CHAPTER 4, IMPACTS OF CONSTRUCTION

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4.0 ENVIRONMENTAL IMPACTS OF CONSTRUCTION

Chapter 4 presents the potential environmental impacts of construction of VCSNS Units 2 and 3. Impacts are analyzed, and a single significance level of potential impact to each resource (*i.e.,* SMALL, MODERATE, or LARGE) is assigned consistent with the criteria that NRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3 as follows:

SMALL — Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

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

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

This chapter is divided into seven sections:

- Land Use Impacts (Section 4.1)
- Water-Related Impacts (Section 4.2)
- Ecological Impacts (Section 4.3)
- Socioeconomic Impacts (Section 4.4)
- Radiation Exposure to Construction Workers (Section 4.5)
- Measures and Controls to Limit Adverse Impacts During Construction (Section 4.6)
- Nonradiological Health Impacts (Section 4.7)

Section 3.9 describes the activities expected to occur for the construction of Units 2 and 3, including those activities both before and after the COL is issued.

The following conventions should help the reader understand the discussion:

- The site – Approximately 3,600 acres of contiguous property owned by SCE&G and Santee Cooper. This includes Unit 1, the approximately 490 acres of land disturbed during construction, and the nearby undisturbed areas (Figure 2.4-1). Subsection 2.2.1 provides a more complete description.
- Offsite areas – Transmission lines are the only offsite areas.

- Site boundary – The site boundary is identical to the exclusion area boundary and encloses approximately 2,560 acres for the combined Units 1, 2, and 3, as depicted on Figure 2.1-1.

- Vicinity – The area within approximately 6 to 10 miles (depending on the subject) radius around the proposed Units 2 and 3 location.

- Region – The area within approximately 50 miles around the proposed Units 2 and 3 location. For some subjects, a region of interest is defined containing the four counties of Fairfield, Newberry, Lexington, and Richland, South Carolina.

- Elevations – The standard for reporting elevations in the COLA is to use NAVD88 elevations. The difference between NAVD88 and NGVD29 elevations (the other system commonly used) is approximately 0.7 feet. Most of the elevations reported in Chapter 4 are for information only and may be rounded. Only in cases where precision is needed or where use of NGVD29 elevations is required (for example, to match permit limits) is the elevation system specified.

4.1 LAND-USE IMPACTS

Site preparation and construction of the proposed VCSNS Units 2 and 3 have the potential to impact land use at the VCSNS site and the surrounding area. Subsection 4.1.1 describes impacts to the site and vicinity. Subsection 4.1.2 describes impacts that could occur along transmission corridors and offsite areas. Subsection 4.1.3 describes impacts to historic properties and cultural resources at the site and along transmission lines. This section does not describe land use changes attributable to increased tax revenues to Fairfield County. Those are addressed in Subsection 4.4.2.2.2.

4.1.1 THE SITE AND VICINITY

4.1.1.1 The Site

Units 2 and 3 and their supporting facilities would be located on the approximately 3,600-acre VCSNS site described in Subsection 2.2.1. The site utilization plan depicted in Figure 3.9-1 indicates that approximately 490 acres would be disturbed during construction. Most of the land that would be occupied by the power block for Units 2 and 3 was disturbed during the construction of Unit 1; however, some construction would occur on land that has not been recently disturbed.

Approximately 240 of the 490 acres disturbed during site preparation and construction would be dedicated permanently to the new units and their supporting facilities. Temporary facilities and spoils storage would affect an additional 180 acres. Some of the land was disturbed in the last 30 years and currently consists of pine and hardwood stands and wetlands managed by SCE&G (U.S. NRC 2004). SCE&G has surveyed these areas for threatened and endangered species and cultural resources as described in Subsections 2.4.1 and 2.5.3.

All site preparation and construction activities would be conducted in accordance with federal, state, and local regulations and best construction practices. As described in Subsection 3.9.1, SCE&G would acquire all necessary permits and authorizations and implement environmental controls such as storm water management systems and spill containment controls before earth-disturbing activities begin. Site preparation and construction activities that would affect land use include clearing, grubbing, grading and excavating, and stockpiling soils. Permanently disturbed locations would be stabilized and contoured in accordance with design specifications. Re-vegetation would comply with site maintenance and safety requirements. Methods to stabilize areas and prevent erosion or sedimentation would comply with applicable laws, regulations, permit requirements, good engineering, construction practices, and recognized environmental best management practices. The South Carolina Storm Water Management Best Management Practices Handbook (SCDHEC 2005) and industry guidance would be followed to reduce storm water quantity, improve storm water quality, and protect receiving waters and downstream areas.

The intake and discharge facilities are in the 100-year floodplain. With those exceptions, construction activities would occur outside of the 100- and 500-year floodplains (FEMA 1982). As stated in Subsection 2.2.1, no mineral deposits are actively mined within the site and no prime farmland soils are found on the site. Fairfield County does have zoning laws. Therefore, the site would have to meet zoning requirements as described in Subsection 2.2.1. There are wetlands on the site; however, impacts to wetlands would be minimal and limited to the cooling tower area, The bridge on the main access road would span the wetlands along Mayo Creek (Section 4.3). Wetland impacts would be mitigated in accordance with U.S. Army Corps of Engineers regulations.The site is not in the coastal zone and thus, not subject to the Coastal Zone Management Act. The Broad River is not a Wild and Scenic River. Accordingly, SCE&G concludes that the site land use impacts would be SMALL and would not warrant mitigation, with the potential exception of wetlands mitigation at the cooling towers.

4.1.1.2 The Vicinity

Land within 6 miles of the site is predominantly rural and forested (Figure 2.2-2). The Monticello Reservoir, immediately north of the site, comprises 6,500 acres (U.S. NRC 2004). The Parr Hydroelectric Wildlife Management Area (Figure 2.1-3), immediately west of the site, comprises 4,400 acres of water and uplands (SCDNR 2006).

There is a campground that can accommodate recreational vehicles and a store adjacent to the site in Jenkinsville, South Carolina. The facility operated during construction of Unit 1. In addition, local landowners could convert some property to mobile home parks to house construction workers. No other land use changes in the vicinity as a result of the construction workforce are anticipated.

Given that the immediate vicinity has already accommodated a large construction workforce over many years duration, SCE&G concludes that impacts to land use in the vicinity of VCSNS site from construction of Units 2 and 3 would be SMALL and would not require mitigation.

4.1.2 TRANSMISSION CORRIDORS AND OFFSITE AREAS

As discussed in Subsection 2.2.2, SCE&G and Santee Cooper have determined that a total of six new 230 kV transmission lines (four single-circuit lines and one SCE&G double circuit line) will be necessary to transmit the additional electricity generated from the two proposed units to the power grids. Santee Cooper has prepared a siting study (Santee Cooper 2008) that describes the routing for their new transmission lines. The definitive routes of the new SCE&G transmission lines would be determined by a formal siting process; however, a siting study was prepared (SCE&G 2008) to identify potential routes that provide a reasonable estimate and evaluation of the magnitude of impacts that would likely result from construction of the lines. The Santee Cooper and SCE&G transmission line routes that have been analyzed are described in Subsection 2.2.2.

The Public Service Commission (PSC) requires any jurisdictional utility (this applies to SCE&G but not Santee Cooper) proposing to build "major facilities," including transmission lines of 125kV or more, to apply for a Certificate of Environmental Compatibility and Public Convenience and Necessity (or "Certificate"). The PSC's rules are set forth at Title 58, Chapter 33, of the South Carolina Code of Laws (SC Government 2007). An applicant for a Certificate must provide the PSC with "a summary of any studies made by…the applicant of the environmental impact of the facility . . ." The PSC cannot grant a Certificate for the construction, operation, and maintenance of a major utility facility unless the applicant has adequately defined "the nature of the probable environmental impact" and the PSC has determined that the impact on the environment is "…justified, considering the state of available technology and the nature and economics of the various alternatives" under consideration.

SCE&G has approached the siting of power plants and transmission lines in systematic, step-wise fashion. Once the need for additional generating capacity has been demonstrated, and the size and location of generating units have been determined, SCE&G analyzes transmission system requirements. System generation, load, and transmission studies determine termination or connection points. Once termination and connection points have been determined SCE&G initiates the siting process to develop transmission line corridors.

SCE&G's transmission line siting process is described in a document titled, "Transmission Line and Substation Siting Processes," (SCE&G 2000). The document outlines a three-phase process that begins with project scoping and ends with agency submittals. Phase 1 includes the delineation of the "study area" (large area that could accommodate a number of possible transmission corridors), appropriate agency contacts, initial data gathering, and compilation of Geographic Information System layers including land use (developed versus undeveloped areas, roads, highways, and railways), surface waters, wetlands, natural resources (sensitive habitats, threatened and endangered species), and cultural resources. This data is used to produce "constraint" maps of the study area showing features that could impinge on the possible corridors for the line route. These features include schools, hospitals, public lands, and important natural and cultural resources. After an initial public workshop in which SCE&G shares information of the study area/project with the public and solicits its comments and concerns, SCE&G undertakes an evaluation process to identify two or more alternate routes through areas of "least" constraint. The recommendations and/or comments of the public, and of the state (South Carolina Department of Natural Resources, South Carolina Department of Health and Environmental Control, and South Carolina Department of Archives and History, State Historic Preservation Office) and federal (U.S. EPA, U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers) resource agencies, are appropriately factored into the selection of alternate routes.

Phase 2 of the siting process involves a second public workshop where actual route corridors are presented and comments received. Following the workshop, further field review may be necessary or route adjustments. After developing evaluation and weighting factors, rating of routes, and a cost and engineering

evaluation that factors in relative cost and "constructability" of alternate routes, a final route or preferred route is selected. The final phase, Phase 3, involves notification of "study area" property owners of the selected route. Any studies are undertaken for the selected route that may be required, such as archaeological and ecological surveys, and the development of mitigation measures, such as erosion control measures. For the selected route, the siting process is described in a Siting Report that fully documents the siting process and the project's environmental impacts. This report, which follows the Council on Environmental Quality's National Environmental Policy Act guidance, is the "centerpiece of all project permit applications" (SCE&G 2000). The Siting Report (sometimes called "Environmental Assessment Report") is submitted to agencies along with applications for permits and licenses, including the previously-discussed application for Certificate of Environmental Compatibility and Public Convenience and Necessity with the PSC for voltages of 125kV and greater.

The certification process outlined above means that jurisdictional utilities in South Carolina must consider environmental factors as well as engineering and economic factors when they select routes for new transmission lines. To the extent practicable, SCE&G selects routes based on compatibility with existing land uses and the presence/absence of important cultural and ecological resources. With respect to aquatic resources, SCE&G tries to minimize or avoid impacts to streams, ponds, reservoirs, and wetlands.

Santee Cooper follows a similar process to select routes for its transmission lines. One exception is that Santee Cooper is not under the oversight of the PSC. Santee Cooper is a state-owned public power and water utility created by Act of the South Carolina Legislature as codified by the South Carolina Code of Laws, Section 58-31-10 et seq. Santee Cooper's transmission line siting process (Santee Cooper 1996, Santee Cooper undated) generally follows the same construction permitting processes as does SCE&G, which may include seeking permits from state and federal agencies such as SCDHEC, the United States Corps of Engineers, and the Federal Energy Regulatory Commission, as necessary for the particular permitting activity. The Utility Facility Siting and Environmental Protection Act does not apply to Santee Cooper.

Figure 2.2-4 provides the routing of the new transmission lines. Nearly all of the new Santee Cooper lines would be routed in existing transmission rights-of-way (Santee Cooper 2008). SCE&G's VCSNS-Lake Murray No. 2 line would also use existing corridors for its entire length (SCE&G 2008). Potential routes for the other new SCE&G lines were identified and evaluated in SCE&G (2008). Actual land use in the corridors would be determined once the specific transmission route is finalized. As presented in Table 2.2-4, land use in the proposed corridors is a mix of agriculture, planted forest resources, and natural forested land. Table 2.4-2 lists protected species in the counties crossed by the proposed transmission lines. The reports of the siting studies (Santee Cooper 2008, SCE&G 2008) provide further details.

SCE&G and Santee Cooper would comply with applicable laws, regulations, permit requirements, and accepted engineering, environmental management, and

construction practices. Therefore, although impacts to offsite land use could be MODERATE, they would be mitigated by careful siting to minimize sensitive land uses.

4.1.3 HISTORIC PROPERTIES

Table 2.5-24 lists 21 properties within 10 miles of the site that appear on the National Register of Historic Places. None are located on SCE&G property. As described in Subsection 2.5.3, cultural resource surveys of the affected VCSNS property identified 26 archaeological sites including one cemetery. Two locations associated with the cemetery were recommended as eligible and potentially eligible, respectively, for inclusion on the National Register. SCE&G has initiated correspondence with the State Historic Preservation Office regarding the construction of Units 2 and 3 and their supporting facilities (Appendix A).

Excavations for Units 2 and 3 would extend down to bedrock. SCE&G maintains procedures that include actions to protect cultural, historic, and paleontological resources. As part of the site preparation activities, before land-disturbing activities begin, SCE&G would prepare similar procedures for construction activities. Protection measures could include preconstruction surveys, establishment of buffer zones, and installation of exclusion fencing. In rare instances, construction activities may inadvertently encounter buried archaeological/cultural resources, in which case work in the immediate area would be halted.

Subsection 2.5.3 summarizes National Historic Register properties in the counties the new transmission corridors would cross. Before the clearing of any new transmission corridors, SCE&G or Santee Cooper would correspond with the South Carolina State Historic Preservation Office as required by the National Historic Preservation Act. All land-disturbing activities associated with constructing new transmission line corridors and modifying existing corridors would follow established SCE&G and Santee Cooper procedures as described in the previous section. Further details are provided in the reports of the siting studies (Santee Cooper 2008, SCE&G 2008).

SCE&G concludes that impacts to historic or cultural resources from construction would be SMALL and would not require mitigation.

Section 4.1 References

1. FEMA (Federal Emergency Management Agency) 1982. *Flood Insurance Rate Map, Fairfield County (Unincorporated Areas),* Panel 175 of 200, South Carolina, Effective Date: July 19, 1982. Available at www.msc.fema.gov. Accessed October 11, 2006.

2. Santee Cooper undated. *Site/Routing Procedure*, Moncks Corner, South Carolina.

3. Santee Cooper 1996. Transmission Line Standards Reference Manual, Section 3, *Transmission Line Location, Engineering Survey, and Right-of-Way Activities,* June 1, 1996.

4. Santee Cooper 2008. V. C. Summer Nuclear Station Units 2 and 3 Transmission Line Siting Study Santee Cooper. Moncks Corner, South Carolina, Prepared by MACTEC Engineering and Consulting, Inc., Columbia, South Carolina, August 25, 2008.

5. SCDHEC (South Carolina Department of Health and Environmental Control) 2005. Storm Water *Management BMP Handbook*. August 2005. Available at www.scdhec.com. Accessed September 9, 2006.

6. SCDNR (South Carolina Department of Natural Resources) 2006. *Wildlife Management Area Regulations 2006-2007.* Available at www.dnr.sc.gov, accessed September 12, 2006.

7. SCE&G 2000. *Transmission Line and Substation Siting Processes*. January 2000.

8. SCE&G 2008. V. C. Summer Nuclear Station Units 2 and 3 Transmission Line Siting Study SCE&G. Columbia, South Carolina, Prepared by Facilities Planning & Siting, PLLC, Charlotte, North Carolina, August 2008.

9. SC Government (South Carolina) 2007. *The 1976 Code of Laws: Title 58-Public Utilities, Services, and Carriers, Chapter 33 Utility Facility Siting and Environmental Protection*. Available at http://www.scstatehouse.net/code/statmast.htm. Updated January 9, 2007.

10. U.S. NRC 2004. *Generic Environmental Impact Statement License Renewal for Nuclear Power Plants Regarding the Virgil C. Summer Nuclear Station. Final Report*. NUREG-1437 Supplement 15. Washington, D.C. February. 2004.

4.2 WATER-RELATED IMPACTS

Water-related impacts from construction of a nuclear power plant would be similar to those from any large construction project. Large construction projects can, if not properly planned, result in impacts to groundwater, the physical alteration of local streams and wetlands, and impacts to downstream water quality as a result of erosion and sedimentation or spills of fuel and lubricants used in construction equipment. Because of this potential for harming surface and groundwater resources, SCE&G would obtain a number of permits before initiating construction. Tables in Section 1.2 provide a complete list of construction-related authorizations that would have to be obtained before initiating construction activities.

Subsection 4.2.1 discusses hydrologic alterations that could occur as a result of construction. Subsection 4.2.2 explores water use conflicts. Subsection 4.2.3 examines water quality issues. Subsection 4.3.1 addresses wetlands.

4.2.1 HYDROLOGICAL ALTERATIONS

Proposed construction activities that could result in impacts to the hydrology at the VCSNS site include:

- Clearing land at project site and constructing infrastructure such as roads and storm water drainage systems
- Construction of new buildings (reactor containment structure, turbine building, and cooling towers), structures (*e.g.*, electrical substation), road/rails, and parking lots
- Construction of new raw water intake structure on the Monticello Reservoir and discharge structure on the Parr Reservoir
- Construction of new water treatment facility intake and discharge at the Monticello Reservoir
- Temporary disturbance of currently vegetated areas for construction laydown areas, concrete batch plants, sand/soil/gravel stockpiles, and construction-phase parking areas
- Dewatering of foundation excavations during construction
- Clearing and construction of transmission lines

Potentially affected water bodies include the drainage associated with the Mayo Creek, Monticello Reservoir, Parr Reservoir, and the Broad River.

The South Carolina Department of Health and Environmental Control (SCDHEC) recently issued a new regulation requiring a National Pollutant Discharge Elimination System (NPDES) general permit for construction activities that impact

one acre or more (SCDHEC 2006). SCDHEC requires parties with operational control of construction sites that disturb one acre or more to obtain an NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities (Clark 2006). This entails filing a Notice of Intent for Stormwater Discharges from Large and Small Construction Activities, in essence a permit application, along with a Storm Water Pollution Prevention Plan prepared by a certified individual. The Storm Water Pollution Prevention Plan must be approved before the General Permit can be issued. Construction permit requirements would be incorporated into VCSNS environmental procedures. These procedures would describe the temporary and permanent erosion and sediment control measures to be installed and maintained during the course of construction. For example, retention ponds would be constructed, as needed, to accommodate surface water runoff and to allow sediment-laden water from dewatering activities to pass through them, if necessary, before discharge at an NPDES permitted outfall.

Dewatering activities for construction of the power blocks would not impact local water well users. Offsite water well users would be isolated by the Broad River, Monticello Reservoir, and the presence of local drainage divides within the site area. These drainage divides tend to act as outfalls for local groundwater flow and as local barriers to flow created by dewatering, thereby limiting potential impacts to the areas of construction. Dewatering for the main structures would occur within a limited area for a reasonably short period of time. Once dewatering ceases, the water level at the site is expected to return to normal levels. Dewatering would not present problems with subsidence because of the short duration and localized nature of the dewatering events. Groundwater pumped from wells installed to dewater large construction areas could be discharged directly to surface water without passing through a settlement basin. Dewatering an excavation within sheet piles, open excavation, or behind a cofferdam could be pumped to a settling basin before discharge through a permitted NPDES outfall.

As discussed in Subsection 2.2.2, the additional generation would require three new transmission lines for Unit 2 and three new lines for Unit 3. The routing of these lines has not been selected yet, but SCE&G and Santee Cooper procedures require consideration of environmental values and evaluation of environmental impacts in siting the lines (Subsection 4.1.2).

SCE&G currently does not plan to use groundwater or surface water during the construction of new transmission lines or modification of existing transmission lines. Because SCE&G complies with federal and state regulations regarding the siting of transmission lines, uses construction best management practices (including use of existing corridors to the extent practicable), and sites and constructs the lines under state oversight, alterations to groundwater and surface water sources in the region would likely be SMALL.

SCE&G would follow best management practices for soil and erosion control. Therefore, SCE&G believes impacts to the local hydrology from onsite construction activities would be SMALL and would not warrant mitigation.

4.2.2 WATER USE IMPACTS

4.2.2.1 Surface Water

SCE&G evaluated the proposed use of surface water from the Monticello Reservoir during the site construction phase of the project. Because of the lack of existing groundwater production wells at the VCSNS site and the availability of water from the Monticello Reservoir, SCE&G would use surface water from the Monticello Reservoir for domestic and construction activities. SCE&G did not evaluate groundwater production capacity for the site location due to the general low yield capabilities of the underlying soils and bedrock. A general description of the groundwater underlying VCSNS site is provided in Subsection 2.3.1.2.

Water use requirements for construction of a nuclear plant are similar to those for other large industrial construction projects. SCE&G would obtain water for various standard construction uses, such as dust abatement, mixing concrete, and potable water required by the construction workforce from the Monticello Reservoir. Based on water use projections, the peak surface water withdrawal rates associated with construction activities would be 420 gallons per minute (gpm). Surface water consumptive loss during construction would represent an extremely small fraction (0.044%) of the lowest annual mean flow of 966,000 gpm (2,153 cubic feet per second [cfs]) and 0.11% of the 7Q10[a] flow of (382,800 gpm [853 cfs]) of the Broad River at the Alston station (USGS 2007) located approximately 1.2 miles downstream of Parr Shoals Dam.

