2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

Virgil C. Summer Nuclear Station (V.C. Summer), owned by South Carolina Electric and Gas (SCE&G) and South Carolina Public Service Authority (Santee Cooper), is located in Fairfield County, in predominantly rural north-central South Carolina. It is situated on the shore of Monticello Reservoir about 42 km (26 mi) northwest of Columbia, the State capital. The plant consists of a nuclear reactor, cooling and auxiliary water systems, and transmission facilities. The nuclear reactor is a pressurized light-water reactor with three steam generators turning turbines to generate electricity. Cooling system water is provided from Monticello Reservoir. The plant and its environs are described in Section 2.1, and the plant's interaction with the environment is presented in Section 2.2.

2.1 Plant and Site Description and Proposed Plant Operation During the Renewal Term

V.C. Summer is located on 909 ha (2245 ac) of SCE&G-owned land approximately 130 m (425 ft) above sea level, 24 km (15 mi) west of the county seat of Winnsboro, and 42 km (26 mi) northwest of Columbia, the State capital. Fairfield County is part of the Central Midlands Region (approximately 600,000 residents in year 2000) that also encompasses Lexington, Richland, and Newberry counties. Figures 2-1 and 2-2 depict the site location and features within 80 and 10 km (50 and 6 mi), respectively. The site exclusion area boundary's western axis is slightly longer (1783 m [5850 ft]) than its eastern axis (1631 m [5350 ft]) (SCE&G 1978). The exclusion area boundary also represents the site boundary.

V.C. Summer is located in a sparsely populated, largely rural area, with forests and small farms composing the dominant land use. This Piedmont terrain varies from gently rolling to hilly and includes broad stream valleys. Jenkinsville and Peak are the closest settlements, although there are also homes built along the main plant access road. The Broad River flows in a northwest-to-southeast direction approximately 1.6 km (1 mi) west of the site and serves as the boundary between Fairfield County (to the east) and Newberry County (to the west).
V.C. Summer is co-located with a hydroelectric facility. The general area has been used for energy production since 1914 when this reach of the Broad River was impounded for a small, run-of-the-river hydroelectric plant and Parr Reservoir was created. Later, a coal-fired power plant operated for decades nearby. Originally 750 ha (1850 ac), Parr Reservoir was enlarged to approximately 1780 ha (4400 ac) in 1977, by raising the level of the dam by 2.7 m (9 ft) (SCE&G 1978). This modification was necessary to support the development of the Fairfield Pumped Storage Facility (FPSF), which was built on Frees Creek, a small tributary of the Broad River. Monticello Reservoir, a 2630-ha (6500-ac) impoundment, was built in the Frees Creek

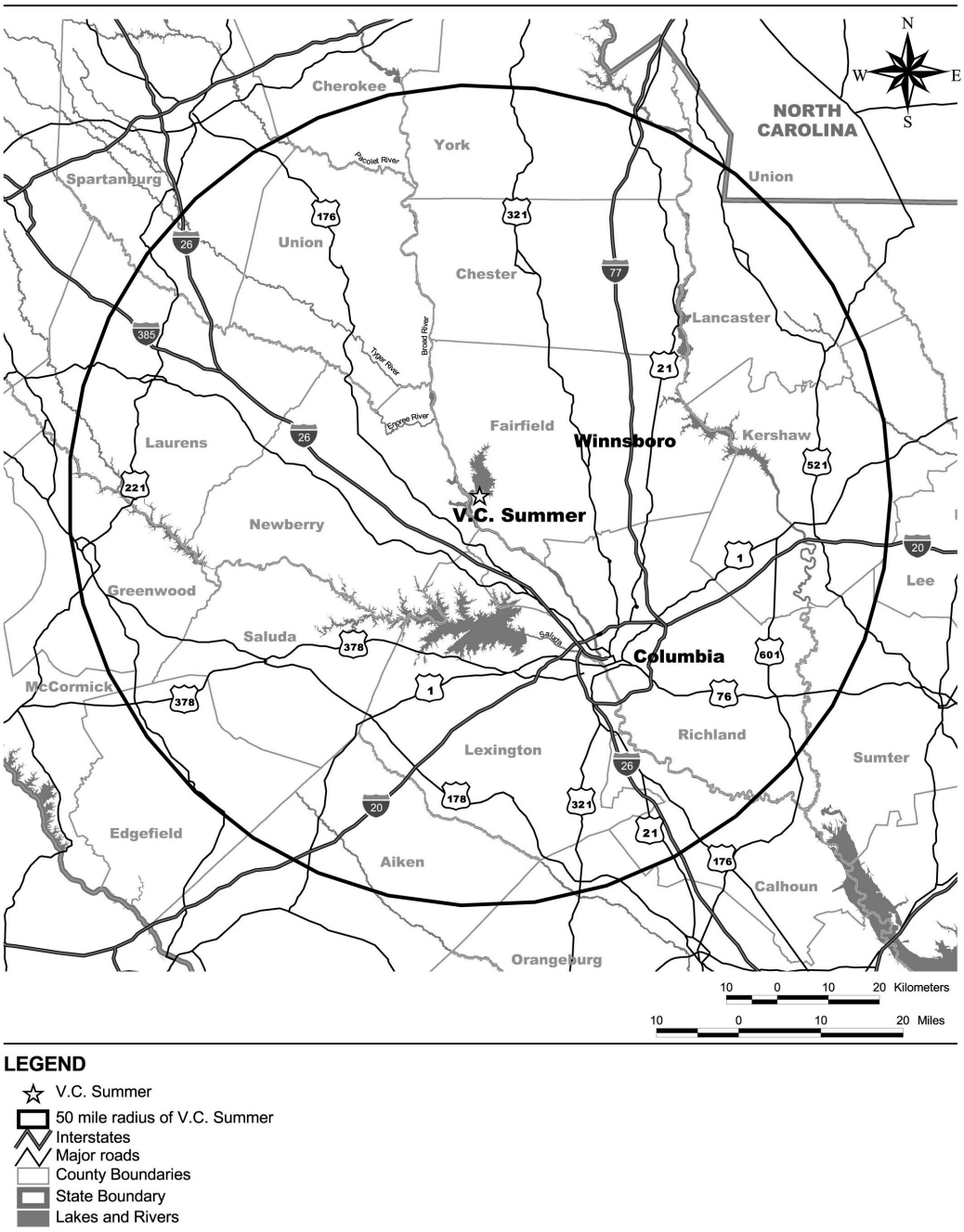

Figure 2-1. Location of V.C. Summer 80-km (50-mi) Region

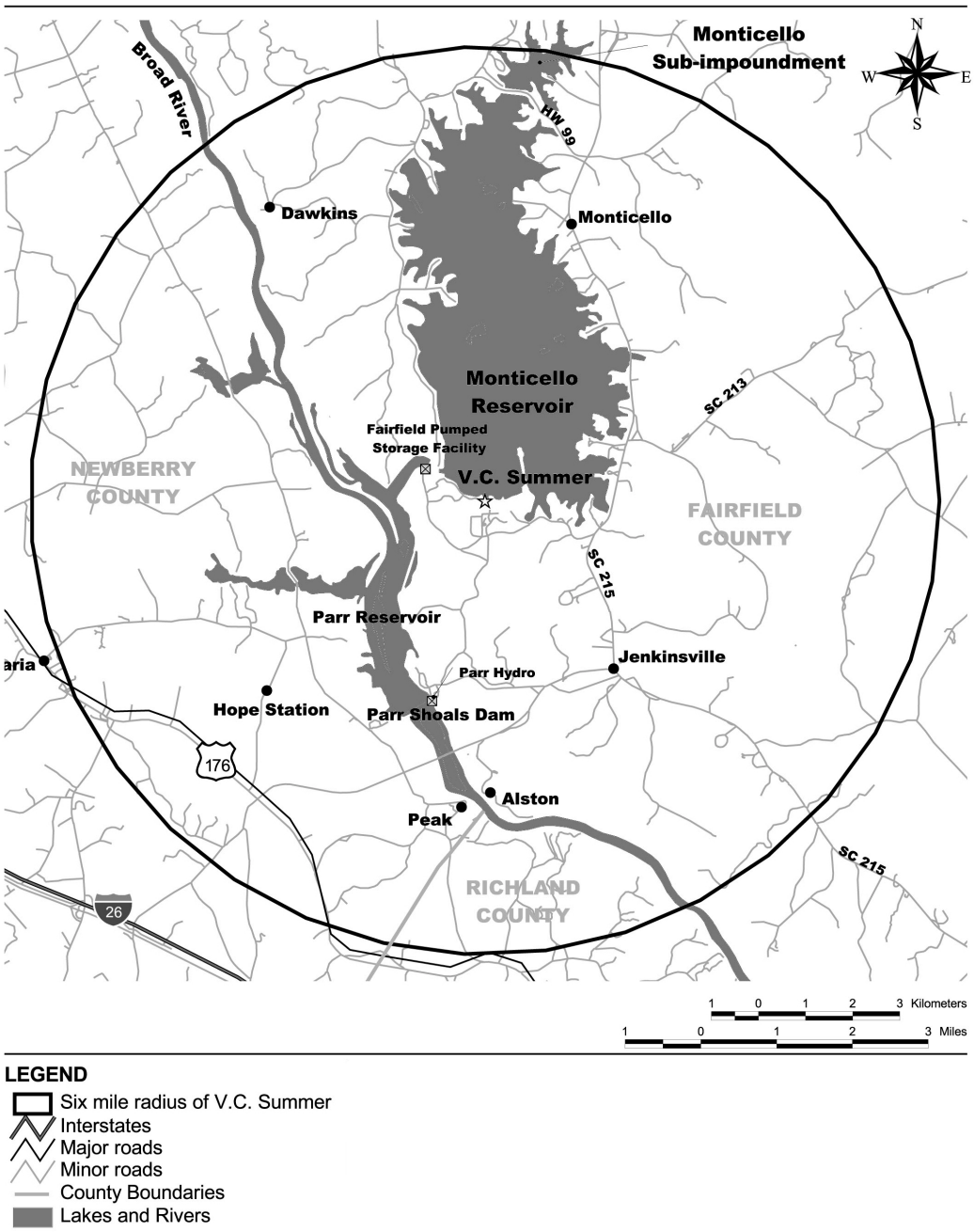

Figure 2-2. Location of V.C. Summer 10-km (6-mi) Region

valley to serve as the upper pool for FPSF and the cooling water source for V.C. Summer. Parr Reservoir, which had historically been the source of water for Parr Hydro, assumed a dual function, providing water for both Parr Hydro and FPSF.

V.C. Summer is located on the south shore of Monticello Reservoir (Figure 2-2). Monticello Reservoir is hydrologically connected (by a conduit that passes under the Highway 99 causeway) to a smaller 121-ha (300-ac) body of water known as the Monticello Subimpoundment that is managed for recreational boating and fishing by SCE&G and South Carolina Department of Natural Resources (SCDNR). SCE&G maintains the property, which includes boat launch, swimming, and picnic facilities. Lake Monticello Park, situated on the eastern shore of Monticello Reservoir, provides day use recreation including a playground, tennis courts, ball fields, picnic sites, and swimming.

Lake Murray State Park to the southwest of V.C. Summer impounds the Saluda River and offers marinas with fishing and boating and camping opportunities and includes Dreher Island State Recreation Area. Lake Wateree State Recreation Area, 24 km (15 mi) to the east of Winnsboro, permits motorized boating and is popular for fishing. The Sumter National Forest is about 48 km (30 mi) north of V.C. Summer and provides multi-use recreation. The approximately 9000-ha (22,200-ac) Congaree Swamp National Monument at the Broad and Saluda river confluence is located in lower Richland County, southwest of Columbia. It preserves the last significant tract of old-growth bottomland hardwood forest in the United States along with outstanding wetland habitat.

2.1.1 External Appearance and Setting

The domed reactor building is the tallest structure at V.C. Summer. It is surrounded by the auxiliary buildings, the control building, turbine building, and diesel generator building. There are facilities for fuel handling and related support shops, warehouses, and storage. Service water pond dams extend into Monticello Reservoir to the east as do the discharge bay and canal. The intake structure is located north of the station. A wastewater treatment area and the substation are located to the south. The FPSF is about one-half mile to the west.

The entire nuclear station and support facilities are not easily visible from adjacent communities because of the topography and forested cover. The station can be viewed from SC 215 and lands along the eastern shore of Monticello Reservoir.

The V.C. Summer site lies within the Piedmont Physiographic Province and is underlain by igneous and metamorphic crystalline rocks, including migmatites in transitional areas between metamorphic and igneous bodies. Bedrock within this portion of the Piedmont is metasedimentary and metavolcanic and contains granites, gneisses, and schists

(SCE&G 2002a). Crystalline bedrock has been deeply weathered into a saprolitic mantle of soil 40 to 20 m (40 to 85 ft) thick at the site. The upper soil profile is characterized by a silty and clayey horizon (SCE&G 2002a).

2.1.2 Reactor Systems

V.C. Summer is a single-unit plant with a domed concrete containment building. The station includes a pressurized light-water reactor nuclear steam supply system designed and furnished by Westinghouse Electric Company and a turbine generator manufactured by General Electric Corporation. The unit was designed for an output of 2775 megawatts thermal [MW(t)] with corresponding net electrical output of approximately 900 megawatts electric [MW(e)]. It achieved initial criticality in October 1982 and began commercial operation in January 1983 (SCE&G 2002a).

In 1996, SCE&G sought approval from the Nuclear Regulatory Commission (NRC) to upgrade performance to a core power output of 2900 MW(t) with a net electrical output of 945 MW(e). In August 1997, instrument changes improving measurement accuracy resulted in a 9-MW increase in indicated electrical power output, to 954 MW(e). In the Spring of 1999 a more efficient high-pressure turbine rotor increased the net electrical output to 966 MW(e) (SCE&G 2002a).

The reactor containment structure is a steel-lined, reinforced-concrete, 46.9-m- (154-ft-) diameter cylinder with a hemispheric dome and a flat reinforced concrete foundation mat (SCE&G 2002a). The concrete vertical walls are 1.2 m (4 ft) thick, with an outside diameter of 40.8 m (134 ft). The dome is 0.9 m (3 ft) thick, and the overall height is approximately 50.6 m (166 ft) above grade. Air pressure inside the containment structure is maintained at between -0.1 and +1.5 psig below atmospheric pressure for routine operations. Together with its engineered safety features, the containment structure is designed to withstand an internal pressure of 57 psig above atmospheric pressure and provides radiation shielding for both normal operation and design basis accident conditions (SCE&G 2002a).

2.1.3 Cooling and Auxiliary Water Systems

V.C. Summer operates as a once-through cooling plant that withdraws from and discharges to a cooling pond, Monticello Reservoir. Monticello Reservoir was built to supply cooling water to the station and to provide an upper reservoir for the FPSF located on Parr Reservoir.

To limit the heat load rejected to Monticello Reservoir, in 1996 SCE&G installed the Turbine Building closed-cycle cooling water system to provide cooling for certain station loads that were

previously handled by the circulating water system. The closed system does not handle any of the heat load directly associated with reactor cooling. The closed-cycle cooling water system supplies cooling water to equipment associated with the turbine, generator, and other non-nuclear systems in the Turbine Building. The system uses a forced-draft (closed-cycle) cooling facility with four fans and eight cooling coils to reject waste heat to the atmosphere. This cooling structure is 26 by 13 m (86.9 by 41.9 ft) with a maximum elevation of 140 m (459.5 ft) (grade elevation is 133 m [435 ft]) (SCE&G 1996). It is located outside of the protected area fence, approximately 152 m (500 ft) northwest of the Reactor Building. Under normal operation, one of the two closed-cycle cooling water pumps circulates treated water through the cooling coils, transferring heat removed from the various components to spray water and then to the atmosphere by evaporation of the spray water in the air stream produced by the cooling fans. The Turbine Building closed-cycle water system is independent of plant emergency cooling facilities, and is not required for reactor protection or safe shutdown (SCE&G 2002a).

