carolina Employment Security Commission, 2006). The Pender County Board of Education is the only employer in Pender County with more than 1,000 employees. Similarly, the Brunswick County Board of Education is the only employer in Brunswick County with more than 1,000 employees. Staffing at GNF–A is projected to increase to approximately 3,000 workers within 5 years (GNF–A, 2008a).

North Carolina's southern coast has four hospitals that provide comprehensive health care services, including New Hanover Regional Medical Center (the largest hospital in southeastern North Carolina), Cape Fear Hospital (Wilmington's other hospital), Brunswick Community Hospital (located just south of Wilmington), and Pender Memorial Hospital (located just north of Wilmington). More than 620 physicians practice in the New Hanover/Pender County area (Wilmington Today, 2008).

The southern North Carolina coast is also served by three separate public school systems. New Hanover County has the largest system (10th largest in the state), as it encompasses Wilmington, the largest city on the state's coastline. The system is organized as K–5, grades 6–8, and grades 9–12, implementing a middle school concept using junior high schools. There are more than 288 courses available to students at the four senior high schools in New Hanover County. In addition to the strong public schooling system, the region offers a growing list of private schools, both secular and religion based, that meet an extensive range of educational requirements. Beyond that, the University of North Carolina at Wilmington, the Miller-Motte Business College, and Cape Fear Community College offer undergraduate and graduate degrees (All about Wilmington, 2008).

Because 84 percent of the population within 8 km [5 mi] of the GNF–A facility resides in New Hanover County, the NRC staff considers GNF–A a significant economic source for New Hanover County. The NRC staff assessed New Hanover County's tax bases. According to the New Hanover County Tax Department, the 2008 projected county tax base as of June 30, 2008,

is approximately $29.1 billion, excluding exempt parcels. The fiscal year 2008–2009 tax base is estimated to be $33.4 billion (a growth of 1.7 percent). This is the smallest increase in the past 15 years. Revenue from sales taxes is expected to decrease 8 percent. Sales taxes are the second largest revenue source for the county behind property taxes (New Hanover County, 2008).

3.4 Climatology, Meteorology, and Air Quality

The following climate and meteorology data is based on information from the National Climatic Data Center report (2004). The mean annual temperature in Wilmington is about 17 °C [62.7 °F] with the monthly mean ranging from 7.1 °C [44.8 °F] in January to 27 °C [80.1 °F] in July. The mean annual precipitation for Wilmington is 148 cm [58.44 in]. Monthly precipitation rates are fairly uniform and range from 7.8 to 20 cm [3.09 to 7.97 in] with July through September being the wettest months. The mean annual snowfall for the area is 4.3 cm [1.7 in] occurring between December and March.

From 1930 to 1996, winds were predominately from the southwest throughout each year but typically prevailed from the north in January and February. Monthly mean wind speeds ranged from 11 to 16 km/h [7 to 10 mph] (National Climatic Data Center, 1998).

Wilmington's severe weather conditions include thunderstorms, tornados, and hurricanes. The mean number of storm events classified as "thunderstorm and high wind" occurring in New Hanover County was under six per year from 1995 to 2006 (National Climatic Data Center, 2007). The thunderstorm and high wind classification is reserved for more extreme storm events that can include severe thunderstorms, damaging winds, or hail. Between 1995 and 2006, seven tornados were reported in New Hanover County and none had a rating greater than F1 on the Fujita Tornado Damage Scale. An increase in the Fujita Tornado Damage Scale number represents an increase in tornado severity. Tornados with a rating between F2 and F5 are considered "strong-violent" (Lott, et al., 2000). Between 1995 and 2006, New Hanover County experienced 12 hurricanes or tropical storms (National Climatic Data Center, 2007). These events produce high winds, above-normal tides, and heavy rains.

Several authorities and regulations address air quality. Regulations that apply to air pollutant control include 40 CFR Part 50, National Primary and Secondary Ambient Air Quality Standards; 10 CFR Part 20, Standards for Protection Against Radiation; and 10 CFR 70.59, Effluent Monitoring Reporting Requirements. The Division of Air Quality at NCDENR regulates GNF–A non-radiological airborne emissions. Radiological airborne emissions are regulated by NRC under 10 CFR Part 20 and by EPA under 40 CFR Part 91.

Air quality at GNF–A can be affected by airborne effluents released from process stacks. Airborne effluents are treated with high-efficiency particulate absolute filters, scrubbers, or both and sampled prior to release for non-radiological and radiological pollutants. For radiological pollutants, the total gross alpha activity released to the atmosphere from process stacks from 1995 to 2005 has ranged from 0.55 to ~7.4 MBq/yr [15 to ~700 μCi/yr] (GNF–A, 2007b). These activities do not exceed limits of 46 MBq [1,250 μCi per quarter] {185 MBq/yr [5,000 μCi/yr]} specified in 40 CFR Part 190 for required written reporting of airborne emissions. The average gross alpha concentrations have varied from 1×10^{-10} to 2×10^{-9} Bq/cm^3 [4×10^{-15} to 6×10^{-14} μCi/cm^3]. GNF–A uses a conservative dilution factor of 100 at the GNF–A site boundary, which decreases these values to well below the most conservative regulatory limit of 2×10^{-9} Bq/cm^3 [5×10^{-14} μCi/cm^3] for U-234 (Class Y) specified in 10 CFR Part 20. As allowed

by 10 CFR 20.1302, GNF–A is authorized to apply a dilution factor of 100 to the measured stack discharges for the purpose of evaluating the airborne radioactivity at the closest site boundary. This conservative dilution factor was derived using standard diffusion models and conservative assumptions regarding physical and atmospheric characteristics of the site (GNF–A, 2007a).

The National Ambient Air Quality Standards (NAAQS) specify acceptable air concentration thresholds for six common non-radiological pollutants: nitrogen oxides, ozone, sulfur oxides, carbon monoxide, lead, and particulate matter. Compliance is determined individually for each pollutant, and the area is classified as in attainment when concentration levels comply with NAAQS. The pollutant concentration levels in New Hanover County are in attainment for all NAAQS criteria pollutants.

The NCDENR Division of Air Quality regulates GNF–A non-radiological air emissions. The GNF–A complex is classified as a synthetic minor source for non-radiological emission. Air Permit 1756R17 covers the emissions from the FMO complex where nuclear fuel is fabricated and the FCO where nonradioactive fuel assembly components are manufactured. Air Permit 1161R19 covers the emissions from the Services Components Operation facility and the Aviation facility. Other facilities within the GNF–A complex do not have air emission sources that require an air permit. Both the permits are classified as synthetic minor permits. The goal is to ensure that emissions are under the threshold that would require the facility to obtain a Title V operating permit.

National Emissions Standards for Hazardous Air Pollutants do not apply because GNF–A is not considered a major source of hazardous air pollutants. The synthetic minor air permits specify the conditions and limitations for the permitted air emission sources to remain below the major source classification (Title V). Permit 1756R17 specifies the operation and maintenance requirements for each permitted air emissions source and/or air cleaning device. The NCDENR site air inspector annually verifies each permit requirement. The following limits apply to GNF–A Air Permit 1756R17:

- The incinerator charge rate shall not exceed 320 kg/h [1,200 lb/h]. The maximum charge rate in 2007 was 143 kg/h [315 lb/h].

- The Toxic Air Pollutant limit for HF emissions from the HF recovery building shall not exceed 0.29 kg/day [0.63 lb/day] or 0.029 kg/h [0.064 lb/h]. In 2007, actual HF emissions reported for this source were 0.76 kg/yr [1.68 lb/yr], which equates to 0.002 kg/day [0.005 lb/day] and 0.000086 kg/h [0.00019 lb/h].

- The facility-wide emissions shall be less than 90.7 metric ton/yr [100 ton/y] SO_2, 90.7 metric ton/yr [100 ton/yr] NO_x, 9.07 metric ton/yr [10 ton/yr] HF, and 90.7 metric ton/yr [100 ton/yr] PM10. The actual facility-wide emissions reported in 2007 were 0.16 metric ton/yr [0.18 ton/yr] SO_2, 6.3 metric ton/yr [7 ton/yr] NO_x, 0.15 metric ton/yr [0.16 ton/yr] HF, and 0.39 metric ton/yr [0.43 ton/yr] PM10.

- The operating hours of the 650-kW generator shall not exceed 240 h/yr per permit. The actual total operating hours in 2007 was 45 h.

- The operating hours of the two 1,250-kW generators shall not exceed 1,320 h/generator/yr. The actual total operating hours in 2007 for the two generators was 44 h and 35 h.

- The sulfur content of the #2 fuel oil used for the boilers shall be limited to 0.4 percent by weight and for the generators shall be limited to 0.2 percent by weight. The actual sulfur content in the #2 fuel oil does not exceed 0.05 percent by weight.

- Each washing column in the HF building shall maintain a minimum water flow rate of 20 L/h [5.3 gal/h]. The actual minimum flow rate is set at 25 L/h [6.6 gal/h].

- To ensure enforceability of the facility-wide PM10 emissions limit of 90.7 metric ton/yr [100 ton/yr], preventative maintenance for all permitted scrubbers and fabric filters in operation is performed as required by the air permit and tracked in an electronic database.

3.5 Hydrology

3.5.1 Surface Water

The GNF–A site is located in subbasin 03-26-23, one of the 24 subbasins of the Cape Fear Basin. This subbasin covers 2,060 km^2 [795 mi^2] (NCDWQ, 2006). The Northeast Cape Fear River is the major surface water body in the subbasin and consists of several tributaries—mostly small creeks. One of the largest tributaries is the Prince George Creek, which has a drainage area of 6.2 km^2 [2.4 mi^2] (General Electric Nuclear Energy, 1989).

The State of North Carolina assigns surface water classifications. The Northeast Cape Fear River near the GNF–A site was given a primary classification of C or "aquatic life propagation/protection and secondary recreation" and a supplemental classification of Sw or "swamp waters" (NCDWQ, 2006). Each primary classification has water quality standards designed to support the uses associated with each classification. The C classification establishes the basic protection level for all state surface waters. This portion of the Northeast Cape Fear is not designated as a water supply under any of the five levels of water supply watershed categories in the primary classification system. The supplemental swamp water classification indicates that the water will naturally be more acidic (lower pH values) and have lower levels of dissolved oxygen.

The Northeast Cape Fear River along the GNF–A site boundary has a tidal range of 0.3–1.5 m [1–5 ft] (General Electric Nuclear Energy, 1989). Salinity concentrations vary with the rate of freshwater input and the amount of tidal exchange (GNF–A, 2008a). Hurricane Floyd generated the historic peak flood elevations for New Hanover County in 1999. U.S. Geological Survey (USGS) stream gauges in nearby substations indicated that the flooding caused by Hurricane Floyd was likely greater than that caused by the 100-year flood and very possibly greater than that generated by the 500-year flood (GNF–A, 2008a).

3.5.2 Groundwater

Two primary aquifers lie below the area where the GNF–A site is located: the "shallow" or water table aquifer and the "deep" or principal aquifer that lies below the shallow aquifer. The GNF–A site wells produce process and potable water from the principal aquifer, which is also known as the Peedee aquifer. Sandy parts of the Peedee Formation are utilized as major aquifers over a large part of the Coastal Plain. GNF–A does not use water from the shallow aquifer.