SCE&G would also obtain water for construction uses from Jenkinsville Water Company. As noted in Table 2.5-18, the Jenkinsville Water District obtains groundwater from wells located in Fairfield County. They also purchase water from the Midcounty Water District, which obtains water from the Town of Winnsboro. A new water line would be constructed from VCSNS to a tank operated by Jenkinsville Water District to supply water for the construction facilities located near the intersection of Parr Road and SC Highway 213. Assuming an average consumption rate of 50 gallons per person per day and peak population of 300 workers at these construction facilities, the demand could be as high as 15,000 gallons per day. This peak demand represents approximately 10% of the average usage for the Jenkinsville system but less than 0.5% of the capacity of the Town of Winnsboro system. The Town of Winnsboro has more than 1 million gallons per day of excess capacity (SCDNR 2005). As an interim measure until the planned water treatment facility can supply water, the Jenkinsville system could be used to supply potable water to the area where Units 2 and 3 would be constructed and to the concrete batch plant. The Jenkinsville Water District is able to meet the projected VCSNS demand considering its purchase agreements with Midcounty Water District and the Town of Winnsboro.

a. The lowest stream flow for 7 consecutive days that occurs on average once every 10 years.

Based on these considerations and their temporary nature, SCE&G believes surface water use impacts from construction would be SMALL and would not warrant mitigation.

4.2.2.2 Groundwater

Excavation for new shield building foundations would be at depths of approximately 40 to 50 feet below grade. Dewatering systems would remove subsurface water associated with the shallow, water table aquifer, which occurs at depths from 27 to 34 feet below grade. Excavation, through dewatering of surrounding soils, has the potential to impact adjacent wetlands, but excavation and drainage will be designed to minimize any potential impacts.

There are no plans to use groundwater during the construction phase of the project, but it is conceivable that relatively small amounts of groundwater could be used to provide water to remote construction areas. Based on these considerations and their localized and temporary nature, SCE&G believes groundwater use impacts from construction would be SMALL and would not warrant mitigation.

4.2.3 WATER QUALITY IMPACTS

4.2.3.1 Surface Water

Impacts to surface water quality can occur as the result of soil erosion due to soil disturbance during construction of facilities that could result in increased sediment loading to nearby water bodies.

The Mayo Creek, Monticello Reservoir, Parr Reservoir, and Broad River would be the most likely water bodies to be affected by site construction activity due to the location of new intake and discharge structures. The Mayo Creek and Broad River could receive surface water runoff from areas where construction activities occur. The Monticello Reservoir could be impacted during construction activities associated with the raw water intake for Units 2 and 3 and the water treatment facility. Parr Reservoir could be impacted during construction of the blowdown discharge structure and through potential surface water runoff from construction areas.

As discussed in Subsection 2.3.2, the Federal Energy Regulatory Commission (FERC) license for the Parr Hydro (FPC 1974) limits withdrawal of water from the Monticello Reservoir just to the activities associated with operations of Unit 1. Thus, additional withdrawal of water for the construction activities will require a license amendment. The construction of intake and discharge structures on Parr project land would also require FERC approval.

A new access road would be constructed to allow access to the construction areas from SC 213 (Figure 3.1-3). The road would include a bridge crossing the Mayo Creek. Also, an existing rail spur would be improved and used to deliver equipment and supplies to the site. The cooling towers would be located

approximately 1,000 feet east-southeast of the power blocks. The new switchyard would be constructed 2,000 to 3,000 feet northwest of the power blocks (Figure 3.1-3). Land clearing, excavation, and grading associated with the cooling towers and switchyard would disturb soil and could result in sediment moving downgradient into Mayo Creek or the unnamed stream to the west with rainwater runoff. SCE&G would plan and carry out any road building and other construction activities in accordance with all applicable regulations and best management practices, including erosion control measures such as silt fences and sediment retention basins, to prevent storm water from carrying soil into down-gradient water bodies.

Because the area slated to be disturbed for facilities and supporting infrastructure is more than one acre, SCE&G would, in compliance with the EPA's Phase I storm water regulations and SCDHEC regulations, do the following (Section 3.9):

- Obtain NPDES permit coverage
- Develop an erosion, sedimentation, and pollution control plan
- Implement best management practices, including structural and operational controls to prevent the movement of pollutants (including sediments) into wetlands and water bodies via storm water runoff
- Obtain dredging permits as required

There would be additional construction activities along the shorelines of the Monticello and Parr Reservoirs. These activities would inevitably disturb sediments (dredging, pile driving) and soils (shoreline construction), which would increase turbidity immediately downstream of the construction sites. The construction activities could require permits from the U.S. Army Corp of Engineers and/or SCDHEC. SCE&G would, to the extent practicable, carry out shoreline construction activities during periods when the water level for Parr Reservoir is low (summer, fall) to minimize impacts to water quality. Although the Monticello and Parr Reservoirs are considered waters of the state, the reservoirs are not considered federal navigable waters. Therefore, there is no requirement to obtain a U.S. Army Corps of Engineers' permit for any dredging associated with the construction of the proposed water intakes and discharges.

SCE&G would operate a package sewage treatment plant to support the temporary construction facilities near Parr Road. The treatment plant would process approximately 17,500 gallons per day using sodium hypochlorite for disinfection. The treated effluent would be discharged either to Mayo Creek, Parr Reservoir, or the Broad River. The discharge criteria and location will be established during the NPDES permitting process.

Based on the fact that any ground-disturbing activities would be permitted and overseen by state and federal regulators, and guided by an approved Storm Water Pollution Prevention Plan and the wastewater discharge governed by an NPDES permit with limits designed to ensure that the water quality standards of the

receiving waterbody are not exceeded, SCE&G believes any impacts to surface water during the plant construction phase would be SMALL and would not warrant mitigation beyond those best practices required by permits.

Because SCE&G complies with federal and state regulations regarding the siting of transmission lines, using construction best management practices (including use of existing corridors to the extent practicable), and sites and constructs the lines under state oversight, impacts to surface water sources from transmission line construction in the region would likely be SMALL.

4.2.3.2 Groundwater

The VCSNS site lies atop a drainage divide bounded by stream channels that have cut down in some instances to bedrock. The local rock surface is the boundary between the water table aquifer and the rock aquifer at the site. The streams act as interceptor drains for the groundwater in the water table aquifer (Subsection 2.3.1) and, in some cases, even to the underlying rock aquifer. The water table aquifer beneath the plant is, thus, hydraulically isolated on an interfluvial high. The groundwater is replenished by natural precipitation that percolates to the water table and then moves laterally to one of the interceptor streams. As a consequence, any contaminants (*e.g.*, diesel fuel, hydraulic fluid, antifreeze, or lubricants) spilled during construction would affect only the shallow water table aquifer and would ultimately move to surface water bodies where they could be intercepted.

Any minor spills of diesel fuel, hydraulic fluid, or lubricants during construction of the project would be cleaned up quickly to prevent spilled fuel or oil from moving into surface waters. This would also mitigate impacts to local groundwater because spills would be quickly attended to and not allowed to penetrate into the groundwater.

In the unlikely event small amounts of contaminants escape into the environment, they would have only a small, localized, temporary impact on the water table aquifer. SCE&G believes that any impacts to groundwater quality would be SMALL and would not warrant mitigation beyond those described in this section or required by permit.

Construction of new transmission lines or modification of existing lines is also a possibility and could cause potential impact to surface water along the chosen routes. Any minor spills of diesel fuel, hydraulic fluid, or lubricants during construction along the transmission lines would be cleaned up quickly to prevent spilled fuel or oil from moving into surface waters. This would also mitigate impacts to local groundwater because spills would be quickly attended to and not allowed to penetrate to groundwater. In the unlikely event small amounts of contaminants escape into the environment during transmission line construction, they would have only a small, localized, temporary impact on the water table aquifer. SCE&G believes that any impacts to groundwater quality would be SMALL and would not warrant mitigation beyond those described in this section or required by permit.

Because SCE&G complies with federal and state regulations regarding the siting of transmission lines and offsite facilities, using construction best management practices (including use of existing corridors to the extent practicable), and sites and constructs the lines under state oversight, impacts to groundwater sources in the region would likely be SMALL.

Section 4.2 References

1. Clark, Ann C. 2006. *South Carolina NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities,* Power Point presentation from the series of SCDHEC information sessions on new General Permit. Effective September 1, 2006. Available at http://www.scdhec.gov/water/powerpoint/sw1_frame.htm.

2. FPC (Federal Power Commission) 1974. *Order Issuing New License (Major), Authorizing Project Redevelopment, Permitting use of Project Waters for Condenser Cooling Purposes, Vacating Hearing Order, and Permitting Withdrawal of Intervention*, Project No. 1894, Issued August 28, 1974.

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4. SCDNR (South Carolina Department of Natural Resources) 2005. *The 100 Largest Public Water Supplies in South Carolina–2005*. Water Resources Report 37, 2005.

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4.3 ECOLOGICAL IMPACTS

Section 3.9 describes construction activities, including site preparation and construction of facilities and supporting infrastructure, and provides a schedule for construction activities. The schedule is important because the duration and timing of construction can determine the severity of ecological impacts. This section discusses potential impacts to terrestrial and aquatic communities from construction of VCSNS Units 2 and 3 and describes mitigation measures that could be employed to minimize these impacts.

4.3.1 TERRESTRIAL ECOSYSTEMS

Section 3.9 describes proposed construction activities that could potentially affect terrestrial ecosystems, and provides the approximate durations of such activities. Activities of particular interest to the evaluation of impacts on terrestrial ecosystems include land clearing and noise.

4.3.1.1 The Site and Vicinity

As defined in the introduction to Chapter 4, the “site” consists of the areas noted in Figure 2.4-1, and the “vicinity” consists of the area within 6-10 miles of VCSNS. Subsection 4.1.1 describes the impacts of construction to land use at the site. The approximate area that would be disturbed is 490 acres. Construction of the proposed facilities would result in the removal of essentially all forested habitat within the construction and support areas (Figure 4.3-1). Forests at VCSNS site (Subsection 2.4.1.1) include areas of naturally vegetated pines, planted pines, hardwoods, and mixed pine/hardwoods. Construction activities would result in the removal of approximately 225 acres of planted pines, 103 acres of naturally vegetated pines, 65 acres of mixed pine/hardwoods, and 41 acres of hardwoods. The remaining 56 acres that would be impacted by construction consist of non-forest, open, and recently cleared areas and the estimated areas for the access road (18 acres) and water treatment plant (10 acres). Based on field reconnaissance conducted in 2006 and 2007 (Subsection 2.4.1), the construction and support areas do not contain any old growth timber, threatened or endangered plants, or unique or sensitive plant communities. Therefore, construction activities would not noticeably reduce the local diversity of plants or plant communities.

As noted in Subsection 2.4.1, there are no bald eagle nests in the areas that would be disturbed by proposed construction activities. The two nearest bald eagle nests consist of a nest on the jetty in the Monticello Reservoir and a nest west of the Parr Reservoir (Figure 4.3-1). The nest on the jetty in the Monticello Reservoir is approximately 4,000 feet (0.8 mile) from the proposed raw water intake structure and 1.2 miles from the proposed water treatment plant. The nest west of the Parr Reservoir is approximately 1 mile from the proposed switchyard construction area. Construction activities at these distances would not disrupt breeding and nesting activities of the eagles, and all other construction-related activities would be at even greater distances (Figure 4.3-1).

Bald eagles forage in the Parr and Monticello Reservoirs, the Fairfield Pumped Storage Facility tailrace canal, and the Broad River downstream of Parr Shoals Dam. Construction activities would not be expected to disrupt foraging eagles except possibly at three locations: the area where the blowdown line would discharge into Parr Reservoir, the location of the proposed raw water intake structure in the Monticello Reservoir, and the proposed water treatment plant's intake and discharge in the Monticello Reservoir.

Construction of the blowdown discharge structure would disturb an area of about 120 feet along the shoreline, or 50 feet on each side of a 20-foot-wide structure (Sections 3.4 and 3.9). Eagles that forage along the shores of the Parr Reservoir are accustomed to fishermen and duck hunters moving about the reservoir in power boats and employees of Parr Hydro and Fairfield Pumped Storage Facility working along its shores. Although disturbance from construction of the blowdown line should not be trivialized, it would have no more effect on eagles than these activities. Similarly, the proposed raw water intake structure would be located just west of the existing intake structure in an area where eagles are accustomed to employees working along the shoreline. The intake would be approximately 75 feet wide and construction activities would disturb an area of about 50 feet on each side (Sections 3.4 and 3.9). The small cove in the Monticello Reservoir where the proposed water treatment plant's intake would be located is not an area of frequent human-related activities. However, only about 100 feet of shoreline would be disturbed during construction. The proposed water treatment plant's discharge would be located in the existing Unit 1 discharge canal. Considering the large areas encompassed by the Parr and Monticello Reservoirs, the Fairfield Pumped Storage Facility tailrace canal, and the Broad River, construction activities within the above-noted small areas of shoreline would not be expected to adversely impact foraging eagles.

There are no important species as defined in NUREG-1555 (NRC 1999) within areas that would be disturbed by construction-related activities except bald eagles (discussed above) and common game species such as deer, rabbits, squirrels, and game birds. No areas designated by the U.S. Fish and Wildlife Service as critical habitat for endangered species exist at or in the vicinity of VCSNS. No threatened or endangered plants or animals are known to reside in the construction area (with the exception of bald eagles, discussed above). Therefore, construction would have no impact on important terrestrial habitats or threatened or endangered terrestrial species.

SCE&G has sited the proposed facilities and infrastructure so as to minimize impacts to wetlands and wildlife habitat. The new intake structure would be constructed just west of the existing intake structure in an area devoid of wetlands, and the associated raw (makeup) water line (Figure 4.3-1) would not cross any wetlands. The cooling tower blowdown line would be routed along an existing railroad corridor to minimize impacts to vegetation and wildlife. The upper portion of a small intermittent stream and its associated wetland extend slightly into the area in which the cooling towers would be located; a portion of this wetland would be impacted by construction activities. The proposed main access road would cross the Mayo Creek and its associated wetland. Approximately 1

acre of wetlands is located within the area of disturbance associated with construction of the proposed facilities. SCE&G has submitted a Jurisdictional Determination Request to the U.S. Army Corps of Engineers (USACE) regarding the wetlands that would be disturbed, and wetland-related mitigation has not yet been determined. Impacts to wetlands near areas that would be disturbed (such as the proposed switchyard and construction spoils areas) would be minimized by established best management practices such as silt fencing.

As discussed in Section 4.2, excavation has the potential to affect adjacent wetlands through dewatering of surrounding soils. Excavation and drainage will be designed to minimize any potential impacts from dewatering associated with construction activities.

Land clearing would be conducted according to federal and state regulations, permit requirements, applicable SCE&G procedures, good construction practices, and established best management practices (*e.g.*, directed drainage ditches, silt fencing). Fugitive dust would be minimized by watering the access roads and construction site as necessary. Emissions and spills from construction equipment would be minimized through scheduled equipment maintenance procedures. Subsection 4.3.2 provides more detail on spill controls and sediment and erosion control measures that would be employed.

As the site undergoes clearing and grading, disturbance and habitat loss would displace mobile animals such as birds and larger mammals. Species that can adapt to disturbed or developed areas (*e.g.*, raccoon, opossum, birds) may recolonize portions of the site where grasses and other vegetation are undisturbed or are replanted following construction. Species more dependent on forested habitat may be permanently displaced. Clearing and grading activities could result in the loss of some individuals, particularly less mobile animals such as reptiles, amphibians, and small mammals.

Subsection 4.4.1.2 discusses noise that could result from construction-related activities. As discussed in that section, construction-related noise rapidly attenuates over relatively short distances. At 400 feet from the construction activity, noises could range from approximately 60 to 80 decibels (dBA). Most of the noise levels are below the 80 to 85 dBA threshold at which birds and small mammals are startled or frightened (Golden et al. 1980). Thus, it is not likely that noise from construction activities would disturb wildlife beyond 400 feet from the perimeter of the construction site.

Avian collisions with man-made structures are the result of numerous factors related to species characteristics such as flight behavior, age, habitat use, seasonal and diurnal habitats; and to environmental characteristics such as weather, topography, land use, and orientation of the structures. Most authors on the subject of avian collisions with utility structures agree that collisions are not a biologically significant source of mortality for thriving populations of birds with good reproductive potential (Brown 1993). Few avian collisions with existing structures at VCSNS site have been noted by SCE&G and it is expected that

avian collisions with construction equipment such as cranes during the construction phase would also be negligible.

In summary, while construction-related impacts of habitat loss to local wildlife populations cannot be quantitatively assessed because population data for species on and adjacent to the VCSNS site is not available, there are relatively large tracts of forest available to displaced animals to the north, east, and south of the VCSNS site. Given the fact that approximately 490 acres of affected habitat at the site represents a small portion of the available undeveloped land in the vicinity, the construction-related mortality or temporary displacement of wildlife would be minimal relative to wildlife populations in the vicinity. Construction activities would not reduce the local diversity of plants or plant communities, and would not impact endangered or threatened species. Noise-related impacts and bird collisions during construction would be negligible. Therefore, construction-related impacts to terrestrial resources in the vicinity would be SMALL, and mitigation beyond what is discussed in this section would not be warranted.

4.3.1.2 Transmission Corridors

As discussed in Subsection 2.2.2, SCE&G and Santee Cooper estimate that the additional generation from the proposed Units 2 and 3 would require six new 230 kV transmission lines (four single-circuit lines and one double-circuit line). The lengths of the two new Santee Cooper single-circuit lines (VCSNS-Flat Creek and VCSNS-Varnville) would total 235 miles. All but 2.44 miles of the 235-mile length would be routed within existing corridors maintained by Santee Cooper (Santee Cooper 2008).

The four new SCE&G transmission lines consist of the VCSNS-Lake Murray No. 2 single-circuit line, the VCSNS-Killian single-circuit line, and the VCSNS-St. George double-circuit line. The VCSNS-Lake Murray No.2 line would utilize existing SCE&G corridors for its entire length (SCE&G 2008). SCE&G has conducted siting studies for the VCSNS-Killian and VCSNS-St. George lines by applying a comprehensive, three-phase transmission line siting process to develop potential routes for the new transmission lines that would avoid or minimize effects to environmental resources, cultural resources, scenic quality, and land uses. The primary goal of the SCE&G siting studies was to identify one potential route for the VCSNS-Killian line and one for the VCSNS-St. George line and document the magnitude of impacts that would likely result from construction of the lines over the potential routes. The siting study indicates that approximately 19 miles of the 37-mile VCSNS-Killian line and 66 miles of the 134-mile VCSNS-St. George line would be located adjacent to existing corridors that are maintained for electrical transmission, water, gas or sewer (SCE&G 2008). SCE&G has initiated its three-phase process to select final routes. SCE&G will update the data for each siting study area and implement the public participation component of the siting process. Based on the updated data, alternate routes would be developed for each of the future 230 kV lines and an alternatives analysis would be conducted for each. A comprehensive evaluation and ranking of the routes would be completed before selecting the final routes. SCE&G and Santee Cooper procedures require consideration of environmental values and evaluation of

environmental impacts in siting the new lines. Subsection 4.1.2 describes South Carolina Code Title 58, Chapter 33, under which SCE&G and Santee Cooper would site and construct these new transmission lines. This regulation prescribes the environmental studies required to obtain a Certificate of Environmental Compatibility and Public Convenience and Necessity before construction.

Avian collisions with transmission structures cannot be ruled out, but as discussed in Subsection 4.3.1.1, collisions are not a significant source of mortality for most species. Avian collisions with transmission lines and related structures during construction are expected to be negligible.

Because SCE&G complies with all federal and state regulations regarding the siting of transmission lines, uses construction best management practices (including use of existing corridors to the extent practicable), and sites and constructs the lines under state oversight, impacts to terrestrial ecosystems in the region would likely be SMALL. Environmental effects would not destabilize or noticeably alter important terrestrial ecosystems.

4.3.2 AQUATIC ECOSYSTEMS

Section 3.9 describes proposed site preparation activities that could potentially affect local ecological communities. These include the construction of site access and perimeter roads, rail spurs, parking lots, temporary utilities, office buildings, warehouses, shop and fabrication areas, and underground utilities. Most of these activities will take place in upland areas and would be carried out in such a way as to preclude, under normal circumstances, impacts to local wetlands, streams, and reservoirs. Subsection 4.3.1 assesses the potential impact of these site preparation activities on terrestrial communities. Some site preparation activities do have the potential to affect onsite and offsite water bodies, and will be the focus of the discussion that follows. Activities of particular interest are construction of the new raw water intake structure and water treatment facility on the Monticello Reservoir for Units 2 and 3, construction of four mechanical-draft cooling towers southeast of the power block area, construction of a 1.2-mile-long blowdown line from the cooling tower sump to the shoreline of the Parr Reservoir, and a new construction access road that would connect Parr Road and the main construction site.

Impacts to aquatic ecosystems could result from sedimentation and, although less likely, spills of petroleum products. The potentially damaging effects of construction-generated sediment on aquatic ecosystems have been widely studied and documented. Three major groups of aquatic organisms are typically affected: aquatic plants (both periphyton and vascular plants), benthic macroinvertebrates, and fish. Turbidity associated with suspended sediments may reduce photosynthetic activity in both periphyton and rooted aquatic plants. Deposited sediments can smother these plants. Suspended sediment can interfere with respiration and filter feeding of macrobenthos (especially mussels and aquatic insect larvae), while heavy deposition of sediment on the streambed can blanket both surficial and interstitial habitats of these organisms. Suspended sediment in streams can interfere with respiration and feeding in both young and

adult fish, but juvenile and adult fish are generally able to leave areas with high levels of silt and sediment and find areas with lower silt loads. Deposited sediment may render formerly prime areas unsuitable for spawning or, if deposited after spawning has been completed, may actually destroy eggs and fry.

Petroleum products (including lubricants, diesel fuel, kerosene, hydraulic fluids) are sometimes spilled at construction sites as a result of equipment failure (split hydraulic lines, broken fittings) or human error (overfilled tanks). Petroleum products can, depending on their volatility and chemical makeup (additives are often more toxic than the petroleum product itself), be extremely toxic to aquatic organisms, with effects that may be acute (crude oil and heavy fuel oils smothering aquatic insects and shellfish) or chronic (petroleum residues interfering with reproduction or reducing resistance to disease).

