Progress Energy

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May 15, 2009

Mr. Monte K. Matthews
Regulatory Program Manager
US Army Corps of Engineers
Wilmington District
Raleigh Regulatory Field Office
3331 Heritage Trade Drive, Suite 105
Wake Forest, NC 27587

SHEARON HARRIS NUCLEAR POWER PLANT UNITS 2 AND 3
SUBMITTAL OF SECTION 404(b)(1) ALTERNATIVES ANALYSIS

Reference: Letter from Garry Miller (Progress Energy) to Document Control Desk (NRC), dated February 12, 2009, "Response to USACE Request for Additional Information Regarding the Environmental Review of the Combined License Application for Harris Nuclear Power Plant, Units 2 and 3," Serial: NPD-NRC-2009-023

Dear Mr. Matthews:

In the referenced letter, Progress Energy, Inc. noted that additional information in support of evaluations of the practicable alternatives would be developed to support the Corps' Least Environmentally Damaging Practicable Alternative (LEDPA) analyses and that this information would be completed by May 2009. The referenced letter also noted that this information would be provided to the US Army Corps of Engineers in support of a 404 permit application.

The purpose of this letter is to submit this information as the attached "Section 404(b)(1) Alternatives Analysis" in anticipation of future 404 permitting for the Harris Nuclear Power Plant, Units 2 and 3 and as described in the referenced letter.

If you have questions, please contact Paul Snead at (919) 546-2836 or me at (919) 546-6992.

Sincerely,

Robert H. Kitchen
Manager – Nuclear Plant Licensing

Attachment

cc (with Attachment):
Ms. Jean Manuele, US Army Corps of Engineers
Dr. Donald Palmrose, U.S. NRC Environmental Project Manager

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Harris Advanced Reactor (HAR)
Section 404(b)(1) Alternatives Analysis

Prepared for:

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Raleigh, North Carolina

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Wilmington District

Prepared by:

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Raleigh, North Carolina
May 14, 2009

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404(b)(1) Alternatives Analysis for
Harris Advanced Reactor (HAR) Project
Wake & Chatham Counties, North Carolina

I. Proposed Action

A. Project Background Information

Progress Energy Carolinas, Inc., (PEC) is proposing to add two Westinghouse AP 1000 advanced nuclear reactors to the Shearon Harris Nuclear Power Plant site (Harris site) to meet growing demand for electrical power in its primary customer region. As part of the approval process with the Nuclear Regulatory Commission (NRC), PEC has also completed an Environmental Report (ER) for the Shearon Harris Nuclear Plant Units 2 and 3 Combined Operating License (COL) application. The two units will be referred to as HAR-2 and HAR-3, respectively, in this document. The existing Shearon Harris Nuclear Power Plant Unit 1 will be referred to as HNP is this document. The ER provides detailed information on the proposed plan to add two advanced nuclear reactors to the existing Harris site. Also provided in the ER is information resulting from a proprietary siting study conducted in 2006 that identified sites and assessed each of them against numerous parameters to identify the four sites described herein.

PEC is committed to a long-term, balanced solution to meeting growing energy needs – a solution that includes three main components: (1) increased energy efficiency; (2) investments in renewable energy sources and other emerging energy technologies; and (3) upgrading of existing power plants and investments in new plants when needed.

B. Proposed Action

PEC proposes to install two advanced nuclear reactors at the Harris site. The Harris Advanced Reactor (HAR) project includes the construction of the facility itself, the construction of an intake structure and pipeline to supply make-up water from the Cape Fear River, placement of a second make-up discharge structure within Harris Lake, upgrades to transmission lines and roadways, and increasing the normal pool elevation of Harris Lake from 220 feet NGVD29 to 240 feet NGVD29 to mitigate potential impacts to downstream users of the Cape Fear River from drought conditions. Harris Lake was originally formed between the period 1980-1983 when approximately 4,000 acres were flooded as a result of dam construction across Buckhorn Creek.

C. Specific Activity Requiring Department of the Army Permit

The discharge and intake structures constitute activities that may be considered water dependent. The remaining activities involve unavoidable impacts to jurisdictional wetlands and streams that are subject to the rebuttable presumption concerning non-water dependent activities pursuant to Section 404 regulations under the Clean Water Act (CWA). The purpose of the 404(b)(1) Guidelines is to restore and maintain the chemical,

physical, and biological integrity of waters of the United States through the control of discharges of dredge or fill material. Direct discharges of dredge or fill material will result only from the construction of the HAR-3 cooling tower, intake structures, and temporary discharges associated with the makeup water pipeline. The inundation of wetlands and streams around Harris Lake is not a direct discharge of dredge or fill material, but will result in a conversion of habitat type and specific function through flooding, including conversion of upland areas to waters of the United States.

D. Analysis Methodology

The primary sources of information summarized within this analysis are the COL Application Environmental Report (COLA ER) and a proprietary siting study (PEC 2006). Information from these sources as well as additional information obtained from other PEC documents and supplemented by other available information from various sources was used to summarize potential impacts (direct, secondary, and cumulative) to resources that may be reviewed by the U.S. Army Corps of Engineers (USACE) to determine the least environmentally damaging practicable alternative (LEDPA).

The primary consideration of this analysis was to summarize potential impact on the aquatic ecosystem as well as other potential environmental consequences. Direct impacts considered included potential siting location of the new facility, new or expanded cooling water sources, intake pipes, and related infrastructure improvements including new or relocated roads and transmission lines. This analysis also includes potential impacts on the following parameters, consistent with the 404(b)(1) guidelines: conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and in general, the needs and welfare of the people. Non-nuclear alternatives and alternative sites were reviewed for practicability for meeting purpose and need; alternatives not meeting purpose and need or determined to be impracticable, or determined to result in greater adverse impact on the aquatic ecosystem than the preferred alternative were eliminated from further consideration at appropriate stages in the evaluation, as described in the following sections.

Desktop evaluation techniques were employed to supplement information available in the COLA ER and siting study to assist with identifying potential impacts to aquatic resources and other public interest factors. GIS and Data Management Tasks were completed using MS Access GeoDatabases and ESRI ArcGIS software with Spatial Analyst and 3D Analyst Extensions. The goal of this evaluation was to derive comparable comparisons of the environmental factors at each of the four alternative sites carried forward from the siting study and COLA ER. This study was undertaken at three different levels of resolution: 400 acre potential powerblock impact zones, localized watersheds, and transmission lines.

To estimate impacts for the 400-acre potential powerblock area, the latitude and longitude coordinates for the alternative sites were provided by PEC and 400-acre circles were created outward from each of the center points. Data were extracted and quantified in Geodatabases from National Hydrology High Resolution Dataset, National Wetlands Index Wetlands and Watershed Polygons, USGS Land Use Land Cover Grids, and the National Resources Conservation Service SSURGO Soils. These data were overlaid onto USGS Topographic Digital Raster Graphics and 2008 National Aerial Imagery Program 1 meter Orthoquads to develop a general picture of site condition. FEMA Flood data were not used for comparisons due to unavailability for Marion County.

Volume and flood data for cooling water supply expansion had previously been estimated for the Harris site but not for Robinson or Marion sites. PEC provided estimates of storage volumes for the Robinson and Marion sites that would provide comparable cooling water for reliable operation during drought conditions to that determined for the Harris site, based on available inflow to each site. Grids of the 10 meter National Elevation Dataset were obtained for the Robinson and Marion site watersheds. These grids were converted to Triangulated Irregular Networks (TINs). Volumetric calculations were completed to assess the depth and aerial extent of water storage that would result at each site to provide the equivalent drought mitigation to Harris, and the impacts associated with the water storage footprints.

General routes for transmission line upgrades for the Harris and Brunswick sites were digitized from aerial photography and topographic imagery as well as from data obtained from PEC transmission engineers and the siting study. However, the Wommack Line had not been sited at the time of the study so minimum length was digitized based upon a straight line distance from the Brunswick facility to the Wommack Substation; estimates of wetlands, streams, or other parameters were not undertaken for the new Brunsick to Wommack line. North Carolina Natural Heritage Program Element Occurrence Representations were extracted within a 1-mile buffer from the transmission lines. Potential impacts to red-cockaded woodpeckers from transmission line upgrades were estimated based on occurrences within 1.0 mile that would need additional evaluation if the alternative is selected. Potential impacts to other federal endangered or threatened species from transmission line upgrades were estimated based on occurrences within 500 feet of the lines. National Wetlands Index Wetland and Watershed Polygons and USGS streams were extracted within a 200 foot buffer of each of the transmission lines.

II. Public Interest Factors Considered

A. Basic Project Purpose and Water Dependency

The basic project purpose is to generate electrical power. Electric power generation itself is not a water dependent activity. As a result, the applicant must rebut the presumption that a project alternative is available that would not affect special aquatic sites.

The proposed project is the development of new baseload generating capacity to supply electricity to PEC's service area, using advanced technology to produce reliable

generation that is located proximate to its major customer base and that minimizes overall impacts to the environment.

B. Overall Project Purpose for the 404(b)(1) Analysis

The overall project purpose is to develop new baseload generating capacity to reliably supply electricity to PEC's service area using advanced technology. In this instance, advanced technology indicates nuclear power generation using advanced reactor technology. The purpose of this 404(b)(1) analysis is to evaluate the applicant's demonstration that its preferred alternative is the least environmentally damaging practicable alternative to the aquatic ecosystem that meets the project purpose.

C. Project Need

The new baseload generation needs to be reliable and proximate to PEC's major customer base. The project also needs to minimize overall environmental impacts as much as practicable. An increased volume of cooling water is needed to safely and reliably produce this baseload amount during drought conditions. As a result, the normal pool elevation of Harris Lake is proposed to be raised from 220 feet NGVD29 to 240 feet NGVD29 to provide this additional capacity.

III. Alternatives

A. Development of Alternatives

Headquarters of the U.S. Army Corps of Engineers (HQUSACE) guidance from 22 April 1986 and November 1992 requires that alternatives be practicable to the applicant and that the purpose and need for the project must be the applicant's purpose and need. This guidance also states that project purpose is to be viewed from the applicant's perspective rather than only from the broad, public perspective. The essential point of the HQUSACE policy guidance is that under the Section 404(b)(1) Guidelines, an alternative must be available to the applicant to be a practicable alternative. Section 40 CFR 230.10 (a) of the Guidelines state that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant environmental consequences". Pursuant to 40 CFR 230.10(a)(2) practicable alternatives are those alternatives that are "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose". The 404(b)(1) Guidelines Preamble, "Economic Factors", 45 Federal Register 85343 (December 24, 1980) states, "if an alleged alternative is unreasonably expensive to the applicant, the alternative is not practicable".

Although sufficient information must be developed to determine whether the proposed activity is in fact the least environmentally damaging practicable alternative (LEDPA), the Guidelines do not require an elaborate search for practicable alternatives where, as

here, it can be reasonably anticipated that there are only minor differences between the environmental impacts of the proposed activity and potentially practicable alternatives. Those alternatives that do not result in discernibly less impact to the aquatic ecosystem may be eliminated from the analysis since section 230.10(a) of the Guidelines only prohibits discharges when a practicable alternative exists which would have less adverse impact on the aquatic ecosystem. Since evaluating practicability is generally the more difficult aspect of the alternatives analysis, this approach should save time and effort for both the applicant and the regulatory agency. By initially focusing the alternatives analysis on the question of impacts to the aquatic ecosystem, it may be possible to limit, or eliminate altogether, the number of alternatives which have to be evaluated for practicability.

Section 404 authorization cannot be granted for jurisdictional impacts resulting from the discharge of dredge or fill material if there is a practicable alternative to the proposed action which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have any other significant adverse environmental consequences. The alternatives analysis must rigorously explore and objectively evaluate reasonable and practicable alternatives capable of achieving the overall project purpose.

B. Sequenced Search for Less Environmentally Damaging Alternatives

1. No Action Alternative

The No Action alternative is one in which PEC would not provide any additional baseload generation to service its customer base. This alternative is not practicable in light of the studies conducted by PEC that document the need to provide reliable base load generation. Based on projected population growth, the No Action alternative is not practicable and does not meet the applicant's stated purpose and need.

2. Other Project Designs

The Environmental Report (COLA ER) identified alternatives that would require the construction of new generating capacity, such as wind, geothermal, oil, natural gas, hydropower, municipal solid wastes, coal, photovoltaic cells, solar power, wood waste/biomass, and energy crops, as well as any reasonable combination of these alternatives. In addition, alternatives that would not require new generating capacity were evaluated, including initiating energy conservation measures and Demand-Side Management (DSM), reactivating or extending the service life of existing plants within the power system, and purchasing electric power from other sources. Section 9.2 of the COLA ER discusses these alternatives. All but coal and natural gas were eliminated from further consideration based on availability in the region, overall feasibility, and environmental consequences.

For coal, impacts to the aquatic environment would not be less than the preferred alternative, and coal would also have additional significant adverse environmental consequences (COLA ER 9.2.3.1). The nuclear plant would require a dry land footprint

of 192 acres compared to 1,700 acres required for a coal–fired plant. Both types of facilities would require a similar amount of inundated footprint for cooling water. Transmission line upgrades would be similar for both types of facilities. Conventional coal systems produce emissions resulting in carbon footprint approximately 200 times higher than a nuclear power generation facility. Human health effects from coal combustion are also greater, and acid rain is a potential impact. Coal was dropped from further consideration.

For natural gas, impacts to the aquatic environment would not be less than the preferred alternative, and gas would also have additional significant adverse environmental consequences (COLA ER 9.2.3.2). The gas-fired alternative would require a footprint of 110 acres, plus at least an additional 3,600 acres of land required for wells, collection stations, and pipelines to bring the natural gas to the generating facility. The natural gas facility would also require significant cooling water (COLA ER 9.2.3.2.3). Transmission line upgrades would be similar for both types of facilities. Current gas-powered electricity generation has a carbon footprint that is about half that of coal, but still approximately 100 times higher than the carbon footprint of a nuclear power generation facility. Natural gas was dropped from further consideration.