Groundwater is used at the GNF–A site for industrial process water and drinking water. The average annual withdrawal is approximately 22.8 million L/day [0.6 million gal/day]. Measurement of water levels in wells tapping the Peedee aquifer does not show a long-term downward trend (GNF–A, 2008a). Potential future withdrawal rates based on planned construction and expansion of facilities at the site (see Section 2.6) indicate that the existing water use and future estimated use (approximately 10 percent increase), when evaluated cumulatively with other past, present, and foreseeable future actions, will not exceed the sustainable yield of the aquifer in the area.

GNF–A monitors groundwater for various constituents from 88 monitoring wells across the GNF–A site. Releases of contaminants during operations at the GNF–A site over the past 40 years have impacted groundwater in several specific locations. These locations include

- Northwest Site Area—Groundwater in this area has been impacted by trichloroethylene and its degradation products cis-1, 2 dichloroethylene and vinyl chloride. The contamination is associated with lubricant handling during the 1960s and 1970s. NCDENR approved a monitored natural attenuation corrective action remedy for this area in 1999. Calcium fluoride storage in the northwest site area has also resulted in uranium and fluoride reaching groundwater. The area was excavated in 1996 to remove contaminated soil and backfilled in 2000. Monitoring in nearby wells indicates attenuation of groundwater impacts and the absence of significant risk exposure from the primary constituents (fluoride and uranium) (GNF–A, 2008a). Soil samples obtained between 2001 and 2005 do not indicate uranium levels above background levels (GNF–A, 2007b).

- Waste Treatment Area—Waste treatment operations resulted in the release of nitrate to the Peedee aquifer. Groundwater monitoring has indicated that the nitrate in the Peedee aquifer is naturally attenuating and that the area of elevated nitrate is static and not migrating (GNF–A, 2008a).

- FCO Clean-Room Area—A release of acid process solutions occurred in the FCO clean-room area in the mid-1990s. The impacted area was within the area beneath the active FCO manufacturing building. As part of the remedy, impacted soil was excavated and disposed offsite. Groundwater quality in this area continues to be monitored for parameters including pH, fluoride, nitrate, and five metals (chromium, zirconium, tin, nickel, and copper) (GNF–A, 2008a).

- FMO/Fuels Manufacturing Operation Expansion (FMOX) Area—Process liquid containing fluoride, nitrate, and uranium was accidentally released into the subsurface through a construction joint in the FMOX building in 1991. The impacted soil beneath the building was excavated, and a groundwater-collection sump was installed to recover contaminated groundwater from the shallow aquifer. Since 1992, groundwater has been monitored to detect changes in quality by sampling wells installed around the perimeter of the FMO/FMOX building (GNF–A, 2008a).

- Aeration Basin/Process Lagoon Area—Selected inorganic and radiological constituents have occasionally been detected in shallow, localized groundwater. This area is monitored on a regular basis in accordance with the current NRC Materials License SNM–1097 (GNF–A, 2008a).

- East/Central Site Elevated Organic Solvents—Historic releases of organic solvents have led to groundwater detections in the east/central areas of the GNF–A site. Remediation and containment of areas with elevated volatile organic compounds are implemented through the withdrawal of principal aquifer groundwater in site recovery and process water wells. Pumping conditions in these wells is routinely monitored, and the system is adjusted to provide effective hydraulic containment for constituents of concern (GNF–A, 2008a).

NCDENR oversees all locations where groundwater has been impacted by contaminant releases. Programs established in coordination with governing regulatory agencies monitor and/or remediate areas where contaminant releases have impacted groundwater. NCDENR is provided status and monitoring reports as required on an ongoing basis.

3.5.3 Wetlands

As depicted on the U.S. Department of the Interior National Wetland Inventory Map, wetland areas are located in and around the GNF–A property. Some wetlands are identified as palustrine, forested, needleleaf, saturated, and partly drained. Other wetland areas are identified as palustrine, scrub-shrub, needle-leaved, evergreen/broadleaved, deciduous, saturated or temporally flooded, palustrine unconsolidated bottom, mud, permanently flooded, and impounded. Based on aerial photographs of New Hanover County, the majority of naturally occurring wetlands were drained prior to 1963 (GNF–A, 2008a).

3.6 Geology and Seismology

3.6.1 Geology and Soils

New Hanover County is located within the Coastal Plain physiographic province of the southeastern United States. Sedimentary formations of the Coastal Plain range in age from Late Cretaceous to Recent. They mainly consist of unconsolidated sand, clay, gravel, marl, and limestone, which have been deposited on a surface of Pre-Cretaceous granite, schist, and gneiss (Siple, 1957). The sedimentary strata of the Coastal Plain as a whole have a monoclinal eastward dip and thicken as a wedge eastward and coastward (LeGrand and Brown, 1955). The uppermost beds dip only a few feet per mile under the extreme eastern part of North Carolina. Along and near the coast, the combined thickness of sedimentary formations is several hundred meters to greater than 3 km [several hundred feet to greater than 10,000 ft] (Harris, et al., 1979).

At Wilmington, crystalline bedrock penetration in a well at the relatively shallow depth of 330 m [1,100 ft] reflects basement topography of the Great Carolina Ridge or Cape Fear Arch (LeGrand and Brown, 1955). The Cape Fear Arch is a broad, southeast-trending, anticlinal feature whose axis is roughly parallel to the Cape Fear River. The shallow basement at Wilmington interrupts the down dip, wedge like thickening of formations elsewhere in the Atlantic Coastal Plain. Structural aspects of the Cape Fear Arch are not well known. Harris, et al. (1979) suggested that the Cape Fear Arch represents a basement fault that has experienced episodic movement from the Early Cretaceous through the Quaternary period. Other evidence suggests that complex northeast-trending structures cross the Cape Fear Arch in the area northwest of Wilmington (LeGrand, 1955).

In New Hanover County near Wilmington, the Lower Tertiary Castle Hayne Formation lies unconformably above the Upper Cretaceous Peedee Formation. The Castle Hayne Formation

is extremely variable in composition, ranging from a cream to white marl composed of loose, broken shell fragments to a gray, dense silicified limestone (LeGrand and Brown, 1955). The Peedee, which is approximately 215 m [700 ft] thick in the Wilmington area, is composed chiefly of dark-gray to green gluaconitic sand and massive drab-black clay (LeGrand and Brown, 1955). Many beds contain calcareous material, and thin indurated shell beds are widespread.

GNF–A operations have affected soil and sediment quality. From 1995 to 2005, sediments collected from the effluent channel downstream of the final process basins and from the storm water channel draining the FMO area had average annual uranium concentrations ranging from 0.36 to 5.89 ppm [0.8 to 13.7 pCi/g] and 0.86 to 9.49 ppm [2.0 to 22 pCi/g], respectively (GNF–A, 2007b). These sediments are elevated in uranium when compared to onsite and offsite background uranium soil concentrations, which ranged from 0.07 to 1.66 ppm [0.2 to 3.8 pCi/g] over the same time period. The highest onsite uranium concentrations in soils are found in the waste box storage pad areas of the facility. From 1989 to 1995, the average annual uranium soil concentrations in this area ranged from 2.9 to 56.2 ppm [6.7 to 130 pCi/g] (GNF–A, 2007b). Corrective actions were implemented in 1995 to reduce the volume of contaminated material in the storage pad areas. Due to these actions, uranium soil concentrations have remained relatively constant since 1995. From 1995 to 1997, the average annual uranium soil concentrations in the storage pad areas ranged from 3.2 to 16.1 ppm [7.4 to 37 pCi/g] (GNF–A, 2007b). Soil sampling in this area was discontinued in 1998.

3.6.2 Seismology

Similar to most of the eastern United States, the area around Wilmington, North Carolina, is not seismically active (North Carolina Geological Survey, 2007). There are no known active fault zones or concentrations of significant historic seismicity in North Carolina. The two largest recorded earthquakes in the region occurred on January 18, 1884, and on March 5, 1958. No substantial damage was reported from either earthquake. Press reports indicate that houses shook and some people were rolled out of bed, suggesting that these two earthquakes had maximum modified Mercalli Intensity values of V (USGS, 2007a).

The nearest known seismic source is located approximately 240 km [150 mi] southwest of the GNF–A site, near Charleston, South Carolina. Charleston experienced a large earthquake in 1886, with maximum Mercalli Intensity value of X and an estimated magnitude of 7.3 (USGS, 2007a). Paleoseismic information indicates similar earthquakes shook the Charleston, South Carolina, region several times over the past several thousand years (Petersen, et al., 2008). A repeat of the Charleston earthquake is considered the most significant source to the seismic hazards for the southeast coast of the United States, including Wilmington, North Carolina (Peterson, et. al., 2008). Estimates of repeat times for a Charleston Earthquake range between 250 and 1,000 years (North Carolina Geologic Survey, 2007; Talwani and Schaeffer, 2001). Based on the 2008 national seismic hazard map (USGS, 2007b), the GNF–A site has a 2 percent probability of exceeding a peak-ground acceleration of 0.10g–0.12g (the acceleration due to gravity) in a 50-year period.

3.7 Ecology

3.7.1 Terrestrial

According to the U.S. Forest Service, the New Hanover County area is located in the Atlantic Coastal Flatlands ecoregion with the dominant vegetation communities composed mainly of southern mixed forest and oak-hickory-pine forest. Other communities found in this region

include southern floodplain forests and pocosin (*Pinus-Ilex*). The Northeast Cape Fear River floodplain contains some "very high quality" natural communities (NCDWQ, 2006). The dominant vegetation in the region is needle-leaved evergreen forest with smaller areas of evergreen broad-leaved forest. In northern portions of the region, the dominant species cover is mainly longleaf pine (*Pinus palustris*) and slash pine (*Pinus caribaea, P. elliottii)*. Pond pine (*Pinus serotina*), a fire-maintained species, is prevalent in coastal North Carolina, where poorly drained organic soils are present and wildfire is common. In floodplain and riparian areas, the dominant vegetation type consists of the oak-gum-cypress forest composed of water oak (*Quercus nigra*), laurel oak (*Quercus hemisphaerica*), swamp tupelo (*Nyssa biflora)*, sweetbay (*Laurus nobilis)*, bald cypress (*Taxodium distichum)*, and pond cypress (*Taxodium ascendens*). In areas that are mostly hardwood, the dominant species consists of laurel oak (*Quercus hemisphaerica*), water oak (*Quercus nigra*), sweetbay (*Laurus nobilis)*, sweetgum (*Liquidambar*), live oak (*Quercus virginiana)*, red maple (*Acer rubrum)*, and spruce pine (*Pinus glabra)* (U.S. Forest Service, 1994).

Animal species found in the region may consist of white-tailed deer *(Odocoileus virginianus*), black bear (*Ursus americanus*), bobcat (*Felis rufus)*, gray fox (*Urocyon cinereoargentus)*, raccoon (*Procyon lotor)*, cottontail rabbit (*Sylvilagus floridanus)*, gray squirrel (*Sciurus carolinensis)*, fox squirrel (*Sciurus niger*), striped skunk (*Mephitis mephitisa)*, swamp rabbit (*Sylvilagus aquaticus*), and various small rodents and shrews. Game birds such as turkey (*Meleagris gallopavo)*, bobwhite (*Colinus virginianus*), and mourning dove (*Zenaida macroura*) are present. Nongame birds and species of migratory waterfowl are also in abundance. In flooded areas, ibis (*Eudocimus albus, Plegadis* spp.), cormorants (*Phalacrocorax auritus, P. carbo*), herons (*Ardea herodius, Egretta* spp., *Butorides* spp., *Nyctanassa* spp.*)*, egrets (*Ardea alba, Bubulcus ibis, Egretta* spp.), wood storks (*Mycteria americana),* and belted kingfishers (*Megaceryle alcyon)* are common. Songbirds such as the red-eyed vireo (*Vireo olivaceus)*, cardinal (*Cardinalis cardinalis, Pheucticus* spp., *Passerina* spp., *Spiza americana)*, tufted titmouse (*Baeolophus bicolor)*, ruby-throated hummingbird (*Archilochus colubris)*, eastern towhee (*Pipilo erythrophthalmus)*, wood thrush (*Hylocichla mustelina)*, summer tanager (*Piranga rubra)*, blue-gray gnatcatcher (*Polioptila caerulea)*, hooded warbler (*Wilsonia citrina)*, and Carolina wren (*Thryothorus ludovicianus*) may also inhabit this region. Reptiles include the box turtle (*Terrapene carolina carolina*), common garter snake (*Thamnophis sirtalis*), eastern diamondback rattlesnake (*Crotalus adamanteus*), timber rattlesnake (*Crotalus horridus*), and American alligator (*Alligator mississippiensis*) (U.S. Forest Service, 1994).