Several factors tend to mitigate impacts of construction site petroleum spills on aquatic communities. First, spills generally occur in upland areas of construction sites (laydown yards, parking lots, staging areas, fuel depots) where spill control and cleanup are relatively straightforward propositions. Second, the volumes of fuels and lubricants spilled at construction sites are almost always small; tens of gallons rather than hundreds or thousands of gallons.

To ensure that wetlands, streams, and aquatic communities are not harmed by petroleum products or other industrial chemicals, SCE&G would restrict activities that involve the use of petroleum products and solvents, should degreasing of parts and equipment be done onsite rather than at a vendor's shop, to designated areas, such as the laydown, fabrication, and shop areas described in Subsection 3.9.1.6. Fuel and lubricants would be stored with spill containment appropriate to the volume of petroleum products stored in the construction area. SCE&G would prepare a construction-phase Spill Prevention, Control, and Countermeasure Plan in accordance with 40 CFR 112.7 to ensure that personnel are trained to respond to petroleum and chemical spills and that necessary spill control equipment is on site and immediately accessible. Given that refueling, lubrication, and degreasing of vehicles and heavy equipment would take place in restricted areas of the site, well removed from waterways and that the Spill Prevention, Control, and Countermeasure Plan would ensure that trained personnel with spill control equipment are on hand to deal quickly with spills, there is a very small likelihood that spilled petroleum products or industrial chemicals would make their way into down-gradient wetlands and streams to harm aquatic habitats or aquatic organisms.

SCDHEC requires parties with operational control of construction sites that disturb one acre or more to obtain an NPDES General Permit for Stormwater Discharges from Large and Small Construction Activities (SCDHEC 2003; Clark 2006). This entails filing a Notice of Intent for Storm Water Discharges from Large and Small Construction Activities, in essence a permit application, along with a Storm Water Pollution Prevention Plan prepared by a certified individual. The Storm Water Pollution Prevention Plan must be approved before the General Permit can be issued. The permit holder and contractors ("co-permittees") must meet at the construction site to review the Storm Water Pollution Prevention Plan and sign off

on its provisions, including design of erosion control measures, frequency of inspections (to ensure erosion control measures are working as designed), and reporting requirements (normally monthly, to SCDHEC).

4.3.2.1 The Site and Vicinity

4.3.2.1.1 Construction of Intake Structure and Blowdown Line

The construction of the intake and blowdown structures would result in the permanent loss of a small amount of aquatic habitat, less than 1 acre for both structures, and some temporary aquatic habitat degradation during construction. As described in Subsection 3.9.1.10, current plans call for installation of a steel-sheet cofferdam with dewatering system west of the existing Unit 1 intake to facilitate construction of a raw water intake and pumphouse for Units 2 and 3. Installation of the cofferdam would allow earthmoving, excavating, and tunneling equipment to operate on dry ground, which is more efficient than working “blind” from shore or barge, with the added benefit of reducing the potential for erosion and sedimentation. A floating silt curtain (turbidity curtain) would be installed in the reservoir outside (approximately 50 feet distant) of the cofferdam, to isolate the construction area and to prevent sediment-laden water from moving into the Monticello Reservoir. A silt curtain consists of a heavy filter fabric supported by a floating boom and kept in place with anchor cables and curtain weights. Once the cofferdam and turbidity curtain are in place, the area inside the cofferdam would be dewatered with submersible pumps, with the sediment-laden water being pumped to the area between the sheeting piling and the turbidity curtain (see Subsection 3.9.1.10). Silt curtains, which are widely used to limit increases in turbidity and suspended solids associated with dredging and bridge building projects, have been designated a best management practice by the U.S. Corps of Engineers (Francingues and Palermo 2005).

The area upslope and adjacent to the raw water intake construction area would be stabilized with erosion control devices appropriate to soil type and terrain to ensure that soil loosened by heavy equipment is not carried into the Monticello Reservoir with storm water runoff. Slope stabilization and erosion control measures could include mulching (with hay, straw, or wood chips), erosion control blankets, silt fences, stone gabions, rip-rap, or other erosion control measures recommended by SCDHEC in its handbook and field manual on best construction management practices for storm water management (SCDHEC 2005a; 2005b). When construction has been completed, the disturbed areas would be seeded with a mixture of grasses and legumes to establish a perennial vegetative cover and prevent erosion, in accordance with SCDHEC recommendations (SCDHEC 2005a; 2005b).

SCE&G intends to route the blowdown line along an existing railroad spur (Figure 2.1-1) that connects Unit 1 to the Norfolk Southern line, reducing the amount of land clearing and land disturbance that would be necessary. However, current plans call for upgrading the rail spur and widening the associated right-of-way, which could include cutting and filling slopes and installing sheet piling along sections of the spur to widen and stabilize the railroad bed. Because the rail spur

parallels a small, intermittent stream for roughly 0.5 mile, construction activity associated with widening and upgrading the railroad line and installing the blowdown line (these activities would be closely coordinated) could result in soil loss and some sediment being carried into the down-gradient stream with storm water.

When conducting forest management work, SCE&G's Forestry Department voluntarily follows the South Carolina Forestry Commission's Best Management Practices manual (SCFC undated), a document that is based on EPA guidance. With regard to forestry operations adjacent to intermittent streams, the South Carolina Forestry Commission Best Management Practices manual calls for establishing primary (extending 40 feet from either side of the steam) and secondary (extending 40 to 120 feet from either side of the stream, depending on slope) streamside management zones in which certain forest management practices should be followed. In the primary zone, trees may be removed as long as "other vegetation" (herbaceous vegetation, ground cover) and "organic debris" (leaves and forest litter) are left on the forest floor. In the primary zone, trees should be removed "…in a manner that minimizes disturbance of the forest floor, exposure of mineral soil, or degradation of stream bank stability" (SCFC undated). All limbs, tops, and logging debris should be removed from the stream channel when work has been completed. Toxic and hazardous materials including fuels, lubricants, and solvents should be handled and stored outside of the primary streamside management zone.

SCE&G would follow the South Carolina Forestry Commission Best Management Practices when cutting timber and clearing land for the expanded right-of-way. SCE&G intends to further limit impacts to the intermittent stream by conducting land clearing during dry seasons (summer and early fall) and by stabilizing steep slopes immediately after the work has been completed to prevent erosion. Neither of these mitigative measures is specifically called for in the South Carolina Forestry Commission best management practices.

SCE&G has not finalized the design of the blowdown line and discharge structure; however, a conceptual design has been completed. It may be necessary to drive pilings at the reservoir's edge to stabilize the discharge pipe as it moves from high ground into the reservoir. It may also be necessary to do some contouring of the hillside to maintain the pipe's angle as it moves down the hill to the reservoir.

Despite SCE&G's best efforts to prevent erosion and sedimentation, some localized sedimentation would inevitably occur in the immediate area of the new intake (Monticello Reservoir) and new blowdown discharge (Parr Reservoir). Some macroinvertebrates would be smothered by silt. Fish would be displaced, and would move to other areas of these two reservoirs that offer more macroinvertebrate prey or higher-quality spawning habitat. SCE&G would avoid or minimize construction impacts to water quality through best management practices and good construction engineering practices such as storm water retention basins and the previously described cofferdam. SCE&G's goal would be to protect water quality and thus ensure the protection of aquatic communities.

4.3.2.1.2 Construction of Raw Water Line, Cooling Towers, Roads, and Supporting Infrastructure

Based on the proposed locations of the Units 2 and 3 facilities and infrastructure (see Figures 2.1-1 and 2.4-1), the only permanent stream that could be affected by construction is the Mayo Creek, which rises south of the existing VCSNS site, flows south and then west before emptying into the Broad River below the Parr Shoals Dam. It is conceivable that sediment could move into the Mayo Creek with storm water runoff during construction of the mechanical-draft cooling towers or the new access road, which would necessitate building a bridge across the Mayo Creek.

Anticipating possible impacts from site construction, SCE&G commissioned baseline surveys of fish in the Mayo Creek drainage (TtNUS 2007a). These surveys, which encompassed the mainstem of the stream and several small tributaries, indicate that the creek contains fish populations that are typical of the Piedmont and Upper Coastal Plain of the Carolinas and Georgia. No freshwater mussels were observed and no fish species were collected that are listed by the state of South Carolina or U.S. Fish and Wildlife Service. These surveys (and a survey conducted by SCE&G in May 2007) suggest that fish communities of small Mayo Creek tributaries with intermittent flow or highly variable flow are noticeably less diverse than the fish community of the Mayo Creek mainstem, which has substantial year-round flow (TtNUS 2007b). A small number of species, most notably the hardy and drought-tolerant creek chub (*Semotilus atromaculatus*), appear to predominate in small Mayo Creek tributaries and intermittent streams flowing west to Parr Reservoir.

Only one species, the creek chub, was found in the unnamed, north-flowing Mayo Creek tributary that could potentially be affected by construction of the new access road and construction support facilities near Parr Road. Two species, bluehead chub (*Nocomis leptocephalus*) and redbreast sunfish (*Lepomis auritus*), were found in the unnamed Mayo Creek tributary that drains the area where the Units 2 and 3 cooling towers would be built. Construction-related sedimentation could, depending on effectiveness of erosion controls (see Section 4.6, “Measures and Controls to Limit Adverse Impacts During Construction”), reduce density and diversity of benthic organisms in these small streams. Impacts to fish would depend on streamflows during construction, and could range from displacement (fish moving downsteam to the main portion of Mayo Creek) to elimination (if fish movement is blocked and they are unable to escape the area of sedimentation).

Based on the fact that any land-disturbing activities would be of relatively short duration, permitted and overseen by state and federal regulators, guided by an approved Storm Water Pollution Prevention Plan, any small spills will be mitigated according by a Construction Phase Spill Prevention, Control, and Countermeasure Plan, and no habitats and no species designated by the South Carolina Department of Natural Resources or the U.S. Fish and Wildlife Service as sensitive or critical are present, SCE&G concludes that impacts to aquatic communities from construction of Units 2 and 3 facilities and supporting

infrastructure would be SMALL and temporary in nature. No mitigation beyond that stipulated in the various construction permits and plans would be warranted.

4.3.2.2 Transmission Corridors

SCE&G and Santee Cooper have determined that three 230kV lines would be required for Unit 2 and three 230kV lines would be required for Unit 3 (see Subsection 2.2.2). At this point in the planning process, SCE&G and Santee Cooper have not finalized routes of new transmission lines that would be required to connect these new units to the regional grid. The corridor siting process described in Subsection 4.1.2 reflects SCE&G's and Santee Cooper's commitment to avoiding, whenever possible, impacts to surface waters, ecologically sensitive areas (*e.g.*, wetlands and critical habitats), and protected species (SCE&G 2000; Santee Cooper undated; 1996).

Based on siting studies prepared by SCE&G and Santee Cooper, it appears unlikely that any of the new lines would cross any state parks, national parks, state conservation areas, state or national wildlife refuges, or critical habitat for any federally listed species. Aside from the fact that relatively few parks, refuges, and conservation areas are in the areas that would be crossed by new lines, SCE&G and Santee Cooper have transmission siting procedures (SCE&G 2000; Santee Cooper undated; 1996) that ensure locations of state and federal lands and ecologically sensitive areas are factored into siting of new lines. Furthermore, once possible routes (the "study area") of lines have been identified, SCE&G solicits input of state and federal resource agencies to ensure agency concerns are considered in selection of final route(s). Under normal circumstances, this means that new transmission lines are routed around state and federal parks, state conservation areas, and wildlife refuges.

Six state and federally listed aquatic species are known to occur in the counties that would be crossed by the new transmission lines (see Table 2.4-2). These include one fish, the shortnose sturgeon (*Acipenser brevirostrum*), one freshwater mussel, the Carolina heelsplitter (*Lasmigona decorata*), and four sea turtles, the loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), the leatherback sea turtle (*Dermochelys coriacea*), and the Kemp's ridley sea turtle (*Lepidochelys kempii*). The federally listed Carolina heelsplitter is found in three of the Piedmont counties (Chester, Lancaster, and Saluda) that would be crossed by new transmission lines. In South Carolina, the federally listed shortnose sturgeon is found in the Savannah River, "one or more" of the rivers flowing into St. Helena Sound (Ashepoo, Combahee, and Edisto Rivers), the Cooper River, the Santee River, and one or more Winyah Bay Rivers (SCDNR 2008). There is also a landlocked or "damlocked" population in the Santee-Cooper reservoir system (Lake Moultrie, Lake Marion, and tributaries, the Congaree River being the most important.). Little is known about the status of these populations (SCDNR 2008). With respect to counties crossed by proposed transmission lines, eight counties border or contain rivers that are potentially used by spawning shortnose sturgeon: Aiken (Savannah River), Colleton (Ashepoo, Combahee, and Edisto Rivers), Dorchester (Edisto River), Hampton (Combahee River), Lexington (Congaree River), Orangeburg (Lake Marion), and Richland (Congaree River). The new

VCSNS-Varnville transmission line would cross the Edisto River southwest of the town of St. George and would cross the Salkahatchie River (tributary of the Combahee River) northeast of the town of Varnville. It is unknown if shortnose sturgeon ascend the Salkahatchie River or if they ascend the Edisto River as far as St. George. The loggerhead sea turtle nests on Colleton County beaches (SCDNR 2006), but the new VCSNS-Varnville line would be well inland, of any beaches that might be used by nesting turtles. The other three sea turtle species rarely nest in South Carolina. As noted throughout this chapter, SCE&G solicits input from state and federal resource agencies to ensure agency concerns are considered in selection of routes for new transmission lines. If there is potential for construction of a new transmission line to degrade habitat of a listed aquatic species, SCE&G and/or Santee Cooper would work closely with the agency to develop a construction schedule and construction techniques that are protective of the habitat and species in question.

The new transmission lines could cross a number of intermittent and perennial streams in the Coastal Plain and Piedmont of South Carolina. Land clearing for transmission corridors could, if not properly managed, affect aquatic plants, aquatic insects, mussels, and fish in the streams crossed by the lines. SCE&G and Santee Cooper personnel involved in transmission line maintenance and transmission corridor vegetation management, follow procedures and best management practices intended to prevent degradation of water quality in wetlands, streams, and reservoirs crossed by transmission lines (SCE&G 2007; Santee Cooper 2006). Personnel involved in building new lines and substations will also be expected to follow the same procedures and best management practices designed to protect water quality and potentially affected aquatic communities.

In summary, SCE&G and Santee Cooper have transmission line and substation siting procedures in place to ensure that wetlands, streams, and sensitive aquatic habitats are protected. When possible, these areas are avoided entirely. When avoiding them is not feasible, protection of these areas is factored into the planning phase (*i.e.*, selecting the route through the wetland or over the stream least likely to result in erosion and sedimentation) and the construction phase (*i.e.*, using equipment specifically designed for work around wetlands and stream, installing erosion controls). In every instance, best management practices would be employed to minimize impacts of transmission line construction on aquatic life, including populations of state- and federally listed species. With the adoption of these practices, impacts to aquatic ecosystems would be SMALL, of short duration, and would not require additional mitigation.

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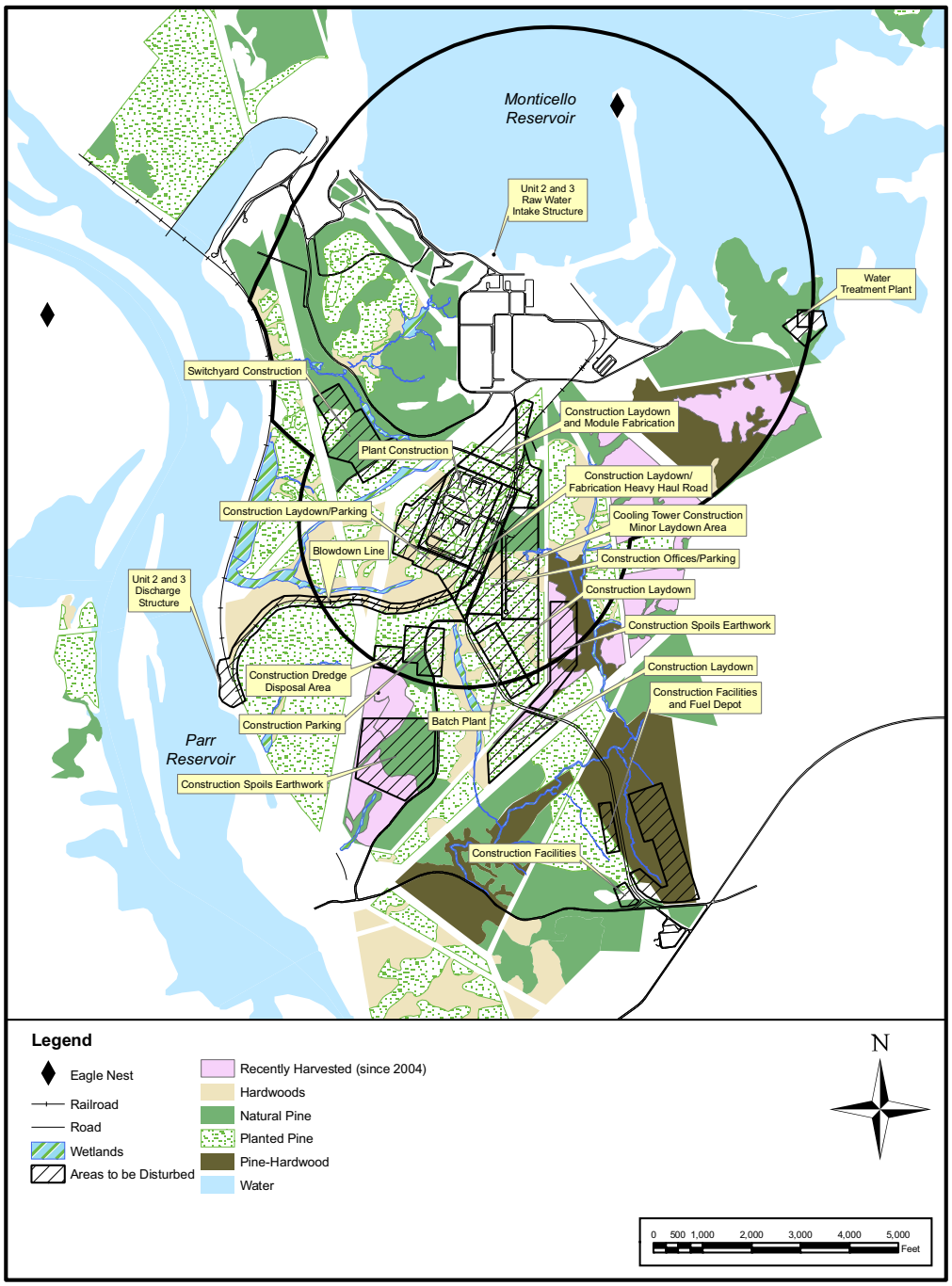

Figure 4.3-1. Habitats and Areas That Will Be Disturbed During Construction of Units 2 and 3

4.4 SOCIOECONOMIC IMPACTS

Very large construction projects such as VCSNS Units 2 and 3 result in migration of workers to the area (Section 3.10). Marked changes in traffic patterns, tax revenues, community services, and economic development often occur in sparsely populated regions such as Fairfield County. In addition, the construction activities can produce noise, dust, and other impacts on people in the immediate area. When concentrations of minority or low-income populations are present, there is the potential to disproportionately and adversely impact these population groups. This section addresses these issues and evaluates the impacts and potential mitigation measures.

4.4.1 PHYSICAL IMPACTS

Construction activities can cause temporary and localized physical impacts such as noise, odors, vehicle exhaust, and fugitive dust emissions. Vibration and shock impacts are not expected because of the strict control of blasting and other shock-producing activities. This subsection addresses potential construction impacts that may affect people, buildings, and roads. Any physical impacts would be SMALL and, therefore, all are presented qualitatively.

The discussion that follows applies most directly to construction of the proposed Units 2 and 3; however, construction would also occur in the transmission line corridors. The location of this construction is not known at this time (Subsection 2.2.2). Because transmission line construction is much smaller than plant construction and is diffused over potentially hundreds of miles of transmission corridor, no specific analysis of the socioeconomic impacts of the lines' construction is provided. Subsections 4.1.2 and 4.3.1.2 address the land use and ecological implications of transmission line construction.

The construction site would be in an industrial area surrounded by forests. All construction activities would occur within the construction site boundary. Therefore, impacts on existing Unit 1 facilities from constructing new units would be SMALL, incremental impacts to those associated with their normal operation. The use of public roadways and railways would be necessary to transport construction materials and equipment. A new construction access road will be built from SC 213. The roadways require some minor repairs or upgrading, such as patching and filling potholes and widening to allow safe equipment access. No extensive work is planned to the existing railways. Should SCE&G determine during construction planning that additional roads are needed, they would be constructed in accordance with applicable federal and state regulations.

4.4.1.1 Groups or Physical Features Vulnerable to Physical Impacts

4.4.1.1.1 People

Approximately 12,200 people live within 10 miles of Units 2 and 3 (Table 2.5-1). The vicinity is predominately rural and characterized by farmland and wooded tracts. No significant industrial or commercial facilities other than the VCSNS

nuclear units exist or are planned for the vicinity. Population distribution details are given in Subsection 2.5.1.

People who could be vulnerable to noise, fugitive dust, and gaseous emissions resulting from construction activities are listed below in order of most vulnerable to least vulnerable:

- Construction workers and personnel working onsite
- People working or living immediately adjacent to the site
- Transient populations (*i.e.*, temporary employees, recreational visitors, tourists)

Construction workers would have adequate training and personal protective equipment to minimize the risk of potentially harmful exposures. Emergency first-aid care would be available at the construction site, and regular health and safety monitoring would be conducted during construction.