Based on environmental impacts and economics, PEC has concluded that nuclear power is a suitable electric generating power source (COLA ER 10.4.1.2). For the remaining analysis, nuclear will be considered the technology of choice.

3. Alternative Sites

PEC has identified the need for new base load generation through advanced reactor technology to begin commercial operation in 2018 or later for HAR-2 and 2019 or later for HAR-3 (COLA ER 1.1.7). During the evaluation process certain key assumptions and/or criteria were used to aid in locating and optimal site for building and operating an advanced reactor for new nuclear base load generation. They are as follows:

- The new nuclear plant siting location must be suitable to envelope the range of specific design parameters contemplated for deployment of a standard plant design as certified by the NRC.
- The location must be compatible with PEC's System Operation and Transmission Delivery capabilities.
- The recommended site's expected licensing path and regulatory outlook must reduce PEC's schedule and financial risk for establishing new nuclear base load generation.
- The cost of the new nuclear generation as impacted by the location must be reasonable and fair, and methods to ensure greater certainty of the cost/schedule during the licensing, design engineering, and construction phases of the project must be included.
- Evaluation criteria and methodology established as part of the EPRI Early Site Permit Demonstration Program will be employed in the nuclear plant site selection process. Specifically, the EPRI Siting Guide: Site Selection and

Evaluation Criteria for an Early Site Permit Application dated March 2002 will be utilized.

- The evaluation and selection process will include "greenfield" (e.g., locations with no current generation facilities), existing nuclear generation plant locations, and other potentially suitable sites.
- Compliance with current NRC regulations and NRC guidance (as of November 2005), including 10 CFR Part 50 – "Domestic Licensing of Production and Utilization Facilities", 10 CFR Part 52- "Early Site Permits, Standard Design Certifications, and Combined Licenses for Nuclear Power Plants", SECY-05-0139, "Semi-annual Update of the Status of New Reactors Licensing Activities and Future Planning for New Reactors", dated August 4, 2005.
- Compliance with NEPA – National Environmental Policy Act requirements.

In accordance with the EPRI Siting Guide, the site selection process typically involves sequential application of exclusionary, avoidance, and suitability criteria evaluation (includes site reconnaissance, topographic data collection), and technical screening by application of scoring and associated weighting factors applied to the suitability criteria. The exclusionary, avoidance, and suitability criteria address a full range of considerations important in nuclear power facility siting, including health and safety, environmental, socioeconomic and land use, and engineering and cost aspects. The region of interest is screened using exclusionary criteria to identify the potential sites by eliminating areas in which it is not feasible to site a nuclear facility due to regulatory, institutional, facility design impediments, or environmental constraints (PEC 2006).

Eleven potential sites in North and South Carolina were evaluated by PEC using exclusionary and avoidance criteria such as water supply, adverse environmental impacts, insufficient land area, or unavoidable transmission lines (see COLA ER 9.3.1.1 for further details). Four alternative sites considered further included one greenfield (undeveloped) site (Marion site), and three locations with existing nuclear generating capabilities, Shearon Harris Nuclear Plant site (Harris site), H.B. Robinson Nuclear Plant site (Robinson site), and the Brunswick Steam Electric Plant site (Brunswick site).

The process then becomes one of comparing the alternative sites, and identifying a site that possesses the most favorable set of conditions for siting a nuclear power facility. The evaluation technique to this point ensures the remaining alternative sites have no fatal flaws that could result in extended licensing delays and increased costs. Thus, the remaining alternative sites are evaluated against suitability criteria, resulting in a transition from the elimination approach to an evaluation approach for the suitable sites. The objective of evaluation against suitability criteria is to rank the alternative sites for determination of the preferred site(s). The suitability criteria are grouped into four categories with features in each category relevant to the specific aspects of facility development that are weighted and scored to provide a relative comparison of the candidate sites. These categories are as follows: (1) health and safety; (2) environmental; (3) land use and socioeconomic; and (4) engineering and cost-related. The multiple features of the suitability criteria are combined into one composite value for each of the alternative sites (PEC 2006).

For each of the four alternative sites, PEC determined a 400-acre project study area (power block) would be used to identify the location where the facility footprint would be located. Each 400-acre power block for each alternative site was assessed against the suitability criteria identified earlier as well as other criteria consistent with 404(b)(1) guidelines as described previously in Section I.D. Analysis Methodology. Infrastructure required for the construction/operation of a nuclear site was also assessed during this phase of the evaluation.

a. Marion Site

The Marion site is currently undeveloped land (*i.e.*, greenfield site) that lies adjacent to the Pee Dee River in Marion County, South Carolina. Approximately 94 percent of the 400-acre power block identified by PEC is undisturbed land that is currently providing wildlife habitat. The remaining 6 percent consists of pasture, crops, and developed lands. Approximately 40 percent (162 acres) of the undisturbed land within the 400-acre power block is wetlands (**Table 1**). The majority of the wetlands are identified as palustrine, forested wetlands (PFO). Other wetland types occurring on the Marion site include palustrine, shrub-scrub (PSS), and palustrine emergent (PEM). A previous study by PEC concluded that wetland types comprise bottomland hardwoods, mixed-hardwood wetlands, depression wetlands, jurisdictional ditches, and an excavated pond (S&ME 2001). Areas identified as containing hydric soils, based on current Natural Resource Conservation Service (NRCS) data, total approximately 280 acres. However, some of the hydric soils are the result of small inclusions within a larger mapping unit. The Marion site has the greatest amount of undisturbed wetlands and mapped hydric soils occurring within the 400-acre power block of any of the four alternative sites. The potential for direct impacts to these special aquatic sites as a result of site development is high and will result in the loss of wetland habitat. Marion site elevations appear to be at or slightly below the 100-year floodplain. As a result, construction on this site may also impact federally designated floodways.

Additional wetland impacts and land disturbance would result from the construction of the necessary infrastructure to support the new facility at this location. This may include, but is not limited to, roadways, railroad spurs, transmission lines, etc. Large expanses of existing forested wetlands would have to be crossed to reach the site. Wetland areas would have to be crossed to connect a railroad with a spur line servicing any future facility. Transmission lines do occur just to the north of the Marion site. Direct interconnection cost for the additional generating capacity if the Marion site were used would be approximately $8 million and consist of major modification at the Marion 230-kV substation as well as 3 miles of new 230kV line. The ER indicates that transmission line upgrades to safely and reliably serve the Marion site would cost an estimated $410 million (COLA ER 9.3.2). These necessary upgrades would include the following new transmission lines: Marion to Whiteville 230kV line; Marion to Cumberland 230kV line; Whiteville to Wallace 230kV line; Fayetteville Woodruff St to Raeford 230kV line; and several transformer replacements.

Based on water storage projections that would provide adequate cooling water for reliable operation during drought conditions as determined for the Harris site, the calculated storage needed for the Marion site would be approximately 58,000 acre-feet; this is based on inflow available (7Q10) of 688 cfs for the Pee Dee River (PEC 2009c). Potential dam siting studies have not been undertaken, but a rough calculation using Spatial Analyst and 3D Analyst indicates that a dam placed on the Pee Dee River just upstream from the proposed Marion site would require inundating more than 12 river miles of the Pee Dee River to achieve the necessary storage area. The generally flat topography associated with river and stream valleys in this area could result in the reservoir having depths of three feet or less in most areas. The shallow nature of the proposed reservoir could also lead ultimately to potential issues with water quality resulting from lack of thermal stratification, as found in deeper lakes, as well as potential oxygen depletion resulting from this lack of stratification and eutrophication. Eutrophication results from the decay of organic material and an increase in nutrient supply, often from runoff occurring upstream (Brewer 1994). The extensive wetland areas that would be inundated by the proposed reservoir would tend to provide a large amount of organic matter that would support the eutrophication process. The Pee Dee River itself would likely provide increased nutrient inputs from upstream runoff that would, at least temporarily, be held within the reservoir further contributing to the eutrophication process. Additionally, the facility would be at an elevation lower than the normal pool of the reservoir, which would present a hazard during flood events without extensive dike construction or raising the power block. The process of creating a reservoir on the Pee Dee River would also require extensive permitting with state and federal agencies and would likely be a multi-year process involving extensive analysis. The dam on the Pee Dee River would also impede navigation as well as the natural movement of resident fish species up and down the river.

Potential wetland impacts were not fully quantified, but the approximately 38.3 square mile reservoir would impact special aquatic sites of differing types in this region. Dominant wetland types potentially impacted by inundation include bottomland hardwood wetlands along the Pee Dee River and its tributaries; mixed hardwood wetlands and hardwood sloughs located in the river's floodplain, and wet pine flatwoods located further away from the river, outside the floodplain. The western side of the Pee Dee River is slightly lower in elevation that the east side and as a result, the wetland areas are more extensive with some areas of potential wetland extending up to three miles across the landscape on the west side of the river. The proposed reservoir would also impact stream and surface waters; primarily the Pee Dee River itself. The loss of riparian habitat along the Pee Dee River would be detrimental to the aquatic and wetland dependant species occupying that habitat. Riparian areas provide food resources for animals throughout the food web. Riparian vegetation along streams is critical as a primary food source to invertebrates that form the base of the food web (National Research Council 2002). Although the creation of this reservoir on the Pee Dee River has the potential to negatively affect special aquatic sites, it is reasonable to assume that the creation of special aquatic sites (primarily fringe wetlands and aquatic beds) would likely result from the inundation in those areas where conditions are suitable. Factors such as

topography and soil type would dictate where wetlands would reform around the new reservoir.

In summary, the Marion site is not environmentally preferable to the Harris site as summarized above and as discussed in the COLA ER Chapter 9.3. The Marion site is eliminated from further analysis due to greater potential impact to wetlands resulting from power block and transmission construction in comparison to the preferred alternative (Harris site). Additional impacts resulting from the Marion site would include forming a reservoir on the Pee Dee River, which will negatively affect up to 12 river miles and large areas of floodplain wetlands and riparian corridors.

b. Robinson Site

The H.B. Robinson Steam Electric Plant (Robinson site) is located on Lake Robinson, which was formed by impounding Black Creek in the late 1950s. Lake Robinson is approximately 7 miles long, 0.25 to 0.75 mile wide, and has approximately 20 miles of shoreline. It has a mean depth of 14.4 feet and a maximum depth of 44 feet at the dam (Robinson ER 2.2). The Robinson site is an existing PEC facility located on approximately 6,020 acres of property in northwestern Darlington and southwestern Chesterfield counties in South Carolina, including the 2,250-acre Lake Robinson. The site has an existing 710 MW nuclear reactor as well as fossil and combustion turbine generating capabilities. The 400-acre power block on the Robinson site, as identified by PEC, contains both terrestrial and open water areas. Land use impacts associated with the addition of two additional units to the Robinson site are expected to be minor due to the disturbed nature of approximately 50 percent of the 400-acre power block. Jurisdictional wetlands and waters of the US account for approximately 29 percent of the 400-acre power block, with Lake Robinson accounting for approximately 86 acres (**Table 1**). PFO wetlands comprise approximately 18 acres and PEM wetlands comprise approximately 6 acres. Large expanses of bottomland hardwood wetlands comprising hundreds of acres also occur in the headwater areas of Lake Robinson (ESI 2005). Areas identified as containing hydric soils, based on current Natural Resource Conservation Service (NRCS) data, total approximately 185 acres. However some of the hydric soils are the result of small inclusions within a larger mapping unit. Direct impacts to special aquatic sites within the 400-acre power block resulting from the additional units would be relatively small.

Lake Robinson and the surrounding wetland communities provide habitat for fish and other aquatic organisms such as plankton and benthic macroinvertebrates. PEC has completed a number of long-term monitoring studies to summarize the health and trends of the aquatic communities associated with the Robinson site. These studies have shown that Lake Robinson continues to function as expected for a relatively unproductive dystrophic aquatic ecosystem (*i.e.*, a "blackwater" impoundment with low nutrient concentrations, low pH, low buffering capacity, and naturally stained water that limits light penetration), despite thermal inputs from the Robinson site (Robinson ER 2.2). The Robinson site appears to be somewhat challenged for water supply based on operational experience at the existing units, where some restrictions on operations have been required

based on thermal effects. Expansion of Lake Robinson would likely be the only way to adequately supply the additional water supply needed for the additional generating capacity without further contributing to the thermal stress. Extensive high quality riparian bottomland hardwood wetlands (PFO6) occupy the headwaters of Lake Robinson along Black Creek. Black Creek itself can be characterized as riverine, lower perennial (R2) system based on Cowardin classification. Dominant vegetation within the bottomland hardwood wetland consists of swamp tupelo (*Nyssa sylvatica* var. *biflora*), lizard's tail (*Saururus cernuus*), Virginia chainfern (*Woodwardia virginica*), titi, red maple (*Acer rubrum*), and fetterbush (*Lyonia lucida*). PEM wetlands that occur along the edge of Black Creek contain cattail (*Typha latifolia*), giant cane (*Arundinaria gigantea*), water lily (*Nymphea odorata*), wool grass (*Scirpus cyperinus*), and soft rush (*Juncus effusus*). Trees within the riparian wetlands displayed prominent buttressing. Age estimates of the stands vary between 30 and 50 years old (ESI 2005). Bottomland hardwood forests are particularly notable wetlands because of the large areas that they cover in the southeastern United States and because of the rapid rate at which they are being converted to other uses such as agriculture and human settlements (Mitsch & Gosselink 1986). The expansion of Lake Robinson would inundate large areas of these high-quality wetlands, thus changing the overall community structure including the loss of large reaches of the Black Creek channel itself. The water regimes of bottomland hardwood wetlands are divided into five zones; transitioning from wetter areas near the creek or river, to drier areas closer to the uplands. This natural zonation pattern will shift as a result of raising the level of Lake Robinson. Some of the zones that naturally occur close to the water source should reform; however, the outermost zones may expand out into areas that contain unsuitable topography or soils resulting in the loss of certain habitat components of the bottomland hardwood system. This loss of certain habitat types may affect certain wetland and aquatic dependent species as well as alter the natural riparian corridor that currently exists along Black Creek.

