CHAPTER 4
ENVIRONMENTAL IMPACTS OF CONSTRUCTION

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ACRONYMS AND ABBREVIATIONS

µCi/ml	microCurie per milliliter
µg/L	microgram per liter
µrem	microrem
µrem/hr	microrem per hour
ac.	acre
A.D.	Anno Domini
ADD	average day demand
ATWS	additional temporary work space
BMP	best management practice
CFR	Code of Federal Regulations
cm	centimeter
COL	Combined License
COLA	Combined License Application
CP&L	Carolina Power & Light Company
ESA	Endangered Species Act
dBA	decibel (A-weighted scale)
DCD	Westinghouse Electric Company, LLC, AP1000 Design Control Document, Rev. 16
DOT	Department of Transportation
E&SCP	Erosion and Sedimentation Control Plan
ER	Environmental Report
ESRI	Environmental Systems Research Institute, Inc.
EAB	exclusion area boundary

ACRONYMS AND ABBREVIATIONS (CONTINUED)

FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FSAR	Final Safety Analysis Report
ft.	foot
GI-LLI	Gastrointestinal tract – lower large intestine wall
GIS	geographic information system
G.S.	General Statute
ha	hectare
HAR	proposed Shearon Harris Nuclear Power Plant Units 2 and 3
HAR 2	proposed Shearon Harris Nuclear Power Plant Unit 2
HAR 3	proposed Shearon Harris Nuclear Power Plant Unit 3
HNP	existing Shearon Harris Nuclear Power Plant Unit 1
in.	inch
JVT	Joint Venture Team
KF&R	Kiker Forestry & Realty, Inc.
km	kilometer
kV	kilovolt
LPD	liter per day
m	meter
MBTA	Migratory Bird Treaty Act
MCFRBA	Middle Cape Fear River Basin Association
MDD	maximum day demand
mg/L	milligram per liter

ACRONYMS AND ABBREVIATIONS (CONTINUED)

mgd	million gallons per day
mi.	mile
mld	million liters per day
MPCA	Minnesota Pollution Control Agency
mR	milliRoentgen
mrad	millirad
mrem	millirem
mrem/yr	millirem per year
msl	mean sea level
NCAC	North Carolina Administrative Code
NCBI	North Carolina Biotic Index
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOT	North Carolina Department of Transportation
NCDWQ	North Carolina Division of Water Quality
NCNHP	North Carolina Natural Heritage Program
NCNPS	North Carolina Native Plant Society
NCWRC	North Carolina Wildlife Resources Commission
NGG	Nuclear Generation Group
NGVD29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NRHP	National Register of Historic Places
ODCM	Off-site Dose Calculation Manual
OSHA	Occupational Safety and Health Administration
pCi/L	picoCurie per liter
PEC	Progress Energy Carolinas, Inc.
ppb	parts per billion
ppm	parts per million
ROW	right-of-way
S&L	Sargent & Lundy, LLC
SHPO	State Historic Preservation Office
SMZ	streamside management zone
SPCA	Sedimentation Pollution Control Act of 1973
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TDS	total dissolved solids
TIA	transportation impact analysis
TLD	thermoluminescent dosimeter
U.S.C.	United States Code
UDO	Unified Development Ordinance
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

ACRONYMS AND ABBREVIATIONS (CONTINUED)

WQS	water quality standards
WPCA	Water Pollution Control Act
WTP	water treatment plant
WWTP	wastewater treatment plant

4.0 ENVIRONMENTAL IMPACTS OF CONSTRUCTION

This chapter evaluates the environmental impacts related to construction of the proposed Shearon Harris Nuclear Power Plant Unit 2 (HAR 2) and the proposed Shearon Harris Nuclear Power Plant Unit 3 (HAR 3) and several appurtenant facilities (Figure 4.0-1). These appurtenant facilities include electric transmission lines, an electric switchyard, modifications to the dam at Harris Reservoir, the Harris Lake makeup water system intake structure and pumphouse, the Harris Lake makeup water system pipeline and the discharge structure on Harris Reservoir, and blowdown pipelines from HAR 2 and HAR 3 to be installed in the Harris Reservoir in parallel with the existing blowdown pipeline for the existing Shearon Harris Nuclear Power Plant Unit 1 (HNP).

For this discussion and consistent with the information presented in ER Chapter 2, the following terms are used:

- **Plant Site**. The plant site is the area within the fence line (Figure 4.0-2). This area includes the footprint of the proposed Shearon Harris Nuclear Power Plant Units 2 and 3 (HAR), including the reactor buildings and generating facilities.

- **HAR Site**. The HAR site is an irregularly shaped area comprised of the following site components: the plant site (area within the fence line), Harris Reservoir, Harris Reservoir perimeter, the dam at Harris Reservoir, the pipeline corridor, and the intake structure and pumphouse (Figure 2.0-2). The HAR site is located within Wake and Chatham counties.

- **Exclusion Zone**. The area within the exclusion area boundary (EAB). The exclusion zone is represented by two circles, each with a radius of 1245 meters (m) (4085 feet [ft.]), centered on the reactor building of each unit (Figure 4.0-3).

- **Pipeline Corridor**. The pipeline corridor includes the Harris Lake makeup water system pipeline and corridor connecting the Harris Reservoir and the Cape Fear River. The pipeline components will transport makeup water from the Cape Fear River to the Harris Reservoir (Figure 4.0-4).

- **Intake Structure and Pumphouse**. The Harris Lake makeup water system intake structure and pumphouse will be constructed on the Cape Fear River (Figure 4.0-5).

- **Harris Lake**. Harris Lake includes both the Harris Reservoir and the Auxiliary Reservoir.

- **Harris Reservoir**. The Harris Reservoir is also known as the Main Reservoir. It does not include the affiliated Auxiliary Reservoir.

- **Harris Reservoir Perimeter**. The Harris Reservoir perimeter describes the area impacted by the 6-m (20-ft.) change in the reservoir's water level.

- **Transmission Corridors and Off-Site Areas**. Transmission corridors and off-site areas describe areas outside the site boundary that may fall within the footprint of new or existing transmission line corridors.

- **Vicinity**. The vicinity is a band or belt 9.7-kilometers (km) (6-miles [mi.]) wide surrounding the HAR site (Figure 2.0-6). The vicinity includes a much larger tract of land than the HAR site. The vicinity is located within four counties: Wake, Chatham, Harnett, and Lee.

- **Region**. The region applies to the area within an 80-km (50-mi.) radius from the center point of the HAR power block footprint, excluding the site and vicinity (Figure 4.0-6). The following counties are located entirely within the region: Chatham, Durham, Harnett, Lee, Orange, and Wake. The following counties are located partially within the region: Alamance, Caswell, Cumberland, Franklin, Granville, Guilford, Hoke, Johnston, Montgomery, Moore, Nash, Person, Randolph, Richmond, Robeson, Sampson, Scotland, Vance, Wayne, and Wilson. The region includes the economic centers of Raleigh, Durham, Fayetteville, Cary, and Chapel Hill.

HAR site preparation and construction for the HAR are anticipated to take a total of approximately 60 months. HAR site preparation is expected to be completed within 18 months to provide an adequate time of approximately 42 months for the water level in Harris Reservoir to rise 6 m (20 ft.) and reach an elevation of 73.2 m (240 ft.) National Geodetic Vertical Datum of 1929 (NGVD29) prior to operation (Reference 4.0-001). The installation of the intake structure and pumphouse on the Cape Fear River and shoreline, the Harris Lake makeup water system pipeline, and the discharge structure on Harris Reservoir are anticipated to occur over a 10-month period within the 18-month time window for HAR site preparation (Reference 4.0-002). Construction is anticipated to be completed within the same 42 months as the change in Harris Reservoir water elevation (Reference 4.0-001).

Prior to the construction, the HAR site will be prepped for plant construction and eventual operation. These preparations include the following:

- Construction of the intake structure.

- Construction of the pumphouse.

- Construction of the Harris Lake makeup water system pipeline.

- Construction of the discharge structure on Harris Reservoir.

- Clearing along the Harris Reservoir perimeter.

- Modifications to the Main Dam at Harris Reservoir. The Main Dam currently includes a concrete service spillway with an ogee-shaped crest on the west abutment of the dam. The spillway is uncontrolled and has a crest net length of 15.2 m (50 ft.) with a pier at mid-length. The crest of the current spillway is at an elevation of 67.1 m (220 ft.) NGVD29 and will be increased to a proposed elevation of 73.2 m (240 ft.) NGVD29. The proposed spillway will also have an uncontrolled, ogee-shaped crest with a net length of 15.2 m (50 ft.) and a pier at mid-length.

- Relocation and/or modification of affected infrastructure associated with changes in the water elevation of Harris Reservoir (Figures 4.0-7, 4.0-8, and 4.0-9).

The Harris Lake makeup water system pipeline, intake structure, and pumphouse components will transport makeup water from the Cape Fear River to the Harris Reservoir. Water from the Cape Fear River would be used to increase the water level of Harris Reservoir approximately 6 m (20 ft.) to provide adequate cooling tower makeup water for HAR 2 and HAR 3.

HAR site construction activities will follow site preparation. These activities include the following:

- Construction of HAR 2 and HAR 3 (Figure 4.0-2).

- Construction of the blowdown pipelines from HAR 2 and HAR 3 into Harris Reservoir (Figure 4.0-10).

- Construction of a new access road (Figure 4.0-11).

- Relocation of Harris Lake County Park infrastructure.

- Relocation of boat ramps and other infrastructure.

- Preparation of the perimeter of the lake in anticipation of increasing the water level within Harris Reservoir.

- Development of three new transmission lines for HAR 3 and the associated electric switchyard.

Preparation of the perimeter of the lake in anticipation of increasing the water level within Harris Reservoir will occur during the construction phase of the project, as described above. These construction activities and the associated impacts resulting from the physical relocation of infrastructure, including those associated with recreation, are addressed in this chapter. Pumping water from the Cape Fear River to maintain the new water level will be an ongoing process during plant operations. For the purposes of this ER, the evaluation of impacts associated with the withdrawal of water from the Cape Fear River and the

maintenance of the water level in Harris Reservoir are discussed in ER Chapter 5. This discussion includes the inundation of land; evaluation of water intake impacts on aquatic ecosystems; and operational impacts on infrastructure.

Construction of the HAR Units 2 and 3 (HAR) will occur at a location to the north of the HNP. The HAR site is composed of impervious surfaces, crushed stone, and some tree-covered areas. In addition, land use is designated for the HNP as heavy industrial. Construction of the HAR will not change that land use designation (Reference 4.0-003).

Throughout this chapter, environmental impacts of the alternatives will be assessed using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance — SMALL, MODERATE, or LARGE. This standard of significance was developed using Council on Environmental Quality guidelines set forth in the footnotes to Table B-1 of Title 10 of the Code of Federal Regulations (CFR) Part 51, Subpart A, Appendix B, and is as follows:

- **SMALL**. Environmental effects are not detectable or are so minor 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.

The impact categories evaluated in this chapter are the same as those used in the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, Volumes 1 and 2.

This chapter is organized into the following sections:

- Section 4.1 — Land Use Impacts

- Section 4.2 — Water-Related Impacts

- Section 4.3 — Ecological Impacts

- Section 4.4 — Socioeconomic Impacts

- Section 4.5 — Radiation Exposure to Construction Workers

- Section 4.6 — Measures and Controls to Limit Construction-Related Adverse Impacts

4.0.1 REFERENCES

4.0-001 Spragins, Lewis, Progress Energy, "Workforce Assumptions and Construction Timeframe – HAR 2 & 3," Joint Venture Team – Request for Information 175, March 8, 2007.

4.0-002 CH2M HILL, “Progress Energy Harris Site – Archaeological Field Investigation Meeting Summary,” January 11, 2007.

4.0-003 Sargent & Lundy, LLC, “Construction Input for Makeup Water Line and HAR Units 2 & 3,” Request for Information -158, “Attachment C – Construction Parking Lots, Laydown Areas, Roads – Surfacing,” January 26, 2007.

4.1 LAND USE IMPACTS

Land use impacts include any direct or indirect impacts to the HAR site and the vicinity resulting from construction of HAR 2, HAR 3, and appurtenant facilities including electric transmission lines, an electric switchyard, modifications to the Main Dam at Harris Reservoir, blowdown structures within Harris Reservoir, the Cape Fear River intake structure and pumphouse, and the Harris Lake makeup water system pipeline. In addition, indirect construction impacts associated with the proposed change in the reservoir elevation are addressed, including enhancements to area roadway infrastructure, access to the wastewater treatment plant (WWTP), and effects on other structures. One hundred percent of the land at the HAR site is classified as heavy industrial, and approximately 85 percent of the land within the vicinity is forested or agricultural. Industrial land use within the vicinity of the HAR site is limited to areas near the HNP and along adjacent highway and railroad corridors. As detailed in the following subsections, construction activities will not significantly impact land use in nearby communities or in the greater region.

4.1.1 HAR SITE AND VICINITY

Two main types of land use impacts exist: direct impacts that affect the HAR site and appurtenant facilities and secondary impacts that affect the vicinity. To a lesser extent, impacts may affect the region. The following subsections document the land use impacts. In general, because existing access roads and infrastructure will be used for construction, HAR site and vicinity land use impacts will be negligible. This subsection also discusses long-term or short-term impacts on land use at the HAR site and vicinity.

4.1.1.1 Land Use Directly Affected by Construction

Construction will be confined to the HAR site, which includes HAR 2 and HAR 3, the raw water intake structure immediately north and east of HAR 2 and HAR 3 on Harris Reservoir, three new electric transmission lines, an electric switchyard, modifications to the dam at Harris Reservoir, an intake structure and pumphouse, and Harris Lake makeup water system pipeline from the Cape Fear River to Harris Reservoir. The following topics are discussed in more detail in their respective subsections:

- Subsection 4.1.2.1 — Blowdown Pipelines
- Subsection 4.1.2.2 — Transmission Line Construction
- Subsection 4.1.2.3 — Main Dam Modifications
- Subsection 4.1.2.4 — Cape Fear River Intake Structure and Pumphouse
- Subsection 4.1.2.5 — Pipeline Corridor

Areas that will be disturbed by construction on either a long-term or short-term basis are located at or near the following coordinates:

HAR 2	Latitude (North): 35°38'15.39" Longitude (West): -78°57'29.84"
HAR 3	Latitude (North): 35°38'23.90" Longitude (West): -78°57'34.71"

The HNP plant site covers 178 hectares (ha) (440 acres [ac.] or 0.69 mi.^{2}) (Reference 4.1-001). The addition of HAR 2 and HAR 3 affects approximately 78 ha (192 ac. or 0.3 mi.^{2}), which primarily appears to experience ongoing disturbance resulting from the construction and operation of the HNP. Portions of the areas that will be re-surfaced permanently or temporarily currently contain infrastructure, parking areas, and roads associated with the HNP. Required parking for the new units may impact closed landfill 92-G requiring coordination with appropriate regulatory agencies. Borrow material required for the construction of the HAR will be generated within the construction footprint during grading and leveling. Construction material required for the HAR will be transported to the site by rail and truck. In ER Subsection 2.2.1, Figure 2.2-1 shows the land use at the HAR site. Utility construction is consistent with the "Wake County Land Use Plan" (Reference 4.1-002).

The existing industrial portion of the HAR site is located on a peninsula extending into Harris Reservoir. Raw water intake for the HAR will be located on Harris Reservoir immediately north and east of the HNP. No natural wildlife habitat remains in this area. Small fragmented woodlots are present in the industrial portion but limited habitat is available (Reference 4.1-003).

HAR 2 is on an area of mowed vegetation with no other vegetation. HAR 3 is in an area recently clear-cut and replanted to loblolly pine. The young pines are less than 10 years old and substantial herbaceous vegetation grows among the young trees (Reference 4.1-003).

Within the HAR construction area, the following areas will be re-surfaced:

- **Permanently**. Approximately 47 ha (118 ac. or 0.18 mi.^{2}) will be permanently re-surfaced for the construction of HAR 2, HAR 3, and associated infrastructure. This includes asphalt or crushed stone covering 41.2 ha (103.5 ac. or 0.16 mi.^{2}), with seeded topsoil covering the remaining 6 ha (14.7 ac. or 0.0.23 mi.^{2}).

- **Temporarily**. Approximately 30 ha (74 ac. or 0.12 mi.^{2}) within the plant site will be covered with crushed stone and used for temporary construction laydown.

The perimeter of Harris Reservoir and the surrounding area are currently placed in timber production. A recent land use coverage analysis indicated that more

than 70 percent of the land contained in the watershed is forested (Reference 4.1-003). Subsection 4.1.1.1.2 discusses long-term and short-term impacts of construction on the perimeter of the reservoir.

Construction impacts on land use at the HAR will be SMALL because of the existing industrial use.

4.1.1.1.1 Makeup Water Pipeline Corridor and Appurtenant Structures

Operations at HAR 2 and HAR 3 will require additional makeup water from Harris Reservoir. The raw water intake on Harris Reservoir will be located north and east of the HAR. The construction of an intake structure and pumphouse on the Cape Fear River are proposed to maintain the increased water level in Harris Reservoir. A new makeup water pipeline will be built primarily in the Fayetteville transmission right-of-way (ROW) (Figure 4.0-4). The existing Fayetteville line is a secondary line and is not one of the seven 230-kilovolt (kV) lines originating in the HNP switchyard.

A new outfall structure will be constructed and maintained on Harris Reservoir. Water from the Cape Fear River and natural fill will be used to increase the level of Harris Reservoir approximately 6 m (20 ft.) to provide adequate cooling tower makeup water for HAR 2 and HAR 3.

A new intake structure and pumphouse will be required to move water from the Cape Fear River to Harris Reservoir to raise the reservoir level to approximately 73.2 m (240 ft.) NGVD29 to support the operation of HAR 2 and HAR 3 (Reference 4.1-004). ER Subsection 2.4.1.4 and Section 4.3 discuss the makeup water pipeline corridor in detail. The intake structure will be constructed immediately upstream of Buckhorn Dam within the Cape Fear River channel. The pumphouse will be on the northern bank of the Cape Fear River adjacent to the existing discharge canal and remnants of the abandoned hydropower system that was located on Buckhorn Dam. The proposed Harris Lake makeup water system pipeline will extend along existing ROWs to the shore of Harris Reservoir upstream of the dam. Section 4.3 discusses the intake structure and pumphouse in greater detail.

The pumphouse is proposed to be located in a small cove on the east side of the Cape Fear River, just north of Buckhorn Dam. The main operating elevation of the pumphouse will be 1.5 m (5 ft.) above the 100-year flood level of 52 m (170 ft.) NGVD29. An intake channel, with a width of approximately 10.7 m (35 ft.) and a depth of approximately 1.7 m (5.5 ft.), will be dredged into the cove. The channel will consist of reinforced concrete slab with sloped riprap sides. The intake structure and pumphouse will encompass approximately 1.4 ha (3.4 ac. or 0.0053 mi.^{2}).

A designated staging area (0.4 ha [1 ac. or 0.0016 mi.^{2}]) will be used temporarily for construction refueling and storage throughout the duration of construction, which is proposed to occur in the 10-month period. This construction will be

conducted in parallel with the construction of the pipeline corridor and discharge structure.

Generally, the pipeline corridor will primarily follow the existing Fayetteville transmission line ROW for approximately 4.2 km (2.6 mi.). The remaining portion of the pipeline corridor will run approximately 1.4 km (0.9 mi.) along Buckhorn Road, an existing access road, and through forested land adjacent to the proposed intake structure and pumphouse at the Cape Fear River. The Harris Lake makeup water system pipeline, which will be constructed in a corridor approximately 30.5-m (100-ft.) wide, will run from the intake at the Cape Fear River to Harris Reservoir, a distance of roughly 6 km (4 mi.) .

Impacts from construction on current land use in the ROW will be SMALL, short-term, and minimal.

4.1.1.1.2 Agricultural and Special Uses at the HAR Site

The HAR site has no special agricultural resources (such as prime or unique farmland) because no land within the site boundary or in the appurtenant makeup water pipeline corridor is classified as agricultural. No known significant mineral resources (sand and gravel, coal, oil, natural gas, or ores) are located within the HAR site boundaries or in the pipeline corridor (Reference 4.1-005). No construction activities will take place within a floodplain (Reference 4.1-006), a coastal zone (Reference 4.1-007), a federal wild and scenic river (Reference 4.1-008), or a state natural and scenic river (Reference 4.1-009). No areas within the HAR site boundary have been identified as wetlands, although approximately 47 ha (117 ac. or 0.18 mi.^{2}) of wetlands exist along the perimeter of the reservoir and near the dam. These wetland areas were created or modified during the construction of the HNP (Reference 4.1-001). These wetlands will be inundated because of the increased water level of the reservoir. However, inundation will also create new wetlands. Potential adverse effects on wetlands will be limited by complying with applicable state and federal laws (Reference 4.1-003).

4.1.1.1.3 Long-Term Impacts on Land Use Directly Affected by Construction

Construction at the HAR site is not expected to have long-term impacts on land use. It is expected that the industrial nature of the facility will continue during construction. As a result, the impact will be SMALL.

Construction and clearing around the Harris Reservoir perimeter is expected to have a SMALL impact on land use within the vicinity and along the shoreline. Forested land use (that is, the ability to harvest timber) will be affected in the long term on approximately 1068 ha (2639 ac. or 4.12 mi.^{2}) of the area within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contour because of the increase in the elevation of Harris Reservoir. This area will be cleared before the water rises to allow future boating activities along the expanded shoreline. Although tree

stumps will not be completely removed during logging, remaining tree stumps will not affect future boating activities. ER Section 4.3 addresses the ecological effects of this clearing. Infrastructure near the perimeter will be affected in the short term by rising waters. Affected structures will be moved to higher ground and are expected to be available for use by the start of HAR operation. Boat ramps are expected to be available for use throughout construction activities. Use of these structures will not be adversely affected in the long term.

4.1.1.2 Land Use Secondarily Affected by Construction

The closest communities to the primary area of construction (that is, the HAR site) in the eastern sectors include (Reference 4.1-005):

- City of Apex, population 20,212, located 13.9 km (8.6 mi.) northeast.
- Town of Holly Springs, population 9192, located 10.9 km (6.8 mi.).
- Town of Fuquay-Varina, population 7898, located 15.7 km (9.8 mi.) east.

No undesirable land use impacts will occur to these communities from preparation and construction.

Land use impacts to nearby communities or properties would be the result of an increased construction labor force (up to 3150 new employees) in the area. A small percentage of the construction labor force may opt to relocate to the vicinity. However, based on the discussion in ER Subsection 2.5.2 and Section 4.4, adequate property and community services are available to support relocated workers. It is anticipated that minimal infrastructure and/or expanded development will be required to accommodate their needs. As discussed in detail in Section 4.4, a significant amount of the labor force needed for construction of the HAR would not permanently relocate to the vicinity but would commute from within the region.

ER Figure 2.2-1 in Subsection 2.2.1 shows the land use within the vicinity. Such land uses include:

- Recreation
- Roadways
- Significant natural areas
- Waterfowl habitat
- Streamside management zones
- Wetlands

- Mineral resources

4.1.1.2.1 Recreation

Normal recreational practices near the HAR site will not be altered during construction until the relocation of infrastructure begins and/or the reservoir level begins to rise. Current infrastructure proposed for removal or modification includes the following (Reference 4.1-004):

- Boat launch facilities
- Multiple segments of roadways
- Harris Lake County Park
- Other infrastructure:
  - Wake County Fire Training Facility
  - Affected firing ranges
  - PEC facility buildings
  - Transmission towers

4.1.1.2.1.1 Boat Launch Facilities

Five boat launch facilities on Harris Reservoir will be impacted by the increased water level. One boat launch is located in Harris Lake County Park (car-top boat launch) and will be mitigated along with the park, as discussed above. The locations of the other four boat launch facilities are shown on Figure 4.0-9 with labels bl-01 through bl-04. Two boat ramps were installed for PEC use (bl-02 and bl-03) and will be relocated if needed by PEC prior to inundation. Two boat launch facilities are available for public use on Harris Reservoir — Holleman's Crossing boat launch facility (bl-01) and the North Carolina Highway 42 (Highway NC-42) (Dam Site) boat launch facility (bl-04) (Reference 4.1-004).

The impact to Holleman's Crossing and Highway NC-42 boat launch facilities from a rise in water level to 73.2 m (240 ft.) NGVD29 will be significant, because both facilities will be at least partially inundated. PEC is committed to mitigating, as necessary, the losses resulting from the increased water level at both of these publicly used facilities.

At the Holleman's Crossing boat launch, the two ramps (bl-02), 56-space parking lot (pl-01), and a portion of the access road from Bartley Holleman Road (rd-02) will be inundated. At the Highway NC-42 boat launch, the two ramps (bl-04) and one-half of the 66-space parking lot (pl-02) will be inundated.

The boat ramps will be relocated uphill from their current locations. Portions of the existing paved areas are located above 73.2 m (240 ft.) NGVD29, therefore, only a small area of land will need to be cleared for boat ramps and parking areas. Relocation of boat launch facilities will comply with relevant regulations and best management practices (BMPs) to minimize the potential for adverse effects. The impact on land use from these relocations will be SMALL.

4.1.1.2.1.2 Roadways

Multiple roadways exist within the 67.1- to 73.2-m (220-ft. to 240-ft.) NGVD29 contour (Figure 4.0-7). In-use roadways, along with associated infrastructure (bridges and culverts) will be reconstructed in their current locations to accommodate the rise in the reservoir's elevation. Modification of roadways, bridges, and culverts will comply with relevant regulations and permits. Appropriate BMPs will be implemented to minimize the potential for erosion and sedimentation. Effects from road relocation or reconstruction would be limited to clearing and placing fill to expand the road base to support the new elevated roadway.

The site and vicinity contains highways, county roads, and unimproved or unmaintained roads within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contour that will be affected by the Harris Reservoir level rise to 73 m (240 ft.) NGVD29, as shown on Figure 4.0-7. Approximately 4873 m (15,988 ft.) of public roads will be affected by the rise in reservoir level. The rise in reservoir elevation will require enhancements to the existing roads. In-use roadways, along with associated infrastructure (bridges and culverts), will be reconstructed in their current locations, whenever possible, to accommodate the rise in the reservoir's elevation. Road enhancements may impact adjacent land; therefore, the purchase of adjacent lands may be required. Assuming that the top surface of the reconstructed roads will be at an elevation of 75.96 m (249 ft.) (100-year flood level of 74.1 m [243 ft.] plus 1.8 m [5.9 ft.] for wind/wave action) and that 30.5 m (100 ft.) of road on each side of the affected section will need to be resurfaced, an estimated 4873 m (15,988 ft.) of paved roads will be affected.

PEC initially contacted the North Carolina Department of Transportation (NCDOT) in April 2007 and held a meeting in August 2007 to discuss the HAR site and its potential effects on local roadways. The NCDOT may require temporary bypasses across Harris Reservoir and other locations. Inundation would occur gradually as the reservoir level rises.

The names and lengths of road segments projected to be affected by the rise in the water level of Harris Reservoir and potential mitigation alternatives are described below. The road abbreviations referred to in this subsection (for example, rd-101) are global positioning system (GPS) locations collected in the field and are shown on Figure 4.0-7.

Highway NC-42 drops to an elevation of 73.5 m (241.0 ft.) NGVD29 near the southwest corner of Harris Reservoir as shown on Figure 4.0-7 (rd-101). An

estimated 236 m (777 ft.) of Highway NC-42 will need to be resurfaced to avoid impacts from wind and wave action and a 100-year flood event. A dike could be installed or this section of road could be raised to prevent inundation during periods of flooding. (Reference 4.1-004)

Local roads with sections that dip below 73.2 m (240 ft.) NGVD29 include Rex Road (section between rd-105 and rd-106), New Hill-Holleman Road (section between rd-31 and rd-107, and section between rd-108 and rd-109), Shearon Harris Road (rd-114), Holly Springs/New Hill Road (section between rd-112 and rd-113), Cass Holt Road (section between rd-102 and rd-103), and Sweet Springs Road (rd-104) (Reference 4.1-004).

An approximately 587-m (1927-ft.) section of Rex Road (section from rd-105 to rd-106) will need to be improved to avoid inundation (Reference 4.1-004). A bridge or causeway will need to be constructed. Construction of this future crossing may affect adjacent landowners on both sides of Rex Road.

Two sections of New Hill-Holleman Road (section between rd-31 and rd-107 and section between rd-108 and rd-109) will be affected. An estimated 1072-m (3519-ft.) section, including the existing bridge over White Oak Creek will need to be expanded and raised for boat clearance. A second bridge will need to be built over Little White Oak Creek. The section of road that will be affected is estimated to be 597 m (1960 ft.). (Reference 4.1-004)

The three depressions on Shearon Harris Road (rd-110, rd-114, and rd-115) and the causeway to the plant site (rd-33) are located above 73.2 m (240 ft.) NGVD29. These road sections will not be directly inundated; however, they could potentially be affected by wind and wave action during a 100-year flood event. An estimated 583 m (1914 ft.) of Shearon Harris Road and 427 m (1402 ft.) of the causeway will need to be improved. (Reference 4.1-004)

A section of Holly Springs/New Hill Road (section between rd-112 and rd-113) will be inundated. A bridge will need to be constructed over the White Oak Branch of Harris Reservoir. The construction is estimated to affect a 510-m (1675-ft.) section. (Reference 4.1-004)

Cass Holt Road (section between rd-102 and rd-103) and Sweet Springs Road (rd-104) are gravel roads with small bridge crossings over a tributary of Buckhorn Creek. These bridges will need to be lengthened to span the inundation from Harris Reservoir. The construction is estimated to affect 273 m (895 ft.) of Cass Holt Road and 282 m (925 ft.) of Sweet Springs Road. (Reference 4.1-004)

Several roads around the HNP and the Harris Energy & Environmental Center (HEEC) are likely to be affected. The old construction road that enters the plant at the north (rd-32) is located below 73.2 m (240 ft.) NGVD29 at the eastern end of the earthen dam on which the road was constructed. An estimated 416 m (1364 ft.) of road will need to be improved. Approximately 442 m (1450 ft.) of the HEEC sewage treatment plant access road (rd-01) is likely to be inundated. The

lower HEEC entrance road, near New Hill Holleman Road (section between rd-11 and rd-13) is located below 73.2 m (240 ft.) NGVD29 and, therefore, will be inundated. (Reference 4.1-004)

Two sections of the Town of Cary Police Department firing range access road are located below 73.2 m (240 ft.) NGVD29 and will need to be mitigated (rd-34).

In addition, several unimproved or unmaintained roads will be inundated relocated or modified when the water level is increased (Reference 4.1-004). These roads are located on PEC property and only used by PEC for access to its property. These roads will not be relocated or modified.

Approximately 3150 additional work trips during peak hours will occur on the roads and highways during construction. However, the roads and highways will not be unduly congested except for brief periods (10 to 15 minutes) during the beginning and ending of shifts. Subsection 4.4.2.8 discusses this analysis in more detail. To determine the impact of additional workers on traffic, average daily traffic counts for nearby routes were obtained from the NCDOT website (Reference 4.1-010). Based on the addition of the average daily traffic counts and the expected number of additional trips resulting from construction, the additional construction activity would not put an excessive burden on the roadways near the HAR site.

4.1.1.2.1.3 Harris Lake County Park

Located in Wake County approximately 32 km (20 mi.) southwest of Raleigh, Harris Lake County Park opened to the public in 1999. The 275-ha (680 ac.- or 1.06-mi.^{2}) park is owned by PEC and leased to Wake County Parks, Recreation, and Open Space who manages the park. During FY 2005 to 2006, the park received 107,000 visitors, with a peak of approximately 1000 visitors per day. Recreation is the primary reason people visit the park. Recreational activities at the park include playing disc golf, mountain biking, playground use, and fishing.

Approximately 41 percent (113 ha [279 ac. or 0.44 mi.^{2}]) of the park is located at an elevation below 73.2 m (240 ft.) NGVD29 and will be inundated when the water level rises (Reference 4.1-004). The U.S. Geological Survey (USGS) has designated that land use for this portion of the park will change from a forested land-use category to water bodies.

Most of the park facilities are located below 73.2 m (240 ft.) NGVD29 and will be inundated (Reference 4.1-004). The Harris Lake County Park facilities that will be affected by the rise in water level include the following:

- Three sections of County Park Drive.
- Sections of gravel (maintenance) roadways.
- Three parking lots.

- Three shelters.
- A fishing pier.
- An amphitheater.
- A restroom building.
- A playground and picnic area.
- A car-top boat launch.
- The Buckhorn Disc Golf Course.
- The Peninsula Hiking Trail.
- Three mountain bike trails (Hog Run – beginner, intermediate, and advanced).
- The flower gardens.
- The Shearon Harris Longleaf Pine Management Area.

PEC is committed to relocating the park services affected by the increased water level. PEC met with Wake County in July 2007 to discuss the proposed plans and potential impacts to the park, and is committed to working with Wake County to ensure impacts to the park are minimized. Park facilities will be removed or relocated during the construction phase and prior to the water level increase. There will be temporary impacts during construction while the park facilities are relocated. The overall recreational impacts from construction will be SMALL and short-term.

4.1.1.2.1.4 Other Infrastructure

PEC has identified other infrastructure that will be located below 73.2 m (240 ft.) NGVD29 and will be inundated from the increased lake level (Reference 4.1-004). The additional infrastructure that will be affected include the Wake County Fire Training Facility, the Shearon Harris firing range, the Town of Cary firing range, and transmission towers. In addition, the following PEC facilities will be impacted:

HNP Area

- HNP picnic area.
- Restroom near picnic area.

- Playground near picnic area.
- Old ball field near picnic area.
- Landfill 92-G.

HEEC

- Remote storage building for transmission lines.
- Laydown yard east of the Non-Destructive Examination (NDE) Bunker and Technical Training Facility II building.
- NDE bunker.
- Lineman training area.
- Reconductor training area.
- Access road to the sewage treatment plant.