People working onsite or living near the construction site would not experience any physical impacts greater than those that would be considered an annoyance or nuisance. In the event that atypical or noisy construction activities would be necessary, public announcements or notifications would be provided. These activities would be performed in compliance with local, state, and federal regulations, and site-specific permit conditions.

Fugitive dust and odors could be generated as a result of normal construction activities. Mitigation measures (*e.g.*, paving disturbed areas, water suppression, reduced material handling) would prevent or reduce such occurrences. Additional mitigation control measures would address any nuisance issues case by case. Odors could result from exhaust emissions and would dissipate on site.

Exhaust emissions from construction equipment would have no discernible impact on the local air quality. All equipment would be serviced regularly and operated in accordance with local, state, and federal emission requirements (see Subsection 4.4.1.3).

Reasonable efforts would be made to ensure that transient populations (mostly sportsmen using the Broad River and the Parr and Monticello Reservoirs) are aware of the potential impacts of construction activities. Signs would be posted at or near construction site entrances and exits to make the public aware of the potential for high construction traffic.

4.4.1.1.2 Buildings

Construction activities would not impact any offsite buildings because of distance. The nearest residence is approximately 1.4 miles from the center of the Units 2 and 3 footprint (Figure 5.8-1). In the event that pile-driving or blasting is necessary, the building(s) most vulnerable to shock and vibration would be those

within the VCSNS boundary. The construction activities would include the use of dampeners to reduce vibration and staggering activities to not compound vibration as appropriate. However, Unit 1 buildings have been constructed to safely withstand any possible impacts, including shock and vibration from construction activities associated with the proposed activity. No historically significant buildings (see Subsection 2.5.3) exist in the vicinity of the proposed construction site.

4.4.1.1.3 Roads and Railways

The transportation network in Fairfield County is already a well-developed system, and would not be physically impacted significantly as a result of construction activities. From SC 213, the construction workforce would access the site on the new access road depicted on Figure 3.9-1. The new access road would minimize disruption of Unit 1 traffic from SC 215. Material transportation routes (haul routes) would be selected based on equipment accessibility, existing traffic patterns, noise restrictions, logistics, distance, costs, and safety. Methods to mitigate potential impacts include avoiding routes that could adversely affect sensitive areas (*e.g.*, housing, hospitals, schools, retirement communities, businesses) to the extent possible and restricting activities and delivery times to daylight hours.

No new public roads would be required as a result of construction activities. Some minor road repairs and improvements in the vicinity of the VCSNS site (*e.g.*, patching cracks and potholes, adding turn lanes, reinforcing soft shoulders) would be necessary to enable equipment accessibility and reduce safety risks.

The construction site exit would be marked clearly with signs maintained such that they are clear of debris and markings are visible. Any damage to public roads, markings, or signs caused by construction activities would be repaired to preexisting conditions or better.

The new access road would have four lanes to accommodate the additional traffic. This road would tie back into the existing South Lake Access Road north of the construction site. Modifications would also be made to the access road leading to the intake structure at the Monticello Reservoir. A new heavy haul road would be built to support movement of materials from the laydown and fabrication areas to the construction site. The new road would be private and fully contained within the existing site boundary.

The existing rail spur running to the VCSNS site could be supplemented with additional rail spurs to the concrete batch plant, construction laydown, and fabrication areas for the new units. Improvements to the onsite rail spur will be made to support delivery of a transformer that will be installed in conjunction with the planned refueling outage at Unit 1 in October 2009. Norfolk Southern will be upgrading the offsite rail line to support Unit 1 transformer delivery. The existing rail line from Peak, South Carolina, to the site may require further upgrades by the railway company to facilitate movement of the heaviest loads. The upgrades could include installation of new ballast or rail sections on the existing rail bed.

Any effects of physical impacts would be SMALL and would not warrant mitigation.

4.4.1.1.4 Solid Waste Disposal

Construction of Units 2 and 3 would generate the following solid waste:

- debris from land clearing,
- excavation material,
- scrap building materials, wooden pallets, crates,
- solid waste from packaging materials, office waste, and breakroom waste, and
- potentially hazardous waste such as solvents and paints.

Construction waste could be minimized by using excavated material where fill is needed at the site, ordering materials in the appropriate quantities and returning overage to the vendor, and recycling scrap metal. The construction materials needed in the greatest quantities are the components of concrete (aggregate, sand, and cement), rebar, steel, and piping, and any excess materials could be returned to the vendor or recycled. In addition, the construction of the AP1000 reactors would utilize modular techniques with many components assembled at their fabrication point and shipped to VCSNS for installation, minimizing waste.

Construction waste estimates are not yet available for this construction project. However, construction debris and municipal solid waste estimates were made based on the projected workforce. Construction debris generation can be estimated on the square footage of the structures to be built. A description of the five principal generation structures is found in Section 3.1.2. These structures are concrete and steel, which leads to minimal waste since the concrete would be poured and scrap steel would be recycled. Other support structures such as the cooling towers and intake structure would also be constructed of concrete and steel. Moreover, construction of roads and pipelines would also allow waste minimization measures, leaving little waste for disposal. Section 3.1.2 indicates that training needs would be met by expanding an existing building and that existing administrative buildings, warehouses, and other support facilities would be used, expanded, or replaced.

Construction debris could be disposed of in a construction and demolition debris (C&D) landfill. There are several C&D landfills in counties adjacent to Fairfield County where VCSNS is located (SCDHEC 2008). A new C&D landfill in Richland County, Richland County C&D #2, has a permitted annual disposal rate of 200,000 tons and 28 years of disposal capacity available (SCDHEC 2007a). Although construction debris estimates are not available for the proposed VCSNS units, the generation rate would be expected to consume a very small percentage

of the available capacity considering just this one landfill. The impact to the availability of C&D disposal capacity in the region would be negligible.

Solid waste such as office and breakroom waste would be disposed of in a local municipal solid waste landfill. There are four active landfills permitted for the disposal of MSW located within 50 miles of VCSNS. These landfills are Northeast Landfill (Richland County), Richland Landfill, Union County Regional MSW Landfill, and Greenwood County MSW Landfill (SCDHEC 2007b). The South Carolina Department of Health and Environmental Control (2007a) reported that 1.4 million tons of waste was disposed of in these landfills in FY 2007 and that they have 4.6, 6.7, 14.5, and 23.2 years of remaining capacity, respectively, at their current disposal rate (SCDHEC 2007a). The waste generation from the proposed units would be expected to consume a very small percentage of the disposal capacity of the landfills within 50 miles. Therefore, the impact from offsite land disposal of solid waste would be SMALL.

Hazardous waste would be managed under the VCSNS Unit 1 EPA generator identification number. Proper management, transportation and disposal of hazardous waste will be coordinated with the VCSNS Unit 1 Environmental Coordinator, SCE&G Units 2 and 3 construction organization, and the construction contractor. Hazardous waste would be shipped only to treatment, storage and disposal facilities approved by SCANA's Corporate Environmental Services Department. These facilities could either be in-state or out-of-state facilities. South Carolina has four commercial hazardous waste facilities that received over 10,000 tons of hazardous waste in 2007 (U.S. EPA 2008). The total amount of hazardous waste managed in the state in 2007 was approximately 200,000 tons (U.S. EPA 2008). The small quantities of hazardous waste that could be generated from construction of VCSNS Units 2 and 3 are negligible compared to the amount of hazardous waste managed in the state in 2007.

4.4.1.2 Predicted Noise Levels

As presented previously, Fairfield County is predominantly farmland and wooded tracts. Areas that are subject to farming are prone to seasonal noise-related events such as planting and harvesting. Wooded areas provide natural noise abatement control to reduce noise propagation.

As Table 4.4-1 illustrates, noise levels attenuate with distance. The noise from a jackhammer can be as high as 108 dBA up close but only 82 dBA 100 feet away. (A 6 dB decrease is perceived as roughly halving loudness; a 6 dB increase doubles the loudness.) The noise levels listed in Table 4.4-1 are representative of noise levels expected at the VCSNS construction site. Construction workers would use hearing protection in accordance with OSHA safety standards.

The exclusion area boundary would be greater than a half mile in all directions from the center of the Units 2 and 3 footprint. No major roads, public buildings, or residences are located within the exclusion area.

The following controls or similar ones could be incorporated into activity planning, thus, further minimizing noise and associated impacts:

- Regularly inspect and maintain equipment to include noise aspects (*i.e.*, mufflers)
- Restrict extreme noise-related activities (*e.g.*, blasting, steam blows) to daylight hours
- Restrict delivery times to daylight hours

Given the distance to members of the public, impacts from the environmental noise of construction activities would be SMALL and temporary and would not require mitigation.

4.4.1.3 Air Quality

Units 2 and 3 would be located in Fairfield County, South Carolina, which is part of the Columbia Intrastate Air Quality Control Region (40 CFR 81.108 and 81.341). The Clean Air Act establishes National Ambient Air Quality Standards (NAAQS), which include the following criteria pollutants:

- sulfur dioxide (SO_2)
- Particulate matter with aerodynamic diameters of 10 microns or less (PM_{10})
- Particulate matter with aerodynamic diameters of 2.5 microns or less ($PM_{2.5}$)
- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Ozone (O_3)
- Lead (Pb)

Areas of the United States having air quality as good as or better than the NAAQS are designated by U.S. EPA as attainment areas. Fairfield County is classified as an attainment area under the NAAQS criteria. Areas having air quality that is worse than the NAAQS are designated by EPA as non-attainment areas. The nearest non-attainment areas to the construction site are in Richland and Lexington Counties (the Columbia, South Carolina metropolitan area), which are classified as non-attainment areas due to exceedances of the 8-hour ozone standard. These counties are approximately 4 miles and 7.4 miles southeast of the construction site, respectively.

Temporary and minor impacts to local ambient air quality could occur as a result of normal construction activities. Fugitive dust and fine particulate matter emissions, including those less than 10 microns (PM_{10}) in size, would be generated during earthmoving and material handling activities. Construction equipment and offsite vehicles used for hauling debris, equipment, and supplies also produce emissions. The pollutants of primary concern include PM_{10} fugitive dust, reactive organic gases, oxides of nitrogen, carbon monoxide, and to a lesser extent, sulfur dioxides. Variables affecting construction emissions (*i.e.*, type of construction vehicles, timing and phasing of construction activities, and haul routes) cannot be accurately determined until the project is initiated. Actual construction-related emissions cannot be effectively quantified before the project begins. General estimates are available and the impacts on air quality can be minimized by compliance with all federal, state, and local regulations that govern construction activities and emissions from construction vehicles.

Specific mitigation measures to control fugitive dust would be identified in a dust control plan, or similar document, prepared before project construction. These mitigation measures could include some or all of the following:

- Stabilize construction roads and spoil piles
- Limit speeds on unpaved construction roads
- Periodically water unpaved construction roads to control dust
- Perform housekeeping (*i.e.*, remove dirt spilled onto paved roads)
- Cover haul trucks
- Minimize material handling (*i.e.*, drop heights, double-handling)
- Cease grading and excavation activities during high winds and during extreme air pollution episodes
- Phase grading to minimize the area of disturbed soils
- Revegetate road medians and slopes

While emissions from construction activities and equipment would be unavoidable, a mitigation plan would minimize impacts to local ambient air quality and the nuisance impacts to the public in proximity to the project. The mitigation plan would include:

- Phase construction to minimize daily emissions
- Perform proper maintenance of construction vehicles to maximize efficiency and minimize emissions

Impacts to air quality from construction would be SMALL and would not warrant additional mitigation.

4.4.2 SOCIAL AND ECONOMIC IMPACTS OF CONSTRUCTION

This subsection evaluates the demographic, economic, infrastructure, and community impacts to the region as a result of constructing Units 2 and 3. The evaluation assesses impacts of construction-related activities including the presence of the construction workforce in the region.

4.4.2.1 Demographic Impacts

Socioeconomic impacts are the result of changes to a community's employment baselines. Changes to employment drive changes to population baselines. Changes in population result in changes to spending in the area. Changes to demands on social service systems such as public safety and education also result from changes to population. Changes in employment and population also affect demand in the area's infrastructure including housing stock and road systems.

SCE&G based its analyses on the estimated peak of 3,600 construction workers and an expected construction period beginning with preconstruction activities in 2008 and continuing through completion of Unit 3 in 2019. Preconstruction activities are expected to last approximately 30 months and construction activities to take an additional 93 months.

The 2000 population within 50 miles of the construction site was approximately 1,028,075 people and it is projected to grow to approximately 1,295,424 by 2020 (see Table 2.5-1) for an average annual growth rate of 1.2% during the construction period.

Of the current workers at Unit 1, nearly 95% reside in Fairfield County, the home site of the plant, or in one of three adjacent counties: Lexington, Newberry, or Richland. Therefore, these four counties comprise the region of influence and are the focus of these analyses. The remaining 5% of the current workers maintain a permanent address elsewhere. Of the current employees who live in the region of influence, approximately 9.7% live in Fairfield County, 36% in Lexington County, 19% in Newberry County, and 35% in Richland County. SCE&G assumed that the construction workforce for Units 2 and 3 who would migrate to the four-county region from outside the region would locate in individual counties in approximately the same proportion as the existing Unit 1 workforce. SCE&G also assumed spending by workers and the number of indirect jobs created by changes in population within the counties in the region of influence would be distributed among the counties in approximately the same proportion as the spending and job creation patterns of the existing workforce.

SCE&G anticipates employing 3,600 construction workers at peak construction activity (Table 3.10-2 and Figure 3.10-1). As indicated in Table 4.4-2, approximately 70% of the required workforce would be skilled crafts labor and

approximately 30% of the workforce is expected to be management or related administrative support personnel. SCE&G estimates that 50% of the skilled crafts workers (1,260 people) would be drawn from within the four county region, while the remainder of skilled crafts workers (1,260 workers) and 100% of the managerial/administrative support personnel (about 1,080 individuals) would currently reside outside of the region of influence. If the required construction labor force is pulled from within the region in a greater portion than is anticipated in this analysis, impacts from construction activities would be less than are presented in Table 4.4-2.

The 3,600 jobs created by the proposed action would be in Fairfield County and would be new jobs to the county. Some of workers fulfilling these jobs would already live in one of the four counties, some would move into one of the four counties, and some would continue to live outside of the region of influence.

The in-migration (workers who currently live outside of the region of influence but are expected to establish residence in one of the four counties) of approximately 2,340 direct workers to the region of influence would create new indirect jobs in the area because of the “multiplier” effect. The multiplier effect recognizes that each dollar spent on goods and services by a construction worker becomes income to a vendor, who saves a portion of that income, pays taxes from that income, and spends the remainder of the earnings. In turn, this re-spending becomes income to someone else, who in turn saves part, uses a portion to pay taxes, spends the rest, and so on. The final multiplier indicates the amount of turnover from the initial dollar spent. The Economics and Statistics Division of the U.S. Department of Commerce Bureau of Economic Analysis uses an economic model, RIMS II, to calculate multipliers for industry jobs in a particular geographical area and earnings by incorporating buying and selling linkages among regional industries. RIMS II estimated the employment multiplier for new plant construction-related expenditures in the four-county region of influence as 2.045, meaning that for each construction worker new to the region, an additional 1.045 jobs would be created in the region of influence (U.S. BEA 2006).

Approximately 85% of the managerial/administrative in-migrating workers and 70% of the in-migrating skilled crafts workers are expected to move into the region of influence with families. Within the counties in the region of influence, Fairfield County has the largest average household with 2.6 individuals per household (USCB 2000a). Therefore, for this analysis, the average household size is estimated to be 2.6 members. The remaining 15% of managerial/administrative workers and 30% of skilled crafts workers would relocate to the region of influence without families. Indirect jobs would be created by the spending of the 2,340 in-migrating direct workers, with or without families. SCE&G estimates based on Bureau of Economic Analysis multipliers, that approximately 2,446 indirect jobs (2,340 × 1.045) would be created in the region of influence and another 1,317 indirect jobs (1,260 × 1.045) outside the region of influence. These indirect jobs in the region would likely occur in the counties in the same portion that in-migrating workers are expected to live in each county. Table 4.4-3 displays information about the number of direct jobs, the number of indirect jobs, and the total or composite number of new jobs in each of the four counties. Indirect jobs would

represent new jobs in the county but the jobs are expected to be filled by existing residents of the county. Indirect jobs are usually in the service industry. Often entrepreneurs, sole proprietors, and sometimes currently unemployed individuals form businesses to serve the needs of the directly employed workers and their families. The additional new composite jobs (direct and indirect jobs) represent an increase of 1.8% of the 2005 civilian labor force in the region of influence.

Some directly employed workers without families and some directly employed workers with families are expected to relocate to one of the counties in the ROI. The total population change would be 5,220 persons, or about 0.9 percent of the 2000 population in the region. Table 4.4-4 displays this information. The expected change in population in each of the four counties is considered to be small, less than 3%. Changes in Fairfield County would be 504 people or 2.1% of the 2000 population; 1,902 people in Lexington County or 0.9% of the 2000 population; 999 people in Newberry County or 2.8% of the 2000 population; and 1,815 people in Richland County or about 0.6% of the 2000 population.

4.4.2.2 Community Impacts

Social, economic, infrastructure, and community impacts to the four-county region would result from constructing Units 2 and 3. SCE&G expects site preparation and construction related activities to continue for more than 10 years and employ as many as 3,600 workers during the peak period.

4.4.2.2.1 Economy

The impacts of construction activities on the regional economy are based on the region's current and projected economy and population. The COL, if approved, would be in effect for 20 years after approval, and construction could begin anytime in that 20 years. For this analysis, SCE&G assumed site preparation would begin in October 2008. Construction would begin in April 2011, following NRC issuance of the COL and completion of the site preparation activities for Units 2 and 3. The construction workforce would start to arrive when site preparation begins in the preconstruction phase.

As stated previously, spending by members of the construction workforce would create 2,446 indirect jobs in the region in addition to those 3,600 direct jobs, at peak period, created by the project itself. An influx of 2,340 construction workers migrating into the region coupled with 1,260 other workers who now live in the region but would then be working at VCSNS would have positive economic impacts in the region. The creation of such a large number of direct and indirect jobs could reduce unemployment and would create business opportunities for goods and service-related industries, including the housing industry. Workers would be expected to spend most of their earnings in the county of permanent residence; hence, most of the indirect jobs related to VCSNS construction activities would be in those counties in proportion to the residential distribution patterns. However, Fairfield County could receive a disproportionately high number of these indirect jobs because the large onsite workforce would likely purchase fuel, food, and other incidentals in the greater Jenkinsville/Fairfield

County area. The two smaller counties in the region of influence—Fairfield and Newberry—would experience the greater economic impacts because of their relatively small population and employment bases. In the two larger counties, Lexington and Richland, the economic impacts would be less.

The peak period of construction is expected to have 3,600 workers onsite and occur in year six of the construction schedule (Table 3.10-2). If preconstruction activities begin in October 2008, the peak construction period would occur in 2013. A second, somewhat smaller (up to 3,500 workers) period of increased construction activities would occur in year 8 of the construction schedule, or approximately 2015. The workforce estimate depicted in Figure 3.10-1 reflects the construction of Unit 2 and then Unit 3.

SCE&G concludes that the impacts from construction on the economy or labor force in the region of influence would be SMALL in Lexington, Newberry, and Richland Counties. The impacts in Fairfield County would be LARGE because the proposed project is located in the county and because the county currently has such a small labor pool and population base. Changes to population and employment baselines would result in a LARGE impact in Fairfield County. Because the impacts enhance the economic viability of the county specifically and the region of influence generally, mitigation would not be warranted.

4.4.2.2.2 Taxes

Several types of tax revenues would be generated by construction activities; the construction would require that commodities be purchased from vendors who would pay sales, payroll, and business income taxes. Worker wages would be taxed as personal income. Worker expenditures would also generate sales taxes and business income that would be taxed. In addition, SCE&G pays payroll taxes and property taxes on Unit 1 and would be expected to pay taxes related to the construction of Units 2 and 3 as discussed below. Increased revenues to multilevels of government are viewed as a benefit to the state and the local jurisdictions in the region. Table 4.4-5 displays information about average base wages for construction personnel. SCE&G estimates that at the peak period of construction, the average monthly base salary (2,000-hour work year, before overtime pay) for all workers would be $2,811 or $33,728 annually. Therefore, the peak construction monthly payroll, before overtime considerations, would be approximately $10,119,600 for the 3,600 construction workers. Individuals in South Carolina pay an average of 29.3% of gross earnings in taxes for all end-use sources (gasoline, cigarette, retail sales, and personal income at the federal, local, and state level). At this percentage rate, taxing jurisdictions would receive approximately $34.6 million dollars during the 12-month period with peak employment from workers' earnings. Estimates of the amount of taxes that businesses would pay as a result of the construction workers' presence or taxes paid by indirectly employed individuals were not determined. However, wages and salaries of the construction workforce would have a multiplier effect, where wages would be spent and then re-spent within the region. Because of the multiplier effect and the additional demand for goods and services, retail and service sector businesses in the region of influence would experience increased sales. There

would also be opportunities for new startup businesses and increased job opportunities with taxable wages and salaries. South Carolina collected $2,608,227,000 in individual income taxes in the fiscal year ending in June 2006 (SCBCB 2006). During the 12-month period that includes the peak construction workforce of 3,600 individuals, the annual payroll would generate approximately $118,047,650 in basic gross salaries; at an average tax rate of 10.5% on personal income, this annual payroll would generate $12,395,000 for the state of South Carolina or approximately 0.48% of what was collected by the state in personal income tax in the fiscal year ending in June 2006.

Property Taxes

Property taxes for Units 2 and 3 would not be due during construction. Property taxes on Units 2 and 3 are applicable only after the units are in-service.