Impacts to special aquatic sites resulting from transmission upgrades are also expected to be high. Direct interconnection for the additional generating capacity at the Robinson site is estimated to cost $8 million and would require a new onsite 230kV substation and 0.1 mile of new onsite 230kV line. Upgrades to the transmission lines associated with the Robinson site would cost approximately $286 million (COLA ER 9.3.2). These necessary upgrades would include the following new lines: Robinson to Camden 230kV line; Robinson to Sumter 230kV line; Robinson to Florence 230kV line; Robinson to Laurinburg 230kV line; and replacement of numerous transformers along several existing routes. These new lines would incur significant wetland impacts through wetland conversion that is necessary to prepare the ROW.

Based on water storage projections that would provide adequate cooling water for reliable operation during drought conditions as determined for the Harris site, the estimated storage needed for the Robinson site would be over 2,000,000 acre-feet; this is based on inflow available (7Q10) of 19 cfs for Black Creek (PEC 2009c). Potential dam modification studies have not been undertaken, but a rough calculation using Spatial Analyst and 3D Analyst indicates that raising the existing dam would begin flooding the existing nuclear plant at the point where only approximately 3% of the required

additional storage is obtained. Increasing the reservoir to the full size needed to achieve the required additional storage capacity was determined to be impracticable.

Additional constraints associated with Lake Robinson involve the lack of ownership of much of the land surrounding the lake. Lake expansion would require numerous land acquisitions and relocations. In summary, the Robinson site is not environmentally preferable compared to the Harris site as summarized above and in COLA ER Chapter 9.3. The Robinson site is eliminated from further analysis due to the impracticability of providing an adequate reliable cooling water source and greater potential impact to the high quality bottomland hardwood forested wetlands along Black Creek than the lower quality wetland impacts resulting from the preferred alternative (Harris site).

c. Brunswick Site

The Brunswick site is located on approximately 1,200 acres in Brunswick County, North Carolina. The site has two existing nuclear units (Units 1 & 2). The Brunswick site has the potential to impact more wetlands and streams through filling within the 400-acre power block than the Harris site (preferred alternative); however, initial analysis indicates that the Brunswick site does have some site attributes that may be viewed as desirable for construction and operation of additional nuclear power capacity, primarily reliable cooling water supply not requiring expansion or creation of a water storage reservoir. Therefore, the Brunswick site is being carried forward for further evaluation pursuant to Section 404(b)(1).

d. Harris Site (Preferred Action)

The Harris site is an existing PEC facility that currently generates electrical power with one nuclear reactor (Unit 1). The actual plant site currently covers approximately 440 acres and the proposed addition of the HAR Units 2 & 3 will affect approximately 192 additional acres. PEC owns 10,744 acres at the site which was originally planned to support four operating units with a larger reservoir. The construction of Units 2 & 3 will also require appurtenant facilities including electric transmission lines, an electric switchyard, and modifications to the Harris Lake dam, intake structures and pumphouse, the Harris Lake makeup water system pipeline, a discharge structure on Harris Lake, and blowdown pipelines from Units 2 & 3 into Harris Lake. The existing infrastructure at the Harris site, including Harris Lake, combines to make this the Preferred Action for PEC. Although PEC proposes to raise the level of Harris Lake to provide a reliable cooling water source during drought conditions for Units 2 & 3, PEC believes that this site can be defined as the LEDPA pursuant to Section 404(b)(1) when compared to the overall impacts to aquatic resources that would result from any of the other three alternative sites.

4. Summary and Alternatives Carried Forward

Four alternative sites were evaluated for potential impacts to aquatic resources. Table 1 provides a summary of the potential wetland and stream impacts within the 400-acre powerblock.

Table 1. Estimated Wetlands, Hydric Soils, and Streams within each 400-Acre Power Block Area

Alternative Site	NWI Wetlands (ac) (PFO, PEM, PSS, PUB, E1/2)	Mapped NRCS Hydric Soils (ac)[2]	Streams from National Hydrography Dataset (ft)	Existing Nuclear Site (Y/N)[3]
Marion	162	280	2,970	N
Robinson	24	185	3,764	Y
Brunswick	35 [1]	97	2,029	Y
Harris	5	33	235	Y

[1] 32 ac consists of estuarine wetlands.
[2] Also includes non-hydric soil mapping units containing hydric inclusions.
[3] Many of the mapped hydric soils have likely been disturbed and are no longer intact on the existing nuclear sites.

Additional water storage capacity was identified as needed for the Marion, Robinson, and Harris sites to provide reliable cooling water during drought conditions. The Brunswick site was identified as having sufficient water supply to meet the needs of the new units without additional water storage required.

Based on preliminary estimates for the Marion site, a new reservoir would be required to be constructed on the Pee Dee River which would inundate approximately 38.3 square miles including extensive bottomland hardwoods along 12 river miles to achieve the necessary 58,000 acre-feet of storage. In addition to having the largest amount of wetlands fill that could be required for the powerblock, the severity of the impact from constructing a new reservoir on the Pee Dee River resulted in the Marion site being eliminated from further consideration.

Based on preliminary estimates for the Robinson site, the existing reservoir can not be expanded to meet the additional storage capacity needed for the new units. The existing facility would begin flooding at the point where only 3% of the 2,000,000 acre-feet of additional storage is obtained. Increasing the reservoir to achieve additional storage capacity for reliable operation during drought periods was determined to be impracticable and resulted in the Robinson site being eliminated from further consideration.

Although the Brunswick site potentially has a larger amount of wetlands and stream impact than the Harris site within the 400-acre powerblock, the Brunswick site has sufficient water supply for the new units while the Harris site will require expansion of

Harris Lake to provide the additional storage capacity needed for the new units. Based on the impacts to wetlands and streams from the increased lake elevation at Harris, the Brunswick site was not eliminated from further consideration based on impacts to aquatic resources within the powerblock area.

The Harris site alternative and the Brunswick site alternative have been selected to carry forward for further evaluation as part of the alternatives analysis process.

IV. EVALUATION

This section of the document will evaluate in greater detail the anticipated changes to the physical, chemical and biological characteristics of the aquatic environment as well as human use characteristics and impacts that may result from the construction of new reactors at either the Brunswick site or the Harris site.

A. Anticipated Changes to the Physical/Chemical Characteristics of the Aquatic Environment

1. Substrate

Brunswick

Impacts to the substrate within the 400-acre powerblock would consist of filling all or a portion of the about 35 acres of wetlands present within the 400-acre powerblock. The filling of wetlands would be an adverse impact for this alternative.

Harris

The impacts to the substrate for the HAR-2 and HAR-3 sites includes impacting 2 of the 5 acres of wetlands within the 400-acre powerblock for construction of HAR-3; temporary impacts to wetlands for construction of the 2.6 mile pipeline from the Cape Fear River to Harris Lake; and dredging of an intake structure on the Cape Fear River above the Buckhorn Dam. The filling of wetlands would be an adverse impact for this alternative.

The addition of 20 feet of additional water in Harris Lake would inundate areas that are currently located above the current normal pool elevation. The inundation of the areas above the current normal pool elevation would likely cause resorting of sediments beneath the water surface and some shoreline erosion due to wave action. These newly inundated areas would be expected to reach steady-state conditions relatively quickly.

2. Currents, circulation or drainage patterns

Brunswick

There is not expected to be a significant effect on currents, circulation or drainage patterns from the filling of wetland areas within the 400-acre powerblock. The new cooling water intake for the new units may result in temporary hydrologic alterations as well as minor changes in circulation of the intake canal.

No adverse environmental consequences are anticipated for this alternative.

Harris

The filling of wetlands within the HAR-2 and HAR-3 development areas is not expected to have a significant effect on currents or circulation. Drainage patterns within the fill areas will be changed to meet site grading requirements. Drainage of the HAR-2 and HAR-3 development areas will be toward Harris Lake and the auxiliary reservoir.

The construction of the new makeup water intake structure will have temporary hydrological alterations consisting of sedimentation. Construction areas for the intake will be isolated by dewatering with the water being pumped to a sedimentation basin and allowed to drain back into the river. However, the work will be performed under a sediment and erosion control plan and NPDES permit. The construction of the intake structure would have a temporary adverse environmental consequence for this alternative.

3. Suspended particulates, turbidity

Brunswick

There are no expected long-term effects of suspended particles, turbidity on the wetlands, canals or streams from the construction of the facility. The facility currently operates under an active NPDES permit which would be expanded to include the new development area. Sedimentation during construction will be minimized by performing the work in accordance with an erosion and sediment control plan.

No adverse environmental consequences are anticipated for this alternative.

Harris

There are no expected long-term effects of suspended particulates, turbidity on the freshwater streams, the Cape Fear River or Harris Lake and impoundments. The current facility operates under an NPDES permit and the permit will be expanded to include the new HAR-2 and HAR-3 facilities.

The only potential source of suspended particles, turbidity for the Cape Fear River would be during construction of PEC's surface water intake near Buckhorn Dam. The increased suspended particles, turbidity during the construction of PEC's surface water intake may have a temporary impact on a canoe input located downstream of Buckhorn Dam. There would be an impact to the Cape Fear River Floodplain during construction of PEC's intake structure. Sediment built up as a result of construction activities will be removed. Appropriate USACE Section 404, NCDENR 401 Water Quality Certification, and NPDES permits will be obtained (COLA ER 4.2.1.2 and 4.2.2.1).

Increased suspended particles, turbidity will be expected for Harris Lake and impoundments during construction of HAR-2 and HAR-3. PEC will perform the construction activities in accordance with an erosion and sediment control plan to limit the amount of sediment in stormwater. Water collected during the dewatering of the construction area will be allowed to settle and be filtered before it is returned to Harris Lake or impoundments (COLA ER 4.2.2.2).

Clearing of trees around the Harris Lake prior to raising the water level may have an effect on the amount of sediment runoff. However, silt fences and other erosion control devices will be used to minimize the impact.

4. Water quality

Brunswick

The Brunswick site uses a once-through cooling system that withdraws water from the Cape Fear River and discharges the water into the Atlantic Ocean. Based on the Brunswick ER, the site operates under an NPDES permit that requires semi-annual temperature readings at the discharge point. The two new units at the Brunswick site would employ a closed cycle cooling system that would draw much less flow than once-through cooling, but would result in incremental increase in the amount of water withdrawn from the river. Based on the ER, potential effects of heat shock caused by the thermal discharge into the Atlantic Ocean is not a significant factor for the Brunswick Site (COLA ER 9.3.2.2.2.5).

Potential contaminants in the Cape Fear River are related to its use for ship traffic to the Port of Wilmington and to the industrial plants located upstream to the north. The FSAR noted that pollution of the river with industrial and sanitary sewage is to such an extent that oysters harvested in the lower river areas are taken by the North Carolina Division of Fisheries for transplanting in cleaner waters for natural purging prior to human consumption (FSAR 2.4.1.2.3).

There are no expected changes to salinity for the facility as there will be no changes to the locations of the intake and discharge canals.

Harris

Temperature readings of Harris Lake have been collected between 1990 and 2004. The temperature measurements indicate that the water in the reservoir is generally stratified during the warmer months (May and July) and relatively free circulating in January and November. Data collected from the deepest monitoring point within Harris Lake (about 56 feet) during May indicated readings ranging from 55.4 to 72.1°F. In November, the temperature ranged from 52.3 to 61.5°F. Based on the ER, the Harris Lake would have sufficient heat rejection capacity and should not have a significant thermal impact on aquatic ecology and water quality (COLA ER 2.3.3.2).

Temperature readings have been collected at two locations in the Cape Fear River near the Harris site between 1968 to present. The temperature reading from these locations varied seasonally and ranged from 35.6 to 93.2°F. Temperature readings measured on the Haw River at Jordan Lake Dam (upstream of the Harris site) between 1981 through 1985 and during 2004 indicated temperatures ranging from 39.2 to 89.6°F (COLA ER 2.3.3.1.1).

Based on the COLA ER, it is expected that normal releases of contaminants into the environment from the Harris site will have negligible effects on surface and groundwater uses and will be in compliance with an approved National Pollutant Discharge Elimination System (NPDES) permit issued by the North Carolina Department of Environment and Natural Resources (NCDENR). This permit requires that discharges are controlled from systems (such as discharge lines, sewage treatment facilities, radwaste treatment systems, activated carbon treatment systems, water treatment waste systems, facility service water, and stormwater runoff) to Harris Lake. The effect on water quality in Harris Lake due to the operation of the Harris Site will be monitored to ensure compliance with the issued NPDES permits for construction and operation (COLA ER 3.3).

No adverse environmental consequences are anticipated for this alternative.

5. Flood control functions

Brunswick

The nominal elevation of the existing facility is 20 feet mean sea level (MSL). The elevation of the maximum storm event is expected to reach 22 feet MSL. As such, water levels would be expected at two feet above grade. Buildings at the facility are waterproofed to an elevation of 22 feet MSL. Flood control for the canals is managed by levees located at elevations of 22 feet MSL. There is a potential adverse impact for flooding, but only related to extreme storm events and not under normal weather conditions.

Harris

The final floor elevations for HAR-2 and HAR-3 are proposed to be 261 feet National Geodetic Vertical Datum of 1929 (NGVD29). The main plant areas of HAR-2 and HAR-3 calculated Probable Maximum Flood (PMF) elevations are below the proposed final floor elevations (FSAR 2.4.2 and 2.4.3.6.4).

The uncontrolled ogee spillway on the main dam of Harris Lake has a current elevation 220 feet NGVD29, but is proposed to be raised to an elevation of 240 feet NGVD29. The auxiliary reservoir has an elevation of 252 feet NGVD29 and is not proposed to be raised. The main dam of Harris Lake and the auxiliary reservoir both are at elevations of 260 feet NGVD29 (FSAR 2.4.3). Flooding on Buckhorn Creek above the main dam is expected to be controlled by the uncontrolled ogee spillway of the dam. At the PMF elevation, only 16 percent of the Buckhorn Creek drainage basin would be flooded (FSAR 2.4.3 a).

There are no significant adverse environmental consequences related to flooding for the Harris site.