3.7.2 Aquatic

The Northeast Cape Fear River and its associated tributaries and creeks serve as the aquatic community around the GNF–A site. A mixture of freshwater and saltwater fish are found in the Northeast Cape Fear River, including channel catfish (*Ictalurus punctatus*), hybrid bass (*Morone saxatilis*x *chrysops*), largemouth bass (*Micropterus salmoides*), American shad (*Alosa sapidissima*), Atlantic croaker (*Micropogonias undulatus*), Atlantic stingray (*Dasyatis sabina*), Atlantic sturgeon (*Acipenser oxyrhynchus*), and spotted seatrout (*Cynoscion nebulosus*). The species of fish that occupy the river and its tributaries will vary seasonally and will shift with the salinity of the water. The fish community of the river will be composed of more estuarine species during drought conditions, when river salinities may be elevated (GNF–A, 2008a). The Northeast Cape Fear River and its tributaries serve as important nursery areas for marine species. At least 19 species of marine finfish and 3 species of invertebrates that have commercial value use the lower Northeast Cape Fear River and its tributaries as nursery areas (General Electric Nuclear Energy, 1989). The Atlantic and Shortnose sturgeon (*Acipenser*

oxyrhynchus, A. brevirostrum) use the Northeast Cape Fear River for a nursery, but do not ascend into the smaller tributaries (GNF–A, 2008a).

3.7.3 Threatened and Endangered Species

Nine federal-listed species can potentially be found in New Hanover County (U.S. Fish and Wildlife Service, 2009). These nine species also received the same status at the state level. In addition, North Carolina listed another nine species as threatened and six species as endangered at the state level (The North Carolina Natural Heritage Program, 2009). Summary information for the federal- and state-listed species is located in the Appendix.

3.8 Noise

The description of noise in the affected environment will be limited to the area in and around the GNF–A property. Noise levels, especially unwanted sound, can degrade the quality of life. Discomfort or annoyance results from noise that is repetitive, is long in duration, and/or approaches high levels. There are two factors that determine the impact of noise: intensity (loudness), measured in decibels, and time exposure, measured in hours and minutes. In 2002, baseline sound levels were tested at 22 locations throughout the site and ranged from 38.0 to 64.5 decibels (GNF–A, 2007b). Example sounds for this decibel level range would be from a quiet library or room to an operating dishwasher or vacuum cleaner (American Speech-Language-Hearing Association, 1997). A likely contributor to outdoor noise at this type of facility would be the heating, ventilation, and air conditioning equipment. Overall, there has been a general site-wide decrease in sound levels with time. Only one location, just south of the property boundary near the FCO, exhibited an increase in noise level between 1995 and 2005, not including the contribution of sound from a one-time highway-construction project using heavy equipment within the sampling area. Since 1989, sound levels have consistently increased only near the highway. Most decreases brought sound levels near or below the sound levels from 1989. In most cases, there has been substantial sound reduction since 1995, including one location in the western portion of the GNF–A site that decreased by 18.7 decibels. This is consistent with the rural nature of the site surroundings and the fact that the manufacturing-generated noises are well contained within the manufacturing buildings. All samples over the past three site tests have been below Occupational Safety and Health Administration Standard 1910.95, which requires a hearing conservation program at sound levels above 85 decibels.

3.9 Historical and Cultural Resources

New Hanover County has a diverse prehistoric and historical background. Archeological evidence indicates that the Catawba and other groups lived in the Carolinas for many years before European contact, beginning with Hernando De Soto's expedition in 1540 (First Nations, 2006). Over 700 prehistoric and historic archeological sites have been recorded in New Hanover County including the Rose Hill Shipwreck, the H.G. Wright Shipwreck, the Cape Fear Civil War Shipwreck District, and the Wilmington Historic and Archaeological District (North Carolina State Historic Preservation Office, 1999).

Archeological site maps at the North Carolina Office of State Archeology and documentation from GNF–A (2008a,b) indicate that six previously recorded terrestrial archeological sites are located on the GNF–A Site and a submerged archeological site is located adjacent to the site property in the Northeast Cape Fear River. A search of the National Register of Historic Places database (2008) confirmed 19 prehistoric and historic listings in New Hanover County (National

Register of Historic Places, 2008). The submerged site consists of a 1700–1730 shipwreck, known as the "Rose Hill" wreck, which at the time of documentation was the earliest recorded shipwreck in North Carolina (Wilde-Ramsing, 1987, 1988). The shipwreck has been recommended for inclusion in the National Register of Historic Places.

The property is the location of the colonial "Rose Hill Plantation." The Rose Hill Plantation was founded by Richard Quince, a prominent businessman in the Lower Cape Fear Area, in the mid-1780s. Many of the archeological findings to date are associated with the plantation activities, such as rice fields and a graveyard. The Rose Hill Cemetery was a community graveyard and served several surrounding plantation sites. The graveyard has been surveyed and marked and is under further investigation at this time with the recent discovery of additional gravesites. The location of the rice fields adjacent to the river is evidenced by topographical maps and aerial photography of the site.

Numerous records exist documenting colonial activity in this area that extends back to the 1660s. Several “tar pits” were recently discovered during a 2007 archeological survey coordinated by RTI International (Research Triangle Park, North Carolina), confirming historical records of extensive logging of the site for naval stores and tar.

3.10 Scenic/Visual Resources

An analysis of the scenic/visual resources of GNF–A was not conducted prior to construction of the existing facilities and has not been conducted since construction. The visual features at the GNF–A site consist of a variety of man-made features and natural landscapes that include industrial development, wooded uplands, streams, wetlands, and the Northeast Cape Fear River. Flat topography is the foremost feature affecting the visual characteristics of the GNF–A site. Elevations range from near sea level around the Northeast Cape Fear River to about 12 m [40 ft] in the eastern portion of the site. Therefore, any relatively elevated feature on the landscape, whether natural or man-made, becomes a highly visible object. GNF–A facilities are prominent visual features in the area due to the numbers and massive sizes of the building.

3.11 Public and Occupational Health and Safety

GNF–A manufactures fuel assemblies and intermediate fuel components for the nuclear power industry. Its operations may also be classified as a chemical production plant with similarly noted hazards. While minor compared to chemical hazards, low levels of radioactive materials (primarily uranium) could possibly be released. For accident conditions, the hazard may involve releasing higher concentrations of materials over relatively short periods of time. The following section briefly describes the radiation levels in the affected area and the corresponding occupational health factors. There is also information on occupational injury rates.

For a U.S. resident, the average annual estimated total effective dose equivalent (TEDE) from natural background radiation sources is 3 mSv [300 mrem], but it varies by location and elevation (Shleien, et al., 1998). The source of this dose includes cosmic radiation, radionuclides generated by interactions between the atmosphere and cosmic radiations (cosmogenic), radiation sources in the earth (terrestrial), radionuclides in the air (inhaled), and radionuclides that exist in the body. This average annual TEDE does not include the additional dose the average American receives from man-made sources such as medical diagnostic tests and consumer products. Because of its low elevation, relatively low radon levels, and relatively low concentration of radionuclides in the earth, the natural background radiation level near

GNF–A in North Carolina is lower than the average at 1.2 mSv/yr [120 mrem/yr] (Kathren, 1984).

Direct irradiation levels taken by measuring gamma radiation exposure at the GNF–A site boundary are at background readings (GNF–A, 2007b). Calculated potential annual radiological doses to the public from GNF–A gaseous effluents from 1995–2005 ranged from 3.0×10^{-4} to 4.0×10^{-3} mSv [0.03 to 0.4 mrem] (GNF–A, 2007b). The NRC annual dose limit for the public is 1 mSV [100 mrem].

Doses from liquid effluent were calculated from actual radioactivity values from sampling data and actual liquid effluent flow from the Final Process Lagoon Effluent for 2003–2005. These calculations are provided in Table 6. The maximum projected potential TEDE was calculated assuming that an individual continuously ingested the liquid effluent concentration over the course of the entire year. For comparison purposes, the uranium liquid effluent limit in 10 CFR Part 20 Appendix B is 0.011 Bq/mL [3×10^{-7} μCi/mL] for uranium-234.

The collective dose represents the summed dose to all workers during a given year and can be used to estimate the expected number of excess cancers in the exposed population. The collective dose includes both the committed effective dose equivalent for internal exposures and the deep dose equivalent for external exposures resulting from fuel manufacturing. The TEDE is the sum of the committed effective dose equivalent and the deep dose equivalent. All doses

Table 6. Historical Measured Liquid Effluent Concentration and Calculated Total Effective Dose Equivalent (TEDE)

Year	Liquid Effluent Concentration	Maximum Projected TEDE
2007	0.0026 Bq/mL [7.11×10^{-8} μCi/mL]	0.12 mSv/y [12 mrem/yr]
2006	0.0032 Bq/mL [8.58×10^{-8} μCi/mL]	0.14 mSv/yr [14 mrem/yr]
2005	0.0046 Bq/mL [1.25×10^{-7} μCi/mL]	0.21 mSv/yr [21 mrem/yr]
2004	0.0034 Bq/mL [9.29×10^{-8} μCi/mL]	0.15 mSv/yr [15 mrem/yr]
2003	0.0020 Bq/mL [5.44×10^{-8} μCi/mL]	0.09 mSv/yr [9 mrem/yr]

were determined using the dosimetry methodology and techniques described in International Commission on Radiological Protection Publication 60 (1991). The collective dose and the average and maximum TEDE for the 5-year period between 2003 and 2007 are provided in Table 7.

Risks to occupational health and safety include exposure to industrial hazards, hazardous materials, and radioactive materials. Industrial hazards for the GNF–A facility are typical for similar industrial facilities and include exposure to chemicals and accidents ranging from minor cuts to industrial machinery accidents. The incident rate accounts for both the number of Occupational Safety and Health Administration recordable injuries and illnesses and the total number of man-hours worked. The incident rate is used for measuring and comparing work injuries, illnesses, and accidents within and between industries. Another measure of work-related injuries and illnesses is the “days away, restricted, or job transfer (DART)” rate. This rate tracks the number of days an injured worker is either away from work, restricted from normal work duties, or transferred because of the injury. Table 8 summarizes the GNF–A incident rate and the DART rate for the years 2005 through 2007 and provides a comparison to national data for similar industries. There are no known health effect studies specific to the Wilmington facility.