A source of revenue from property taxes would be taxes generated by housing purchased by the construction workforce relocating to the region of influence. In-migrating workers could construct new housing or increase the demand for existing housing. Newly constructed housing would increase each county's tax base, thus increasing property tax revenues. The increased demand for existing housing would have little overall effect on tax revenues in the more heavily populated jurisdictions, but in rural Fairfield and Newberry Counties, the beneficial effects could be more significant.

Summary of Tax Impacts

In summary, the amount of taxes collected over the more than 10-year construction period would increase the total amount of taxes that local, state, and federal taxing jurisdictions collected. However, the amount of sales and personal/ business income taxes collected would be relatively small compared to the total amount of taxes collected by the state of South Carolina and the governmental jurisdictions within the region of influence. The tax payments to Fairfield County government would have a LARGE and beneficial impact in the county. The addition of any new workers to the state and those workers' wages added to the state's base of 2,080,519 individuals in the labor force (Table 2.5-10) is important, but small.

SCE&G concludes that the potential beneficial impacts from all types of taxes collected during construction period in various forms (personal income, business income, inventory, payroll related, sales, and personal and real property, etc.) would be LARGE in Fairfield County and SMALL in Newberry, Lexington, and Richland Counties. Since the impacts are generally SMALL and the additional tax revenue increases the economic vitality of the region, mitigation would not be warranted.

4.4.2.2.3 Land Use

In the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, NRC 1996), NRC presents their method for defining the

impact significance of offsite land use during refurbishment (*i.e.*, large construction activities). SCE&G reviewed this methodology and determined that the significance levels were appropriate to apply to an assessment of offsite land use impacts as a result of new construction at VCSNS. Fairfield County is the focus of the land use analysis because the new units would be built there, and roughly one-tenth of the construction workforce would likely reside there.

Higher percentages of the construction workforce would live in Lexington, Newberry, and Richland Counties than in Fairfield County. Newberry County is rural with nearly 2,800 vacant housing units as of the 2000 Census (Table 2.5-16). There could be substantial new housing construction in the county to accommodate the approximately 448 direct workers who would move into the county. Most new homes would likely be built near existing communities to take advantage of existing infrastructure, and thus residential development would change land use in those communities. However, the overall land use patterns of Newberry County would be unlikely to change significantly. Lexington and Richland Counties are heavily populated and contain the Columbia metropolitan area and surrounding suburbs. The 1,666 direct workers moving into Lexington and Richland County would readily find housing among the approximately 220,770 units existing in 2000 (Table 2.5-16). Land use changes in those two counties are influenced by a variety of socioeconomic forces, which would dilute potential land use impacts created by the construction of the new units at VCSNS.

Land Use in Fairfield County

The land area of Fairfield County is 687 square miles (Fairfield County 1997). The county has two small incorporated municipalities, the town of Ridgeway and the town of Winnsboro. The predominant land use is forestry (87% of the unincorporated area in 1990). In 1990, developed areas represented approximately 13% of the total land area in the county (Section 2.2). Most industry is related to forestry or manufacturing. There are no new industries known to have located in the area as a result of the VCSNS presence. Approximately 10% of the current VCSNS workforce who live in the region of influence, live in Fairfield County.

As stated in Section 2.2 and Subsection 2.5.2.4, Fairfield County and municipalities within the county have adopted comprehensive land use plans to guide development. From 1990 to 2000, the Fairfield County population grew at an average annual growth rate of approximately 0.5%. The County encourages growth in areas where public facilities, such as water and sewer systems, exist or are scheduled to be built in the future. Fairfield County promotes an arrangement of land use, circulation, and services that would contribute to the economic, social and physical health, safety, welfare, and convenience to the county (Fairfield County 1997).

Construction-Related Population Growth

Construction of Unit 1 had a large, temporary, indirect impact on the economy in Fairfield County, as evidenced by an upswing in residential and commercial

activity during that period. The economy has since returned to preconstruction levels.

As stated in Subsection 2.5.1, the 2000 population of Fairfield County was approximately 23,454 and had a population density of 34 people per square mile. At the peak period of construction, construction-related population growth in Fairfield County may reach nearly 504 people (workers and families, Subsection 4.4.2.1), an increase of 2.1% over the 2000 estimated population. According to NRC guidelines, construction-related population changes of this magnitude would be considered SMALL.

The increase in population from the construction workforce would be small for all four counties. The 2000 census (USCB 2000b) estimated that Lexington County had a population density of about 309 people per square mile. The construction population would be an increase of 1,902 people or about 0.9% to the estimated 2000 base. Newberry County had a population density of 57 people per square mile. In-migrating construction workforce and families would increase its population by about 2.8% from the 2000 base. Richland County had a population density of 424 people per square mile. The in-migrating construction workforce and families would be an increase of 0.6% over the 2000 baseline.

Conclusion

Fairfield County is predominantly rural and forestry-based land use would likely continue to dominate in the foreseeable future. Commercial and residential development has historically been minimal. The county's land use experienced little change with the construction of Unit 1 in the mid-1980s. The construction of Units 2 and 3 would create a temporary upswing in residential and commercial activity. A temporary conversion of some land to other uses (mobile home parks, RV camp sites, convenience stores, hotel/motel property, etc.) is possible. Some construction workers could become long-term residents. However, based on the Unit 1 construction experience, SCE&G estimates that most in-migrating construction workers and their families would leave the region of influence upon project completion, and residential and commercial activity would return to approximately preconstruction levels. Therefore, offsite land use changes would be small, thus, the impact would be considered SMALL in surrounding counties of Lexington, Richland, and Newberry, but MODERATE in Fairfield County. Because the changes would be small, the impacts would be SMALL or MODERATE. Since the increases would result in greater economic vitality in each of the counties, mitigation would not be warranted.

4.4.2.2.4 Transportation

Impacts of the proposed construction activities on transportation and traffic would be most obvious on the state-owned and maintained rural roads of Fairfield County, particularly SC 215, a two-lane highway that provides access to Unit 1 from the north and south, and SC 213, which provides access from the east and west. Impacts of construction on traffic are determined by five elements:

- The number of construction workers and their vehicles on the roads
- The number of shift changes for the construction workforce
- The number of truck deliveries to the construction site
- The projected population growth rate in Fairfield County, the county most affected by the construction
- The capacity of the roads

For this analysis, SCE&G has assumed that the construction population of 3,600 workers would be split equally among four shifts and each shift would include 25% of the total construction workforce. The shift structure would not be as described, but this assumption results in a conservative traffic analysis. While it is a common practice for construction workers to carpool, this analysis conservatively assumes one worker per vehicle. During peak and near-peak periods of construction, there would be approximately 850 to 900 vehicles per shift (SCE&G has used 900 for this analysis). In addition to construction workers, SCE&G estimates that approximately 100 truck deliveries would be made daily to the construction site.

Both truck deliveries and construction workforce would enter the site using a new access road that would be accessed from SC 213 (Figure 3.1-3). The construction access road would minimize the disruption of the flow of traffic for the Unit 1 workforce (and outage workforces) using the Unit 1 entrance from County Road 311 that intersects SC 215 approximately 1.5 miles north of Jenkinsville. The intersection of the access road (Parr Road) and SC 213 would be equipped with an island and turning lanes to facilitate access to and from SC 213.

Roadway traffic is classified by the ability of drivers to maneuver, and the maintenance of the traffic flow. Movement on roads with a Level of Service A is described as free-flowing at or above the posted speed limit. Level of Service B may limit lane changes, but does not reduce speed. Level of Service C and D are progressively more congested. Level of Service E provides marginal service, and usually occurs on roads servicing traffic beyond their design capacity. Traffic flow is irregular, speed varies rapidly, but the speed limit is rarely reached.

The South Carolina Department of Transportation (SCDOT) assumes the maximum road capacity on a two-lane rural minor arterial such as SC 215 to be 5,292 passenger cars per day with Level of Service A. The same road with Level of Service E would have as many as 14,472 vehicles per day. SC 213 is considered a rural major collector with a Level of Service design capacity of 4,214 cars per day at Level of Service A. As a rule of thumb, SCDOT engineers use 10% of the vehicle daily count as the number of vehicles per maximum hour of traffic when they plan road improvements.

The SCDOT considers tractor trailers as equivalent to 3 to 3½ passenger vehicles. Smaller trucks such as cement trucks and other delivery trucks would be considered the equivalent of two passenger vehicles.

Traffic on SC 215 south of VCSNS site, as measured by the 2005 Average Annual Daily Traffic, was 1,700 vehicles per day (see Table 2.5-12 and Figure 2.5-3; location 1). Traffic on SC 213, south of VCSNS site, as measured by the 2005 Average Annual Daily Traffic was 2,400 vehicles. Based on the SCDOT planning rule of thumb, the average number of vehicles on SC 215 during the hour of the day with maximum usage is 170 and the road is designed to support 529 vehicles per hour at Level of Service A. For SC 213, the average number of vehicles during the hour of the day with maximum usage is 240 and the road is designed to support 421 vehicles per hour at Level of Service A.

VCSNS has a current workforce of 635 individuals. For purposes of analysis, SCE&G conservatively assumed that 100% of the current VCSNS workforce would be working, with 60% day-shift; 30% night-shift; and 10% graveyard shift, and that all workers on a shift arrive and leave during the same hour. Therefore, the afternoon shift change results in the highest traffic count, with approximately 380 day workers leaving and 190 night-shift workers arriving, for a total of 572 vehicles during the hour of shift change. Also conservatively, SCE&G assumed that 50% (286 vehicles) of the traffic comes from the south on SC 215 and 50% (286 vehicles) comes from the west on SC 213. Most of the current workforce lives to the southwest of VCSNS.

If construction workers would also be changing shifts at the same time, there could be an additional 1,800 construction worker vehicles entering or leaving the site during the afternoon shift change. SCE&G assumes that 50% (900) would use SC 215, and then travel a short distance on SC 213 west to the construction entrance and 50% (900) would use SC 213 east to the construction entrance. To reduce congestion, delivery vehicles would be scheduled to not arrive or depart during shift changes so deliveries are not considered further in this analysis of traffic impacts.

The 2000 Fairfield County population was approximately 23,454 (Table 2.5-3) and is expected to increase by approximately 6% by 2010, the approximate time SCE&G estimates preconstruction activities can begin. Because most of the traffic on SC 215 and 213 during shift change is plant-related and the conservative assumptions SCE&G has made regarding the timing of VCSNS traffic on SC 215 and 213, local traffic was not factored into the analysis.

The SCDOT rates the capacity of SC 215 at 5,292 vehicles per day (or 529 vehicles per hour during the hour of greatest usage) at Level of Service A, with a maximum capacity of 14,472 vehicles per day (or 1,447 vehicles per hour) at Level of Service E. During shift change of the current unit as described in this analysis, with 286 cars on the road, SC 215 would maintain a Level of Service of A (529 cars per hour). SC 213, with 286 cars on the road would maintain a Level of Service of A (421 cars per hour). An additional 900 cars on SC 215 would decrease the Level of Service to D for the commuting hour. An additional 900 cars on SC 213 would decrease the Level of Service to less than E for the commuting hour. Using these conservative estimates, road capacity on SC 213 would be exceeded during the months of greatest construction activity.

In addition to the operation and construction workforce analyzed above, SCE&G conservatively estimates that an average outage workforce of approximately 1,000 workers for Unit 1 uses SC 215 and SC 213 for approximately 1 month during every refueling outage (which occurs on an 18-month schedule).

Construction workers would have a MODERATE to LARGE impact on the two-lane highways in Fairfield and Newberry County, specifically SC 215, SC 213, and the highways that feed into them. Mitigation would be necessary to accommodate the additional vehicles on SC 215 and 213.

Mitigation measures would be included in a construction management traffic plan developed before the start of construction. Potential mitigation measures could include establishing a centralized parking area away from the site and shuttling construction workers to the site in buses or vans, encouraging carpools, staggering construction shifts so they do not coincide with operational shifts, and scheduling construction deliveries to avoid shift change times. SCE&G could also establish a shuttle service from the Columbia area, where a significant portion of the construction workforce would likely settle. The Unit 1 operations workforce would continue to enter the plant at the current entrance on SC 215.

4.4.2.2.5 Aesthetics and Recreation

As part of construction of Units 2 and 3, approximately 490 acres would be cleared and excavated, roads would be constructed, and heavy equipment would be brought to the site by road and rail. Most of the clearing would be at the location of the new units. However, portions of the Monticello and Parr Reservoirs shorelines would be cleared, excavated, and graded for the raw water and water treatment plant intake structures and the discharge structure. The clearing and excavation for Units 2 and 3 and their support facilities would not be visible from offsite roads, although clearing and construction activities for the water treatment facility and intake and discharge structures would be visible from the reservoirs. SCE&G would use best management practices to prevent erosion and sedimentation, including reseeding bare earth, but the affected shorelines would clearly be a construction site for the duration of the intake and discharge structures construction.

Construction of Units 2 and 3 would require a 250-foot-tall crane tower. The steel tower could be visible from SC 213 and 215, and the Broad River, but the open structure would not significantly impact the aesthetics at the site or the surrounding rural area. Because the aesthetic impacts of construction would be localized and the reach of the river is not popular for recreational boating except by fishermen, SCE&G has determined that impacts would be SMALL and not warrant mitigation.

The Parr Hydroelectric Project Wildlife Management Area is immediately north and west of the SCE&G property. The Wildlife Management Area is used by hunters and the boat landing by fishermen during the appropriate seasons. Use of the area and boat landing is seasonal. Construction impacts such as noise and air pollutants would be limited to the VCSNS site and would not be noticeable from

offsite. Construction would not directly affect any other recreational facilities in the region of influence, although some facilities could expect a high use as construction workers and their families enjoy the recreational sites. Impacts on aesthetics and recreation would be SMALL in all four counties and, therefore, would not warrant mitigation.

4.4.2.2.6 Housing

Rental property is scarce in rural Newberry and Fairfield Counties which are the counties closest to the VCSNS site. It is more plentiful in the larger municipalities such as Columbia, West Columbia, Irmo, and Lexington which are in Lexington and Richland Counties. The counties with larger populations—Lexington and Richland Counties—have more vacant housing. Table 2.5-16 summarizes housing characteristics in Fairfield, Lexington, Newberry, and Richland Counties.

Impacts on housing from the construction workforce depend on the number of workers already residing within the region of influence, worker determined acceptable commuting distances, and the number of workers that would relocate from outside the region to inside the region and thus require housing. SCE&G estimates that 2,340 workers would move from outside of the region of influence to one of the counties in the region of influence. Approximately 1,800 of these workers would bring families and 540 workers would relocate to the region of influence without families. All 2,340 in-migrating workers would need housing. Some of the workers would require permanent housing, generally owner-occupied, and others would elect to rent housing. Still others would elect to reside in transitional housing such as residential hotels, motels, rooms in private home, or to bring their own housing in the form of campers and mobile homes. Fairfield County has numerous RV camper sites with complete service connections. In addition, motels in Winnsboro, Newberry, and in Irmo offer shelter by the week/month. It is likely that additional temporary housing accommodations will be developed in the private sector to satisfy the demand for temporary housing.

As indicated in Table 4.4-6, there were almost 22,000 vacant housing units in the region of influence in 2000. SCE&G estimates that, in absolute numbers, the available housing would be sufficient to house the construction workforce. In-migrating workers could secure housing from the existing stock, in any of the four counties within the region, have new homes constructed, or bring their own housing to the region. Construction employment would increase gradually, reaching the peak of 3,600 workers in the sixth year of construction activities, allowing time for market forces to anticipate and accommodate the influx of workers and their families.

Because Fairfield and Newberry Counties have small populations, their housing markets would likely be the most impacted. However, these counties have much higher vacancy rates for housing units than do the two larger counties. If all in-migrating workers to Fairfield County were demanding housing from the existing stock, the impact would be 2.2% of the 2000 inventory or 14% of the vacant units available that year. If all in-migrating workers to Newberry County were to demand housing from the existing stock, the impact would be 2.7% of the inventory in 2000

or 16.1% of the vacant housing available that year. The Lexington and Richland County housing markets would experience a small impact on housing, 0.9% and 0.6% of the 2000 inventory, respectively.

SCE&G concludes that the potential impacts on housing would be SMALL for all four counties and would not warrant mitigation.

4.4.2.2.7 Public Services

Water Supply Facilities

SCE&G considered both construction demand and population increases on local water resources. Construction could bring as many as 5,220 new residents to the region, with a peak onsite construction workforce of 3,600 workers. The average per capita water usage in the U.S. is 90 gallons per day (gpd) per person (EPA 2003).

VCSNS does not currently use water from a municipal system. The Monticello Reservoir provides potable water for Unit 1 and would provide the water for the construction of Units 2 and 3. Therefore, water use by the onsite workforce would not impact municipal water suppliers. The Unit 1 potable water system uses an average of 27,800 gpd of surface water and has a maximum daily capacity of 1.296 million gpd (Subsection 2.3.2.2). The estimated peak construction potable water demand is 108,000 gpd (peak construction workforce of 3,600 × 30 gpd). The estimated potable water use is well within the capacity of the existing VCSNS water system. However, SCE&G plans to construct a new water treatment facility that would support both potable and non-potable water demand during construction of Units 2 and 3. SCE&G would also obtain water for construction uses from Jenkinsville Water Company. As noted in Table 2.5-18, the Jenkinsville Water District obtains groundwater from wells located in Fairfield County. They also purchase water from the Midcounty Water District, which obtains water from the Town of Winnsboro. A new water line would be constructed from VCSNS to a tank operated by Jenkinsville Water District to supply water for the construction facilities located near the intersection of Parr Road and SC Highway 213. Assuming an average consumption rate of 50 gallons per person per day and peak population of 300 workers at these construction facilities, the demand could be as high as 15,000 gallons per day. This peak demand represents approximately 10% of the average usage for the Jenkinsville system but less than 0.5% of the capacity of the Town of Winnsboro system. The Town of Winnsboro has more than 1 million gallons per day of excess capacity (SCDNR 2005). As an interim measure until the planned water treatment facility can supply water, the Jenkinsville system could be used to supply potable water to the area where Units 2 and 3 would be constructed and to the concrete batch plant. The Jenkinsville Water District is able to meet the projected VCSNS demand considering its purchase agreements with Midcounty Water District and the Town of Winnsboro. Construction impacts on surface water supplies would be SMALL and would not warrant mitigation.

The impact to the local water supply systems from construction-related population growth can be estimated by calculating the amount of water that would be required by the total population increase. Assuming a conservative average consumption per person of 90 gpd (EPA 2003), total consumption in the region of influence could increase by 469,800 gpd due to a construction-related population increase of 5,220 people in the four counties. The excess public water supply capacity from surface water in Fairfield County alone is approximately 1.4 million gpd, and all four counties have excess surface water capacity (see Table 2.5-18). The consumption increase would be spread over the four-county region of influence. Thus, impacts of the in-migrating construction workforce on municipal water supplies would be SMALL and would not warrant mitigation.

Wastewater Treatment Facilities

Early in the construction period, portable toilet facilities would be provided at the construction work site. A new sanitary waste treatment system would be constructed to support Units 2 and 3 operations. This system would be constructed early in the construction period to allow the workforce to transition from portable toilet facilities to the permanent system. A separate sanitary wastewater treatment plant would serve the offsite construction support facilities.

Subsection 2.5.2.7 describes the public wastewater treatment systems in the four counties, their capacities, and current demands. Wastewater treatment facilities in the four counties have excess capacity (Table 2.5-19). The impact to local wastewater treatment systems from construction-related population increases can be determined by calculating the amount of water that would be used and disposed of by these individuals. To be conservative, SCE&G estimates that 100% of the assumed water consumption of 90 gpd per person would be disposed of through the wastewater treatment facilities. The construction-related population increase of 5,220 people could require 469,800 gpd of additional wastewater treatment capacity in the four-county area. Currently, the four counties have excess wastewater treatment capacity of more than 40 million gpd, including 25 million gpd of excess capacity in the system serving the Columbia metropolitan area. Impacts of the in-migrating construction workforce on wastewater treatment facilities in the region would be SMALL and would not warrant mitigation.

Police, Fire, and Medical Facilities

In 2005, Fairfield, Lexington, Newberry, and Richland Counties' persons-per-police-officer ratios were approximately 321:1, 504:1, 457:1, and 376:1, respectively (Table 2.5-20). SCE&G currently has and would continue to employ its own security force at VCSNS.

Construction of Units 2 and 3 would produce an influx of approximately 504 new residents to Fairfield County. Approximately 1,902 new residents would move into Lexington County, 999 into Newberry County, and 1,815 into Richland County. The rest of the construction workforce and families would live outside of the region of influence. If there were no changes in the number of police officers, the population increases attributable to construction activities at VCSNS would

increase the persons-per-police-officer ratios slightly (Table 4.4-7). The percent increase in ratio attributable to the construction population increase would be SMALL, less than 3% for Fairfield, Lexington, Newberry, and Richland Counties. Based on the small percentage increase in persons-per-police-officer ratios, SCE&G concludes that the potential impacts of construction on police services for all four counties would be SMALL. This conclusion is based in part on an analysis NRC performed of nuclear power plant refurbishment impacts sustained during original plant construction (U.S. NRC 1996). NRC selected seven case study plants whose characteristics represented the spectrum of nuclear power plants in the United States today. NRC reported that:

> "(No) serious disruption of public safety services occurred as a result of original construction at the seven case study sites. Most communities showed a steady increase in expenditures connected with public safety departments. Tax contributions from the plant often enabled expansion of public safety services in the purchase of new buildings and equipment and the acquisition of additional staff."

SCE&G concludes that any potential impacts on police services could be mitigated by using increased property tax revenues to fund additional police officers and facilities.