6. Storm, wave and erosion buffers

Brunswick

The nominal elevation of the existing facility is 20 feet MSL. The elevation of the maximum storm event is expected to reach 22 feet MSL. As such, water levels would be expected at two feet above grade. Buildings at the facility are waterproofed to an elevation of 22 feet MSL. Wave action from the maximum water depth of two feet would yield a wave height elevation of 25.6 feet MSL (1.6 foot wave run-up has a vertical face of 3.6 feet). All doors are designed to prevent leakage and the buildings are designed as Seismic Class 1 and could withstand the static and dynamic effects of a 1.6 foot wave (FSAR 2.4.5).

Water elevations within the intake and outflow canal during maximum storm events would be expected to be 22 feet MSL. Wave heights are expected to be three feet (25 feet MSL) with a wave run-up height of 25.3 feet MSL.

There is a potential adverse impact for storm and wave buffers for this alternative, but only related to extreme storm events and not under normal weather conditions.

Harris

The safety-related structures at the HAR-2 and HAR-3 facilities are protected from high water levels up to elevation 261 feet NGVD29, which is higher than anticipated flood levels due to wave run-up in the reservoirs or direct rainfall at the plant site. The upstream face of the Main Dam and both upstream and downstream faces of the

Auxiliary Dam are protected by riprap designed for the worst calculated wave action. The downstream face of the Main Dam is protected by a layer of oversized rock. The backwater effects of Buckhorn Creek on the downstream face of the Main Dam are not expected to be significant. However, protection of the downstream face serves as an additional safety precaution (FSAR 2.4.5.5).

There is no expected adverse impact for storm and wave buffers for this alternative.

7. Aquifer recharge

Brunswick

The development of the 400-acre power block is not expected to have an impact on aquifer recharge. The surficial aquifer beneath the site has been reported to be located at a depth of between 2 and 10 feet. The localized groundwater flow direction may be impacted due to the construction of the subsurface structures for the reactors; however, due to the sandy nature of surface soils, infiltration in the areas around the reactor units would help minimize the loss of the shallow aquifer area. Small individual potable wells in the area are located in the surficial aquifer. The Castle Hayne Aquifer is the primary drinking water source for the area (community and municipal drinking water wells). There are no known Castle Hayne Aquifer primary recharge areas in the vicinity of the property. As such, the construction of the facility should not have an effect on the recharge for the Castle Hayne Aquifer.

No adverse environmental consequences are anticipated for this alternative.

Harris

The construction of HAR-2 and HAR-3 is not expected to have an impact on aquifer recharge. The Harris site is underlain by the surficial aquifer that lies at depths ranging from 2 to 30 feet below the land surface. Rain water percolates through the residual soil and into the surficial aquifer which generally discharges to one of the reservoirs or surface water. The surficial aquifer is underlain by a low permeability bedrock aquifer (FSAR 2.4.13.1.1 and 2.4.12.1.2). Development of the site will have a minor effect on surficial groundwater recharge due to increased impervious area. However, since there is a hydraulic connection between Harris Lake and the surficial aquifer, the overall effect of loss in pervious area should be minimal. The bedrock aquifer has a hydraulic connection with Harris Lake with recharge occurring through bedding plains, fractures and joints beneath the water surface of the lake. Increased water levels on Harris Lake are not expected to negatively affect aquifer recharge.

No adverse environmental consequences are anticipated for this alternative.

8. Baseflow

Brunswick

The base flow of the Cape Fear River in the vicinity of the Brunswick site has been measured at 8,100 to 10,000 cubic feet per second (cfs). The cooling water discharges to the Atlantic Ocean which has no discharge flow constraints (COLA ER 9.3.2.2.3). The increased withdraw of water from the Cape Fear River is not expected to significantly impact the base flow of the Cape Fear River. No adverse environmental consequences are anticipated for this alternative.

Harris

The current normal pool level for the Harris Lake is 220 feet NGVD29 and the auxiliary reservoir is 252 feet NGVD29. The pool elevation of the Harris Lake is proposed to be 240 feet NGVD29 with no change in pool elevation for the auxiliary reservoir (COLA ER Section 2.3).

The current Cape Fear River base flow is 3,384 cubic feet per second (cfs), based on data collected each month between 1924 and 2004, and is not expected to be affected by water withdrawal for the Harris Site (FSAR 2.4.1-204) assuming a maximum withdrawal rate of 133.68 cfs (COLA ER 2.3). The withdraw of makeup water from the Cape Fear River is estimated to be 3.6 percent of the average daily flow reported at the Lillington Gauging Station (COLA ER 9.3.2.2.1.5).

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 Harris 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.

No adverse environmental consequences are anticipated for this alternative.

9. Mixing zone

Brunswick

Thermal effluent from the Brunswick site discharges through two 13-foot diameter, 2000-foot long submerged pipes that extend into the Atlantic Ocean. Water depth at the point of discharge is approximately 10 feet. The ocean floor near the discharge pipes is sandy, with no hard bottom outcroppings or attached vegetation that might attract fish. There is a strong westerly tidal and longshore flow in this region. Although aquatic species might use the nearshore area around the discharge location, the slight increase in temperature above ambient ocean temperature is not enough to cause heat shock (COLA ER 9.3.2.2.2.5).

Harris

For the HAR, heated water discharged to Harris Lake will be from blowdown of the two new cooling towers and the service water system to control dissolved solids in the closed cycle system. The cooling tower blowdown water will be discharged into Harris Lake through two new blowdown pipes, one for each of the new cooling towers, installed parallel to the existing discharge pipe for the HNP cooling tower blowdown water. The results of modeling indicate that the discharge plume is approximately 300 feet in diameter. The temperature difference between the plume and ambient water temperature is less than 0.5°F, which meets the NPDES criterion of no increase greater than 5°F (COLA ER 5.3.2.1). Because the HAR site is located on a large reservoir system that will provide sufficient heat rejection capacity for the two new units, plant operation is not expected to have significant thermal impacts to aquatic ecology and water quality (COLA ER 5.3.2.1).

B. Biological Characteristics and Anticipated Changes

1. Special aquatic sites

Brunswick

The Brunswick site is located on the Lower Cape Fear River estuary, which includes 22,000 acres of salt marsh and 18,000 acres of tidal flats and small tidal streams. This section of the Lower Cape Fear River near the Brunswick site ranges from one to two miles wide and is mostly shallow except for a shipping channel maintained by the U.S. Army Corps of Engineers (Brunswick ER 2.2). Special aquatic sites known to occur on the Brunswick site include wetlands, mudflats, and vegetated shallows. The siting study evaluating the four alternative sites concluded that the Brunswick site ranked third with regard to wetlands due to the expansive marshes that are adjacent to the site (PEC 2006). The 400-acre power block identified by PEC contains wetland, terrestrial and open water habitats. Approximately 35 percent of the 400-acre power block at the Brunswick site is currently developed with the remainder consisting of natural and previously disturbed vegetative communities. Estuarine wetlands (E1/E2) account for approximately 32 acres along with approximately 2 acres of PEM wetlands and 1 acre of PSS wetlands (Table 1). Areas identified as containing hydric soils, based on current Natural Resource Conservation Service (NRCS) data, total approximately 96 acres. However, some of the hydric soils are the result of small inclusions within a larger mapping unit. Direct impacts to special aquatic sites resulting from construction on the 400-acre power block would likely be small.

Impacts to special aquatic sites resulting from transmission upgrades are expected to be high. Direct interconnection cost for the additional generation should the Brunswick site be used would cost approximately $8 million and consist of a new 230kV substation and 0.2 mile of new 230kV line. Upgrades to the transmission lines associated with the Brunswick site would cost approximately $309 million (PEC 2006). These necessary

upgrades would include the following new transmission lines totaling approximately 341 miles: Brunswick to Cumberland 230kV line; Brunswick to Clinton 230kV line; Brunswick to Jacksonville 230kV line; and a Brunswick to Wommack 230kV line. These new lines would incur significant wetland impacts through wetland conversion that is necessary to prepare the ROW (Table 2). In summary, direct impacts resulting from construction of the power block are minimal. Direct impacts to special aquatic sites will primarily result from wetland conversion associated with the extensive transmission line upgrades. These anticipated impacts amount to approximately 2,272 acres of wetlands and 24 acres of open water. Of the wetland total; approximately 541 acres are PEM and PSS wetlands and will not result is a conversion from a forested wetland system. Forested wetlands that could be converted under the Brunswick site scenario comprise a minimum of 1,115 acres. Approximately 610 acres of additional wetlands that would be affected by the transmission lines are not specified by type in the NWI dataset used to estimate acreage. These amounts do not account for impacts associated with the new line to the Wommack substation, as this 89-mile line has not been sited or proposed for collocation at the time of this document. Due to the landscape and physiographic region that this new line would cross, it can be reasonably anticipated that the Wommack line would incur considerable wetland impacts in addition to those already quantified above.

Harris

Land use within the 400-acre power block area identified by PEC at the Harris site consists primarily of developed land (51%) with the next highest land use being open water (17%). Special aquatic sites known to occur on the Harris site, including Harris Lake and its perimeter, include wetlands, aquatic beds, and riffle/pool complexes. PSS wetlands account for approximately 5 acres within the 400-acre power block (Table 1). Areas identified as containing hydric soils, based on current Natural Resource Conservation Service (NRCS) data, total approximately 100 acres. However, some of the hydric soils are the result of small inclusions within a larger mapping unit. Impacts to wetlands or other special aquatic sites anticipated to result directly from the footprint of HAR-2 and HAR-3 include an approximately 2-acre constructed pond that has naturalized with emergent and successional vegetation. This 2-acre wetland impact will result from the construction of the HAR-3 cooling tower (COLA ER 4.3.2.1). Impacts to this wetland cannot be avoided or minimized due to constraints associated with new facility siting in relation to existing infrastructure.

To provide a reliable water source for HAR-2 and HAR-3 during drought conditions, the normal pool elevation of Harris Lake is proposed to be increased from 220 feet NGVD29 to 240 feet NGVD29. The original discharge that served to create Harris Lake occurred during construction of the Harris Lake Dam pursuant to the ACOE permit (SAWCO77-N-019-0441) issued in 1977. The dam was designed for a maximum water level elevation of 239.1 feet NGVD29 based on the original permit schematics; however, it was only filled to an elevation of 220 feet NGVD29. Harris Lake's additional water capacity will come from a combination of natural fill due to rain and from water withdrawal from the Cape Fear River. The proposed rise in normal pool elevation of Harris Lake will inundate special aquatic sites including intermittent and perennial

streams along with wetlands that occur between the 220 feet NGVD29 and 240 feet NGVD29 contours. Additionally, aquatic beds that occur below the 220 feet NGVD29 contour will also be inundated but are expected to quickly reestablish once the new lake elevation stabilizes. PEC authorized a comprehensive wetland delineation for the jurisdictional features that occur between the 220 feet NGVD29 and 240 feet NGVD29 contours to quantify potential impacts to special aquatic sites. This delineation effort occurred between November 2008 and February 2009. Wetland types identified in the delineation report include emergent wetlands, lacustrine fringe wetlands, and terrestrial forested and herbaceous wetlands. The contractor defined the emergent wetlands as those occurring in the littoral zone (waterward of the normal 220 feet NGVD29 contour). Lacustrine fringe wetlands were defined by their location on the landward edge of the lake with their hydrology being primarily driven by the lake surface. Terrestrial forested and herbaceous wetlands are located inland from the shoreline. The results of the delineation effort indicate that the following special aquatic sites will be affected by inundation resulting from raising the normal pool elevation of Harris Lake to 240 feet NGVD29 (CH2M-Hill 2009).

- Wetlands (forested/herbaceous) - approximately 180 acres will be converted to lentic habitat
- Emergent wetlands (aquatic bed) – approximately 340 acres will be temporarily affected, but will reform at new contour
- Fringe wetlands – approximately 60 acres will be temporarily affected, but will reform at new contour
- Open water (ponds) – approximately 15 acres
- Intermittent streams – approximately 65,600 linear feet converted to lentic habitat
- Perennial streams – approximately 70,200 linear feet converted to lentic habitat

Due to the nature of the impact (inundation), it is believed that the impacts to both the emergent wetlands and the fringe wetlands are temporary in nature. These two wetland types should reform once the lake stabilizes at the new 240 foot NGVD29 contour. Some of the impacts to the forested and herbaceous wetlands may also be temporary as some new wetland areas will undoubtedly be created in stream valleys and topographic draws as a result of the new lake elevation. Stream channel footage will be lost to inundation and the habitat will convert from a lotic habitat to lentic habitat. The purpose of the 404(b)(1) Guidelines is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredge or fill material. The loss of the special aquatic sites described above is not the result of a discharge of dredge or fill material, but rather a change in habitat type by conversion to a different type; aquatic habitat will increase overall through conversion of additional upland areas to lake habitat.

Other appurtenant facilities that may incur impacts to special aquatic sites as a result of HAR-2 & HAR-3 construction include blowdown pipelines, transmission line construction, main dam modifications, Cape Fear River intake structure and pumphouse, and the pipeline corridor (COLA ER 4.1). The blowdown pipeline will be trenched via a barge into Harris Lake westward from the cooling towers for HAR-2 and HAR-3 and will

result in minimal bottom disturbance (COLA ER 4.1.2.1). Modifications to the main dam will not impact any special aquatic sites. The proposed intake structure, pumphouse and pipeline will provide makeup water for Harris Lake to provide a reliable cooling water supply during for HAR-2 and HAR-3 drought conditions. Some dredging will be required in the Cape Fear River to accommodate the new intake structure, which is proposed to be constructed just above Buckhorn Dam. Construction impacts will be minimized by using cofferdams. The pipeline corridor will cross two wetlands (one adjacent to the river and one farther inland), one perennial stream, four intermittent streams, and two ephemeral channels. These impacts are temporary in nature and pre-construction contours will be reestablished. Impacts to special aquatic sites resulting from the makeup water supply intake, pumphouse and pipeline appear to be minimal.