Table 7. Historical Occupational Dose Data					
Year	Collective Committed Effective Dose Equivalent (person-Sv)*	Collective Deep Dose Equivalent (person-Sv)*	Collective TEDE† (person-Sv)*	Average TEDE	Maximum TEDE
2003	0.45	0.10	0.55	0.69 mSv [69 mrem]	5.1 mSv [510 mrem]
2004	0.58	0.11	0.7	0.75 mSv [75 mrem]	4.7 mSv [470 mrem]
2005	0.48	0.12	0.6	0.64 mSv [64 mrem]	5.6 mSv [560 mrem]
2006	0.5	0.1	0.6	0.62 mSv [62 mrem]	4.8 mSv [480 mrem]
2007	0.42	0.07	0.48	0.5 mSv [50 mrem]	5.3 mSv [530 mrem]
*To convert to person-rem, multiply by 100. †TEDE = total effective dose equivalent.					

Table 8. Historical Incident Rate Data					
Year	GNF–A* Incident Rate	National Incident Rate	GNF–A Fatalities	GNF–A DART† Rate	National DART Rate
2005	0.5	2.5	0	0.17	1.4
2006	1.3	2.9	0	0.75	1.5
2007	1.1	Not Available	0	0.42	Not Available
*GNF–A = Global Nuclear Fuel–Americas †DART = days away, restricted, or job transfer					

4.0 ENVIRONMENTAL IMPACTS

Pursuant to 10 CFR Part 51, the NRC staff reviewed the applicant's environmental report; collected information from local, regional, state, and federal government agencies; and evaluated the environmental impacts for the various resources on the affected environment. The staff applied the guidelines outlined in NUREG–1748 in their evaluation. In accordance with this guidance, the staff evaluated the direct, indirect, cumulative, short-term, and long-term effects that each resource may encounter from the Proposed Action. The staff qualified the effects in terms of SMALL, MODERATE, or LARGE.

NRC applies the same qualitative measurements in its environmental impact assessments for nuclear power plants using the following definitions:

- SMALL—Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

- MODERATE—Environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource.

- LARGE—Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

4.1 Land Use

Under the terms of the license renewal, GNF–A will continue its current fuel fabrication processes at the GNF–A site. For the short and long term, the Proposed Action will not change land use at GNF–A. The facility already exists, and no substantial changes such as modifications in land use are associated with the license renewal. Therefore, the NRC considers that direct and short- and long-term environmental impacts on land use resulting from continued operations will be SMALL.

The GNF–A site is zoned for heavy industrial use. The area southwest of GNF–A between the Northeast Cape Fear River and the main branch of the Cape Fear River is also zoned for heavy industrial use. Industrial operations in this area include BASF Corporation, Elements Chromium, and the L. V. Sutton coal-fired power plant. Continued use of the GNF–A site and lands to the southwest of the site for industrial land use may have an effect on other environmental resources. A second Advanced Technology Center has recently been constructed along with a storm water retention pond and a new parking lot that disturbed a total of approximately 12 ha [30 acres] of land. A planned Tooling Development Center will consist of five buildings and also disturb approximately 12 ha [30 acres]. The proposed GLE Facility would be located within the Wilmington Site and disturb approximately 45 ha [113 acres] of land zoned by New Hanover County for heavy industrial land use.

Based on current New Hanover County zoning criteria and land use surrounding the GNF–A site, it is likely that land use at the GNF–A site will remain industrial in the future, regardless of the site's tenant. The NRC staff considers the cumulative environmental impacts of the Proposed Action and planned future construction activities on continued land use described above to be SMALL.

The No-Action Alternative could impact land use. If GNF–A chooses to stop its operation and vacate the property, NRC would require environmental remediation of the site. In the short-term, land use would support decommissioning activities by providing locations for equipment, waste, and decontamination. The NRC staff considers this to be a SMALL impact. After completion of decommissioning, the lands may become available for use by a new industrial tenant depending on the level of decontamination achieved. Future environmental impacts of land use would depend on the activities and operations of the new tenant and the level of decontamination achieved.

4.2 Transportation

The recent completion of I-140 between U.S. Highway 421 in New Hanover County and U.S. Highway 17 in Brunswick County has improved access to the GNF–A site. As described in Section 3.2, the segment of I-140 between I-40 and Castle Hayne Road is now the most common route for vehicular traffic to and from the GNF–A site. ADT count data indicate that the opening of this segment of I-140 has reduced traffic volume on alternate routes to the GNF–A site (e.g., Holly Shelter Road between I-40 and Castle Hayne Road). The Proposed Action would not add substantial GNF–A traffic to the local roadways. Residential growth may result in small increases in traffic volumes. Also, accidents may impact the flow of traffic as vehicles divert onto alternate roads. If a commute route, such as I-140, closes due to an accident, alternate roads connecting I-40 to Castle Hayne Road, such as Holly Shelter Road and North

College Road, have adequate capacity to accommodate traffic to and from GNF–A. Environmental impacts can also be caused by transporting products into and away from the GNF–A site. Although the number of future radioactive shipments is expected to rise nationwide, the number of shipments to and from GNF–A is not expected to increase significantly. The number of hazardous material shipments involving GNF–A would continue to be very small in comparison to the total number of hazardous material shipments nationwide. Contractors transport GNF–A materials in approved shipping containers and tanks. DOT and NRC previously considered the environmental and radiation safety effects of performing these operations. Therefore, the NRC staff considers the short-term direct impacts of Proposed Action on transportation to be SMALL.

A developer is proposing a new 95-ha [237-acre] continuing care retirement community (River Bluffs subdivision) that would be built on the undeveloped land parcel bounded by the GNF–A site southern property line, I-140, and the Northeast Cape Fear River (GNF–A, 2008a). Municipalities located within the WMPO planning area maintain zoning and subdivision ordinances that require developers, when the development meets an identified threshold, to submit a transportation impact analysis. The transportation impact analysis evaluates the potential development and mitigation measures necessary to facilitate the safe and efficient movement of people and goods. WMPO identified planned highway improvements that will provide for additional capacity and mobility near the GNF–A site include the widening of Castle Hayne Road from 2 to 4 lanes from Martin Luther King Jr. Parkway to I-140 (WMPO, 2005). The laser enrichment facility will result in an estimated 900 additional ADTs during the site preparation and construction phase. Construction materials would be shipped to the site by trucks. This would significantly add to the traffic volumes on the road and increase the potential for traffic congestion during peak commuting hours. The proximity of the laser enrichment facility to the NC 133/I-140 interchange and direct connection of I-140 to I-40 would allow truck shipments and workers commuting to and from the laser enrichment facility construction site to bypass traveling on surface roadways in the surrounding communities. Based on projected population and employment growth estimates and anticipated development of residential communities and commercial lands, the NRC staff considers the long-term direct impacts of the Proposed Action on transportation to be SMALL to MODERATE.

Cumulative impacts from transportation may result from the increased demand on local roads due to residential growth and further development of the industrial sector. Most of the industrial development near the GNF–A site is on the northeast side of the Northeast Cape Fear River. No new industrial developments are known to be planned in the immediate vicinity of GNF–A on the east side of the river. In case of a road closure, several alternative routes exist to commute to and from the GNF–A site. From the north, the site can be accessed from I-40 by exiting on Holly Shelter Road or North College Road and traveling south on Castle Hayne Road. From the south, the site can be accessed from I-140 or by traveling north on Castle Hayne Road from the downtown district of Wilmington. The WMPO has developed a long-range transportation plan that is intended to meet the future travel demand of people and goods within the Wilmington urban area. The plan was developed in consultation with local and regional planning initiatives to be responsive to growth and economic changes as well as the area's evolving priorities. Priorities include highway projects such as the I-140/Route 17 Bypass, Cape Fear Skyway, NC 133 widening, and Village Road widening. Operations from the laser enrichment facility would increase radioactive material truck shipments to and from the GNF–A site that currently occur due to GNF–A operations. Following NRC and DOT requirements for packaging and transport, trucks would be used to ship uranium hexafluoride (UF_6) feed to the site, UF_6 products to customers, and the UF_6 tails and LLRW to licensed treatment or disposal facilities. Interstate highway routes would be followed for these shipments. Completion of these projects

should improve transportation flow and reduce noise level impacts. NRC finds that the WMPO planning efforts will keep the cumulative impacts on transportation SMALL.

The No-Action Alternative could have a MODERATE short-term impact on transportation. Decommissioning activities could result in increased vehicle movements due to demolition activities and shipment of materials offsite. The long-term environmental impact of transportation would depend on the future use of the site, which in turn depends on the level of site decontamination.

4.3 Socioeconomics

The NRC staff considered each of the following socioeconomic factors for the locale: economy; employment levels; population growth; housing units/vacancy rates; available educational services; health care; and the local tax base. No change in socioeconomic impacts is anticipated from the Proposed Action in the short term. Because no major changes are associated with the license renewal and the workforce is already in the community, the NRC staff believes that GNF–A's continued operations produce a SMALL short-term socioeconomic impact.

In the long term, socioeconomic impacts would be based on GNF–A employment levels and overall population changes and their impacts on various resources. The three-county population is growing at a relatively fast rate. Based on the census population estimates presented in Table 3 for the 6-year period from 2000 to 2006, the estimated population growth rate for the three-county study area is at 18.8 percent, which is almost double the 10 percent rate for the state over the same period. For the 30-year period between 2000 and 2030, the population growth rate for the three-county study area is expected to be 87 percent, which is approaching twice the 52.5 percent rate for the state over the same period. Based on the data presented in Table 4, the population density for New Hanover County is almost 10 times greater than either Pender or Brunswick Counties. This strongly illustrates the urban nature of Wilmington and New Hanover County relative to the comparably rural Pender and Brunswick Counties. The higher population growth rates for the three-county area will result in increased urbanization and higher population densities. Housing needs will continue to increase at rates greater than the state average and increase the tax base.

The 2004 household median incomes and percentages below the poverty level were approximately comparable to state data. The 2006 unemployment rate in the three-county area was lower (better) than the statewide rate. These low unemployment rates in the three-county area, along with the presence of strong and continuing employers, demonstrate that the economic conditions near GNF–A are economically robust. Growth is expected within the three counties over the next 25 years and is important in assessing the cumulative impacts over the 40-year license renewal period. The Wilmington area continues to be a desirable location for health care providers to serve the surrounding rural areas. The NRC staff believes that GNF–A's continued operations would have SMALL long-term and direct socioeconomic impacts.

Indirect effects from the Proposed Action may include increased traffic, greater demands on public transportation and health care, more road congestion, greater noise, and potentially overcrowded schools as the population increases. Based on the region's projected growth, the NRC staff considers the potential indirect impacts to be SMALL.

Also, the staff considered cumulative socioeconomic effects in the affected region. Evaluating the documented and projected changes in the population growth of the greater Wilmington area in Tables 3 and 4 shows extensive population growth is expected within the three-county study area over the next 25 years. This growth will be accompanied by new residential, small, and commercial developments, along with the necessary infrastructure. The characteristics of the unemployment rate and median income of the area show that the area has a well-established economy that can sustain economic adversity. Education, an important socioeconomic factor, is vastly available in the greater Wilmington area on all levels. Approximately 350 permanent workers would be needed to operate the laser enrichment facility following start-up (GNF–A, 2008b) and 900 workers will be required during construction. Based on the estimated number of new workers required for start-up and operation, the NRC staff considers the cumulative environmental impacts of the Proposed Action on socioeconomics to be SMALL.