In 2000, Fairfield, Lexington, Newberry, and Richland Counties' persons-per-firefighter ratios were 215:1, 893:1, 182:1 and 593:1, respectively (Table 2.5-20). If there were no changes in the number of firefighters in the counties, population increases due to construction would increase the persons-per-firefighter ratios slightly (Table 4.4-8). The percent increase in ratios attributed to construction would be less than 3% for Fairfield, Lexington, Newberry, and Richland Counties. In 1997, county planners indicated they were implementing an expansion of Fairfield County firefighting capabilities (Fairfield County 1997). Since then, one additional fire station has been built. In addition, the part-time emergency medical services staff was converted to permanent emergency medical service/fire staff that manage two stations full time. Fairfield County considers the current level of public safety and fire protection adequate and capable of accommodating population increases. Therefore, SCE&G concludes that the potential impacts of nuclear power plant construction on fire protection services would be SMALL for all four counties and mitigation would not be warranted.

Detailed information concerning the medical services in the four-county region is provided in Subsection 2.5.2.7. Minor injuries to construction workers would be assessed and treated by onsite medical personnel. Other injuries would be treated at one of the hospitals in the region of influence, depending on the severity of the injury. For the existing VCSNS workforce, agreements are in place with local medical providers to support emergencies. SCE&G would reach similar agreements to provide emergency medical services to the construction workforce. Construction activities should not burden existing medical services.

The medical facilities in the four counties provide medical care to much of the population within the region. The peak construction workforce would increase the

population in the region by approximately 0.9%. The potential impacts of construction on medical services would be SMALL, and mitigation would not be warranted.

4.4.2.2.8 Social Services

This subsection focuses on the potential impacts of construction on the social and related services provided to socially and economically disadvantaged segments of the population. This subsection is distinguished from environmental justice issues, which are discussed in Subsection 4.4.3.

Construction activities could be viewed as economically beneficial to the population served by the Department of Social Services. The constructing contractor could hire local unemployed or underemployed individuals, thus improving their economic position and decreasing their need for the services provided by the Department of Social Services. SCE&G concludes that the potential impacts of construction on the demand for social and related services would be SMALL and positive and therefore would not warrant mitigation.

Education

Approximately 21% to 22% of the population in the four counties is considered "school aged," between 5 and 19 years old (USCB 2000a). SCE&G applied these population distribution percentages to the construction workforce population to estimate the number of construction workforce-related school-aged children in each of the four counties. Table 4.4-9 displays information about the population and school enrollment in the four-county region. SCE&G estimates that in a construction-workforce related population of 5,220 people, roughly 1,018 individuals would be school-aged children. The school districts in all four counties have student teacher ratios below the state-mandated maximum of 28:1, and the construction workforce would not push any district's ratios higher than the state mandate.

The student populations in Fairfield, Lexington, Newberry, and Richland Counties would increase by 1.9%, 0.8%, 2.5%, and 0.5%, respectively, from the construction-related population increase. NRC considers increases in enrollment of 3% or less to be SMALL (U.S. NRC 1996). The Fairfield, Lexington, Newberry, and Richland Counties' school systems could accommodate the increase in student population associated with construction. Lexington and Richland Counties plan to build additional schools before the construction period begins (see Subsection 2.5.2.8). The impact to the four counties would be SMALL.

The peak construction workforce would not be reached until approximately 6 years after site preparation begins. SCE&G would provide the local communities with timely information regarding the proposed construction activities at VCSNS, giving schools several years to make accommodations for the additional influx of students. Increased tax revenues as a result of the increased population and property taxes would provide funding for schools. No additional mitigation would be warranted.

4.4.3 ENVIRONMENTAL JUSTICE

Environmental justice refers to a federal policy under which each federal agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The NRC has a policy on the treatment of environmental justice matters in licensing actions (69 FR 52040). Figures 2.5-6 through 2.5-11 (Subsection 2.5.4) locate minority and low-income populations within 50 miles of Units 2 and 3. The proposed construction site is in a predominantly Black races census block group, and adjacent census block groups on the east side of the Broad River also have predominantly Black races populations.

SCE&G evaluated whether the health or welfare of minority and low-income populations could be disproportionately affected by construction activities. SCE&G identified the most likely pathways by which adverse environmental impacts associated with construction could affect human populations. If the adverse impacts were found to be small, SCE&G concluded there would be no disproportionate impact on low-income or minority populations. For each pathway, the following paragraphs demonstrate that impacts to the general population would be SMALL and thus the impacts to low-income and minority populations would not be disproportionately high and adverse.

Land use in the region could be impacted through new housing construction to accommodate the incoming population, but most new homes would likely be built near existing communities. A temporary conversion of some land to other uses (mobile home parks, convenience stores, hotel or motel property, etc.) is possible. Given that the immediate vicinity has already accommodated a large construction workforce over a long duration, impacts associated with construction of Units 2 and 3 would be SMALL (Subsection 4.1.1.2). Likewise, any impacts to historic or cultural resources from construction would be SMALL and would not warrant mitigation (Subsection 4.1.3).

Impacts to surface water, including the Broad River, Monticello Reservoir, Parr Reservoir, or Mayo Creek, are expected to be SMALL, because any ground-disturbing activities would be permitted and overseen by state and federal regulators, and guided by an approved Storm Water Pollution Prevention Plan (Subsection 4.2.3.1). In the unlikely event small amounts of contaminants escape into the environment, they would have only a small, localized, temporary impact on the water table aquifer, which is hydraulically isolated Subsection 4.2.3.2). Any impacts to groundwater quality would be SMALL and would not warrant mitigation beyond those described in Subsection 4.2.3.2 or required by permit.

Construction has the potential to affect terrestrial habitat on the plant site. However, the area of the affected habitat represents a small portion of the available undeveloped land in the vicinity, and the construction-related mortality or temporary displacement of wildlife would be minimal relative to wildlife populations in the vicinity. Construction activities would not reduce the local diversity of plants or plant communities, and would not impact threatened or

endangered species. Noise-related impacts and bird collisions during construction would be negligible (Subsection 4.3.1.1). Impacts to aquatic ecosystems could result from sedimentation and, although less likely, spills of petroleum products. However, any land-disturbing activities would be of relatively short duration, would be permitted and overseen by state and federal regulators, and would be guided by an approved Storm Water Pollution Prevention Plan. Further, any small spills would be mitigated according to a Construction Phase Spill Prevention, Control, and Countermeasures Plan. There are no habitats or species present designated by South Carolina Department of Natural Resources or the U.S. Fish and Wildlife Service as sensitive or critical. SCE&G concludes that construction-related impacts to terrestrial resources and aquatic communities in the vicinity would be SMALL.

Construction activities could cause temporary and localized physical impacts such as noise, odors, vehicle exhaust, and fugitive dust emissions. The exclusion area boundary is greater than half a mile in all directions from the new units' footprint. No major roads, public buildings, or residences are located within the exclusion area. Exhaust emissions from construction equipment and dust would cause minor and localized adverse impacts to air quality; however, a mitigation plan would minimize impacts to local ambient air quality and the nuisance impacts to the public close to the project. Impacts to air quality from construction are expected to be SMALL and temporary and would not be noticeable from offsite (Subsection 4.4.1.3). Likewise, noise impacts from construction would be SMALL and temporary, and would not warrant mitigation (Subsection 4.4.1.2).

Construction traffic would have a MODERATE to LARGE impact on two-lane highways in Fairfield and Newberry counties, particularly SC 213 and 215 and the highways that feed them. Mitigation would be necessary to accommodate the additional vehicles. SCE&G would develop a construction management traffic plan before the start of construction (Subsection 4.4.2.2.4).

The large construction project would reduce unemployment and create business opportunities for housing and service-related industries. The impacts of construction on the economy of the region would be beneficial and SMALL everywhere in the region except Fairfield and Newberry counties, where the positive impacts on the local economy would be MODERATE to LARGE (Subsection 4.4.2.2.1) and would not warrant mitigation.

Because Fairfield and Newberry counties have small populations and economies, and would experience the greatest relative increase in population, their housing markets would likely be most impacted. However, these counties have much higher vacancy rates than do Lexington and Richland counties. The economies of Fairfield and Newberry counties also would benefit from increased property values and the addition of housing. Increasing demand for homes could increase rental rates and housing prices, potentially displacing low-income populations (Subsection 4.4.2.2.6). However, very few block groups in Fairfield, Newberry, and Lexington counties have significant, low-income populations (Table 2.5-26 and Figure 2.5-11), and it is unlikely that the construction workforce would need low-income housing. Because construction employment would increase gradually,

allowing time for market forces to anticipate and accommodate the influx, the impacts to housing would be SMALL throughout the region of influence, and mitigation beyond self-adjusting market conditions would not be warranted.

SCE&G also assessed potential impacts from construction on public services in the vicinity of the plant (Subsection 4.4.2.2.7). Impacts to water supply facilities, wastewater treatment facilities, police, fire, and medical facilities would be SMALL, and would not warrant mitigation. Construction could be viewed as economically beneficial to the disadvantaged population served by the Department of Social Services, and impacts would be SMALL and positive.

School systems in Lexington, Richland, Newberry, and Fairfield counties could accommodate the increase in student population, and impact to these counties would be SMALL. SCE&G would provide the local communities with timely information regarding the proposed construction activities at VCSNS, giving schools several years to make accommodations for the additional influx of students. The quickest mitigation would be to hire additional teachers and move modular classrooms to existing schools. Increased tax revenues as a result of increased population and property taxes would provide funding for schools (Subsection 4.4.2.2.8).

Any potential radiological exposure impacts during construction would be limited to onsite construction workers. The annual doses (from all pathways) meet the public dose criteria and design objectives. In addition, VCSNS would be continually monitored during construction and appropriate actions would be taken as necessary to ensure that the construction workers are protected from radiation (Section 4.5).

SCE&G contacted local government officials and the staff of social welfare agencies concerning unusual resource dependencies or practices that could result in potentially disproportionate impacts to minority and low-income populations. No agency reported such dependencies or practices, as subsistence agriculture, hunting, or fishing, through which the populations could be disproportionately adversely affected by the construction project (TtNUS 2007). SCE&G did not identify any location-dependent disproportionately high and adverse impacts affecting minority and low-income populations.

In summary, no construction-related disproportionately high or adverse health or environmental effects impacting minority or low-income population health or welfare were identified. Therefore, SCE&G concludes that impacts of construction of Units 2 and 3 to minority and low-income populations would be SMALL and that additional mitigation beyond that described above would not be warranted.

Section 4.4 References

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Table 4.4-1
Peak and Attenuated Noise (in dBA) Levels Expected from Operations of Construction Equipment

Source	Nose Level (peak)	Distance from Source			
		50 feet	100 feet	200 feet	400 feet
Heavy trucks	95	84–89	78–83	72–77	66–71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80–89	74–82	68–77	60–71
Dozer	107	87–102	81–96	75–90	69–84
Generator	96	76	70	64	58
Crane	104	75–88	69–82	63–76	55–70
Loader	104	73–86	67–80	61–74	55–68
Grader	108	88–91	82–85	76–79	70–73
Dragline	105	85	79	73	67
Pile-driver	105	95	89	83	77
Forklift	100	95	89	83	77

Source: Golden et al. (1980).

Table 4.4-2
Peak Construction Workforce

Construction Workforce	Percent of workers	AP1000 2 units
Total Peak Workforce		3,600
Managerial/Administrative Support	30	1,080
Skilled Crafts Workers	70	2,520
Managerial/Administrative Support at Peak		1,080
Available from Region of Influence	0	0
In-Migrating Managerial/Administrative Support	100	1,080
Skilled Crafts Workers		2,520
Available from Region of Influence	50	1,260
In-migrating Skilled Crafts Workers to Region of Influence	50	1,260

Table 4.4-3
Direct and Indirect Workers for Each County in Region of Influence

				Percent of 2005 Labor Force[a]		
County	Direct Jobs	Indirect Jobs	Composite Jobs	Direct Jobs	Indirect Jobs	Composite Jobs
Fairfield	3,600	236	3,836	31	2.0	33
Lexington	0	891	891	0.0	0.7	0.7
Newberry	0	468	468	0.0	2.6	2.6
Richland	0	851	851	0.0	0.5	0.5
ROI	3,600	2,446	6,046	1.1	0.7	1.8

a) BLS (2005a) for 2005 labor force

Table 4.4-4
Change in Population from In-Migrating Construction Workers

County	Population in 2000[a]	Additional Population Due to Construction Workforce	Total Population	In-Migrants (Workers & Families) as Percent of Total Population
Fairfield	23,454	504	23,958	2.1
Lexington	216,014	1,902	217,916	0.9
Newberry	36,108	999	37,107	2.8
Richland	320,677	1,815	322,492	0.6
ROI	596,253	5,220	601,473	0.9

a) USCB (2000a)

Table 4.4-5
Average Monthly Base[a] Salary During Construction

BLS Occupational Code	Labor Skill Set[b]	Percent of Construction Labor Force[b]	Mean Annual Salary[c]
49-2093	Mechanical Equipment	3	$35,170
47-2111	Electrical	10	$36,720
47-2051	Concrete	10	$26,530
47-2221	Structural Steel	2	$35,220
47-2072	Other Civil	2	$27,430
47-2151	Piping/ Instrumentation	14	$28,580
47-2073	Site Support	20	$28,970
47-2131	Specialty	7	$27,180
47-1011	Non-Manual	25	$45,650
47-4099	Unclassified[d]	7	$28,350
		Average annual salary	$33,728
		Average monthly salary	$2,811

a) For 2,000 hour work-year; no overtime considered.
b) Table 3.10-1.
c) Base mean salary, May 2005, in South Carolina from BLS (2005b).
d) Added “skill set” to have estimated percents reach 100% of labor force.

Table 4.4-6
Housing for In-Migrating Construction Workers

County	Existing Housing Units 2000 (Baseline) [(a)]	Occupied Units 2000[(a)]	Vacant Units 2000[(a)]	Expected Change in Units Occupied	Change in Baseline Housing Units as Percent	Change to Vacant Units as Percent
Fairfield	10,383	8,774	1,609	226	2.2	14
Lexington	90,978	83,240	7,738	853	0.9	11
Newberry	16,805	14,026	2,779	448	2.7	16
Richland	129,793	120,101	9,692	814	0.6	8.4
ROI	247,959	226,141	21,818	2,340	0.9	11

a) USCB (2000a)

Table 4.4-7
Changes in Police Officer Ratios Due to Construction Population Increase

County	Population 2000[a]	Construction Related Population Increase	Population 2000 plus Construction Population	Current Number of Police Officers[b]	Current Officers to 2000 Population[b]	New Ratio	Percent Change
Fairfield	23,454	504	23,958	73	321	328	2.1
Lexington	216,014	1,902	217,916	429	504	508	0.9
Newberry	36,108	999	37,107	79	457	470	2.8
Richland	320,677	1,815	322,492	852	376	379	0.6

a) USCB (2000b)
b) Table 2.5-20

Table 4.4-8
Changes in Firefighter Ratios Due to Construction Population Increase

County	Population 2000[a]	Construction Related Population Increase	Population 2000 plus Construction Population	Current Number of Firefighters[b]	Current Firefighters to 2000 Population[b]	New Ratio	Percent Change
Fairfield	23,454	504	23,958	109	215	220	2.1
Lexington	216,014	1,902	217,916	242	893	900	0.9
Newberry	36,108	999	37,107	198	182	187	2.8
Richland	320,677	1,815	322,492	541	593	596	0.6

a) USCB (2000b)
b) See Table 2.5-20.

Table 4.4-9
Estimated Additional School-Aged Children in the Four-County Area

County	Total Number of School Aged Children[a]	Percent of Population School Aged Children 2000[a]	Expected Change in School Aged Children	Percent Change to Number of School Aged Children
Fairfield	5,192	22.14	100	1.9
Lexington	46,741	21.64	369	0.8
Newberry	7,538	20.88	187	2.5
Richland	71,345	22.25	362	0.5
ROI	130,816	21.94	1,018	0.8

a) USCB (2000a)

4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

4.5.1 SITE LAYOUT

The physical location of the new units relative to the existing VCSNS Unit 1 is depicted on Figure 3.1-3. As shown, the new units will be south of the existing unit. Construction activity will take place outside the Unit 1 protected area, but partially inside the Unit 1 exclusion area boundary.

4.5.2 RADIATION SOURCES

During the construction of the new units, the construction workers could be exposed to radiation sources from the routine operation of Unit 1. Furthermore, Unit 3 construction workers could be exposed to radiation from Unit 2 operation.

4.5.2.1 Direct Radiation

The existing unit's principal sources contributing to direct radiation exposure at the construction site include the Unit 1 reactor building (See Figure 3.1-3), the old steam generator recycle facility, and the planned independent spent fuel storage installation. In addition, workers constructing Unit 3 could be exposed to direct radiation from the Unit 2 shield building. Because the primary sources of gamma-emitting radioactivity associated with Unit 1 are contained within heavily shielded areas or containers, and given the large distance between Unit 1 and the location of the new units, external radiation doses from this facility are expected to be indistinguishable from background. According to the 2005 Radiological Environmental Operating Report, direct radiation measurements in the vicinity of the proposed construction area are not significantly different than preoperational monitoring values (SCE&G 2006a).

4.5.2.2 Gaseous Effluents

Construction workers could be exposed to radioactivity in gaseous effluents from Unit 1. Sources of gaseous releases for the existing unit are currently confined to four paths: main plant vent, reactor building purge line, waste gas storage tank, and oil incinerator (SCE&G 2007). The annual releases for 2005 were reported as 110 curies of fission and activation products, 0.00185 curies of iodine-131, 1.44×10^{-5} curies of particulates with half-lives greater than eight days, and 3.12 curies of tritium (SCE&G 2006b). The annual releases for 2005 are assumed to be typical for the existing unit. Unit 3 construction workers could be exposed to radioactivity in gaseous effluents from Unit 2. Subsection 3.5.2 presents the projected gaseous effluent releases for Unit 2.

4.5.2.3 Liquid Effluents

Construction workers could be exposed to radioactivity in liquid effluents from Unit 1. Effluents from the liquid waste disposal system result in small amounts of radioactivity in the Monticello and Parr Reservoirs. The annual liquid radioactivity releases for 2005 were reported as 0.076 curies of fission and activation products,

466 curies of tritium, and 0.85 curies of dissolved and entrained gases (SCE&G 2006b). The annual releases for 2005 are assumed to be typical for the existing unit. Subsection 3.5.1 presents the projected liquid effluent releases for Unit 2. Applying the Units 1 and 2 liquid effluent doses to Unit 3 construction workers is conservative in that it assumes these construction workers engage in the same activities that lead to the calculated liquid effluent doses (*i.e.*, consuming fish and drinking untreated surface water).

4.5.3 MEASURED AND CALCULATED DOSE RATES

The measured or calculated dose rates used to estimate worker dose are presented below.

4.5.3.1 Direct Radiation

4.5.3.1.1 Old Steam Generator Recycle Facility

SCE&G conducts periodic surveys of the area around the old steam generator recycle facility. A recent radiological survey shows general area readings outside of the building at 4 to 8 microrem per hour (SCE&G 2006c), which is not significantly different from background radiation levels. Therefore, there will be no direct radiation exposure from this facility to Units 2 and 3 construction workers.

4.5.3.1.2 Independent Spent Fuel Storage Installation

Thermoluminescent dosimeter (TLD) surveys for other pressurized water reactor independent spent fuel storage installations indicate that the direct radiation dose from the independent spent fuel storage installation becomes indistinguishable from background levels at approximately 600 feet from the storage installation. Given the distance from the planned VCSNS independent spent fuel storage installation to the Units 2 and 3 construction sites (1,000 feet and 1,600 feet), there would be no direct radiation exposure from this facility to Units 2 and 3 construction workers. Furthermore, according to current schedule projections, the independent spent fuel storage installation would not begin operation to receive Unit 1 spent nuclear fuel until nearly all the construction activity has ceased.

4.5.3.1.3 Units 1 and 2 Direct Radiation Exposure to Unit 3

As discussed in Subsection 5.4.1.3, the direct radiation dose rate from an AP1000 is expected to be less than 1 mrem per year, based on NUREG-1437 (U.S. NRC, 1996). Based on NUREG-1437, the direct radiation dose from Unit 1 is also expected to be negligible. It is assumed that the direct radiation dose rates from Unit 1 to Unit 3 and from Unit 2 to Unit 3 are each 1 mrem per year.

4.5.3.2 Gaseous Effluents

4.5.3.2.1 Unit 1 Gaseous Effluent Exposure to Units 2 and 3

The maximum annual gaseous effluent dose to the organ of a hypothetical Maximum Exposed Individual (MEI) in an unrestricted area from the existing Unit 1 is 0.036 mrem, according to an effluent report (SCE&G 2006b). The effluent report does not identify the organ or the corresponding total body dose. The total body dose may be estimated by dividing the organ dose by the organ weighting factor from ICRP 30 (ICRP 1979). Since the thyroid has the lowest weighting factor of all organs, the organ receiving the maximum dose is conservatively assumed to be the thyroid. Dividing the organ dose by the thyroid weighting factor of 0.03 yields a gaseous effluent total body dose of 1.2 mrem.

4.5.3.2.2 Unit 2 Gaseous Effluent Exposure to Unit 3

Using the XOQDOQ and GASPAR codes, as described in Section 5.4, a worker at Unit 3 would receive a total body radiation dose of 0.43 millirem per year and a maximum organ (skin) dose of 1.6 millirem per year from normal Unit 2 radiological releases.

4.5.3.3 Liquid Effluents

4.5.3.3.1 Unit 1 Liquid Effluent Exposure to Unit 3

The maximum annual liquid effluent doses to the hypothetical MEI in an unrestricted area from the existing Unit 1 are 0.0042 mrem to the total body and 0.0048 mrem to the gastrointestinal tract, large-lower intestine (GI-LLI), according to an effluent report (SCE&G 2006b). The effluent report provides the highest calculated organ dose. It is conservatively assumed that the thyroid dose is equal to the GI-LLI dose.