Seven 230-kV transmission lines currently connect the Harris site to the transmission system. No transmission upgrades specific to HAR-2 are planned. Three existing corridors will be expanded by no more than 100 feet to accommodate new lines required to connect the HAR-3 switchyard to the PEC electrical grid. The new lines total approximately 103 miles of line and include the Wake 230-kV line, the Erwin 230-kV line and the Fort Bragg Woodruff Street 230-kV line. The anticipated cost of the transmission upgrades at the Harris site are expected to be the lowest of all four of the alternative sites; <$2 million for both units (COLA ER 9.3.2.2.1.10). The expanded corridors could impact approximately 1,250 acres of which approximately 4 percent is wetlands (COLA ER 4.1.2.2). These wetlands will likely be impacted through conversion from forested wetlands to successional/emergent wetlands through ROW clearing.

PEC has demonstrated through numerous other transmissions line construction projects that detrimental impacts to wetlands from ROW construction are minimal because most areas can be spanned completely. If discharges are necessary, they are typically limited to footings for support structures. Impacts from these three line expansions are expected to be small, with wetland conversion being the primary impact. Preliminary evaluations indicate that total wetland acreage within the proposed transmission line upgrade areas is approximately 148 acres. Open water and riverine habitat accounts for approximately 48 acres; leaving approximately 100 acres of PFO, PEM and PSS wetlands. Forested wetlands that would be converted by ROW expansion account for approximately 76 acres. The remaining 24 acres are either PEM or PSS wetlands and would not be adversely affected by ROW clearing.

In summary, the most significant impacts resulting from the construction and operation of HAR-2 and HAR-3 result from increasing the normal pool elevation of Harris Lake by approximately 20 feet to provide adequate cooling water supply during drought conditions (*i.e.*, drought mitigation). Downstream communities that rely on the Cape Fear River could be negatively impacted by the withdrawals from the river during drought conditions if the elevation of Harris Lake were not raised to provide a reliable supply of water.

Summary

Table 2. Potential impacts to aquatic resources.

Aquatic Resource	Source of Potential Impact					
	400-ac power block		Water supply		Transmission Upgrades	
	Harris	Brunswick	Harris	Brunswick	Harris	Brunswick[2]
Wetlands Affected	5 ac	35 ac	580 ac [1]	0	100 ac	>2,272 ac
Open Water Affected	0	0	15 ac [1]	0	48 ac	>24 ac
Streams Affected	235 ft	2,029 ft	135,800 ft [1]	0	78,200 ft	>198,700 ft

[1] Impacts resulting from inundation due to Harris Lake expansion; an additional 0.7 acre of temporary wetland impact results from the pipeline construction. Approximately 400 acres of these wetlands (aquatic beds and fringe wetlands) expected to reform at new elevation

[2] Does not include new minimum 89-mile Brunswick to Wommack 230-kV transmission line; potential impacts could not be determined due to routing not identified for this corridor.

Direct impacts to special aquatic sites at the Brunswick site resulting from construction in the powerblock area are expected to be minimal, however the potential wetland impacts associated with the transmission line upgrades for the Brunswick site are far greater than those impacts expected to result from the Harris site. A minimum of 1,115 acres of forested wetlands would be converted as a result of ROW clearing under the Brunswick site scenario. The Harris site would have the lesser amount of impacts to special aquatic sites when the effects from the transmission lines are included.

Types of impacts associated with construction of the Harris site powerblock, water supply and transmission lines consist of fill, inundation, and conversion. Powerblock impacts of approximately 2 acres will include the discharge of fill material and are considered to be permanent. Impacts from the inundation of special aquatic sites around Harris Lake are considered a loss of habitat type and functional value. They are not a direct discharge as occurs with fill material. However, approximately 400 acres of the aquatic site impacts around Harris Lake are expected to reform at the new pool elevation. These include the aquatic bed impacts (340 ac) and the fringe wetland impacts (60 ac). Fifteen acres of open water habitat will remain open water habitat; just of a lacustrine nature instead of PUB. Impacts resulting from the water supply system are minimal and temporary in nature.

2. Habitat for fish and other aquatic organisms

Brunswick

The Lower Cape Fear River estuary and surrounding marsh and wetlands provide important habitat for fish and other aquatic organisms at various life cycle stages. The major categories of aquatic biota include phytoplankton, zooplankton, larvae and post larvae of fish and shellfish, and juvenile and adult fish and shellfish. The Cape Fear

River, up to Highway 421, is considered Essential Fish Habitat by the National Marine Fisheries Service (NMFS) for egg, larval, and/or juvenile life stages of the following species: red drum, bluefish, summer flounder, gag grouper, gray snapper, cobia, king mackerel, Spanish mackerel, black sea bass, spiny dogfish, brown shrimp, pink shrimp, white shrimp, plus twelve different shark species (NMFS 2009). The primary habitat types utilized by the aquatic organisms in the vicinity of the Brunswick site include the water column, shell bottom habitat, wetlands, and soft bottom habitat. Direct impacts to aquatic habitat resulting from the construction in the power block area are expected to be small.

However, the additional generating capacity resulting from the advanced reactors at the Brunswick site will require additional cooling water to be pumped from the existing canal. The Brunswick site currently operates two units with once through cooling. Cooling water is withdrawn from the Cape Fear River Estuary and discharged to the Atlantic Ocean via a 6-mile long discharge canal. The two new units would use closed cycle cooling with much less water flow required. The increase in water flow required for the closed cycle cooling systems, though nominal in comparison to once through cooling systems, could cumulatively increase the entrainment and impingement of aquatic organisms making this site less attractive as an alternative site. A fish diversion structure located at the mouth of the intake canal and fine-mesh traveling screens plus a fish return system have been installed to reduce the entrainment and impingement of aquatic organisms. Despite these intake modifications, additional flow would expose smaller aquatic organisms in this nursery area to increased risk of entrainment. Cooling water flow for all units flows along a single common intake canal. The design of the fish diversion structure was engineered for the existing two operating units only. Make-up water for two additional units could challenge the integrity of the diversion structure resulting in damaged diversion screens and extensive maintenance activities. Repairs are completed as quickly as possible. However, past data have indicated the temporary openings provide entry points for larger aquatic organisms including endangered and threatened species such as loggerhead, green, and Kemp's Ridley sea turtles. In addition to the possibility of increased impingement rates this increases the risk of increased incidental takes of sea turtles.

Increased cooling water flow rates may also jeopardize cooling water system reliability depending on the magnitude of the increase. Past operating experience has shown that increased velocity in the intake canal associated with sedimentation increases the occurrences of fine-mesh screen clogging events. In addition there are significant environmental challenges to plant operation in this estuarine setting that do not exist for the location of the Harris site. These include intake blockage resulting from large volumes of marine algae, dense concentrations of marine zooplankton, and the large bio-fouling community associated with marine waters (PEC 2009a).

The additional cooling water will also result in additional discharge through the existing pipes that extend into the Atlantic Ocean. The ocean floor surrounding the discharge pipes is sandy with no hard bottom outcroppings. This additional thermal discharge is

expected to have a minimal effect on habitat for fish and other aquatic organisms due to the strong westerly and long shore flow in this area.

In summary, the effects on aquatic habitat and ecology resulting from new reactors at the Brunswick site could be significant relative to the other alternatives considered due to the increased volume of necessary cooling water. This would create additional entrainment and impingement impacts to aquatic organisms, including sea turtles as well as the increased possibility of blockages that are associated with the operation of such a system in brackish water. Increased blockages could pose significant health and safety issues for the plant and surrounding area (PEC 2009a).

Harris

An ecological study conducted on the Harris site in 2006 identified no significant aquatic habitat within the footprint of the proposed HAR-2 and HAR-3 facilities. There is a constructed pond of approximately 2 acres containing both submerged and emergent vegetation that would be filled within this area for the construction of the HAR-3 cooling tower (COLA ER 4.3.2.1). The 2006 study also identified seven sites within the Harris Lake expansion area that were selected for biotic sampling using NC-DENR sampling protocols. For aquatic macroinvertebrates, these evinced scores of less than or equal to 3 on the 5-point scale, thus indicative of overall fair-to-poor ecological conditions. It should be noted that at the time of sampling, the central Piedmont area of North Carolina was in a state of 'moderate drought' with corresponding reduction in stream flow; many of the aquatic taxa quantified in these assays require well-oxygenated flowing water and thus the drought may have temporarily depressed the abundance of these organisms. Sampling of piscine (fish) species via electro-shocking revealed a similar range of poor to good for the seven sampling sites.

Although inundation is not a direct discharge of dredge or fill material it does represent a loss of functional value of those streams and wetlands affected and a conversion of aquatic habitat types does occur. As such, quantifying this loss is required under Section 404. Increasing the normal pool elevation of Harris Lake will replace approximately 135,800 linear feet of lotic habitat (*i.e.*, streams) with lentic habitat (*i.e.*, lake) and replace approximately 180 acres of forested/herbaceous wetlands with lentic habitat. Stream species will either move to favorable stream conditions located above the 240 foot NGVD29 contour or perish. Some species individuals may experience a loss of habitat (COLA ER 4.3.2.2.3). However, other suitable stream habitat for these species occurs in the region, and no specific populations are expected to be lost from the region. The loss of these habitats is mitigatable through compensatory mitigation. Temporary aquatic habitat loss will occur to approximately 340 acres of emergent wetlands (*i.e.*, aquatic beds) and 60 acres of fringe wetlands occurring along the shoreline of the lake. These habitats will reform at the higher pool elevation and represent only a temporary loss of aquatic habitat.

The transmission line upgrades will result in wetland conversion due to ROW expansion; however, the overall loss of aquatic habitat is expected to be minimal. Other appurtenant

facilities do not incur any significant loss of aquatic habitat, however the intake structure and pipeline that will supply makeup water to Harris Lake does have the potential to affect resident fish species in the Cape Fear River such as bluehead chub (*Nocomis leptocephalus*), bluegill (*Lepomis macrochirus*), redbreast sunfish (*L. auritus*), white shiner (*Luxilus albeolus*), and other common species. The impact on native fish resulting from the intake structure and makeup water line is expected to be minimal. The impingement and entrainment issues that would likely result from expansion of the Brunswick site are greater than those that would be experienced at the Harris site. In summary, the increased capacity of Harris Lake will result in the conversion of significant stream and wetland habitat to a lentic system due to inundation, however, this impact should not result in any detrimental ecological effects to their receiving waters; Harris Lake, Buckhorn Creek, or the Cape Fear River.

Summary

Table 3. Impacts to fish and aquatic habitat

Site	Potential Impact			
	Impacts from Power Block Construction	Essential Fish Habitat	Entrainment/ Impingement Issues	Impacts from Transmission Upgrades
Brunswick	Yes	Yes	Yes- higher impacts	Yes – larger
Harris	Yes	No	Yes-lower impacts	Yes – smaller

Both sites will incur impacts to aquatic habitat either through direct conversion of habitat through transmission line upgrades or through inundation. However, the potential effect on aquatic organisms as a result of increased water flow through the Brunswick site may result in greater detrimental effects on the aquatic ecosystem as a whole. Compliance with CWA 316 should avoid significant impacts. The loss of approximately 400 acres of aquatic habitat at the Harris site is expected to be only temporary in nature. The aquatic bed habitat and fringe wetlands are expected to reform at the new pool elevation.

3. Wildlife habitat

Brunswick

Potential impacts to wildlife habitat at the Brunswick site should be relatively minor as most of the site construction would utilize previously disturbed portions of the site. Upgrades to the transmission lines, which will be necessary for the new generating capacity will likely incur greater impacts to wildlife habitat from new ROW clearing. Three of the new Brunswick lines are anticipated to be located adjacent to existing transmission line ROWs and impacts to most wildlife habitat would be considered minimal. The routing of the fourth line has not been determined and could result in potential impacts to forest-interior species if new location crosses extensive forested areas. Potential impacts to threatened and endangered species habitat are treated in Section 4 below.

Harris

There will be little wildlife habitat impact arising directly from the footprint of HAR-2 and HAR-3. HAR-2 will be built on a primarily paved and gravel-covered area that also contains non-native grasses. HAR-3 will be built on an area recently clear cut and replanted with loblolly pine (*Pinus taeda*) [COLA ER 4.3.1.1.1). The saplings are less than 10 years old. Because of the low habitat quality, low vegetative diversity, and ongoing timber management within the Harris site, conversion of these areas to HAR-2 and HAR-3, with their supporting infrastructure, should have minimal effects to wildlife habitat. The North Carolina Wildlife Resources Commission (NCWRC) "Guidance Memorandum to Address and Mitigate Secondary and Cumulative Effects to Aquatic and terrestrial Wildlife Resources and Water Quality" will be used when developing sediment and erosion lands and to manage buffer zones following construction.

Increasing the pool elevation of Harris Lake will inundate an estimated 4,055 acres of terrestrial and aquatic habitat. However, none of the impacted forest types (as identified in the 2006 field study) are considered uncommon in the North Carolina Piedmont. Historically, all of the areas have been harvested or cleared. PEC has indicated their intent to maintain uncut buffer zones of approximately 100' along the reservoir edge and along stream courses, where possible; these areas can serve as important migratory corridors for the movement of motile terrestrial species out of the impacted area. Approximately 13,227 acres of PEC land around Harris Lake has been enrolled in the North Carolina Game Land Program (COLA ER 4.3.1.2.1). Additional undeveloped land adjacent to the PEC property will provide habitat outside the affected area, but some species may ultimately overpopulate the area. Adverse effects will be most evident for less mobile species that cannot easily relocate. Possible actions to reduce mortality of these species include the timing of construction activities to accommodate life cycles of less mobile species. There is evidence of a blue heron (*Ardea herodias*) rookery in the southeastern portion of the reservoir; this species is not endangered but is protected under the Migratory Bird Treaty Act. PEC has outlined protective measures in the Harris ER that will minimize adverse effects to the rookery including establishment of a buffer zone, timing of construction, and timing of rise in pool elevation (COLA ER 4.3.1.2.2).

Approximately 26 acres will be cleared for the pipeline corridor. The majority of this area has been previously disturbed. Little existing terrestrial wildlife habitat will be permanently disturbed as a result of the pipeline corridor.