The main cooling system at V.C. Summer is the circulating water system. It is designed to remove 6.67 x 10^9 Btu/h of heat from the main and auxiliary condensers as well as the turbine auxiliaries (NRC 1981). Cooling water is drawn from the Monticello Reservoir at a rate of approximately 32 m^3/s (1143 cfs), passed through the condensers, and ultimately returned to Monticello Reservoir. The intake structure, located along the south shoreline of the reservoir, has three pump bays, each with two entrances. Each entrance is 4 m (13 ft) wide and 8 m (25.5 ft) high, extending from the bottom of the pump house (elevation 119 m [390.0 ft]) to the bottom of a skimmer wall (elevation 127 m [415.5 ft]). The entrances are each equipped with vertical traveling screens (mesh size 1.0 x 0.89 cm [0.4 x 0.35 in.]) and two sets of trash racks of conventional design (NRC 1981).

After leaving the condensers, circulating water moves via a 3.7-m- (12-ft-) diameter pipe from the plant to a semi-enclosed discharge basin. From the basin, the heated effluent moves through a 305-m- (1000-ft-) long discharge canal to Monticello Reservoir. The discharge canal directs the discharge flow (heated effluent) to the northeast. A 790-m- (2600-ft-) long jetty prevents the recirculation of the heated water. Figure 2-3 shows the intake structure, discharge basin, discharge canal, and associated features of the V.C. Summer circulating water system.

To mitigate the effects of excessively warm water in the discharge canal on the fishery, the entire length of the discharge canal was dredged during July and August of 1993. The dredging increased the amount of cool water that flows into the canal during low reservoir levels. Dredging altered the circulation patterns in the canal and increased the cool water flow such that the temperature at the bottom of the discharge bay in summer remained 10 to 15 degrees cooler than “end-of-pipe” discharge temperatures (SCE&G 1996). Between 1995 and

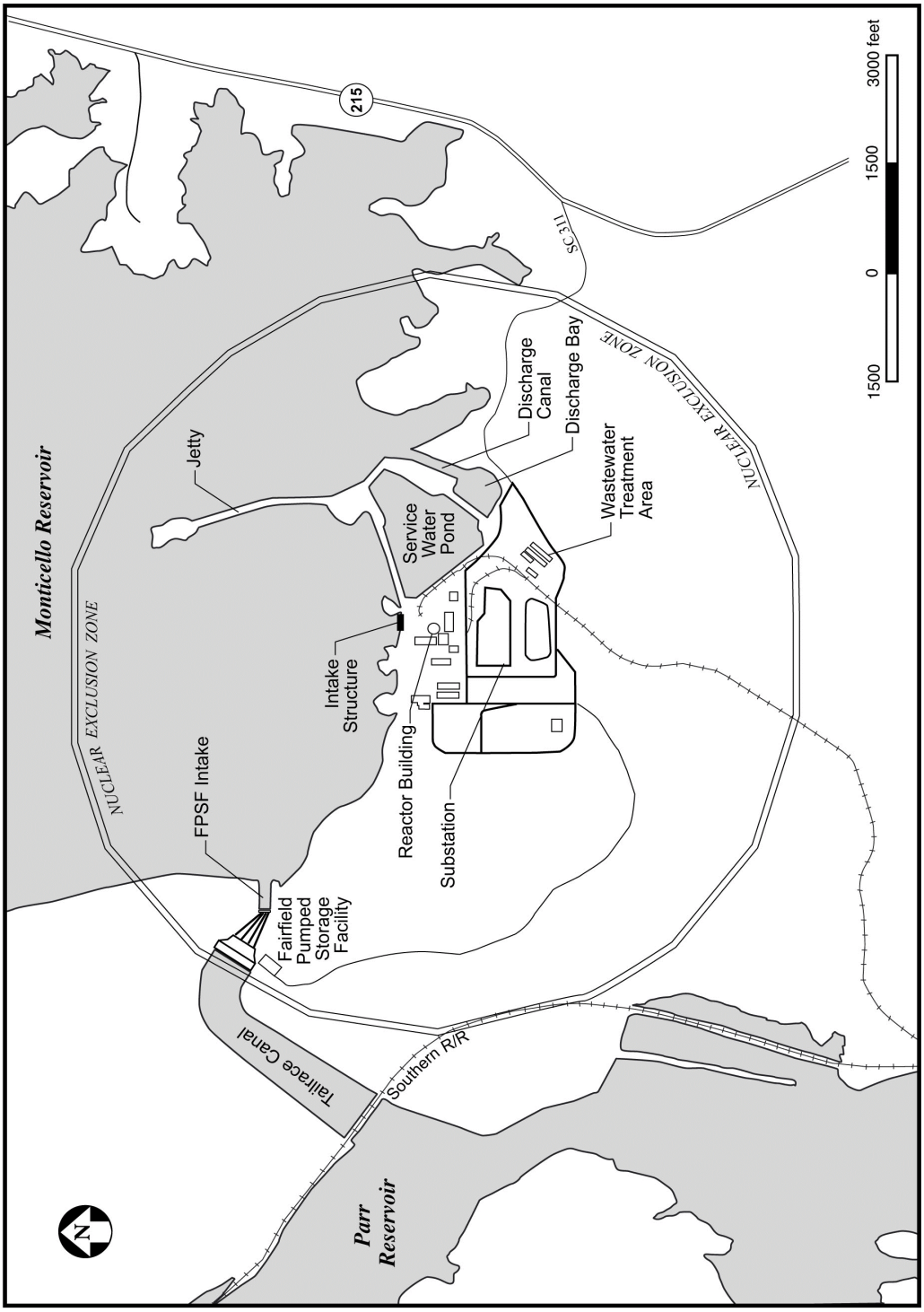

Figure 2-3. V.C. Summer Powerblock Area

2000, the maximum water temperatures measured in Monticello Reservoir at a sampling station just outside the mouth of the discharge canal ranged between 35.1 and 39.8 °C (95.2 and 103.7 °F). The maximum discharge temperature established by the National Pollutant Discharge Elimination System (NPDES) permit and measured at the point at which the flow from the cooling system enters the discharge embayment is 45 °C (113 °F) (SCDHEC 2002). The maximum plume temperature measured at the intake of the FPSF is 32.2 °C (90 °F) (SCDHEC 2002). The discharge canal conveys the water from the discharge embayment toward the main body of the reservoir and toward the FPSF.

The NRC defines “cooling pond” as a humanmade impoundment that does not impede the flow of a navigable system and that is used primarily to remove waste heat from condenser water (NRC 1996). Under this definition, Monticello Reservoir is categorized as a cooling pond. The NRC notes that nuclear power plants with cooling ponds represent a unique subset of closed-cycle systems in that they operate as once-through plants (with large condenser flow rates), but withdraw from relatively small bodies of water created for the plant (NRC 1996). The “natural body of water” (the Broad River/Parr Reservoir) is not relied on for heat dissipation, but is used as a source of makeup water to replace that lost to evaporation from the cooling pond (Monticello Reservoir) and as a receiving stream for discharges from the cooling pond.

V.C. Summer Nuclear Station Quarterly Water Use Reports indicate the theoretical maximum loss of cooling system water to evaporation is 0.6 m^3/s (22 cfs) (SCE&G 1998, 1999b). Because cooling water is withdrawn from and discharged back to Monticello Reservoir, the evaporative loss occurs from the reservoir. Make-up water for the evaporative losses is taken from the Broad River/Parr Reservoir. The theoretical maximum evaporative loss represents 14.7 percent of the minimum allowable instantaneous flow of 4.2 m^3/s (150 cfs), 9.4 percent of the lowest daily mean flow 6.6 m^3/s (235 cfs), and approximately 0.3 percent of the daily mean flow 185 m^3/s (6535 cfs) of the Broad River at Alston, South Carolina. However, water potentially used for cooling at the facility is not removed directly from a stream with natural flow, but from the Parr Reservoir, an impounded section of the Broad River. The minimum flow restrictions are Federal Energy Regulatory Commission- (FERC-) mandated as part of the relicensing of the Parr Hydroelectric Project. The restrictions do not directly apply to V.C. Summer. While V.C. Summer has established minimum water surface elevation guidelines for Monticello Reservoir to be considered as part of the cooling system operations, there is no minimum water surface elevation requirement for Monticello Reservoir. Therefore, the timing or quantity of water to be withdrawn from the Parr Reservoir to replenish the Monticello Reservoir is not subject to a regulatory requirement.

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

SCE&G uses liquid, gaseous, and solid radioactive waste management systems to collect and treat the radioactive materials that are produced as a by-product of V.C. Summer plant operations. These systems process radioactive liquid, gaseous, and solid effluents to maintain releases within regulatory limits and to maintain levels as low as reasonably achievable (ALARA) before they are released to the environment. The V.C. Summer waste processing systems meet the design objectives of Title 10 Code of Federal Regulations (CFR) Part 50, Appendix I ("Numerical Guides for Design Objective, and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water Cooled Nuclear Power Reactor Effluents"). Radioactive material in the reactor coolant is the primary source of gaseous, liquid, and solid radioactive wastes in light-water reactors. Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products are contained in the sealed fuel rods, but small quantities escape from the fuel rods and contaminate the reactor coolant. Neutron activation of the primary coolant system is also responsible for coolant contamination.

Nonfuel solid wastes result from treating and separating radionuclides from gases and liquids and from removing contaminated material from various reactor areas. Solid wastes also consist of reactor components, equipment, and tools removed from service, as well as contaminated protective clothing, paper, rags, and other trash generated from plant design modifications and operations and routine maintenance activities. Solid wastes are shipped to a waste processor for volume reduction before disposal or are sent directly to the licensed disposal facility. Spent resins and filters are dewatered and packaged for shipment to licensed offsite processing or disposal facilities (SCE&G 2002b). Currently, solid waste is shipped to Barnwell, South Carolina.

Fuel rods that have exhausted a certain percentage of their fuel and are removed from the reactor core for disposal are called spent fuel. V.C. Summer currently operates on an 18-month refueling cycle. The spent fuel assemblies are currently stored onsite in a spent fuel pool in the Auxiliary Building adjacent to the Containment Building. Spent fuel has been stored at V.C. Summer since 1984 with anticipated storage capacity being available until 2018. V.C. Summer does not currently have an independent spent fuel storage installation.

The Offsite Dose Calculation Manual (ODCM) for V.C. Summer describes the methods used for calculating concentration of radioactive material in the environment and the estimated potential offsite doses associated with liquid and gaseous effluents from V.C. Summer (SCE&G 1999a). The ODCM also specifies controls for release of liquid and gaseous effluents to ensure compliance with NRC regulations (NRC 1991).

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

The liquid waste processing system (LWPS) at V.C. Summer collects and processes potentially radioactive liquid wastes for recycle or for release to the environment (SCE&G 2001). Liquid wastes are sampled and analyzed before they are discharged. Based on a laboratory analysis, these wastes are either released under controlled conditions via the penstocks of the FPSF or retained for further processing. The LWPS consists mainly of two subsystems designated as Drain Channel A and Drain Channel B. Drain Channel A typically processes all water that can be recycled, and Drain Channel B typically processes all water that is to be discharged except for secondary system wastes. In addition to the LWPS, very low concentrations of radioactive liquid wastes are also released to Monticello Reservoir in the circulating water discharge for V.C. Summer (SCE&G 1999b).

Drain Channel A processes reactor-grade water that enters the LWPS via equipment leaks and drains, valve leakoff, pump seal leakoffs, tank overflows, and other tritiated and aerated water sources. Deaerated tritiated water inside the Reactor Building from sources such as valve leakoff, which is collected in the reactor coolant drain tank, may be routed directly to the boron recycle waste holdup tanks for processing. Administratively controlled equipment drains are the major contributors of water to Drain Channel A. Valve and pump leakoffs outside the Reactor Building are also collected in the waste holdup tank for processing and recycling. Abnormal liquid sources include leaks that may develop in the reactor coolant and auxiliary systems.

The basic composition of the liquid collected in the waste holdup tank is boric acid and water with some radioactive contamination. Liquid collected in this tank is normally treated by evaporation to remove radioisotopes, boron, and air from the water so that it may be reused in the Reactor Coolant System. The condensate leaving the LWPS waste evaporator may pass through the waste evaporator condensate demineralizer and then enter the waste evaporator condensate tank. When a sufficient quantity of water has collected in the waste evaporator condensate tank, it is normally transferred to the reactor makeup water storage tank for reuse. If the condensate requires further processing, it may be passed through the waste evaporator condensate demineralizer again or, if necessary, returned to the waste holdup tank for additional evaporation. Liquid in the waste holdup tank can also be sent directly to a demineralizer and then to a waste monitoring tank where it is stored prior to discharge.

Drain Channel B collects and processes nonreactor-grade liquid wastes from floor drains, equipment drains containing nonreactor-grade water, laundry and hot shower drains, and other nonreactor-grade sources. Drain Channel B equipment includes a floor drain tank and filter, laundry and hot shower tank and filter, chemical drain tank, waste monitor tank demineralizer and filter, two waste monitor tanks, and a waste evaporator. Non-recyclable reactor coolant leakage enters the floor drain tank from system leaks inside the Reactor Building via the

Reactor Building sump, from system leaks in the Auxiliary Building via the floor drains, and from the floor drain tank from the sample room and chemical laboratory. Laundry and hot shower drains are the largest volume source of liquid wastes and normally need no treatment for removal of radioactive material. This water is transferred to a waste monitor tank via the laundry and hot shower filter and discharged if the activity level is below acceptable limits.

Liquid wastes are released from the waste monitor tanks through the penstocks of the FPSF into Parr Reservoir. The discharge valve is interlocked with two process radiation detection monitors and closes automatically when the concentration of radioactive materials in the liquid discharge exceeds a preset limit.

The Excess Liquid Waste Processing and Storage Subsystem provides additional waste handling capability to supplement the LWPS. This processing and storage subsystem can accept excess liquid waste from the floor drain tank, laundry and hot shower tank, and waste holdup tank when these tanks are filled to capacity. Also, potentially radioactive wastes are collected from the Hot Machine Shop, Fuel Handling Building drains, and the decontamination pit. In addition, the Turbine Building floor drain system discharge will be directed to this subsystem when radioactive concentration in excess of limits is detected. The subsystem consists of two storage tanks, two process pumps, two redundant demineralizers, and two backflushable filters. Liquid waste from either storage tank is sent to the waste monitor tank prior to discharge.

The spent resin sluice portion of the LWPS consists of a spent resin storage tank, a spent resin sluice pump, and a spent resin sluice filter. The system is designed to transport spent resin to the spent resin storage tank for treatment. Following treatment, the sluice water is available for subsequent resin sluicing operations.

The ODCM prescribes the alarm/trip setpoints for the liquid-effluent radiation detection monitors, which are derived from 10 times the effluent concentration limits provided in 10 CFR Part 20, Appendix B, Table 2, Column 2 (SCE&G 1999a). There are two liquid-effluent radiation monitors for the primary radioactive liquid waste discharge pathway at V.C. Summer. The alarm/trip setpoint for each liquid-effluent monitor is based on the concentration of radioactive material in a batch of liquid to be released or in the continuous liquid discharge (SCE&G 1999a).