4.5.3.3.2 Unit 2 Liquid Effluent Exposure to Unit 3

Using the LADTAP code, as described in Section 5.4, an adult maximally exposed individual would receive a total body radiation dose of 0.051 millirem per year and a maximum organ (GI-LLI) dose of 0.17 millirem per year from normal Unit 2 liquid radiological releases.

4.5.4 CONSTRUCTION WORKER DOSES

Construction worker doses were conservatively estimated using the following information (see Subsection 4.4.2):

- The estimated maximum dose rate for each pathway
- An exposure time of 2,000 hours per year
- All gaseous releases assumed at ground level

- A peak loading of 3,600 construction workers for calculation of doses from Unit 1, and a peak loading of approximately 3,500 workers after Unit 2 operations begin (Section 3.10)

The estimated maximum annual dose for each pathway as well as the total dose is shown in Table 4.5-1.

4.5.4.1 Direct Radiation

Subsection 4.5.3.1 indicates an average annual dose of 1 millirem per unit from Units 1 and 2 based on continuous exposure. Adjusting for an occupancy time of 2,000 hours per year yields a total annual direct dose from both units of 0.46 mrem per year to the total body as well as total effective dose equivalent (TEDE).

4.5.4.2 Gaseous Effluents

The annual gaseous effluent doses to a Unit 3 construction worker after Unit 2 is operating (Subsection 4.5.3.2), which accounts for an exposure time of 2,000 hours per year, are 0.27 millirem for the total body, and 0.0081 millirem for the critical organ (skin) from Unit 1 gaseous effluent releases and 0.43 millirem for the total body, and 1.6 millirem for the critical organ (skin) from Unit 2 gaseous effluent releases. The total dose is 0.70 millirem total body and 1.6 millirem to the critical organ (skin).

4.5.4.3 Liquid Effluents

The annual liquid effluent doses to the maximally exposed member of the public in Subsection 4.5.3.3 are based on continuous occupancy. They are almost entirely attributable to ingestion of untreated surface water and fish. Although it is unlikely that the construction workers would be exposed to liquid effluent pathways, SCE&G assumed that the annual liquid effluent dose rates to which the workers would be exposed are the same as those for the maximally exposed member of the public, adjusted for an exposure time of 2000 hours per year. The resulting doses are 0.00096 millirem for the total body and 0.0011 millirem for the GI-LLI from Unit 1 liquid effluent releases and 0.012 millirem for the total body, and 0.039 millirem for the critical organ (GI-LLI) from Unit 2 liquid effluent releases. The total annual dose is therefore 0.013 millirem total body and 0.041 millirem to the critical organ (GI-LLI).

4.5.4.4 Total Doses

The annual doses from all three pathways are summarized in Table 4.5-1 and compared to the public dose criteria in 10 CFR 20.1301 and 40 CFR 190 in Tables 4.5-2 and 4.5-3, respectively. The unrestricted area dose rate in Table 4.5-2 was estimated from the annual TLD doses. Since the calculated doses (1.2 millirem per year and 0.00060 millirem per hour) meet the public dose criteria of 10 CFR 20.1301 and 40 CFR 190, the workers will not need to be classified as radiation workers. Table 4.5-4 shows that the doses also meet the design objectives of 10 CFR 50, Appendix I, for gaseous and liquid effluents.

The maximum annual collective total effective dose equivalent to the AP1000 construction work force after the beginning of Unit 2 operations is estimated to be 4.3 person-rem. The calculated doses are based on available dose rate measurements and calculations. It is possible that these dose rates will increase in the future as site conditions change. However, the VCSNS site will be continually monitored during the construction period and appropriate actions will be taken as necessary to ensure that the construction workers are protected from radiation.

Section 4.5 References

1. ICRP 1979. *Limits for Intakes of Radionuclides by Workers*, Part 1, International Commission on Radiological Protection, Publication 30, Pergamon Press, 1979.

2. SCE&G (South Carolina Electric & Gas) 2006a. *Radiological Environmental Monitoring Report - Virgil C. Summer Nuclear Station for the Operating Period January 1, 2005 to December 31, 2005,* April 2006.

3. SCE&G 2006b. *Virgil C. Summer Nuclear Station - Annual Effluent and Waste Disposal Report for the operating period January 1, 2005 to December 31, 2005.* April 2006.

4. SCE&G 2006c. *Survey Report of Steam Generator Recycle Facility,* number Q-8015, 8016. V.C. Summer Nuclear Station, August 14, 2006.

5. SCE&G 2007. *Offsite Dose Calculation Manual for South Carolina Electric & Gas Company Virgil C. Summer Nuclear Station*, Revision 25. January 2007.

6. U.S. NRC 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, NUREG-1437, Office of Nuclear Regulatory Research, Washington, D. C., May 1996.

Table 4.5-1
Annual Construction Worker Doses

	Annual Dose (millirem)		
	Total Body	Critical Organ	Total Effective Dose Equivalent
Direct radiation	0.46	N/A	0.46
Gaseous effluents	0.70	1.6 (skin) 0.70 (thyroid)	0.73
Liquid effluents	0.013	0.017 (thyroid) 0.041 (GI-LLI)	0.025
Total	1.2	1.6 (skin) 0.71 (thyroid)	1.2

Table 4.5-2
Comparison with 10 CFR 20.1301 Criteria for Doses to Members of the Public

Criterion	Dose Limit	Estimated Dose (TEDE)
Annual dose (millirem)	100	1.2
Unrestricted area dose rate (millirem/hour)	2	0.00060

Table 4.5-3
Comparison with 40 CFR 190 Criteria for Doses to Members of the Public

	Annual Dose (millirem)	
Organ	Limit	Estimated
Total body	25	1.2
Thyroid	75	0.71
Other organ	25	1.6 (skin)

Table 4.5-4
Comparison with 10 CFR 50, Appendix I Criteria for Effluent Doses

	Annual Dose (millirem)	
	Limit	**Estimated**
Total body dose from liquid effluents	3	0.012
Organ dose from liquid effluents	10	0.039 (GI-LLI)
Total body dose from gaseous effluents	5	0.43
Skin dose from gaseous effluents	15	1.6
Organ dose from gaseous radioactive iodine and particulates (include tritium and carbon-14)	15	0.69 (thyroid)

4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

The following measures and controls would limit adverse environmental impacts:

- Compliance with applicable local, state, and federal ordinances, laws and regulations intended to prevent or minimize the adverse environmental effects of construction activities on air, water and land, workers, and the public
- Compliance with existing permits and licenses for VCSNS Unit 1
- Compliance with existing VCSNS procedures and processes applicable to construction projects
- Incorporation of environmental requirements of construction permits in construction contracts

Many of these measures and controls would be incorporated into a Construction Environmental Controls Plan as described in Subsection 4.6.1. Other measures and controls such as requirements of existing permits and permits issued for construction as well as construction best management practices (*e.g.*, erosion control measures) would be implemented through existing and modified VCSNS procedures. Subsection 4.6.2 discusses construction-related measures and controls for environmental impacts that would be addressed in site procedures. In Table 4.6-1, the environmental impacts and measures and controls discussed in other sections of Chapter 4 are briefly presented.

4.6.1 CONSTRUCTION ENVIRONMENTAL CONTROLS PLAN

The plan contains descriptions of the environmental management controls that would be used on the site to assist in meeting the overall environmental management objectives for the project. The processes for achieving these objectives include the following.

4.6.1.1 Summary Matrix of Environmental Permit Requirements for Construction

While the existing plant procedures address current regulatory requirements and existing permit requirements, a summary matrix of environmental requirements for construction would be prepared for all relevant construction-phase environmental requirements as contained in the project's permits. The summary would include a listing of the project-specific permit requirements, the titles of the persons responsible for ensuring compliance with each requirement, the calendar or scheduled activity start dates by which compliance with each requirement must be completed, and the current status of each action item.

4.6.1.2 Environmental Awareness Training

Mandatory environmental awareness training for all construction personnel as part of their regular site orientation would be required. The training would be provided before construction personnel, including subcontractor employees, are allowed to work onsite. The training provided is based on the environmental requirements applicable to the project and is project-specific. The following list provides a typical outline for the main topics covered in such a training session:

- General Site Maintenance (*e.g.*, staying within approved work limits, good housekeeping, no open burning, fire prevention)
- Erosion and Sediment Control (*e.g.*, assessing site conditions and erosion control requirements, installing and maintaining erosion and sediment control measures while working in the area, reporting nonfunctioning erosion control measures)
- Sensitive Areas Protection (*e.g.*, working only within approved limits, maintaining buffer zones around sensitive resources, storing hazardous materials away from wetlands and streams, restrictions on dewatering near surface water bodies)
- Unanticipated Discoveries (*e.g.*, stop work immediately if archaeological artifacts, contaminated soils, containers, pipes, and tanks are discovered/ uncovered and immediately notify supervisor)
- Hazardous Material/Waste Handling (*e.g.*, hazard identification, segregation, container management, proper labeling, disposal at approved disposal sites)
- Spills Prevention and Response (*e.g.*, proper storage of hazardous materials, secondary containment, spill response, and notifications)

The training session would stress the importance of maintaining “environmental awareness” in the employee's everyday duties. Environmentally sensitive areas on and adjacent to the site, as well as construction exclusion zones, would be described and located on project drawings. The presentation would be followed by a question and answer period. Attendance at the training session would be mandatory and would be recorded in an appropriate training roster.

4.6.1.3 Environmental Compliance Reviews/Coordination Meetings

Periodic site environmental compliance reviews and coordination meetings between site project personnel would be conducted. The purpose of these meetings would be to discuss current and future construction work activities as they relate to maintaining environmental compliance. Typically, these meetings could be held in tandem with the weekly project status meetings but could be held more frequently as construction activities warrant (*e.g.*, before construction activities begin in or near an environmentally sensitive resource). The meetings

could also provide a forum to discuss and resolve any outstanding environmental corrective actions/issues.

4.6.1.4 Environmental Compliance Inspections and Documentation

Regular environmental compliance inspections of construction activities would be performed. The field inspections would be conducted and documented to confirm that the site activities remain in compliance with all applicable environmental requirements for the project. Issues addressed during the onsite inspections would include:

- Adherence to approved clearing limits, buffers, and exclusion zones
- Adequate installation and maintenance of erosion and sediment control measures
- Correct implementation of required mitigation measures for work in and around environmentally sensitive resources (*e.g.*, wetlands, rivers and streams, archaeological sites)
- Proper solid waste management activities (*e.g.*, sufficient number of trash containers, waste segregation, use of designated storage areas, labeling)
- Proper hazardous materials management activities (*e.g.*, stored to minimize spills, reduce exposure, prevent fires/explosions)
- Implementation of fugitive dust control measures (*e.g.*, watering roads, covering truck loads)

Environmental inspection reports would typically be used to document the results of each site inspection and to note and describe any areas of concern requiring corrective actions. Identified corrective actions would be provided to the appropriate personnel for resolution in a timely manner.

4.6.2 ENVIRONMENTAL PROCEDURES

Although current site environmental procedures address current regulatory and permit requirements, additional project permit requirements for construction would be incorporated and would address specific measures for mitigation during the construction phase. Sections of the procedures would address any construction activities not currently included. The following topics would be reviewed and sections of the procedures revised, as appropriate, to address.

4.6.2.1 Noise and Vibration

Requirements related to mitigating noise and vibration impacts from construction activities could include measures such as restricting noise and vibration generating activities to daylight hours, prohibiting construction activities from specific roads and neighborhoods, using less vibration producing equipment and/

or methods (*e.g.*, dampeners, staggering activities), and verifying that noise control equipment on vehicles and equipment is in proper working order. Notifications to regulatory agencies and nearby residents regarding atypical noise and vibration events (*e.g.*, pile-driving, blasting, steam/air blows) could also be addressed in this section.

4.6.2.2 Air Quality (Fugitive and Vehicular Emissions)

Procedure sections would describe the techniques that would be used to minimize the generation of fugitive dust from construction activities and reduce the release of emissions from construction equipment and vehicles. Fugitive dust control measures such as watering of roads, covering truck loads and material stockpiles, reducing materials handling activities, and limiting vehicle speed are typically required. Visual inspection of emission control equipment is also a common requirement.

4.6.2.3 Erosion and Sedimentation Control

Procedure sections would describe the erosion and sediment control measures to be implemented and maintained during the course of construction. These measures would cover temporary and permanent measures and all relevant detailed engineering drawings illustrating the permanent plant design.

Depending on project-specific conditions and permit requirements, the information addressed in this section could include:

- Clearing limits and maintenance of existing vegetative cover
- Site grading
- Topsoil stripping and stockpiling
- Management of excess rock
- Temporary erosion controls (*e.g.*, silt fencing, mulching, erosion control blankets, temporary seeding)
- Permanent erosion controls (*e.g.*, reestablishing natural drainage patterns, vegetated swales, permanent seeding/plantings)
- Checking of dams, rip-rap, retention/detention basins, and sediment barriers
- Slope restoration and protection
- Roads and equipment crossings
- Maintaining of drainage patterns

4.6.2.4 Construction Storm Water Management

This section would describe the measures used to manage storm water runoff from construction areas and to prevent and/or minimize contamination of storm water due to project activities (*e.g.*, hazardous material storage, waste management, material stockpiles).

Upon completion of detailed design, the temporary and permanent storm water management measures would be addressed in the project-specific Erosion and Sediment Control Plan and Storm Water Management Plan. These plans should reference relevant detailed design drawings and address the erosion and sedimentation control measures to be used to control storm water runoff and to prevent and/or minimize contamination of storm water from project activities.

4.6.2.5 Protection of Sensitive Resources

The procedure section would describe the mitigation measures for environmentally sensitive resources within the project site, or in the immediately surrounding area, that could be adversely impacted during construction. These areas would have been identified during preconstruction surveys of the site area as part of the overall project development and permitting effort. The required mitigation measures are typically addressed in project permits.

The following are some environmentally sensitive resources that are commonly encountered during construction activities along with the typical mitigation measures required to eliminate and/or reduce impacts on the resources.

- Wetlands – The primary mitigation measures are avoidance based on preconstruction surveys and installation of exclusion fencing. Some project activities may require temporary impacts to wetlands. These impacts will be mitigated by following permit/consent conditions which may include

  - Reduced clearing limits and preservation of existing vegetative cover
  - Maintenance of existing drainage patterns
  - Prohibitions/restrictions on equipment and vehicular travel
  - Prohibition of maintenance/refueling near wetland boundaries

  The requirements for restoring disturbed areas would also be addressed.

- Rivers and streams – The primary mitigation measure is avoidance through installation of exclusion fencing. Direct impact to a waterway (*e.g.*, crossing of a pipeline, constructing an access road, installation of discharge pipe) in which case specific mitigation measures may be spelled out in permits/consents. Other mitigation measures may include:

- Limits on the length of time of the disturbance
- Seasonal limits and restrictions for in-water work
- Reduced clearing limits and preservation of existing vegetative cover near the stream banks
- Installation of only specified crossings (*e.g.*, mat bridges)
- Use of silt curtains and other sediment transport barriers
- Restrictions on fill activities and materials
- Restoration of stream beds, banks, and natural vegetation.

- Areas of special status wildlife habitats or vegetation – The primary mitigation measures are avoidance based on preconstruction surveys, establishing buffer zones, and installing exclusion fencing. In rare instances, construction activities may inadvertently encounter special status wildlife species, their habitat, or vegetation (*e.g.*, threatened or endangered species), in which case work in the immediate area would be halted and environmental experts (including possibly agency officials and environmental consultants) would be contacted to determine proper mitigation measures so that work may resume.

- Archaeological/cultural resource areas – The primary mitigation measures are avoidance based on preconstruction surveys, establishing buffer zones, and installing exclusion fencing. In rare instances, construction activities may inadvertently encounter buried archaeological/cultural resources, in which case work in the immediate area would be halted and archaeological experts (including possibly agency officials and environmental consultants) would be contacted to determine proper mitigation measures so that work may resume.

4.6.2.6 Unanticipated Discoveries

This section of the procedure would describe the procedure to be followed, including on and offsite notifications, in the event unanticipated discoveries are made during project construction. Unanticipated discoveries could include: contaminated or suspect soils and groundwater; buried pipes; drums and tanks; building foundations; cultural artifacts; and bones. Construction would be immediately halted in the area of the unanticipated discovery and the situation immediately reported. For unanticipated discoveries that could be immediately hazardous to human health (*e.g.*, broken natural gas line, medical waste, unexploded ordnance), the site safety representative would also be immediately notified. Additional investigations, such as sampling work and analysis, and notifications to appropriate agencies are typically made.

4.6.2.7 Hazardous Materials Management

This procedure section would describe the hazardous materials management program that would be implemented and how hazardous materials (*e.g.*, petroleum products and chemicals) would be managed to minimize the potential for threats to human health and the environment. The management program must address the need for Materials Safety Data Sheets for all hazardous materials brought on site and county and state-specific requirements regarding handling, storage, secondary containment, and disposal.

4.6.2.8 Solid Waste Management (Hazardous/Nonhazardous Wastes)

This procedure section would describe the solid waste management program for construction wastes generated at the site. The management program typically would address nonhazardous wastes and hazardous wastes through separate procedures. In all cases, the management program must be compliant with all relevant environmental requirements including county and state-specific waste handling and transportation practices and approvals, demonstrated waste minimization activities, and offsite recycling of certain common construction wastes (*e.g.*, used oil, antifreeze, scrap metal, wood).

4.6.2.9 Asbestos and Lead-Based Paint

In the event that construction activities could encounter hazardous substances such as asbestos, asbestos-containing material, or lead-based paint, this section would contain the county and state-specific regulatory requirements for containment and/or removal of such materials by trained, authorized personnel. Site-specific procedures could also address regulations governing the overall management of the removal and abatement work including:

- Prework notifications
- Removal by certified contractors
- Handling before disposal
- Transport to and disposal at licensed facilities
- Post-work closure reports

4.6.2.10 Spill Prevention and Response

This section would describe the spill prevention and response program (Spill Prevention Control and Countermeasure Plan) and associated procedure. The section would address how to manage all hazardous materials and wastes in such a manner as to prevent releases and to minimize the potential for threats to human health and the environment. The management program would address the need for secondary containment, spill response materials, spill thresholds for release to the environment (*e.g.*, reportable quantities), emergency response

actions, and notification requirements for project personnel, and appropriate agencies.

4.6.2.11 Cleanup and Restoration

This procedure section would describe the requirements related to cleanup and restoration of the site and any other areas used by the project during construction (*e.g.*, offsite laydown yards). Contractors would remove all construction materials and debris, restore all surface (*e.g.*, swales, roads, fences, gates, walls) and subsurface (*e.g.*, drainage tiles, wells, utilities) features in accordance with landowners' and permit/consent requirements, and adhere to all requirements regarding permanent stabilization, including revegetation of disturbed areas.

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

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.1 Land Use Impacts		
4.1.1 The Site and Vicinity	• Ground-disturbing activities on 490 acres including clearing, grubbing, grading, and excavating • Stockpiling of soils onsite	• Implement storm water management systems, groundwater monitoring wells, and spill containment controls. • Permanently disturbed locations would be stabilized and contoured in accordance with design specifications. • Comply with applicable laws, regulations, permits, good engineering and construction practices, and recognized environmental best management practices. • Follow South Carolina Storm Water Management Best Management Practices handbook and industry guidance. • Locate all but intake and discharge structures outside of 100 and 500-year floodplains.

Table 4.6-1 (Sheet 2 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.1.2 Transmission Corridors and Offsite Areas	• Construction of transmission lines in new corridors	• Conduct siting study that takes into account environmental impacts. • Incorporate recommendations of federal and state agencies into route selections including the recommendations of the South Carolina Department of Health and Environmental Control, South Carolina Department of Natural Resources, South Carolina Department of Archives & History, U.S. EPA, US Fish & Wildlife Service, US Army Corps of Engineers. • Site new corridors to minimize or avoid critical or sensitive habitats or species as much as possible. • Before site disturbance, conduct archaeological and ecological surveys as needed and determine site-specific erosion control measures. • Comply with all applicable laws, regulations, permits, sound engineering, environmental management, and construction practices.
4.1.3 Historic Properties and Cultural Resources	• Ground-disturbing activities including grading, excavation, and construction of new facilities/ transmission lines	• Select transmission routes to avoid historical properties. • Consult State Historic Preservation Office (South Carolina Department of Archives & History). • Before site disturbance, conduct archaeological surveys. • Develop and implement procedure for construction activities that includes actions to protect cultural, historic, or paleontological resources.

Table 4.6-1 (Sheet 3 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.2 Water-Related Impacts		
4.2.1 Hydrologic Alterations	• Potential need to dewater excavation area or install groundwater wells • Construct facilities and new transmission lines in new corridors.	• Comply with applicable laws, regulations, permits, sound engineering and construction practices, and recognized environmental best management practices. • Install drainage system to divert dewatering runoff to settling basin before discharge through a permitted NPDES outfall. • Follow best management practices for erosion control. • Continue conducting hydrological monitoring to determine baseline hydrological conditions and detect changes.
4.2.2 Water-Use Impacts	• Use surface water (Monticello Reservoir) as water source for some water during construction.	• No measures or controls would be necessary because peak surface water use rate (420 gpm) would be an extremely small fraction (0.044%) of the lowest annual mean flow of Broad River which provides makeup water to Monticello Reservoir. • FERC authorization needed for construction water use.
	• Use public water supply as source for some water during construction.	• No measures or controls would be necessary because demand would peak at well below available excess capacity.