Impacts to wildlife habitat resulting from the transmission line could involve an estimated 1,250 acres, of which 90 percent is either agricultural or undisturbed. NCWRC indicates that part of the proposed transmission line upgrades will cross a Significant Natural Heritage Area known as Buckhorn Bluffs and Levees. A small portion of NCWRC's Urban Wildlife Conservation Corridor will also be impacted by inundation from rising lake levels. Potential impacts to threatened and endangered species habitat are treated in Section 4 below.

4. Endangered or threatened species

Brunswick

There are no USFWS designated critical habitats occurring within the 400-acre power block. Federally protected species listed for Brunswick County by USFWS includes the following: American alligator (*Alligator mississippiensis*), bald eagle (*Haliaeetus leucocephalus*), Eastern puma (*Puma concolor couguar*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), piping plover (*Charadrius melodus*), red-cockaded woodpecker (*Picoides borealis*), shortnose sturgeon (*Acipenser brevirostrum*), West Indian manatee (*Trichechus manatus*), wood stork (*Mycteria americana*), Cooley's meadowrue (*Thalictrum cooleyi*), rough-leaved loosestrife (*Lysimachia asperulaefolia*), and seabeach amaranth (*Amaranthus pumilus*). Federally protected species that could potentially be affected by future facility expansion include the red-cockaded woodpecker, Cooley's meadowrue, and rough-leaved loosestrife. Nesting habitat for the red-cockaded woodpecker does not occur on the plant site, but the birds may forage on the site. In addition to the potential for protected species on the site itself, there are also considerations that must take into account the possibility of protected species occurrences and impacts associated with the transmission line upgrades, which extend beyond Brunswick County. Cooley's meadowrue and rough-leaved loosestrife occur in existing PEC transmission lines. Golden sedge (*Carex lutea*), which is not listed for Brunswick County, also occurs in PEC transmission lines in Pender and Onslow Counties (Brunswick ER 2.5). PEC typically manages the suitable habitat for protected plant species that occur in their powerline corridors per USFWS and NCWRC guidelines. In 1993, PEC signed a Memorandum of Agreement with NCDENR to preserve and protect rare, threatened, and endangered species and sensitive natural areas occurring on transmission ROWs. PEC also follows best management practices for management of rare plants on their ROWs (Brunswick ER 2.5).

Expansion of existing transmission line rights-of-way by an additional 100 feet to accommodate the new Brunswick transmission lines may result in adverse impacts where the new transmissions lines may pass through red-cockaded woodpecker habitat. Red-cockaded woodpecker nesting habitat consists of primarily old-growth pine forest with relatively open understory, but they forage in pine stands as young as 30 years within 0.5 miles of the nesting cavity trees. Gaps in suitable habitat, particularly openings greater than 200 feet separating RCW habitat are considered a barrier for RCWs and the USFWS considers creation of such gaps to be an adverse impact within occupied habitat due to higher risk of predation. The RCW is listed for Brunswick County and also for the counties into which new transmission lines would be built. NCNHP data indicates that 45 red-cockaded woodpecker occurrences have been documented within approximately 1.0 mile of the new transmission line routes. Detailed assessments would be required to determine if these, or any previously undocumented red-cockaded woodpecker cavity trees, are located within 0.5 mile of the new transmission lines.

The Brunswick plant maintains an incidental take permit with USFWS for the unintended take of protected sea turtle species from impingement and entrainment. Incidental take data provided by PEC documents that a total of 221 sea turtles (loggerhead, Kemp's and green) were entrapped between 1994 through 2008 under the current generating capacity (PEC 2009b). This resulted in 31 mortalities. An increase in cooling water flow needed for the new reactors has the potential to result in additional sea turtle takes. The Brunswick site does appear to have the potential for more adverse environmental consequences for threatened and endangered species than the Harris site.

Harris

There are no USFWS designated critical habitats associated with the Harris site (COLA ER 5.6.2). Federally protected species listed for Wake and Chatham Counties includes the following: bald eagle, red-cockaded woodpecker, dwarf wedgemussel (*Alasmidonta heterodon*), Michaux's sumac (*Rhus michauxii*), Cape Fear shiner (*Notropis mekistocholas*), and harperella (*Ptilimnium nodosum*). The Cape Fear shiner likely does not occur in the vicinity of the proposed water intake structure, given the limited distribution of the species and the lack of habitat at the proposed structure location. 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 is thought to be extirpated in this area. The dwarf wedgemussel is not known to occur in the Cape Fear basin, and it is likely that this mussel would not occur in this area. The intake pipe in the Cape Fear River should not adversely affect the Cape Fear shiner or dwarf wedgemussel due to the lack of suitable habitat in the area of the proposed structure. There are known occurrences of bald eagles from Harris Lake and Jordon Lake, as well as nesting bald eagles along the Cape Fear River near the Agape Lutheran Camp (5-6 miles downstream). NCWRC indicates that the new shoreline of Harris Lake will move within the secondary management zone of a bald eagle nest near Avent Ferry Road. These eagles, including breeding pairs, likely use Harris and Jordon Lakes as a food source. The proposed action should not adversely affect bald eagles other than temporarily removing potential perching locations along Harris Lake in the zone between the existing and proposed pool elevations. Trees that can be utilized for perching will remain intact at and above the 240 foot NGVD29 contour. PEC has procedures in place if threatened or endangered species are discovered on a site or on a transmission line corridor (COLA ER 9.3.2.2.1.4).

USFWS has indicated to PEC via a letter dated 29 January 2007 that any removal of pine trees equal to or greater than 10 inches diameter breast height may provide suitable nesting or foraging habitat and surveys will be necessary to document the presence or absence of the red-cockaded woodpecker. Field surveys for Michaux's sumac and harperella should also be conducted in potential habitat areas during the appropriate survey window. The results of said surveys will be necessary for inclusion in the final Environmental Impact Statement.

The proposed upgrades and expansions of certain transmission lines have the potential to affect threatened or endangered species though habitat conversion or loss. Red-cockaded woodpeckers are known to occur in mature longleaf pine forests crossed by the Harris-

Fayetteville transmission corridor (COLA ER 5.6.1.1); NCNHP data show that 8 red-cockaded woodpecker clusters are found within 1.0 mile of the transmission line on Fort Bragg. Any activities involving the removal of pines will require surveys for this species to ensure that no birds or cavity trees are impacted and that foraging habitat is not adversely impacted. NCNHP data also document three red-cockaded woodpecker records in Wake County within 1.0 mile of the transmission lines; however, two of these occurrences were reported as destroyed and the other as historic (last seen more than 20 years ago).

NCNHP data documents two other federally endangered species in or within 500 feet of the new potential transmission line corridors. Two records, one historic (Neuse River), for dwarf wedgemussel are documented in NCNHP data within streams crossed by a new transmission line. Avoiding in-stream work and minimizing clearing of streambank vegetation would minimize potential impacts to this species. Adverse impacts would not be expected for the other species, rough-leaved loosestrife, for similar reasons identified for the Brunswick site.

Michaux's sumac is also known to occur in disturbed areas along existing ROWs elsewhere in the area, however ROW expansion should not negatively impact this species as said expansion will open up more potential habitat for Michaux's sumac in certain areas. A research plot containing Michaux's sumac is adjacent to PEC property within the Harris Research Tract. This research area will not be impacted by any activities associated with the HAR project.

Summary

Table 4. Threatened and Endangered Species Documented Occurrences (NCDENR 2008).

Potential Impact Source	Site	
	Brunswick	Harris
400-Acre Power Block	None	None
Water Supply Canal (Brunswick), Water Supply Intake and Reservoir (Harris)	Loggerhead, Kemp's Ridley, and Green sea turtles (31 mortalities resulting from 221 entrapments between 1994 – 2008)	None
Transmission Line Upgrades[1]	Red-cockaded Woodpecker (45), Shortnose Sturgeon (1), Manatee (1), Rough-leaved Loosestrife (8), Cooley's Meadowrue (3), Golden Sedge (2),	Red-cockaded Woodpecker (11), Dwarf Wedgemussel (2), Rough-leaved Loosestrife (2)

[1] Red-cockaded Woodpecker element occurrences within 1.0 mile; all others within 500 feet.

The Brunswick site has the potential for greater adverse impact to federally threatened and endangered species than the Harris site due to potential increase in incidental take of three species of sea turtle within the intake canal, and greater potential adverse impact to red-cockaded woodpeckers along the new transmission lines (Table 4). With proper best management practices and protection during construction, no adverse impacts to the plants or other aquatic animals within the transmission line upgrade areas are expected.

5. Biological availability of possible contaminants in dredge or fill material

Brunswick

The source of fill material to be placed in wetland and streams has not been clearly defined. Per the 404(b)(1) guidelines, the fill will be free of petroleum products and hazardous substances as well as free from chemical, biological, and other pollutants.

Harris

The source of fill material to be placed in wetlands and streams has not been clearly defined, although onsite material from grading of HAR-3 may be used as a source for fill material. Per the 404(b)(1) guidelines, the fill will be free of petroleum products and hazardous substances as well as free from chemical, biological, and other pollutants. The Harris site provides more opportunity for use of fill from onsite sources than does the Brunswick site.

C. Human Use Characteristics and Impacts

1. Existing and potential water supplies; water conservation

Brunswick

The Brunswick site only uses one on-site water supply well at the biology lab; all other potable water for the facility is supplied by Brunswick County. According to the ER, the Brunswick site uses 1 percent of the treated water production capacity of Brunswick County and two percent of actual production. Uses of potable water provided by the Brunswick County water system to the Brunswick site do not stress system's capacity to supply water to residents and businesses (Brunswick ER 4.15). The businesses and residents in the vicinity of the Brunswick site use either water from wells or municipal water. In the vicinity of the site, shallow wells in the surficial aquifer are adequate for small potable water supplies, but for larger water yields the Castle Hayne Aquifer is the most important aquifer. The Castle Hayne Aquifer provides water to the Sunny Point Military Ocean Terminal and to the municipalities of Long Beach and Southport. Residents of New Hanover County get their drinking water primarily from water wells with the exception of the City of Wilmington that gets its water from the lower Cape Fear River. Wells in New Hanover County used for domestic purposes are in the surficial sand aquifer and for larger yields, are located in the Castle Hayne (Brunswick ER 2.3).

Due to the salinity of the water in the Cape Fear River downstream of the Brunswick site, there are no withdrawals of water from this area as a water supply.

No adverse environmental consequences are anticipated for this alternative.

Harris

Groundwater will not be used for the facility operation. The subsurface geology consists of Triassic aged sedimentary rocks with well yields of between 10 and 25 gallons per minute. Use of groundwater in the vicinity of the site is restricted as PEC owns most properties within a 2-mile radius. A well survey performed by PEC indicated that the closest water supply well to the HAR site is located 1.2 miles to the north-northwest. The private wells identified were noted as being 75 to 360 feet deep and cased in the bedrock aquifer. Only two communities within 5 miles of the Harris Site use groundwater as a source of drinking water (New Hill and Fuquay-Varina). The Fuquay-Varina community is located in Wake County and is located in the Carolina Slate Belt (COLA ER 2.3.2.2).

Potable water for the Harris site comes from and will come from the reservoir.

No adverse environmental consequences are anticipated for this alternative.

2. Recreational or commercial fisheries

Brunswick

The Cape Fear River, up to Highway 421, is considered Essential Fish Habitat by the NMFS for egg, larval, and/or juvenile life stages of the following species: red drum, bluefish, summer flounder, gag grouper, gray snapper, cobia, king mackerel, Spanish mackerel, black sea bass, spiny dogfish, brown shrimp, pink shrimp, white shrimp, plus twelve different shark species (NMFS 2009). The Magnuson-Stevens Fishery Conservation and Management Act is the primary law governing marine fisheries management in United States federal waters. The Act was first enacted in 1976 and amended in 1996. The 1996 amendments focused on rebuilding depleted fisheries, protecting essential fish habitat, and reducing bycatch. The increased volume of cooling water necessary to operate the new reactors at the Brunswick site could result in increased rates of entrainment and impingement, which could have the potential to affect commercial and recreational fisheries stocks.

Harris

No adverse environmental consequences are anticipated for this alternative. Recreational fishing opportunities should be enhanced with the larger impoundment. There is no known commercial fishing industry on Harris Lake.

3. Other water related recreation

Brunswick

There is no public access for the intake canal for the Brunswick site. No adverse environmental consequences are anticipated for this alternative.

Harris

Displacement of public boat ramps and public access areas will result from expansion of Harris Lake. Replacement ramps and access areas at higher elevations will be built.

4. Aesthetics of the aquatic ecosystem

Brunswick

No adverse environmental consequences are anticipated for this alternative. Because the new reactors would be placed near the existing units with substantial buffer of land controlled by PEC, no changes in existing aesthetics of nearby aquatic ecosystems would be expected.

Harris

No adverse environmental consequences are anticipated for this alternative. The HNP uses vegetation as a visual screen or buffer from surrounding land uses so construction and operational activities will not be visible to nearby residences. Because the HAR sites will be screened by the existing HNP from the main portion of the reservoir, individuals pursuing water-based activities on Harris Reservoir will have minimal exposure to construction activities (COLA ER 10.3.1.10.2). There will be temporary impacts to aesthetic views along the lake perimeter during site clearing that will be undertaken prior to raising the water level.

5. Parks, national and historic monuments, national seashores, wild and scenic rivers, wilderness areas, research sites, etc.

Brunswick

No parks, national and historic monuments, national seashores, wild and scenic rivers, wilderness areas, or research sites are present on the Brunswick site. No adverse environmental consequences are anticipated.

Harris

The Harris Lake County Park would be impacted by construction at the Harris site, specifically by the raising of the pool level of Harris Lake (COLA ER 4.1.1.2.1.3, 4.4.2.6). These impacts would include the flooding of approximately 279 acres within

the current park boundaries as well as the displacement of other amenities. However, PEC is committed to relocating the park services affected by the increased water level. Numerous additional facilities are located within a 50-mile radius of the Harris site that would offset temporary displacements during construction.

6. Traffic/transportation patterns

Brunswick

The proposed Brunswick site is located near the City of Southport and the site is accessed by local roads. State Highways 87, 133, and 211 provide access to the area, and feed into U.S. Highway 17 (COLA ER 9.3.2.2.2.7). Temporary access road and additional plant roads have not been fully assessed, but are expected to be similar in nature to those required at the Harris site.