During 2001, there were 335 batch releases of liquid effluents with a total volume of 8.90×10^7 L (2.35×10^7 gal) of liquid waste released prior to dilution (SCE&G 2002b). In this liquid waste, there was a total fission and activation product activity of 0.0015 TBq (0.04 Ci) and total tritium activity of 18.65 TBq (504 Ci). These volumes and activities are typical of past years. Each drain channel uses one 3.8×10^4 L (10,000 gal) liquid waste-holdup tank. The

actual liquid waste generated is reported in the Annual Effluent and Waste Disposal Report for V.C. Summer (SCE&G 2002b). See Section 2.2.7 for a discussion of the calculated doses to the maximally exposed individual as a result of these releases.

SCE&G does not anticipate any increase in liquid waste releases during the renewal period.

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

The Gaseous Waste Processing System (GWPS) is the primary gaseous waste handling system for V.C. Summer. It is designed to remove fission product gases from the reactor coolant in the volume control tank (SCE&G 2001). The system is also designed to collect gases from the boron recycle and waste evaporators, reactor coolant drain tank, recycle holdup tanks, and reactor vessel. The GWPS is a closed-loop system composed of two waste gas compressors, two catalytic hydrogen recombiners, eight gas decay tanks to accumulate the fission product gases, one gas decay tank drain pump, one gas drain filter, and four gas traps. All of the equipment is located in the Auxiliary Building. The principal source to the GWPS during normal operation is taken from the gas space in the volume control tank.

During normal power operation, nitrogen gas is continuously circulated around the GWPS loop by one of the two compressors. Hydrogen gas is added to the volume control tank where it is mixed with fission gases, which are stripped from the reactor coolant. The contaminated hydrogen gas is then vented from the tank into the circulating nitrogen stream to transport the fission gases into the GWPS. The resulting nitrogen-hydrogen-fission gas is pumped to the recombiner where oxygen is combined with the hydrogen to produce water vapor. After the water vapor is removed, the resulting gas stream is circulated to the waste gas decay tanks and back to the compressor suction to complete the loop circuit.

The Auxiliary Building Charcoal Exhaust System continuously exhausts air drawn from building areas with the potential for radioactive contamination. The supply and exhaust ducts are arranged so that air flow is always in the direction of progressively greater potential contamination. Exhaust air from these areas is drawn through the roughing/high-efficiency particulate air (HEPA)/charcoal filter plenums continuously and is routed to the main exhaust fans and plant vent.

In addition to the GWPS, the Reactor Building can also release radioactive gases intermittently. Radioactive gases are released inside the Reactor Building when primary system components are opened or if leakage from the primary system occurs. The gaseous activity inside the Reactor Building may be purged continuously by a small purge system during normal operation. It may also be released when the larger Reactor Building Purge System is used during cold shutdown. If necessary, the Reactor Building Charcoal Cleanup System can be used to recirculate the Reactor Building atmosphere prior to purging. The Reactor Building purge

systems are exhausted to the outside atmosphere through HEPA filters and charcoal absorbers.

Secondary systems that can also release gaseous wastes include the Turbine Building, the Condenser Air Removal System, and Steam Generator Blowdown. Turbine Building steam leakage may release radioactive gas if primary to secondary leakage occurs. Turbine Building Ventilation System exhausts are not treated prior to release. If primary to secondary leakage occurs, then offgas from the Condenser Air Removal System may contain radioactive gases. When condenser offgas contains any significant amount of radioactive material, it is exhausted through HEPA filters and charcoal adsorbers in the Auxiliary Building Charcoal Exhaust System for particulate and iodine removal. Gaseous releases from Steam Generator Blowdown are infrequent. Radioactive gaseous effluents can also be released from the Oil Incineration Facility when it is operated on an as needed or infrequent basis.

Radioactive gaseous wastes are monitored at three primary release points at V.C. Summer: Auxiliary Building, Reactor Building (intermittently), and the Turbine Building. These release points are monitored for noble gases, and radioiodines and particulate activity, as appropriate (SCE&G 2001). Two radiation monitors (routine and high-range back-up) provide noble gas monitoring and iodine and particulate sampling for the Auxiliary Building exhaust. The Reactor Building also has two similar radiation monitors. The Turbine Building only has one monitor for gases. The ODCM prescribes alarm/trip setpoints for these effluent monitors and control instrumentation to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20 for gaseous effluents (SCE&G 1999a). These release points are continuously or intermittently monitored and provide alarms with automatic valve closure when radiation levels exceed a preset level, thus terminating discharge (SCE&G 1999a).

During 2001, there was a total fission and activation gas activity of 2.08×10^{-3} TBq (5.63×10^{-2} Ci), no iodine activity, a total particulate activity of 6.88×10^{-7} TBq (1.86×10^{-5} Ci), and a total tritium activity of 1.00×10^{-3} TBq (0.27 Ci) released from V.C. Summer (SCE&G 2002b). These releases are typical of past years. The actual gaseous waste generated is reported in the *Annual Effluent and Waste Disposal Report for V.C. Summer* (SCE&G 2002b). See Section 2.2.7 for a discussion of the calculated doses to the maximally exposed individual as a result of these releases.

SCE&G does not anticipate any increase in gaseous releases during the renewal period.

2.1.4.3 Solid Waste Processing

The Solid Waste System at V.C. Summer is designed to package and/or solidify radioactive wastes for shipment to an approved offsite burial facility. Solid wastes consist of evaporator concentrates, chemical laboratory samples, spent resins, used filter cartridges, radioactively contaminated hardware, and compacted wastes such as rags, paper, and clothing.

Liquid wastes contained in the Waste Evaporator Concentrates Tank or Chemical Drain Tank can be transferred into the liner located in the solidification area as needed. When required, radwaste solidification is accomplished using approved vendor-supplied equipment and process control program.

Primary and secondary spent resins are transferred from their respective holdup tanks to either a disposable liner in the solidification area or a liner in the truck bay. The resins may then be either solidified or dewatered for shipment. Filters are of the disposable cartridge type. Storage and disposal of all filters are within either high-integrity containers or U.S. Department of Transportation approved containers depending on the specific activity of the filters. Radioactively contaminated hardware can consist of damaged or used equipment or instruments. Such material is disposed of in the same manner as filter cartridges or compacted waste, depending upon radiation levels.

The solid waste system is normally operated on a batch basis. Radioactive waste is generally stored in the shielded areas of the radwaste area (SCE&G 2001). Storage areas are designed to accommodate the waste generated over a period in excess of a month. Solid wastes from V.C. Summer are either shipped directly to an offsite licensed disposal facility (e.g., spent resins) or consigned to a licensed processing facility for volume-reduction and decontamination activities (e.g., compactible trash). The material that remains after volume reduction is transported by the processing facility to a final disposal facility, depending on the radioactive limits. Lower-level wastes (i.e., miscellaneous solid materials) are disposed of at a licensed facility such as those in Barnwell, South Carolina, or Envirocare in Utah. Higher-level wastes (i.e., spent resins) are typically sent directly to a licensed disposal facility such as Barnwell, South Carolina (SCE&G 2002b).

Disposal and transportation of solid wastes are performed in accordance with the applicable requirements of 10 CFR Parts 61 and 71, respectively. There are no releases to the environment from radioactive solid wastes generated at V.C. Summer.

In 2001, V.C. Summer made 12 shipments of solid wastes to Envirocare (Clive, Utah) and two shipments of solid wastes to Barnwell, South Carolina, with a total volume of 11.2 m^3 (396 ft^3) and a total activity of 2.93 TBq (79.17 Ci) (SCE&G 2002b). These shipments are representative of the shipments made in the past several years and are not expected to change

substantively during the license renewal period. The actual amount of solid waste generated is reported in the *Annual Effluent and Waste Disposal Report for V.C. Summer* (SCE&G 2002b). SCE&G continues to reduce its solid waste volumes and minimize waste generated.

2.1.5 Nonradioactive Waste Systems

Various nonradioactive wastewater management and disposal activities are conducted at V.C. Summer. They include collection, treatment, and disposal of the following (SCDHEC 2002):

- sanitary wastes,
- condensate polisher backwash,
- clarifier blowdown,
- carbon filter backwash,
- gravity filter backwash,
- steam generator blowdown,
- wastewater from various sumps,
- boiler house drains,
- ion exchange regeneration,
- chemical metal cleaning wastes (primarily citric acid), and
- sumps in the chemical feed equipment area, caustic tank area, and “D” battery room.

Subsequent to the appropriate treatment processes the wastewater streams are discharged to Monticello Reservoir and monitored and regulated according to NPDES permit number SC0030856 administered by the South Carolina Department of Health and Environmental Control (SCDHEC) (SCDHEC 2002).

Storm water from the western portions of the V.C. Summer area is discharged to an unnamed tributary of the Broad River that flows into Parr Reservoir. Storm water from the eastern portions of the V.C. Summer area flows into Mayo Creek, which also drains to the Broad River, but enters the river from below the dam.

Four wastewater treatment lagoons are used to process the various types of wastewater. Wastewater potentially containing oil is processed through an oil/water separator and then solids are settled prior to discharge.

Sanitary wastewater is treated in an aeration pond, followed by a stabilization pond. The effluent is chlorinated in a chlorine contact chamber prior to commingling with other wastewater and subsequent discharge.

For wastewater resulting from backwash, filtering, and blowdown processes, treatment consists of sedimentation for the reduction of suspended solids content, then the water is discharged.

For wastewater resulting from ion exchange regeneration and sumps in the chemical feed equipment area, caustic tank area, and “D” battery room, treatment consists of flow equalization and neutralization in a 3.8 x 10^5 L (100,000 gal) wastewater treatment tank before the effluent is discharged.

Wastewater containing chemical metal cleaning wastes treatment consists of neutralization and sedimentation prior to discharge.

Solid wastes are disposed using licensed disposal methods appropriate for the waste type. Paint, oils, and solvent wastes are managed by permit as hazardous wastes and disposed of in accordance with the rules and regulations of the SCDHEC Bureau of Land and Waste Management.

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation of a nuclear plant. Maintenance activities conducted at V.C. Summer include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and public safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. SCE&G refuels V.C. Summer on an 18-month schedule. Up to 700 additional contract workers are employed for the 30- to 40-day refueling outage.

SCE&G performed an aging management review and developed an integrated plant assessment for managing the effects of aging on systems, structures, and components in accordance with 10 CFR Part 54. The aging management program is described in Section 2 of the License Renewal Application (SCE&G 2002c). The integrated plant assessment identified the programs and inspections that are managing the effects of aging at V.C. Summer. Previously, SCE&G has performed some major component replacement activities at V.C. Summer (e.g., steam generator replacement), and the integrated plant assessment did not identify any need for additional refurbishment or replacement activities. SCE&G assumes that an additional 60 workers will be needed to perform all the necessary surveillance, monitoring, inspections, testing, trending, and recordkeeping activities during the license renewal period.

2.1.7 Power Transmission System

SCE&G built eight transmission lines for the specific purpose of connecting V.C. Summer to the transmission system. Two additional transmission lines were built by Santee Cooper, the co-owner of V.C. Summer, to connect it to the regional grid. A number of these lines share the same corridor and a number of these are tie lines into an existing line. A pre-existing Duke Power Company transmission line crosses the V.C. Summer site, but does not connect to the V.C. Summer switchyard or the SCE&G transmission system.

Originating at V.C. Summer, the SCE&G transmission lines generally run in a southerly direction, with five terminations near V.C. Summer (Parr 1 and 2, Fairfield 1 and 2, and Denny Terrace 1 Tie Line), one near Aiken, South Carolina (Graniteville), and two near Columbia, South Carolina (Pineland and Denny Terrace 2) (Figure 2.4). The Santee Cooper lines run approximately east and west to substations near Blythewood and Newberry, South Carolina, respectively.

Table 2-1 identifies the transmission lines by where each line connects to the electric grid. A discussion of the features of the transmission lines, including voltage, right-of-way width and length, and presence of other lines in the right-of-way, follows and are summarized in Table 2-1.

Table 2-1. V.C. Summer Transmission Line Corridors

Transmission Line or Tie Line	Number of Lines	kV	Length		Width		Area	
			km	(mi)	m	(ft)	ha	(ac)
Parr 1 and 2	2	230	3.7	2.3	70	240	27	67
Fairfield 1 and 2	2	230	1.6	1	50	170	8	21
Denny Terrace 1 Tie Line	1	230	4	2.5	30	100	12	30
Pineland 1	1	230	38	23.5	70	240	277	684
Denny Terrace 2	1	230	40	25	30	100	132	327
Graniteville	1	230	100	62.5	50	170	521	1288
Blythewood	1	230	32	20	30	100	98	242
Newberry	1	230	29	18	30	100	88	218

Source: SCE&G 2002a

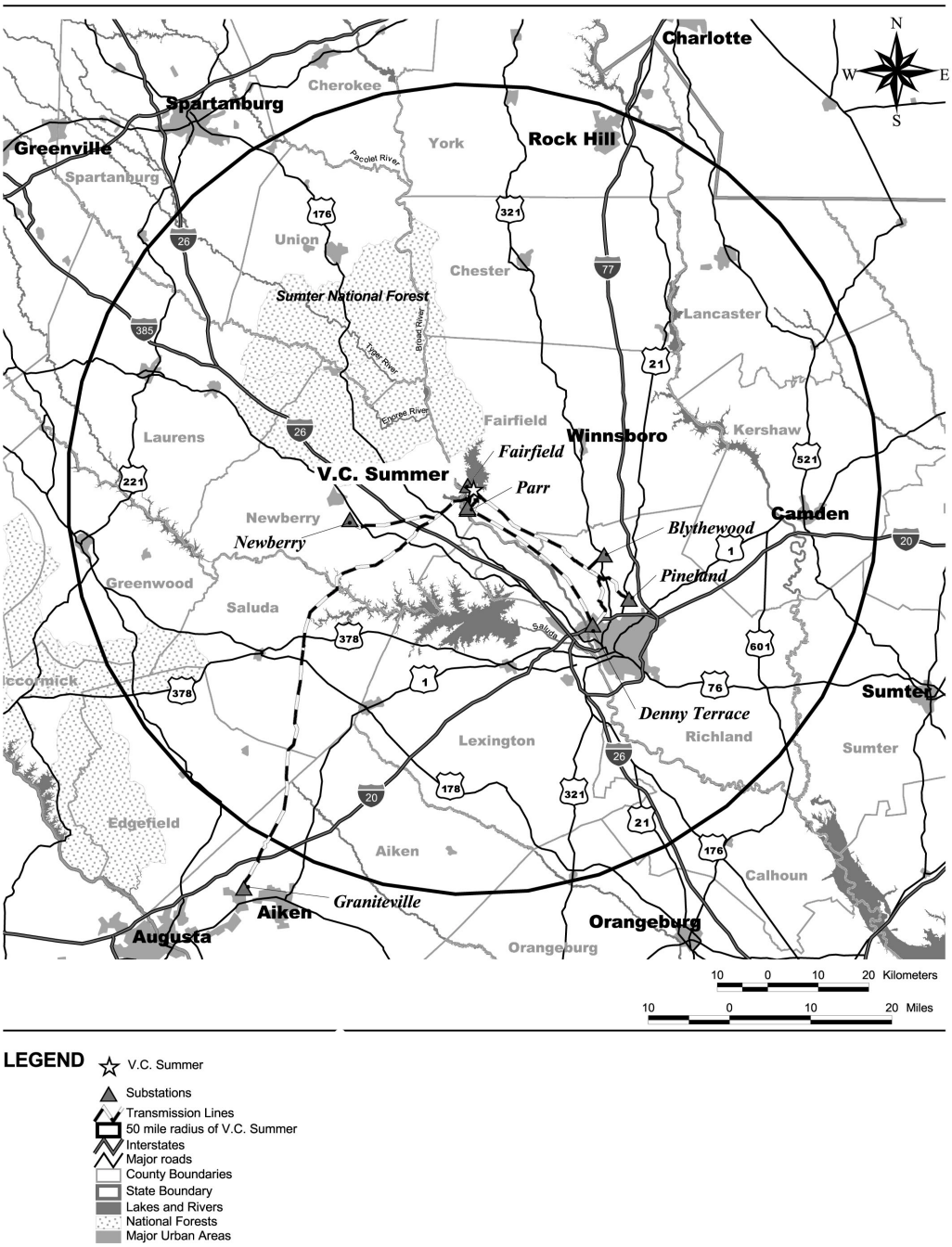

Figure 2-4. V.C. Summer Transmission Lines

- Summer-Parr No. 1 and No. 2 – These two SCE&G lines, which occupy the same 70-m (240-ft) right-of-way to the Parr Substation, operate at 230 kV. The lines' lengths are each 3.7 km (2.3 mi). For approximately 0.8 km (0.5 mi), these lines share the corridor with the Graniteville line and Santee Cooper's Newberry line.