Harris Reservoir Perimeter

- PEC firing range.
- Sidewalls of the Auxiliary Dam.
- Cooling tower blowdown pipeline access manhole.
- Numerous warning signs located along the current edge of Harris Reservoir.
- Two PEC boat ramps.
- Ten emergency siren towers along the shores of Harris Reservoir.
- Transmission line towers.
- Unused transmission tower foundations.
- Wood duck nesting boxes.

The affected portions of the infrastructure listed above will be modified or relocated during the construction phase of the HAR site, as needed. Construction activities will comply with relevant regulations and best BMPs to minimize the potential for adverse effects. The impact on land use from these relocations will be SMALL and short-term.

4.1.1.2.2 Significant Natural Areas

PEC property in the vicinity of the HAR site contains five areas that the North Carolina Department of Environment and Natural Resources (NCDENR) have identified as significant natural areas (Reference 4.1-011). Small portions of three of these areas (Holleman's Crossroads slopes, Utley Creek slopes, and Jim Branch/Buckhorn Creek forests) lie within the 4348-ha (10,744-ac. or 16.88-mi.^{2}) HAR site. ER Section 2.4 briefly describes these areas. In addition, PEC owns the Harris Research Tract, a 513-ha (1267-ac. or 1.98-mi.^{2}) parcel in the vicinity of the HAR site. North Carolina State University currently uses the Harris Research Tract for long-term forest research (Reference 4.1-001). PEC has also enrolled in the National Wild Turkey Federation's "Energy for Wildlife" program to integrate wildlife management activities into land management program decisions at the HAR site (Reference 4.1-001). Relocation of native species of vegetation observed during surveys to the degree practicable will reduce the long-term direct effects to vegetation. The North Carolina Wildlife Resources Commission and volunteer organizations will be consulted for relocation, with North Carolina Natural Heritage Program advising and monitoring any relocation.

4.1.1.2.3 Waterfowl Habitat

PEC cooperates with the North Carolina Waterfowl Association to conserve and enhance waterfowl habitat around Harris Reservoir. Since 1983, 77 wood duck nesting boxes have been installed around the shore of the reservoir. PEC volunteers, in cooperation with the Western Wake Ducks Unlimited chapter and Harris Lake County Park, annually inspect and maintain the wood duck boxes to ensure their continued use (Reference 4.1-001).

4.1.1.2.4 Streamside Management Zones

In areas managed for timber harvest, streamside management zones have been established along riparian zones. Riparian zones include intermittent streams, open water shoreline, and wetlands. These zones act as buffers to protect surface water habitats from erosion and chemical applications (Reference 4.1-012).

4.1.1.2.5 Wetlands

During a 2006 field observation, numerous wetlands were found within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours (Figure 4.3-4). Approximately 47 ha (117 ac. or 0.18 mi.^{2}) of wetlands are located within the 67.1- to 73.2-m (220-ft. to 240-ft.) NGVD29 contour. At the 67.1-m (220-ft.) NGVD29 elevation contour, numerous shallow wetland areas fringe the reservoir within the normal pool of the reservoir. Section 4.3 discusses wetland areas between the 67.1-m and 73.2-m (220-ft. and 240-ft.) NGVD29 contours that will be affected by Harris Reservoir's heightened elevation. ER Table 2.4-6 describes these areas. Approximately 47 ha (115 ac. or 0.18 mi.^{2}) of wetlands occurring

outside the reservoir fringe would be inundated by increasing the pool level to 73.2 m (240 ft.) NGVD29. Before the start of construction, wetland areas affected by the increased lake level will be delineated. Further, coordination with the appropriate regulatory agencies to address Clean Water Act (CWA) 404 and 401 requirements will occur and required mitigation will be completed before construction begins.

4.1.1.2.6 Mineral Resources

No mineral rights have been leased within the exclusion area and there are no outstanding mineral rights that could result in the production of either surface or subsurface minerals at the HAR site (Reference 4.1-005). However, a brick facility operates in the vicinity. No HAR-related construction activities will significantly affect the operation of this facility, nor will they affect existing mineral rights or land use at the brick operation.

4.1.1.2.7 Long-Term Impacts to Land Use Secondarily Affected by Construction

Based on the information provided in Subsections 4.1.1.2.1, 4.1.1.2.2, 4.1.1.2.3, 4.1.1.2.4, 4.1.1.2.5, 4.1.1.2.6, and 4.1.1.2.7, which outline the effects of construction on land use, impacts will generally be SMALL, short-term, and minimal.

4.1.1.3 Land Use Plans

No federal, state, or regional land use plans exist for this area. However, the surrounding counties have land use plans. Construction at the HAR site and in the vicinity will primarily affect Wake and Chatham counties. Although eight counties are within the region, only four counties may be primarily affected by construction at the HAR site. These counties — Wake, Chatham, Lee, and Harnett — are discussed in the following subsections. (ER Subsection 2.2.3 discusses the county plans in detail.)

4.1.1.3.1 Wake County

The “Southwest Wake Area Land Use Plan: Land Use Classification Map” shows the westernmost portion of Wake County as primarily residential with some office/research park and industrial uses along U.S. Highway 1 (Reference 4.1-013). Other large land areas include the Shearon Harris Game Lands, which are classified as forestry/light industry.

4.1.1.3.2 Chatham County

The area south and west of the HAR site is located in Chatham County. The Chatham County zoning categories for this area include heavy industrial use and office and institutional use along U.S. Highway 1 and Old U.S. Highway 1. Old U.S. Highway 1 is surrounded by low-density residential/agricultural use

(Reference 4.1-014). The area south of the proposed Cape Fear River intake and pumphouse site is primarily rural and undeveloped.

4.1.1.3.3 Lee County

The area immediately south of the intake structure and pumphouse on the Cape Fear River is located in Lee County. The southern edge of Buckhorn Dam abuts rural forested areas in the county. Sanford, which is located in central Lee County, is the largest population area. (Reference 4.1-015) The northern portion of the county is largely rural and undeveloped, with residential and industrial uses planned for the U.S. Highway 1 corridor that bisects the county. Long-range plans for the area note the need to promote development along highway corridors, but otherwise to maintain the area's open, rural character. The banks of the Cape Fear River are designated for conservation. (Reference 4.1-016)

4.1.1.3.4 Harnett County

Harnett County abuts the area immediately east and south of Lee County and Buckhorn Dam along the Cape Fear River. Northern Harnett County, which also abuts Wake and Chatham counties, experiences growth in that area because of the rapid population changes in Wake County. Harnett County's long-range plan has not been updated since 1976 (Reference 4.1-017). However, one study has been developed to address growth from Wake County, and Harnett County asserts that its long-range plan will be revised. Land use maps show conservation areas along the Cape Fear River.

4.1.1.4 HAR Site Restoration and Management Actions

Mitigation measures designed to lessen the impact of construction activities will be specific to erosion control, controlled access roads for personnel and vehicle traffic, and restricted construction zones. The HAR site preparation work will be completed in two stages. The first stage will consist of stripping, excavating, and backfilling the areas occupied by structures and roadways. The second stage will consist of developing the HAR site with the necessary facilities to support construction, such as construction offices, warehouses, trackwork, large unloading facilities, water wells, construction power, and construction drainage.

Grading and drainage will be designed to minimize erosion during the construction period. Action will be taken to restore areas consistent with existing and natural vegetation. Approximately 78 ha (192 ac. or 0.3 mi.^{2}) will be required for construction facilities, including permanent facility structures and laydown. To the extent possible, HNP roads will be used for construction traffic. If necessary, temporary gravel roads will be installed, along with HAR site grading and drainage facilities. This will permit all-weather use of the HAR site for travel and storage of materials and equipment during construction.

Land use impacts associated with the construction of the HAR site will be SMALL. Section 4.6 discusses associated measures and controls to limit environmental impacts.

4.1.2 APPURTENANT FACILITIES AND OFF-SITE AREAS

ER Section 3.7 describes the three new transmission lines and corridors and the associated switchyard that will be developed. Seven 230-kV transmission lines currently connect the HNP to the transmission system (Reference 4.1-001). Three new transmission lines will connect the 230-kV HAR 3 switchyard to the PEC electric grid. These transmission lines will be connected to the existing Fort Bragg, Erwin, and Wake substations. The existing maintained transmission corridors will be widened no more than 100 ft. to accommodate the proposed lines for HAR 3. The Fort Bragg, Erwin, and Wake lines run through primarily agricultural and undeveloped land. Of the 13.25 km^2 (5.11 $mi.^2$) or 3273 ac. that would be impacted by widening the existing lines, approximately 2 percent is residential land (ER Figure 2.2-3). Further, approximately 6 percent is open water and wetlands. More than 90 percent of the land impacted by the widening of the three existing corridors is agricultural or undeveloped land. Once specific effects from construction are identified, appropriate measures will be taken to minimize the disturbances. Because the new lines are expected to be adjacent to or within existing maintained transmission corridors, impacts are expected to be SMALL.

Approximately 1641 ha (4055 ac. or 6.3 $mi.^2$) will be inundated by the proposed increase in the water level of Harris Reservoir (Figure 4.0-7). The shoreline of Harris Reservoir will change from its current perimeter length of 139,379 m (457,281 ft.) to 239,063 m (784,327 ft.) following inundation. Consequently, land use will change from forested areas to cleared and inundated shoreline.

An approximately linear 75,438 m (247,500 ft.) of stream, which occurs between the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours, will be inundated by the water level increase. Affected streams include ephemeral, intermittent, and perennial streams (Reference 4.1-003).

The area proposed for inundation represents 33 percent of the HNP land. Approximately 1128 ha (2787 ac. or 4.35 $mi.^2$) of the area within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours is forested. Land in the perimeter will be cleared prior to the increase in water level to prevent interference with boating activities. Infrastructure that would be affected by the increase in water level will require relocation or reconstruction above the new water level. Figures 4.0-7, 4.0-8, 4.0-9, 4.3-1, 4.3-2, 4.3-3, and 4.3-4 show areas that would be affected by the increased water level.

This subsection includes information about the following appurtenant facilities and off-site areas:

- Subsection 4.1.2.1 — Blowdown Pipelines

- Subsection 4.1.2.2 — Transmission Line Construction
- Subsection 4.1.2.3 — Main Dam Modifications
- Subsection 4.1.2.4 — Cape Fear River Intake Structure and Pumphouse
- Subsection 4.1.2.5 — Makeup Water Pipeline Corridor

4.1.2.1 Blowdown Pipelines

Blowdown pipelines will be constructed to discharge water from HAR 2 and HAR 3. These pipelines will be placed adjacent to the existing blowdown pipeline that services the HNP. The synthetic blowdown pipelines, with diameters of less than 1.2 m (4 ft.), will extend westward into Harris Reservoir from the cooling towers of HAR 2 and HAR 3 (Figure 4.0-10). A barge will trench the blowdown pipelines into the bottom of Harris Reservoir and rocks will be added to prevent buoyancy. The trenches will not be wider than 1.2 m (4 ft.) and are not anticipated to be deeper than the top few feet of the lakebed. During trenching, turbidity barriers will be implemented to minimize increases in water column turbidity resulting from bottom disturbance. More detail on the impacts resulting from the installation of the blowdown pipeline is provided in Subsection 4.3.1.2.

Construction staging and laydown will occur within existing disturbed areas and along utility corridors. A narrow band of vegetation will be cleared along the edge of the roadway and utility corridors to accommodate safe vehicular movement and construction of the blowdown pipelines. Trenches will be open cut and spoil sidecast in upland areas along the existing ROWs. The trenches will be approximately 1.8-m (6-ft.) deep to accommodate the proposed 91-cm (36-in.) blowdown pipelines and allow for 0.9 m (3 ft.) of cover. Land use impacts associated with the construction of the blowdown pipelines will be SMALL.

4.1.2.2 Transmission Line Construction

Seven 230-kV transmission lines currently connect the HNP to the transmission system (Reference 4.1-005). These lines will also be used for HAR 2. Three new transmission lines will connect the 230-kV HAR 3 switchyard to the PEC electric grid. These transmission lines will be connected to the existing Fort Bragg, Erwin, and Wake substations. The three existing corridors will be widened no more than 100 ft. to accommodate the new lines. The proposed routing of the new lines for HAR 3 are being evaluated to be adjacent to or within existing maintained transmission corridors from the HNP.

PEC is a vertically integrated investor-owned company regulated by the State of North Carolina and the Federal Energy Regulatory Commission (FERC). Although PEC will bear the ultimate responsibility for defining the nature and extent of system improvements, as well as the design and routing of connecting transmission lines, separate agencies and reports are required to obtain licenses for the new transmission lines. (Reference 4.1-018)

The Fort Bragg, Erwin, and Wake lines run through primarily agricultural and undeveloped land (Figure 2.2-3). Of the 13.25 km^2 (5.11 $mi.^2$) or 3273 ac. that would be impacted by widening the existing lines, less than 2 percent is residential land, and less than 4 percent is wetlands. More than 90 percent of the land impacted by the widening of the three existing corridors is agricultural or undeveloped land. More detail is provided in ER Section 2.2. Construction activities would include vegetation-clearing and logging of existing forested land along potential ROWs. This impact will not be significant or noticeably alter significant existing land uses because the existing ROWs traverse land in active agricultural production. Minimal plots of land would be removed from agricultural production where new transmission towers would be sited. Land-clearing or construction activities in the ROWs would follow BMPs and would be mitigated to the extent possible. As a result, impacts of new transmission construction are expected to be SMALL.

4.1.2.3 Main Dam Modifications

The Main Dam to Harris Reservoir will be modified to safely allow the reservoir level to rise. Plans are underway to modify the Main Dam spillway crest from 220 ft. to 240 ft. NGVD29. Land use impacts associated with modifications of the Main Dam will be SMALL. No changes to land use are expected from this modification.

4.1.2.4 Cape Fear River Intake Structure and Pumphouse

To facilitate water needs for the HAR site, makeup water will be pumped from the Cape Fear River into Harris Reservoir through a pipeline constructed for that purpose. Construction impacts will arise from the construction of an intake and pumping structure at the Cape Fear River (Figure 4.0-5).

Dredging will be required in the channel of the Cape Fear River and the inlet at the confluence with the discharge channel. Disposition of this dredged material will require sediment analysis and identification of an acceptable disposal location. As needed, measures will be taken to eliminate the development of disease vectors (e.g., mosquitoes) within dredge spoil ponds.

Impacts from construction of the intake will be minimized by following BMPs. It is anticipated that the intake structure will be built on the Cape Fear River above the Buckhorn Dam, which is upstream of Lock and Dam 3. The hydrologic alterations resulting from the construction of the new intake structure and outfall are mainly related to sediment. The construction area will be temporarily isolated from the river by cofferdams, or similar structures, and dewatered. Special erosion and siltation control measures will be incorporated with construction to minimize impacts. Sediment deposition in the vicinity of the intake or outlet structures will be removed following construction. This work will be bounded by the requirements of a stormwater pollution prevention plan. Appropriate U.S. Army Corps of Engineers (USACE) regulations, NCDENR 401 Water Quality

Certification, and NPDES permits will be obtained for these activities, as necessary. Land use impacts associated with construction of the Cape Fear River intake structure and pumphouse will be SMALL.

4.1.2.5 Pipeline Corridor

The pipeline corridor and the pipeline from the corridor to Harris Reservoir within the Upper Cape Fear River Basin are in (Reference 4.1-019):

- NCDENR Division of Water Quality Sub-basin 030605
- U.S. Geological Survey 14-Digit Hydrologic Unit Codes 03030004020010, 03030004020020, and 03030002060170

The proposed Harris Lake makeup water system pipeline will be constructed in compliance with applicable federal and state regulations and guidelines, and with the specific requirements of the necessary permits. Construction and restoration will be conducted using typical cross-country construction techniques. An E&SCP will describe in detail the typical cross-country construction and restoration techniques and mitigation measures to be used for the pipeline. In addition, the Spill Prevention, Control, and Countermeasure Plan (SPCCP) will be developed prior to construction.

The pumphouse is proposed to be located in a small cove on the east side of the Cape Fear River, just north of Buckhorn Dam. The main operating elevation of the pumphouse will be 1.5 m (5 ft.) above the 100-year flood level of 52 m (170 ft.) NGVD29. An intake channel, with a width of approximately 10.7 m (35 ft.) and a depth of approximately 1.7 m (5.5 ft.), will be dredged into the cove. The channel will consist of reinforced concrete slab with sloped riprap sides. The intake structure and pumphouse will encompass approximately 1.4 ha (3.4 ac. or 0.0053 mi.^{2}).

A designated staging area (0.4 ha [1 ac. or 0.0016 mi.^{2}]) within the construction corridor will be temporarily used for construction refueling and storage throughout the duration of construction, which is proposed to occur in a 10-month period (Figure 4.0-4). This construction will be conducted in parallel with the construction of the Harris Lake makeup water system pipeline corridor and discharge structure. Effects associated with construction will be short-term direct and indirect.

The ROW for the makeup water pipeline crosses seven stream channels and contains two wetlands (ER Table 2.4-8) (Reference 4.1-003).

PEC will implement dust mitigation measures as necessary and at the discretion of the construction contractor or environmental inspector. Measures to minimize dust primarily will include using water trucks to dampen the ROW under dry, dusty conditions. Special consideration will be given to residential areas, as well as roadway areas where clear visibility is important.

Land use impacts associated with construction of the pipeline will be SMALL.

4.1.2.6 Potential Physical Impacts to Land Use from Construction

This subsection reviews potential physical impacts to land use from construction of the transmission lines and the pipeline corridor. Modifications to the Main Dam and the blowdown pipeline trench will also result in some physical impact to the reservoir, as described in the following subsections.

4.1.2.6.1 Potential Impacts to Land Use from Construction of Modifications to Harris Reservoir Structures

Construction activities on the dam spillway and blowdown pipeline trench are expected to have a short-term physical impact on land use in the area. For example, construction of the blowdown pipeline trench may result in local turbid areas in the lake and construction of the spillway changes may result in sedimentation along Buckhorn Creek below the dam. Proper mitigation and management methods implemented during construction will limit the potential water quantity and quality effects to the surface water (such as Harris Reservoir, stream crossings, and intermittent drainage ways) and groundwater.

PEC assumes that the Main Dam will be operated to maintain reservoir water levels at existing levels. There may be some clearing in forested areas to allow the use of roadways for construction equipment and laydown. However, it is anticipated that these activities will not adversely affect land use once the activities have been completed.

4.1.2.6.2 Potential Impacts to Land Use from Construction of Transmission Lines

Construction of new transmission lines is expected to have short-term and long-term physical impacts on land use. Three new transmission lines will connect the 230-kV HAR 3 switchyard to the PEC electric grid. These transmission lines will be connected to the existing Fort Bragg, Erwin, and Wake substations. The three existing transmission corridors will be widened no more than 100 ft. on one side to accommodate the new lines. As described in more detail in Subsection 4.1.2.2, the Fort Bragg, Erwin, and Wake lines run through primarily agricultural and undeveloped land (Figure 2.2-3). More than 90 percent of the land impacted by the widening of the three existing corridors listed above is agricultural or undeveloped land. Steps will be taken to fully evaluate and mitigate impacts from the construction of the new lines. ER Subsection 2.2.2 describes the locations of existing corridor routes, the area involved, and land use.

4.1.2.6.2.1 Long-Term Physical Changes in Land Use as a Result of Transmission Line Construction

Minor long-term physical changes in land use are expected from construction in the anticipated transmission corridor. Of the 13.25 km^2 (5.11 $mi.^2$) or 3273 ac. that would be impacted by widening the existing lines, less than 2 percent is residential land, and less than 4 percent is wetlands. When constructing the new transmission lines, floodplains and wetlands will be identified and avoided to the degree possible. Impacts that can not be avoided will be minimized and mitigated as required by applicable permit requirements. Adverse effects to water courses, wetlands, and floodplains within a transmission ROW will be avoided to the extent possible. Section 4.6 describes mitigation measures. Widening of the transmission corridors is not expected to change residential or agricultural land use in the areas impacted.

No federal, state, or regional land use plans exist for this area. However, the four counties affected by construction have land use plans, and most are updated annually. Subsection 4.1.1.3 provides details about these land use plans.

The anticipated transmission lines will not cause long-term changes to special agricultural resources, such as prime or unique farmland. No known significant mineral resources (sand and gravel, coal, oil, natural gas, or ores) are located within potential transmission corridors (Reference 4.1-005). No construction activities for the transmission corridor will take place within a coastal zone (Reference 4.1-007), a federal wild and scenic river (Reference 4.1-008), or a state natural and scenic river (Reference 4.1-009). Planning new transmission corridors will also consider lands that may be controlled or owned by Native American Tribes or groups.

4.1.2.6.2.2 Short-Term Changes in Land Use Resulting from Transmission Line Construction

Some minor changes to the land use may result from constructing transmission lines in the anticipated transmission corridors. However, these effects will be short-lived.

4.1.2.6.2.3 Construction Impacts on the Geologic Environment from Transmission Line Construction

The only construction impacts on the geologic environment will result from transmission tower erection. Some soil disturbance and re-grading may occur when the foundations for the transmission towers are constructed. This impact on land use is minor and mitigation measures are discussed in Section 4.6.

Transmission line construction would follow many of the same practices described for constructing the makeup water pipeline. The new transmission lines required to deliver power from HAR 3 could cross forest land and, possibly, residential land. Some land in the region is currently in seasonal agricultural

production. However, no adverse environmental effects are expected from line corridor construction. The principal land use impacts from construction activities within a potential ROW would be temporary, except in forested areas, where clearing will create permanent open areas. Construction-related impacts on land use in the new transmission line ROWs is expected to be SMALL.

4.1.2.6.3 Potential Impacts to Land Use from Construction of Pipeline

As noted in Subsection 4.1.1.1.1, the Harris Lake makeup water system pipeline, which will be constructed in a corridor approximately 30.5 m (100 ft.) wide, will run from the intake at the Cape Fear River to Harris Reservoir, a distance of roughly 6 km (4 mi.).

4.1.2.6.3.1 Long-Term Physical Changes in Land Use as a Result of Pipeline Construction

No long-term physical changes in land use are anticipated from construction in the intake structure, the pumphouse, and the pipeline corridor. The pipeline, which will be routed primarily along the Fayetteville transmission line ROW, will be trenched into the ground to the extent practicable. During pipeline corridor preparation, soil borings will be taken to determine if blasting or other methods should be used. Elevated pipe racks will be installed over power line crossings. Pier foundations will be installed in stream crossings to support the pipe racks.

No federal, state, or regional land use plans exist for this area. However, the county affected by construction has land use plans. Subsection 4.1.1.3 provides details about land use plans.

The pipeline corridor will not cause long-term changes to special agricultural resources, such as prime or unique farmland. No known significant mineral resources (sand and gravel, coal, oil, natural gas, or ores) are located within the pipeline corridor (Reference 4.1-005). No construction activities for the pipeline corridor will take place within a coastal zone (Reference 4.1-007), a federal wild and scenic river (Reference 4.1-008), or a state natural and scenic river (Reference 4.1-009).

The new pipeline will extend from the pumphouse on the Cape Fear River to Harris Reservoir (Figure 4.0-4). Generally, this pipeline primarily will follow the existing Fayetteville transmission line ROW for approximately 4.2 km (2.6 mi.). The remaining portion of the Harris Lake makeup water system pipeline corridor will run approximately 1.4 km (0.9 mi.) along Buckhorn Road, an existing access road, and through forested land adjacent to the proposed intake structure and pumphouse at the Cape Fear River.

To prepare the existing corridor along the access road (Buckhorn Road) for construction, an additional 22.9 m (75 ft.) will be cleared. The existing ROW will also require the clearing of an additional 15.2 m (50 ft.) of width. That is, an area of 9.7 ha (23.9 ac. or 0.037 mi.^{2}) will be cleared. Existing access roads along the

Cape Fear River, the transmission line corridors, and the cleared corridor from the transmission line to Harris Reservoir will be used. To minimize clearing, no new access roads will be constructed. Ecological protective equipment (such as construction mats and horizontal drilling) will be identified and used, as needed.

One staging area for construction refueling and storage along the transmission line corridor will be used. This area may need to be cleared prior to construction.

The Harris Lake makeup water system pipeline will be trenched into the ground to the extent practicable. During preparation, soil borings will be taken to determine whether blasting or other methods should be used. Elevated pipe racks will be installed over power line crossings. Pier foundations will be installed in stream crossings to support the pipe racks.

If limited blasting is necessary to install the pipeline, a blasting plan will be developed and implemented. Blasting will be limited by charge size or tamped. Ground acceleration from the blast will be low enough so that nearby building foundations will not be damaged from the initial shock or subsequent vibrations.

Construction will be conducted when conditions within streams are low flow or dry. Stabilization methods, such as seeding and erosion control matting, will be installed immediately following construction. The necessary federal, state, and local permits will be obtained before installing stream crossings. Stream effects will be minimized by adhering to permit requirements and following BMPs during clearing and construction activities.

A maximum area of 0.2 ha (0.6 ac. or 0.0009 mi.^{2}) will be disturbed at any one time during construction of the makeup water pipeline. Trenching will occur, followed by installation of the pipe and backfill. The area will then be re-graded, seeded, and maintained to restore terrestrial ecological habitat. People will not be allowed to re-enter the disturbed area until after re-growth has occurred.

The Harris Lake makeup water system pipeline will be constructed over an approximate 10-month period, along with construction of the intake and discharge structures. This schedule should provide enough flexibility so that pipeline trenching across drainage channels and streams would occur during dry periods.

Construction of the pipeline will involve temporary disturbances to topography. Some potential wetlands will be disturbed along the banks of the Cape Fear River during construction of the intake structure and pumphouse. Mitigation measures will be implemented as necessary and the appropriate permits will be obtained. For the most part, however, no long-term changes to the topography will result from the construction of the pipeline.

Construction of the pumphouse and intake structure will not affect long-term land use along the Cape Fear River. Short-term changes are discussed in the following subsections.

4.1.2.6.3.2 Short-Term Changes in Land Use Resulting from Pipeline Construction

Some minor impacts to land use may result from construction of the water intake structure, pumphouse, and pipeline corridor. However, it is expected that these effects will be minimal. Construction will occur in an existing, developed transmission corridor and along an existing access road. No new access roads will be required, and a small staging area for construction equipment will be dismantled and replanted with vegetation after construction. The pipeline will be trenched into the ground where possible.

4.1.2.6.4 Construction Impacts on the Geologic Environment from Pipeline Construction

Construction of the pipeline will have a localized affect on the geologic environment. Some soil disturbance and re-grading will occur with construction of the pipeline, and some minor sedimentation may occur during construction of the intake structure and pumphouse. This impact on land use will be SMALL. Section 4.6 discusses necessary mitigation measures.

4.1.3 HISTORIC PROPERTIES

Prior to construction of the HNP, the University of North Carolina conducted an archaeological investigation of the plant site. The survey was conducted in late fall 1978 and focused on the area to be impacted by plant construction and the area targeted for the planned reservoir. The area surveyed included approximately 1641 ha (4055 ac.) that would be inundated by the cooling water reservoir. Prior to initiation of the survey, there were no known archaeological sites within the impoundment area. During the course of the survey, 36 prehistoric sites and one historic site were discovered. Most of the sites found were on relatively flat terraces rimming more pronounced bluffs. The archaeological sites ranged from those containing only a few flakes to some containing a moderate concentration of artifacts, including diagnostic tools. All of the sites, which fell in the Woodland and Archaic periods ranging from 600 A.D. to 1000 A.D., were occupied for a relatively brief period of time. The investigation concluded that archaeological sites in the area have been significantly altered and influenced by erosion forces and historical land use practices. Sites in the HNP area were mostly occupied by the Middle and Late Archaic people and consisted of migratory bands of hunters that left artifacts similar in nature across North Carolina and the southeast United States. (Reference 4.1-020)

PEC has developed a policy consistent with the General Statutes (G.S.) of North Carolina designed to protect historic properties (Reference 4.1-021), and Section 106 of the National Historic Preservation Act (NHPA) (Reference 4.1-022). This policy is designed to protect known historic sites on PEC property. PEC has a policy to conduct assessments on projects that may have the potential to impact cultural resources (for example, archaeological, historical, or architectural). The

policy ensures appropriate identification of historic properties and consultation with the State Historic Preservation Office (SHPO) (Reference 4.1-023).

Although historic property surveys were conducted in the HNP area prior to construction of the HNP and Harris Reservoir, additional areas will be impacted by the HAR. Follow-up investigations, pursuant to Section 106 of the NHPA, will be required to identify the full extent of historic properties immediately adjacent to and within the HAR site area (Reference 4.1-024). Section 106 provides regulatory guidance on the identification, evaluation, and protection of historic properties. Much of the area for HAR 2 and HAR 3 facilities has not been surveyed. Construction of HAR 2 and HAR 3; construction of the intake structure and associated makeup water pipeline from the Cape Fear River to Harris Reservoir; and the increased operating water level of Harris Reservoir will affect areas that have not been surveyed.

According to NUREG-1555, with the construction of a new or expanded nuclear power plant, planned data and information on historic properties within 16 km (10 mi.) of the proposed plant are required. A cursory review shows significant modern disturbance within 16 km (10 mi.) of the HAR site (Reference 4.1-025).

PEC initiated consultation with the SHPO on August 14, 2006, regarding the two additional plants at the HAR site (Reference 4.1-026). The letter initiating consultation with the SHPO outlined the proposed undertaking at the HAR site and requested guidance regarding potential impacts on historic properties. Potential impacts identified included the following:

- Construction of HAR 2 and HAR 3.
- The increased reservoir level from 67.1 m (220 ft.) NGVD29 above mean sea level (msl) to approximately 73.2 m (240 ft.) NGVD29 above msl.
- The installation of an intake structure on the Cape Fear River.
- The installation of an intake water pipeline from the Cape Fear River to Harris Reservoir.

The SHPO responded to PEC on September 20, 2006, indicating that areas affected by the new plant, intake structure, and intake pipeline would require a Phase I archaeological investigation (Reference 4.1-027). In addition, a portion of the area around Harris Reservoir that will be inundated by an increase in the operating level of the reservoir will also require a Phase I archaeological investigation.

PEC contracted with New South Associates to address issues associated with historic properties at the HAR site.

4.1.3.1 Archaeological Survey

In autumn of 2006, New South Associates conducted an archaeological survey of a proposed pipeline corridor from the Cape Fear River to Harris Reservoir. The survey area consisted of a 61 m wide by 5.6 km long (200 ft. wide by 3.5 mi long) corridor that abutted either an existing transmission line ROW or an existing dirt road. The survey included background research, discovery through shovel testing at 30-m (98-ft.) intervals and surface survey, delineation, analysis, and reporting (Reference 4.1-028).

The proposed corridor included only one previously recorded site (31CH332) and no listed or nominated historic resources. Site 31CH332 was originally discovered in the 1970s, and a 2006 compliance review of the area indicated that the site no longer existed in 2006 (Reference 4.1-029).

The survey resulted in the discovery of the following three sites and two isolated finds (Reference 4.1-028):

- 31CH846, an eroded site containing prehistoric lithic artifacts.
- 31CH847/847, a surface deposit of twentieth century domestic artifacts and a sparse surface deposit of prehistoric lithic artifacts.
- 31CH848, a surface dump containing twentieth century cans and a glass jug.
- 31CH849, a single shard of salt-glazed stoneware from surface contexts.
- 31CH850, a single fragment of possible fire-cracked rock from plow zone contexts.

None of these resources can add significantly to our knowledge of the prehistory or history of Chatham County. All are recommended not eligible for the National Register of Historic Places (NRHP). The proposed Harris Lake makeup water system pipeline will not affect resources listed in, nominated to, or eligible for the NRHP. No further work is warranted, and clearance to construct is recommended (Reference 4.1-028).

The report generated by New South Associates documenting the findings of the archaeological survey on the Harris Lake makeup water system was submitted to the SHPO on May 16, 2007. The SHPO responded to PEC in August 2007 and concurred with the recommendations of the New South Associates report that none of the site referenced above are eligible for the NRHP and no further work is required. (Reference 4.1-030)

To address future findings during construction, PEC and New South Associates met with representatives from the SHPO to discuss the proposed path forward

for future findings during construction. The following subsections describe the approach that the PEC and SHPO have agreed upon.

4.1.3.2 Archaeological Reconnaissance and Geomorphological Investigation

New South Associates also conducted an archaeological reconnaissance and geomorphological investigation of the area around Harris Reservoir that will be inundated by the increased water level. The geomorphological investigations included a map and literature review and the excavation of 19 backhoe trenches in areas with high potential for deeply buried cultural strata. The investigations were successful both in verifying the potential for deep sites in certain areas and demonstrating that only high energy, modern deposits were present in other areas (Reference 4.1-025).

The archaeological reconnaissance identified areas of extreme modern disturbance, therefore, lacking potential for intact archaeological sites. The archaeological background noted that surveys near Harris Reservoir and for nearby Jordan Lake found a non-random distribution, with landform and slope traits positively linked with site locations (Reference 4.1-025).

4.1.3.3 Post-Application Activities

PEC has agreed to meet the requirements of Section 106 of the NHPA, prior to raising the reservoir level. PEC and its consultant have met with representatives from the SHPO's office to discuss this proposed path forward. The SHPO responded to PEC in August 2007 and concurred with the path forward on the Archaeological Reconnaissance and Geomorphological Investigation. (Reference 4.1-030)

To allow more time for planning and budgeting, PEC will complete the Phase I investigations after the HAR COLA is submitted. The Phase I Archaeological Survey will examine all high-probability landforms using screened shovel tests on a 30-m (98-ft.) grid interval. After eliminating low-probability areas resulting from modern disturbance, slope, or modern stream dynamics, it is estimated that approximately 498 ha (1231 ac. or 1.92 mi.^{2}) will require high-probability survey. In addition, approximately 29.2 ha (72.2 ac. or 0.11 mi.^{2}) of alluvial settings have a potential for cultural strata below the reach of shovel testing. Fifty 1-m by 1-m (3.3-ft. by 3.3-ft.) units will be excavated as an initial survey effort.