On-site railroad access is already provided in the immediate vicinity of the proposed site, but an additional 0.1 mile of rail would be needed to connect to the existing rail line (COLA ER 9.3.2.2.2.7).

No significant adverse environmental consequences are anticipated.

Harris

Roads and highways in the vicinity will not be adversely impacted by operation of the new facility; because most of the operational workers are expected to already live within a 50-mile radius of the plant site, traffic would be divided over the two primary access routes, U.S. Highway 1, and Old U.S. Highway 1, as well as supported by the proposed Western Wake Parkway when this controlled access parkway is completed (COLA ER 5.8.2.8).

A new interchange on U.S. Highway 1 and Shearon Harris Road may be required to support construction and operation of the HAR; additional plant roads will be constructed prior to HAR construction (HAR 5.1.1.1.2). PEC has initiated discussion with NCDOT regarding county and state roadway impacts due to increased lake levels in the Harris Reservoir required for operations of the HAR. The rise in reservoir elevation will require enhancements to existing roads affected by the increased lake level; in-use roadways, along with associated infrastructure, will be reconstructed in their current locations to accommodate the rise in the reservoir's elevation (COLA ER 5.1.1.2.2.4).

On-site railroad access is already provided in the immediate vicinity of the proposed site, but an additional 0.2 mile of rail would be needed to connect to the existing rail line (COLA ER 9.3.2.2.1.7).

No significant adverse environmental consequences are anticipated.

7. Energy consumption or generation

Brunswick

The addition of two Westinghouse AP1000 units will provide an electrical output of at least 2000 megawatt electric (MWe) (COLA ER 1.1.3). Four new 230-kV transmission lines would be required for the addition of a single advanced reactor at the Brunswick site; these transmission lines are identified as the new Brunswick to Cumberland 230-kV, new Brunswick to Clinton 230-kV, new Brunswick to Jacksonville 230-kV, and new Brunswick to Wommack 230-kV (PEC 2006). Potential routing studies have not been undertaken, but they would be expected to be adjacent to or within existing ROWs where possible. The total length for three existing ROWs that may be expanded is approximately 251.5 miles; the route required for the new Brunswick to Wommack line is estimated to be an additional minimum 89.4 miles, for a total of at least 340.9 miles of new transmission line. Potential impacts to natural resources are described in appropriate sections of this document.

Costs for the construction of the required transmission system upgrades is estimated at $309 million, based on addition of a single new reactor; addition of the second new reactor may result in additional required transmission upgrades and associated additional costs (COLA ER Table 10.4-1).

Harris

The addition of two Westinghouse AP1000 units will provide an electrical output of at least 2000 megawatt electric (MWe) (COLA ER 1.1.3). Seven 230-kV transmission lines currently connect the existing Harris Nuclear Plant (HNP) to the PEC electric grid system, with an eighth line planned for 2011. These transmission lines will also connect HAR-2 through the HNP common expanded switchyard to the PEC electric grid. HAR-2 will connect to the PEC grid utilizing existing towers, lines, and ROWs that currently support HNP operations (COLA ER 3.7.1.1). Three new 230-kV transmission lines will connect the HAR-3 switchyard to the PEC electric grid. The proposed routing of the three new transmission lines for HAR-3 is being evaluated to be adjacent to or within the existing ROWs. These three transmission lines will be connected to the existing Fort Bragg Woodruff Street Substation, Erwin Substation, and Wake Substation. The total length of the three new transmission lines is approximately 103 miles. Potential impacts to natural resources are described in appropriate sections of this document.

Costs for the construction of the required transmission system upgrades in estimated at $2 million, based on addition of both new reactors (COLA ER Table 10.4-1).

8. Navigation

Brunswick

Although the Cape Fear River adjacent to the Brunswick site constitutes navigable waters, the intake canal is restricted with no public access. No adverse impacts to navigation are anticipated for this alternative.

Harris

The existing dam across Buckhorn Creek provides an impediment to navigability for recreational watercraft. Expanding the reservoir will increase the surface area available for recreational watercraft. No adverse impacts to navigation are anticipated for for this alternative.

9. Safety

Brunswick

Safety related to seismic activity is considered to be a low level of concern at the Brunswick Site. Five low magnitude earthquakes were recorded for the period from 1860 to the present, but there was no significant damage noted (FSAR 2.5.2.1). No adverse environmental consequences are anticipated for this alternative.

Harris

The COL Application document noted that review of geological, seismological, geophysical, and geotechnical data for the Harris Site did not identify anything that would preclude the safe operation of the proposed facilities (COLA ER 2.5.0.1.2). No adverse environmental consequences are anticipated for this alternative.

10. Air quality

Brunswick

The Brunswick site would use saltwater for cooling which would result in cooling water salt drift (COLA ER 10.4.1.3). Since the construction of the facility would constitute a major modification under Environmental Protection Agency (EPA) guidelines and could result in a significant increase in particulate emissions due to salt drift, the facility may be required to obtain a Prevention of Significant Deterioration (PSD) air quality permit (40 CFR § 52.21).

A small increase in air emissions may occur during construction of the proposed Brunswick site. During construction activities at the Brunswick site, controls will be implemented to mitigate potential air emissions from construction sources. The small

increase in emissions during construction is not expected to pose a significant adverse environmental consequence for the site.

Harris

The Harris site uses fresh water from Harris Lake for use in cooling. The use of fresh water for cooling would not be expected to cause a significant increase in particulate emissions and may indicate that a PSD air quality permit would not be required for the Harris site. The Harris site would be required to comply with an emissions permit (COL Application 9.3.2.2.1.2). The construction of the proposed facility is not expected to pose a significant environmental consequence for the facility or surrounding area.

A small increase in air emissions may 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. During construction activities at the HAR site, controls will be implemented to mitigate potential air emissions form construction sources (COLA ER 10.3.1.4). The small increase in emissions during construction is not expected to pose a significant adverse environmental consequence for the site.

11. Noise

Brunswick

There were no significant noise concerns noted in the ER or FSAR for the Brunswick Site. Temporary increases in noise levels are expected during construction. Noise levels will be controlled by following Occupational Safety and Health Administration (OSHA) regulations, Federal noise pollution control regulations and applicable local noise ordinances. The construction of the facility is not expected to pose a significant adverse environmental consequence related to noise.

Harris

Temporary increases in noise levels are expected during construction of HAR-2 and HAR-3. The temporary noise increases can be expected due to clearing of trees prior to raising the reservoir level, during grading, and the actual construction of the HAR-2 and HAR-3 facilities. Noise levels will be controlled by following Occupational Safety and Health Administration (OSHA) regulations, Federal noise pollution control regulations and applicable local noise ordinances. The construction of the facility is not expected to pose a significant adverse environmental consequence related to noise.

12. Historic properties

The *National Historic Preservation Act* (NHPA) requires that projects subject to Federal permitting be evaluated with respect to their potential impact to historic and archaeological sites listed in or eligible for listing in the *National Register of Historic*

Places (National Register). The Area of Potential Effect (APE) for a project is determined in consultation with the State Historic Preservation Office (SHPO).

Brunswick

No coordination has occurred to date with the North Carolina SHPO regarding potential expansion of the Brunswick site. However, when the existing site was permitted, coordination with the North Carolina Department of Arts, Culture, and History and the NRC occurred, which resulted in a conclusion that the construction of the original Brunswick site would not impact National Register properties (Brunswick ER 2.11, 4.19).

Additionally, no archaeological survey has been conducted of the approximately 400-acre area at the Brunswick site. However, the uplands within this area have been previously disturbed during construction of the current nuclear facility, including construction that began, but was ceased, on cooling towers that were determined to not be necessary to the operation of the facility (Personal communication, Linda Hickok, 4 May 2009). As such, this area has a low potential to contain intact archaeological sites eligible for listing in the National Register. It would be expected, but cannot be stated, that the NC SHPO would recommend no archaeological survey for the Brunswick site based on previous disturbance.

No properties listed in or eligible for listing in the National Register are located on the proposed construction areas at the Brunswick site. While there are properties listed in the National Register, eligible for listing in the National Register, or potentially eligible for listing in the National Register within a 10-mile radius of the site, none of these properties would be directly or indirectly impacted (Brunswick ER 2.11, 4.19; NC SHPO, Records on file).

Harris

No adverse environmental consequences are anticipated. Coordination with the North Carolina SHPO pursuant to Section 106 of the NHPA has been conducted by PEC for the HAR site (COLA ER 2.5.3.2, 4.1.3). This coordination resulted in the recommendation by the NC SHPO for an archaeological survey of the APE, defined as the approximately 400-acre proposed HAR site as well as the proposed reservoir expansion area and the associated water make-up line. These surveys were conducted in 2007-2009 (Espenshade 2007; Espenshade et al. 2007; Personal communication, Linda Hickok, 23 April 2009). None of these archaeological surveys encountered any archaeological sites that could be considered eligible for listing in the National Register. A management summary for the Phase I archaeological survey of the proposed reservoir expansion area has been submitted to the SHPO, and the final report is in preparation.

No properties listed in or eligible for listing in the National Register are located at the HAR site. While there are properties listed in the National Register, eligible for listing in the National Register, or potentially eligible for listing in the National Register within a

10-mile radius of the site, none of these properties will be directly or indirectly impacted by construction activities or newly constructed structures (COLA ER 2.5.3.1). No impacts to historic properties are anticipated for the site.

13. Land use classification

Brunswick

The Brunswick site is on land already owned by PEC and is already zoned for uses compatible with the development of new units (COLA ER 9.3.2.2.2.1). No adverse environmental consequences are anticipated.

Harris

The HAR site is to be located on land that is already owned by PEC and is already zoned for uses that are compatible with the development of new reactor units (COLA ER 9.3.2.2.1.1). No adverse environmental consequences are anticipated.

14. Economics

With the PEC service area, the Annual Peak increased by 24.6 percent and the Annual Load increased by 18.1 percent from 1997-2006, indicative of the growing need for electrical power with the PEC service area. On average within that 10 year time span, the need for power within the PEC service area increased by nearly 900 megawatts every four years. From the year 2007-2008 to 2021-2022, PEC anticipates load to increase by 24.7 percent (PEC 2006). Construction at either site would help maintain an adequate supply to load ratio and reliable electrical service to commercial customers, which would help maintain and support growth of economic activity within the PEC service area.

Brunswick

No adverse environmental consequences are anticipated. It is anticipated that construction of two units at the Brunswick site would create a maximum of 3,150 jobs in the construction sector over the 7 year construction period (COLA ER 4.4.2.1), as well as approximately 773 jobs to operate the new facilities (COLA ER 5.1.1.1.2). Given the anticipated 2010 population of the four-county region surrounding the site of 437,592 (PEC 2006, Attachment V Criterion P3), the effect on the local and regional economies from construction and post-construction employment at the site would be considered small.

Harris

No adverse environmental consequences are anticipated. Construction of two units at the Harris site would create a maximum of 3,150 jobs in the construction sector over the 7 year construction period (COLA ER 4.4.2.1), as well as approximately 773 jobs to operate the new facilities (COLA ER 5.1.1.1.2). Given the anticipated 2010 population

of the five-county region surrounding the site of 1,532,854 (PEC 2006, Attachment V Criterion P3), the effect on the local and regional economies from construction and post-construction employment at the site would be considered small (COLA ER 4.4.2.1).

15. Property values

A study on the effect of nuclear facilities on the value of surrounding property found that the presence of a nearby nuclear facility did not negatively impact property values (Bezdek and Wendling 2006).

Brunswick

No adverse environmental consequences are anticipated. The Brunswick site is an existing nuclear power plant site; no negative impacts to adjacent property values are anticipated.

Harris

No adverse environmental consequences are anticipated. The Harris site is an existing nuclear power plant site; no negative impacts to adjacent property values are anticipated.

16. Regional growth

Brunswick

No adverse environmental consequences are anticipated. From 2000 to 2010, it is projected that the population of the four-county region consisting of Brunswick, Columbus, New Hanover, and Pender counties will grow by 32.9 percent to approximately 437,592 (PEC 2006, Attachment V Criterion P3, 1.2.1, 3.1). It is anticipated that the population in Brunswick County and surrounding areas will continue to grow at a similar rate. Construction at the site would not be a catalyst for significant in-migration to the region over and above that which is already anticipated, as the peak construction workforce is anticipated to be approximately 3,150 (COLA ER 4.4.2.1).

Harris

No adverse environmental consequences are anticipated. From 2000 to 2010, it is projected that the population of the five-county region consisting of Chatham, Durham, Harnett, Orange, and Wake counties will grow by 38.1 percent to approximately 1,532,854 (PEC 2006, Attachment V Criterion P3, 1.2.1, 3.1). It is anticipated that the population in Wake County and surrounding areas will continue to grow at a similar rate. Construction at either site will not be a catalyst for significant in-migration to the region over and above that which is already anticipated. Construction at the site would not be a catalyst for significant in-migration to the region over and above that which is already anticipated, as the peak construction workforce is anticipated to be approximately 3,150 (COLA ER 4.4.2.1).

17. Tax revenues

Post-construction property tax revenues in the counties in which the additional facilities would be placed would increase based on the increase in property value resulting from the construction of high value nuclear facilities. Also, increases in sales tax revenue would be expected from construction at either site resulting from the local purchase of construction materials or goods and services by temporary construction workers. As it is anticipated that most workers at the site would come from within North Carolina, it is anticipated that the effect to income tax revenues would be small (Brunswick ER 2.7, 4.17.2; COLA ER 4.4.2.2).

Brunswick

No adverse environmental consequences are anticipated.

Harris

No adverse environmental consequences are anticipated.

18. Employment

Construction of two units is anticipated to require a peak construction labor force of approximately 3,150 people (COLA ER 4.4.2.1). It is anticipated that 2,362, or 75 percent, of the estimated peak of 3,150 construction force would live in the region, with the other 25 percent relocating to the region. It is anticipated that an additional 773 full-time or contract employees will be required for the operation of two additional reactors (COLA ER 5.1.1.1.2).