- Summer-Fairfield No. 1 and No. 2 – These two 230-kV lines provide power to and from SCE&G's FPSF. The lines are only 1.6 km (1 mi) long and occupy a 50-m (170-ft), SCE&G wholly-owned corridor.

- Summer-Denny Terrace No. 1Tieline – This 4-km (2.5-mi), 230-kV tie line connects Summer Station to the Denny Terrace No. 1 line near Parr, South Carolina, well north of the Denny Terrace Substation. The line was built by SCE&G and occupies a 30-m (100-ft) right-of-way.

- Summer-Pineland No. 1 – This SCE&G line provides power at 230 kV to the Pineland Substation 9.6 km (6 mi) northeast of Columbia. The right-of-way width is 70 m (240 ft) for the approximately 29 km (18 mi) that the line shares the corridor with the Denny Terrace No. 2 line and then 30 m (100 ft) for the remaining 8.8 km (5.5 mi). Santee Cooper's Blythewood line parallels this line for approximately 27 km (17 mi).

- Summer-Denny Terrace No. 2 – This 230-kV SCE&G line to the Denny Terrace Substation two miles north of Columbia follows the Pineland corridor for approximately 29 km (18 mi) and then continues for approximately 11 km (7 mi) in a 30-m (100-ft) right-of-way. Santee Cooper's Blythewood line parallels this line for 27 km (17 mi).

- Summer-Graniteville – This SCE&G line provides 230 kV of power to the Graniteville Substation. The line is 100 km (62.5 mi) long. For the first 0.8 km (0.5 mi), it occupies the same right-of-way as the Newberry and Summer-Parr No. 1 and No. 2 lines. Then for 4 km (2.5 mi) it parallels the Newberry line. For the remaining 96 km (59.5 mi), it is the sole occupant of the corridor. The right-of-way width is 50 m (170 ft) as far as the Broad River and then 30 m (100 ft) to Graniteville.

- Summer-Blythewood – The Blythewood line is owned by Santee Cooper. It is a 230-kV line that runs for approximately 32 km (20 mi), sharing the corridor with the Summer-Pineland and the Denny Terrace No. 2 lines for the first 27 km (17 mi). For the remaining 5 km (3 mi), the right-of-way is 30 m (100 ft).

- Summer-Newberry – This Santee Cooper line, which is approximately 29 km (18 mi) long, operates at 230 kV and provides power to the Newberry Substation. For the first 0.8 km

(0.5 mi), it shares the corridor with the Summer-Parr No. 1 and No. 2 and the Graniteville lines. For the next 4 km (2.5 mi) it shares the corridor with the Summer-Graniteville line. For the remaining 24 km (15 mi), it occupies the 30-m (100-ft) right-of-way alone.

In total, for the specific purpose of connecting V.C. Summer to the transmission system, SCE&G and Santee Cooper have constructed approximately 250 km (160 mi) of transmission lines (over 190 km [120 mi] of corridor because of co-located lines) that occupy approximately 800 ha (2000 ac) of corridor.

2.2 Plant Interaction with the Environment

Sections 2.2.1 through 2.2.8 provide general descriptions of the environment near V.C. Summer as background information. They also provide detailed descriptions where needed to support the analysis of potential environmental impacts of refurbishment and operation during the renewal term, as discussed in Chapters 3 and 4. Section 2.2.9 describes the historic and archaeological resources in the area, and Section 2.2.10 describes possible impacts associated with other Federal project activities.

2.2.1 Land Use

The V.C. Summer site covers approximately 909 ha (2245 ac), an area that includes portions of Monticello Reservoir and FPSF. Approximately 348 ha (860 ac) are covered by the waters of Monticello Reservoir. A portion of the property (approximately 150 ha [370 ac]) consists of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass. Some functions, such as the truck equipment and maintenance facility, serve both V.C. Summer and Parr Hydro. Some 50 ha (125 ac) are dedicated to transmission line rights-of-way. However, much of the V.C. Summer property consists of forested areas (approximately 360 ha [890 ac]). The primary terrestrial habitats at V.C. Summer are pine forest, deciduous forest, and mixed pine-hardwood forest (SCANA 2000). The pine forests at V.C. Summer include planted pines and naturally vegetated pines. Most of the deciduous forests at the site are located along stream bottoms and surrounding slopes. Streamside management zones at the site are protected in accordance with best management practices established by the South Carolina Forestry Commission.

The lands at V.C. Summer are designated for industrial development in the Fairfield County Comprehensive Plan (Fairfield County 1997), which states that these lands are intended to encourage industrial growth that provides quality employment opportunities and makes effective use of the county's resources. These are the only industrial lands in western Fairfield County.

The lands surrounding Monticello Reservoir are designated by the Plan for Residential Conservation and Development and Rural Development. Several commercial clusters are also depicted along SC 215 near V.C. Summer on the Comprehensive Land Use and Development Plan. The Fairfield County Comprehensive Plan observes the unfulfilled development potential of Monticello Reservoir and designates it for Resource Preservation. Monticello Reservoir has experienced less development than other lakes in the region because power boating is not permitted, and the water level varies daily by 1.2 m (4 ft) to service Parr Hydro.

2.2.2 Water Use

Monticello Reservoir, a 2630-ha (6500-ac) impoundment, was built in the Frees Creek Valley to serve as the upper pool for the FPSF and the source of make-up cooling water for V.C. Summer. Cooling water is drawn from Monticello Reservoir at a rate of approximately 32 m^3/s (1143 cfs), passed through the condensers, and ultimately returned to Monticello Reservoir. The primary consumption of water from the Monticello Reservoir by the nuclear station is only attributable to evaporative loss. V.C. Summer Quarterly Water Use Reports indicate the theoretical maximum loss of cooling system water to evaporation is 0.6 m^3/s (22 cfs) (SCE&G 1998, 1999b). Ultimately, these losses are made up from water acquired from the Parr Reservoir on the Broad River. Water is withdrawn from Monticello Reservoir for potable use and other non-cooling related uses at V.C. Summer. This water is treated at the water treatment plant prior to use. For the year 2002, the total rate of water withdrawal from Monticello Reservoir by the water treatment plant was 0.01 m^3/s (0.045 cfs).

Pursuant to the Federal Water Pollution Control Act of 1977 (FWPCA), also known as the Clean Water Act, the water quality of the plant effluents is regulated through the NPDES. The SCDHEC is the agency delegated to issue NPDES permits. The current permit (SC0030856) was issued December 2002 and is due to expire April 2007. Any new regulations promulgated by the U.S. Environmental Protection Agency (EPA) and SCDHEC would be included in future permits.

The Broad River was impounded in 1914 for a small, run-of-the-river hydroelectric plant (Parr Hydro). The impoundment is known as Parr Reservoir. In 1977 the surface area of Parr Reservoir was expanded from 750 ha (1850 ac) to 1780 ha (4400 ac) by raising the level of the dam by 2.7 m (9 ft) (SCE&G 1978). This modification was necessary to support the development of the FPSF. Parr Reservoir, which had historically been the source of water for Parr Hydro, assumed a dual function, providing a headwater pool for Parr Hydro and a tailwater pool for FPSF.

The daily cycle of operation at the FPSF transfers up to 416 m^3/s (14,700 cfs) of water from Parr Reservoir to Monticello Reservoir and back (NRC 1981). Operations vary, depending on the season and system needs. In summer, FPSF generally pumps water from Parr Reservoir to Monticello Reservoir between the hours of 11 pm and 8 am and generates power (by releasing water) between the hours of 10 am and 11 pm. In winter, FPSF generally pumps water from Parr Reservoir to Monticello Reservoir between 11 pm and 6 am and generates between the hours of 6 am and 1 pm. The level of generation varies from one generator up to the maximum output of eight, depending on demand. Maximum output may not be necessary on all days. Pumping is normally done at maximum capacity. FPSF is normally operated 7 days a week.

As a result of FPSF operations, Parr Reservoir is subject to daily fluctuations in water level of as much as 3 m (10 ft) (NRC 1981), but the daily average is approximately 1.2 m (4 ft) (Dames and Moore 1985a). These water level fluctuations can expose and then re-inundate up to 1030 ha (2550 ac) of Parr Reservoir with each cycle of pumpback and generation (release of water). The amount of water pumped from and returned to Parr Reservoir daily represents as much as 88 percent of its total volume (NRC 1981).

The annual mean flow of the Broad River is approximately 5.8×10^9 m^3/yr (2.1×10^{11} ft^3/yr). The Federal Power Commission (FERC's predecessor agency) licensed the Parr Hydroelectric Project in 1974, contingent upon a minimum instantaneous release at the Parr Powerhouse of 4.2 m^3/s (150 cfs) during most months of the year and a minimum instantaneous release of 28 m^3/s (1000 cfs) during the March-April-May striped bass (*Morone saxatilis*) spawning period (NRC 1981). For the periods 1896 to 1907 and 1980 to 2000, the lowest daily mean flow of the Broad River at the Alston, South Carolina, gauging station was 6.7 m^3/s (235 cfs) (Cooney et al. 2001). The lowest recorded daily mean flow of 4.2 m^3/s (149 cfs) was measured at the Richtex Station, approximately 11 km (7 mi) downstream of Parr Reservoir (NRC 1981).

There are two groundwater removal (dewatering) wells on the site that are used to lower the water table and alleviate problems with water seepage into below-grade portions of buildings. This is the only withdrawal of groundwater associated with V.C. Summer. It is estimated that both wells withdraw less than 1.6 L/s (26 gpm) and both wells discharge to the site storm water system (SCE&G 2002a).

2.2.3 Water Quality

Potential environmental issues associated with water quality include three separate areas: the Monticello Reservoir, the Broad River and Parr Reservoir, and groundwater.

2.2.3.1 Monticello Reservoir Hydrology and Water Quality

The most complete source of information on the water quality and biotic resources of Monticello Reservoir is a series of reports prepared in support of a FWPCA Section 316(a) Demonstration for V.C. Summer and summarized in a final report (Dames and Moore 1985a) submitted to SCDHEC and the NRC in April 1985. A station-to-station comparison of preoperational (1978 to 1982) and operational (1983 to 1984) water chemistry in Monticello Reservoir showed significant differences in 13 of 27 chemical parameters analyzed (Dames and Moore 1985a). In 10 cases, concentrations of chemicals or measurements were higher in the preoperational phase and in three cases concentrations were higher in the operational phase. None of these differences was related to operations of V.C. Summer.

The highest temperature observed in Monticello Reservoir over the 1983 to 1984 operational phase was 34.2 °C (93.6 °F) at a depth of one foot at Station 14 (the sampling point closest to the discharge canal) in August 1983 (Dames and Moore 1985a). A discernible thermal plume was present on 12 of 24 monthly field surveys at this same location, but survey results were confounded by plant operations (the plant was off-line during four surveys and at 50 percent power or less during three surveys). When plumes were detected, they were observed to a depth of 0.3 to 0.9 m (1 to 3 ft). Below this depth, the influence of the thermal plume was not evident. In more recent years (1995 to 2000), maximum temperatures at a sampling station just outside the mouth of the discharge canal ranged from 35.1 to 39.8 °C (95.2 to 103.7 °F). The maximum discharge temperature established by the NPDES permit and measured at the point at which the flow from the cooling system enters the discharge embayment is 45 °C (113 °F) (SCDHEC 2002). The maximum monthly average plume temperature measured at the intake of the FPSF is 32.2 °C (90 °F) (SCDHEC 2002). Monticello Reservoir is currently rated as one of the least eutrophic reservoirs in South Carolina, and is characterized by low nutrient (total phosphorus and total nitrogen) concentrations (SCDHEC 1998).

Storm water and wastewater discharges to Monticello Reservoir and Mayo Creek are regulated and monitored under NPDES permit number SC0030856 (SCDHEC 2002) administered by the SCDHEC. The range of parameters monitored includes flow, temperature, various metals, pH, total suspended solids, oil and grease, biochemical oxygen demand, fecal coliform, residual chlorine, and ammonia. Two minor violations, one for oil and grease and one for residual chlorine, were noted by SCDHEC over the past five years and promptly investigated and corrective measures were taken.

2.2.3.2 Broad River and Parr Reservoir Hydrology and Water Quality

The 1998 SCDHEC report notes that water quality in the Broad River from the Tyger River to the Parr Shoals dam is suitable for a range of aquatic life, but is experiencing a significantly increasing trend in total phosphorous concentrations (SCDHEC 1998) from upstream (agricultural and municipal) sources. In addition, fecal coliform bacteria levels are occasionally elevated in this stretch of the river.

Temperatures and dissolved oxygen (DO) levels in water leaving Parr Reservoir are monitored at a U.S. Geologic Survey water quality monitoring station just downstream of the Parr Hydro powerhouse. Temperature and DO levels vary seasonally and show an inverse relationship, with high temperatures associated with relatively low DO levels and low temperatures associated with relatively high DO levels. Temperatures in water year 1999-2000 (Oct. 1, 1999, through Sept. 30, 2000) ranged from 3.5 °C (38.3 °F) in February to 31 °C (87.8 °F) in August, with corresponding DO concentrations of 13.1 mg/L and 4.9 mg/L (13.1 ppm and 4.9 ppm) (Cooney et al. 2001).

Currently, Parr Reservoir maintains an intermediate trophic state among reservoirs in South Carolina; its river-like flows and short retention time (approximately four days) produce high DO levels (in most months) and high turbidity in the reservoir. Aquatic life and recreational uses are fully supported in Parr Reservoir, according to SCDHEC (1998), meaning that water quality is adequate to support a balanced indigenous community of organisms, with no restrictions on recreational users.

2.2.3.3 Groundwater Quality

V.C. Summer does not discharge directly to groundwater. However, before construction of the Monticello Reservoir, groundwater flowed toward Frees Creek. After construction and filling of the reservoir, the local groundwater table would have been raised and the flow direction would have reversed, away from the Frees Creek drainage.

Groundwater in the vicinity of the site is highly mineralized, due to prolonged contact with, and dissolution of, rock minerals, and as a result, is generally higher than local surface waters in hardness, dissolved solids, and conductivity (Dames and Moore 1985a). The water of Monticello Reservoir is relatively low in the concentration of common ions, low in hardness, and low in dissolved solids/conductivity (Dames and Moore 1985a).

Groundwater is monitored semi-annually as required by NPDES permit number SC0030856 (SCDHEC 2002) administered by the SCDHEC. The range of parameters monitored include groundwater table elevation, ammonia, pH, specific conductivity, iron, lead, sulfate, nitrate, and total dissolved solids.