The No-Action Alternative could potentially have socioeconomic impacts. The expiration of the license would lead to the closure of the fuel fabrication portion and the related or supporting facilities portion of GNF–A and the elimination of many jobs. Approximately 650 nuclear workers could be affected if FMOs were to cease (GNF–A, 2008a). The extent of the impact would vary based on the number of people who find new jobs locally and the nature of those jobs. The tax base would also be reduced. In the short term, decommissioning activities would likely provide some reduced level of employment for a period of time. However, this work force would no longer be needed when decommissioning was completed. The NRC staff considers these impacts to be SMALL to MODERATE. Long-term impacts depend on the future use of the site and the level of site decommissioning.

4.4 Air Quality

Potential impacts on air quality for the affected environment at GNF–A can result from the release of airborne effluents. The effluents may contain radiological or non-radiological chemical constituents. From 1995 to 2005, average gross alpha concentrations emitted from GNF–A process stacks have varied from 1×10^{-10} to 2×10^{-9} Bq/cm^3 [4×10^{-15} to 6×10^{-14} µCi/cm^3] (GNF–A, 2007b). The staff finds the GNF–A radioactive emission concentrations to be low and considers the direct dose impact to the public to be well below the limit listed in 10 CFR 20.1101 (d). The Proposed Action does not include any change to the facility or process that would increase the emission concentrations.

Potential impacts from non-radiological airborne effluents are minimized by compliance with permit limits that the NCDENR Division of Air Quality regulates. In 2003, GNF–A reported facility-wide emissions of 0.16 metric ton/yr [0.18 ton/yr] SO_2, 6.3 metric ton/yr [7 ton/yr] NO_x, 0.15 metric ton/yr [0.16 ton/yr] HF, and 0.36 metric ton/yr [0.43 ton/yr] PM10 (GNF–A, 2008a). These emission rates are significantly below established permit limits of 90.7 metric ton/yr [100 ton/yr] SO_2, 90.7 metric ton/yr [100 ton/yr] NO_x, 9.07 metric ton/yr [10 ton/yr] HF, and 90.7 metric ton/yr [100 ton/yr] PM10. In addition, the Proposed Action does not include any change to the facility or process that would increase the emission rate of these constituents. With respect to NAAQS criteria pollutants, the NRC staff considers that continued operations at GNF–A will not result in a significant direct impact to air quality.

Based on the above findings, NRC considers the short-term, direct, and indirect environmental impact on air quality from continued operations at GNF–A to be SMALL. Furthermore, if the concentrations of radiological constituents and the amounts of non-radiological constituents continue to remain low as operational history has shown, the NRC staff finds the long-term environmental impact on air quality to be SMALL.

Indirect and cumulative environmental impacts may result from the emissions (i.e., process stack, vehicular) released by other industrial companies located in the affected area. The L.V. Sutton coal-fired power plant is located between the Northeast Cape Fear River and the main branch of the Cape Fear River southwest of the GNF–A site. From 1995 to 2006, the L.V. Sutton plant released approximately 8,200 metric ton/yr [9,000 ton/yr] NO_x and approximately 18,000 metric ton/yr [20,000 ton/yr] SO_2 into the atmosphere. Because winds in the Wilmington area are predominantly from the southwest for much of the year, these emissions could affect air quality in the affected area. Air modeling predicts that the air emissions to the atmosphere from the combined operation of GNF–A, and the laser enrichment facility will not substantially change the ambient air quality (GNF–A, 2008b). Based on this assessment, the NRC staff considers the indirect and cumulative environmental impact on air quality to be MODERATE.

The No-Action Alternative may degrade the air quality over the short term and cause direct impacts to the affected area based on high levels of demolition dust and exhaust from vehicles during decommissioning activities. The NRC staff considers the impacts to be SMALL. The long-term and cumulative impacts will depend upon the next occupant of the property.

4.5 Water Quality

Potential short-term surface water impacts associated with continued GNF–A operations include changes in water quality in the Northeast Cape Fear River and its tributaries due to contaminated effluent discharges. Liquid effluents from the process and sanitary waste systems are treated and discharged into the Northeast Cape Fear River in accordance with NPDES Permit NC0001228 and 10 CFR Part 20 requirements. Potential impact is minimized by compliance with the discharge limits outlined in the NPDES permit. From 1995 to 2005, the NPDES permit limits for the process wastewater were exceeded one time. The combination of elevated ammonia and pH levels resulted in the failure of an effluent toxicity test on fathead minnows during the second quarter of 2004. Process control improvements were initiated and subsequent tests have all passed. From 1995 to 2005, the NPDES permit limits for the sanitary wastewater were exceeded three times: biochemical oxygen demand in 1995, total suspended solids in 1996 and pH in 2003. In all three cases, corrective actions were implemented and results from subsequent analyses were within permit limits. Another direct impact to the quality of surface water can result from storm water runoff. Storm water discharges at the GNF–A site are regulated in accordance with NPDES Permit NCS000022. The conditions of the permit require analytical samples to be taken semiannually as part of a storm water monitoring program to determine compliance with permit limits for lead, pH, oil and grease, and total suspended solids. Based on the monitoring requirements of NPDES permits, NRC considers the short-term and direct impacts on surface water quality resulting from continued GNF–A operations to be SMALL.

In the long term, the planned expansion of GNF–A facilities such as the Tooling Development Center will increase the volume of process and sanitary wastewater treated and discharged to the Northeast Cape Fear River. The wastewater management practices that would be used

during operation of the laser enrichment facility would not cause water quality standards or limits to be exceeded. Treated process water will be pumped to the GNF–A lagoons prior to release to the environment under the existing GNF–A NPDES effluent permit. Surface water runoff from the laser enrichment facility would be routed to storm water detention ponds before being discharged to receiving waters, which would regulate storm water quality and quantity as required by the NPDES storm water permit. Based on information provided by GNF–A, the current process and sanitary treatment systems have adequate capacity to accommodate the volume increase (GNF–A, 2008a). NRC considers the long-term, indirect and cumulative impacts on surface water quality from the planned expansion of the GNF–A facilities to be SMALL.

Potential short-term and direct groundwater impacts associated with continued GNF–A operations include changes in water quality due to contaminant releases caused by material leaks or spills. In the past, spills and leaks have resulted in groundwater contamination at several locations on the GNF–A site (see Section 3.5.2). GNF–A has implemented NCDENR-approved monitoring and control remedies to minimize the current impact and eliminate the future concern of past groundwater contamination. The potential for future leaks and spills is minimized by implementation of a chemical safety program and training procedures, which to date have effectively prevented their occurrence. In addition, GNF–A has an extensive environmental monitoring program that includes routine sampling of groundwater at 88 wells across the GNF–A site to monitor water quality. The existing groundwater supply well system used at the GNF–A site would provide water for laser enrichment facility operations. Groundwater modeling predicts that the additional pumping would lower groundwater levels to a small extent, but the groundwater flow patterns would remain largely unchanged (GNF–A, 2008b). Waste management practices will prevent contamination of groundwater from the laser enrichment facility operations (GNF–A, 2008b). Based on past contamination at the site and the measures that are in place to remediate and monitor groundwater quality, the NRC staff considers the short-term environmental impacts on groundwater quality from continued operations to be SMALL to MODERATE.

No significant impacts to the water quality of wetlands are anticipated from continued operations at the GNF–A site. The GNF–A facilities already exist, and no substantial changes to the property such as filling or clearing of onsite wetland areas are associated with the license renewal. Water quality in wetlands in and around the GNF–A site may potentially be affected by discharges of liquid effluents (e.g., storm water runoff) and gaseous emissions. As discussed above for surface waters, operating within permit limits and routine environmental monitoring of soil and surface water are intended to minimize potential impacts on water quality. The NRC staff considers the short-term, long-term, direct, indirect, and cumulative environmental impacts on wetlands from continued operations at GNF–A to be SMALL.

The No-Action Alternative could affect surface water and groundwater quality. In the short term, decommissioning activities could result in increased levels of liquid effluent, increased effluent discharges from runoff, and increased potential for spills. The NRC staff considers these impacts to be MODERATE. In the long term, the impact would depend on the decontamination level achieved (i.e., whether the site was released for restricted or unrestricted use).

4.6 Geology and Soils

Environmental impacts considered for this resource include, but are not limited to, land stability (the occurrence of earthquakes) and disruption of natural drainage. Within the GNF–A site, the land is considered stable and has been for some time. The nearest seismic source to the GNF–A site is the Charleston, South Carolina, seismic zone, located approximately 240 km [150 mi] southwest of the site. Although occurrences of small magnitude earthquakes (2.1 to 4.0 on the Richter scale) have been recorded in the Wilmington area, seismic hazard analysis indicates that the likelihood of significant vibratory ground shaking from a large earthquake is very small.

The immediate area surrounding GNF–A is relatively flat with features typical of the region. Natural drainage occurs on the site along three unnamed streams. Treated effluent from GNF–A operations is discharged into one of these streams. Sediments along the effluent stream are sampled regularly as part of the GNF–A environmental monitoring program. Developed areas of the GNF–A site are located on the eastern portion of the property above the 100- and 500-year floodplain and about 11 m [35 ft] above mean high tide. No developed areas of the site have experienced flooding during the operation history of the GNF–A site (GNF–A, 2008a). Based on the above analysis, the NRC staff believes there is little direct or indirect environmental impact on the geology and soils as a result of GNF–A's continued operations and, therefore, considers the direct impact SMALL.

Indirect, short-term, and long-term impacts on soils may result from spills, leaks, and inadvertent discharges that flow uncontained into the ground. The impacts are related to the extent of the release, sediment transport, and groundwater movement. GNF–A minimizes the possibility and impact of accidental releases by confining hazardous materials in closed systems within the buildings, performing frequent inspections, providing appropriate material handling training, and administering its environmental monitoring program. These programs have eliminated the occurrence of spills since their inception. With continued proper attention and care, spills and leaks should be minimal. The GNF–A environmental monitoring program, which samples soils, groundwater, and surface water at points of release, does not indicate recent soil contamination within or in the immediate surrounding environs of the site. Therefore, the NRC staff considers the resultant releases to the soil from continued operations would produce SMALL direct, indirect, short-term, and long-term environmental impacts.

Cumulative impacts can result from accidental releases of chemicals into the soils. This may produce toxic sediment contamination and degradation of the groundwater. As discussed in Section 3.6.1, GNF–A has experienced onsite soil contamination in the past. Radiological areas requiring future remediation are identified and documented in GNF–A internal records as required by 10 CFR 70.25 (GNF–A, 2008a). These areas have radiological soil contamination levels that currently do not represent a measurable dose to workers or the public and are routinely monitored. Section 3.5.2 discussed industrial operations over the past 40 years at the GNF–A site that have impacted groundwater in several specific locations. These areas have been documented and are being monitored and/or undergoing remediation by programs established in coordination with governing regulatory agencies. NCDENR oversees groundwater contamination issues and is provided status and monitoring reports as required on an ongoing basis. In accordance with NRC license conditions and NCDENR requirements,

GNF–A continues to routinely monitor groundwater quality. Operation of the laser enrichment facility would not involve additional soil disturbances beyond that required for site preparation and construction (GNF–A, 2008b) and additional areas susceptible to soil erosion and dust generation would not be created. Therefore, the NRC staff considers the impact of the laser enrichment facility on geology to be SMALL. Based on past soil and groundwater contamination, the NRC staff projects the cumulative impacts on geology and soils at the GNF–A site to be SMALL to MODERATE.

The No-Action Alternative may produce impacts because decommissioning activities may affect surficial geology from erosion. The main geological impacts experienced during decommissioning would result from the cleanup of contaminated soils and sediments. The NRC staff considers these impacts to be SMALL to MODERATE. The long-term geological impact would depend on the land use after license termination and the level of decontamination achieved.