According to NUREG-1555, when new transmission lines are planned, data and information on historic properties within 1.9 km (1.2 mi.) of the proposed corridors are required. According to SHPO administrators, no electronic or database records exist for properties in potential corridors (Reference 4.1-031). When planning new transmission lines, existing historic properties will be considered and SHPO will be consulted.

Construction impacts on historic sites are expected to be SMALL, based on current information. As a result, no cost-benefit, removal plan, or preservation of resources is required. However, PEC will continue to review and assess sites before construction activities begin. If additional historic or cultural resources are discovered, the SHPO will be consulted and the appropriate studies will be undertaken.

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4.2 WATER-RELATED IMPACTS

This section describes proposed hydrological alterations and the potential water use effects from site preparation and construction phases of the HAR. The following items describe the scope of this evaluation:

- A listing of proposed construction activities that could affect hydrology, water quality, or water use. This includes HAR site preparation and construction of the following infrastructure:
  - HAR 2 and HAR 3.
  - HAR raw water pumphouse structure to supply makeup water to HAR 2 and HAR 3.
  - Construction related to raising the existing Main Dam spillway crest to 73.2 m (240 ft.) NGVD29.
  - Modification of the existing 230-kV switchyard for HAR 2.
  - Installation of three new transmission lines and a new 230-kV switchyard for HAR 3.
  - Blowdown pipelines.
  - Pumphouse on the Cape Fear River to supply makeup water to the Main Reservoir.
  - Harris Lake makeup water system discharge structure at the Main Reservoir to supply makeup water from the Cape Fear River.
  - Harris Lake makeup water system pipeline from the Cape Fear River intake structure to the discharge structure on the Main Reservoir.
  - New stormwater drainage outfalls from the HAR site.
  - Temporary drainage outfalls for use during construction.
- Descriptions of construction effects on surface water hydrology (water quantity and quality), surface water use, and groundwater.
- Proposed controls, practices, and procedures to minimize adverse construction effects on water quantity, water quality, and water use.
- An evaluation of compliance with applicable federal, state, regional, and local standards and regulations.

Primary construction will be confined to the HAR site, modification of the existing switchyard for HAR 2, the installation of three new transmission lines for HAR 3 and the 230-kV switchyard for HAR 3, the cooling tower blowdown pipeline corridor, and the Harris Reservoir makeup water pipeline corridor (including the Harris Reservoir makeup water discharge structure at the Main Reservoir and the Harris Reservoir makeup water pumphouse structure at the Cape Fear River). Figure 4.0-1 shows the new structures that will be constructed. In addition, once the HAR becomes operational, construction activities will occur to address effects to existing infrastructure. The effects of raising the reservoir level to 73.2 m (240 ft.) NGVD29 will be mitigated by the following construction activities:

- Relocating emergency siren towers from the current shoreline to the future shoreline (above 73.2 m [240 ft.] NGVD29).
- Constructing improvements to existing roads and bridges to raise them above 73.2 m (240 ft.) NGVD29.
- Building a new access road to the PEC WWTP.
- Building a new access road to the Town of Cary's firing range, because the current access road is below 73.2 m (240 ft.) NGVD29.
- Building a new PEC firing range to replace the existing firing range, which is partially located below 73.2 m (240 ft.) NGVD29.
- Building new facilities or relocating existing facilities to mitigate the loss of 93 ha (243 ac. or 0.38 mi.^{2}) of Harris Lake County Park.
- Building four new boat ramps, parking lots, and access roads to mitigate the loss of two existing public boat ramps (Holleman's Crossing boat ramp and North Carolina Highway 42) and two used by PEC.
- Renovating the Auxiliary Dam spillway to raise the sidewalls above 73.2 m (240 ft.) NGVD29.
- Building new PEC facilities to replace facilities located below 73.2 m (240 ft.) NGVD29. These facilities will include storage and maintenance structures, picnic area, restroom, playground, ball field, and electrical training area.

Proper mitigation and management methods implemented during construction will limit the potential water quantity and quality effects to surface water (for example, Main Reservoir, stream crossings, and intermittent drainage ways) and groundwater. The analysis in this section assumes that the Main Dam will be operated to maintain water levels at existing levels. The hydrologic effects of raising the water elevation are addressed in ER Section 5.2.

4.2.1 HYDROLOGIC ALTERATIONS

This subsection identifies and describes anticipated hydrologic alterations and the potential water-related effects resulting from the proposed construction activities. Effects of hydrologic alterations on consumptive water use are addressed in Subsection 4.2.2. Hydrologic alterations may result from the following HAR site preparation and construction activities:

- Alteration of the existing watershed surface, including buildings, structures, and paved surfaces such as parking lots and access roads.
- Temporary disturbance of the ground surface for stockpiles, materials storage, or temporary access roads.
- Construction of water intake and discharge structures.
- Construction of cofferdams and storm sewers.
- Dredging operations.
- Dewatering activities and other operations affecting water levels.
- Construction activities contributing to sediment runoff.
- Removal of woody vegetation and shrubs along the shore of the Main Reservoir, at the HAR site, and in the transmission corridors, the HAR blowdown pipeline corridor, and the pipeline corridor including the intake structure.

Potential hydraulic alterations that could result from these construction activities include:

- Changes in surface water drainage characteristics.
- Increases in impervious surfaces.
- Erosion and sedimentation.
- Changes in groundwater levels from dewatering activities.
- Subsidence resulting from groundwater withdrawals.
- Altering groundwater level and flow directions/gradient by raising reservoir level.

The following subsections discuss the possible hydrologic alterations and effects resulting from these construction-related activities. In addition, this discussion

describes practices that will be implemented to minimize the effects of hydrologic alterations and applicable federal, state, regional, and local standards and regulations that will be implemented.

Construction erosion control measures and stormwater controls are required under the following regulations:

- North Carolina G.S. Chapter 113A, Article 1 (Reference 4.2-001).
- North Carolina Sedimentation Pollution Control Act of 1973 (SPCA) (Reference 4.2-002).
- Wake County's Unified Development Ordinance (UDO), which includes erosion and sediment control, stormwater, and riparian buffer protection (Reference 4.2-003).
- Chatham County Soil and Erosion and Sedimentation Control Ordinance (Reference 4.2-004).
- Chatham County Flood Damage Prevention Ordinance (Reference 4.2-005).
- North Carolina's General Stormwater NPDES Permit for Construction Activities (Reference 4.2-006).
- North Carolina's Stormwater Management regulations (15A North Carolina Administrative Code [NCAC] 02H.1000) (Reference 4.2-007).
- Federal CWA (Reference 4.2-008).
- USACE's Section 404 wetland permit (Reference 4.2-009).
- USACE's Nationwide Permit 12 on utility line crossings of streams (Reference 4.2-010).
- NCDENR 401 Water Quality Certification (Reference 4.2-009).

These regulations will be followed during construction activities. In addition, specific erosion control measures will be implemented to minimize effects to Harris Lake (that is, the Main Reservoir and the Auxiliary Reservoir) and HNP operations.

4.2.1.1 Freshwater Streams and Harris Lake

The most considerable hydrologic feature related to the HAR site is Harris Lake, which consists of the Main and Auxiliary Reservoirs. The Main Reservoir provides the cooling water for the HNP. Under conditions of Main Dam failure,

the HNP would use the independent Auxiliary Reservoir for emergency core cooling (Reference 4.2-011).

The HAR site is located immediately north of the HNP, between the Thomas Creek and Tom Jack Creek branches of the reservoir system. The HAR would also use the Main Reservoir as a source for cooling water.

No hydrologic alterations of the watershed upstream of Harris Lake on Buckhorn Creek or the five tributaries (Tom Jack Creek, Thomas Creek, Little White Oak Creek, White Oak Creek, and Cary Creek) are expected to occur from construction activities at the HAR site. Construction to mitigate the effects of raising the Main Reservoir elevation may affect these tributaries. By using proper erosion and sediment controls, as required by law, these effects will be minimized.

Limited hydrologic alterations will occur on Harris Lake and its tributaries near HAR 2 and HAR 3 and, subsequently, on Buckhorn Creek downstream of Harris Lake. The alterations related to HAR site preparation and construction will generally increase the volume of runoff to the lake and may temporarily alter the quality of runoff to the lake, particularly related to sediment.

The use of heavy equipment during construction will compact soils. Construction activities will also increase the amount of impervious surfaces at the HAR site. Each of these actions will likely result in higher rates of stormwater runoff into Harris Lake and lower amounts of rainfall infiltrating to groundwater. These higher rates of runoff can increase in-stream erosion rates along small tributaries in the Buckhorn Creek Drainage Basin, which can locally increase sediment loads to Harris Lake.

The higher rate of stormwater runoff can also increase pollutant loads to Harris Lake. Grading and construction activities may temporarily increase siltation on and immediately downstream of the HAR site. During rainstorms, erosion from a cleared site is much higher than erosion from a vegetated site. However, erosion control measures, as required by permit regulations, will be implemented to minimize these inputs.

The North Carolina SPCA and North Carolina's general NPDES stormwater permit require the development of a plan to control erosion and sedimentation for construction activities that disturb 0.4 ha (1 ac. or 0.0016 mi.^{2}) or more of land (Reference 4.2-002 and Reference 4.2-006). Wake County's UDO also has an ordinance that meets the state requirements (Reference 4.2-003). The erosion and sediment control plan must include control measures that prevent sediment effects to water quality. BMPs must be implemented that will control sedimentation from the peak runoff generated by a 10-year storm.

During the HAR site preparation and construction phases, design measures will be incorporated to avoid concentrated flows that have a high potential to transport sediment. The construction of the HAR will incorporate visual

inspections of construction erosion control measures to monitor their effectiveness and to aid in determining whether other mitigation measures are necessary. In accordance with state and local regulations, cleared surfaces will be reseeded with native plants within 60 calendar days of construction completion. Fifteen-meter (15-m) (50-ft.) riparian buffers will be maintained on-site, as required by Wake County's UDO (Reference 4.2-003). These riparian buffers will serve as an additional protection measure. Impacts from the alteration of the existing watershed, including buildings, structures, and paved surfaces such as parking lots and access roads, will be SMALL.

During construction, potential effects to surface water quality in Harris Lake and its tributaries near the HAR site also include hydrocarbons from heavy equipment. Refueling will occur in a designated upland area to minimize the surface water quality effects from any spills that might occur. This impact to surface water quality would be SMALL.

By following the sedimentation and erosion control plan and the grading plan, implementing and maintaining BMPs to control sedimentation for the 10-year storm, and protecting riparian buffers, the effects to the surface water quality of Harris Lake and its tributaries will not be significant for the activities described previously.

Clearing trees along the shore prior to raising the Main Reservoir elevation to 73.2 m (240 ft.) NGVD29 will potentially impact Harris Lake as a result of sedimentation. These clearing activities will require a variance from the riparian buffer ordinance requirements included in Wake County's UDO. Forestry BMP guidelines will be followed to minimize the effects of erosion and sedimentation on Harris Lake (Reference 4.2-012). Barriers such as silt fences will be used to prevent sediment from reaching the lake. In addition, to the maximum extent practicable, construction activities will be scheduled to minimize the time the land is cleared. The land will be divided into small manageable areas, cleared, and then reseeded as quickly as possible. Impacts related to the clearing of existing trees and vegetation along the Main Reservoir will be SMALL.

Clearing trees around the Main Reservoir will also impact wetlands around the reservoir perimeter; if wetlands are classified as forested, they will be converted to scrub/shrub wetlands. This conversion impacts the ecological value of the wetland, but not the hydrologic value of the wetland.

Hydrologic alterations will not change the long-term quality of discharge to Buckhorn Creek from the Main Reservoir. Increased erosion during construction might slightly increase sediment concentrations and associated nutrients. These changes will be mitigated by incorporating construction erosion mitigation practices, as required by federal and state laws, and by adhering to stormwater BMPs after construction. Before water is discharged to Buckhorn Creek, any sediment load increases to the Main Reservoir will be buffered by the sediment removal capability of the reservoir. Construction activities related to raising the existing Main Dam spillway crest from 67.1 m (220 ft.) to 73.2 m (240 ft.)

NGVD29 will occur within the existing concrete structure and will have minimal impacts on the water quantity and quality of the Main Reservoir or Buckhorn Creek. As described previously, proper safeguards will be undertaken to minimize construction-related effects to Harris Lake, thereby preventing long-term effects to downstream habitats in Buckhorn Creek.

Corridor preparation work or construction activities may affect smaller streams and intermittent streams along the transmission corridors and the HAR Reservoir makeup water pipeline corridor. Such activities may include crossing the streams with the pipelines, mowing, removing woody vegetation, causing temporary disturbances along access routes for construction equipment, and digging small excavations for tower and pipeline base pads. These structure pads will be located in places with adequate separation from drainage ways and streams. Where construction or equipment traffic exposes soil, appropriate erosion control and revegetation methods will be applied. Disturbed areas at tower and pipeline pad sites are expected to be smaller than the sizes of disturbed areas that trigger federal and state requirements for permanent stormwater management facilities. All construction will comply with Wake and Chatham counties' erosion and sediment control ordinances and North Carolina's SPCA. Impacts related to corridor preparation and construction activities are expected to be SMALL.

Measures will be taken during construction to minimize effects to surface waters. The transmission lines will cross each stream at approximately a 90-degree angle to ensure stability and prevent erosion. Trenchless technology is a technique that can be used to minimize stream effects. However, where trenchless technology is not practicable, appropriate BMPs will be in place. These BMPs will follow USACE's guidance from Nationwide Permit 12 on utility line crossings of streams (Reference 4.2-010). (An individual USACE Section 404 permit [Reference 4.2-009] will be obtained to cover the overall wetland and stream effects related to construction of the HAR.)

Construction activities will cause only temporary effects to streams and wetlands. All construction will be performed in accordance with CWA Section 401 and Section 404 regulations and North Carolina's regulations concerning CWA Section 401 water quality certifications.

The area that will be cleared around the Main Reservoir is classified as floodplain. Article 14 of Wake County's UDO addresses flood hazard areas. Wake County's definition of development includes dredging, filling, and grading, and construction and preparation activities that will impact the floodplain. Thus, PEC will need to obtain a permit from the county for these activities. The Harris Lake makeup water system pipeline and pumphouse construction will impact floodplains in Chatham County. Chatham County also has a flood protection ordinance, and plans will need to be submitted to and reviewed by the County prior to construction activities. All activities will comply with Wake and Chatham counties' flood protection ordinances.

4.2.1.2 Cape Fear River

Construction of a new intake structure to supply makeup water to the Main Reservoir will temporarily affect the Cape Fear River. The hydrologic alterations resulting from the construction of the new structure will be primarily limited to sediment. Construction areas will be temporarily isolated from the river by cofferdams, or similar structures, and dewatered. The water will be pumped to a sedimentation basin, if necessary, and allowed to drain back into the river at a location away from the proposed intake structure. Construction activities will be designed to control shoreline and bank erosion and minimize effects on the Cape Fear River. Following construction, any sediment deposition near the structures will be removed. Appropriate USACE Section 404, NCDENR 401 Water Quality Certification (Reference 4.2-009), and NPDES permits will be obtained for these activities. Adhering to the conditions specified in these permits and authorizations will minimize these temporary effects. The impacts on the Cape Fear River will be SMALL.

4.2.1.3 Other Impacts to Harris Lake from Surface Disturbance

HAR 2 and HAR 3 will be located to the north of the HNP. Presently, the majority of the area for the proposed location of HAR 2 is covered with gravel or grass and graded to an elevation of 79.2 m (260 ft.) NGVD29 (Reference 4.2-011). The runoff from this area is collected and controlled by a stormwater drainage system and eventually discharged into either the Auxiliary or Main Reservoir. The proposed location for HAR 3 will require cutting and filling of the land surface, thereby altering the current drainage pattern. The construction of HAR 2 and HAR 3 and disturbances to the existing ground surface could increase the sediment load through runoff to Harris Lake. Grading and drainage during construction will be designed consistent with the erosion and sediment control plan to avoid erosion during construction.

Construction erosion and stormwater control measures will also be followed in newly disturbed areas used for material staging, parking, or other construction-related facilities. The preparations of these areas will temporarily or, in some cases, permanently alter the existing terrain and drainage by clearing, grading, transporting soil and spoils, and conducting other activities. Comprehensive construction erosion control measures will be employed to minimize the effects of the runoff and diminish siltation in the adjacent drainage ways and Harris Lake. Impacts to the disturbed areas used for material staging, parking, or other construction-related facilities would be SMALL, such as minimal soil erosion, effluent, and waste management.

During construction, a minimal amount of silt deposition in the drainage ways and Harris Lake will be unavoidable. However, erosion will be monitored and control measures implemented to minimize the potential for additional sediment deposition. Proper safeguards (such as sediment basins, silt fencing, and revegetation of disturbed areas) will be used to minimize sediment and nutrient transport to Harris Lake to prevent long-term effects on downstream habitats. An

erosion and sediment control plan will be filed for approval by NCDENR, Land Resources, as well as Wake County. Upon approval of the plan by Wake County, NPDES Phase II stormwater conditions for construction sites will also apply during construction and operation (Reference 4.2-013).

Surface disturbance from the construction of overhead transmission lines and the Harris Reservoir makeup water pipeline is expected to be limited and temporary. Such disturbance includes the removal of trees and shrubs, movement of construction equipment, and excavation for the foundations of the transmission line towers and pipeline structures. This disturbance is expected to be minimal, because the construction activities will be short-term or isolated at individual tower and pipeline base pads. The appropriate erosion control measures will be incorporated into the design contract documents to minimize the effects of disturbances that occur near the lake or other surface waters. To minimize erosion, ground disturbance will be reduced and native ground vegetation will be re-established following construction. An E&SCP will be established before construction in compliance with the SPCA of 1973. The plan will include a buffer zone, minimally exposed slopes, and installed erosion control devices. Impacts associated with the construction of the overhead transmission lines and the Harris Reservoir makeup water pipeline will be SMALL.

4.2.1.4 Other Impacts to Harris Lake from Subsurface Excavation Activities

In some areas, construction will involve excavation up to a depth of approximately 12 m (40 ft.) (elevation of 67.1 m [220 ft.] NGVD29) in accordance with the Westinghouse Electric Company, LLC, AP1000 Design Control Document, Rev. 16 (DCD). Although some of the soil may be used for backfill, the majority of the soil will be deposited in spoil and excavation areas that will be identified during the design phase. During construction, these spoil areas will be graded flat, compacted by normal construction traffic, and surrounded by a silt fence or a vegetated buffer strip to minimize water and wind erosion. If necessary, water will be sprayed on exposed soil to minimize wind erosion during dry periods. Vegetation will be grown on stockpiles to prevent erosion, as required by Wake County's UDO (Reference 4.2-003). Impacts caused by temporary disturbance of the ground for soil stockpiles will be SMALL.

4.2.1.5 Other Impacts to Harris Lake from Initial Increase in Lake Level from 67.1 m and 73.2 m (220 ft. to 240 ft.)

Harris Reservoir will be filled through a combination of natural fill due to rain and water withdrawal from the Cape Fear River in approximately 42 months of site preparation. Prior to filling, the forested area between 67.1 m and 73.2 m (220 ft. and 240 ft.) NGVD29 will be cleared of most trees. Trees between 72.2 m and 73.2 m (237 ft. and 240 ft.) NGVD29 are suggested to be thinned, but some will remain to limit erosion. Some existing plants will remain to discourage soil erosion. Maintenance of the lake level through pumping from the Cape Fear River may have an impact on lake water quality. Review of water quality data

compiled in ER Subsection 2.3.1, indicates that water quality is generally good in the Cape Fear River and similar to that of Harris Reservoir. However, nutrients are of critical interest in southeastern lakes due to their role in algal growth and subsequent eutrophication.

A number of differences exist between the Harris Reservoir and Cape Fear River water quality that could have impacts on long-term water quality and could change the overall characteristics of the lake these are discussed in ER Subsection 5.2.2.2.2. Although not directly assessed, it is expected that turbidity may increase in localized areas because of the inflow of water from the Cape Fear River, causing mixing and stirring up sediment from the lake floor. Water quality changes will need to be evaluated prior to permit application. Appropriate methods for this are discussed in Subsection 5.2.3.

The proposed initial increase in lake level from 67.1 m to 73.2 m (220 ft. to 240 ft.) NGVD29 will have a SMALL impact on water quality of Harris Reservoir for this initial filling period. Detailed analyses, discussed in Subsection 5.2.3, were conducted to evaluate potential impacts. Additional analyses may be required during the state permitting process to ensure that all state water quality standards are met, that any changes made to water quality are in compliance with the Water Pollution Control Act (WPCA).

4.2.1.6 Groundwater

A hydrologic alteration will result from construction activities including the permanent change in groundwater levels within the HAR site from grading and a series of stormwater drainage ditches. North of the HAR site is characterized as a topographic high (maximum ground surface elevation of approximately 91.4 m [300 ft.] NGVD29). The water table in the vicinity of the HAR site is directly influenced by this topographic high and occurs as a ridge-like mound northwest of HAR 2 and HAR 3. The position of the groundwater ridge marks a natural recharge area from which groundwater flows west toward the Auxiliary Reservoir, south toward the emergency service water discharge channel, and east toward the Thomas Creek Branch of the Main Reservoir. After grading, a series of stormwater drainage ditches, which will intersect the water table based on known elevations, will be dug around and within the construction area to direct stormwater away from HAR facilities. Stormwater drainage ditches installed in the northern area will have a bottom elevation of approximately 80.5 m (264 ft.) NGVD29, while drainage ditches closer to the HAR facilities will have a bottom elevation of approximately 78 m (256 ft.) NGVD29. These ditches will intercept the surficial groundwater flow from the north, preventing the continued groundwater flow toward HAR 2 and HAR 3. Deeper groundwater will only rise above the bottom of the ditches briefly following heavy rains.

The net effect of this lower grade elevation and this network of stormwater drainage ditches, which will intersect the water table based on known groundwater elevations, will be to effectively lower the existing water table around the plant construction and to avoid seepage into the construction area

and proposed facilities. Groundwater flow within the surficial material will be redirected toward these ditches from both the north and south sides and ultimately discharge into the Main Reservoir to the east. Potential impacts in surface water drainage characteristics and groundwater levels from the network of stormwater drainage ditches would be SMALL.

Expanding the width of the stormwater drainage ditches near the discharge points may provide an opportunity to create additional wetlands to meet wetland mitigation requirements. Close coordination with the appropriate resource agencies will be required before a definitive mitigation strategy is developed and the area is determined suitable. The channels and riparian zone along the edges of the channels could be planted with native vegetation such as cattails, sedges, and hydrophilic grasses. Any wetlands created could provide supplemental habitat for area wildlife.

In addition to the stormwater drainage ditches, hydrologic alterations anticipated from construction activities also include the temporary changes in groundwater levels from dewatering of excavations for proposed structures. Potential impacts that need to be considered during the design of the excavation and dewatering activities include the following:

- The amount of water that will need to be removed based on the embedment depth.
- Slope stability and subsidence issues that can occur when water is removed from the unconsolidated materials.
- The lateral extent of groundwater depressions caused by dewatering.
- The management and handling of the water removed from the excavation and its eventual discharge to the Main Reservoir.
- Changes in water quality.

In accordance with the DCD, the proposed maximum embedment depth of approximately 12 m (40 ft.) (elevation of 67.1 m [220 ft.] NGVD29) is below the static water table in the regolith and Newark Supergroup (upper Triassic Series) bedrock. Nested monitoring well pairs MWA-3S/D and MWA-8S/D were installed within the footprint of the reactor locations for HAR 2 and HAR 3. Surficial aquifer monitoring wells MWA-3S and MWA-8S recorded the highest groundwater elevations, which ranged from 78.2 to 79.3 m (256.6 to 260.2 ft.) NGVD29 and 77.9 to 78.4 m (255.5 to 257.1 ft.) NGVD29, respectively.

Excavation activities for the HNP did not include a permanent dewatering system. Groundwater seepage into the excavation was minimal because of the low permeability of the rock. Most inflow into the excavation was caused by rainfall, although minor seepage of groundwater occurred along joints and

bedding planes. The intermittent use of sump pumps drained the excavation. (Reference 4.2-014)

Dewatering of the excavation for construction may be required in the immediate area around the HAR site. The dewatering effluent obtained from the HAR 2 and HAR 3 excavations will be intermittently pumped and discharged to an adjacent drainage ditch and into the Main Reservoir. Measures will be implemented, such as sedimentation traps or filtration, to ensure that erosion or siltation caused by the dewatering will be negligible. Existing sediment basin facilities will be considered or new facilities constructed to accommodate dewatering flows. A limited amount of silt deposition in the drainage ditches and the Main Reservoir will be unavoidable. However, the effects of these activities will be confined to the construction period. They will be monitored and controlled using BMPs for sediment control. Proper safeguards will be implemented to prevent long-term effects on downstream habitats from construction activities. Potential impacts in groundwater levels from dewatering would be SMALL.

Based on available water quality data, groundwater removed from HAR site drainage ditches and excavations and discharged to the Main Reservoir will not affect the reservoir water quality. Groundwater samples were collected on September 12, 2006, from six nested monitoring well pairs (MWA-4S/D, MWA-7S/D, and MWA-9S/D) screened in the surficial and bedrock aquifers. The analytical results from these samples were compared to the North Carolina Fresh Surface Water Quality Standards (WQS) for Class WS-V Waters[1] (Reference 4.2-015). Groundwater parameters collected during this September 2006 sampling event, except for arsenic and total dissolved solids (TDS), were below the WQS for freshwater. Arsenic exceeded the WQS of 10 micrograms per liter (µg/L) or parts per billion (ppb) in monitoring well MWA-7D with a concentration of 12.2 µg/L (ppb) (Table 2.3.3-17 in the HNP ER). The average arsenic concentration for all six wells was 5.2 µg/L (ppb). TDS exceeded the WQS of 500 milligrams per liter (mg/L) or parts per million (ppm) in monitoring wells MWA-9S and MWA-9D with concentrations of 558 and 664 mg/L (ppm), respectively. The average TDS for all six wells was 457 mg/L (ppm). Average concentrations of arsenic and TDS were below the North Carolina WQS. However, the potential for changes in water quality will be considered during the design phase. In addition, water will be discharged to the Main Reservoir in accordance with NPDES permit conditions. (Reference 4.2-016)

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[1] "Class WS-V: waters that are protected as water supplies, which are generally upstream of and draining to Class WS-IV waters or waters previously used for drinking water supply or waters used by industry to supply their employees, but not municipalities or counties, with a raw drinking water supply source, although this type of use is not restricted to a WS-V classification. Class WS-V waters are suitable for all Class C uses. The Commission may consider a more protective classification for the water supply if a resolution requesting a more protective classification is submitted from all local governments having land use jurisdiction within the affected watershed; no categorical restrictions on watershed development or wastewater discharges are required, however, the Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of downstream receiving waters (15A NCAC 2B.0203). ("15 NCAC 02B.0218 Fresh Surface Water Quality Standards for Class WS-V Waters [1]")

If monitoring wells or piezometers were interfering with foundation excavations, they would be properly abandoned in accordance with applicable regulations (Reference 4.2-017).

4.2.2 WATER USE IMPACTS

The construction-related effects on water use are evaluated based on construction effects to water quality and quantity.

4.2.2.1 Freshwater Streams and Cape Fear River

No known communities, either upstream or downstream of Harris Lake, draw water from Buckhorn Creek for public water supply. The closest public surface water user downstream of the HAR site is in Lillington, North Carolina. Lillington is on the Cape Fear River, about 22 km (13.7 mi.) downstream from the confluence of the Cape Fear River and Buckhorn Creek. (Reference 4.2-018) No significant effects in the quantity or quality of flow are expected in Buckhorn Creek from construction-related activities. Construction effects on water quality and quantity in the Cape Fear River downstream of Buckhorn Creek are expected to be negligible. Lillington's water supply is not expected to be affected. Water use impacts from construction on the Cape Fear River will be SMALL.

The Town of Sanford and Lee County operate a water supply intake on the Cape Fear River upstream of Buckhorn Dam and the proposed water supply intake (Reference 4.2-018). The Town of Sanford and Lee County's water supply intake will not be affected from increased sedimentation during construction of PEC's water supply intake.

There may be a temporary impact on recreational use of the Cape Fear River upstream of Buckhorn Dam while the intake structure is constructed. A canoe input is located on the River below Buckhorn Dam.

The Cape Fear River floodplain will be impacted during construction of the intake structure. All construction activities will comply with Chatham County flood control ordinances.

4.2.2.2 Lakes and Impoundments

The HNP is the only major water user on Harris Lake. The HNP uses the Main Reservoir water for operational cooling and relatively smaller amounts for potable water and fire protection. During HAR construction activities, the main potential water use effect will be short term, consisting of temporary increases in the suspended solids concentrations of water drawn into the HNP's water systems. Long-term effects are less significant, consisting of temporary increases in the sediment loading to the Main Reservoir and the minimal loss of reservoir and associated ecological and cooling water storage capacity.

Specific practices identified in the erosion and sediment control plan will restrict the limited amount of additional sediment in stormwater related to construction activities. During construction of the proposed intake structure for HAR 2 and HAR 3, the HNP intake structure will be protected to prevent suspended sediment from entering the cooling system. Special construction techniques (such as watertight sheet piling with dewatering of submerged areas to expose the construction zone) will be implemented, where necessary, to prevent migration of suspended solids. Water collected from dewatering operations will be settled or filtered before water is allowed to return to the reservoir system.

No other industrial, municipal, commercial, or agricultural users of Harris Lake water exist (Reference 4.2-018). The potential exists for short-term construction-related changes in suspended solids concentrations that may have minor effects on fishing, swimming, or other recreational uses of the Main Reservoir. The minor and short-term nature of these effects, the implementation of a specific E&SCP, and the significant distance from recreational access points to the HNP site effectively limit potential effects and minimize the exposure of recreational users to these effects. A small quantity of water is likely to be needed from Harris Lake for HAR construction. Therefore, water use impacts for HAR construction will be SMALL.

Two public boat ramps (Holleman's Crossing boat ramp and NC Highway 42 boat ramp) and two boat ramps used by PEC will be relocated to accommodate the increase in Main Reservoir elevation. PEC has indicated that the ramps will be kept in place during construction so there should be no recreational loss during construction. There will also be a temporary impact on recreational use of Harris Lake County Park while some facilities are relocated. Water-related uses impacted at the park include boating and fishing (the park has a fishing pier). To minimize the time that the facilities are affected, new facilities could be constructed prior to filling the Main Reservoir. Thus, construction should not impact the use of existing facilities, other than during relocation of facilities.

Preparation activities (clearing trees) will occur within a designated floodplain, but these activities will not impact the floodplain function. PEC will comply with the flood hazard area section of Wake County's UDO.

Construction of the HAR 3 cooling tower will result in filling a small (approximately 2 ac. or 0.003 $mi.^2$) constructed pond. This pond was created during construction of the first reactor as a source of water for fire control until Harris Reservoir filled but has not been used since the reservoir filled. There are no industrial, municipal, commercial, or agricultural users of this pond.

4.2.2.3 Groundwater Use

As discussed in Subsection 4.2.1.3, the construction of HAR 2 and HAR 3 will cause localized effects to ambient groundwater levels. In September 2006, PEC performed a water use survey as part of the annual HNP Land Use Census Survey for the HNP (Reference 4.2-003). The closest residents located relative to

the HAR site were surveyed concerning drinking water sources (groundwater, surface water, or public water supply) and well details, if known. The closest resident is about 1.9 km (1.2 mi.) from the HAR site in the north-northwest direction (ER Subsection 2.3.2.3). Visual observations confirmed that residents had water wells located on the associated property. Private water well depths ranged from 22.9 to 109.7 m (75 to 360 ft.) below ground surface and were completed within bedrock aquifer systems. No other water well details or usage rates were available from private residents. (Reference 4.2-019)

Based on the information available, including the distances from HAR 2 and HAR 3 and the depth of existing wells, dewatering of the surficial and bedrock aquifers during construction activities is not expected to have an adverse effect on local water wells. During construction, the potential for effects attributable to construction dewatering and other activities will be evaluated using on-site monitoring wells and piezometers (ER Section 6.3). Potential impacts to the local water table from construction dewatering activities would be SMALL.

4.2.3 REFERENCES

4.2-001 North Carolina General Assembly, North Carolina General Statute 113A-1,,North Carolina Environmental Policy Act of 1971," *Environmental Policy Act*, Article 1, 1971.

4.2-002 North Carolina Department of Environment and Natural Resources, Division of Land Resources, "Sedimentation Pollution Control Act of 1973 (SPCA), (As amended through 1999) North Carolina General Statutes Chapter 113A, Article 4, Website, www.dlr.enr.state.nc.us/pages/sedimentpollutioncontrol.html, accessed December 14, 2006.

4.2-003 Wake County Government, "Wake County Unified Development Ordinance," Article 17, General Site Design and Performance Standards, April 17, 2006.

4.2-004 Chatham County, "Soil Erosion and Sedimentation Control Ordinance," March 21, 2005, Revised January 1, 2006.

4.2-005 Chatham County, "Flood Damage Prevention Ordinance."

4.2-006 North Carolina Department of Environment and Natural Resources, Division of Water Quality, "Stormwater Unit :: NPDES Phase I Stormwater Program," Website, h2o.enr.state.nc.us/su/NPDES_Phase_I_Stormwater_Program.htm, accessed February 23, 2007.

4.2-007 North Carolina Administrative Code, "ENR-Environmental Management Commission T15A: 02H .1000," Section .1000 - Stormwater Management, 15A NCAC 02H .1001, December 1, 1995.

4.2-008 U.S. Environmental Protection Agency, Wetland Regulatory Authority, “Regulatory Requirements.”

4.2-009 North Carolina Department of Environment and Natural Resources, Division of Water Quality, “Pre-Construction Notification (PCN) Application Form For Section 404 and/or Section 10 Nationwide, Regional and General Permits, Section 401 General Water Quality Certifications, and Riparian Buffer and Watershed Buffer Rules,” March 2005.