2.2.4 Air Quality

V.C. Summer is located approximately 42 km (26 mi) northwest of Columbia, South Carolina, with terrain consisting of rolling hills. The region has a temperate climate and is located midway between the humid eastern and dry western climatic zones. The weather at any time may be typical of either of these zones, or it may represent a combination of the zones. The region has long, hot summers and cool winters. Rapid changes in the weather are common, especially during the winter. Climatological records for Columbia, South Carolina, are generally representative of V.C. Summer. These records indicate that the average maximum temperatures for Columbia range from a low of about 13.9 °C (57.1 °F) in January to a high of about 33.5 °C (92.3 °F) in July. The annualized average maximum temperature is about 23.9 °C (75.1 °F). Average minimum temperatures range from a low of about 2.89 °C (37.2 °F) in January to a high of about 21.8 °C (71.3 °F) in July. The annualized average minimum temperature is about 12.2 °C (54.0 °F).

The average precipitation ranges from a low of about 6.5 cm (2.57 in.) in October to a high of about 14.0 cm (5.50 in.) in July. The average annual precipitation is about 115.0 cm (45.1 in.). The summer rains are largely in the form of local thunderstorms, occurring on an average of 11 days per month during this season. Strong winds and heavy rains are experienced once or twice per year, as effects of passing tropical storms. The average annual snowfall is about 3.1 cm (1.2 in.), most of which falls in the months of January and February. Based on statistics for the 30 years from 1954 through 1983 (Ramsdell and Andrews 1986), on the average, only nine tornadoes are expected to occur in South Carolina during the course of a year. The probability of a tornado striking the site is expected to be about 6×10^{-5} per year.

Wind energy potential is generally rated on a scale of 1 through 7. Areas suitable for wind turbine applications have a rating of 3 or higher. There is little wind energy potential in the Southeast region for existing wind turbine applications (Elliot et al. 1987). Even along coastal areas, existing data from exposed sites indicate at best only class 2 at 50 m (164 ft) above ground. The only places in the Southeast region estimated to have class 3 or higher annual average wind resource are the exposed ridge crests and mountain summits confined to northeastern Georgia and extreme northwestern South Carolina (along the ridges of the Blue Ridge Mountains).

V.C. Summer is located within the Columbia Intrastate Air Quality Control Region (AQCR) (40 CFR 81.108). This AQCR consists of the territorial area encompassed by the boundaries of Fairfield County, Lexington County, Newberry County, and Richland County in the State of South Carolina. The air quality in these regions is designated as better than national standards, in attainment, or unclassified for all criteria pollutants, in 40 CFR 81.341. There are no mandatory Class I Federal areas, in which visibility is an important value designated in 40 CFR Part 81, within 160 km (100 mi) of the V.C. Summer site.

In July 1997, the EPA revised the national standard for ground-level ozone from a 0.12-ppm, 1-hour “peak” standard to a 0.08-ppm, 8-hour “average” standard (62 FR 38856). This new standard is commonly referred to as the 8-hour standard. The District of Columbia Court of Appeals ruled against EPA in October 1999, and later the U.S. Supreme Court upheld the 8-hour standard in February 2001. It is not yet clear when EPA will make the 8-hour ozone nonattainment designations; however, the State is responding proactively. On August 23, 2002, SCDHEC published a “Notice of Drafting” in the State Register for an Early Action Plan for measures to attain the 8-hour standard before any nonattainment designation. The State intends to implement control measures in anticipation of future EPA actions.

Diesel generators, boilers, and other activities and facilities associated with the V.C. Summer site emit various nonradioactive air pollutants to the atmosphere. Air emissions from these sources are subject to the terms, limitations, standards, and schedules of a SCDHEC Conditional Major Air Quality Permit (Air Permit). Emissions are regulated under Air Quality Permit Number CM-1000-0012, which expires July 2004. Equipment with nonrad air emissions at the facility includes

- emergency diesel generator #1 (5100 KkW);
- emergency diesel generator #2 (5100 KkW);
- 112 million Btu/h No. 2 oil auxiliary boiler;
- 750,000 Btu/h waste oil incinerator;
- water treatment clay transfer silo; and
- other insignificant sources, including petroleum product storage, diesel-engine air compressors and water pumps, and maintenance facilities.

The Air Permit includes facility-wide limits on emissions of sulfur dioxide, nitrogen oxides, and carbon monoxide and includes source-specific limitations on particulate matter, opacity, sulfur dioxide, and hours of operation. There are no significant changes proposed for nonrad air emissions from the V.C. Summer site, and there are no significant changes proposed to the limits and conditions of the Air Permit.

2.2.5 Aquatic Resources

Aquatic resources in the vicinity of V.C. Summer are associated with Monticello Reservoir on Frees Creek and with Parr Reservoir on the Broad River. Monticello Reservoir (2630 ha [6,500 ac]) was constructed in 1977 on Frees Creek to serve as the cooling water source for V.C. Summer and as the upper reservoir for the FPSF. Parr Reservoir was established in the early 1900s with the construction of the Parr Hydro facility. In 1977 Parr Reservoir was enlarged from 750 ha (1850 ac) to 1780 ha (4400 ac) for added pumped storage exchange with Monticello Reservoir and as makeup water for evaporative losses from Lake Monticello due to V.C. Summer operations (SCE&G 2002a). Parr Reservoir undergoes daily depth fluctuations due to the operations of the FPSF. The reservoir is shallow, and pumped storage withdrawals, amounting to 88 percent of the reservoir's volume, can drop water levels as much as 3 m (10 ft) daily, exposing up to 1030 ha (2550 ac) of the reservoir's 1780 ha (4400 ac). Average daily water fluctuations are 1.2 m (4 ft).

The aquatic environment of Monticello Reservoir is also dominated by daily fluctuations in surface elevation of up to 1.4 m (4.5 ft) due to pumped storage activities. Monticello Reservoir is deep (average depth of 18 m [59 ft]; maximum depth of 38 m [126 ft]) and has a small watershed of 445 ha (11,000 ac) with little natural surface water flow. Surface water temperatures in the vicinity of V.C. Summer may reach as high as 39.8 °C (103.7 °F) from cooling water releases, with a monthly permitted average of 32.2 °C (90 °F) near the FPSF.

SCE&G monitored water quality and aquatic communities in the Monticello Reservoir, Broad River, and Parr Reservoir from mid-1978 through 1984 to assess the impacts of FPSF and V.C. Summer operations (Dames and Moore 1985a, 1985b). These studies represent the most comprehensive information on the biotic communities of the Broad River in the vicinity of V.C. Summer.

The reservoir is one of the least eutrophic lakes in the state, with low hardness and low phosphorus and nitrogen levels (Haddon 1995, SCE&G 2002a). The small watershed provides limited opportunity for nutrient sources to support aquatic productivity, although daily pumping from the Broad River by the FPSF may provide an additional nutrient supply. The lake supports a smaller shad population compared to some other reservoirs in the region (Christie and Stroud 1996, Nash et al. 1990); this condition may be a reflection of the low productivity of the lake. The near-shore environment is dominated by the daily fluctuations in reservoir surface elevation and may provide little opportunity for establishment of aquatic vegetation.

Monticello Reservoir contains a diverse fish community with 38 reported species. Additionally, the Asiatic clam (*Corbicula* sp.), an introduced species, has become established in the lake.

Standing crop of fish in 1984, approximately two years after the plant began operating, was dominated by bluegill (*Lepomis macrochirus*) and gizzard shad (*Dorosoma cepedianum*), with substantial populations of pumpkinseed (*L. gibbosus*) and channel catfish (*Ameiurus punctatus*) (Table 2-2). Based on studies conducted in 1978 to 1984, fish populations in Monticello Reservoir appeared to be unaffected by V.C. Summer operations (Dames and Moore 1985b).

From 1986 to 1995, the SCDNR conducted cove rotenone studies of Monticello Reservoir fish populations, which yielded higher standing stocks than earlier studies (Table 2-2). Dominant fish in 1986–1987 included gizzard shad, bluegill, channel catfish, and white catfish (*Ameiurus catus*). In 1989, blue catfish (*Ictalurus furcatus*) were collected from Monticello Reservoir for the first time. In 1995, white perch (*Morone americana*) were reported from the reservoir. By 1996, blue catfish was the most dominant fish and white perch was the sixth most dominant species. Other dominant species included gizzard shad, bluegill, channel catfish, and white catfish. Other recently introduced and newly collected species included the green sunfish (*Lepomis cyanellus*), brook silversides (*Labidesthes sicculus*), and the swallowtail shiner (*Notropis procne*). The introduction of the white perch and blue catfish is of concern to the lake fishery because of their competition for limited forage and predation on other species (SCE&G 2002a).

Fishery investigations (Christie and Stroud 1996, 1997, 1998, 1999, Nash et al. 1990) suggest that introduction of blue catfish and white perch has had a significant effect on the fishery of Lake Monticello. In 1987-1989, catfish comprised 61 percent of the fish caught and white perch were not present (Nash et al. 1990). By 1999 catfish species comprised 82 percent of fish numbers and 88 percent of fish weight harvested. The most harvested species were blue catfish (60,202 fish, 51 percent by weight), channel catfish (44,630 fish, 33.7 percent by weight), white perch (17,205 fish, 3 percent by weight), and bluegill (11,479 fish, 1 percent by weight) (Christie and Stroud 1999).

In the late 1980s, fish kills were observed in the V.C. Summer discharge bay in the late summer and early fall. Monitoring by SCE&G identified high discharge temperatures combined with Monticello Reservoir drawdowns as the probable cause of the fish kills. At lower reservoir levels, the flow of cooler water along the bottom of the discharge canal into the discharge bay was restricted, and temperatures rose to lethal levels for fish. From 1991 to 1993, SCE&G undertook several measures to resolve this problem, including removing a hump in the discharge canal (1992), limiting drawdown of Monticello Reservoir (1992), and dredging the entire length of the canal (1993). Monitoring in 1994 and 1995 verified that fish kills in the discharge channel had ceased (SCE&G 2002a).

At the upper end of Monticello Reservoir is a smaller impoundment, known as Monticello Subimpoundment. Although hydraulically connected to the main reservoir by a conduit that passes under SC 99, the water level in this subimpoundment is minimally influenced by pumped

Table 2-2 Standing Stock of Dominant Fishes of Monticello Reservoir

Species	1984[a] kg/ha (lb/ac)	1987[b] kg/ha (lb/ac)	1988[b] kg/ha (lb/ac)	1989[b] kg/ha (lb/ha)	1995[c] kg/ha (lb/ac)	1996[d] kg/ha (lb/ac)
gizzard shad (*Dorosoma cepedianum*)	13.69 (12.2)	84.4 (75.3)	37.0 (33.0)	25.2 (22.5)	46.8 (41.8)	103 (91.9)
threadfin shad (*Dorosoma petenense*)	0.14 (0.12)	16.5 (14.7)	10.6 (9.5)	10.4 (9.3)	1.71 (1.52)	2.8 (2.5)
channel catfish (*Ameiurus punctatus*)	2.78 (2.5)	62.7 (55.9)	75.9 (67.7)	31.5 (28.1)	36.1 (32.2)	98.7 (88.1)
white catfish (*Ameiurus catus*)	0.70 (0.62)	25.7 (22.9)	55.6 (49.6)	30.5 (27.2)	0.38 (0.34)	48.3 (43.1)
blue catfish (*Ictalurus furcatus*)	- -	- -	- -	4.9 (4.4)	7.67 (6.84)	123.7 (110.4)
white perch (*Morone americana*)	- -	- -	- -	- -	0.50 (0.45)	24.6 (21.9)
white bass (*Morone chrysops*)	present	0.7 (0.62)	0.3 (0.26)	1.0 (0.9)	30.0 (26.8)	0.2 (0.2)
bluegill (*Lepomis macrochirus*)	14.69 (13.1)	57.3 (51.1)	55.9 (49.6)	70.9 (13.3)	18.5 (16.5)	56.0 (49.9)
pumpkinseed (*Lepomis gibbosus*)	3.48 (3.1)	3.5 (3.1)	5.49 (4.9)	4.6 (4.1)	0.86 (0.77)	3.1 (2.8)
black crappie (*Pomoxis nigromaculatus*)	0.03 (0.026)	8.7 (7.8)	6.16 (5.5)	0.3 (0.27)	0.01 (0.01)	0.5 (0.45)
largemouth bass (*Micropterus salmoides*)	1.04 (0.93)	6.4 (5.7)	6.4 (5.7)	3.9 (3.5)	4.19 (3.74)	6.5 (5.8)
yellow perch (*Perca flavescens*)	0.59 (0.53)	10.0 (8.9)	14.8 (13.2)	9.7 (8.7)	- -	4.4 (3.9)
TOTAL	40.13 (35.8)	306.3 (273.2)	281.2 (250.8)	204.5 (182.5)	154.3 (137.7)	482.3 (430.3)

[a] Dames and Moore 1985b
[b] Nash et al. 1990
[c] Christie and Stroud 1996
[d] Christie and Stroud 1997

storage operations on the main impoundment. The subimpoundment is managed for recreation by SCE&G and SCDNR. Dominant fish species include gizzard shad, sunfish, crappie, and largemouth bass.

Monticello Reservoir and the subimpoundment are used for recreational fishing. The recreational fishery of Monticello Reservoir is dominated by catfish and sunfish. A roving creel survey, including interviews with fishermen, was conducted by SCDNR from June 1997 through May 1999 (Christie and Stroud 1999). Anglers expended an estimated 115,973 hours of fishing effort during that time. Fishing occurred from the bank (26 percent of effort), from docks (6 percent of effort), and from boats (68 percent of effort). Catfish were targeted by 51 percent of the total effort, while black crappie and largemouth bass received 15 percent and 5 percent of the effort. Fishing success was 0.9 fish/h, ranging from a high of 3 fish/h in the summer to 0.8 fish/h in the fall. Harvest rates were 56.1 fish/ha or 11.9 kg/ha (22.7 fish/ac or 10.8 lbs/ac). Harvest was dominated by blue catfish, channel catfish, and white perch.