Brunswick

No adverse environmental consequences are anticipated. The construction employment would consist of approximately 15.1 percent of the four-county regional construction labor pool (Brunswick, Columbus, New Hanover, and Pender counties) for the Brunswick site, and 2.1 percent of the total regional labor pool, based on year 2000 numbers (PEC 2006, Attachment V Criterion 3.1). The region around the Brunswick site will be able to supply and/or absorb the necessary number of workers for construction and operation of the units.

Harris

No adverse environmental consequences are anticipated. The construction employment would consist of approximately 6.3 percent of the five-county regional construction labor pool (Chatham, Harnett, Durham, Orange, and Wake counties) for the Harris site, and 0.1 percent of the total regional labor pool, based on year 2000 numbers (PEC 2006, Attachment V Criterion 3.1). The region around the Harris site will be able to supply

and/or absorb the necessary number of workers for construction and operation of the units.

19. Public facilities and services

Brunswick

The Brunswick site contains an existing nuclear power plant. Public services are expected to be adequate and expected to expand to meet the demands in a similar fashion as those already provided. Wastewater treatment at the Brunswick site is provided by a 0.055 MGD domestic wastewater treatment plant (Brunswick ER Appendix B). Other public facilities (parks, transportation, water supply) are addressed elsewhere in this document. No adverse environmental consequences are anticipated.

Harris

The Harris site contains an existing nuclear power plant. The projected capacity of the public services is adequate and expected to expand to meet the demands of a slight population growth in the area (COLA ER 2.5.2.7). Wastewater treatment at the Harris site is provided by the HNP wastewater treatment plant, which is located in the exclusion area boundary (COLA ER 2.5.2.7). Other public facilities (parks, transportation, water supply) are addressed elsewhere in this document. No adverse environmental consequences are anticipated.

20. Business activity

The anticipated maximum number of construction workers at either site is 3,150, and it is anticipated that most workers would come from the surrounding region (COLA ER 4.4.2.1). It is anticipated that 2,362, or 75 percent, of the estimated peak of 3,150 construction force would live in the region, with the other 25 percent relocating to the region. For either alternative, 773 full time employees would be needed for operation of the new plants (COLA ER 5.1.1.1.2). Increases in business sales could be expected from construction at either site resulting from the local purchase of construction materials or goods and services by temporary construction workers (Brunswick ER 2.7, 4.17.2; COLA ER 4.4.2.2).

Brunswick

No adverse environmental consequences are anticipated. Given that the anticipated 2010 population of the four-county region surrounding the site is 437,592 (PEC 2006, Attachment V Criterion P3), the effect on local and regional business activity from construction and post-construction employment at the site would be considered positive, but small.

Harris

No adverse environmental consequences are anticipated. Given that the anticipated 2010 population of the five-county region surrounding the site is 1,532,854 (PEC 2006, Attachment V Criterion P3), the effect on local and regional business activity from construction and post-construction employment at the site would be considered positive, but small (COLA ER 4.4.2.1).

21. Prime and unique farmland

Brunswick

The Brunswick site includes no prime farmland soils within the 400-acre power block, but a small amount of Baymeade fine sand (Loamy, siliceous, semiactive, thermic Arenic Hapludults, map symbol BaB) a soil considered a farmland of statewide importance. The transmission line upgrades will cross agricultural areas, some of which may contain prime or unique farmland. No adverse environmental consequences are anticipated for this alternative.

Harris

The Harris site includes former areas of prime farmland within the 400-acre power block. Creedmoor sandy loam, 2 – 6% slopes (Fine, mixed, semiactive, thermic Aquic Hapludults, map symbols CrB and CrB2) is the only prime farmland soil series mapped within the power block. However, the soils were mapped before the development of the site and it is doubtful they still exist without considerable alteration. The transmission line upgrades will cross agricultural areas, some of which may contain prime or unique farmland. No adverse environmental consequences are anticipated for this alternative.

22. Food and fiber production

Brunswick

The transmission line upgrades associated with the Brunswick site will cross agricultural lands that are used for crop production. However, the overall affects are expected to be small. No adverse environmental consequences are anticipated for this alternative.

Harris

The transmission line upgrades associated with the Harris site will cross agricultural lands that are used for crop production. However, the overall affects are expected to be small. No adverse environmental consequences are anticipated for this alternative.

23. Water quantity

Brunswick

The Brunswick Site is located 9,000 feet west of the Cape Fear River. The Cape Fear River has a daily freshwater discharge rate of between 8,100 and 10,000 cfs. The Brunswick Site is considered to have sufficient water quantity and impacts are expected to be small. The ER did not identify any significant issues with water quantity for the Brunswick Site.

Harris

The Harris Site will use surface water from Harris Lake for domestic, process and cooling tower makeup water. The normal water withdraw from Harris Lake is 93.74 cfs and the normal consumptive water use is 62.66 cfs. The normal water return rate after use in HAR-2 and HAR-3 is expected to be 31.09 cfs. Makeup water will be obtained from the Cape Fear River near the Buckhorn Dam to maintain the proposed operating water level of 240 feet NGVD29. According to the COLA ER document, the water supply was adequate to support the two-unit plant operation, including the makeup water from the Cape Fear River even under severe drought conditions.

24. Mineral needs

Brunswick

No significant differences identified between the two alternatives since PEC owns all the properties and their mineral rights. No adverse environmental consequences were identified for this alternative.

Harris

No significant differences identified between the two alternatives since PEC owns all the properties and their mineral rights. There are no known mineral resources of economic significance on the HAR property. Oil and gas exploration of the Triassic Basin in the 1980s identified no oil or gas (COLA ER 2.5.0.1.2). No adverse environmental consequences were identified for this alternative.

25. Consideration of private property

Brunswick

No adverse environmental consequences are anticipated. All proposed construction or related impacts at the site will occur completely on property currently owned by PEC (PEC 2006, Attachment V Table 3-1, Criterion P10, 4.3.2).

Harris

No adverse environmental consequences are anticipated. All proposed construction or related impacts at the site will occur completely on property currently owned by PEC (PEC 2006, Attachment V Table 3-1, Criterion P10, 4.3.2).

26. Community cohesion

It has been determined that there are no significant health and safety impacts related to the construction of additional nuclear facilities at either site (PEC 2006, Attachment V 3.3). As all construction activities would take place on property owned by PEC, there would be no displacement of minority or low-income groups (PEC 2006, Attachment V Table 3-1, Criterion P10, 4.3.2). As the anticipated maximum number of construction workers at the site is 3,150, and as it is anticipated that most workers would come from the surrounding region, the effects on the social structure of the region from construction at either site would be small (COLA ER 4.4.2). As such, the effects of construction at the site on community cohesion would be no less than anticipated due to normal population growth.

Brunswick

No adverse environmental consequences are anticipated. In the year 2000, within a 50-mile radius of the Brunswick site, the low-income population was 48,233, or 14.6 percent of the total area population, while the minority population was 76,393, or 23.3 percent of the total area population. Of 257 United States Census block groups within a 50-mile radius of the Brunswick site, 3 exceeded the threshold for low-income populations, while 41 exceeded the threshold for aggregate minority populations. No minority or low-income populations are located in immediate vicinity of the Brunswick site (Brunswick ER 2.6.2).

Harris

No adverse environmental consequences are anticipated. In the year 2000, within a 50-mile radius of the Harris site, the low-income population was 113,905, or 10.3 percent of the total area population, while the minority population was 358,446, or 32.3 percent of the total area population. Of 1,144 United States Census block groups within a 50-mile radius of the Harris site, 58 exceeded the threshold for low-income populations, while 253 exceeded the threshold for aggregate minority populations. No minority or low-income populations are located in immediate vicinity of the Harris site (COLA ER 2.5.4).

27. Community growth and development

As the anticipated maximum number of construction workers at the site is 3,150, and as it is anticipated that most workers would come from the surrounding region, the effects on community growth and development from construction at the site would be small (COLA

ER 4.4.2). For either alternative, 773 full time employees would be needed for operation of the new plants (COLA ER 5.1.1.1.2).

Brunswick

No adverse environmental consequences are anticipated. From 2000 to 2010, it is anticipated that the population of the four-county region consisting of Brunswick, Columbus, New Hanover, and Pender counties will grow by 32.9 percent to approximately 437,592 (PEC 2006, Attachment V Criterion P3, 1.2.1, 3.1).

Harris

No adverse environmental consequences are anticipated. From 2000 to 2010, it is anticipated that the population of the five-county region consisting of Chatham, Durham, Harnett, Orange, and Wake counties will grow by 38.1 percent to approximately 1,532,854 (PEC 2006, Attachment V Criterion P3, 1.2.1, 3.1).

28. Relocations (business, homes, etc.)

Brunswick

No adverse environmental consequences are anticipated. The Exclusion Area Boundary (EAB) for the Brunswick site would include only property currently owned by PEC (Brunswick ER 2.1; PEC 2006, Attachment V Table 3-1, Criterion P10, 4.3.2). No residential or commercial relocations would be necessary at the site.

Harris

No adverse environmental consequences are anticipated. The Exclusion Area Boundary (EAB) for the Harris site would be within the current EAB for the existing reactors (COLA ER 1.1.2, 3.1; PEC 2006, Attachment V Table 3-1, Criterion P10, 4.3.2). No residential or commercial relocations would be necessary at the site.

29. Recreation

Brunswick

No adverse environmental consequences are anticipated. The Brunswick site does not contain any recreational facilities that would be impacted by plant construction.

Harris

The Harris Lake County Park would be impacted by construction at the Harris site, specifically by the raising of the pool level of Harris Lake (COLA ER 4.1.1.2.1.3, 4.4.2.6). These impacts would include the flooding of approximately 279 acres within the current park boundaries, as well as the displacement of other amenities. However,

PEC is committed to relocating the park facilities affected by the increased water level. Numerous additional facilities are located within a 50-mile radius of the Harris site that would offset temporary displacements during construction.

D. Summary

PEC has evaluated a number of alternatives for achieving new baseload generation that is reliable and proximate to PEC's major customer base. The No Action alternative would not meet the stated purpose and need and was eliminated from consideration. Non-nuclear alternative energy sources were evaluated and found to not meet the stated purpose and need and were eliminated from further consideration. PEC evaluated 11 sites for potential use for adding the nuclear baseload required to meet purpose and need; 7 of these sites were eliminated through exclusionary criteria during the siting study. Of the four carried forward for further consideration, the Harris site was selected as the applicant's preferred alternative based on results of PEC's technical evaluation, strategic considerations, and transmission study. Review of environmental considerations resulted in elimination from further consideration of the Marion site and Robinson site due to higher wetland and stream impacts within the 400-acre powerblock as well as greater adverse environmental consequences that would result from providing adequate storage capacity for cooling water needed for reliable power generation during drought conditions than at the Harris site. In addition to having greater impact to wetlands than the Harris site for the 400-acre powerblock, the Brunswick site also would result in greater impact to wetlands through conversion of type along the new transmission line upgrades than the Harris site would impact though inundation and conversion of type through reservoir expansion. In addition, the Brunswick site has greater potential adverse impacts to habitat for the federally endangered red-cockaded woodpecker along the new transmission line upgrades, and potential adverse impacts through increased incidental take of federally threatened and endangered sea turtles within the intake canal. No other significant adverse environmental consequences were identified among the other public interest factors for the Harris site. Because the Harris site has the least impact on the aquatic environment and no other significant adverse environmental consequences, the Harris site is the least environmentally damaging preferred alternative.

V. SUMMARY OF SECONDARY AND CUMULATIVE IMPACTS

NEPA defines secondary impacts as those impacts caused by the proposed action or alternatives and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts result from the incremental impact of the proposed action or alternatives when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (Duke University 2002).

Examples of secondary impacts include growth inducing effects or changes in land use patterns that themselves cause changes in air, water, or other natural systems. Construction of the HAR-2 and HAR-3 units at the Harris site is not expected to result in

any significant growth inducing effects. Population growth is coming to this part of the state regardless of the proposed action at the Harris site. The land use at the Harris site is already conducive to construction of the new units. Necessary infrastructure such as roads, railways and line corridors are in place. PEC owns a vast amount of property surrounding the Harris site, much of which will remain undisturbed except for what is affected by the rise of the normal pool elevation of Harris Lake. The expansion of the transmission lines identified earlier in this document will convert existing land cover as a result of ROW clearing. Forested land will be converted to herbaceous or successional communities and forested wetlands will be converted to low-growing wetland habitats. PEC uses all applicable best management practices to protect sensitive areas, including wetlands and streams, when constructing or expanding ROWs. PEC has initiated in-stream flow studies in Buckhorn Creek and the Cape Fear River to determine potential water withdrawal scenarios. This data is not expected to be available until November 2009.

Cumulative effects result from the spatial and temporal crowding of environmental perturbations. The effects of human activities will accumulate when a second perturbation occurs at a site before the ecosystem can fully rebound from the effect of the first perturbation (CEQ 1997). In the case of the preferred alternative, the increased capacity of Harris Lake to supply reliable cooling water during drought conditions will be the primary ecosystem perturbation resulting from the project. This assertion is based on the analysis of anticipated effects to the aquatic ecosystem associated with the HAR project that is contained herein. One effect that is reasonably foreseeable may result from the replacement of public access areas, including boat ramps, around Harris Lake that will be lost as a result of inundation. However, these areas will be constructed using all applicable best management practices to prevent adversely affecting the water quality of Harris Lake. Existing wetland habitat within and along the lakeshore fringe of Harris Lake will be temporarily lost to inundation and re-established over time on the new shoreline. In addition, stream habitats and associated wetlands will also be inundated; however it is not expected to have any detrimental effect on downstream water quality nor is there expected to be any additional impacts from reservoir expansion after this action is complete. Fish habitat and surface area that is usable for aquatic recreation will actually be increased by the reservoir expansion. Land clearing associated with the reservoir expansion is not expected to result in any detrimental habitat fragmentation. The structure of the human environment surrounding the Harris site is not expected to be negatively affected by the construction of the HAR project. There should be no changes in community dynamics or loss of neighborhoods or community character as a result of the HAR project.

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