4.2-010 U.S. Army Corps of Engineers, "Decision Document Nationwide Permit 12."

4.2-011 Carolina Power & Light Company, "Shearon Harris Nuclear Power Plant Final Safety Analysis Report,” Amendment 27, 1983.

4.2-012 North Carolina Administrative Code, “NC Forest Practices Guidelines Related To Water Quality - 15A NCAC 1I .0100 -.0209.”

4.2-013 North Carolina Department of Environment and Natural Resources, Division of Water Quality, “Stormwater Unit: NPDES Phase II Stormwater Program,” Website, h2o.enr.state.nc.us/su/NPDES_Phase_II_Stormwater_Program.htm, accessed March 6, 2007.

4.2-014 Carolina Power & Light Company, “Shearon Harris Nuclear Power Plant Final Safety Analysis Report,” Amendment 15, 1983.

4.2-015 North Carolina Department of Environment and Natural Resources, Division of Water Quality, “Redbook' Surface Waters and Wetland Standards,” NC Administrative Code 15A NCAC 02B .0100 and .0200, amended effective: April 1, 2003.

4.2-016 CH2M HILL, “Memorandum: Data Validation Summary – Shearon Harris Nuclear Plant Water Quality Sampling,” October 11, 2006.

4.2-017 North Carolina Administrative Code, “Subchapter 2C – Well Construction Standards, Section .0100 – Criteria and Standards Applicable to Water-Supply and Certain Other Type Wells,” 15A NCAC 02C .0101.

4.2-018 North Carolina Department of Environment and Natural Resources, Public Water Supply Section, “Attributes for data located within specified buffer zone of Non-Transient Non-Community,” using NC SWAP info (Computer Application), Website, 204.211.89.20/Swap, accessed June 19, 2006.

4.2-019 Progress Energy Carolinas, Inc., Letter to Busch Goncarovs, “2006 HNP Land Use Census,” October 3, 2006.

4.3 ECOLOGICAL IMPACTS

This section evaluates the terrestrial and aquatic ecological impacts related to construction of the HAR 2 and HAR 3 and several appurtenant facilities (Figure 4.0-1). These appurtenant facilities include electric transmission lines, an electric switchyard, modifications to the dam at Harris Reservoir, intake structure and pumphouse, the Harris Lake makeup water system pipeline, a discharge structure on Harris Reservoir, and blowdown pipelines from HAR 2 and HAR 3 into Harris Reservoir.

This section includes information about both terrestrial ecosystems and aquatic ecosystems.

4.3.1 TERRESTRIAL ECOSYSTEMS

Potential effects to important species are described within this document. “Important species” are those species meeting the criteria described in NUREG-1555 as defined as follows:

- State- or federally listed threatened, endangered, or species of concern.
- Federally proposed for listing or candidate threatened or endangered species.
- Commercially or recreationally valuable species.
- Species essential to the maintenance and survival of species that are rare and commercially or recreationally valuable.
- Species critical to the structure and function of the local terrestrial or aquatic ecosystem.
- Species that may serve as biological indicators to monitor the effects of the facilities on the terrestrial or aquatic ecosystem.

Although other species with specific designations in the state have the potential to exist within the HAR, the evaluation of impacts in this document will focus on those considered “important species” consistent with the previous definition.

4.3.1.1 Plant Site

The HNP site covers 178 ha (440 ac. or 0.69 mi.^{2}) (Reference 4.3-001). The addition of HAR 2 and HAR 3 affects approximately 78 ha (192 ac. or 0.3 mi.^{2}) (Reference 4.3-002). This area experiences ongoing disturbance resulting from the operation of the HNP (Reference 4.3-003). Portions of the areas that will undergo permanent and temporary re-surfacing currently contain infrastructure, parking areas, and roads associated with the HNP. Figure 4.0-2 shows the affected areas.

Within the 78-ha (192-ac. or 0.3 mi.^{2}) HAR 2 and HAR 3 construction area, the following areas will be re-surfaced:

- Approximately 48 ha (118 ac. or 0.18 mi.^{2}) will be permanently re-surfaced for the construction of HAR 2, HAR 3, and associated infrastructure. This includes asphalt or crushed stone covering 42 ha (103 ac. or 0.16 mi.^{2}), with seeded topsoil covering the remaining 6 ha (15 ac. or 0.023 mi.^{2}) (Table 4.3-1) (Reference 4.3-002).

- Approximately 30 ha (74 ac. or 0.12 mi.^{2}) within the plant site will be covered with crushed stone and used for temporary construction purposes. This includes 10 ha (24 ac. or 0.038 mi.^{2}) for construction parking, 7 ha (18 ac. or 0.028 mi.^{2}) for construction offices and a warehouse, and 13 ha (32 ac. or 0.05 mi.^{2}) for construction laydown (Table 4.3-1) (Reference 4.3-002).

Increased stormwater flows from re-surfaced areas will not result in impacts related to flooding because stormwater channels will be properly designed and Harris Reservoir can accommodate increased volumes. The following paragraphs discuss the potential for sedimentation and erosion impacts from construction areas.

HAR site preparation activities will occur in two stages:

1. The first stage will include stripping, excavating, and backfilling areas occupied by structures and roadways.

2. The second stage will involve the development of facilities to support construction (for example, construction offices, warehouses, construction drainage).

Construction and erosion control measures and stormwater controls, as discussed in Subsection 4.2.1, are applicable to this subsection and will be followed during clearing, preparation, and construction activities. On-site grading and drainage will be designed to minimize erosion during the construction period. The terrestrial ecosystems will experience short-term direct and indirect effects from preparation and construction activities.

Sedimentation is a primary short-term adverse effect associated with both clearing and construction. The potential for other short-term effects, such as a degradation of water quality over time, also exist from clearing and construction. Clearing and construction will be conducted in a manner that minimizes sedimentation by complying with federal, state, and county regulations and ordinances. Section 4.2 more thoroughly discusses BMPs, including sedimentation control measures. Erosion and sedimentation control devices will be maintained, regularly inspected, and re-assessed following storms. The North Carolina Wildlife Resources Commission's (NCWRC's) "Guidance Memorandum

to Address and Mitigate Secondary and Cumulative Effects to Aquatic and Terrestrial Wildlife Resources and Water Quality" will be used when developing a sediment and erosion control plan and when planning updated riparian zone buffer management following construction (Reference 4.3-004).

Land disturbance will be planned and conducted to minimize the extent and duration of disturbance of stream channels. Any necessary stream crossings will be as close to perpendicular to stream flow as possible. These stream crossings will be monitored quarterly during the first 24 months of clearing and construction, as well as annually if construction continues for a duration exceeding 24 months (Reference 4.3-004).

Permanent roads with a total linear length of 10,424 m (34,200 ft.), with widths ranging from 7.9 m to 9.8 m (26 ft. to 32 ft.), will be constructed. Roads will require the commitment of a total area of 9.7 ha (23.9 ac. or 0.037 mi.^{2}), resulting in both short-term and long-term adverse effects (Reference 4.3-002). An asphalt-paved access road 4724 m (15,500 ft.) long and 9.8 m (32 ft.) wide will be constructed along an existing unpaved road partially running parallel to U.S. Highway 1 (Figure 4.0-11). Two additional asphalt-paved roads will be constructed within the footprint of HAR 2 and HAR 3. One road will be 3048 m (10,000 ft.) long and 9.8 m (32 ft.) wide and the other will be 2652 m (8200 ft.) long and 7.9 m (26 ft.) wide (Reference 4.3-002).

Construction dust will be controlled to minimize short-term effects such as sedimentation to streams and Harris Reservoir and degradation of water quality. Measures to control construction fugitive dust include wetting the area, as necessary, and using erosion and sedimentation control measures.

Clearing for HAR 2, HAR 3, and their associated structures will include the removal of overburden soil and some weathered rock (Reference 4.3-002). Excavation depths will range from removal of topsoil to a depth of approximately 12.2 m (40 ft.) where the reactor components are located. Excavated soil may require stockpiling at various stages during construction. Any soil generated during construction that is considered spoil material will be appropriately managed in the construction area and used or "wasted" in the construction area during final grading. Erosion control measures will be implemented during stockpiling activities to minimize runoff and sediment loading to adjacent drainage channels. Measures to control erosion could include, but not be limited to, silt fencing, mulching, check dams, and infiltration/detention areas. Indirect effects to adjacent drainage channels and Harris Reservoir resulting from stockpiling of soil will be short-term.

Clearing will comply with relevant regulations, permits, plant operation guidelines, and utility safety and testing guidelines. Riprap protection will be placed on slopes facing the reservoir. Following excavation, fill will be placed and compacted at the plant site. Fill will be dewatered and compacted in layers. Extensive dewatering within the plant site will not occur; sumps and pumps will

be sufficient for dewatering (Reference 4.3-002). Water from dewatering actions will be discharged through a filter device onto adjacent upland areas.

Soil will be excavated and concrete and granular sub-grade material will be installed to develop the transport pad, haul road, and assembly pads at the plant site. Stormwater ditches will also be excavated and protected with stone linings. Ditches will be excavated to install pipes connecting the storm sewer with stormwater control structures. Trenches will be backfilled following pipe installation (Reference 4.3-002).

4.3.1.1.1 Impacts to Vegetative Communities

Although fragmented woodlots exist in the HAR site, they provide little habitat for wildlife. These woodlots are within managed timber areas that experience frequent disturbances, including timber harvesting and replanting.

HAR 2 will be built on a primarily paved and gravel-covered area with mowed vegetation. The HAR 2 site is occupied predominately by non-native grasses and lawn weeds. Limited numbers of pioneering species of native vegetation exist in this area (Reference 4.3-003). Construction on the HAR 2 site will not noticeably affect vegetation communities.

HAR 3 will be built on an area recently clear-cut and replanted to loblolly pine (*Pinus taeda*). The saplings in this area are less than 10 years old. (Reference 4.3-003) The HAR 3 site will require clearing prior to construction and will experience a long-term direct adverse effect because of the permanent loss of terrestrial vegetation. The young loblolly pine monoculture at the HAR 3 site lacks vegetative diversity. (Reference 4.3-003) In addition, some clearing of the loblolly pine stand, which is managed for timber harvest, will occur at some future point, with or without the construction of HAR 3.

Biologists conducting an ecological survey in August 2006 at the HAR 2 and HAR 3 sites observed no important vegetative species (Reference 4.3-003). PEC contacted the U.S. Fish and Wildlife Service (USFWS), NCWRC, and North Carolina Natural Heritage Program (NCNHP) requesting information on listed species and important habitats (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species existing within the HAR site (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important terrestrial plant species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.1.2 Impacts to Wildlife

The HAR site and associated infrastructure adjoin forested habitat. However, the HAR 2 site provides almost no habitat value for wildlife and the HAR 3 site provides limited habitat value for wildlife because of fragmented woodlots and frequent timber management activities (Reference 4.3-003). Animals that would

use young pine plantation habitat are mobile and would relocate to nearby areas to avoid the disturbance. It is possible that some less mobile wildlife, such as macro-invertebrates, may be adversely affected.

The presence and operation of the HNP, near U.S. Highway 1, and ongoing timber stand improvement provide steady ambient noise levels. In addition, the construction of the HNP produced the same magnitude of noise as will occur with the construction of HAR 2 and HAR 3. Therefore, effects to wildlife will be no greater than those previously experienced.

Typical equipment used in construction and clearing generate peak noise levels between 70 and 98 decibels (A-weighted scale) (dBA) at a distance of 15 m (50 ft.) from the equipment (Reference 4.3-008). Because multiple pieces of equipment are likely to be operating simultaneously, the total noise could exceed the peak noise level of any one piece of equipment by 1 to 3 dBA. Noise naturally attenuates over distance, typically decreasing by 3 dBA with every doubling of distance (Reference 4.3-009). Therefore, the actual noise levels experienced by wildlife after relocating from the construction area would be lower than the noise level at 15 m (50 ft.).

Adverse effects have been observed in laboratory animals within a range of 72 and 101 dBA (Reference 4.3-010). Adverse effects beyond an initial startle response are more likely to result from continuous rather than intermittent loud noises. However, intermittent noises at lower noise levels may be more irritating.

Peak construction noise would be intermittent, with the continuous noise level expected to be between 70 and 80 dBA at 15 m (50 ft.) (Reference 4.3-008). These thresholds, the natural attenuation of sound over distance, the short duration of preparation and construction, and the consistent and historical presence of noise within the area create a small potential for short-term noise-related adverse effects on wildlife. These adverse effects would be limited to the duration of construction.

Birds collide with many types of anthropogenic structures. Hoist cranes are the only construction infrastructure expected to pose a risk for avian collisions at the HAR construction site. The NRC evaluated nuclear plants and found that avian mortality resulting from collisions with nuclear plant infrastructure does not have substantial effects on bird populations. A proactive measure to avoid avian collisions would be to illuminate construction equipment at night. Other recommendations to prevent avian collisions include avoiding areas where birds are known to congregate, enhancing power-line visibility, and limiting construction to the daytime on days with good weather (Reference 4.3-011).

Biologists conducting an ecological survey in August 2006 at the HAR 2 and HAR 3 sites observed no important wildlife species (Reference 4.3-003). PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important wildlife species

existing within the HAR site (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important terrestrial plant species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.1.3 Conclusion

Short-term periodic adverse effects resulting from noise, sedimentation, and construction traffic will subside after completing the 42-month construction period. Some limited long-term effects will occur because of the commitment of industrial and managed lands for HAR 2, HAR 3, their associated infrastructure, and permanent access roads.

Direct and indirect short-term effects stemming from HAR site preparation and construction activities will be SMALL because PEC and its contractors will comply with federal, state, and local regulations, ordinances, and BMPs. Because of the low habitat quality, low vegetative diversity, and ongoing timber management within the plant site, conversion of these areas to HAR 2 and HAR 3, with their supporting infrastructure, will have a SMALL long-term direct terrestrial ecological effect.

4.3.1.2 Harris Reservoir Perimeter

Harris Reservoir will be filled to 73.2 m (240 ft.) NGVD29; however, the original design was 76.2 m (250 ft.) NGVD29 . Approximately 1641 ha (4055 ac. or 6.3 mi.^{2}) will be inundated by the proposed increase in the water level of Harris Reservoir (Figure 4.0-7). Following inundation, the shoreline of Harris Reservoir will change from its current perimeter length of 139,379 m (457,281 ft.) to 239,063 m (784,327 ft.). The acreage proposed for inundation represents approximately 33 percent of the land within the HNP. Approximately 75 percent, 1068 ha (2639 ac. or 4.12 mi.^{2}), of the area within the 67.1-m to 73.2-m (220-ft to 240-ft.) NGVD29 contours is forested. Land within the perimeter will be cleared before increasing the water level so that debris will not interfere with future boating activities (Reference 4.3-015). Infrastructure affected by the increase in water level will be relocated or reconstructed above the new water level. Figures 4.0-7, 4.0-8, 4.0-9, 4.3-1, 4.3-2, 4.3-3, and 4.3-4 show areas affected by the increased water level.

Current infrastructure proposed for removal or modification includes structures within Harris Lake County Park, the Wake County Fire Training Facility, the Shearon Harris firing range, several PEC facility buildings, four boat launches, multiple segments of roadway, and transmission towers (Figures 4.0-7, 4.0-8, and 4.0-9) (Reference 4.3-012). ER Section 5.1 discusses the relocation of infrastructure. Relocation areas above the 73.2-m (240-ft.) contour have not been determined yet. Relocation activities will comply with relevant regulations and BMPs to minimize the potential for adverse effects.

Multiple roadways exist within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours (Reference 4.3-012). In-use roadways, along with associated infrastructure (bridges and culverts), will be reconstructed in their current locations to accommodate the rise in the reservoir's elevation. These roadways have a total length of 4873 m (15,988 ft.) (Reference 4.3-002). Modification of roadways, bridges, and culverts will comply with relevant regulations and permits. Appropriate BMPs will be implemented to minimize the potential for erosion and sedimentation. Effects from road relocation/reconstruction would be limited to clearing and placing fill to expand the road base supporting the new elevated roadway.

Blowdown pipelines will be constructed to discharge water from HAR 2 and HAR 3. These pipelines will be placed adjacent to the existing blowdown pipeline that services the HNP. The plastic blowdown pipelines, with diameters of less than 1.2 m (4 ft.), will extend westward into Harris Reservoir from the cooling towers of HAR 2 and HAR 3 (Figure 4.0-10) (Reference 4.3-013). A barge will trench the pipelines into the bottom of Harris Reservoir and rocks will be added to prevent buoyancy. The trenches will not be wider than 1.2 m (4 ft.). During trenching, turbidity barriers will be installed to minimize increases in water column turbidity resulting from bottom disturbance.

Construction and infrastructure modification activities will predominantly occur in previously disturbed areas. Therefore, new disturbance would be minimized and the potential for sedimentation and ecological effects would be limited. As discussed in Subsections 4.2.1 and 4.3.1.1, sedimentation and erosion control plans and measures will be implemented to minimize direct and indirect adverse effects.

4.3.1.2.1 Impacts to Vegetative Communities

The perimeter of Harris Reservoir is heavily wooded. Use coverage analysis has estimated that approximately 70 percent of the land within the watershed is forested. The amount of forested land may have decreased since the analysis because of increased urban growth pressure and timber harvesting (Reference 4.3-014). Forest types within this area include alluvial forests, bottomland hardwood forests, hardwood re-growth forests, and loblolly pine plantations (Reference 4.3-003). ER Subsection 2.4.1.2.1 more thoroughly discusses these forest types.

No areas surrounding Harris Reservoir contain virgin timber. Historically, all of the areas have been harvested or cleared. Trees above the streamside management zones (SMZs) surrounding Harris Reservoir, which are under timber management plans, are frequently disturbed for silvicultural practices. Bottomland hardwood or alluvial forests occur where streams with relatively broad valleys extend away from the reservoir. The topography near the Harris Dam is steep on both sides. The area to the south and west of the dam is forested. A historical roadbed was cut through this area, creating steep slopes on either side of the road.

The forest surrounding Harris Reservoir is typically mixed pine-hardwood, giving way to sub-xeric (partially dry habitat) hardwood forest on upper slope positions. To the east and north of the dam, vegetation is similar to that on the south and west of the dam. However, because this area was burned in early 2006, the forest is more open (Reference 4.3-003).

The types of alluvial and hardwood forests present along the Harris Reservoir perimeter are common throughout North Carolina and the region. Forest stands in the area dominated by loblolly pine do not occur naturally, but result from planting. Loblolly pine stands range from those planted within the past 5 years to those planted more than 25 years ago (Reference 4.3-003). Clearing these trees will not have a significant adverse effect on the diversity of tree species within the region. In addition, because trees above the SMZs are managed for timber harvest, clearing operations will occur with or without increasing the reservoir's water level.

Trees will be left in some areas to create snag habitats for wildlife, particularly within the 72.2-m to 73.2-m (237-ft. to 240-ft.) NGVD29 contours. The topography within these contours provides the potential for creating wetland habitats when the water level of the reservoir rises. In addition, a buffer zone of at least 30.5 m (100 ft.) of vegetation will be left along the new Harris Reservoir perimeter and along those stream corridors within PEC-owned land PEC will acquire land, when possible, adjacent to Harris Reservoir. However, PEC does not have the discretion to implement buffer zones in those areas where the land is not available for purchase.

Kiker Forestry & Realty, Inc. (KF&R) conducts forest management for PEC. Timber removal operations comply with state and federal laws, guidelines, and recommendations. To minimize adverse effects, KF&R implements BMPs consistent with the NCDENR, Division of Forest Resources forest management practice requirements (Reference 4.3-015). Timber removal will involve clearing the area in phases to minimize the amount of exposed ground at any one time. To minimize erosion and sedimentation, the ground will be stabilized with herbaceous vegetation, primarily through seeding and mulching, as quickly as possible after clearing. Straw mats containing grass seed could be used on the steeper slopes to provide stabilization. Temporary changes in traffic patterns on the existing access roads may occur during timber removal.

Logged material and debris will be removed and recycled. The removal of stumps will depend on their location. In locations with the potential to conflict with recreational activities (water skiing or boating), stumps will be removed or cut to ground level. In other locations, stumps will be left in place. An existing commercial facility along the west bank of Harris Reservoir has the potential for use as a repository for logged materials. If this area could hold logged materials, such materials would not need to be taken to local landfills.

If relocations are necessary, PEC will coordinate with volunteer organizations to relocate native plants. Native plants will be moved to areas above the 73.2-m (240-ft.) NGVD29 contour and to other areas of the HAR requiring revegetation. Relocating plants will preserve individual species, local genotypes, and any special status species to the degree possible while minimizing adverse effects to vegetation.

Edge habitat will increase with clearing and construction activities. This edge habitat will create additional space for plant and animal species well adapted to such conditions.

Timber will be harvested between 67.1-m and 73.2-m (220-ft. and 240-ft.) NGVD29 contours before the water level is increased, resulting in considerable long-term effects on the forested vegetation around Harris Lake. Clearing the vegetation around Harris Lake in preparation for the lake level increase will eliminate the long-term effects that result from timber removal under the current program described above. Refraining from timber removal will not minimize the effects on forested vegetation because the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 elevations will be immersed or submerged when the water level rises. With or without timber harvest, the long-term effect on the forested vegetation inhabiting this zone will be significant. As a mitigation measure, when possible, PEC, in cooperation with NCNPS, will relocate native plants that are currently part of the forested community around the lake to other areas above the 73.2-m (240-ft.) NGVD29 elevation.

When the roads are modified, vegetation will be removed. The potential for habitat fragmentation from the road work is minimal because, to the extent possible, roadways will be modified in their existing locations and the surrounding areas will become inundated.

PEC has enrolled 5353 ha (13,227 ac. or 20.67 mi.^{2}) in the area surrounding Harris Reservoir in the North Carolina Game Lands Program (Figure 4.3-1) (Reference 4.3-001). This area is known as the Shearon Harris Game Lands. PEC originally agreed to enroll approximately 1619 ha (4000 ac.) in the program or an area approximately equal to the area committed to the reservoir. (Reference 4.3-016) PEC has voluntarily added land to the North Carolina Game Lands Program over the years. Approximately 818 ha (2022 ac. or 3.16 mi.^{2}), or 15 percent, of the game lands will be inundated. PEC will actively engage with the NCWRC and other state agencies to evaluate mitigation of this long-term direct effect. A forested or vegetated buffer of at least 30.5 m (100 ft.) will be secured surrounding the reservoir and along stream corridors, where possible. This buffer will protect water quality and provide habitat for displaced wildlife.

Some areas above the 73.2-m (240-ft.) NGVD29 contour will also be cleared or disturbed for the relocation of affected infrastructure. The areas for relocation of infrastructure have not been determined yet. Proposed relocation areas will be environmentally evaluated following their determination.

The forest communities along the perimeter of Harris Reservoir include three areas NCNHP NCDENR has designated as natural areas of regional significance: Holleman's Crossroads slopes, Utley Creek slopes, and Jim Branch/Buckhorn Creek forests (Figure 4.3-2) (Reference 4.3-017). Effects to the vegetation in these areas will be limited to the zone of inundation. PEC will consult with the NCNHP, NCWRC, and other relevant federal or state agencies on effective methods to mitigate for impacts to the natural areas.

- The Holleman's Crossroads slopes (approximately 55 ha [135 ac. or 0.21 mi.^{2}]) are composed of a series of narrow ridges and ravines along the edge of Harris Reservoir just north of Holleman's Crossroads and State Road 1130. These slopes contain ridges of sedimentary rocks with mature hardwoods, shrubs, and small trees (Reference 4.3-017). An area of 19 ha (48 ac. or 0.075 mi.^{2}), or 36 percent of the total area, which overlaps with that of the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours, will undergo clearing and lake inundation.
- The Utley Creek slopes (approximately 239 ha [590 ac. or 0.92 mi.^{2}]) are immediately south of Utley Creek. They are located within several hundred yards to the east of the Holleman's Crossroads slopes. This area is composed of mature hardwood forests along north-facing slopes (Reference 4.3-017). An area of 2.6 ha (6.5 ac. or 0.01 mi.^{2}), or 1 percent of the total area, overlaps with that of the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours, and will undergo clearing and lake inundation.
- The Jim Branch/Buckhorn Creek forests occupy approximately 10 ha (25 ac. or 0.039 mi.^{2}), 3.2 km (2 mi.) south of the Holleman's Crossroads slopes. Two separate portions make up the area; slopes along Buckhorn Creek and slopes along Jim Branch. Both areas are primarily mature mesic mixed hardwood and dry-mesic oak-hickory forests. A blue heron rookery in primarily mature loblolly pines has historically existed along Jim Branch. (Reference 4.3-017) An area of 0.8 ha (1.9 ac. or 0.003 mi.^{2}), or 8 percent of the total area, overlaps with that of the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours, and will undergo clearing and lake inundation.

In 1998, PEC conducted a self-assessment of over 50 important animal and plant species with the potential to occur in the HNP vicinity. This survey was based on studies by the Pacific Northwest National Laboratory for the NRC and lists prepared by the USFWS and NCNHP (Reference 4.3-001).

The only identification of a federally listed threatened or endangered terrestrial vegetative species in the HAR vicinity was the federally and state-listed endangered Michaux's sumac (*Rhus michauxii*). In 2001, Michaux's sumac was transplanted to the Harris Research Tract (an adjacent PEC-owned parcel) to establish an experimental population. Botanists from North Carolina State University are monitoring the experimental Michaux's sumac population (Reference 4.3-001). Because this area will not be disturbed by construction or

inundation, no effects to this experimental population of Michaux's sumac are expected.

The federally and state-listed endangered harperella (*Ptilimnium nodosum*) historically inhabited Chatham County. However, it has not been observed in the county in recent years. (Reference 4.3-018)

Table 4.3-2 includes an additional six federally listed vegetative species of concern, as identified using the NCNHP database, that exist within Chatham and Wake counties (Reference 4.3-018). Table 2.4-2 provides information about state-listed species that exist within Wake and Chatham counties.

Biologists conducting an ecological survey in August 2006 along the Harris Reservoir perimeter observed no important vegetative species (Reference 4.3-003). PEC contacted USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species existing within the area to be inundated (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section. If an important terrestrial plant species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

Terrestrial ecological effects along Harris Reservoir will be MODERATE, resulting from the clearing of 1641 ha (4055 ac. or 6.3 mi.^{2}) of forest habitat. Clearing to prepare for the increase water level in Harris Reservoir will result in a noticeable loss of vegetation and forested habitat around the perimeter of Harris Lake primarily to those using the lake and perimeter lands for recreation, but it will not destabilize the resource because PEC has approximately 5353 ha (13,227 ac. or 20.67 mi.^{2}) enrolled in the North Carolina Game Lands Program. Because there will be a reduction of 1641 ha (4055 ac. or 6.3 mi.^{2}), in forested habitat, herbivore pressure could increase in other forested areas as animals move from the disturbed area into the remaining habitat. Increased herbivore pressure following animal relocation could result in reduction or loss of understory vegetation and a shift to species that are less palatable to the herbivores. This change in vegetation would be an indirect effect of clearing activities that would be maintained through the eventual inundation of the area between the 67.1-m and 73.2-m (220-ft. and 240-ft.) NGVD29 contours.

4.3.1.2.2 Impacts to Wildlife

PEC has approximately 5353 ha (13,227 ac. or 20.67 mi.^{2}) of forested habitat enrolled in the North Carolina Game Lands Program. Additional undeveloped land adjacent to PEC property will provide habitat outside the affected area, which will minimize direct adverse effects to terrestrial wildlife. However, because the remaining terrestrial habitat area will be smaller than the existing habitat, some species may overpopulate the area. There will be a lower carrying capacity for most terrestrial species because of the loss of habitat. Mobile animals

(mammals, birds, and some reptiles) are likely to relocate to nearby undisturbed areas. However, these species will either displace or crowd animals already living in those areas. The gradual nature of clearing and construction will minimize the effects. Over time, these species will reach equilibrium with the smaller habitat size, which will result in somewhat smaller populations. Because impacts to wildlife will neither destabilize nor noticeably alter any important attribute of the resource, impacts will be SMALL.

Adverse direct effects will be most acute to less mobile species that are unable to easily relocate (some reptiles, amphibians, and macro-invertebrates), resulting in the immediate loss of some individuals. Possible actions to reduce mortality of these animals include appropriately timing construction activities to accommodate the life cycles of less mobile species (for example, draining and grading wetlands after amphibians have undergone metamorphosis).

Prior to flooding, roads will be modified by increasing their elevation. Because of the subsequent flooding, road modifications will not fragment habitat, and animal crossings will not be necessary. The long-term effect of roadway modifications to wildlife will be negligible.

A forested buffer of at least 30.5 m (100 ft.) will be secured surrounding the reservoir and along stream corridors, where possible. This buffer will provide habitat for displaced wildlife.

PEC cooperates with the North Carolina Waterfowl Association to conserve and enhance waterfowl habitat around Harris Reservoir. Since 1983, 77 wood duck nesting boxes have been installed around the shore of the reservoir in conjunction with the Western Wake Ducks Unlimited chapter and Harris Lake County Park (Reference 4.3-001). Wood duck boxes will be relocated along the perimeter of the new shore to avoid adverse effects to this species. Part of PEC's participation in the National Wild Turkey Federation's "Energy for Wildlife" program included the construction of bluebird boxes. An unspecified number of these bluebird boxes fall within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours (Reference 4.3-001). Bluebird boxes identified within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours will be relocated prior to land clearing. The nest boxes will be relocated when they are not inhabited by birds.

As previously discussed, typical equipment used in construction and clearing generate peak noise levels between 70 and 98 dBA at a distance of 15 m (50 ft.) from the equipment (Reference 4.3-008) and total HAR site noise may exceed the peak noise level of any one piece of equipment by 1 to 3 dBA (Reference 4.3-009). It is expected that noise-sensitive animals will relocate away from the area where loud noise is being generated. Because noise naturally attenuates over distance, typically decreasing by 3 dBA with every doubling of distance (Reference 4.3-009), the actual noise levels experienced by wildlife after relocating from the clearing area would be lower than the noise level at 15 m (50 ft.). Operation of the HNP, ongoing logging operations around Harris

Reservoir, and adjacent roadways and highways currently result in peak noise levels consistent with those described previously.

Peak construction noise would be intermittent, with the continuous noise level expected to be between 70 and 80 dBA at 15 m (50 ft.). These thresholds, the natural attenuation of sound over distance, and the short duration of clearing in any given area create a small potential for short-term noise-related adverse effects on wildlife during construction.

No equipment or structures used around the perimeter of Harris Reservoir or in road relocation will pose collision hazards for birds. No adverse effects are expected from bird collisions at the HAR construction site.

PEC personnel and contractors comply with state and federal agency protocols specifically designed for endangered and threatened species. PEC actively engages with the NCNHP and other agencies to protect and manage habitat for important species. PEC has procedures in place to protect endangered or threatened species if they are encountered at the HAR site, and provides training for employees on these procedures.

The USFWS has not designated any areas in the HAR site as critical habitat for federally listed threatened or endangered species. As discussed in Subsection 4.3.1.2.1, in 1998, PEC conducted a self-assessment of over 50 important animal and plant species with the potential to occur in the HNP vicinity. In the past several decades, two federally listed species (bald eagle and red-cockaded woodpecker) have been confirmed in the terrestrial vicinity of the HAR site. (Reference 4.3-001) PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any additional important wildlife species (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

In a self-assessment, PEC identified federally endangered red-cockaded woodpeckers (*Picoides borealis*) as having the potential to be affected by the HAR site expansion. An active colony was located near the HAR site in the 1980s, but was abandoned by 1990 because of fire suppression and a lack of gene flow (Reference 4.3-017). No evidence of red-cockaded woodpeckers in the area that will be inundated was found during surveys (Reference 4.3-003). It is unlikely that red-cockaded woodpeckers will re-colonize the area because no active clusters exist within 48.3 km (30 mi.) (Reference 4.3-017). Prior to clearing and construction, a survey will be conducted to determine whether any individuals are present. Although it is unlikely that red-cockaded woodpeckers will be affected by plant expansion, precautions will be taken before removing timber, including educating timber harvesters. If red-cockaded woodpeckers are

sighted during construction activities, methods for their protection will be investigated immediately.

Bald eagles (*Haliaeetus leucocephalus*) have been observed within the HAR site and vicinity. Bald eagles were de-listed by the USFWS from the Endangered Species Act (ESA) in August 2007 and are no longer endangered at the federal level. However, the species is still protected under the Bald and Golden Eagle Protection Act (Reference 4.3-019), and the Migratory Bird Treaty Act (MBTA) (Reference 4.3-020). An active bald eagle nest was reported in the 2004 to 2005 nesting season near Harris Reservoir on PEC property north of State Road 1130. This nest was approximately 610 m (2000 ft.) from the shoreline of the White Oak Creek arm of the reservoir. (Reference 4.3-001) In 2007 it was noted that this nest had been abandoned, and a new nest was located closer to the lake. Precautions will be taken to avoid interfering with bald eagles. These precautions include limiting timber harvest near known nesting areas during the nesting season (December to July), and educating timber harvesters. Further precautions to protect bald eagles will be explored if nests or individual birds are found within areas scheduled for clearing or construction.

A blue heron (*Ardea herodias*) rookery (Figure 4.3-3) is located in the southeastern portion of Harris Reservoir near Buckhorn and Cary creeks within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours (Reference 4.3-001). PEC personnel recently surveyed the area and observed only one inactive nest at the location. Great blue herons are protected by the MBTA, which makes it unlawful to remove birds, feathers, eggs, or nests without a permit (Reference 4.3-002). PEC has the necessary permits to comply with the MBTA.

If blue herons are determined to be nesting within the HAR site, the following actions will be taken to minimize adverse effects:

- During the courtship and nesting season (February to July), a buffer zone of approximately 305 m (1000 ft.) along the periphery of the colony would be maintained. Studies have indicated that buffer zones of varying widths around nesting colonies can be effective. Maintaining a buffer of 305 m (1000 ft.) during critical periods is a conservative mitigation measure.