4.7 Ecology

Potential impacts on the terrestrial and aquatic ecology, including threatened and endangered species, would be associated with changes in either the amount or quality of habitat. Aquatic quality could also be affected by liquid or gaseous emissions or material spills. GNF–A minimizes the possibility of these impacts by operating within permit conditions and implementing material handling procedures. GNF–A processes its wastewater discharge through an onsite sewage treatment facility and performs testing and monitoring to assure releases are within regulatory limits. Also, GNF–A limits the spread of spills and leaks through a series of physical and administrative protocols (i.e., spill containment basins, double containment tanks, training, and inspections) that have proven to be effective since their implementation (GNF–A, 2008b). With this considered, there is a low probability that liquid effluents from GNF–A would impact any aquatic ecology. The NRC staff considers the direct impacts on aquatic ecology to be SMALL.

The NRC staff considered other short-term, long-term, and indirect effects that might occur within the Proposed Action's timeframe. The most reasonable and foreseeable effects involve future land development for residential, commercial, or recreational purposes within the affected region beyond the GNF–A site. Continued operations would not result in any additional terrestrial impacts. The facility is currently in operation on a developed site with its lands previously disturbed. While plans do not exist for expansion, future expansions would require an additional environmental assessment. Adverse impacts to aquatic life in the river are minimized by many factors, such as distance from the facility to the river. Construction of the laser enrichment facility will displace some local wildlife populations to a nearby habitat in the western portion of the GNF–A site. The NRC staff also considered cumulative ecological effects in the affected region. Staff focused on the ecological effects associated with continued land use. GNF–A is located in an area zoned as heavy industrial, while the land north of the site is zoned rural agricultural. Further development may result in potential habitat fragmentation or loss of biological diversity. Local officials will consider this effect in their future development decisions. However, at this time, GNF–A does not plan to expand its operations or change its land use. Operation of the proposed laser enrichment facility and the existing GNF–A facility is not expected to noticeably alter the impact to biotic communities or wildlife. The NRC considers short-term, long-term, indirect, and cumulative impacts on ecology to be SMALL to MODERATE for the Proposed Action.

The No-Action Alternative would result in the expiration of the GNF–A license and decommissioning of its facility. This action may result in soil erosion concerns or alterations/restrictions to animal movement from fencing. Noise from the construction or from the increased traffic may affect animal behavior during decommissioning activities. Some of these outcomes are short term (i.e., construction noise) and may have little effect on the terrestrial ecology. However, other outcomes may cause longer term effects (i.e., removal of food source, therefore forcing relocation). The NRC staff considers the direct, indirect, and short-term impacts to be SMALL. In the long term, the land would eventually become available for another use or could remain unoccupied. Therefore, the ecological impact would depend on the final determination of the land.

4.8 Noise

No change in noise impacts is anticipated from the Proposed Action. Potential impacts associated with noise include elevated levels in either the ecological or human community. The Occupational Safety and Health Administration regulate noise levels, and in 29 CFR Part 1910, Occupational Noise Exposure, requires employers to implement a hearing conservation program when worker noise exposures exceed the 85-decibel threshold. Noise levels at GNF–A are below this threshold at all testing locations. In 2002, sound levels were tested at 22 locations throughout the site and ranged from 38.0 to 64.5 decibels (GNF–A, 2007b). Many of the manufacturing operations are conducted indoors, and some of the sound is retained in the buildings, which reduces offsite noise levels.

Although GNF–A is located in an area zoned as heavy industrial, historical records and consultations with local officials confirm a low site boundary noise level during all of the facility's operating hours. GNF–A conservatively measures the noise level at the fence line. This measurement would include the sounds emanating from the heating, ventilation, and air conditioning equipment, which generate the loudest external noise. The NRC staff considers the long-term, short-term, and direct impact of noise as SMALL.

Indirect noise from the facility could result from heavy trucks and other transportation vehicles servicing GNF–A. Cumulative impacts include noise associated with the surrounding facilities. The nearest industrial neighbor is designated as an industrial/heavy manufacturing facility. From consultations with local officials, these noise levels are also low. Therefore, continued site operations for this Proposed Action are not expected to significantly produce any further cumulative impacts upon the industrial neighbor. Additionally, the approximate distance to the nearest nonindustrial neighbors is residential—0.6 km [0.4 mi]; school—2.4 km [1.5 mi]; and hospital—1.6 km [1 mi]. Based on sound-level modeling, the NRC staff has determined that sound levels at nearby residential subdivisions from equipment and vehicle traffic for the combined construction of the proposed laser enrichment facility and the existing GNF–A facility operation would be MODERATE (GNF–A, 2008b). However, noise levels are expected to remain below the applicable New Hanover County Noise Ordinance and EPA sound-level limits. The NRC staff considers the impacts during operations at the laser fuel enrichment facility to be SMALL. Given the low noise levels at the site and their dissipation with distance, the staff determines that the indirect and cumulative impact of noise from GNF–A is SMALL.

The NRC staff considers that the short- and long-term environmental impacts from noise are not different from the impacts discussed above. The NRC staff does not consider the noise level an audible intrusion based on this assessment. The NRC staff considers the short-term and long-term impacts to be SMALL.

The No-Action Alternative could affect noise. In the short term, decommissioning activities could result in increased noise from activities such as building demolition, which the NRC staff considers to cause SMALL to MODERATE impacts. The long-term impact would depend on the postlicense termination use of the site, and available options would depend on whether the site was released for restricted or unrestricted use.

4.9 Historical and Cultural

No change in impacts to historical or cultural resources is anticipated from the Proposed Action. Potential historical and cultural impacts could include both known and undiscovered resources. Impacts to known resources are unlikely. No National Register properties or National Historic Landmarks are located within the GNF–A property. The only known historical site identified onsite is a 19th-century cemetery associated with the Rose Hill Plantation during its use as a rice plantation. This cemetery was not disturbed during the original construction of the plant (General Electric Nuclear Energy, 1989) and is located away from the developed portion of the site. The Proposed Action does not include any substantive changes such as expansion or modification that would disturb new areas. The NRC staff considers that the short-term, direct, and indirect impacts on historical and cultural resources are SMALL.

Normally, a site must be at least 50 years old to be considered for entry into the National Register of Historic Places (National Park Service, 2008). The License SNM–1097 was initially issued in 1969. The current license renewal request is for 40 years. Therefore, elements of the facility could be considered for eligibility for listing on the National Register of Historic Places when the 50-year threshold is reached. Because of this potential for listing, the NRC staff considers that the long-term impacts on historical and cultural resources are SMALL to MODERATE.

The addition of the laser enrichment facility to the site will not cause additional impact on historical and cultural resources, because the new facility is not expected to impact undisturbed areas of the GNF–A site (GNF–A, 2008b). Two archeological sites were identified within the laser enrichment facility study area. One of the sites was determined not to be historically significant. The second site, located on the edge of a bluff overlooking the Northeast Cape Fear River, was determined to be a prehistoric archeological site dating to the Middle Woodland period. This archeological site would not be disturbed by the activities required to construct the proposed laser enrichment facility. Therefore, the NRC staff considers that the cumulative impacts of the Proposed Action on historical and cultural resources are SMALL.

The No-Action Alternative could impact historical and cultural resources. In the short term, decommissioning activities could expand into previously undisturbed areas that may contain archeological resources; should this occur, the impacts would be MODERATE to LARGE. The long-term impact would depend on the postlicense termination use of the site, and available options would depend on whether the site was released for restricted or unrestricted use.

4.10 Scenic and Visual

In Section 3.10, the GNF–A site was described as relatively flat topography with elevations ranging from near sea level to about 12 m [40 ft] across the site. GNF–A facilities are prominent visual features in the area due to the numbers and massive sizes of the buildings and are highly visible. Although the applicant does not propose any construction activities in its license renewal application that would impose direct effects, the existing facilities have a MODERATE impact on scenic and visual resources. The staff does not anticipate any changes in these impacts due to continued operations at GNF–A and therefore finds no additional increase in scenic and visual impacts. Therefore, the short-term, long-term, direct, and indirect visual/scenic impacts of the Proposed Action are considered MODERATE.

Construction of the laser enrichment facility will add slightly to the cumulative visual and scenic impacts of the site. The laser enrichment facility structures would neither visually impact any known historical, archeological, or cultural resources on or near the GNF–A site, nor create visual, audible, or atmospheric elements that are out of character with the GNF–A site vicinity or alter its existing mixed land use setting. Depending on the location of the new facility, the NRC staff considers that a SMALL impact could result from the addition of the facility

The No-Action Alternative could have direct short-term, SMALL to MODERATE scenic and visual impacts caused by decommissioning activities. The long-term impact would depend on the postlicense termination use of the site, and available options would depend on whether the site was released for restricted or unrestricted use. Ultimately, the No-Action Alternative impact would depend upon the next occupant's construction plans.

4.11 Public and Occupational Health

The continued handling of materials and conduct of operations at GNF–A poses potential impacts to public and occupational health. For normal operations, the potential impacts are related to the release of low levels of toxic or radioactive materials (primarily uranium) to the environment over the 40-year license renewal period. For accident conditions, the hazard may involve releasing higher concentrations of materials over relatively short periods of time.

10 CFR Part 70, Subpart H, promulgated in 2000 (65 FR 56211, September 18, 2000), requires fuel fabrication facilities to perform an Integrated Safety Analysis (ISA). An ISA is defined in 10 CFR 70.4 as "a systematic analysis to identify facility and external hazards and their potential for initiating accident sequences, the potential accident sequences, their likelihood and consequences, and the items relied on for safety." Items relied on for safety are structures, systems, equipment, components, and activities of personnel that prevent potential accidents that could exceed the performance requirements in 10 CFR 70.61. The performance requirements define high-consequence accidents and intermediate consequence accidents.

High-consequence accidents are defined in terms of (i) radiation dose to a worker, (ii) radiation dose to an individual located outside the controlled area, (iii) an intake of soluble uranium by an individual located outside the controlled area, or (iv) a chemical exposure to an individual. High-consequence events must be controlled by items relied on for safety such that the event is highly unlikely or its consequences are less than the defined high consequences.

Intermediate consequence accidents are defined in terms of (i) radiation dose to a worker, (ii) radiation dose to an individual located outside the controlled area, (iii) an environmental release, or (iv) a chemical exposure to an individual. Intermediate consequence events must be controlled by items relied on for safety such that the event is unlikely or its consequences are less than the defined intermediate consequences.

In accordance with 10 CFR 70.62(c), GNF–A performed an ISA for the Wilmington facility and submitted an ISA summary to the NRC for review in October 2004. The ISA summary is not available for public review because it contains information that is related to the security of the facility. In the performance of the ISA, GNF–A identified no accident sequences with potential consequences meeting the public exposure or environmental release criteria in 10 CFR 70.61(c) for an intermediate consequence accident. As documented in NRC (2008), NRC determined that the facility can be operated in compliance with the performance requirements of 10 CFR 70.61, which is adequate to control the environmental consequences of accidents to a level acceptable to NRC.

No change in public health impacts is anticipated from the Proposed Action. Potential public health impacts could occur if contaminants released from GNF–A enter the environment and are transported from the site through air, surface water, or groundwater. The potential contaminants include small quantities of uranium and HF from the DCP (GNF–A, 2007b).