Table 4.6-1 (Sheet 4 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.2.3 Water Quality Impacts	• Land clearing, excavation, and grading associated with facilities, supporting infrastructure, and transmission corridors resulting in sediment loading • Construction of intake and discharge structures and potential dredging would increase turbidity. • Potential minor spills of petroleum products	• Use best management practices, including structural (*e.g.*, slit fences and sediment retention basins) and operational controls, to prevent movement of pollutants (including sediments) into wetlands and water bodies. • Develop erosion, sedimentation, and pollution control plan. • Use NPDES monitoring program for Unit 1 to detect water quality changes due to construction activities. • Obtain and comply with storm water permit; conduct monitoring as required by the permit. • Develop and comply with approved Storm Water Pollution Prevention Plan. • Obtain NPDES and U.S. Army Corp of Engineers permits and comply with permit requirements. • Conduct shoreline construction, when pool level of Parr Reservoir is low, to the extent practicable. • Quickly clean up any spilled fuel or oil. • Before site disturbance at new transmission corridors, determine site-specific erosion control measures. • Follow South Carolina Storm Water Management Best Management Practices handbook and industry guidance. • Install storm water drainage system and stabilize disturbed soils.

Table 4.6-1 (Sheet 5 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.3 Ecological Impacts (*i.e.*, impacts on the physical environment)		
4.3.1 Terrestrial Ecosystems	• Removal of all forested habitat, but area does not have old growth timber, rare or unusual plants, or unique or sensitive plant communities, so no reduction in diversity of plant life • Habitat loss, but no threatened or endangered plants or animals are at the site or in the vicinity • Displacement of animals from the construction site, but site does not support important species (per NUREG 1555) other than common game species • Loss of less mobile individual animals • Impact to wetland partially located on the cooling tower construction site • Wetland at Mayo Creek spanned by access road bridge • Impacts to wetlands from sediment loading during construction • Land disturbance at new transmission line corridors	• Land clearing would be conducted according to federal and state regulations and permits, SCE&G procedures, good construction practices, and established best management practices. • Schedule equipment maintenance procedures to minimize emission and spills. • Minimize fugitive dust by watering. • Determine mitigation measures for the impacted wetland areas in consultation with USACE before beginning construction. • Install silt fencing or other controls to protect wetland.

Table 4.6-1 (Sheet 6 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.3.2 Aquatic Ecosystems	• Potential impacts to surface water from petroleum/solvent spills • Permanent loss of less than 1 acre of aquatic habitat • Temporarily degraded aquatic habitat • Impacts to surface water and wetlands from increased sediment load during construction • Land clearing for and construction in new transmission corridors • New transmission lines in counties with listed aquatic species	• Prepare and implement Spill Prevention Control and Countermeasure plan for construction activities. • Use NPDES monitoring program for Unit 1 to detect water quality changes due to construction activities. • Restrict activities using petroleum products and solvents to designated areas that are equipped with spill containment. • Install cofferdam and storage of excavated sediment and soils in spoils area designed to prevent loading in wetlands and watercourses, use storm water retention basins as needed; reseeding of spoils area after construction. • Develop and implement a construction Storm Water Pollution Prevention Plan; conduct monitoring as required by the storm water general permit. • Stabilize upslope and adjacent areas to shoreline construction sites with erosion control devices and after construction, reseed the areas. • Follow South Carolina Forestry Commission best management practices manual and SCDHEC handbook and field manual best management practices to prevent sediment loading and minimize soil disturbance.

Table 4.6-1 (Sheet 7 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.3.2 Aquatic Ecosystems (continued)		• Avoid wetlands and water bodies and sensitive areas when possible, plan transmission route to minimize impacts to wetland and waterbodies that must be crossed and use equipment specifically designed for work around wetlands and streams, install erosion controls, and implement best management practices to minimize impacts to aquatic ecosystems. • Before transmission line construction, conduct surveys, as needed, and determine site-specific erosion control measures. • If there is potential for construction of a new transmission line that could degrade habitat of a listed aquatic species, work closely with the state agency to develop a construction schedule and construction techniques that are protective of the habitat and species in question.

Table 4.6-1 (Sheet 8 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.4 Socioeconomic Impacts (*i.e.*, Impacts on the Human Community)		
4.4.1 Physical Impacts	• Temporary and localized noise, fugitive dust, and exhaust emissions during construction	• Train and appropriately protect construction workers to reduce the risk of potential exposure to noise, dust, and exhaust emissions. • Make public announcements or prior notification of atypically loud construction activities. • Regularly inspect and maintain equipment to include exhaust and noise aspects. • Phase construction to minimize daily emissions. • Restrict extreme noise-related activities to daylight hours. • Restrict delivery times to daylight hours. • Develop and implement a dust control plan that includes mitigation measures such as watering unpaved roads, stabilizing construction roads, phasing grading activities and ceasing them during high winds, etc. • Post signs near construction entrances and exits to make the public aware of potentially high construction traffic areas. • Develop construction management traffic plan before the start of construction.
	• Construction debris and solid waste requiring disposal in regional landfills that have available capacity	• Minimize waste by using excavated material where fill is needed, ordering materials in appropriate quantities and returning overage to the vendor, and recycling scrap metal.

Table 4.6-1 (Sheet 9 of 10)
Summary of Measures and Controls to Limit Adverse Impacts During Construction

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.4.2 Social and Economic Impacts	• Employ 3,600 construction workers during peak construction employment of which 2,340 would migrate into the region, 70% to 80% would be employed > 4 years. • Additional job creation of 1.04 jobs per construction job to be mostly filled by the local workforce • Increase population in Fairfield, Lexington, Newberry, and Richland Counties by 2.1%, 0.9%, 2.8%, and 0.6% respectively over year 2000 levels. • Increase residential property tax revenues. • In-mitigrating construction workers lead to temporary offsite land-use changes. • Road capacity on SC 213 would be exceeded and increase traffic on SC 215 and other 2-lane roads in Fairfield and Newberry Counties. • Localized aesthetic impacts • Gradual influx of workers to peak at 2,340, with 1,800 bringing families • Increased water consumption and discharges to wastewater treatment facilities • Increase students population in Fairfield, Lexington, Newberry and Richland Counties by 1.9%, 0.8%, 2.5%, and 0.5% respectively.	• Develop construction management traffic plan prior to the start of construction. • Regularly communicate with local school authorities regarding construction worker influx. • Coordinate with job training institutions.
4.4.3 Environmental Justice Impacts	• No construction-related disproportionately high and adverse human health or environmental effects on minority or low-income populations health or welfare.	• Mitigating measures for construction impacts identified within this table.

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

Section Reference	Impact Description or Activity	Specific Measures and Controls
4.5 Radiation Exposure to Construction Workers	• No impacts identified (construction worker estimated radiation exposure is well below all limits including annual dose to members of the public).	• No mitigation measures required.
4.7 Nonradiological Health Impacts	• Potential for construction injuries and death	• Train contractors on safety requirements to ensure contractors arriving onsite are adequately trained with regard to VCSNS safety requirements. • Require construction contractors and subcontractors to develop and implement safety procedures. • Provide onsite services for emergency first aid, and conduct regular health and safety monitoring.

NPDES = National Pollutant Discharge Elimination System
USACE = United Stated Army Corps of Engineers

4.7 NONRADIOLOGICAL HEALTH IMPACTS

4.7.1 PUBLIC HEALTH

Members of the public can potentially be put at risk by construction of the units and associated transmission lines. Nonradiological air emissions and dust can transport offsite through the atmosphere to where people are living. Noise can also propagate offsite. The increase in traffic from commuting construction workers and deliveries can result in additional air emissions and traffic accidents. Subsection 4.4.1 addresses the physical impacts to the public from construction activities.

4.7.2 OCCUPATIONAL HEALTH

Construction of the units and associated transmission lines would involve risk to workers from accidents or occupational illnesses. These risks could result from construction accidents (*i.e.*, falls and burns), exposure to toxic or oxygen-replacing gases, and other causes. SCE&G has a Safety Services Department and an industrial safety program. SCE&G has procedures and provides training on such topics as electrical work practices, confined space entry, personal protective equipment, response to injuries and accidents, heat stress, and other topics. The VCSNS Safety Training Advisory Committee, in addition to overseeing the scheduling and effectiveness of current employees' safety training, develops and coordinates contractor training to ensure contractors arriving onsite are appropriately trained with regard to safety requirements.

The Bureau of Labor Statistics maintains records of a statistic known as total recordable cases, which is a measure of work-related injuries or illnesses that include death, days away from work, restricted work activity, medical treatment beyond first aid, and other criteria. The 2005 nationwide total recordable cases rate published by the Bureau of Labor Statistics for utility system construction is 5.6 per 100 full-time workers (BLS 2006a). The statewide total recordable cases rate for South Carolina is 3.5 per 100 workers (BLS 2006b). Based on this statistical data, SCE&G has calculated the number of total recordable cases incidences for the construction of the proposed units as the total recordable case rate times the number of workers. Using quarterly employment numbers (Table 3.10-2) and both the national and South Carolina total recordable cases rates, SCE&G estimated the annual average total recordable cases over the 41 quarters of preconstruction and construction activities and the peak annual number of total recordable cases. The estimates are presented in Table 4.7-1.

Bureau of Labor Statistics data for fatal occupational injuries (BLS 2006c) and average employment (BLS 2006a) was used to calculate a nationwide annual rate of fatal occupational injuries. Applying the annual rate of fatalities to a construction project with an estimated average employment similar to what would be required to construct two AP1000 units results in an estimate of six deaths during the project.

However, SCE&G does not expect the construction of two AP1000 units to result in total recordable cases or deaths at the levels predicted by these statistical analyses. SCE&G has developed and implemented a worker health and safety program with a goal of zero accidents. SCE&G will require all contractors and subcontractors to have and implement a health and safety program that, at a minimum, meets the same requirements as SCE&G's health and safety program. SCE&G will require construction contractors and subcontractors to develop and implement safety procedures with the intent of preventing injuries, occupational illnesses, and deaths.

Section 4.7 References

1. BLS (Bureau of Labor Statistics) 2006a. Table 1. *Incidence Rates of Nonfatal Occupational Injuries and Illnesses by Industry and Case Types, 2005.* Available at http://www.bls.gov/iif, accessed April 26, 2007.

2. BLS 2006b. Table 6. *Incidence Rates of Nonfatal Occupational Injuries and Illnesses by Industry and Case Types, 2005, South Carolina.* Available at http://www.bls.gov/iif, accessed April 26, 2007.

3. BLS 2006c. Table A-1. *Fatal Occupational Injuries by Industry and Event or Exposure, All United States, 2005.* Available at http://www.bls.gov/iif, accessed April 26, 2007.

Table 4.7-1
Estimated Total Recordable Cases

	TRC Incidence Based on U.S. Rate	TRC Incidence Based on South Carolina Rate
Average Annual	119	74
Peak annual period	196	123

4.8 SEPARATION OF PRECONSTRUCTION FROM CONSTRUCTION IMPACTS

NRC regulations prohibit beginning construction of a nuclear reactor without prior NRC authorization such as a COL. Generally, this prohibition applies to structures, systems, or components that are safety related. Other activities, commonly referred to as "preconstruction," can be performed without prior NRC approval. The environmental report for a COL application must address preconstruction and construction activities to facilitate NRC analysis of their cumulative impact.

NRC regulation 10 CFR 51.4 defines "construction" as follows: driving of piles; subsurface preparation; placement of backfill, concrete, or permanent retaining walls within an excavation; installation of foundations; or in-place assembly, erection, fabrication, or testing, which are for:

- Safety-related structures, systems, or components (SSCs) of a facility
- SSCs relied upon to mitigate accidents or transients or used in plant emergency operating procedures
- SSCs whose failure could prevent safety-related SSCs from fulfilling their safety-related function
- SSCs whose failure could cause a reactor scram or actuation of a safety-related system
- SSCs necessary to comply with security requirements
- SSCs necessary to comply with facility fire protection requirements
- Onsite emergency facilities (technical support and operations centers) necessary to comply with emergency planning and preparedness requirements

The regulation also defines what is not "construction:"

- Site exploration, including necessary borings to determine foundation conditions or other preconstruction monitoring to establish background information related to the suitability of the site, the environmental impacts of construction or operation, or the protection of environmental values
- Preparation of a site for construction of a facility, including clearing of the site; grading; installation of drainage, erosion and other environmental mitigation measures; and construction of temporary roads and borrow areas
- Erection of fences and other access control measures
- Excavation

- Erection of support buildings (such as, construction equipment storage sheds, warehouse and shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and office buildings) for use in connection with the construction of the facility

- Building of service facilities, such as paved roads, parking lots, railroad spurs, exterior utility and lighting systems, potable water systems, sanitary sewerage treatment facilities, and transmission lines

- Procurement or fabrication of components or portions of the proposed facility occurring at other than the final, in-place location of the facility

The latter list can cause confusion because in common practice, these “preconstruction” activities also entail construction-type activities. In the nuclear power industry, these have become called "preconstruction" activities because they generally occur before construction activities. It must be recognized, however, that preconstruction activity for one SSC can be contemporaneous with construction activity for another SSC.

Sections 4.1 through 4.7 analyze impacts without distinction between preconstruction and construction activities. Section 4.8 provides that distinction and presents the SCE&G bases for separating the combined impacts into impacts attributable to "preconstruction" activities and impacts attributable to "construction" activities.

Table 4.8-1 identifies the combined impacts analyzed in Sections 4.1 through 4.7. The table also provides estimates of the percentage of impacts attributable to preconstruction and construction activities, identification of the significance of these separated impacts, and discussion of the SCE&G bases for making this separation. Two factors form the bases for most of the separations, construction acreage and labor hours. The following paragraphs discuss these factors.

Acreage

SCE&G believes that the categorization of some impacts as "preconstruction" or "construction" is proportional to the amount of acreage disturbed. Delineation between preconstruction and construction acreages can be problematic. For example, the containment building and the turbine building are adjacent structures. The containment building is obviously safety related and its structure and foundation work is within the scope of construction. The turbine/generator system is within the scope of construction because failure of the turbine/generator could cause a reactor scram. However, an argument could be made that a plausible failure of the turbine building structure or foundation, such as by settling, would not result in a reactor scram or safety system actuation, making the structure and foundation activity preconstruction. Thus, identical activities occurring on adjacent locations at, potentially, the same time, could result in identical impacts that are categorized differently (i.e., as preconstruction and construction).

Rather than trying to create a "checkerboard" of such categorizations, SCE&G concluded that it was reasonable to categorize impacts associated with all activity within the area of the five principal generation structures as "construction" and impacts associated with activity outside this area as "preconstruction." The principal generation structures, as identified in Section 3.1.2, consist of the following:

- Nuclear island (containment, shield, and auxiliary buildings)
- Turbine building
- Annex building
- Diesel generator building
- Radwaste building

These structures comprise what is commonly called the powerblock area.

SCE&G believes that this approach is conservative because, while some activity within the powerblock might arguably be preconstruction, SCE&G is unaware of activities related to VCSNS outside the powerblock that would be construction, with one exception. The exception, installation of the circulating water pumps and associated equipment, would occur within the preconstruction-related pumphouses and, as such, would not increase the construction acreage over the value attributed to the powerblock. As discussed in Subsection 4.1.1, the total onsite disturbed acreage for VCSNS Units 2 and 3 is approximately 490 acres. As shown on Figure 3.9-1, the powerblock area would occupy 46.5 acres, or approximately 9.5 percent of the total onsite disturbed acreage. Thus, for combined preconstruction and construction impacts whose significance is proportional to acreage disturbed, SCE&G estimates that 90 percent of the total would be preconstruction and 10 percent would be construction.

Labor Hours

SCE&G believes that the categorization of some impacts as preconstruction or construction is proportional to the number of labor hours involved. SCE&G's approach to using labor hours is consistent with the approach using disturbed acreage. SCE&G estimates that approximately 80 percent the total number of labor hours expended will be attributable to construction within the powerblock. Thus, for combined preconstruction and construction impacts whose significance is proportional to labor hours worked, 20 percent of the total would be preconstruction and 80 percent would be construction.

Table 4.8-1 (Sheet 1 of 4)
Separation of Preconstruction and Construction Impacts

	Separation of Impacts (%)			
ER Section	**Combined Preconstruction and Construction Impact Significance**	**Preconstruction Impact Significance**	**Construction Impact Significance**	**Basis for Separation**
4.1 Land-Use Impacts				
4.1.1 The Site and Vicinity	S	S (90)	S (10)	Acreage[(a)]
4.1.2 Transmission Corridors and Offsite Areas	M	M (100)	NA	Transmission lines not included in definition of construction
4.1.3 Historic Properties				
Site viewshed	S	S (0)	S (100)	No clear view offsite. Any impact limited to large structures located in powerblock area
Transmission lines	S	S (100)	NA	Transmission lines not included in definition of construction
4.2 Water-Related Impacts				
4.2.1 Hydrologic Alterations				
Transmission lines	S	S (100)	NA	Transmission lines not included in definition of construction
Site	S	S (90)	S (10)	Acreage(a)
4.2.2 Water Use Impacts				
4.2.2.1 Surface Water	S	S (90)	S (10)	Acreage(a)
4.2.2.2 Groundwater	S	S (0)	S (100)	Impacts attributable to powerblock dewatering
4.2.3 Water-Quality Impacts				
4.2.3.1 Surface Water				

Table 4.8-1 (Sheet 2 of 4)
Separation of Preconstruction and Construction Impacts

		Separation of Impacts (%)		
ER Section	**Combined Preconstruction and Construction Impact Significance**	**Preconstruction Impact Significance**	**Construction Impact Significance**	**Basis for Separation**
4.2 Water-Related Impacts (Cont.)				
Site	S	S (90)	S (10)	Acreage(a)
Transmission lines	S	S (100)	NA	Transmission lines not included in definition of construction
4.2.3.1 Groundwater				
Onsite	S	S (90)	S (10)	Acreage(a)
Transmission lines	S	S (100)	NA	Transmission lines not included in definition of construction
4.3 Ecological Impacts				
4.3.1 Terrestrial Ecosystems				
4.3.1.1 Site and Vicinity	S	S (90)	S (10)	Acreage(a)
4.3.1.2 Transmission Corridors	S	S (100)	NA	Transmission lines not included in definition of construction
4.3.2 Aquatic Ecosystems				
4.3.2.1 The Site and Vicinity	S	S (90)	S (10)	Acreage(a)
4.3.2.2 Transmission Corridors	S	S (100)	NA	Transmission lines not included in definition of construction
4.4 Socioeconomic Impacts				
4.4.1 Physical Impacts				
4.4.1.1 Groups or Physical Features Vulnerable	S	S (20)	S (80)	Labor hours(b)

Table 4.8-1 (Sheet 3 of 4)
Separation of Preconstruction and Construction Impacts

	Separation of Impacts (%)			
ER Section	**Combined Preconstruction and Construction Impact Significance**	**Preconstruction Impact Significance**	**Construction Impact Significance**	**Basis for Separation**
4.4 Socioeconomic Impacts (Cont.)				
4.4.1.2 Noise	S	S (20)	S (80)	Labor hours(b)
4.4.1.3 Air	S	S (20)	S (80)	Labor hours(b)
4.4.2 Social and Economic Impacts				
4.4.2.1 Demographic Impacts	S	S (20)	S (80)	Labor hours(b)
4.4.2.2 Community Impacts				
4.4.2.2.1 Economy				
Lexington, Newberry, Richland Counties	S	S (20)	S (80)	Labor hours(b)
Fairfield County	L	S (20)	L (80)	Labor hours(b)
4.4.2.2.2 Taxes				
Lexington, Newberry, Richland Counties	S	S (20)	S (80)	Labor hours(b)
Fairfield County	L	M (20)	L (80)	Labor hours(b)
4.4.2.2.3 Land Use				
Lexington, Newberry, Richland Counties	S	S (20)	S (80)	Labor hours(b)
Fairfield County	M	S (20)	M (80)	Labor hours(b)
4.4.2.2.4 Transportation	M to L	S (20)	M to L (80)	Labor hours(b)
4.4.2.2.5 Aesthetics and Recreation	S	S (20)	S (80)	Labor hours(b)

Table 4.8-1 (Sheet 4 of 4)
Separation of Preconstruction and Construction Impacts

		Separation of Impacts (%)		
ER Section	**Combined Preconstruction and Construction Impact Significance**	**Preconstruction Impact Significance**	**Construction Impact Significance**	**Basis for Separation**
4.4 Socioeconomic Impacts (Cont.)				
4.4.2.2.6 Housing	S	S (20)	S (80)	Labor hours(b)
4.4.2.2.7 Public Services	S	S (20)	S (80)	Labor hours(b)
4.4.2.2.8 Social Services	S	S (20)	S (80)	Labor hours(b)
4.4.3 Environmental Justice	S	S (20)	S (80)	Labor hours(b)
4.5 Radiation Exposure to Construction Workers	S	S (20)	S (80)	Labor hours(b)
4.7 Non-radiological Health Impacts	S	S (20)	S (80)	Labor hours(b)

a) Acreage - Work on powerblock area is assumed to be nuclear safety related and, therefore, construction. Powerblock area would occupy approximately 46.5 acres of a total disturbed area of approximately 490 acres, or approximately 10 percent. Preconstruction would occupy the remainder, or 90 percent, of the acreage

b) Labor Hours - Work on powerblock area is assumed to be nuclear safety related and, therefore, construction. Work on powerblock area would account for an estimated 80 percent of the labor hours. Preconstruction would occupy the remainder, or 20 percent, of the labor hours.

L = LARGE—Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.
M = MODERATE—Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
NA = Not applicable.
S = SMALL—Environmental effects are not detectable or are so minor they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, impacts that do not exceed permissible levels in U.S. Nuclear Regulatory Commission regulations are considered SMALL.