- Although, over time, blue herons habituate to human disturbance in the area surrounding them, it is recommended that logging and construction activities not occur within 1000 m (3281 ft.) of a colony during the nesting season (Reference 4.3-021).

- Increasing the water level during the migratory period would allow the herons to adapt by requiring them to find a new nesting area upon their return.

- Leaving some trees to die just below the 73.2-m (240-ft.) contour could create a suitable location for a new rookery.

Construction and clearing are expected to have a short-term direct effect on the blue heron rookery.

Within the HAR site or vicinity, 101 bird species protected by the MBTA have been sighted (Table 2.4-1) (Reference 4.3-022). Jordan Lake, designated by the National Audubon Society's North Carolina State Office as an Important Bird Area, is within 16 km (10 mi.) of Harris Lake. It provides high-quality avian habitat for any displaced birds. Jordan Lake, which comprises approximately 19,020 ha (47,000 ac. or 73.44 mi.^{2}) of bottomland hardwood forest, pine forest, deciduous forest, mixed forest, and water, supports a large number of bird species. This lake contains the state's largest population of bald eagles. As many as 4 bald eagle nests and 71 bald eagles have been documented at Jordan Lake over a single breeding season (Reference 4.3-023).

Direct adverse effects to migratory bird species will be short term and limited to the time of clearing and construction. Because high-quality habitat, such as Jordan Lake, are adjacent to the HAR site, the effects of clearing and construction will be minimized because migrating birds will prefer to migrate through these unaffected areas. Clearing activities will be scheduled, if possible, to the period when migratory bird species, including neotropicals, are not actively nesting (spring months).

Several federally listed species of concern may occur within the HAR vicinity. The southern hognose snake (*Heterodon simus*) is listed as obscure, with the last date of observation in Wake County unknown. Bachman's sparrow (*Aimophilia aestivalis*) historically inhabited Wake County and currently inhabits parts of Chatham County (Reference 4.3-018). The southeastern myotis (*Myotis austroriparius*) has not been observed on-site or in the vicinity of the HAR. Although it historically migrated through the area, the species has not been observed within Wake County in the last 50 years (Reference 4.3-018).

Indirect effects to wildlife populations may result from crowding and overpopulation when animals relocate from areas adjacent to the reservoir to surrounding areas. The increase in animal numbers will place a greater demand on food resources in the surrounding areas. If immediate population numbers exceed the carrying capacity of the surrounding lands, malnutrition may result. Malnourished animals are more susceptible to disease and illness, and increased mortality could result.

4.3.1.2.3 Conclusion

Inundating the area surrounding Harris Reservoir will decrease vegetation and wildlife terrestrial and NCNHP identified regionally significant habitats by 1641 ha (4055 ac. or 6.3 mi.^{2}), resulting in a long-term direct effect. Relocation of sensitive species of native vegetation will reduce the long-term direct effects to vegetation. Because relatively large areas of undeveloped land adjoin PEC property, wildlife will relocate and adapt to the altered habitat area over time. Wildlife will experience some short-term direct effects associated with clearing

and construction activities and long-term direct and indirect effects from the loss of habitat. With the exception of permanent habitat loss, because of forest management, the area would experience these effects without inundation. Because impacts to wildlife will neither destabilize nor noticeably alter any important attribute of the resource, impacts will be SMALL. Terrestrial ecological effects along Harris Reservoir will be MODERATE, resulting from the clearing of 1641 ha (4055 ac. or 6.3 mi.^{2}) of forest habitat. Clearing to prepare for the increase water level in Harris Reservoir will result in a noticeable loss of vegetation, but will not destabilize the resource.

4.3.1.3 Intake Structure and Pumphouse

HAR 2 and HAR 3 will require additional makeup water from Harris Reservoir. The construction of an intake structure and pumphouse are proposed on the Cape Fear River to provide additional water to Harris Reservoir. Figure 4.0-5 shows affected areas. This area was disturbed during the construction of Buckhorn Dam. In addition, a hydropower facility once existed along the edge of the dam in this area, with associated infrastructure. These facilities were removed, but remnant concrete, stone, and gravel still exist. This area also has a parking area and trails that are used for recreation and to launch boats downstream of the dam.

Communication with the North Carolina Division of Coastal Management indicates that plant expansion will not require a federal Consistency Review under the North Carolina Coastal Area Management Act (Reference 4.3-024).

The proposed pumphouse location is a small cove on the east side of the Cape Fear River, just north of Buckhorn Dam. This area is adjacent to a discharge canal that extends from the Cape Fear fossil-fuel plant more than 8 km (5 mi.) upstream. The cove was formed in conjunction with the development of the drainage canal and the historical hydropower facility. The main operating elevation of the pumphouse will be 1.5 m (5 ft.) above the 100-year flood level of 52 m (170 ft.) NGVD29. An intake channel, with a width of approximately 10.7 m (35 ft.), will be dredged into the cove. The channel will consist of reinforced concrete slab with sloped riprap sides. The intake structure and pumphouse will encompass approximately 1.8 ha (4.4 ac. or 0.0069 mi.^{2}).

A designated staging area (0.4 ha [1 ac. or 0.0016 mi.^{2}]) will be temporarily used for construction refueling and storage throughout the duration of construction, which is proposed to occur over a 10-month period. This area is currently used as parking and for access to the dam area. This construction will be conducted in parallel with the construction of the makeup water pipeline corridor and discharge structure (Reference 4.3-013). Both direct and indirect effects associated with construction will be short term.

Dredging will be required in the channel of the Cape Fear River and the inlet at the confluence with the discharge channel. Disposition of this dredged material will require sediment analysis and identification of an acceptable disposal

location. As needed, measures will be taken to eliminate the development of disease vectors (for example, mosquitoes) within dredge spoil ponds.

The Cape Fear River channel and riparian corridor will be restored following installation of the intake structure and pumphouse to eliminate the potential for long-term effects. As discussed in Section 4.2 and Subsection 4.3.1.1, sedimentation and erosion controls will be implemented. Short-term effects are associated with sedimentation.

4.3.1.3.1 Impacts to Vegetative Communities

The proposed facilities along the Cape Fear River are located in an area where the piedmont transitions to the coastal plain. Vegetation in this area can be generally characterized into either Piedmont Bottomland Forests or Piedmont Swamp Forest. Both types of communities are generally characterized as areas that experience flooding at least occasionally and some areas for longer periods. Both community types also experience sedimentation from flooding, resulting in the input of nutrients and fertile soil. In both communities, flooding commonly results in stress on or mortality of tree species (Reference 4.3-025).

Terrestrial vegetation will be cleared in a maximum area of approximately 1.8 ha (4.4 ac. or 0.0069 mi.^{2}). The clearing of the staging area will result in a direct short-term effect on terrestrial vegetation, while the permanent clearing associated with the intake structure and pumphouse will have a long-term direct effect.

Because the intake structure and pumphouse are located along a river, where edge habitat already occurs, fragmentation or edge habitat would not be increased. Disturbed ground can promote invasive species colonization.

Biologists conducting an ecological survey in August 2006 at the HAR 2 and HAR 3 sites observed no important vegetative species (Reference 4.3-003). PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species existing within the HAR site (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important terrestrial plant species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.3.2 Impacts to Wildlife

The discussion of terrestrial wildlife in Subsection 4.3.1.2.2 is applicable to the intake structure and pumphouse. The infrastructure associated with the pumphouse and intake structure will have little effect on terrestrial wildlife. No more than 1.8 ha (4.4 ac. or 0.0069 mi.^{2}) of terrestrial habitat will be lost.

As discussed in Subsection 4.3.1.1.2, typical equipment used in construction and clearing generate peak noise levels between 70 and 98 dBA at a distance of 15 m (50 ft.) from the equipment (Reference 4.3-008) and total HAR site noise may exceed the peak noise level of any one piece of equipment by 1 to 3 dBA (Reference 4.3-009). No equipment or structures used for constructing the intake structure and pumphouse will pose collision hazards for birds. No adverse effects are expected from bird collisions.

Biologists conducting an ecological survey in August 2006 observed no important wildlife species in the area of the proposed intake structure and pumphouse (Reference 4.3-003). PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important wildlife species existing within the area (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important terrestrial plant species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.3.3 Conclusion

Because of the small footprint of approximately 1.8 ha (4.4 ac. or 0.0069 mi.^{2}) and the existence of other water-related infrastructure at the proposed location of the intake structure and pumphouse, the terrestrial ecological effect of construction is expected to be SMALL for short-term and long-term direct and indirect effects.

4.3.1.4 Pipeline Corridor

The Harris Lake makeup water system pipeline will extend from the pumphouse on Cape Fear River to Harris Reservoir (Figure 4.0-4). This pipeline will follow the existing Fayetteville transmission line ROW for approximately 4.2 km (2.6 mi.), while the remaining portion of 1.4 km (0.9 mi.) will run along Buckhorn Road, an existing access road.

The existing corridor along the Buckhorn Road access road will require the clearing of an additional 22.9 m (75 ft.), while the existing ROW will require the clearing of an additional 15.2 m (50 ft.). That is, an area of 10.5 ha (25.9 ac. or 0.04 mi.^{2}) will be cleared. To minimize clearing, no new access roads will be constructed. Existing access roads along the Cape Fear River, the transmission line corridors, and the cleared corridor from the transmission line to Harris Reservoir will be used. Ecological protective equipment (such as construction mats and horizontal drilling) will be identified and used, as needed (Reference 4.3-002).

One staging area for construction refueling and storage along the transmission line will be used. This area may need to be cleared prior to construction. It will be located in an upland area at least 15 m (50 ft.) from any wetland or water body.

The Harris Lake makeup water system pipeline will be trenched into the ground to the extent practicable. Prior to the construction phase, soil borings will be taken to determine if blasting or other methods should be used. Elevated pipe racks will be installed across power line crossings and pier foundations will be installed in stream crossings to support the pipe racks. Should blasting be necessary, a blasting plan will be developed and implemented. Any blasting will be limited or damped such that the ground acceleration is low enough so that bedrock or building foundations away from the blasting site are not damaged.

Construction will be conducted when conditions within streams are low flow or dry. Stabilization methods, such as seeding and erosion control matting, will be implemented immediately following construction. The necessary federal, state, and local permits will be obtained before installing stream crossings. Stream effects will be minimized by adhering to permit requirements and following BMPs during clearing and construction activities.

The pipeline will be composed of carbon steel pipe 1.1 m (3.5 ft.) in diameter. Because of elevation changes along the corridor, vacuum breaker/air release valves will be located at each peak in elevation, with a valve to provide energy dissipation and allow flow control. The pipeline will be coated to retard corrosion and buried.

An outfall discharge structure for the makeup water pipeline will be constructed on the western edge of Harris Reservoir at the fourth estuary from the west end of the dam (Figure 4.0-4). Construction of this structure will require a temporary 0.4-ha (1-ac. or 0.0016 mi.^{2}) staging area for construction refueling and storage. This staging area will be located in an upland area at least 15 m (50 ft.) from any wetland or water body.

The pipeline will be constructed of reinforced concrete with a stilling basin followed by a sloped discharge chute and a second stilling basin terminating with a riprap apron. The discharge structure will be designed to dissipate water energy to prevent erosion of the surrounding area and suspension of bottom sediments.

A maximum area of 0.2 ha (0.6 ac. or 0.0009 mi.^{2}) will be disturbed at any one time during construction of the makeup water pipeline. Trenching will occur first, followed by installation of the pipe and backfill. The area will be re-graded then seeded and maintained to restore terrestrial ecological habitat. People will not re-enter the disturbed area until after re-growth has occurred (Reference 4.3-012).

The construction of the Harris Lake makeup water system pipeline will occur between September 2009 and June 2010, along with the construction of the intake and discharge structures. This period should provide flexibility for trenching the pipeline across drainage channels and streams during dry periods (Reference 4.3-012).

The discussions of sedimentation and erosion in Section 4.2 and Subsection 4.3.1.1 are relevant to this subsection. Relevant regulations, permits, and BMPs will be followed during HAR site preparation and construction activities.

4.3.1.4.1 Impacts to Vegetative Communities

The proposed Harris Lake makeup water system pipeline ROW crosses two primary habitat types: old field community and forest. The existing transmission line ROW was cleared of woody vegetation beyond the sapling stage and is regularly maintained as an old field community. The forested area adjacent to the roadway consists of mixed-age hardwoods primarily early re-growth and mature re-growth (Reference 4.3-003).

The discussion of timber removal in Subsection 4.3.1.2.1 is also applicable to timber removal along the Harris Lake makeup water system pipeline corridor. In addition, the makeup water pipeline will require erosion control measures at stream and channel crossings and along steep topographic slopes. Disturbed areas will be restored and stabilized immediately following construction. Slope breakers, trench plugs, and other BMPs will be used to control erosion and facilitate restoration.

Because transmission line and road ROWs exist, only minor effects are expected to terrestrial vegetative communities. Because of the existing adjacent disturbance, fragmentation and creation of additional edges will be minimized.

Carolina grass-of-parnassus (*Parnassia caroliniana*) is the only important vegetative species of interest known to potentially occur along the makeup water pipeline corridor (Reference 4.3-001). Additional seasonally appropriate surveys will be conducted prior to clearing and construction to determine whether the species has become established. If this species is found, measures will be taken to minimize negative effects. Because a more savanna-like habitat would be created, Carolina grass-of-parnassus could benefit from the clearing of woody vegetation.

Biologists conducting an ecological survey in August 2006 observed no important vegetative species along the proposed makeup water pipeline corridor (Reference 4.3-003). PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species existing within the area (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important terrestrial plant species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.4.2 Impacts to Wildlife

The discussion of wildlife in Subsection 4.3.1.2.2 is applicable to the pipeline corridor.

No equipment or structures used for constructing the Harris Lake makeup water system pipeline will pose collision hazards for birds. No adverse effects are expected from bird collisions.

Species of interest along the pipeline corridor include red-cockaded woodpeckers and Eastern tiger salamanders (*Ambystoma tigrinum*). Red-cockaded woodpeckers are known to occur in mature longleaf pine forests crossed by the Harris-Fayetteville transmission corridor. No evidence of red-cockaded woodpeckers was found during the survey of the proposed pipeline route. However, if mature longleaf pine must be removed, resource agencies will be consulted on what surveys are necessary to ensure there are no red-cockaded woodpeckers or cavity trees present, or if nests or birds are present, that the necessary mitigation measures are undertaken (Reference 4.3-002). Seasonally appropriate surveys will be conducted to ensure that important species are not within the area prior to clearing and construction. If these species are found, resource agencies will be consulted on the appropriate mitigation measures.

Biologists conducting an ecological survey in August 2006 observed no important wildlife species along the makeup water pipeline corridor (Reference 4.3-003). PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species existing within the area (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important terrestrial wildlife species is located within the construction area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.4.3 Conclusion

Approximately 10.5 ha (25.9 ac. or 0.04 mi.^{2}) will be cleared for the pipeline corridor. The majority of this area has been previously disturbed. These areas will be replanted. Therefore, although mature vegetation will be permanently lost, the overall terrestrial ecological adverse effect will be SMALL. Little existing terrestrial habitat will be altered, and precautions will be taken to minimize adverse effects.

4.3.1.5 Transmission Corridors

Seven 230-kV transmission lines currently connect the HNP site to the transmission system (Reference 4.3-001). Three existing transmission corridors will be expanded no more than 100 feet each to accommodate new lines required to l connect the 230-kV HAR 3 switchyard to the PEC electrical grid. The

transmission corridors that will be expanded include the existing Fort Bragg, Erwin, and Wake lines. The expanded corridors will impact approximately 903 ha (2232 ac. or 3.49 mi.^{2}) immediately adjacent to the existing lines (ER Figure 2.2-3). More than 90 percent of the impacted area is agricultural and undeveloped land. Approximately 562-ha (1390-ac. or 2.17 mi.^{2}) of forest will be impacts during expansion of the existing corridors. Approximately 6 percent is wetland and open water and approximately 2 percent is residential. During construction activities associated with these new corridors, appropriate measures will be taken to minimize the disturbances. The appropriate state and federal resource agencies will be consulted on the construction and operation of these transmission lines, including any necessary studies or mitigative measures.

4.3.1.5.1 Impacts to Vegetative Communities

PEC signed a Memorandum of Understanding with NCDENR to preserve and protect rare, threatened, and endangered species and sensitive natural areas within transmission ROWs (Reference 4.3-001). PEC follows BMPs for managing rare plants along transmission ROWs.

Edge habitat will increase with clearing and construction activities and fragmentation. Invasive species may colonize this edge habitat. Edge habitat often provides additional niches for plants and animal species adapted to this environment, which can enhance populations of these species.

4.3.1.5.2 Impacts to Wildlife

PEC signed a Memorandum of Understanding with NCDENR to preserve and protect rare, threatened, and endangered species and sensitive natural areas within transmission ROWs (Reference 4.3-001).

PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC in response to PEC's request identified a bald eagle nest near Buckhorn Dam. The construction of new transmission lines and corridors has the potential to impact this nest. (Reference 4.3-006). PEC is committed to avoiding impacts, to the maximum degree possible, to individual birds using the bald eagle nest near Buckhorn Dam. PEC will cooperate with the aforementioned agencies during the planning of new transmission lines and corridors to determine control measures and possible mitigation, as needed. The response from USFWS is consistent with important species identified in this section (Reference 4.3-007).

If an important terrestrial animal species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.1.5.3 Conclusion

The terrestrial ecological effects will be further assessed after the routing of the three new transmissions lines has been finalized. Impacts from the installation of the three new lines are expected to be SMALL.

4.3.2 AQUATIC ECOSYSTEMS

4.3.2.1 Plant Site

Subsection 4.3.1.1 generally discusses the HAR 2 and HAR 3 sites. Figure 4.0-2 shows affected areas. The discussions of sedimentation and erosion in Section 4.2 and Subsection 4.3.1.1 are relevant to this subsection.

Cofferdams will be installed to temporarily isolate Harris Reservoir from construction activities. Construction water will go through a sedimentation basin, if necessary, prior to draining back into the reservoir. Regular maintenance, repair, and proper storage of equipment will prevent site preparation-related or construction-related contaminant spills. HAR site preparation and construction activities will comply with federal, state, and local regulations and BMPs to prevent adverse aquatic ecological effects.

As discussed under surface water, construction of the HAR 3 cooling tower will result in filling an approximately 2-ac. constructed pond.

4.3.2.1.1 Impacts to Water Quality

Direct adverse effects stemming from runoff and sedimentation within the HAR 2 and HAR 3 sites will be short term and limited to the duration of HAR site preparation and construction. The potential for runoff and sedimentation to streams, the Main Reservoir, and the Auxiliary Reservoir will be limited by control measures and compliance with regulations and BMPs.

4.3.2.1.2 Impacts to Vegetative Communities

The only aquatic habitat present within the HAR 2 and HAR 3 sites is the approximately 2-ac. constructed pond that would be filled for the HAR 3 cooling tower. This pond contains submerged aquatic vegetation and has emergent wetland vegetation around its perimeter. Both the submerged and emergent vegetation communities would be lost upon filling the pond, and these effects will be included in the Clean Water Act 404 permit.

Other than the constructed pond, there are small areas where water temporarily pools and hydrophytic vegetation occurs (Reference 4.3-003). However, the period of inundation is too short to support aquatic vegetation. The constructed pond is the only habitat that will experience direct adverse effects at the HAR 2 and HAR 3 sites.

Aquatic vegetation within the Main Reservoir, the Auxiliary Reservoir, and streams downslope of HAR 2 and HAR 3 may experience short-term adverse effects from runoff and sedimentation. Appropriate erosion and sedimentation control BMPs will be implemented to minimize the potential for indirect effects. Work activities will comply with regulations.

Areas adjacent to HAR 2 and HAR 3 requiring earthmoving for construction may be locations for creating wetlands or enhancing existing wetlands. This would be a potential mitigation strategy for replacing wetlands that will be lost in other areas of the HAR site. This mitigation strategy would be considered after consultation with the appropriate federal and state agencies to determine if these strategies could be employed in areas where only minor topographical alterations would be required.

No important aquatic plant species occur on the HAR 2 and HAR 3 sites because there is no habitat to support these species. PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence with NCWRC in response to PEC's request did not identify important vegetative species within the HAR 2 and HAR 3 sites (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic plant species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.1.3 Impacts to Wildlife

The only aquatic habitat within the HAR 2 and HAR 3 sites is the approximately 2-ac. pond that would be filled for placement of the HAR 3 cooling tower. This pond may contain some fish, although there is no evidence of fish in the pond. It is likely that amphibians use the margins of the pond for breeding. Aquatic invertebrates would also use these habitats and also may use submerged aquatic vegetation as habitat. Wading birds and snakes are likely to forage around the perimeter of the pond. Aquatic life capable of relocating would be displaced by the construction activity. Less mobile organisms, including benthic and other aquatic invertebrates, fish, amphibians, and reptiles would likely experience mortality when the pond is filled.

It also is possible that amphibians and benthic invertebrates may exist in some of the small areas where water stands following precipitation and where hydrophytic vegetation develops. The presence of benthic invertebrates and amphibians could result in short-term effects of injury and mortality during HAR site preparation and construction. Long-term effects will occur because of the permanent loss of habitat.

Aquatic life within streams, the Main Reservoir, and the Auxiliary Reservoir may experience short-term adverse effects from runoff effluent and sedimentation. Section 4.2 discusses runoff effluent. Appropriate erosion and sedimentation

control BMPs will be implemented to minimize the potential for indirect effects. These impacts are expected to be localized, with the greatest effects in the immediate area of plant construction (Thomas Creek arm) and with lesser effects from plumes in the downstream main stem reservoir. Other upstream arms will likely not be affected by construction activities. Work activities will comply with regulations.

The primary threats to aquatic wildlife from HAR site preparation and construction are from sediment loading and runoff. Sediment and runoff effluent may introduce contaminants, potentially leading to detrimental toxicological effects on various aquatic organisms. Sediment is detrimental to the aquatic ecosystem in several ways including the following:

- Turbidity associated with sedimentation may lead to reduced feeding success of fish, although fish are able to relocate to less turbid areas (Reference 4.3-026).
- Sedimentation may decrease incoming light, reducing the production of aquatic vegetation and phytoplankton (Reference 4.3-026).
- Sediment can interfere with external physical attributes of aquatic life (for example, clogging of gills and respiratory organs) (Reference 4.3-027).
- At times, sediment may completely cover benthic organisms. However, most water bodies have adjusted to periodic sedimentation, so many benthic organisms are able to dig out of small sediment quantities (Reference 4.3-026).
- Spawning habitats may become covered, thus hindering reproduction (Reference 4.3-027).

Sediment ponds and created or enhanced wetlands will be monitored to assure their proper condition and function. It is possible that nuisance aquatic insects, such as mosquitoes, could breed in these areas. Mosquitoes and other nuisance aquatic insects can act as disease vectors, posing a potential health risk to workers and the surrounding area. If nuisance aquatic insects are found in stormwater control structures, appropriate control measures would be implemented to eliminate this potential threat.

No important aquatic animal species are believed to occur within the HAR 2 and HAR 3 sites. PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important wildlife species within the HAR 2 and HAR 3 sites (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic animal species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.1.4 Conclusion

SMALL short-term adverse aquatic ecological effects stemming from runoff effluent and sedimentation will be limited or prevented through compliance with regulations, BMPs, and control measures. SMALL direct long-term adverse effects will result because of a permanent loss of habitat for aquatic vegetation and wildlife at the HAR 2 and HAR 3 sites.

4.3.2.2 Harris Reservoir Perimeter

Subsection 4.3.1.2 generally discusses the perimeter of Harris Reservoir. About 1641 ha (4055 ac. or 6.3 mi.^{2}) will be inundated, changing the area from terrestrial to aquatic habitat.

Harris Reservoir was created by impounding Buckhorn Creek, a tributary of the Cape Fear River. Buckhorn Creek has five primary tributaries above the Harris Reservoir Dam: Tom Jack Creek, Thomas Creek, Little White Oak Creek, White Oak Creek, and Cary Branch (Reference 4.3-001). The dam was completed in late 1980, and the reservoir reached its full-pool elevation of 67.1 m (220 ft.) in February 1983. The water level in the reservoir is controlled by a spillway at the 67.1-m (220-ft.) elevation in the Harris Dam. The main body of Harris Reservoir has a surface area of 1441 ha (5.6 mi.^{2} or 3561 ac.), a maximum depth of 18 m (59 ft.), and a mean depth of approximately 5.3 m (17.4 ft.). The Auxiliary Reservoir, which is immediately west of the developed portion of the HAR site, has a surface area of approximately 132 ha (325 ac. and 0.5 mi.^{2}) (Reference 4.3-028). Once the Harris Reservoir surface elevation is raised, the 100-year flood level will be at the 74.1-m (243-ft.) NGVD29 contour surrounding Harris Reservoir.

In preparation for the rising reservoir water level, HAR site preparation will be conducted along much of the perimeter of Harris Reservoir. The discussions of sedimentation and erosion in Section 4.2 and Subsection 4.3.1.1 are relevant to this subsection. HAR site preparation and construction activities will comply with federal, state, and local regulations and BMPs to prevent adverse aquatic ecological effects along the Harris Reservoir perimeter.

4.3.2.2.1 Impacts to Water Quality

Streamside management zones (SMZs) are a large component of current on-site forest management practices implemented to protect water bodies. SMZs are designated along riparian zones to trap and filter sediment and applied chemicals before they reach the body of water. Forestry BMPs, as designated by NCDENR's Department of Forestry, are followed. These practices include integrating buffers when possible, installing water retention bars to prevent soil erosion, and controlling stream crossings by logging equipment (Reference 4.3-015).

Much of the perimeter of Harris Reservoir is proposed for timber removal, so SMZs cannot be implemented. Therefore, cofferdams will be installed to temporarily isolate Harris Reservoir from HAR site preparation and construction areas. Construction water will go through a sedimentation basin, if necessary, before draining into the reservoir. Shoreline and bank erosion will be controlled. The appropriate safeguards to minimize erosion and sediment disposition will be implemented, as necessary. Available safeguards including, but not limited to, sediment basins, silting areas, and herbaceous revegetation of disturbed areas, will be implemented. Regular maintenance, repair, and proper storage of equipment will prevent site-preparation- or construction-related contaminant spills from reaching aquatic habitats. The appropriate regulations, permit requirements, and BMPs will be followed to prevent adverse ecological effects.

Work will be conducted within the requirements of a stormwater pollution prevention plan (Reference 4.3-029). U.S. Army Corps of Engineers (USACE) Section 404, North Carolina Division of Water Quality 401 water quality certification, and National Pollutant Discharge Elimination System permits will be obtained for work activities (Reference 4.3-030, Reference 4.3-031, Reference 4.3-032). Permit requirements and applicable BMPs will be implemented. Where possible, new SMZs of at least 30.5 m (100 ft.) adjacent to the 73.2-m (240-ft.) NGVD29 contour will be designated to buffer the new shoreline of Harris Reservoir. Although PEC does not currently own all the land adjacent to Harris Reservoir, efforts will be made to obtain this land prior to HAR operational status. Water quality monitoring will be conducted throughout site preparation and construction activities to comply with regulations.

In 2006 field observations, numerous wetlands were found within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours (Figure 4.3-4). Approximately 47 ha (117 ac. or 0.18 mi.^{2}) of wetlands exist within the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours, as determined by field observation and described in Section 2.4.2.1 (Reference 4.3-003). These wetlands will be delineated according to USACE guidelines and mitigation measures will be implemented prior to construction. ER Subsection 2.4.2.2 provides a more extensive discussion of the wetlands in this area.

Additional wetlands occur in the littoral zone of Harris Reservoir. These areas were not identified during the site visit because it is anticipated that similar wetlands will re-establish at the new reservoir elevation in suitable habitat.

Although much of the land between the 67-m and 73-m (220-ft. and 240-ft.) NGVD29 contours will be cleared, HAR site preparation will be conducted over an extended period of up to 18 months (Reference 4.3-033). This will require the temporary preservation of existing wetlands. Therefore, precautions (for example, mats and barriers) will be taken during the removal of timber and construction along the reservoir perimeter to minimize wetland effects. These precautions will be consistent with BMPs, and erosion control plans filed with state agencies prior to construction activities.

An approximately linear 109,057-m (357,800-ft.) length of stream occurs between the 67.1-m to 73.2-m (220-ft. to 240-ft.) NGVD29 contours. This stream length will be inundated by the water level increase. ER Subsection 2.4.2.2 discusses affected streams, including ephemeral, intermittent, and perennial streams (Reference 4.3-003).

PEC will consult with the appropriate federal and state agencies to discuss the appropriate mitigation measures as part of the consultation and issuance of the USACE 404 permit and the NCDWQ 401 Water Quality Certification for the project.

4.3.2.2.2 Impacts to Vegetative Communities

Harris Reservoir has historically experienced algal blooms, although one has not been observed since 1998. The reservoir has been classified as eutrophic within the past 5 years, and several invasive species have been observed. These invasive species include hydrilla (*Hydrilla verticillata*), water primrose (*Ludwigia spp.*), water hyacinth (*Eichhornia crassipes*), and water lettuce (*Pistia stratiotes*) (Reference 4.3-001).

No important aquatic plant species are believed to exist along the Harris Reservoir perimeter. PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic plant species is located within the area, PEC will consult with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.2.3 Impacts to Wildlife

The primary threat to aquatic ecological health from HAR site preparation and construction is sediment loading stemming from timber removal and construction-related runoff. Subsection 4.3.2.1.3 discusses adverse aquatic effects from sedimentation and runoff.

Harris Reservoir currently has low turbidity and high water clarity (Reference 4.3-028). The implementation of BMPs and compliance with regulations will minimize any short-term increases in turbidity.

Aquatic wildlife species within streams may experience negative effects from sedimentation, runoff effluent, and physical disturbance. Sedimentation must be controlled, especially in the areas where dissolved oxygen (DO) levels were recently observed to be lower than the state standard. These areas include Little White Oak Creek, White Oak Creek, and Big Branch (Reference 4.3-003). These low DO concentrations are not caused by HNP operation but are the result of the

streams being in the Triassic Basin, typically dry up over summers, and have low inflow, which affect DO levels.

Sediment ponds and created or enhanced wetlands will be monitored. If mosquitoes (a potential disease vector) are found, measures will be taken to control them. Properly created wetlands produce a healthy aquatic ecosystem. In such wetlands, natural predators control the mosquito population, eliminating the need for additional control measures.

As discussed in ER Section 2.4, benthic invertebrates exist within Harris Reservoir and its tributaries. Benthic communities were evaluated in seven streams to the north and west of Harris Reservoir. The evaluations were based upon two metrics: the Ephemeroptera, Plecoptera, and Trichoptera Taxa Criteria and the North Carolina Biotic Index Criteria (NCBI). Four of the stream communities were bioclassified as “poor,” two were “fair,” and one was above “fair.” The results indicate that habitat conditions at most of the sampled stations were not conducive to supporting robust benthic invertebrate communities (Reference 4.3-003).

PEC will consult with the appropriate state agencies on what other studies are necessary to document the presence of mussels in Utley Creek and other tributaries prior to any Site Preparation or Construction activities (Reference 4.3-003).

Fish were also evaluated at the seven streams to the north and west of Harris Reservoir using the NCBI metric. Two streams were bioclassified as “poor,” three were “fair,” and two were above “fair.” The poor classifications were likely a reflection of the limited connective habitat in those streams because of dry weather and stream geomorphology (Reference 4.3-003).

Effects from sedimentation, runoff, or physical disturbance are not likely to cause significant further degradation to benthic or fish habitat. However, some stream habitat will change to lake habitat. An approximately linear 109,057-m (357,800-ft.) length of stream will be inundated by the water level increase (Reference 4.3-003). Fish and benthic invertebrate communities will shift from those typical of flowing waters to those typical of impounded environments. Stream species will either move to favorable upstream habitats above the 73.2-m (240-ft.) elevation contour or perish. Some species individuals may experience a loss of habitat. However, other suitable stream habitat for these species occurs in the region, and no species populations would be lost from the region.

The increase in the reservoir’s water level will be relatively slow. Therefore, it is expected that the fish and invertebrate communities in Harris Reservoir will be able to relocate to and colonize suitable depths and habitats as the water level rises. No adverse effects to fish and invertebrate species in Harris Reservoir, beyond displacement and relocation to favorable habitats, are expected.

Harris Reservoir is used extensively as a recreational fishing area. Representative important species pursued by anglers include largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), and catfish (*Ictalurus punctatus* and *Ameiurus catus*) (Reference 4.3-001). HAR site preparation and construction will have short-term adverse effects on these recreationally important species because reservoir access will be interrupted and boat ramps will be relocated.

ER Subsection 2.4.2.3.2 discusses important species of fish and mussels that may occur within the Cape Fear River and its tributaries. Important species are those species which are state or federally listed threatened, endangered, or are species of concern; federally proposed for listing or candidate threatened or endangered species; commercially or recreationally valuable species; species essential to the maintenance and survival of species that are rare and commercially or recreationally valuable; species critical to the structure and function of the local terrestrial or aquatic ecosystem; or species that may serve as biological indicators to monitor the effects of the facilities on the terrestrial or aquatic ecosystem. PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Subsection 4.3.2.3 discusses correspondence with NCWRC on important species within the Cape Fear drainage. The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic animal species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.2.4 Conclusion

Although extensive HAR site preparation and construction will occur along the perimeter of Harris Reservoir, compliance with regulations, BMPs, and the use of control measures will cause SMALL short-term adverse effects. Any direct effects to species would be SMALL. The long-term aquatic effect of HAR site preparation and construction along the Harris Reservoir perimeter will be positive, increasing aquatic habitat.

4.3.2.3 Intake Structure and Pumphouse

Subsection 4.3.1.3 generally discusses the intake structure and pumphouse. The discussions of sedimentation and erosion in Section 4.2 and Subsection 4.3.1.1 are relevant to this subsection.

Regular maintenance, repair, and proper storage of equipment will prevent site-preparation- or construction-related contaminant spills from reaching aquatic habitats. HAR site preparation and construction work will comply with federal, state, and local regulations and BMPs.