Contaminants may be transported through the environment in a variety of ways, and the public may be exposed from both internal and external pathways. Potential releases to the air may cause internal exposures directly through inhalation or indirectly through ingestion of crops and animal products that come in contact with contaminants in the air. External exposures can occur directly from the plume or from particles from the plume deposited on the ground and other surfaces. Potential liquid releases to surface water or groundwater may lead to internal exposures through drinking water or eating irrigated crops. External and/or internal exposures may also occur from recreational activities, including boating and swimming in affected surface waters.

The exposure pathways described previously may be categorized into three general pathways that could affect the general public: direct irradiation, airborne effluents, and liquid effluents from the GNF–A facility. Direct irradiation levels taken by measuring gamma radiation exposure at the GNF–A site boundary are indistinguishable from background readings (GNF–A, 2007b). A number of effluent treatment systems are in place at GNF–A, as well as an effluent monitoring program to ensure that potential releases to the environment are within federal and state regulations and are maintained ALARA (GNF–A, 2007b).

GNF–A sources of radioactive liquid and airborne effluents are controlled and monitored, and monitoring data have verified the controls effectively limit radioactive releases to below regulatory limits (GNF–A, 2007b). The most likely public exposure pathway is by inhalation of airborne effluents. Calculated annual radiological doses to the public from GNF–A operations from 1995 to 2005 were at most approximately 4 percent of the 0.1 mSv [10 mrem] annual dose limit from 10 CFR 20.1101 for air emissions of radioactive material.

Modeling analysis predicts that the impact on public or occupational health from the use, release, and treatment of radiological materials during combined operation of the laser enrichment facility with the existing GNF–A operations would be SMALL (GNF–A, 2008b). The non-radiological chemicals (e.g., hydrogen fluoride) potentially released from the laser enrichment facility operation are not persistent and would not accumulate in the environment or cause cumulative health effects. Any non-radiological impacts to worker or public health would be SMALL and would be managed by a combination of process controls, best management and ALARA practices, and monitoring programs. Based on this information, the NRC staff considers all of the environmental impacts related to public and occupational health to be SMALL.

The No-Action Alternative could have short-term public health impacts due to decommissioning activity impacts on other resource areas such as air, hydrology, and noise, which the NRC staff considers to be SMALL to MODERATE. The long-term impact would depend on the postlicense termination use of the site, and available options would depend on whether the site was released for restricted or unrestricted use.

4.12 Waste Management

No change in impacts from waste management is anticipated from the Proposed Action. Potential waste management impacts associated with GNF–A operations include changes in air, water, or soil quality due to contaminated liquid or gaseous effluent streams and material leaks or spills. No solid wastes are disposed of onsite. As discussed earlier, operating within permit conditions and implementing material handling procedures are intended to minimize any potential impacts in these areas.

Through routine operations, GNF–A does generate waste liquid effluents. GNF–A recovers certain waste liquid effluents and either reuses the component in its process line or sells it as a commercial product (e.g., HF is recovered from the DCP and is sold to a commercial chemical company for their use). Other liquid wastes designated for disposal are collected within the plant's wastewater treatment system, treated, sampled for radioactive and non-radioactive constituents, and then discharged at the surface water discharge points. GNF–A containerizes small volumes of certain liquid wastes for treatment and disposal at an offsite facility. Potential indirect effects from this waste management practice include changes in groundwater or soil quality due to releases of certain hazardous chemicals. Direct impacts from leaks or spills can affect runoff and eventually groundwater resources depending on the level of the accidental release. Direct impacts can occur by accidental releases during waste transportation. The NRC staff evaluated each of these conditions within the various environmental resources discussed in this chapter and considers the direct, indirect, and short- and long-term impacts to be SMALL.

No significant additional cumulative effects are anticipated for the areas discussed as the affected environment. GNF–A is currently in compliance with relevant environmental standards and regulations, as well as NRC regulations related to radiation dosage to the public and facility workers. Further, the facility has implemented an ALARA program, routine environmental and radiation monitoring, a radiation safety program, a chemical safety program, and an environmental protection program to minimize the associated direct, indirect, and cumulative effects. Finally, GNF–A also conducts regulatory compliance inspections, program audits, and self-assessments to minimize adverse direct, indirect, and cumulative effects.

Laser enrichment facility operations would generate process liquid radioactive waste that would be collected in a closed drain system connected to a liquid radioactive waste treatment system. Treated radioactive waste effluent will be discharged to the existing GNF–A final process lagoon facility. Sanitary wastewater from the laser enrichment facility will be collected in the sewer system connected to the existing GNF–A site activated sludge sanitary wastewater treatment plant. The addition of the estimated quantities of process and sanitary wastewaters from the laser enrichment facility to the quantities of similar wastewaters from other existing and planned operations, such as the Tooling Development Center, would be within the maximum allowable limit allowed under the site's current NPDES permit for discharge to the onsite effluent channel, which flows to the unnamed tributary #1 to the Northeast Cape Fear River. Surface water runoff from the laser enrichment facility would be routed to storm water detention ponds before being discharged to receiving waters, which would regulate storm water quality and quantity as required by the NPDES storm water permit. Operation of the laser enrichment facility would generate municipal solid waste and other industrial nonhazardous solid wastes, Resource Conservation and Recovery Act hazardous wastes, and LLRW requiring offsite disposal. No high-level radioactive wastes or mixed wastes would be generated by the laser enrichment facility operations (GNF–A, 2008b). Therefore, the NRC staff considers the cumulative effects on waste management to be SMALL.

The No-Action Alternative could have short-term terrestrial impacts due to decommissioning activity impacts on other resource areas such as air, hydrology, and noise. Decommissioning activities could increase the amount of waste generated, especially if facility demolition was performed. The NRC staff considers these impacts on waste management to be SMALL to MODERATE. The long-term impact would depend on the postlicense termination use of the site, and available options would depend on whether the site was released for restricted or unrestricted use.

5.0 AGENCIES AND PERSONS CONSULTED

The NRC staff consulted with other agencies regarding the Proposed Action in accordance with NUREG–1748. These consultations are intended to ensure that the requirements of the Endangered Species Act Section 7 and the National Historic Preservation Act Section 106 are met and provide the designated state liaison agency the opportunity to comment on the Proposed Action.

5.1 State of North Carolina

On March 9, 2009, A. Kock of the NRC sent a letter (Kock, 2009) along with 16 copies of the draft environmental assessment for this proposed action to the North Carolina State Clearinghouse for distribution, review, and comment. Copies of the draft EA were distributed to the Cape Fear Regional Council of Governments, the Department of Environment and Natural Resources, the Department of Agriculture, the Department of Cultural Resources, the Department of Transportation, and Crime Control & Public Safety, Division of Emergency Management, Floodplain Management Program. In an email letter from V. McMillan dated April 16, 2006 (McMillan, 2009a), Ms. McMillan transmitted State of North Carolina comments on the draft EA. No comments were received from the Cape Fear Regional Council of Governments,

the Department of Agriculture, the Department of Cultural Resources, the Department of Transportation, or Crime Control & Public Safety. Comments received from the Department of Environment and Natural Resources, Division of Water Quality and Division of Environmental Health are addressed below:

Department of Environment and Natural Resources, Division of Water Quality Comments:

Comment 1: The Division of Water Quality (DWQ) has reviewed the subject project. GNF-A holds a permit for the discharge of up to 1.8 MGD of process wastewater and 75,000 GPD of domestic wastewater, and there have not been any compliance issues with their discharge permit (NC0001228) that is also currently in the process of being renewed. However, the Division has the following comments that need to be addressed prior to a Finding of No Significant Impact (FNSI) being issued for the project:

The document should clarify whether "sanitary water" is the same as "wastewater."

Response 1: Sanitary water is a type of wastewater.

Comment 2: Section 1.3 – Text states that GNF-A is pursuing the renewal of a 40 year license for the site to continue operation with "no major upgrades or refurbishment activities." DWQ is concerned that of this EA and subsequent permits will allow for the future construction of the laser enrichment and tooling development buildings to piggyback on any approvals intended solely for GNF-A.

Response 2: This EA evaluates the direct, indirect, and cumulative environmental impacts of the GNF-A facility on the affected environment. The outcome of this review is intended only to inform the NRC decision of whether or not to approve GNF-A's request for a license renewal (the proposed action). GNF-A does not require NRC approval to build the planned Tooling Development Center. A separate EIS is currently being developed by the NRC to evaluate the impacts of the proposed laser enrichment facility. Therefore, this EA is not intended to be used to approve the building of the Tooling Development Center, nor to inform the NRC decision of whether or not to grant a license for the proposed laser enrichment facility.

Comment 2a: Section 1.3 – This section should also mention the future tooling development center.

Response 2a: The planned Tooling Development Center is one of the "additional facilities" mentioned in Section 1.3 which states, "...it is expected that several additional facilities will be built during the license renewal period that will have cumulative impacts associated with the Proposed Action."

Comment 2b: Section 1.3 – If construction of these two facilities (the laser enrichment and tooling development centers) will be allowed by approval of this EA, please make that clear in the document.

Response 2b: See Response 2

Comment 2c: Section 1.3 – More explanation of the interrelatedness of the GNF-A facility and the laser enrichment and tooling development projects is required to understand how the impacts from the latter two projects can be viewed as cumulative impacts of the GNF-A renewal and not separate, direct impacts unto themselves.

Response 2c: Cumulative impacts are discussed in Section 4.

Comment 3: Section 2.6 – DWQ requests to comment upon any license amendments the facility may pursue during the 40-year period for its license renewal.

Response 3: NRC will consult with the state of North Carolina regarding any amendments to GNF-A's license which require NRC environmental review.

Comment 4: Section 3.5.1 should include that the project is located in Cape Fear subbasin number 03-06-23.

Response 4: Section 3.5.1 has been revised to include this information.

Comment 5a: Section 4.1 - Description of the land use impacts from the laser enrichment center needs to be added.

Response 5a: Section 4.1 has been revised to include this information.

Comment 5b: Section 4.1 - Text in this section (page 34) says the tooling development center will impact 30 acres and need a new road. However, the first paragraph says that since the GNF-A facility already exists that short and long term impacts on land use will be small. While this statement may be true, considering that the site is 1664 acres, impacts will not be minimized if construction occurs in or around wetland areas. Therefore, GNF-A needs to provide more detail on the proposed building impacts. (Please address in section 4.5 also).

Response 5b: The first paragraph states that the direct and indirect impacts of the GNF-A facility on land use will be small. Cumulative impacts of the GNF-A facility and other reasonably foreseeable future activities, including the planned Tooling Development Center, are presented in the third paragraph. The direct, indirect, and cumulative impacts are considered small due to the fact that the affected areas are zoned for heavy industrial land use. Impacts to wetlands are discussed in Section 4.7.

Comment 6a: Section 4.5 - Text in this section states "potential short-term surface water impacts...include changes in water quality in the northeast Cape Fear River and its tributaries due to contaminated effluent discharges" and that liquid effluents are treated and discharged "in accordance with NPDES Permit NC0001228 and 10 CFR Part 20 requirements." It would seem that if effluents are in compliance with NPDES permit limits that the discharges would not be considered "contaminated." (Similar statements are found in section 2.4, pages 10-11.) Please clarify this issue.

Response 6a: GNF–A activities produce process and sanitary liquid effluent streams that may contain both radiological and non-radiological contaminants. Section 4.5 is meant to convey that the potential for short-term surface water impacts from these effluents is reduced by GNF-A committing to discharge effluents in accordance with its NPDES permit.

Comment 6b: Section 4.5 - The lagoon system mentioned here should be mentioned in section under "Waste Management" discussions.