No aquatic Federal- or State-listed endangered or threatened species are known to occur in Monticello Reservoir or in Parr Reservoir in the vicinity of V.C. Summer or in aquatic habitats crossed by the transmission lines. Two Federal-listed and 12 State-listed aquatic species have been reported from the counties of the V.C. Summer site and transmission lines (Table 2-3). One Federal-listed endangered species, the shortnose sturgeon (*Acipenser brevirostrum*), historically occurred in the Broad River in Lexington and Newberry Counties, but has been extirpated from that stretch of the Broad River. Passage of this species up the Broad River is blocked by dams. In South Carolina, the primary factors affecting populations of this species are habitat alteration due to dredging and dam construction, and pollution. In South Carolina, it currently inhabits the Winyah Bay rivers that drain into Lake Marion, the Santee, Cooper, and Savannah rivers, and the ACE (Ashepoo, Combahee, and Edisto Rivers) Basin. In the latter, shortnose sturgeon are typically found at the freshwater-saltwater interface. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The Carolina heelsplitter (*Lasmigona decorata*), a freshwater mussel listed as Endangered under the provisions of the Endangered Species Act, was historically found in South Carolina in the Pee Dee River system (Clarke 1985 as cited in USFWS 1993, Keferl and Shelly 1988 as cited in USFWS 1993, Keferl 1991 as cited in USFWS 1993). Before a 1987 USFWS survey, the Carolina heelsplitter had not been recorded in the state since the mid-19th century (Keferl and Shelly 1988 as cited in USFWS 1993, Keferl 1991 as cited in USFWS 1993). The USFWS conducted intensive surveys between 1987 and 1990 and found only two surviving populations of the Carolina heelsplitter in the Pee Dee River system; the Goose Creek and Lynches River/Flat Creek populations (Keferl 1991 as cited in USFWS 1993). During the USFWS surveys, a total of only 12 live individuals were found in Flat Creek (1987–1990) and two individuals were found in the Lynches River (both found in 1990). Because the Carolina

Table 2-3. Aquatic Species Listed or Candidates as Endangered or Threatened by the U.S. Fish and Wildlife Service or the State of South Carolina that Occur or Potentially Occur Within or Near the V.C. Summer Site or the Associated Transmission Line Rights-of-Way

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
Plants			
Myriophyllum laxum	Piedmont watermilfoil	--	SC
Potamogeton confervoides	algae-like pondweed	--	SC
Crustaceans			
Distocambarus youngineri	Saluda crayfish	--	SC
Mollusks			
Elimia catenaria	gravel elimia	--	SC
Elliptio lanceolata	yellow lance	--	SC
Lasmigona decorta	Carolina heelsplitter	E	SC
Pyganodon cataraca	Eastern floater	--	SC
Strophitus undulatus	squawfoot	--	SC
Villosa delumbis	Eastern creekshell	--	SC
Fish			
Acipenser brevirostrum	shortnose sturgeon	E	--
Etheostoma collis	Carolina darter	--	SC
Fundulus diaphanus	banded killifish	--	SC
Notropis chiliticus	redlip shiner	--	SC
Rhinichthys atratulus	blacknose dace	--	SC

(a) E = endangered, SC = South Carolina species of special concern, -- = no listing.

heelsplitter populations have been found only in other tributaries to the Pee Dee River and not in the Broad River system near the V.C. Summer site. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

Twelve additional species are listed by the State of South Carolina as species of special concern. Two submerged aquatic plants of shallow water, Piedmont watermilfoil (*Myriophyllum*

laxum) and algae-like pondweed (*Potamogeton confervoides*), are listed as species of special concern for Lexington and Richland Counties. There are no recorded occurrences of these species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The Saluda crayfish (*Distocambarus youngineri*), a burrowing species, is known from Newberry County at two localities over 40 km (25 mi) west of V.C. Summer. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The gravel elimia (*Elimia catenaria*) is an aquatic snail listed as a species of special concern for Richland County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The yellow lance (*Elliptio lanceolata*) is a mussel found in clean sands in flowing water and is listed as a species of special concern for Newberry County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The eastern floater (*Pyganodon cataraca*) is a mussel found in mud, sand, and gravel in ponds, lakes, and streams; it is listed as a species of special concern for Fairfield County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The squawfoot (*Strophitus undulatus*) is a mussel found in mud, sand, or gravel in streams and small rivers; it is listed as a species of special concern in Richland County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The eastern creekshell (*Villosa delumbis*) is a mussel found in muds or soft sand in small rivers and creeks; it is listed as a species of special concern for Fairfield and Richland Counties. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The Carolina darter (*Etheostoma collis*) is a small bottom-dwelling fish of warm pools and runs in small streams; it is listed as a species of special concern for Fairfield and Richland Counties. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The banded killifish (*Fundulus diaphanus*) is a small topwater fish of quiet shallow backwaters of lakes, ponds, rivers, and estuaries; it is listed as a species of special concern for Richland County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The redlip shiner (*Notropis chiliticus*) is a small minnow of pools and runs in small streams; it is listed as a species of special concern for Richland County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The blacknose dace (*Rhinichthys atratulus*) is a small minnow found in small streams with clear water and a gravel bottom; it is listed as a species of special concern for Richland County. There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

2.2.6 Terrestrial Resources

The V.C. Summer site covers approximately 909 ha (2245 ac), an area that includes portions of Monticello Reservoir and FPSF. Approximately 348 ha (860 ac) are covered by the waters of Monticello Reservoir. A significant portion of the property (approximately 150 ha [370 ac]) consists of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass. Some 50 ha (125 ac) are dedicated to transmission line rights-of-way. However, much of the V.C. Summer property consists of forested areas (approximately 360 ha [890 ac]). The primary terrestrial habitats at V.C. Summer are pine forest, deciduous forest, and mixed pine-hardwood forest (SCE&G 2002a). The pine forests at V.C. Summer include planted pines and naturally vegetated pines. Most of the deciduous forests at the site are located along stream bottoms and surrounding slopes.

Forested areas within the 909-ha (2245-ac) V.C. Summer site are managed by SCANA Services' Forestry Operations group, but timber is not routinely harvested. Parr Reservoir provides some limited freshwater marsh habitat in shallow backwaters, around low-lying islands, and in an area east of the FPSF tailrace that was used in the 1970s for the disposal of dredge spoil. These marshes and adjacent shallows are used by migrating dabbling ducks, including mallard (*Anas platyrhynchos*), black duck (*A. rubripes*), and teal (*A. discors* and *A. crecca*). Monticello Reservoir and its subimpoundment also provide resting areas for wintering waterfowl and provide year-round habitat for nonmigratory Canada geese (*Branta canadensis*). Terrestrial wildlife species found in the forested portions of the V.C. Summer property are those typically found in the Piedmont forests of South Carolina.

No areas designated by the U.S. Fish and Wildlife Service as critical habitat for endangered species exist at V.C. Summer or adjacent to associated transmission lines. In addition, the transmission corridors do not cross any State or Federal parks, wildlife refuges, or wildlife management areas. Table 2-4 lists the protected species and their status. SCE&G conducted a survey of threatened and endangered species at V.C. Summer and associated transmission lines (SCE&G 2002e).

Six bald eagle (*Haliaeetus leucocephalus*) nesting sites occur within an 8-km (5-mi) radius of V.C. Summer (SCDNR 2001a). Four of these six nests are believed to be active nesting sites, while the status of two nests is unknown (SCDNR 2001b). There are four bald eagle nesting sites on Parr Reservoir. Three (one active, two unknown status) are in roughly the same area (within 0.8 km [0.5 mi] of one another), on the western shore of the reservoir, approximately 3 km (2 mi) west of V.C. Summer. The fourth is on the Heller's Creek arm of Parr Reservoir, approximately 6.5 km (4 mi) northwest of V.C. Summer. There is a single bald eagle nesting site on the eastern shore of Monticello Reservoir, approximately 5.5 km (3.5 mi) north of V.C. Summer. There is also a nesting site approximately 2 km (2 mi) east of Monticello Reservoir (6.5 km [4 mi] northeast of V.C. Summer) on a tributary of the Little River. One active bald eagle nest in Saluda County is approximately 0.8 km (0.5 mi) west of the Summer-Graniteville transmission line, and one bald eagle nest in Richland County is located approximately 1.4 km (0.9 mi) south of the Summer-Denny Terrace transmission line (SCDNR 2001b). The current status of the Richland County nest is unknown, but the nest was viable as recently as 1995 (SCDNR 2001b). Bald eagles are generally associated with lakes, rivers, and coastal areas (USACE 2002). The bald eagle is Federal-listed as threatened and State-listed as endangered. Bald eagles are commonly observed foraging around Monticello Reservoir, the FPSF tailrace canal, Parr Reservoir, and on the Broad River downstream of Parr Shoals dam.

The wood stork (*Mycteria americana*), State- and Federal-listed as endangered, is known to occur in Aiken County. Although they do not nest in Aiken County, wood storks from the Birdsville Colony (near Millen, Georgia) forage in shallow wetlands on the Department of Energy's Savannah River Site and in specially constructed ponds on the National Audubon Society's Silver Bluff Sanctuary, near Jackson, South Carolina (DOE 1997; NAS undated). No transmission corridors associated with V.C. Summer cross or approach the Savannah River Site or the Silver Bluff Sanctuary.

The red-cockaded woodpecker (*Picoides borealis*), State- and Federal-listed as endangered, is known to occur in Aiken and Richland Counties (SCDNR 2002). Active nest cavities of this cooperative breeder occur in open, mature pine stands with sparse midstory vegetation (USFWS 2002). Suitable habitat for this species does not occur at V.C. Summer, and there are no known active or abandoned cavity trees adjacent to V.C. Summer-associated transmission line corridors (SCDNR 2001b).

Table 2-4. Terrestrial Species Listed or Candidates for Listing as Endangered or Threatened by the U.S. Fish and Wildlife Service or the State of South Carolina that Occur or Potentially Occur Within or Near the V.C. Summer Site or the Associated Transmission Line Rights-of-Way

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
Birds			
Haliaeetus leucocephalus	bald eagle	T	E
Mycteria americana	wood stork	E	E
Picoides borealis	red-cockaded woodpecker	E	E
Plants			
Amphianthus pusillus	pool sprite	T	T
Aster georgianus	Georgia aster	C	--
Echinacea laevigata	smooth coneflower	E	E
Lysimachia asperulifolia	rough-leaved loosestrife	E	E
Oxypolis canbyi	Canby's dropwort	E	E
Ptilimnium nodosum	harperella	E	E
Trillium reliquum	relict trillium	E	E
Amphibians			
Hyla andersonii	pine barrens treefrog	--	T
Plethodon websteria	Webster's salamander	--	E
Mammals			
Corynorhinus rafinesquii	Rafinesque's big-eared bat	--	E
Reptiles			
Gopherus polyphemus	gopher tortoise	--	E

(a) E = endangered, T = threatened, C = candidate for Federal listing, -- = no listing.

Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) is State-listed as endangered. This bat is found in forested areas, especially in pine flatwoods and pine-oak woodlands. It roosts in

hollow trees, under bark, in old cabins and barns, and in wells and culverts (Brown 1997). The species has been recorded in Aiken and Richland Counties (SCDNR 2002), but there are no recorded occurrences in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The gopher tortoise (*Gopherus polyphemus*) is State-listed as endangered and is known to occur in Aiken County (SCDNR 2002). The gopher tortoise inhabits sandy, well-drained areas where adequate vegetation for foraging exists (Martoff et al. 1980). The gopher tortoise has not been recorded north of Aiken County, and no burrows have been recorded in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b). The species' burrows, which are readily visible, have not been observed at V.C. Summer. The gopher tortoise is generally not found in areas of Piedmont soils, which characterize most of the transmission corridors associated with V.C. Summer.

The pine barrens treefrog (*Hyla andersonii*) is State-listed as threatened and is known to occur in Richland County (SCDNR 2002). This species inhabits trees in swamps adjacent to sandhill habitats (Martoff et al. 1980). There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

Webster's salamander (*Plethodon websteria*) is State-listed as endangered. It has been recorded in Saluda and Edgefield Counties (SCDNR 2002), which represent the eastern extent of its range. Webster's salamander inhabits moist, mixed hardwood forests on steep north-facing slopes with rock outcrops (Martoff et al. 1980). There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The pool sprite (*Amphianthus pusillus*) , also known as little amphianthus, is State- and Federal-listed as threatened. This aquatic plant occurs in small (usually less than one square meter) shallow pools on the crests and flattened slopes of granite outcrops (USFWS 2002). These pools completely dry out in summer droughts. Within South Carolina, the pool sprite is known from three counties (USFWS 2002; SCDNR 2002), one of which (Saluda) is crossed by the transmission lines associated with V.C. Summer. Only one occurrence of this plant is known from Saluda County (USFWS 2002), but there are no recorded occurrences in or adjacent to the V.C. Summer-associated transmission line corridors (SCDNR 2001b).
The Georgia aster (*Aster georgianus*), a candidate for Federal listing, is found in dry, open woodlands and disturbed areas, such as roadsides and utility rights-of-way that are regularly mowed. Populations have been found in Edgefield, Fairfield, and Richland Counties (SCDNR 2002). There are no recorded occurrences of this species in or adjacent to the V.C. Summer-associated transmission corridors (SCDNR 2001b).

The smooth coneflower (*Echinacea laevigata*), State- and Federal-listed as endangered, is known to occur in Aiken and Richland Counties (SCDNR 2002). Habitat for this perennial herb is open woods, cedar barrens, roadsides, clear cuts, limestone bluffs, and transmission line corridors. Fire or other disturbance, such as well-timed mowing or clearing, is essential to maintaining the open habitat required for this species (USFWS 2002). There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

The rough-leaved loosestrife (*Lysimachia asperulifolia*) is State- and Federal-listed as endangered. Habitat for this perennial herb consists of Carolina bays and the ecotones between longleaf pine (*Pinus palustris*) uplands and pond pine (*P. serotina*) pocosins. The only known location of the rough-leaved loosestrife within South Carolina is at Fort Jackson in Richland County (USFWS 2002); there are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

Canby's dropwort (*Oxypolis canbyi*) is State- and Federal-listed as endangered. This perennial plant is known to occur in 11 counties within South Carolina, one of which (Richland) is crossed by V.C. Summer transmission lines (SCDNR 2002). This coastal plain species grows in wet meadows, wet pineland savannas, ditches, sloughs, and along the edges of cypress-pine (*Callitris* sp.) ponds (USFWS 2002). There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

Harperella (*Ptilimnium nodosum*) is State- and Federal-listed as endangered. Typical habitat for this annual herb is rocky or gravel shoals, margins of swift-flowing streams, and edges of intermittent pineland ponds (USFWS 2002). Harperella is known in South Carolina from Aiken and Saluda Counties (SCDNR 2002). There is one recorded population of harperella approximately 0.8 km (0.5 mi) west of the Summer-Graniteville transmission line corridor in Saluda County. The most recent observation of this population in the SCDNR database was from 1985 (SCDNR 2001b). There are no recorded occurrences of this species in or adjacent to the V.C. Summer-associated transmission corridors (SCDNR 2001b).

Relict trillium (*Trillium reliquum*) is State- and Federal-listed as endangered. Habitat for this perennial herb is mature, moist, undisturbed hardwood forests (USFWS 2002). Relict trillium is known from Aiken and Edgefield Counties (SCDNR 2002). There are no recorded occurrences of this species in or adjacent to the transmission line corridors associated with V.C. Summer (SCDNR 2001b).

2.2.7 Radiological Impacts

SCE&G conducts an annual radiological environmental monitoring program (REMP) in and around the V.C. Summer site. This program was initiated before plant operation in 1982 (SCE&G 2002d). Through this program, radiological impacts to workers, the public, and the environment are monitored, documented, and compared to the appropriate standards. The objectives of the REMP are to

- provide representative measurements of radiation and radioactive materials in the exposure pathways and of the radionuclides that have the highest potential for radiation exposures to members of the public and

- supplement the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of effluent measurements and the modeling of the environmental exposure pathways.

Radiological releases are summarized in two annual reports: *SCE&G Radiological Environmental Monitoring Report* (SCE&G 2002d) and *SCE&G Annual Effluent and Waste Disposal Report* (SCE&G 2002b). The limits for all radiological releases are specified in the V.C. Summer ODCM (SCE&G 1999), and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the aquatic environment (fish, invertebrates, and shoreline sediment), atmospheric environment (airborne radioiodine, gross beta, and gamma), terrestrial environment (vegetation), and direct radiation.

SCE&G's review of historical data on releases and the resultant dose calculations revealed that the doses to maximally exposed individuals in the vicinity of V.C. Summer were a small fraction of the limits specified in the SCE&G ODCM (SCE&G 1999a) to meet EPA radiation standards in 40 CFR Part 190 as required by 10 CFR 20.1301(d). For 2001 (the most recent year that data were available), dose estimates were calculated based on actual liquid and gaseous effluent release data (SCE&G 2002a). Dose estimates were performed by SCE&G using the plant effluent release data, onsite meteorological data, and appropriate pathways identified in the ODCM.