4.3.2.3.1 Impacts to Water Quality

The primary short-term effects from HAR site preparation and construction include erosion, sedimentation, and effluent runoff. In addition, a riverine wetland, of approximately 0.7 ha (1.6 ac. or 0.0025 mi.^{2}) along the Cape Fear River (Reference 4.3-004) would experience a short-term adverse effect from trenching to install the Harris Lake makeup water system pipeline, intake structure, and pumphouse. However, this area would need to be relocated, because it is within the 73.2-m (240-ft.) NGVD29 contour line and will be inundated by Harris Lake.

The Middle Cape Fear River Basin Association (MCFRBA) annually monitors water quality within the Cape Fear River to provide an indicator of potential change within the basin (Reference 4.3-034).

4.3.2.3.2 Impacts to Vegetative Communities

Vegetation within the Cape Fear River may experience short-term adverse effects from runoff and sedimentation, although this would be minimized by proper control measures and compliance with regulations and BMPs.

The affected wetland is typically inundated and dominated by sweetflag. Following installation of the pipeline infrastructure, this species, which spreads through propagation of rhizomes, would quickly re-colonize the disturbed area through natural processes (Reference 4.3-003).

PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic plant species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.3.3 Impacts to Wildlife

NCDENR currently lists 104 species of fish occurring in the Cape Fear Drainage Basin (Reference 4.3-014). Water withdrawal activities on the Cape Fear River main stem could affect the fisheries community among the smaller minnows and juvenile fish. To mitigate the effects of these activities, fish aversion technologies, such as electric fields or wedge-wire screens, may be used to discourage fish impingement or entrainment into the system. If intake structure construction activities occur in seasons other than winter, effects to fish spawning are possible.

Sediment ponds will be monitored to assure their proper condition and function. It is possible that nuisance aquatic insects, such as mosquitoes, could breed in these areas. Mosquitoes and other nuisance aquatic insects can act as disease vectors, posing a potential health risk to workers and the surrounding area. If

nuisance aquatic insects are found in stormwater control structures, appropriate control measures would be implemented to eliminate this potential threat.

The Cape Fear Shiner (*Notropis mekistocholas*), is a federally and state-listed endangered small minnow endemic to the upper Cape Fear River Basin. The Cape Fear Shiner is known only from the Deep, Haw, and Rocky River sub-basins. Only five populations of the shiner are thought to currently exist (Reference 4.3-035). This fish is unlikely to occur near the proposed water withdrawal structure given the shiner's limited distribution and the lack of habitat conducive to the shiner near the intake structure. The intake structure locale is not within the critical habitat designated for the Cape Fear Shiner by the USFWS (Reference 4.3-036). The Cape Fear Shiner is not known to exist in the portion of the Cape Fear River from Buckhorn Dam to Lock and Dam 3, and, in 2006, the USFWS indicated that construction would not have an adverse effect (Reference 4.3-037). Therefore, no adverse effects to the Cape Fear Shiner are expected.

The dwarf wedgemussel (*Alasmidonta heterodon*) is a federally and state-listed endangered mussel that may occur in Wake County (Reference 4.3-018). However, no extant populations of the dwarf wedgemussel are known within the Cape Fear basin, and it is likely this mussel would not occur in this area (Reference 4.3-038). Therefore, no adverse effects to the dwarf wedgemussel are expected.

PEC contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site (Reference 4.3-005). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic animal species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

An additional four fish and six mussel species are federally listed as being of special concern within Chatham and Wake counties (Table 4.3-3) (Reference 4.3-018). Table 2.4-2 identifies state-listed species in Chatham and Wake counties. Work activities on the Cape Fear River intake structure and pumphouse that directly involve adjacent waters of the Cape Fear River will be scheduled to minimize effects during the spawning periods of these fish.

Federally listed aquatic species in Chatham and Wake counties include the following:

- The Atlantic pigtoe (*Fusconaia masoni*) historically inhabited Chatham County, although it is currently found within Wake County (Reference 4.3-018). It prefers medium-to-large streams with clean, swift waters and stable gravel or sand gravel substrates (Reference 4.3-038).

- The brook floater (*Alasmidonta varicosa*) historically inhabited Chatham County, but has not been observed in recent years (Reference 4.3-018).

It prefers medium streams and rivers with clean, swift waters and stable gravel or sand and gravel substrates (Reference 4.3-038).

- The yellow lance (*Elliptio lanceolata*) is currently distributed in the Neuse River drainage, and is listed as obscure (date of last observation uncertain) within Wake County (Reference 4.3-018). It prefers clean, coarse-to-medium substrate sands and is found in the varying sizes of streams (Reference 4.3-038).

- The yellow lampmussel (*Lampsilis cariosa*) is currently distributed in the Neuse River and Cape Fear River drainages within Chatham County (Reference 4.3-018). It occurs in varying habitats but prefers shifting sands downstream of large boulders in fast-flowing medium rivers and medium-to-large creeks (Reference 4.3-038).

- The green floater (*Lasmigona subviridis*) historically inhabited the Cape Fear River. Its only current occurrence within Chatham and Wake counties is within the Neuse River drainage (Reference 4.3-018). It prefers small-to-medium streams and is intolerant of strong currents. It is generally found in quiet pools and eddies with gravel and sand substrate with high water quality (Reference 4.3-038).

- The Carolina creekshell (*Villosa vaughaniana*) inhabits parts of the Cape Fear River systems within Chatham County (Reference 4.3-018). It prefers silty sand or clay along the banks of small streams (Reference 4.3-038).

- The Carolina darter (*Etheostoma collis lepidinion*) is known to occur within the Cape Fear River drainage within Chatham County (Reference 4.3-018).

- The Carolina redhorse (*Moxostoma* sp. 2) is known to occur within the Cape Fear River drainage within Chatham County (Reference 4.3-018).

- The Roanoke bass (*Ambloplites cavifrons*) is listed as obscure (date of last observation is uncertain) within Wake County (Reference 4.3-018).

- The Carolina madtom (*Noturus furiosus*) inhabits the Neuse drainage within Wake County, but is not known to inhabit the Cape Fear River drainage (Reference 4.3-018).

Adverse effects to species of concern currently known to inhabit sections of the Cape Fear River drainage in Chatham and/or Wake counties are possible. The Atlantic pigtoe is gravid from June to early July. Because the yellow lampmussel and Carolina creekshell remain bradytictic for most of the year, they may experience short-term adverse effects if they are present within the area near the Buckhorn Dam. PEC will consult with federal and state resource agencies on the appropriate surveys to determine the presence or absence of these species and

any necessary mitigation measures in the immediate vicinity of the intake structure construction area before the initiation of construction activities.

4.3.2.3.4 Conclusion

Because of the potential presence of important species and short-term dredging activity, SMALL adverse effects will occur during construction of the intake structure and pumphouse. Compliance with regulations, BMPs, and the implementation of control measures will limit adverse effects.

4.3.2.4 Pipeline Corridor

Subsection 4.3.1.4 generally discusses the pipeline corridor. The discussions of sedimentation and erosion in Section 4.2 and Subsection 4.3.1.1 are relevant to this subsection.

Regular maintenance, repair, and proper storage of equipment will prevent site-preparation-related or construction-related contaminant spills from reaching aquatic habitats. Pipeline corridor preparation and construction work will comply with federal, state, and local regulations and BMPs.

The ROW for the makeup water pipeline crosses seven stream channels (Table 2.4-8) and contains two wetlands (Reference 4.3-003).

4.3.2.4.1 Impacts to Water Quality

One perennial stream crosses the ROW. The remaining channels are small ephemeral and intermittent drainage ways (Table 2.4-8). Biologists identified two wetlands during a field survey in 2006. An emergent wetland (discussed in Subsection 4.3.2.3.1) exists along the Cape Fear River at the terminus of the ROW. A second wetland is located around a pond within the existing cleared utility ROW. This wetland is open water with a narrow fringe of sedges (Reference 4.3-003).

Stream and wetland mitigation will be developed in cooperation with federal and state agencies following delineation according to USACE guidelines. This mitigation will be developed consistent with USACE 404 and NCDWQ 401 Water Quality Certification permits.

Required federal, state, and local permits will be obtained prior to installation of stream crossings. Construction will be limited to when streams are either exhibiting low flow conditions or dry (Reference 4.3-002). Stream effects will be minimized by adhering to permit requirements, following BMPs, and cooperating with state regulators. Wetlands will be delineated and their regulatory status determined. Regulated wetlands will be mitigated in accordance with permit requirements and in cooperation with federal and state regulators.

4.3.2.4.2 Impacts to Vegetative Communities

Effects to vegetative communities, other than those stemming from sedimentation and temporary physical disturbance, are not expected. Contiguous vegetated buffers of at least 30.5 m (100 ft.) will be implemented surrounding affected streams.

PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site. (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic plant species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.4.3 Impacts to Wildlife

Effects to aquatic wildlife, other than those stemming from sedimentation, runoff, and temporary physical disturbance, are not expected. Benthic invertebrates exist within streams that will be crossed.

Important species discussed in Subsection 4.3.2.3.3 are applicable to this subsection. PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site. (Reference 4.3-005) Correspondence from NCWRC did not identify any important wildlife species (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic animal species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.4.4 Conclusion

The short-term nature of installation, as well as compliance with regulations, BMPs, and control measures, will result in a SMALL effect on the aquatic ecosystem along the makeup water pipeline corridor from sedimentation, runoff, and physical disturbance.

4.3.2.5 Transmission Corridor

Subsection 4.3.1.5 provides more detail on the transmission corridors.

4.3.2.5.1 Impacts to Water Quality

Effects to water quality cannot be fully assessed until the location for development is determined. Work activities will comply with regulations, permits, and BMPs to minimize adverse effects.

4.3.2.5.2 Impacts to Vegetative Communities

PEC signed a Memorandum of Understanding with NCDENR to preserve and protect rare, threatened, and endangered plant species and sensitive natural areas within transmission ROWs (Reference 4.3-039).

PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site. (Reference 4.3-005). Correspondence from NCWRC did not identify any important vegetative species (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important aquatic plant species is located within the area, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.5.3 Impacts to Wildlife

PEC signed a Memorandum of Understanding with NCDENR to preserve and protect rare, threatened, and endangered species and sensitive natural areas within transmission ROWs (Reference 4.3-039).

PEC has contacted the USFWS, NCWRC, and NCNHP requesting information on listed species and important habitats within the HAR site. (Reference 4.3-005) Correspondence from NCWRC identified several species in the Cape Fear River of special concern, consistent with those listed in Subsection 4.3.2.3.3 (Reference 4.3-006). The response from USFWS is consistent with important species identified in this section (Reference 4.3-007). If an important species or habitat is located within the transmission line corridor, PEC will cooperate with the aforementioned agencies to determine the appropriate mitigation measures.

4.3.2.5.4 Conclusion

Since the transmission lines are expected to follow existing transmission corridors, impacts on aquatic ecosystems are expected to be SMALL.

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Table 4.3-1
Areas of Proposed Construction

Purpose	Area	Detail
Plant Site – Permanent		
West Side Laydown	6 ha (14.7 ac.)	Cleared and Seeded
Switchyard	2.2 ha (5.5 ac.)	Crushed Stone
Plant Infrastructure	15 ha (38 ac.)	Asphalt or Crushed Stone
Other Area	24 ha (60 ac.)	Asphalt or Crushed Stone
Access Road	4.6 ha (11.4 ac.)	Asphalt
Plant Site – Temporary		
Construction Parking	9.7 ha (24 ac.)	Crushed Stone
Construction Offices and Warehouse	7.3 ha (18 ac.)	Crushed Stone
Construction Laydown	13 ha (32 ac.)	Crushed Stone
Harris Reservoir Perimeter – Permanent		
Harris Reservoir Water Level Increase	1641 ha (4055 ac.)	Land to be inundated by water
Harris Reservoir Perimeter – Temporary		
Discharge Structure Staging	0.4 ha (1 ac.)	
Cape Fear Intake Structure and Pumphouse – Permanent		
Cape Fear Intake Structure and Pumphouse	1.4 ha (3.4 ac.)	Cleared and Dredged
Cape Fear Intake Structure and Pumphouse – Temporary		
Staging	0.4 ha (1 ac.)	Cleared
Makeup Water Pipeline Corridor – Permanent		
Additional Pipeline Corridor Area	9.7 ha (24 ac.)	Cleared
Makeup Water Pipeline Corridor – Temporary		
Pipeline Staging	0.4 ha (1 ac.)	Cleared
Discharge Structure Staging	0.4 ha (1 ac.)	Cleared

Notes:

ac. = acre
ha = hectare

Sources: Reference 4.3-002 and Reference 4.3-013

Table 4.3-2
Federally Listed Terrestrial Species in Chatham and Wake Counties

Species	Common Name	State	Federal	County
Plants				
Isoetes virginica	Virginia Quillwort	SR	FSC	Chatham-historic
Lindera subcoriacea	Bog Spicebush	T	FSC	Wake
Monotropis odorata	Sweet Pinesap	SR	FSC	Chatham, Wake-historic
Phacelia coviellei	Buttercup Phacelia	SR	FSC	Chatham
Ptilimnium nodosum	Harperella	E	E	Chatham-historic
Rhus michauxii	Michaux's Sumac	E	E	Wake
Sagittaria weatherbiana	Grassleaf Arrowhead	SR	FSC	Wake
Trillium pusillum var. virginianum	Virginia Least Trillium	E	FSC	Wake
Vertebrate Animals				
Aimophilia aestivalis	Bachman's Sparrow	SC	FSC	Chatham, Wake-historic
Haliaeetus leucocephalus	Bald Eagle	T	T	Chatham, Wake
Heterodon simus	Southern Hognose Snake	SC	FSC	Wake
Myotis austroriparius	Southeastern Myotis	SC	FSC	Wake-historic
Picoides borealis	Red-cockaded Woodpecker	E	E	Chatham-historic, Wake-historic

Notes:

E = Endangered
FSC = Federal Species of Concern
SC = Special Concern
SR = Significantly Rare
T = Threatened

Source: Reference 4.3-018

Table 4.3-3
Federally Listed Aquatic Species in Chatham and Wake Counties

Species	Common Name	State	Federal	County
Fish				
Ambloplites cavifrons	Roanoke Bass	SR	FSC	Wake
Etheostoma collis lepidinion	Carolina Darter	SC	FSC	Chatham
Noturus furiosus	Carolina Madtom	SC	FSC	Wake
Moxostoma sp. 2	Carolina Redhorse	SR	FSC	Chatham
Notropis mekistocholas	Cape Fear Shiner	E	E	Chatham
Invertebrate Animals				
Alasmidonta heterodon	Dwarf Wedgemussel	E	E	Wake
Alasmidonta varicosa	Brook Floater	E	FSC	Chatham-historic
Elliptio lanceolata	Yellow Lance	E	FSC	Wake
Fusconaia masoni	Atlantic Pigtoe	E	FSC	Wake
Lampsilis cariosa	Yellow Lampmussel	E	FSC	Chatham
Lasmigona subviridis	Green Floater	E	FSC	Wake
Villosa vaughaniana	Carolina Creekshell	E	FSC	Chatham

Notes:

E = Endangered
FSC = Federal Species of Concern
SC = Special Concern
SR = Significantly Rare
T = Threatened

Source: Reference 4.3-018

4.4 SOCIOECONOMIC IMPACTS

This section evaluates the socioeconomic impacts related to construction of the HAR 2 and HAR 3 site and several appurtenant facilities. These appurtenant facilities include modification of the existing switchyard for HAR 2, installation of three new transmission lines and switchyard for HAR 3, modifications to the dam at Harris Reservoir, water intake structure and pumphouse, and Harris Lake makeup water system pipeline.

Direct socioeconomic impacts within the vicinity and region related to construction of the HAR are summarized in the following paragraphs.

- **Impacts to residents**. According to the 2000 Census of Population, five people live within 1.6 km (1.04 mi.) of the HAR site as reported in Section 2.5, Socioeconomics (Reference 4.4-001). GIS data show three houses near or within 1.6 km (1.0 mi.) of the HAR site:

  - Residence 1 is the closest residence to the plant site. It is located over 1.6 km (1.04 mi.) north-northeast on the northern side of U.S. Highway 1 (Figure 4.4-1). Residents of this house may encounter some SMALL construction-related noise. However, the normal traffic noises associated with U.S. Highway 1 will offset such noise.

  - Residence 2 is located 53 m (176 ft.) from the Harris Reservoir perimeter. Tree-clearing activities will result in SMALL adverse noise impacts to occupants of this residence and will be temporary in duration.

  - Residence 3 is located approximately 135 m (445 ft.) from the construction ROW for the proposed makeup water pipeline corridor. This pipeline corridor is being constructed immediately adjacent to an existing overhead utility corridor. Construction impacts to occupants of Residence 3 will be SMALL and temporary in duration.

- **Impacts to recreational users**. Approximately 98 ha (279 ac. or 0.44 mi.^{2}) of recreation facilities at Harris Lake County Park and four boat ramps will be displaced by the rise in the reservoir's water level. Additionally, the following PEC facilities will need to be relocated: storage and maintenance facilities, picnic areas, a restroom, a playground, a ball field, and an electrical training area (Reference 4.4-002 and Reference 4.4-003). Because these areas will be displaced by the change in water level elevation as the HAR is being constructed, people who might have used these areas will have to relocate to other nearby recreation or related areas. Construction impacts to recreational users are anticipated to be SMALL and temporary in duration because these recreation areas will be replaced after construction is complete.

- **Impacts to visitors and users of various facilities**. The Visitors Center, the firearms range, the fire training facility, and the WWTP are shown on Figure 4.4-2. The change in the water level will require:

  - Improvements to existing roads and bridges to raise them to 73.2 m (240 ft.) NGVD29.

  - A new access road that will be constructed for the PEC WWTP.

  - A new access road that will be constructed for the Town of Cary's firing range.

  - A new firing range that will be constructed to replace the existing firing range, which will be partially flooded.

  Access to these facilities will be temporarily disrupted as roads are modified and facilities are rebuilt. Additionally, workers at these facilities will experience some noise associated with the HAR site preparation and construction activities. Overall, these construction activities are anticipated to result in SMALL and temporary impacts to local workers and visitors.

The following paragraph summarizes indirect socioeconomic impacts within the vicinity and region related to construction of the HAR:

- **Impacts to the local economy**. While it is assumed that the majority of the workers needed for construction of the HAR will come from the region, there will be a small in-migration of specialized construction-related workers who may relocate to the area, as further detailed in Subsection 4.4.2. The in-migration of these workers will result in a SMALL indirect beneficial impact to the local economy. Skilled workers, managers, and operations personnel will temporarily reside in the region, frequent local establishments, and purchase goods and services within the vicinity and the region. It is anticipated that HAR site preparation activities will be completed in 18 months and construction activities will be completed in 42 months.

The next subsections discuss the following impacts:

- Subsection 4.4.1 — Physical Impacts

- Subsection 4.4.2 — Social and Economic Impacts

4.4.1 PHYSICAL IMPACTS

The following construction-related physical impacts have the potential to affect nearby populations. These impacts are defined by regulations that specifically

address acceptable levels of change to existing noise, air, and visual quality. The following subsections describe relevant requirements for construction activities that may result in noise, dust, air emissions, and visual aesthetic disturbances. The majority of the construction-related impacts will be short term and temporary. Where impacts are identified that have the potential to be adverse, the HAR COL Applicant is committed to mitigating these physical impacts, where possible, through the use of construction-related BMPs. These BMPs include wetting down roadways and construction sites, scheduling noisy operations during daytime hours, and suppressing blast and shock effects by using mats.

As described in the following subsections, adverse physical impacts from construction activities will be short term and will not significantly affect people in the HAR site, vicinity, or region.

4.4.1.1 Noise

Construction noise will occur during HAR site preparation activities such as clearing, and grading. Construction noise will also occur during construction activities and while installing equipment (such as turbines, generators, pumps, transformers, and switchyard equipment). As a result, background noise levels will increase in the short term. Construction activities will increase ambient noise levels both on- and off-site. To minimize the increased ambient noise, mitigation measures will be implemented.

Construction noise may temporarily disturb nearby residents, workers at nearby facilities, and some individuals participating in recreational activities on or surrounding Harris Reservoir. Construction noise will not be sustained for prolonged periods. In addition, it will vary based on the specific activities and their locations.

- **Plant Site**. Noise generation will occur for the longest periods during construction at the plant site itself. The portions of Harris Reservoir nearest the plant site are off limits to recreational boaters because they are close to the HNP. In addition, noise from boat motors and other watercraft typically would be concurrent with any recreational activities on Harris Reservoir. Usually, watercraft noises would be nearer to recreational participants and louder than construction noises. Those using the reservoir for recreation also have the option of relocating to other areas of the reservoir to avoid construction noise exposure.

- **Harris Reservoir Perimeter**. Short-term noise impacts will occur along the shoreline of Harris Reservoir during the removal of vegetation. Short-term impacts will also occur near Buckhorn Dam on the Cape Fear River during the development and installation of the intake structure and pumphouse, and along the existing transmission line corridor during the installation of the water pipeline. Impacts would be similar to the HAR site construction noise impacts discussed previously.

Noise levels are controlled by the following regulations:

- The Occupational Safety and Health Administration (OSHA) has developed noise exposure limit (29 Code of Federal Regulations [CFR] 1910). These acceptable noise levels for occupied areas such as offices and control rooms relate to workers' health and annoyance factors (Reference 4.4-004).

- Federal noise pollution control regulations (40 CFR 204) identify noise emission standards for construction equipment (Reference 4.4-005).

- Wake County Unified Development Ordinance (Article 17. General Site Design and Performance Standards) cites a sound level of 55 decibels (A-weighted scale) (dBA)[2] as the maximum permitted noise level in areas that are adjacent to any residential district (Reference 4.4-006)

During construction, equipment used for clearing, excavating, trash hauling, and land-filling operations will generate noise. Trucks and other construction equipment are furnished with noise control devices that will minimize off-site noise impacts, keeping such noises within acceptable levels. Typical equipment used in construction generates peak noise levels between 70 and 98 dBA at 15 m (50 ft.) from the equipment (Reference 4.4-007). Because multiple pieces of equipment are likely to be operating simultaneously, the total HAR site noise could exceed the peak noise level of any one piece of equipment (Reference 4.4-008).

Table 4.4-1 provides information about sensitive noise receptors near the HAR site. Figure 4.4-1 shows sensitive noise receptors near the HAR site and their distances from project components.

The following lists the distance of sensitive noise receptors from the plant site:

- **Residences**. The nearest residence (Residence 1) is 1.67 km (1.04 mi.) from the plant site.

- **Church and school**. The Greater New Sweet Springs Church and Moncure Elementary School are 3.36 km (2.09 mi.) and 11.02 km (6.85 mi.) from the plant site, respectively.

- **Campground**. The nearest campground is located at Harris Lake County Park, which is 3.14 km (1.95 mi.) from the plant site.

Sensitive noise receptors close to other project components include:

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[2] "A-weighted" means a specific weighting of the sound pressure level for the purpose of determining the human response to sound. The specific weighting characteristics and tolerances are those given in American National Standards Institute S1.4-1983, Section 5.1.Subp. 3. Daytime. "Daytime" (Reference 4.4-003).

- Greater New Sweet Springs Church, which is located 168 m (552 ft.) from the Harris Reservoir perimeter.

- Residence 2, which is located 53 m (176 ft.) from the Harris Reservoir perimeter.

- Residence 3, which is located 135 m (445 ft.) from the Harris Lake makeup water system pipeline construction ROW.

- Harris Lake County Park campground, which is located 196 m (645 ft.) from the Harris Reservoir perimeter.

It was assumed that noise will result from line sources. Natural attenuation of line source noise occurs over distance, typically decreasing by 3 dBA with each doubling of distance (Reference 4.4-003). The actual noise levels experienced by receptors more than a mile from the construction area would be 18 to 21 dBA lower than the noise level at 15 m (50 ft.) Following the distance attenuation rule, 975.4 m (3200 ft.) would result in six doublings and 1950.7 m (6400 ft.) would result in seven doublings. This would produce a natural attenuation of 18 dBA at six doublings (3 multiplied by 6) and 21 dBA at seven doublings (3 multiplied by 7) (Reference 4.4-008). Peak construction noise would be intermittent, and would not be expected to exceed 83 dBA at the nearest sensitive receptor. This level of intermittent noise would be irritating, but would not cause any deleterious health effects. The continuous construction noise would be lower. These noise effects would be limited to annoyance for the duration of construction. These noise impacts would be SMALL and temporary.

The following lists distances from two of the project components:

- **Pipeline Corridor**. The makeup water pipeline corridor is 9.85 km (6.12 mi.) from the Moncure Elementary School, 135 m (445 ft.) from the nearest residence, and 7.35 km (4.57 mi.) from the Greater New Sweet Springs Church.

- **Intake Structure and Pumphouse**. The water intake structure and pumphouse are located 12.5 km (7.77 mi.) from the Moncure Elementary School, 4.59 km (2.85 mi.) from the nearest residence and 9.69 km (6.02 mi.) from the Greater New Sweet Springs Church.

As a result, there may be SMALL adverse noise impacts to the nearest residences and church. However, these impacts will be temporary because the majority of the construction will occur during weekday working hours. Such activities should not affect weekend church or recreational activities, even though the construction schedule could, at times, span 24-hour days, up to 7 days per week.

Additional traffic will be generated in the area during construction. An increase in traffic to and from the HAR site will temporarily increase the level of vehicular

noise for those residences along routes that access the HAR site. At times, the construction schedule could span 24-hour days, up to 7 days per week. Standard noise control devices (such as mufflers and sound proofing) will be used to reduce noise impacts to nearby residences and other sensitive receptors.

If construction supplies are brought in by rail, additional train traffic may occur during construction. However, because the rail line is currently in use, periodic train traffic to deliver construction supplies will result in a SMALL noise impact, if at all.

Overall, construction noise is expected to result in temporary SMALL impacts to surrounding residential communities and sensitive receptors, such as schools and nearby recreation areas. Noise impacts to recreational users are expected to be SMALL during HAR site preparation activities along the Harris Reservoir shoreline. Because noise-related construction impacts are anticipated to be short in duration, they will result in temporary adverse impacts. No long-term direct or indirect cumulative impacts from construction noise are anticipated.

The makeup pipeline from the Cape Fear River to Harris Reservoir will be trenched into the ground to the extent practicable. During HAR site preparation, soil borings will be taken to determine whether blasting will be necessary for any portions of the makeup pipeline. If blasting is necessary to install the pipeline, a blasting plan will be developed and implemented. Blasting would be limited to daytime work-week hours and would not be conducted in the evenings or at night. This will minimize the noise impacts experienced by surrounding residents. Blasting will be limited by charge size or tamped. Ground acceleration from the blast would be low enough that nearby building foundations would not be damaged from the initial shock or subsequent vibrations. No adverse impacts from blasting are expected.

4.4.1.2 Air Quality

Air emissions may occur during HAR site preparation and construction activities. Potential sources of air emissions during HAR site preparation and construction include the following:

- Dust from exposed ground.
- Smoke from fires to eliminate clearing and grubbing debris or from equipment such as acetylene welders.
- Exhaust from personal vehicles and construction equipment.
- Particulate emissions from concrete facility operations.

A small increase in air emissions will occur during timber removal and HAR site preparation activities required for the Harris Reservoir perimeter, transmission corridors, pipeline corridor, and/or installation of the intake structure and

pumphouse. Currently, timber is being harvested near the HAR site, and continued harvest activities near Harris Reservoir are likely (Reference 4.4-009). Given current timber management operations, the minor timber clearing around Harris Reservoir and along the transmission and pipeline corridors will have a short-term SMALL and negligible impact on overall air quality in the immediate area.

ER Section 2.7 provides specific information on cumulative air quality impacts. Wake County is a non-attainment area for ozone (Reference 4.4-010) and a maintenance area for carbon monoxide (Reference 4.4-011).

During construction activities at the HAR site, controls will be implemented to mitigate potential air emissions from construction sources. These include the following controls and procedures:

- Grading will promote good drainage. This will minimize the potential accumulation of mud on equipment tires that could be transferred to road surfaces.
- All disturbed ground surfaces will be stabilized.
- Those areas that will revert to maintained grounds will be reseeded as soon as practicable to reduce the potential for dust generation.
- During dry conditions, bare ground in the construction area and along nearby construction roads will be wetted to minimize the generation of dust from vehicle traffic.
- Roadways used to access the HAR site will be wetted to minimize dust.
- Applicable air pollution control regulations with regard to open burning and the operation of fueled vehicles will be followed.
- Where required, permits and operating certificates will be obtained.
- Fuel-burning equipment will be maintained in proper mechanical order to minimize emissions.
- All reasonable precautions will be implemented to prevent accidental brush or forest fires.
- Clearing around Harris Reservoir would be phased over time. This would minimize the potential for air emissions at any given time. In addition, because most of the areas would be cleared before constructing HAR 2 and HAR 3, the potential for interaction with air emissions from other construction activities would be minimized.

No open burning would occur in Wake County during the ozone season, which occurs from May to October (Reference 4.4-012).

Construction-related dust and air emissions from equipment, which are expected to be minimal, would be controlled by implementing mitigation measures. Slight but negligible increases in emissions of particulate matter and combustion by-products may occur during HAR site preparation and construction activities.

Overall, construction-related activities will result in SMALL impacts to overall air quality. Surrounding residential communities and sensitive receptors (such as schools) are far enough away from construction areas that they will not be adversely affected by construction-related air emissions. Recreational users may experience localized areas of decreased air quality near construction areas. However, these impacts are anticipated to be minor and temporary. In addition, several other recreation areas are located nearby where people can pursue recreational activities. Air quality impacts are anticipated to be short in duration and, therefore, would result in temporary adverse impacts. No long-term indirect or cumulative impacts to air quality are anticipated from construction-related activities.

4.4.1.3 Visual Aesthetic Disturbances

The HNP uses vegetation as a visual screen or buffer from surrounding land uses. Construction activities at the plant site will not be visible to nearby residences. However, during construction, the plant site and other project components may be visible to boaters or other individuals conducting water-based recreational activities on Harris Reservoir. The HAR site is on the opposite side of the HNP. Because the main portion of Harris Reservoir is south of the HNP, those pursuing water-based activities will have minimal visual exposure to construction activities.

Tree clearing and construction activities will be visible along the Harris Reservoir perimeter, along the transmission corridors, along the pipeline corridor, and at the construction site for the intake structure and pumphouse. Because tree clearing is currently being conducted in the area, the additional clearing may not be a noticeable change from current conditions. As old growth takes over and as young trees grow, vegetation will screen the roads from the timber harvest areas. Recently cleared areas will be stabilized and revegetated, so that the amount of disturbed ground visible at any given time will be relatively small. Recreational users on Harris Reservoir will not be screened from the timber harvesting activities, but can relocate to other portions of the reservoir or other nearby lakes.

Visual aesthetic mitigation measures for construction activities include the following:

- Restricting construction laydown areas to minimize disturbance and visual intrusion.

- Removing construction debris in a timely manner.
- Burning windrows of logging debris as soon as practical following completion of logging in an area.

Overall, some temporary visual aesthetic disturbance will occur as a result of construction-related activities. HAR site preparation and construction activities will result in short-term SMALL visual impacts. Because these impacts will be temporary, no long-term indirect or cumulative impacts to visual aesthetics are expected.

4.4.2 SOCIAL AND ECONOMIC IMPACTS

The following subsections discuss social and economic impacts in the vicinity and region. Impacts from both construction activities and the construction labor force are addressed:

- Subsection 4.4.2.1 — Economic Characteristics
- Subsection 4.4.2.2 — Tax Impacts
- Subsection 4.4.2.3 — Social Structure
- Subsection 4.4.2.4 — Housing
- Subsection 4.4.2.5 — Educational System
- Subsection 4.4.2.6 — Recreation
- Subsection 4.4.2.7 — Public Services and Facilities
- Subsection 4.4.2.8 — Transportation Facilities
- Subsection 4.4.2.9 — Distinctive Communities
- Subsection 4.4.2.10 — Agriculture
- Subsection 4.4.2.11 — Environmental Justice
- Subsection 4.4.2.12 — Racial, Ethnic, and Special Groups
- Subsection 4.4.2.13 — Income Characteristics

It is estimated that a maximum of 3150 workers will be employed to construct the HAR. This maximum construction workforce would occur only for a short duration during the peak construction period (that is, during the installation of the piping and the wiring that occurs at the 50- to 70-percent completion phase).

The 2000 Census recorded 121,528 construction jobs in the region, accounting for 6.41 percent of the jobs in the region. This was a 37 percent increase over the 1990 statistics, which recorded 88,596 construction jobs, accounting for 5.96 percent of the jobs in the region (Table 2.5-12) (Reference 4.4-013). These statistics reflect the growth and development in nearby towns that serve as bedroom communities to the larger City of Raleigh. These statistics also indicate that a significant pool of construction workers already lives in the area. Typical construction workers anticipated to be needed for HAR construction include welders, fabricators, carpenters, millwrights, electricians, ironworkers, laborers, and pipefitters.

Because there is a large pool of construction workers in the region, it is assumed that in-migration of workers to the region would probably be temporary or incidental. Specialists would move to the region when needed for construction tasks, then move away once the job was complete. Overall, it is assumed that the majority (75 percent or approximately 2362) of the new construction workers needed (estimated peak of 3150) for the HAR will already live in the region and the remaining 25 percent (approximately 788) would be highly specialized craft workers that would relocate to the region. It is assumed that these new in-migrants (25 percent of the estimated peak 3150 construction workforce) will follow the same residential patterns as the existing workforce at the HNP. Currently, approximately 91.3 percent of the existing HNP workforce lives in Wake (61.6 percent), Chatham (6.3 percent), Lee (16.2 percent), and Harnett (7.2 percent) counties. The remaining 8.7 percent of workers live in surrounding counties.

Based on this information, a temporary SMALL beneficial economic impact is expected due to the increased employment of regional construction workforce.