Response 6b: The lagoon system is mentioned in Section 2.4 – Waste Management as well as Section 4.12 – Waste Management of the draft EA provided to the state of North Carolina.

Comment 6c: Section 4.5 - The second paragraph states that wastewater from the tooling development center will be pumped to the GNF-A lagoons from treatment and the discharged to the Cape Fear River. Please reconcile this with text in section 2.4 (page 11) that describes how GNF-A is changing its wastewater treatment process to recycle its effluent, eliminating its discharge.

Response 6c: Section 2.4 has been revised to reflect that effluent from GNF-A activities as well as Tooling Development Center and laser enrichment activities will only be recycled as process water as needed. Excess effluent will be discharged to the Cape Fear River.

Comment 6d: Section 4.5 - Third paragraph – The second and fourth sentences contradict each other in that the second sentence describes spills and leaks that have resulted in groundwater contamination and the fourth states that current producers "have effectively prevented their occurrence." Please amend this discussion so that it provides consistent statements regarding spills and resulting contamination events.

Response 6d: The second and forth sentences have been reviewed and found to be consistent. The second sentence discusses past spills and leaks. The fourth sentence reflects that the potential for future spills and leaks has decreased due to the implementation of a chemical safety program and training procedures.

Comment 6e: Section 4.5 - Fourth paragraph – The first and third sentences contradict each other in that the first sentence states that the "Potential impacts to the water quality of wetlands are not anticipated from continued operations at the GNF-A site" and the third sentence states that "Water quality in wetlands in and around the GNF-A site could be affected by discharges of liquid effluents (e.g., storm water runoff) and gaseous emissions." Please amend the text so that it provides consistent statements about the likelihood for fouling the water quality of the wetlands.

Response 6e: The first and third sentences have been revised to address this comment.

Comment 7a: Section 4.12 - The tooling development center and its proposed 11,500 gpd discharge and additional stormwater should be addressed in this section.

Response 7a: Section 4.12 has been revised to include information related to the planned Tooling Development Center.

Comment 7b: Section 4.12 - The second sentence of the second paragraph describes a co-mingling of waste streams that section 2.4 describes as being treated separately. Please reconcile these seemingly contradictory statements.

Response 7b: The second sentence of the second paragraph does not describe a co-mingling of waste.

Comment 7c: Section 4.12 - Please correct the text to indicate that "changes in groundwater or soil quality due to releases of hazardous chemicals" is a direct operational impact of the project.

Response 7c: The EA text has not been changed. Changes to groundwater and/or soil quality are considered to be both a direct and indirect impact, as the fact indicates.

Comment 8a: Section 6 - Text states that the proposed project "will not cause significant additional impact on the environment. The facility already exists, and no changes to the GNF-A facility of its operation are associated with the license renewal. The Proposed Action can be considered a continuation of impacts and was evaluated based on impacts from past operations...Cumulative impacts over the 40-year renewal period were also evaluated and determined to be SMALL to MODERATE." If approval of this project does implicitly sanction the construction of the tool and laser facilities, activities which appear beyond this license renewal, then the impacts from this project must be included in this document.

Response 8a: See Response 2

Comment 8b: Section 6 - While the beginning of the quoted section states that impacts from the project will not be "significant," the last sentence states that the impacts will be "SMALL to MODERATE." The last sentence leads one to believe that there will be significant impacts resulting from this project. Please respond regarding this contradiction.

Response 8b: These statements have been reviewed and found to be consistent. The EA states that the GNF-A facility will not cause significant additional environmental impacts. However, the cumulative impacts of the GNF-A facility in conjunction with all past, present, and reasonably foreseeable future activities are likely to be SMALL to MODERATE.

Comment 8c: Section 6 - If projected impacts are significant, DWQ requests that and EIS be prepared for this project.

Response 8c: The NRC has reached a finding of no significant impact with respect to the proposed action.

<u>Department of Environment and Natural Resources, Division of Environmental Health, Radiation Protection Section Comment:</u>

Comment: I have reviewed the draft environmental report from the NRC that you gave me. I do not have any questions because it appears to be well written and the conclusions are well founded in technical information. I would like to get clarification on one thing. On page 46 in the

fifth paragraph the report states: “Modeling analysis predicts that the impact on public or occupational health from the use, release, and treatment of radiological materials during combined operation of the laser enrichment facility with the existing GNF-A operations would be Small (GNF-A, 2008). What is meant by small in this context? Specifically, is there a dose number that defines how small is SMALL? Given that the background gamma exposure is 120 mr/yr or so, would there be any increase subsequent to beginning operation of the laser facility?

Response: In this context, SMALL is a qualitative quantification of the impacts that is not tied to a specific dose rate. However, dose rates are expected to continue to fall below the regulatory limits of 100 mrem/yr for public exposure and 5 rem/yr for occupational exposures. No increase in dose rates is expected with the proposed action.

5.2 North Carolina State Historic Preservation Office (SHPO)

On January 4, 2008, G. Suber of the NRC sent a letter (Suber, 2008a) to P. Sandbeck of the North Carolina SHPO, requesting information regarding historic and cultural resources potentially affected by the proposed action. In a letter to G. Suber (Gledhill-Earley, 2008), dated January 31, 2008 the North Carolina State Historic Preservation Office replied, stating, “At its current size and location, the GNF-A facility does not affect any historic buildings or archaeological resources eligible for inclusion on the National Register of Historic Places, There are, within the 1664-acre tract of land on which the GNF-A facility is situated, six identified archaeological sites. In addition, there is a very high probability that unidentified archaeological sites also occur on the property. Any development that proposes to increase the footprint of the current GNF-A facility could impact these cultural resources. We recommend that as a condition for approval of any project that increases or otherwise alters the footprint of the GNF-A facility, that an archaeological survey be performed to assess potential effects on cultural resources.”

Response: Any new development, requiring NRC approval, that could impact cultural resources would be subject to an environmental review and/or consultation with the North Carolina State Historic Preservation Office under NEPA.

5.3 Consultations Regarding Threatened and Endangered Species

On January 4, 2008, G. Suber of the NRC sent a letter (Suber, 2008b) to D. Bernhart of the National Oceanic and Atmospheric Administration (NOAA), requesting information regarding threatened and endangered species potentially affected by the proposed action. In a letter to G. Suber (Bernhart, 2008), dated January 16, 2008, the NOAA enclosed a list of federally-protected species under the jurisdiction of the National Marine Fisheries Service for the State of North Carolina. Additionally, on January 4, 2008 G. Suber of the NRC sent a letter (Suber, 2008c) to the North Carolina State Clearinghouse, requesting information regarding local resources potentially affected by the proposed action. Biologists from the N. C. Wildlife Resources Commission responded in a letter to G. Suber via M. McGee (Baggett, 2008) dated February 12, 2008, requesting that the following comments be considered in the EA.

Comment 1: Please include a description of any streams or wetlands affected by the project. Please explain any water that is taken from the Cape Fear River for use in this facility, how it is used, how water use may change in time (i.e. changes in intake needs or uses), as well as how used water is monitored and discharged.
Comment 2: Please include a description of how waste is handled at this facility and include how a possible contamination of surrounding land would be dealt with.

Comment 3: Provide a description of fishery and wildlife resources within the project area, including a listing of federally or state designated threatened, endangered, or special concern species.

As mentioned previously, on March 9, 2009, A. Kock of the NRC sent a letter (Kock, 2009) along with 16 copies of the draft environmental assessment for this proposed action to the North Carolina State Clearinghouse for distribution, review, and comment. The N. C. Wildlife Resources Commission is one of the agencies that reviewed the draft EA, which included the information requested in the February 12 letter (Baggett, 2008). The N.C. Wildlife Resources Commission's review of the draft EA resulted in no comments.

5.4 Tribal Consultations

On January 4, 2008, G. Suber of the NRC sent a letter (Suber, 2008d) to the Waccamaw Siouan tribe, requesting information regarding tribal historic and cultural resources potentially affected by the proposed action. In a letter to G. Suber (Jacobs, 2008), dated February 8, 2008 The Waccamaw Siouan Tribe replied, stating, "The Waccamaw Siouan Tribe has reviewed the documents you sent on the project area and we are unaware of any traditional religious or cultural significance to the tribe at this location however this does not mean that this area does not contain any Tribal artifact and other Tribal significance items. We recommend that you notify the Tribe if any American Indian artifacts or other items of culture significance are found on or adjacent to this site."

6.0 CONCLUSION

The NRC staff concludes that the renewal of license SNM–1097 involving the continued operation of the GNF-A site in Wilmington, North Carolina, will not cause significant additional impact on the environment. The facility already exists, and no changes to the GNF–A facility or its operation are associated with the license renewal. The Proposed Action can be considered a continuation of impacts and was evaluated based on impacts from past operations. Gaseous emissions and liquid effluents are within regulatory limits for non-radiological and radiological components. Public and occupational radiological dose exposures are below 10 CFR Part 20 regulatory limits. Cumulative impacts over the 40-year renewal period were also evaluated and determined to be SMALL to MODERATE. Based on the above, the NRC staff makes a finding of no significant impact with respect to the proposed action.

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APPENDIX

New Hanover County Federal- and State-Threatened and Endangered Species			
Common Name	**Scientific Name**	**Federal Status***	**State Status†**
Seabeach Amaranth	*Amaranthus pumilus*	T‡	T
Rough-leaf Loosestrife	*Lysimachia asperulifolia*	E§	E
Shortnose Sturgeon	*Acipenser brevirostrum*	E	E
American Alligator	*Alligator mississippiensis*	T	T
Green Sea Turtle	*Chelonia mydas*	T	T
Loggerhead	*Caretta caretta*	T	T
Piping Plover	*Charadrius melodus*	T	T
Red-cockaded Woodpecker	*Picoides borealis*	E	E
West Indian Manatee	*Trichechus manatus*	E	E
Sandhills Milkvetch	*Astragalus michauxii*	N/A‖	T
Florida Scrub Frostweed	*Crocanthemum nashii*	N/A	E
Carolina Grasswort	*Lilaeopsis carolinensis*	N/A	T
Snowy Orchid	*Platanthera nivea*	N/A	T
Spring-flowering Goldenrod	*Solidago verna*	N/A	T
Pickering's Dawnflower	*Stylisma pickeringii var. pickeringii*	N/A	E
Cape Fear Threetooth	*Triodopsis soelneri*	FSC¶	T
Confederate Huckleberry	*Gaylussacia nana*	N/A	E
Golden-crest	*Lophiola aurea*	N/A	E
Coastal Beaksedge	*Rhynchospora pleiantha*	FSC	T
Dwarf Bladderwort	*Utricularia olivacea*	N/A	T
Eastern Coral Snake	*Micrurus fulvius*	N/A	E
Eastern Diamondback Rattlesnake	*Crotalus adamanteus*	N/A	E
Eastern Woodrat—Coastal Plain Population	*Neotoma floridana floridana*	N/A	T
Carolina Gopher Frog	*Rana capito*	FSC	T

*U.S. Fish and Wildlife Service. "Division of Endangered Species." 2009. <http://www.fws.gov/nc-es/es/cntylist/new_hanover.html> (January 16, 2009).
†The North Carolina Natural Heritage Program. "Elements of Occurrence Search Page." 2009. <http://149.168.1.196/nhp/county.html> (January 16, 2009).
‡Note: T—threatened
§Note: E—endangered
‖Note: N/A—not applicable
¶Note: FSC—Federal "Species of Concern"