An assessment of doses to the maximally exposed individual from gaseous and liquid effluents was performed by SCE&G for locations representing the maximum dose. In all cases, doses were well below the technical specification limits as defined in the ODCM (SCE&G 2002d). A

breakdown of the maximum dose to an individual located at the V.C. Summer boundary from liquid and gaseous effluents released during 2001 are summarized as follows:

- Total body dose from liquid effluents at the site discharge was 3.96 x 10^{-5} mSv (3.96 x 10^{-3} mrem), which is about 0.13 percent of the 0.03 mSv (3 mrem) dose limit specified in 10 CFR Part 50, Appendix I. The critical organ dose due to the liquid effluents at the site discharge was 4.71 x 10^{-5} mSv (4.71 x 10^{-3} mrem). This dose was about 0.05 percent of the 0.10 mSv (10 mrem) dose limit (SCE&G 2002b).

- The air dose due to noble gases in gaseous effluents was 9.93 x 10^{-7} mSv (9.93 x 10^{-5} mrad) gamma (0.001 percent of the 0.10 mGy [10 mrad] gamma dose limit) and 3.56 x 10^{-7} mGy (3.56 x 10^{-5} mrad) beta (0.0002 percent of the 0.20 mGy [20 mrad] beta dose limit) (SCE&G 2002b).

- The critical organ dose from gaseous effluents due to iodine-131, iodine-133, tritium, and particulates with half-lives greater than 8 days was 1.52 x 10^{-6} mSv (1.52 x 10^{-4} mrem), which is 0.001 percent of the 0.15 mSv (15 mrem) dose limit (SCE&G 2002b).

The applicant does not anticipate any significant changes to the radioactive effluent releases or exposures from V.C. Summer operations during the renewal period and, therefore, the impacts to the environment are not expected to change.

2.2.8 Socioeconomic Factors

The staff reviewed the *V.C. Summer Environmental Report* (SCE&G 2002a) and information obtained from meetings with local and regional agencies during a site visit to Fairfield County and the surrounding area from December 10–12, 2002. The following information describes the housing, public services, land use, demographics, and economy of the communities near V.C. Summer.

2.2.8.1 Housing

SCE&G employs a permanent workforce of approximately 600 employees at V.C. Summer and an additional 130 to 140 long-term contract employees who provide security, maintenance, engineering, and janitorial support; this is within the range of 600 to 800 personnel per reactor unit estimated in the Generic Environmental Impact Statement (GEIS) (NRC 1996). Approximately 95 percent of the permanent employees live in Lexington, Richland, Fairfield, and Newberry Counties. The remaining 4 percent are distributed across 11 South Carolina counties. About 10 percent of the employees live in Fairfield County, and 48 of these (81 percent) live in Winnsboro or Jenkinsville. Table 2-5 summarizes the information for the

Table 2-5. V.C. Summer Employee Residence Information by County

County	Number of Personnel	Percent of Total
Fairfield	59	10
Lexington	210	34
Newberry	126	20
Richland	197	32
Other Counties	29	4
TOTAL	621	100

Source: SCE&G 2002a

permanent workforce. Given the predominance of regular employees living in the Central Midlands Region and the absence of the likelihood of significant socioeconomic effects in other counties, the focus of this analysis is Fairfield, Lexington, Newberry, and Richland Counties.

V.C. Summer is on an 18-month refueling cycle. During refueling outages, which typically last for 30 to 40 days, the number of workers on site increases substantially. In three recent outages, V.C. Summer brought in 613 (refueling-10), 591 (refueling-11), and 791 (refueling-12) contractors, an average of 665 additional workers per outage. Most of these temporary workers are assumed to be located in the same geographic areas as the permanent SCE&G staff. This falls within the GEIS range of 200 to 900 additional workers per reactor outage (SCE&G 2002a).

Table 2-6 provides the number of housing units and housing unit vacancies for the four Central Midlands Counties for 1990 and 2000, derived from U.S. Census Bureau information. Each of these counties has a comprehensive plan that addresses housing needs and provides policies for guiding housing choices. Fairfield County accounted for just 1.7 percent of the Central Midlands Region's new housing units in 2001, compared to 56.5 percent in Richland, 38.2 percent in Lexington, and 3.6 percent in Newberry County (CMCOG 2001).These figures do not include mobile homes, which constitute a growing segment of the affordable housing supply in South Carolina. The Census Bureau reported that 29.3 percent of all housing units in Fairfield County in 2000 were mobile homes (this includes manufactured housing), and these structures provided 24.4 percent of the total housing units in Newberry County compared to 23.1 percent in Lexington County, just 6.6 percent in Richland County, and 20 percent for South Carolina (USCB 2000). Fairfield County has the smallest housing stock in the Central Midlands Region while Richland County has the largest. The Lexington County housing stock grew the fastest, by nearly 35 percent between 1990 and 2000, but it also had the largest change in vacancy rates. The vacancy rate in Fairfield County in 2000 was 15.5 percent but nearly half of

these (724 homes) are actually seasonal and vacation homes (USCB 2000). The vacancy rate for the four Central Midlands counties in 2000 was 8.8 percent and represents nearly 22,000 homes.

2.2.8.2 Public Services

Public services include water supply, education, and transportation.

- **Water Supply**

  Table 2-7 summarizes the daily water consumption and areas served by each water system in Fairfield County, the county most impacted by the relicensing of V.C. Summer. Fairfield County has five public water systems, serving approximately 51 percent of the population. Less than two percent receive water from private residential water systems. The remaining 47 percent rely on individual wells (Fairfield County 1997). Only the town of Winnsboro draws water from a surface supply. The source is a reservoir west of Winnsboro that is part of the Jackson Mill Creek watershed. The reservoir contains approximately 600 million gallons of water (Fairfield County 1997). The remaining four public systems draw from groundwater sources, which have a relatively low yield in the area. However, each of the systems is currently operating below capacity, with room for additional growth and development (Fairfield County 1997). The county has been working to expand water service along major transportation corridors and there has been some discussion of establishing a sewer authority, but the focus of these efforts would likely be the areas along U.S. 21 between Interstate 77 and Lake Wateree and SC 269 south of Winnsboro. Development in western Fairfield County tends to be low-density, single-family residential and served by septic systems that require lots to be an acre or more.

  The major public providers of water in Lexington County include Columbia, West Columbia, the Lexington County Joint Municipal Water and Sewer Commission, Cayce, Lexington, Batesburg-Leesville, Chapin, Pelion, Swansea, the Gilbert-Summit Rural Water District, Gaston Water District, and the Bull Swamp Water District. The remainder are private systems. Nonpublic providers include AAA Utilities, Inc., Carolina Water Service, and Heater Utilities, Inc. Lexington County has ample capacity for additional growth.

  Constraints in Newberry County will be mitigated by the construction of additional water treatment facilities as the need arises (Newberry County 1998). While water is available at the interstate interchanges, the supply is not sufficient for industrial or large-scale

Table 2-6. Housing Units and Housing Units Vacant (Available) by County during 1990 and 2000

	1990	2000	Approximate Percentage Change 1990–2000
Fairfield County			
Housing Units	8730	10,383	18.9
Occupied Units	7467	8774	17.5
Vacant Units	1263	1609	27.4
Newberry County			
Housing Units	14,445	16,805	16.3
Occupied Units	12,314	14,026	13.9
Vacant Units	2141	2779	29.8
Lexington County			
Housing Units	67,510	90,978	34.8
Occupied Units	61,592	83,240	35.1
Vacant Units	5918	7738	30.6
Richland County			
Housing Units	109,563	129,793	18.5
Occupied Units	101,588	120,101	18.2
Vacant Units	7975	9692	21.5

Source: U.S. Census Bureau (USCB) 2000 and CMCOG 2003a

Table 2-7. Fairfield County Public and Private Water Suppliers and Capacities

Water Supplier	Average Daily Use m^3/day (MGD)	Maximum Daily Capacity m^3/day (MGD)
Community Systems		
Town of Winnsboro[b]	6738 (1.78)	11,735 (3.1)
Town of Ridgeway[b]	549 (0.145)	3785 (1.0)
Jenkinsville Water District[b]	477 (0.126)	651 (0.172)
Mid-County Water District 1[b]	276 (0.073)	916 (0.242)
Mid-County Water District 2[b]	246 (0.065)	378 (0.100)
Mitford Water District[b]	303 (0.080)	1514 (0.400)
Private Residential Systems		
Royal Hills Subdivision[a]	7.6 (0.002)	45 (0.012)
Chappel Mobile Home Park[b]	not available	95 (0.025)
Coley's Mobile Home Park[b]	not available	7.9 (0.03)
Fairview Manor[a]	not available	15.8 (0.06)
Lambright Care[a]	not available	not available
Industrial Systems		
V.C. Summer[b]	7.3 (0.0278)	342 (1.296)

a. Fairfield County 1997.
b. SCDHEC 1998.

residential development. The Water and Sewer Authority will make the investment to install water tanks or larger lines only when the demand requires it (Newberry County 1998).

Water service is available to Richland County through public and private water systems. The major public system is operated exclusively by the city of Columbia which has primary water lines extending into four major planning areas. Water service is provided as far west as Chapin and Lake Murray and north to the town of Blythewood. Water service in the northeast extends very close to the Kershaw County line. Southeast of the city, water lines reach to the McEntire Air National Guard Base and the Hopkins area. Columbia's position has been to delay further water extension into unserved, sparsely populated areas until a sufficient customer base has formed. Outside of Columbia's service area, water supply depends on private wells.

- **Education**

The Central Midlands Region includes 11 school districts and 170 public schools with enrollment totaling more than 107,000 students. There are also 75 private schools and nine colleges and universities (CCEDA 2002). Fairfield County will be the focus of this analysis as it is the school district most directly and fiscally impacted by the relicensing of V.C. Summer.

The Fairfield County School District operates eight schools serving 3600 students. The high school is located in Winnsboro, as is the middle (grades 6 to 8) school. There is also an intermediate (grades 4 to 6) school, one elementary, and one primary school (grades K to 6) in Winnsboro. There are also two schools providing pre-K through 6th grade in Blair and Ridgeway. The operating budget for the Fairfield County School District in 2002 was $29.5 million of which approximately $11.4 million is derived from V.C. Summer taxes. Per pupil expenditures for the Fairfield County School District are the highest in the Central Midlands at $8062 in 1999. This compares with $5189 to $6117 for Lexington schools, $5989 for Newberry, and $6035 to $6552 for Richland schools and $5556 for South Carolina (CCEDA 2002).

- **Transportation**

The Central Midlands Region has a transportation network of trucking and railroad terminals and interstate highway access to nine regional airports, three international airports, and three international seaports, giving the area access to both domestic and international markets (CCEDA 2002).

Fairfield County operates a basic public transportation system that operates along established routes but can deviate up to 3.2 km (2 mi) off the route, and does pass close to V.C. Summer along SC 215. The primary means of personal transportation for commuting is private vehicles. Approximately 14 percent of the households in Fairfield County do not have a vehicle (USCB 2000). Road access to V.C. Summer is via

SC 311 (Ollie Bradham Boulevard), a two-lane paved road (see Figure 2-3). SC 311 intersects with SC 215 approximately 2.4 km (1.5 mi) east of V.C. Summer. SC 215 has a north-south orientation and is used by employees traveling from the Richland and Fairfield Counties areas. Additionally, employees traveling from the Richland and Lexington Counties areas may use U.S. 176 north to SC 213, which intersects with SC 215 3.2 to 4.8 km (2 to 3 mi) south of V.C. Summer.

Employees coming from the west and Newberry County area may use several secondary roads such as SC 773 or SC 202 to intersect with U.S. 176 and head south to intersect with SC 213. Traffic counts for each of these highways/roads are shown in Table 2-8 (SCE&G 2002a). Two projects appear on the Long-Range Rural System Upgrades map in the vicinity of V.C. Summer: improvements to SC 213 between SC 215 and SC 176 and for the "Peak Bypass."

Railroad access to V.C. Summer is provided with a spur from the Norfolk Southern line along the east side of Broad River that runs through Columbia and Spartanburg. There is a municipal airport south of Winnsboro and another in Newberry County while

Table 2-8 Traffic Counts for Roads in the Vicinity of V.C. Summer

Route No.	Route Location	Est. AADT[a] (total of both directions)	AADT Year
U.S. 176	SC 34 to SC 219	900	2000
U.S. 176	SC 219 to Richland County Line	1450	2000
SC 213	Newberry County line to SC 215	2300	2000
SC 213	U.S. 176 to Fairfield County line	1750	2000
SC 215	Richland County line to SC 213	1500	2000
SC 215	SC 213 to Chester County line	1250	2000
SC 202	Interstate 26 to U.S. 176	1100	2000
SC 202	U.S. 76 to Interstate 26	1850	2000
SC 773	U.S. 76 to U.S. 176	2700	2000

a = annual average daily traffic volume. Source: SCE&G 2002a.

Columbia Metropolitan Airport provides the entire region with commercial and freight service.

2.2.8.3 Offsite Land Use

Fairfield County

Fairfield County contains approximately 177,414 ha (438,400 ac). Developed or urban land composes just 2 percent of the county. The largest land use category is forest, accounting for 87 percent of the total acreage. This includes public, commercial, and noncommercial forests, as well as farm woodlands. Nonforested land, including all urban or developed land, accounts for the remaining 13 percent. The surface waters of Wateree Lake and Monticello Reservoir, along with the Broad and Catawba Rivers, compose 4 percent of the county (Fairfield County 1997). Roughly 3 percent of the forested land in the county is government owned, primarily in the Sumter National Forest, located in the northwestern part of the county. Privately owned forest land in the county is dominated by corporations, individuals, and the forest products industry. Only 6 percent of the forested land is owned by farmers, reflecting the continued decline in farming in Fairfield County since the Depression era (Fairfield County 1997). Table 2-9 provides more information about these land use patterns.

Most of the growth in Fairfield County has occurred between Winnsboro and Wateree Lake, along the Interstate 77 corridor, and suburbanization is close to Richland County. Elsewhere, development is characteristically sparse and rural, characterizing the county's agricultural past (Fairfield County 1997). The dominant form of residential land use is single-family detached housing and includes a growing number of mobile homes and other manufactured structures. Residential development is found in both isolated and cluster patterns along most county roads (Fairfield County 1997). In the 20 years that V.C. Summer has operated, Fairfield County has experienced minimal population growth: the increase from 1990 to 2000 was only 0.5 percent. The county's economic base continues to be manufacturing, followed by government, industry, and services. Land use trends tend to be evolving simultaneously with the nationwide movement away from agricultural production and toward commerce built on the processing/production of goods and the distribution of services. The Fairfield County Comprehensive Plan was prepared in 1997 and provides policies that promote orderly development while protecting natural resources and prime farmland. The Plan also contains eight policies that promote the location and retention of appropriate industries.

Table 2-9. Land Use in Fairfield County, 1997

	ha (ac)	% County
Total Area	177,424 (438,400)	
Forested Land (by ownership)	155,240 (383,607)	0.87
Public		
National Forest	4678 (11,560)	0.03
Municipal, County, State	193 (478)	0.001
Private		
Forest Industries	52,860 (130,622)	0.30
Farms (farmers)	11,747 (29,027)	0.06
Corporations and Individuals	85,761 (211,920)	0.48
Nonforested Land	22,184 (54,818)	0.13
Developed (urban)	2974 (7350)	0.01
Water	6239 (15,416)	0.04
Other	12,971 (32,052)	0.07

Source: Fairfield County, 1997.