4.4.2.1 Economic Characteristics

This section on economic impacts of construction first considers the total (i.e., direct, indirect, and induced) contribution of constructing the HAR to regional employment, income (i.e., wages and salaries, proprietors' [business owners'] income, and all other income) and output. Second, the construction activity is placed in the context of the larger economy to evaluate the significance of the net contribution to the regional economy.

HAR site preparation is anticipated to take up to 18 months and construction is anticipated to take an additional 42 months, or 60 months for the preparation and construction activities combined. The peak workforce for each unit will occur during the installation of the piping and the wiring that occurs at the 50 to 70 percent completion phase. The construction of the HAR will be staggered by approximately 2 years. This gives a 7-year preparation and construction period for the combined units. This means that when employment on the first unit is peaking, relatively few workers will be employed for the construction of the second unit. Gradually the work force will shift from the first to the second unit.

Once the piping and wiring tasks for the second unit have been completed, the workforce should steadily decline until the HAR is ready for operation. Efforts, such as staggering construction, will be made to schedule construction activities to avoid sharp peaks and declines in the labor force. The peak workforce for the combined units is anticipated to include up to 3150 people. As stated in Subsection 4.4.2, the total number of construction jobs in the region was 121,528 in 2000 (Reference 4.4-013). Based on this information, the construction and preparation peak workforce for the HAR represents approximately 2.6 percent of the construction workforce in the region.

Once the piping and wiring tasks for the second unit have been completed, the workforce should steadily decline until the HAR is ready for operation. Efforts, such as staggering construction, will be made to schedule construction activities to avoid sharp peaks and declines in the labor force.

The Erickson and Associates 2005 economic impact study uses 2002 IMPLAN data and multipliers for counties that comprise the North Carolina Planning Region J (Chatham, Durham, Johnston, Lee, Moore, Orange, and Wake) plus Harnett County, which is outside of but adjacent to Region J. These multiplier effects include “indirect” and “induced” effects which are added to the direct changes in expenditures and employment due to construction to capture the total economic impacts on the region. (Reference 4.4-014)

The Erickson and Associates study estimates an employment multiplier of 1.65. Thus, during peak employment for the HAR construction, the total impact on regional employment is approximately 5197 full-time equivalents (3150 peak workforce multiplied by 1.65). Employment impacts are measured by converting full-time, seasonal, and part-time jobs into their “full-time equivalents.” (Reference 4.4-014)

The cost of constructing each new unit is approximately $2.2 billion. Over a 5-year preparation and construction period, if all expenditures are evenly spaced, average annual construction expenditures would be approximately $435 million for each unit. Assuming that construction of the two units overlaps by 3 years, the annual expenditures would average approximately $440 million for the first 3 years, would double to $880 million for the next 3 years and fall back to $440 million for the last 2 years. These figures consider only the direct impacts of construction expenditures on output. The Erickson and Associates study estimates an output multiplier for the region of 1.61. Thus, the total impact on regional output is approximately $708.4 million ($440 million multiplied by 1.61). This figure doubles to $1.4 billion during the 3 years when construction on the two units is overlapping. (Reference 4.4-014)

Construction workers are expected to live and spend most of their salaries within the region. In addition, these workers are likely to spend some portion of their salaries in the local area for gasoline, beverages, food, and incidental items. Because construction workers will be at this location for some time, there will be a small multiplier effect where money is spent and re-spent in the local area and

later in the region. By patronizing local retail and service-sector businesses, construction workers may temporarily increase sales. The Erickson and Associates study estimates that direct income generated by the construction of one new unit would be approximately 28 percent of the direct construction expenditures. Based on this information, the cost of constructing the HAR has an average direct impact on earnings of approximately $616 million (28 percent of the $2.2 billion construction cost per unit), or approximately $123.2 million average annual direct impact over the 5-year preparation and construction period for each unit. Assuming that the construction period for each of the units overlaps for 3 years during the 7-year construction period, this average annual figure would double to approximately $246.4 million during those 3 years. The Erickson and Associates study estimates a construction income multiplier of 2.82 in the study region. This means that the total impact on income in the region is found by multiplying the $123.2 million of direct construction earnings by 2.82, which results in approximately $347.4 million in average annual income from constructing each unit after accounting for direct, indirect, and induced impacts. During the years when construction employment overlaps, this average annual figure doubles to approximately $694.8 million. (Reference 4.4-014)

These construction activities are sizeable, but so is the size of the local economy, including the construction sector. Overall, actual construction activities and expenditures for construction-related materials should result in a SMALL to MODERATE net beneficial economic impact to the local economy. Construction worker spending may have positive temporary direct and indirect impacts on the business community, sustaining existing businesses in the area and the region, while potentially providing opportunities for some new businesses. However, given that the construction labor force, materials, and capital are supplied from within the region and that these resources would have been otherwise used on other construction projects within the region, these economic impacts represent a transfer of resources within the region rather than a net increase in economic activity within the region.

4.4.2.2 Tax Impacts

The HAR will generate additional tax revenue for the state and local governments, including the following:

- State income tax revenue
- Sales tax revenue
- Property tax revenue

4.4.2.2.1 State Income Tax Revenues

Construction jobs and salaries will generate state income tax revenue. However, it is assumed that most of the construction workers will already live in the existing communities. Therefore, there will be no significant change in state income tax

revenue generated from salaries paid to HAR construction workers. A small proportion of skilled craftsman are anticipated to relocate to the region during the construction period. A SMALL increase in state income tax revenue will be generated from the salaries paid to these skilled craftsmen. The skilled craftsman jobs will account for a very small proportion of the overall workforce in the region, so no major state income tax revenue impact is anticipated.

4.4.2.2.2 Sales Tax Revenue

Sales taxes will be levied on materials purchased for the HAR as well as on goods and services purchased by workers. Sales taxes on such purchases are expected to be a SMALL but beneficial impact to the local economy. Similarly, there may be SMALL direct and indirect beneficial economic impacts from sales tax revenue generated from goods and services purchased by workers who do not currently work in the region.

4.4.2.2.3 Property Tax Revenue

There will be no increase in property tax revenue until after construction is complete. From 2001 to 2004, PEC paid between $7,061,685 and $8,396,063 annually in total real and personal property taxes to Wake County. This averages out to 2.3 percent of Wake County's total tax annual revenues. A portion of these funds is retained for county operations and the remainder is disbursed to the 12 cities and municipalities in the county to fund their respective operating budgets. Approximately 58 percent of the Wake County General Fund is revenue from real and personal property tax generated by HNP. Dispersal of General Fund revenues is as follows: Education: 32.2 percent, Human services: 26.6 percent, Capital and debt: 20.2 percent, General administration: 6.6 percent, Sheriff: 5.7 percent, Public safety: 2.7 percent, Community services: 2.7 percent, Environmental services: 1.0 percent, and Other: 1.3 percent. Once the HAR is constructed, PEC will be subject to additional state and Wake County taxes.

4.4.2.3 Social Structure

ER Subsection 2.5.2.3 describes the social structure for the region. The social structure of the region is not anticipated to change as a result of constructing the HAR. It is assumed that a majority of the HAR construction workforce will already live in the region. Therefore, there will be little change to the existing social structure and patterns of the surrounding community. No significant change in population is anticipated; therefore, the social structure will remain unchanged during construction of the HAR and impacts will be SMALL.

4.4.2.4 Housing

In 2000, a total of 1,187,941 people lived in the Raleigh Metropolitan Statistical Area (80-km [50-mi.] radius) (Reference 4.4-015). Assuming that the majority of new construction workers will already live within the region, construction workers are expected to commute to the HAR site rather than move their families to the

area immediately surrounding the proposed HAR site. Therefore, the demand for housing in the vicinity will not increase significantly.

Construction workers who live outside the 80-km (50-mi.) commuting distance typically will share trailers or campers at existing or new mobile home courts. However, a small number of construction workers may relocate closer to the HAR site to be with their families.

The 2000 Census indicated that the region has a robust housing market, as indicated in the following housing status data (Reference 4.4-016):

- **Wake County** had 258,953 total housing units. Of this number, 242,040 (93.5 percent) were occupied and 16,913 (6.5 percent) were vacant. Of the occupied housing units, 159,456 (65.9 percent) were occupied by owners and 82,584 (34.1 percent) were occupied by renters.

- **Chatham County** had 21,358 total housing units. Of this number, approximately 19,741 (92.4 percent) were occupied and 1617 (7.6 percent) were vacant. Of the occupied housing units, 15,239 (77.2 percent) were occupied by owners and 4502 (22.8 percent) were occupied by renters.

- **Harnett County** had 38,605 total housing units. Of this number, approximately 33,800 (87.6 percent) were occupied and 4805 (12.4 percent) were vacant. Of the occupied housing units, 23,753 (70.3 percent) were occupied by owners, and 10,047 (29.7 percent) were occupied by renters. Table 2.5-11 shows housing characteristics for the region.

In addition to the availability of this year-round housing, there are numerous campground sites available, which have the potential to provide temporary housing for the construction workforce. These sites are discussed in further detail in Subsection 4.4.2.6.

Based on the number of available year-round housing units and the expected portion of the construction workforce that may commute, constructing the HAR will not create a housing shortage. Because housing units in the region are abundant, HAR construction should have little impact on rent or sale prices for houses.

Figure 4.4-1 shows the nearest residences to construction activity. Construction of the HAR will not displace any families or households. Impacts on housing from construction will be SMALL.

4.4.2.5 Educational System

The HAR is located in Wake County. The Wake County Public School System is currently planning an expansion program entitled "Blueprint for Excellence." This program will include new school construction and the renovation of existing facilities through the year 2011 (Reference 4.4-017).

Representatives from local school systems were contacted to determine current and future capacities. Because it is anticipated that most of the HAR construction workers already live in the region, constructing the HAR should not significantly increase the number of pupils in the surrounding school systems. However, if the number of school-aged children increases slightly, the school system may have sufficient capacity to serve them. Impacts to the educational system will be SMALL.

4.4.2.6 Recreation

ER Subsection 2.5.2.6 describes recreational facilities in the vicinity. The rise in water level will affect the following recreational facilities (Reference 4.4-002 and Reference 4.4-003):

- Approximately 98 ha (279 ac. or 0.44 mi.^{2}) of recreation facilities located at the Harris Lake County Park area.
- Four boat ramps (two public boat ramps and two PEC-owned boat ramps).
- Some existing PEC recreation facilities, including a picnic area, a restroom, a playground, and a ball field.

Construction activities will temporarily disrupt recreational activities at these locations. Anglers will continue to be able to fish in Harris Reservoir during construction of the HAR and while the water level rises.

Harris Lake County Park and Harris Reservoir are not the only resources in the region for meeting recreational demands such as those listed previously. Those who use these facilities will modify their recreational activities by visiting other recreational resources when these facilities are unavailable. In addition to the previously described recreational facilities, there are 19 campgrounds (1937 sites) within 80 km (50 mi.) of New Hill, as shown on Tables 4.4-2 and 4.4-3. Sixteen of these campgrounds (1279 sites) are open year-round. (Reference 4.4-018 and Reference 4.4-019)

During construction, recreational impacts will be temporary and SMALL. Efforts will be made to mitigate those recreational resources displaced by construction activities. In the long term, there will be a SMALL beneficial impact to recreation because the reservoir surface area will be expanded by approximately 1641 ha (4055 ac. or 6.3 mi.^{2}). This expanded area will provide visitors with more boating

and fishing opportunities. Additionally, new park facilities will be developed to replace the recreational facilities displaced by the change in water level (Reference 4.4-002).

Individuals participating in recreational activities on Harris Reservoir may be affected by minor noise and visual impacts from HAR construction-related activities. To avoid the local disturbances from construction, recreational users can relocate to other areas on Harris Reservoir. These SMALL recreation impacts will be temporary and short in duration.

It is assumed that most of the construction workers will commute from their current homes, so no significant increase in nearby population is expected. Therefore, there will be no impact to recreational facilities as a result of additional construction workers in the vicinity.

4.4.2.7 Public Services and Facilities

As stated in Subsection 4.4.2, it is assumed that the majority of new construction workers will already live within the region and the remaining workers will relocate to the region. Therefore, public facilities should not be overcrowded. No impacts to public services and facilities are anticipated.

4.4.2.7.1 Security Services

As discussed in more detail in Section 2.2 of the HAR Final Safety Analysis Report (FSAR), PEC currently provides security for the plant site. This security service will be expanded to the HAR site. The New Hill Apex Fire Station and one combination fire and police station are located in Apex. Therefore, existing public facilities will be capable of absorbing any minor increase in demand from increased security needs related to constructing the HAR.

4.4.2.7.2 Water and Wastewater Services

The HAR site is located within the Cape Fear River basin. Five water treatment plants (WTPs) and intakes utilize this river basin as described below. Each WTP is permitted on a maximum day demand (MDD) basis.

The average household size is 2.47 people for the state (Reference 4.4-020). The average wastewater flow rate for a 2-person urban residential household is 287.7 liters per capita per day (76 gallons per capita per day), while a 3-person urban residential household is 249.8 liters per capita per day (66 gallons per capita per day) (Reference 4.4-021). Based on these data, the average household in North Carolina would generate 672 liters per day (177.5 gallons per day) of wastewater. It is assumed that 25 percent of the construction workers (788 in-migrants) will move to the area. This additional peak 3150 construction workforce and their families would generate 529,465 liters per day (139,870 gallons per day) of wastewater. Based on the current settlement patterns for HAR operation workers, the additional generated wastewater from construction

workers and their families would be distributed among the four counties. Therefore, the overall impacts to water and wastewater infrastructure would be SMALL.

Current and projected capacity of water treatment facilities in the area are described below:

- Cary/Apex, Wake County WTP has a permitted capacity of 151 million liters per day (mld) (40 million gallons per day [mgd]) and serves Cary, Apex, Morrisville, Research Triangle Park south. The plant is 6 miles from Jordan Lake, in western Wake County, near U.S. Highway 64. (Reference 4.4-022)
- Chatham County WTP at 11 mld (3 mgd) serves northern Chatham County. The plant is located on the eastern shore of Jordan Lake off U.S. Highway 64. (Reference 4.4-023)
- City of Sanford, Lee County WTP, located above the Buckhorn Dam (45 mld [12 mgd]), serves the City of Sanford, Chatham County East, Lee County WAS District 1, Town of Broadway, and Utilities, Inc. (Carolina Trace) (Reference 4.4-024 and Reference 4.4-025).
- Harnett County Regional WTP (68 mld [18 mgd]) serves unincorporated Harnett County as well as the Harnett County towns of Angier, Coats, Lillington, Linden, and contracts water sales to the towns of Holly Springs and Fuquay-Varina (Reference 4.4-024 and Reference 4.4-026). The plant is located along the Cape Fear River in the Town of Lillington.
- The HNP WTP is located within the EAB.

The NCDENR Division of Water Resources has established water supply allocations from the Cape Fear River Basin, specifically the Cape Fear River upstream of Buckhorn Dam and Jordan Lake. In 2001, the Division of Water Resources reviewed the water demands of the communities using Jordan Lake and downstream to Buckhorn Dam, and concluded the capacity of the watershed was sufficient for projected population demands through at least 2030. (Reference 4.4-024) Water demands for the area and water allocation based on average day demand (ADD) basis are described below:

- Cary, Wake County WTP anticipates an increase in ADD from 59.8 mld (15.8 mgd) in 2005 (for a population of approximately 130,500) to 70.0 mld (18.5 mgd) in 2010 (for a projected population of nearly 152,000) and 94.7 mld (25.0 mgd) in 2020 (for a projected population of nearly 197,000). (Reference 4.4-024)
- Apex, Wake County WTP anticipates an increase in ADD from 11.7 mld (3.1 mgd) in 2005 (for a population of approximately 36,000) to 15.9 mld (4.2 mgd) in 2010 (for a projected population of nearly 49,000) and 23.8 mld (6.3 mgd) in 2020 (for a projected population of nearly 75,000). (Reference 4.4-024)

This growth will require expansion of the Cary-Apex WTP. An expansion of the plant's treatment capacity to 212 mld (56 mgd) is planned to be completed by 2015. (Reference 4.4-027)

- Chatham County WTP anticipates consolidation of its water system to serve customers county-wide in unincorporated areas. In addition, the county plans future sales to the towns of Siler City and Pittsboro, after 2030. In addition to an allocation from Jordan Lake, utilized by the Chatham County WTP, the county receives water for its customers from Pittsboro, Siler City, Sanford, and the Goldston-Gulf Sanitary District. As adjusted by the Division of Water Resources, the anticipated ADD for the county-wide system are expected to increase from 11.0 mld (2.9 mgd) in 2005 (for a population of approximately 16,000) to 23.5 mld (6.2 mgd) in 2010 (for a projected population of just over 20,500) and 30.7 mld (8.1 mgd) in 2020 (for a projected population of nearly 27,000). (Reference 4.4-024)

  This growth will require expansion of the Chatham County WTP. The WTP is anticipated to be expanded to 22.7 mld (6 mgd) in 2008. The expanded WTP will have the ability to expand to 30.3 mld (8 mgd), should it be needed to meet system demand, which should be sufficient for demands through 2020. (Reference 4.4-028)

- City of Sanford, Lee County WTP: Sanford's water system anticipates an increase in ADD from 30.3 mld (8.0 mgd) in 2005 (for a population of approximately 35,000 and substantial commercial demand) to 35.6 mld (9.4 mgd) in 2010 (for a projected population of nearly 41,000 and substantial commercial demand) and 52.0 mld (13.7 mgd) in 2020 (for a projected population of nearly 57,000 and substantial commercial demand). (Reference 4.4-024)

This growth is expected to require expansion of the City of Sanford WTP by 2010 to 2020 based on a comparison of the MDD to the permitted capacity. The MDD is calculated by multiplying the ADD by the peaking ration. The peaking ration is calculated by dividing the maximum day withdrawal of 36.7 mld (9.7 mgd) by the average day withdrawal of 26.5 mld (7.0 mgd). Using the 2010 ADD (35.6 mld [9.4 mgd]) and the calculated peaking ration (5.3 mld [1.4 mgd]), the 2010 MDD is 51.7 mld (13.7 mgd). As stated above, the City of Sanford WTP permitted capacity is 45.4 mld (12 mgd). Based on the projected 2010 MDD of 51.7 mld (13.7 mgd), the City of Sanford WTP would need to expand to meet the projected demand in 2010. (Reference 4.4-024 and Reference 4.4-025)

The 2020 ADD for the City of Sanford WTP is 51.5 mld (13.6 mgd) and the MDD is 72.0 mld (19.0 mgd) (Reference 4.4-024). Based on the projected 2020 MDD of 72.0 mld (19.0 mgd), the capacity would have to be expanded to meet the projected demand in 2020.

- The Harnett County Regional WTP anticipates an increase in ADD from 25.0 mld (6.6 mgd) in 2005 (for a population of approximately 75,000) to 29.1 mld (7.7 mgd) in 2010 (for a projected population of nearly 85,000) and 37.5 mld (9.9 mgd) in 2020 (for a projected population of nearly 110,000). (Reference 4.4-024)

  This growth is expected to require expansion of the Harnett County WTP by 2012. The WTP site has capability of expansion from its current 68.1 mld (18 mgd) capacity to a maximum-day capacity of approximately 90.8 mld (24 mgd). (Reference 4.4-026)

Wastewater treatment facilities in the area include:

- Utley Creek WWTP (23 mld [6 mgd]), the municipal wastewater plant for the Town of Holly Springs, Wake County (Reference 4.4-029).

- Proposed Western Wake Regional Water Reclamation Facility (WRF), which will serve Cary, Apex, Morrisville, and Holly Springs. It will have a treatment capacity of 68 mld (18 mgd) on a maximum month average day basis when it begins operation, which is estimated to occur in 2012. The plant will eventually have a treatment capacity of 114 mld (30 mgd) when it is expanded after 2020 (Reference 4.4-030). The plant is anticipated to be constructed west of Apex, near the intersection of U.S. Highway 1 and Shearon Harris Road (Reference 4.4-031).

- Chatham County Bynum WWTP (0.1 mld [0.03 mgd]) serves a total of 26 customers and does not have any plans to expand their wastewater treatment facility. The county has 3130 water service connections with septic systems. (Reference 4.4-028)

- City of Sanford, Lee County WWTP (25.7 mld [6.8 mgd]) is the municipal wastewater plant for the City of Sanford and serves 7714 customers and does not have any plans to expand their wastewater treatment facility. The City of Sanford has 5610 water service connections with septic systems. (Reference 4.4-025)

- Harnett County's North Harnett Regional WWTP (21.2 mld [5.6 mgd]), the municipal wastewater plant for Lillington, Angier, and other areas of unincorporated Harnett County, serves 3475 customers and has 26,000 septic systems. This wastewater treatment facility does have plans to expand by 2012. (Reference 4.4-024, Reference 4.4-026, and Reference 4.4-032)

Based on the current and projected water and wastewater infrastructure for Wake, Chatham, Lee, and Harnett counties, there is sufficient capacity to absorb the increase in population from construction activities. Impacts from additional

construction workers and their families on the capacity of the water and wastewater infrastructure would be SMALL.

4.4.2.8 Transportation Facilities

The two primary routes accessing the plant site are as follows:

- U.S. Highway 1 to New Hill Holleman Road.
- Old U.S. Highway 1 to Shearon Harris Road.

Figure 4.4-3 shows the transportation corridors.

U.S. Highway 1 and Old U.S. Highway 1 may be impacted by construction-related vehicular traffic.

4.4.2.8.1 Traffic Related to Construction of the HAR

Estimates of the numbers, routes, and timing of additional daily vehicle trips during construction of the HAR are based on the following assumptions:

- Approximately 3150 additional vehicle trips per day would be made. This is the maximum number of vehicle trips during the peak construction period, when around 3150 construction workers are expected. The peak construction period is anticipated to occur once the HAR is 50- to 70-percent complete. Once these tasks are complete, the workforce and average daily vehicle traffic are expected to decline steadily until the HAR is operational.
- One worker per vehicle.

Because it is expected that most construction workers already live within the 80-km (50-mi.) radius of the plant site, traffic would be divided over the two primary access routes.

- Approximately 50 additional miscellaneous trips would occur throughout the day.
- Truck deliveries would occur during peak hours of the workday.

To determine the potential impact of additional workers on traffic, average daily traffic counts for the two major transportation corridors near the plant site were obtained from the NCDOT website. U.S. Highway 1 and Old U.S. Highway 1 are the most direct routes to the plant site from nearby population centers and are described as follows:

- **U.S. Highway 1***:* At its nearest point, U.S. Highway 1 is approximately 2.1 km (1.3 mi.) from the center of the plant site. The average annual daily traffic near the plant site is 18,000 vehicles (Reference 4.4-033).

- **Old U.S. Highway 1***:* At its nearest point, Old U.S. Highway 1 is approximately 3.2 km (2 mi.) from the center of the plant site. The average annual daily traffic for Old U.S. Highway 1 near the plant site is 1800 vehicles (Reference 4.4-034).

During the peak construction period, approximately 3150 construction-related vehicle trips and 50 additional trips may occur per day.

PEC has initiated discussion with NCDOT regarding County and State roadway impacts from increased lake levels in the Harris Reservoir required for operations of the HAR. A Transportation Impact Analysis (TIA) will be completed by PEC to evaluate construction and operational road impacts. As part of this process, a temporary access road at the intersection of U.S. Highway 1 and Shearon Harris Road will be evaluated. This access road would be used during construction of the HAR.

The increased traffic volumes related to the construction of the HAR on both U.S. Highway 1 and Old U.S. Highway 1 will generate SMALL impacts because of the brief duration of the congestion, which will result from vehicles entering and exiting the plant site during shift changes. This congestion is expected to last approximately 10 to 15 minutes.

4.4.2.8.2 Log-Hauling Traffic

Timber clearing operations are currently conducted in Wake and Chatham counties by the NCWRC. During these periodic timber harvesting operations, the local roads experience some increase in log-hauling truck traffic.

Some tree clearing may be necessary at the plant site and along the transmission corridors, the pipeline corridor, and the Harris Reservoir perimeter. The economic impact of these timber harvesting activities is described in Subsection 4.4.2.10.

Additional truck traffic for tree clearing may result in SMALL transportation impacts that will be temporary and short in duration. Because clearing around Harris Reservoir will occur before construction of the HAR, the log-hauling traffic will be separated in time from the traffic related to constructing the HAR. No adverse impacts to traffic are anticipated from the clearing activities around the perimeter of the reservoir.

4.4.2.8.3 Relocation and Reconstruction of Roads

Some roads in the Harris Reservoir area will have to be reconstructed to accommodate the increased water level. It is anticipated that, to accommodate

the increased water level, the roads will be elevated in place. Local traffic on these roads would be disrupted while the modifications are implemented. Temporary detours and traffic control flaggers would be used, as appropriate, to maintain traffic flow during road modifications. Therefore, any disruptions to local traffic resulting from road modifications to accommodate the new Harris Reservoir water level would be SMALL and temporary. Consultation with state and local DOT has been initiated regarding construction and operational impacts on state and local roads as described in Subsection 4.4.2.8.1.

4.4.2.9 Distinctive Communities

The population surrounding the vicinity is fairly homogeneous. No special populations or distinctive communities exist. Because only skilled craftsmen and incidental construction workers are expected to relocate to the region, no unique communities are expected to develop as a result of HAR site preparation or construction activities and impacts will be SMALL.

4.4.2.10 Agriculture

The HAR site is zoned industrial and light residential. However, some nearby areas are used for silviculture or timber management areas (Reference 4.4-035).

As part of the site preparation activities conducted prior to plant operation, some tree clearing may be necessary at the plant site and along the transmission corridors, the pipeline corridor, and the Harris Reservoir perimeter. However, these trees will be a small proportion of the overall timber management lands in the region. NCWRC cash receipts from timber harvesting in Wake and Chatham counties ranged from $290,318 to $802,502 between 2004 and 2007 (Reference 4.4-036):

- Between 2004 and 2005, the NCWRC thinned 331 ac. (volume of 1,459,294 board feet) of sawtimber, accounting for $290,318 in cash receipts for Wake and Chatham counties.

- Between 2005 and 2006, the NCWRC thinned 344 ac. (volume of 2,209,659 board feet) of sawtimber, accounting for $477,093 in cash receipts.

- Between 2005 and 2006, the NCWRC thinned 437 ac. (volume of 2,638,814 board feet) of sawtimber in Wake and Chatham counties, accounting for $802,502 in cash receipts.

Trees cleared during site preparation activities may be sold as timber. However, any economic gain will be offset by the cost of conducting timbering operations along the lakeshore where additional BMPs will have to be implemented and traditional tree clearing methods will not be able to be implemented due to the irregular shape of the lakeshore. Therefore, no positive economic impact is

anticipated from the limited tree clearing associated with site preparation activities prior to plant operation and impacts will be SMALL.

4.4.2.11 Environmental Justice

This subsection evaluates the potential for disproportionate impacts to low-income and minority populations that may result from construction of the HAR. Census data were analyzed to determine the potential effects of construction on low-income and minority populations. When these populations incur more than their "fair share" it is deemed a disproportionate impact. Analysis of census data indicates that no disproportionate impacts to low-income or minority populations in the region (as defined by the U.S. Department of Health and Human Services) will occur (Reference 4.4-037).

Environmental justice issues also include the environmental health effects of air and noise pollution on low-income and minority populations. Construction activities will comply with federal, state, and local regulations. Therefore, no disproportionately high or adverse impacts on minority or low-income populations are anticipated as a result of construction and impacts will be SMALL.

4.4.2.12 Racial, Ethnic, and Special Groups

Baseline data for racial, ethnic, and special groups are defined in ER Section 2.5. Figure 2.5-10 identifies the minority populations in the region (Reference 4.4-038). As stated in Subsection 2.5.2.3, no special groups are located within the region. Impacts to minority, ethnic, or special groups as a result of the construction of the HAR will be SMALL.

4.4.2.13 Income Characteristics

Census block data for household income were evaluated to identify low-income populations. Baseline income characteristic data are defined in ER Section 2.5. Figure 2.5-11 shows the populations below the poverty level within each census block (Reference 4.4-001 and Reference 4.4-039).

Impacts to low-income populations as a result of the construction of the HAR will be SMALL.

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Table 4.4-1
Sensitive Noise Receptors near the HAR Site

Project Components	School	Residence	Church
Plant Site (HAR 2 and HAR 3)	Moncure Elementary School at 11.02 km (6.85 mi.)	Residence 1 at 1.67 km (1.04 mi.)	Prince Chapel Christian Methodist Episcopal Church at 3.36 km (2.09 mi.)
Makeup Water Pipeline Corridor (Reservoir to Cape Fear River)	Moncure Elementary School at 9.85 km (6.12 mi.)	Residence 3 at 135 m (445 ft.)	Greater New Sweet Springs Church at 7.35 km (4.57 mi.)
Intake Structure and Pumphouse	Moncure Elementary School at 12.5 km (7.77 mi.)	Residence 3 at 4.59 km (2.85 mi.)	Greater New Sweet Springs Church at 9.69 km (6.02 mi.)
Harris Reservoir Perimeter	Olive Chapel Elementary School at 8.45 km (5.25 mi.)	Residence 2 at 53 m (176 ft.)	Greater New Sweet Springs Church at 168 m (552 ft.)

Sources: Environmental Reports for HAR Units 2 and 3 - Figures 4.4-1, 4.4-2, and 4.4-3.

Table 4.4-2
Campgrounds within 25 Miles of New Hill

Campground	City	Total No. of Sites	Open	Close
Jordan Lake State Rec. Area (Crosswinds Campground)	Apex	129	all year	
Jordan Lake State Rec. Area (Vista Point)	Apex	50	15-Mar	30-Nov
Jordan Lake State Rec. Area (Parkers Creek)	Apex	250	all year	
Jordan Lake State Rec. Area (Poplar Point)	Apex	580	15-Mar	30-Nov
William B Umstead State Park	Raleigh	28	15-Mar	15-Dec
Falls Lake State Rec. Area (Holly Point Campground)	Raleigh	153	all year	
Falls Lake State Rec. Area (Rollingview Campground)	Raleigh	115	all year	
70 East Mobile Acres	Garner	27	all year	
Spring Hill Park	Chapel Hill	31	all year	

Source: Reference 4.4-018

Table 4.4-3
Campgrounds within 50 Miles of New Hill

Campground	City	Total No. of Sites	Open	Close
Birchwood RV Park	Durham	70	all year	
Cooper's Mobile Home Park & RVs	Clayton	40	all year	
Fayetteville KOA	Wade	85	all year	
Smithfield KOA	Smithfield	60	all year	
RVacation Campground	Selma	50	all year	
Military Park (Fort Bragg Travel Camp)	Fayetteville	24	all year	
Village of Pinehurst RV Park	Pinehurst	55	all year	
Lazy Acres Campground	Fayetteville	50	all year	
Lake Waldo's Beach Campground	Hope Mills	23	all year	
Rock Ridge Campground	Rock Ridge	117	all year	

Source: Reference 4.4-019

4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

This section assesses the potential radiological dose impacts to those who will construct the HAR and be exposed to the HNP and HAR 2 during construction of HAR 3.

Radiation sources in the form of dry active waste, resins, spent (dry cask storage area) and new fuel, radiography sources, contaminated tools and equipment, and irradiated components, may be present in temporary facilities or storage in areas outside of the main plant structures. Temporary facilities (such as trailers, tents, and Sea-Land containers) may also be located in areas outside of plant structures. These temporary facilities may be used for decontamination, maintenance on contaminated components, radiography, waste processing, or other activities. If present, these types of facilities or storage may contribute to construction worker doses if not properly monitored and controlled. However, administrative controls and plant radiological programs and procedures will be used to maintain the doses from these sources and facilities during normal operations within regulatory limits and as low as reasonably achievable. Based on the type of materials and facilities involved, administrative limits on source activity will be established to keep the dose from accidental releases below allowable limits (Reference 4.5-001).

4.5.1 HAR SITE LOCATION

ER Figure 1.1-1 and Figure 2.1-2 show the physical locations of HAR 2 and HAR 3 relative to the layout of various HNP facilities. As shown on these figures, with the possible exception of the expansion of the switchyard and the installation of the HAR facility intake structure, the major construction activities are expected to take place outside the HNP protected area boundary, but inside the restricted area boundary.

PEC proposes to construct HAR 2 first. Thus, HAR 2 construction workers could be exposed to any elevated background levels and gaseous effluent discharges from current HNP reactor operations. Once HAR 2 is operational, workers involved with the construction of HAR 3 would be shielded by HAR 2 and thus the contribution from HNP operations would not contribute appreciably to their total external dose. However, active HAR 2 operations would then be the major contributor to any external doses received, if any, from active operations. It is assumed that doses calculated to HAR 2 construction workers from active HNP operations would be similar to those received by HAR 3 construction workers from active HAR 2 operations.

4.5.2 RADIATION SOURCES

During construction of the HAR facility, construction workers may be exposed to direct radiation and to the radioactive effluents emanating from the routine operation of the HNP.

The design basis radiation source term is listed in Chapter 12 of the HNP FSAR (Reference 4.5-001).

The HNP facility releases airborne effluents via four gaseous effluent discharge points: Plant Vent Stack 1, Turbine Building Vent Stack 3A, and the Waste Processing Building Vent Stacks 5 and 5A (Figure 4.5-1). The expected radiation sources in the gaseous effluents are listed in Chapter 3 of the HNP's Annual Radioactive Effluent Release Report for 2004 (Reference 4.5-002).

Impacts to workers during construction of HAR 2 and HAR 3 from radiation sources associated with the ongoing operation of the HNP facility will be SMALL.

4.5.3 MEASURED RADIATION DOSE RATES AND LIQUID/AIRBORNE CONCENTRATIONS

Environmental radiological monitoring data obtained from the HNP "Radiological Environmental Operating Amended Report" (Reference 4.5-003) were used to assess any radiological dose impacts on the surrounding environment from the operation of the HNP facility. During 2004, HNP collected approximately 1,125 samples of 13 different media types from approximately 880 indicator stations. The results from these samples were compared to the results from approximately 250 control stations. (Reference 4.5-003) (Control stations are locations that are unaffected by plant operations.) In approximately 99 percent of the indicator station samples, there was no difference compared to the results from the activities observed in the corresponding control station samples. The control station samples represented direct radiation; atmospheric, terrestrial, and aquatic environments; Harris Reservoir surface water; and public drinking water. The radiological environmental data indicate that HNP operations in 2004 had no significant impact on the environment or on public health and safety (Reference 4.5-003).

4.5.3.1 Tritium Releases from the HNP

Results from the environmental monitoring program indicate that the continued operation of the HNP has not contributed measurable radiation or increased the presence of gamma radioactivity, with the exception of Harris Lake bottom sediment and aquatic vegetation. For example, the Harris Lake surface water samples revealed tritium concentrations that are well below the USEPA's reportable nondrinking water limit (30,000 picoCuries per liter [pCi/L]) and drinking water limit (20,000 pCi/L). (Reference 4.5-003) However, as stated in the HNP Radiological Environmental Monitoring Report for 2004, the Harris Lake bottom sediment and the aquatic vegetation pose no radiological dose to the general public via this pathway because the sediment is not easily accessible and the aquatic vegetation is not an ingestion pathway and impacts will be SMALL. These samples are for long-term trending only (Reference 4.5-003).

4.5.3.2 Gaseous and Liquid Releases from the HNP Facility

Impacts from HNP effluents during construction of HAR will be SMALL, as discussed below.

4.5.3.2.1 Liquid Effluent Releases

Radioactive materials released in liquid effluents from the HNP to unrestricted areas are required to demonstrate compliance with 10 CFR 50 Appendix I (Off-site Dose Calculation Manual [ODCM] Operational Requirement 3.11.1.2 (Reference 4.5-004) and, on an annual average basis, to be limited to the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2. For dissolved or entrained noble gases, the concentration shall be limited to 0.0002 microCurie per milliliter (µCi/ml) total activity. On an individual release basis, the release concentration for liquid effluents will be limited to ten times the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2, Effluent Concentration (10 CFR 50 Appendix I, ODCM Operational Requirement 3.11.1.1) (Reference 4.5-004).

Radioactive liquids are routinely released as batches from the waste evaporator condensate tank and the treated laundry and hot shower tank. Batch releases may also originate from the secondary waste sample tank and the waste monitor tank at the HNP. Based on analysis of the tank contents, the tank release rate is adjusted, based on the cooling tower blowdown line flow rate, to dilute the tank activities to 50 percent of the allowable concentrations at the release point to Harris Reservoir (Reference 4.5-004).

The liquid effluent release point is at the point of discharge from the cooling tower blowdown line into Harris Reservoir. The cooling tower blowdown line provides liquid effluent dilution prior to release to Harris Reservoir. Concurrent batch releases do not occur at the HNP. The secondary waste sample tank and the normal service water system have a low potential for radioactive effluent releases. Effluent monitors on the secondary waste sample tank and the normal service water lines check these releases (Reference 4.5-004).

Two drain effluent lines exist (Reference 4.5-004):

- **Outdoor tank area drain effluent line**. The outdoor tank area drain effluent line routes rainwater collected in the outdoor tank area to the storm drain system and from there directly to Harris Lake. The line is monitored for radioactivity by the tank area drain transfer pump monitor. If the setpoint were exceeded, the discharge pump would be automatically secured. Effluent could then be diverted to the floor drain system for processing and eventual release.

- **Turbine building floor drains effluent line**. Water collected in the turbine building floor drains is normally routed to the yard oil separator for release to the environment via the waste neutralization system and then

to the cooling tower discharge line. Tritium is expected to be detected in this pathway from sources such as background levels from Harris Lake. If the setpoint were exceeded, the release would be automatically terminated. Effluent could then be diverted to the secondary waste treatment system for processing and eventual release.

During the period of January 1, 2004, through December 31, 2004, the estimated maximum individual off-site dose due to radioactivity released in liquid effluents was 1.86E-02 millirem (mrem), whole body, as compared to a limit of 3.0 mrem, whole body. The estimated maximum individual off-site dose was 2.632E-02 mrem, Gastrointestinal tract (lower large intestine wall) (GI-LLI), as compared to a limit of 10.0 mrem, GI-LLI. (Reference 4.5-002) Doses were calculated using the methodology presented in ER Subsection 2.2.1 of the HNP ODCM (Reference 4.5-004).

4.5.3.2.2 Gaseous Effluent Releases

At the HNP, four gaseous effluent discharge points exist: Plant Vent Stack 1, Turbine Building Vent Stack 3A, and the Waste Processing Building Vent Stacks 5 and 5A (Figure 4.5-1). During refueling outages, when the equipment hatch is removed, there is the potential for airborne particulate releases. All gaseous effluent releases at the plant are considered ground releases (Reference 4.5-004).

If the reactor has been shut down for greater than 30 days, the condenser vacuum pump discharge during initial hogging operations at plant start-up and prior to turbine operation may be routed as dual exhaust to (1) the Turbine Building Vent Stack 3A and (2) the atmosphere directly (Reference 4.5-004).

The stack effluent monitor setpoints ensure that the dose rates from noble gases at the HAR site boundary do not exceed the applicable regulatory limits established for releases to unrestricted areas (Reference 4.5-004).

During the period of January 1, 2004, through December 31, 2004, the estimated maximum individual off-site dose due to radioactivity released in gaseous effluents for the following items were (Reference 4.5-002):

- **Noble gases**. 1.1E-04 millirad (mrad) Beta as compared to a limit of 20.0 mrad and 4.84E-05 mrad Gamma as compared to a limit of 10.0 mrad.

- **Tritium (H-3), iodine-131 (I-131), iodine-133 (I-133), particulates with greater than an 8-day half life**. 2.38E-01 mrem/year (critical organ is the lung) as compared to a limit of 15.0 mrem/year.

- **Doses from gaseous emissions**. Doses resulting from gaseous emissions were calculated using the methodology presented in Subsection 3.3.1 of the HNP ODCM.

4.5.3.3 Direct Radiation Measurements

Environmental thermoluminescent dosimeters (TLDs) are used to measure the ambient gamma radiation levels at many locations in the plant environs and around the HNP. The average quarterly exposure from ambient gamma radiation levels at the indicator stations was 11.7 milliRoentgen (mR) and at the control stations was 15.2 mR. The highest ambient gamma radiation level, which was recorded at an indicator station 14.8 km (9.2 mi.) east southeast of the HNP plant (at Fuquay Varina at the old Carolina Power & Light Company [CP&L] office), averaged 15.7 mR per quarter. (Reference 4.5-003) The differences among these locations are attributed to variations in soils and local geology, and are not the result of HNP plant operations. The quarterly TLD exposures within approximately 3.2 km (2 mi.) of the plant (the inner ring) were compared with the quarterly TLD exposures at approximately 8.1 km (5 mi.) from the plant (the outer ring). The quarterly inner-ring TLD exposures were slightly less than the quarterly outer-ring TLD exposures. The differences ranged from 0.32 to 0.56 mR (Reference 4.5-003).

The HNP protected area fence line TLD readings (that have been compiled over approximately 7 years) might provide a better and more representative estimate of construction worker radiation exposure doses than the TLD data obtained from the inner and outer rings. Figure 4.5-2 displays the average quarterly TLD readings (gross dose in mrem without background correction) for the 16 protected area fence line TLDs for each of the calendar quarters from the 1st quarter of 1999 through the 3rd quarter of 2006 (Reference 4.5-005). Table 4.5-1 provides information about the HNP area TLD locations shown on Figure 4.5-3. The maximum dose of gamma radiation over any 90-day period for the 16 protected area fence line TLD locations was approximately 24 mrem, that is, approximately 11.1 microrems per hour (µrem/hr) (Reference 4.5-005).

Using the maximum gamma dose rate of the 16 protected area fence line TLD locations over a 7-year period is considered both reasonable and conservative for estimating the potential radiation doses to the construction workers. In addition, for the majority of the time during construction of the HAR facilities, the construction workers would be located much farther from the HNP operating radiation sources than the distances reflected in the protected area fence line TLD locations. The HAR facilities will be located outside the HNP protected area fence line and will be away from and HNP radiation sources. Therefore, it can be expected that the maximum radiation dose of approximately 24 mrem per 90-day period would be reduced to background levels.

Impacts to workers during construction of HAR 2 and HAR 3 from radiation doses from liquid, gaseous effluents, and increased ambient radiation levels from the ongoing operation of the HNP facility will be SMALL.

4.5.4 ANNUAL CONSTRUCTION WORKER DOSES

Annual potential radiological dose impacts to construction workers have been conservatively estimated based on the following factors:

- The estimated maximum individual off-site dose due to radioactivity released in the HNP's liquid effluent release pathway (described in Subsection 4.5.3.2.1) was 1.86 E-02 mrem per year (mrem/yr), whole body, and 2.63E-02 mrem/yr, GI-LLI (Reference 4.5-002). Even if doubled for two operating units (HNP and HAR 2) the doses would be negligible contributors.

- The estimated radiological exposure to a construction worker from the operation of the HNP via the gaseous effluent release pathway (described in Subsection 4.5.3.2.2) was less than 2.38E-01 mrem/year (Reference 4.5-002). Even if doubled for two operating units (HNP and HAR 2) the doses would be negligible contributors.

- The direct radiation exposure, as presented in Subsection 4.5.3.3, was based on a 2080-hour work year and an exposure rate of 11.1 µrem/hr or 24 mrem/yr (Reference 4.5-005).

- Based on data from the 16 protected area fence line TLD locations shown on Figure 4.5-2, the annual collective dose to the construction workforce is estimated to be 72.8 person-rem (that is, the maximum individual dose multiplied by the number of people exposed). This estimate assumes 3150 persons based on 2080 working hours per year at an exposure rate of 11.1 µrem/hr (Reference 4.5-005).

- No credit for the reduction in potential dose rate is given for the distance from the HNP protected area fence line TLD locations to the HAR facility construction areas.

Table 4.5-2 compares the estimated doses to a HAR construction worker with the public dose criteria of 10 CFR 20.1301. This comparison demonstrates compliance with 10 CFR 20.1301 criteria and supports the conclusion that those who will construct the HAR facility would not need to be classified as radiation workers nor would they require monitoring.

The largest contributor to the TEDE would be the external dose assumed from active HNP operations (24 mrem/yr). Doses from the liquid and gaseous pathways are considered negligible contributors (well below those specified in 10 CFR 50 Appendix I). It is concluded that annual construction worker doses attributable to HNP operations for the proposed construction areas for HAR 2 and 3 are a small fraction of those limits specified in 10 CFR 20 and 10 CFR Appendix I. Impacts to workers during construction of HAR 2 and HAR 3 resulting from annual doses associated with the ongoing operation of the HNP facility will be SMALL.

4.5.5 REFERENCES

4.5-001 Carolina Power & Light Company, “Shearon Harris Nuclear Power Plant Final Safety Analysis Report,” Amendment 52, 1983.

4.5-002 Progress Energy Carolinas, Inc., “Shearon Harris Nuclear Power Plant Annual Radioactive Effluent Release Report: January 1, 2004 to December 31, 2004,” 2004.

4.5-003 Progress Energy Carolinas, Inc., “Radiological Environmental Operating Amended Report 2004,” 2004.

4.5-004 Progress Energy Carolinas, Inc., “Shearon Harris Nuclear Power Plant Off-Site Dose Calculation Manual (ODCM),” Revision 17, Docket No. STN-50-400, Progress Energy Carolinas,” November 30, 2004.

4.5-005 Nuclear Generation Group, “Area Thermoluminescent Dosimeter (TLD) Monitoring,” DOS-NGGC-0010, Revision 7, 2006, Nuclear Generation Group Standard Procedure Volume 99 Book/Part 99, information obtained from the HNP TLD monitoring group via a request for information.

Table 4.5-1
Description of HNP TLD Locations

Location	Description
1 – 16	Locations at the fence around the plant
17	Security Building
18, 19	Administration Building: 1st Floor 2nd Floor
20, 21	Service Building: 1st Floor 2nd Floor
22, 23, 24	"K" Building: 1st Floor 3rd Floor 4th Floor
25	Operations Support Office
26	Waste Processing Building — Dosimetry Office
27	Waste Processing Building — 276 Elevation Hallway
28	Plant Access Facility
29	Mobile Equipment Shop
30	Chemical Warehouse
31	Paint Shop
32	Bulk Warehouse
33	Water Treatment Building
34	Warehouse Six (outside of area depicted in Figure 4.5-3)
35	Central Receiving and Dedication Facility (outside of area depicted in Figure 4.5-3)

Notes:
TLD = thermoluminescent dosimeter

Source: Reference 4.5-005

Table 4.5-2
Comparison of HAR Construction Worker Estimated Radiation Doses Compared to 10 CFR 20.1301 Public Dose Criteria

Type of Radiation Dose	Annual Public Dose Limits 10 CFR 20.1301	Estimated HAR Construction Worker Dose
Total effective dose equivalent	100 mrem	Approximately 24 mrem
Maximum dose rate in any hour	2 mrem/hr	Less than 1 mrem/hr

Notes:
mrem/hr = millirems per hour

Source: Reference 4.5-005

4.6 MEASURES AND CONTROLS TO LIMIT CONSTRUCTION-RELATED ADVERSE IMPACTS

This section summarizes potential adverse environmental impacts created by the HAR site preparation and construction activities discussed in previous sections of this Environmental Impacts of Construction chapter, along with associated measures and controls to limit those impacts.

4.6.1 REGULATORY CRITERIA

In accordance with NUREG-1555, potential adverse environmental impacts from construction activities are identified and addressed in this section, as well as the specific measures and controls to limit those adverse impacts.

4.6.2 ADVERSE ENVIRONMENTAL IMPACTS

PEC is committed to limiting, minimizing, and reducing adverse environmental impacts during construction activities wherever and whenever feasible and practical. Construction activities at the HAR site will result in certain adverse environmental impacts that are unavoidable, such as the loss of approximately 1441 ha (3561 ac. or 5.6 mi.^{2}) of land around Harris Reservoir.

The “Potential Impact Significance” columns in Table 4.6-1 list the elements identified in NUREG-1555 that relate to construction activities. Table 4.6-1 summarizes the measures and controls to limit potential adverse environmental impacts during construction activities. The following list identifies elements with potential adverse environmental impacts that may be encountered during construction activities:

- Noise
- Erosion and sediment
- Air quality
- Traffic
- Effluents and wastes
- Surface water
- Groundwater
- Land use protection/restoration
- Water use protection/restoration
- Terrestrial ecosystem

- Aquatic ecosystem
- Socioeconomic
- Radiation exposure to construction workers
- Other (site-specific)

Table 4.6-1 uses the NRC's three-level standard of significance levels for each element (i.e., [S]MALL, [M]ODERATE, or [L]ARGE). These significance levels were determined by evaluating the potential effects after any controls or mitigation measures had been implemented. The significance levels used in the evaluation were developed using Council on Environmental Quality guidelines set forth in the footnotes to Table B-1 of Title 10 of the Code of Federal Regulations Part 51, Subpart A, Appendix B:

- **SMALL**. Environmental effects are not detectable or are so minor 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.

The impact categories evaluated in this chapter are the same as those used in the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, Volumes 1 and 2.

4.6.3 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS

The following measures and controls will limit potential adverse environmental impacts related to construction activities for the HAR:

- Compliance with federal, state (i.e., North Carolina), and local laws, ordinances, and regulations intended to prevent or minimize adverse environmental effects (for example, solid waste management, erosion and sediment control, air emissions, noise control, stormwater management, spill response and cleanup, and hazardous waste management).
- Compliance with applicable requirements of existing permits and licenses (e.g., North Carolina NPDES permit, Operating License) for the HNP and other permits and licenses required for construction of HAR 2) and HAR 3 (for example, USACE Section 404 Permit, NCDENR wetlands permit, NCDENR 401 Water Quality Certification).

- Compliance with existing PEC processes and/or procedures applicable to construction environmental compliance activities for the HAR site (for example, solid waste management, hazardous waste management, and spill prevention and response).

- Incorporation of environmental requirements into construction contracts.

- Identification of environmental resources and potential effects during the development of this ER and during the Early Site Permit process.

Construction activities at the HAR site will conform to the goals and criteria set forth in the regulatory guidelines and requirements. PEC will adhere to applicable local, state, and federal requirements during construction activities. Because technology may change between the time when the HAR COLA is issued and a new facility is constructed, no specific commitments are implied in this presentation of potential mitigation measures and controls. The mitigation techniques presented herein represent best management practices or standard industrial practices at the time of the HAR COLA submittal.

Table 4.6-1 (Sheet 1 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.1 Land-Use Impacts																
4.1.1.1 Land Use Directly Affected by Construction								S							1. Impacts on the HAR site. 2. Impacts associated with the makeup water pipeline corridor and appurtenant structures. 3. Impacts on agricultural and special uses at the HAR site. 4. Long-term impacts on land use directly affected by construction.	1. Erosion control and stabilization measures; follow permitting requirements; limit vegetation removal. 2. Erosion control and stabilization measures; follow permitting requirements on Cape Fear River and Harris Reservoir; limit vegetation removal. 3. No special agricultural uses within the site boundary. 4. Erosion control and stabilization measures; follow permitting requirements; limit vegetation removal and use local plant rescue group to re-locate sensitive vegetation.
4.1.1.2 Land Use Secondarily Affected by Construction								S							1. Impacts on nearby communities. 2. Impacts on recreation. 3. Impacts associated with roadway upgrades. 4. Impacts on significant natural areas. 5. Impacts on waterfowl habitat. 6. Impacts on streamside management zone. 7. Impacts on wetlands. 8. Impacts on mineral resources.	1. Minimal expansion of infrastructure. 2. Relocation of recreation infrastructure. 3. Erosion and sediment control. 4. Coordination with application groups/agencies. 5. Conserve and enhance waterfowl habitat. 6. Erosion and sediment control. 7. Permitting and mitigation as required. 8. PEC to maintain control of mineral rights.
4.1.1.4 HAR Site Restoration and Management Actions								S							Impacts of construction on HAR site.	Erosion control, limit vehicle access, stabilize, and revegetation disturbed areas.

Table 4.6-1 (Sheet 2 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.1.2 Appurtenant Facilities and Off-Site Areas								S							Impacts from construction of transmission lines, increased water level of Harris Reservoir, makeup and blowdown pipelines.	Specific measures and controls are discussed in the sections below.
4.1.2.1 Blowdown Pipelines								S							Impacts associated with the Installation of blowdown pipelines from HAR 2 and HAR 3 to discharge point in Harris Reservoir.	Minimize disturbance of lake bottom, designated staging and laydown areas, and minimize clearing of vegetation.
4.1.2.2 Transmission Line Construction								S							Impacts associated with the expansion of three existing transmission corridors for three additional lines required for HAR 3.	Follow BMPs, erosion control, minimize clearing, and comply with permit requirements as required.
4.1.2.3 Main Dam Modifications								S							Impacts associated with the modification of main dam to support increase lake level.	No changes to surrounding land use anticipated.
4.1.2.4 Cape Fear River Intake Structure and Pumphouse								S							Impacts from installation of intake structure on Cape Fear River and discharge structure on Harris Reservoir.	Compliance with applicable permitting requirements; erosion and sediment control.
4.1.2.5 Pipeline Corridor								S							Impacts from installation of pipeline from Cape Fear River to Harris Reservoir.	Erosion and sediment control, designated staging areas, comply with permit requirements during construction and dredging.

Table 4.6-1 (Sheet 3 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.1.2.6 Potential Physical Impacts to Land Use from Construction								S							1. Impacts from construction of Harris Reservoir structures. 2. Impacts from construction of transmission lines. 3. Impacts from construction of pipeline from Cape Fear River to Harris Reservoir.	1. Implement appropriate mitigation and management during construction. 2. Avoid wetlands and floodplains to the degree possible; minimize clearing; comply with permit requirements as required. 3. Use existing transmission ROW to minimize clearing; construction in stream will occur during low flow; limit disturbed area; regrade and revegetate disturbed areas; comply with applicable permits.
4.1.3.3 Post-Application Activities														S	Post-application requirement to minimize impacts.	Conduct additional surveys prior to construction and ground disturbing activities.
4.2 Water-Related Impacts																
4.2.1.1 Freshwater Streams and Harris Lake		S				S									Impacts from construction on Harris Lake and its tributaries.	Follow regulatory and permit requirements; erosion and sediment control; use of silt fences; revegetation of disturbed land; minimize clearing and ground disturbance.
4.2.1.2 Cape Fear River		S				S									Hydrologic impacts from construction of new intake structure on the Cape Fear River.	Follow regulatory and permit requirements; temporarily isolate construction areas through the use of cofferdams or similar structures; remove sediment deposition following construction.
4.2.1.3 Other Impacts to Harris Lake from Surface Disturbance		S			S	S									Impacts to Harris Lake from cutting and filling and alteration of drainage patterns.	Use of appropriate erosion and sediment control, sediment basins and silt fences; follow regulatory and permit requirements; use of buffer zones and minimally exposed slopes.

Table 4.6-1 (Sheet 4 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.2.1.4 Other Impacts to Harris Lake from Subsurface Excavation Activities		S				S									Impacts during deep excavation associated with HAR 2 and HAR 3.	Use of designated spoil and excavation areas; use of silt fencing and vegetated buffer strips; use of dust control; use of vegetation on stockpiles.
4.2.1.5 Other Impacts to Harris Lake from Initial Increase in Lake Level from 220 to 240						S									Impacts from preparation and initial filling of Harris Reservoir.	Implement erosion control measures (e.g., leave select trees) and monitor water quality.
4.2.1.6 Groundwater							S								Hydrologic alterations from construction of HAR 2 and HAR 3.	Install new and expand existing storm water drainage ditches; use of sediment traps or filtration; manage construction dewatering activities; implement BMPs for sediment control.
4.2.2.1 Freshwater Streams and Cape Fear River									S						Impacts on Cape Fear River and intermittent and perennial streams.	Implement sediment and erosion control; comply with regulatory and permit requirements.
4.2.2.2 Lakes and Impoundments									S						Impacts on Harris Lake.	Erosion and sediment control; protection of HNP intake structure; relocation of recreational infrastructure; minimize impacts from clearing on floodplain.
4.2.2.3 Groundwater Use								S							Impacts on groundwater use.	Groundwater elevations will be monitored during construction and dewatering during construction will be limited to the construction area.

Table 4.6-1 (Sheet 5 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.3 Ecological Impacts																
4.3.1.1 Plant Site										S					1. Impacts on terrestrial ecology associated with the HAR site. 2. Impacts on vegetative communities. 3. Impacts on wildlife.	1. Erosion and sediment controls; minimize land disturbance; use perpendicular stream crossings; dust control; manage stockpiles; comply with regulation and permit requirements; protect storm water ditches with stone linings. 2. Coordination with regulatory agencies and implementation of appropriate mitigation measures. 3. Maintain noise level typical of construction projects and illumination of construction equipment at night.
4.3.1.2 Harris Reservoir Perimeter										S to M					1. Impacts on terrestrial ecology on the perimeter of Harris Lake. 2. Impacts on vegetative communities will be MODERATE, as described in the last paragraph of Subsection 4.3.1.2.1. 3. Impacts on wildlife will be SMALL, as described in Subsection 4.3.1.2.2.	1. Follow relevant regulations and BMPs, erosion and sediment control, and use of previously disturbed areas to the degree practicable. 2. Implement BMPs during clearing and logging; remove and recycle logging debris; coordinate volunteer relocation of native plants as appropriate; erosion and sediment control; coordination with relevant state and federal agencies; compliance with permit conditions; implementation of appropriate mitigation measures. 3. Maintain forested buffer around Harris Reservoir to the degree possible; conserve and enhance waterfowl habitat; comply with state and federal requirements; consider migratory birds when scheduling clearing.

Table 4.6-1 (Sheet 6 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[(a), (b)]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [(c)]	Water-Use [(d)]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.3.1.3 Intake Structure and Pumphouse										S					1. Impacts to terrestrial ecology from construction of intake structure and pumphouse on the Cape Fear River. 2. Impacts on vegetative communities. 3. Impacts on wildlife.	1. Use of designated staging areas; construction and dredging will comply with regulatory requirements; restoration of river channel and riparian corridor as required. 2. Limited clearing of vegetation; coordination with regulatory agencies; compliance with applicable permit requirements. 3. Coordination with regulatory agencies; compliance with applicable permit requirements.
4.3.1.4 Pipeline Corridor										S					1. Impacts from construction on Harris Lake makeup water system pipeline. 2. Impacts on vegetative communities. 3. Impacts on wildlife.	1. Use of designated staging areas and existing roads, use of equipment protective of ecology, use of approved blasting plans, follow BMPs during clearing and construction, limiting disturbed areas, revegetation of disturbed areas, and sediment and erosion control. 2. Stabilization of disturbed areas, minimize impacts on listed species, erosion control and BMPs, comply with applicable permit requirements, and coordination with regulatory agencies. 3. Coordination with regulatory agencies and compliance with applicable permit requirements.
4.3.1.5 Transmission Corridors										S					1. Impacts from expansion of transmission corridors. 2. Impacts on vegetative communities. 3. Impacts on wildlife.	1. Minimize disturbance, with applicable permit requirements, and coordination with regulatory agencies. 2. Follow BMPs and MOU to manage and protect rare plants along transmission ROWs. 3. Follow MOU to protect rare and listed species within transmission ROWs and coordination with regulatory agencies.

Table 4.6-1 (Sheet 7 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.3.2.1 Plant Site											S				1. Impacts from construction of HAR 2 and HAR 3 on aquatic ecosystems in the Plant Site. 2. Impacts on water quality. 3. Impacts on vegetative communities. 4. Impacts on wildlife.	1. Use of sediment basins, routing maintenance and repair of equipment, and maintain compliance with regulatory requirements and implementation of BMPs 2. Sediment and erosion control. 3. Sediment and erosion control, implementation of BMPs, compliance with wetland and other permitting requirements as applicable, and coordination with regulatory agencies. 4. Compliance with applicable regulatory and permit requirements, sediment and erosion control (e.g., sediment ponds), coordination with regulatory agencies.
4.3.2.2 Harris Reservoir Perimeter											S				1. Impacts on aquatic ecology on the Harris Reservoir perimeter. 2. Impacts on water quality. 3. Impacts on vegetative communities. 4. Impacts on wildlife.	1. Sediment and erosion control and compliance with regulatory requirements and BMPs. 2. Implementation of BMPs during clearing and logging, erosion and sediment control, maintenance and repair of equipment, compliance with applicable permit requirements, and coordination with regulatory agencies. 3. Coordination with regulatory agencies and compliance with applicable permit requirements. 4. Implementation of BMPs, monitoring of sediment ponds and wetlands, consultation with regulatory agencies, erosion and sediment controls, and compliance with applicable permit conditions.

Table 4.6-1 (Sheet 8 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.3.2.3 Intake Structure and Pumphouse											S				1. Impacts of construction of intake structure and pumphouse on aquatic ecology. 2. Impacts on water quality. 3. Impacts on vegetative communities. 4. Impacts on wildlife.	1. Regular maintenance of equipment and compliance with applicable regulations and BMPs. 2. Evaluate water quality through annual MCFRBA monitoring. 3. Compliance with regulations and BMPs, coordination with regulatory agencies, and implementation of permit requirements. 4. Construction of appropriate fish aversion technologies, comply with permit requirements for listed species (e.g., Cape Fear Shiner, Dwarf Wedgemussel), and coordination with regulatory agencies.
4.3.2.4 Pipeline Corridor											S				1. Impacts of pipeline corridor construction on aquatic ecology. 2. Impacts on water quality. 3. Impacts on vegetative communities. 4. Impacts on wildlife.	1. Specific measures and controls are described below. 2. Coordination with regulatory agencies and compliance with applicable permit requirements. 3. Coordination with regulatory agencies and compliance with applicable permit requirements. 4. Coordination with regulatory agencies and compliance with applicable permit requirements.

Table 4.6-1 (Sheet 9 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.3.2.5 Transmission Corridor											S				1. Impact of the expansion of the transmission corridor on aquatic ecology. 2. Impacts on water quality. 3. Impacts on vegetative communities. 4. Impacts on wildlife.	1. Minimize disturbance, with applicable permit requirements, and coordination with regulatory agencies. 2. Coordination with regulatory agencies and compliance with applicable permit requirements. 3. Follow BMPs and MOU to manage and protect rare plants along transmission ROWs,. 4. Follow MOU to protect rare and listed species within transmission ROWs and coordination with regulatory agencies.
4.4 Socioeconomic Impacts																
4.4.1.1 Noise	S														Impacts of construction related noise.	Use of standard noise control devices (e.g., mufflers, shielding) and blasting per approved plan.
4.4.1.2 Air Quality		S													Impacts from construction activities on air quality.	Dust control, stabilization of disturbed areas, compliance with air pollution control regulations, phased clearing around Harris Reservoir, control of open burning, and mitigation measures on equipment as applicable.
4.4.1.3 Visual Aesthetic Disturbances														S	Impact of construction activities on visual aesthetic disturbances.	Stabilization of cleared areas, restrictions on construction laydown areas, and removal of construction debris in a timely manner.

Table 4.6-1 (Sheet 10 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.4.2 Social and Economic Impacts												S			Beneficial impact of construction activities and the construction labor force on social and economic impacts.	Specific measures and controls are not needed, contribution of construction workforce on the local economy is provided.
4.4.2.1 Economic Characteristics												S to M			Impacts of construction on direct, indirect and induced economic characteristics, including beneficial impacts.	Specific measures and controls are not needed, contribution of construction workforce on the local economy is provided.
4.4.2.2 Tax Impacts												S			Evaluation of state income tax revenue, sales tax revenue and property tax revenue, including beneficial impacts.	Specific measures and controls are not needed, contribution of tax revenues provided.
4.4.2.3 Social Structure												S			Impacts on social structure provided.	Specific measures and controls are not needed, impacts on social structure anticipated to be minor
4.4.2.4 Housing												S			Impacts on housing impacts from construction.	Specific measures and controls are not needed, minor housing impacts outlined.
4.4.2.5 Educational System												S			Impacts to educational systems from construction.	Consultation with local school systems, minor impacts anticipated.
4.4.2.6 Recreation												S			Impacts to recreation such as boat ramps, Harris Lake County Park, etc. specified. One of the impacts will be beneficial.	Coordination with affected organizations and relocation of impacted resources.
4.4.2.7 Public Services and Facilities												S			1. Construction impacts to public services and facilities. 2. Impacts on security services. 3. Impacts on water and wastewater services.	1. Specific measures and control specified below. 2. Additional security forces will be added for HAR 2 and HAR 3. 3. Current capacities of water and wastewater treatment facilities provided, communication with appropriate utilities is ongoing.

Table 4.6-1 (Sheet 11 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.4.2.8 Transportation Facilities				S											1. Impacts on primary transportation routes providing access to the site. 2. Impacts on traffic related to construction of the HAR. 3. Impacts on log-hauling traffic. 4. Impacts from relocation and reconstruction of roads.	1. No specific measures and controls identified. 2. Coordination with NCDOT, completion of transportation impact analysis, and evaluation of a temporary access road off of U.S. Highway 1. 3. Traffic impacts are expected to be temporary and short in duration. 4. Modifications of roads, management of traffic flow, and coordination with appropriate state and local agencies.
4.4.2.9 Distinctive Communities												S			Impacts on special or distinctive communities.	No special or distinctive communities identified; no specific measures or controls.
4.4.2.10 Agriculture												S			Impacts from agriculture including silviculture and timber management.	Implementation of BMPs and specialized tree clearing methods around Harris Reservoir.
4.4.2.11 Environmental Justice												S			Impacts on disproportionate impacts to low-income and minority populations.	Analysis of low-income and minority populations and compliance with applicable federal, state and local regulations.
4.4.2.12 Racial, Ethnic, and Special Groups												S			Impacts to racial, ethnic and special groups in the region.	No impacts anticipated; no specific measures and controls identified.
4.4.2.13 Income Characteristics												S			Impacts on low-income populations.	No impacts anticipated; no specific measures and controls identified.

Table 4.6-1 (Sheet 12 of 12)
Summary of Measures and Controls to Limit Adverse Impacts during Construction

	Potential Impact Significance[a], [b]															
Section Reference	Noise	Erosion and Sediment	Air Quality	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use [c]	Water-Use [d]	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomic	Rad Exp to Const Wkrs	Other (Site-Specific)	Impact Description or Activity	Specific Measures and Controls
4.5 Radiation Exposure to Construction Workers																
4.5.2 Radiation Sources													S		Impacts to construction workers from direct radiation and to the radioactive effluents from HNP routine operation.	Implementation of administrative controls, plant procedures for maintaining the doses from radiation sources, and monitoring.
4.5.3.1 Tritium Releases from the HNP					S										Impacts associated with tritium releases from operation.	Implementation of radiological environmental monitoring program.
4.5.3.2 Gaseous and Liquid Releases from the HNP Facility					S										Impacts associated with gaseous and liquid releases.	Implementation of radiological environmental monitoring program.
4.5.3.3 Direct Radiation Measurements													S		Impacts associated with direction radiation on construction workers outside of the HNP protected area	Implementation of radiological monitoring program, including use of TLDs at designated locations.
4.5.4 Annual Construction Worker Doses													S		Impacts associated with annual potential radiological dose to construction workers.	Implementation of radiological monitoring program, including use of TLDs at designated locations.

Notes:
a) The assigned potential impact significance levels of (S)mall, (M)oderate, or (L)arge are based on the assumption that mitigation measures and controls would be implemented.

b) A blank in the elements column denotes “no impact” on that specific element because of the assessed activities.

c) Land-Use Protection/Restoration.

d) Water-Use Protection/Restoration.

E&SCP = Erosion and Sedimentation Control Plan
ATWS = Additional temporary work space
SPCCP = Spill Prevention, Control, and Countermeasure Plan
SWPPP = Stormwater Pollution Prevention Plan