Lexington County

Lexington County contains over 110,000 parcels located in a 1813-km^2 (700-mi^2) area (Lexington County 1999). Farmland represents 21 percent of the land, as the county is a relatively strong agricultural center. However, Lexington County is encouraging the growth of residential areas by promoting the quality of the school systems and the accessibility of resources. Overall, Lexington County has no specific growth control regulations or ordinances; however, it does have a blend of zoning styles, unrelated to growth control, that encourages a quality type of expansion characterized by a reduction in land allocations that are random and sporadic. According to the Lexington County Land Use Plan (Lexington County 1999), land will continue to be available for development for a variety of uses for several decades.

Newberry County

Newberry County has a total land area of 1678 km^2 (648 mi^2). According to the Comprehensive Plan for Newberry County (Newberry County 1998), the land is characterized by a mixture of rural and urban uses including agricultural, residential, commercial, industrial, public and semiprivate uses and vacant land. The Comprehensive Plan study was limited to the areas around the municipalities, the lake shores of Lake Greenwood and Lake Murray, the U.S. 76 corridor between the town of Little Mountain and the city of Newberry, and portions of SC 773, SC 219, SC 34, and SC 121. The unincorporated portions of the county that fall outside the defined study area do not have land use regulations but may eventually need them for future development (Newberry County 1998). Residential development is generally characterized by low- to medium-density, single-family development. There are a number of vacant lots inside and outside of the study area. Most of these are located along the lake shores, where most of the neighborhood subdivisions have occurred (Newberry County 1998). There are very few multifamily units in the unincorporated areas of the county. The option most selected for affordable housing is the manufactured home. The number of manufactured homes has increased dramatically since 1980. Most are located on individual lots and, more recently, in subdivisions (Newberry County 1998). Unlike a municipality where there is dense commercial development in a downtown or some other commercial district, Newberry County's commercial development is much less dense. In most cases, the commercial development is limited to stores located at the intersections of major roads. The remainder of commercial development exists in areas that serve local residents (Newberry County 1998). Agriculture is represented by 200 or more ha (500 ac) scattered throughout the Comprehensive Plan study area, an area comprised mostly of incorporated and developed portions of the county. Generally, there is ample land available for future development in the county; however, the exact locations of growth will be guided by two major constraints: natural features and infrastructure. The study area is crisscrossed with streams and rivers, so there will be areas where topography and flood plain characteristics will constrain development.

Richland County

Richland County occupies roughly 1937 km^2 (748 mi^2) of land area. Approximately 38 percent of the unincorporated portion of the county is developed, while the remaining 62 percent of the unincorporated land in the county is undeveloped. The unincorporated portions of the county were divided into four separate planning areas and two subareas to facilitate planning (Richland County 1999). A recently prepared comprehensive plan (Richland County 1999) noted that zoning controls were not established in Richland County until September 7, 1977. The absence of zoning controls and restrictions produced an environment where existing development patterns have been a mixture of many types of residential, commercial, and industrial uses. The plan noted further that rural open spaces and prime farmlands are being converted to residential and other suburban uses. The plan concluded that, in order to protect

significant agricultural lands, natural areas, and open space corridors, Richland County will ultimately have to develop specific zoning and growth management tools for directing future development to sustainable areas. As yet, growth control measures have not been developed or adopted.

2.2.8.4 Visual Aesthetics and Noise

V.C. Summer is situated in an undulating wooded area that is primarily rural in character. Residential low-density development typifies this part of Fairfield County. V.C. Summer is visible from certain vantage points along the shore of Monticello Reservoir and SC 215. Several transmission lines can be seen when crossing roads in the area. Noise is generally not an issue because the actual facilities are within an exclusion and buffer zone and front the reservoir.

2.2.8.5 Demography

Population was estimated from V.C. Summer out to 80 km (50 mi) in 16-km (10-mi) concentric rings. In accordance with NRC Guidance, SCE&G used the most recent decennial U.S. Census Bureau census data (USCB 2000) and geographic information system software (ArcView®) to determine demographic characteristics in the V.C. Summer vicinity. Table 2-10 shows population growth rates and projections in the Central Midlands Region from 1980 to 2040.

- **Resident Population Within 80 km (50 mi)**

  All or parts of 21 South Carolina counties and the city of Columbia (State capital), are located within 80 km (50 mi) of V.C. Summer. A small portion of one North Carolina county (Union) also lies within the 80-km (50-mi) radius. In 2000, an estimated 1.03 million people live within 80 km (50 mi) of V.C. Summer, which equates to a population density of 131 persons per square mile. Table 2-11 presents the population distribution within 80 km (50 mi) of V.C. Summer in 10-year increments between 1990 and 2010.

  Applying the GEIS proximity measures, V.C. Summer is classified as Category 3 (having one or more cities with 100,000 or more persons and less than 73 persons/km^2 [190 persons/mi^2] within 80 km [50 mi]). According to the GEIS sparseness and proximity matrix, V.C. Summer ranks of sparseness Category 3 and proximity Category 3 result in the conclusion that V.C. Summer is located in a medium population area.

Table 2-10. Population Growth in the Central Midlands Region of South Carolina 1980 to 2040

	Fairfield County		Lexington County		Richland County		Newberry County	
Year	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
1980	20,700[a]	0.4	140,353[a]	5.8	269,735[a]	1.5	31,242[a]	0.7
1990	22,295[a]	0.8	167,611[a]	1.9	285,720[a]	5.9	33,172[a]	0.6
2000	23,454[a]	0.5	216,014[a]	2.9	320,677[a]	1.2	36,108[a]	0.9
2010	24,200[b]	0.5	244,600[b]	1.7	329,000[b]	0.7	36,400[b]	0.5
2020	25,300[b]	0.5	280,400[b]	1.5	350,100[b]	0.6	38,100[b]	0.5
2030	26,474[b]	0.5	321,473[b]	1.5	377,575[b]	0.6	40,304[b]	0.6
2040	27,565[b]	0.4	359,133[b]	1.2	400,258[b]	0.6	42,091[b]	0.4

a. USCB 2000. b. CMCOG 1999.

Table 2-11. Resident Population Within 80 km (50 mi) of V.C. Summer

	0 to 16 km (0 to 10 mi)	16 to 32 km (10 to 20 mi)	32 to 48 km (20 to 30 mi)	48 to 64 km (30 to 40 mi)	64 to 80 km (40 to 50 mi)	Total
Total 1990	9720	101,479	353,400	160,349	268,826	893,774
Total 2000	10,574	127,716	397,546	189,377	307,117	1,032,330
Total 2010 (est.)	11,247	151,154	437,851	215,455	340,649	1,156,356

Source: CMCOG 2003b

The largest population centers within the 16-km (10-mi) area are the communities of Jenkinsville (948 people in 2000) in Fairfield County and Peak in Newberry County. These areas have not experienced growth relative to other areas that lie outside the 16-km (10-mi) ring, but some new residential development has occurred along SC 215 on the shore of Monticello Reservoir. In fact, the Monticello-Salem area of Fairfield County, where V.C. Summer is located, lost about 10 percent of its population (approximately 240 people) between 1970 and 1990, and currently has a population of about 2200. Fairfield County had a lower population in 2000 (23,454) than it did at the turn of the 20th Century in 1900 (29,425), and it has experienced the slowest growth compared to the three other counties (USCB 2000).

Winnsboro is 24 km (15 mi) west of V.C. Summer and has a population of 16,000. The Fairfield County Comprehensive Plan projects that most of the housing and population growth will occur in and around Winnsboro and Ridgeway. These areas of Fairfield County increased in population by nearly 10 percent or about 1700 people between 1980 and 1990 (Fairfield County 1997). The area between Winnsboro, the Broad River, and U.S. 321 is projected to grow up to 8 percent between 2000 and 2010 (CMCOG 2002).

Areas 32 to 48 km (20 to 30 mi) from V.C. Summer include eastern Newberry County, northern Lexington County, including the rapidly growing Irmo area, and Columbia, the State capitol in Richland County. These are the most rapidly growing areas within the 80-km (48-mi) radius of V.C. Summer where population gains of the 1990s are projected to continue at similar rates during the next 10 years (CMCOG 2002). There were 163 residential building permits issued in 2001 in Newberry County, in contrast to 1724 in Lexington County, and 2550 in Richland County. By comparison, just 78 residential building permits were issued in Fairfield County (CMCOG 2002). The Columbia metropolitan statistical area (Lexington and Richland Counties) grew by 8.4 percent during the 1990s, and is projected to grow by 10.7 percent between 2000 and 2010 (CCEDA 2002).

Population and growth rates 64 to 80 km (38 to 48 mi) away from V.C. Summer tend to diminish with distance. This is particularly true to the north and east.

Table 2-12 lists the age distribution of Fairfield County reported by the 2000 census and compares it to South Carolina's population for the same year. Fairfield County is essentially consistent with South Carolina for each age bracket.

Table 2-12. Age Distribution of Population in Fairfield County

	Fairfield County		South Carolina	
Age Group	**Number**	**Percentage**	**Number**	**Percentage**
Under 4	1580	6.7	264,679	6.6
5 to 17	4548	19.4	744,962	18.5
18 to 44	8539	36.4	1,593,806	39.6
45 to 64	5693	24.3	923,232	23.2
65 and over	3094	13.2	485,333	12.1
Total	23,454	100.00	4,012,012	100.00

Source: CMCOG 2003b

- **Transient Population**

The area within the first 16 km (10 mi) of V.C. Summer is characterized as rural, wooded, and low-density residential. There is no concentration of industrial or commercial facilities or uses within this area, and none are anticipated based upon the land uses denoted in the Comprehensive Plans for Fairfield and Newberry Counties. Transient employment is most likely to be out of this zone rather than into it, with the exception of V.C. Summer.

Monticello Reservoir and the private wooded lands that predominate are within the 16-km (10-mi) area. A small part of the Sumter National Forest is also within this area. The reservoir offers recreational opportunities, including camping and fishing, and day-time activities such as picnic tables, ball fields, and a playground. There are five public boat ramps, and boating is limited to nongasoline powered craft. Deer hunting is very popular in this area of Fairfield County. Private lands are leased specifically for this purpose by various sports clubs because the county is among the most-densely forested in South Carolina.[(a)]

Peak daily and annual transient population numbers are not available for these lake and hunting activities. The Rock Around the Clock Festival is held in late September in Winnsboro to celebrate the nation's oldest continually running municipal clock and attracts between 5000 and 12,000 people. The Pig in the Ridge Barbeque is held in

(a) Personal communication between Daniel Pava, Los Alamos National Laboratory, Los Alamos, New Mexico, and Mark Talbert, Clemson Agricultural Extension Service, Winnsboro, South Carolina. December 10, 2001.

Ridgeway in November and attracts several thousand. V.C. Summer refuels on an 18-month cycle and the worker population increases substantially during these 30- to 40-day outages. An average of 665 additional workers have been brought in during the past three refueling outages.

- **Migrant Labor**

Migrant farm workers are individuals whose employment requires travel to tend or harvest agricultural crops. Migrant workers are typically members of minority or low-income populations. Because migrant workers travel and can temporarily spend a significant amount of time in an area without being actual residents, they may be unavailable for census takers to count. If this occurs, migrant workers would be under-represented in U.S. Census Bureau minority and low-income population counts. There is a growing Hispanic presence in the Central Midlands living near work opportunities such as the poultry processing plants in Newberry and Columbia Farms in Lexington County.[(a)] While Hispanics are increasingly represented in Fairfield County, there has been an exceptional increase in Newberry County as indicated by the 2000 census that shows 4.2 percent of the population as Hispanic, which is a nine-fold increase since 1990 (United Way of the Central Midlands 2002).

In 1997, Fairfield County had 172 individual farms averaging 108 ha (271 ac) and 51 full-time farms. Hay and turkeys are the major products, and the county ranks 38th of 46 in agricultural cash receipts—about $13.5 million in 2001. Timber harvesting is big in Fairfield County where the 1999 delivered value of timber was $32.2 million, placing the county third out of 46 in the state (South Carolina Agricultural Statistics Service 2002 and USDA 1997). The Clemson Agricultural Extension Service estimates that tree harvesting has increased considerably during the past 20 years while the labor to accomplish this has decreased considerably. Approximately 200 people, mostly local African Americans, are employed seasonally, and crews of migrant workers from Mexico plant trees and spray them. There are no migrant worker camps within Fairfield County.[(b)]

Given the expected small number of migrant workers, and the fact that they are not concentrated in Fairfield County, the staff concludes that migrant workers would not

(a) Personal communication between Daniel Pava, Los Alamos National Laboratory, Los Alamos, New Mexico, and Cary Smith, United Way of the Central Midlands, Columbia, South Carolina.
(b) Personal communication between Daniel Pava, Los Alamos National Laboratory, Los Alamos, New Mexico, and Mark Talbert, Clemson Agricultural Extension Service, Winnsboro, South Carolina. December 10, 2001.

materially change the population characteristics of any particular census tract within the county.

2.2.8.6 Economy and Taxes

The communities potentially impacted socioeconomically by relicensing V.C. Summer are located in the four Central Midlands counties: Fairfield, Lexington, Newberry, and Richland. Fairfield County would experience the largest impacts of relicensing because the station is located there, and because economic conditions including the county's tax base are much more affected by V.C. Summer than are the other three counties. Table 2-13 summarizes and compares the unemployment, family poverty level, and median household income for each of the four counties and compares these figures with the State of South Carolina.

Fairfield County has the highest unemployment and poverty rates and the lowest median household income when compared to the three other counties and South Carolina. There are 61 percent more families in poverty in Fairfield County than in the state, and the contrast is higher when compared to the three other counties and particularly Lexington and Richland where family poverty is below the state levels. Both Newberry and Fairfield Counties also have a median household income that is lower than the state; however, the median household income in Fairfield County is projected to rise 24 percent over the next 10 years. Fairfield County unemployment has lowered over time: it was close to 10 percent in 1997. The staff concludes that Fairfield County economic trends should be more closely analyzed regarding the relicensing of V.C. Summer because of these factors.

Table 2-13. Unemployment, Poverty Level, and Median Household Income Comparison

	Percent Unemployed in Civilian Labor Force	Percent Families Below Poverty Level	Median Household Income in Dollars
Fairfield	6.9	17.2	30,376
Lexington	2.6	6.4	44,659
Newberry	4.7	13.6	32,867
Richland	4.3	10.1	39,961
South Carolina	5.9	10.7	37,082

Source: USCB 2000; Fairfield County Chamber of Commerce 2002

The Central Midlands Region, composed of Richland, Lexington, Newberry, and Fairfield Counties, is a varied mixture of rural and metropolitan areas with a total population of almost 600,000 (596,253) and an average annual growth rate of 1.7 percent (USCB 1991, 2000). Newberry and Fairfield Counties are rural. Richland and Lexington Counties encompass the metropolitan area of Columbia, the State capital, and comprise 90 percent of the Central Midland Region's population. From 1990 to 2000, South Carolina's average annual population growth rate was 1.5 percent, while Richland, Lexington, Newberry, and Fairfield Counties increased by 1.2, 2.9, 0.9, and 0.5 percent, respectively (USCB 1991, 2000). Between 2000 and 2040, Richland, Newberry, Lexington, and Fairfield Counties are projected to grow at average annual rates of 0.6, 0.4, 1.7, and 0.4 percent, respectively (USCB 2000, TtNUS 2002). In 2000, South Carolina reported a population of approximately 4.0 million people (USCB 2000). By the year 2040, South Carolina is projected to have 5.6 million people, growing at an average annual rate of 1.0 percent (USCB 2000, TtNUS 2002).

Fairfield and Newberry Counties were settled by Scotch-Irish, English, and German immigrants in the mid-18th century. In the 19th century, large-scale cotton farming replaced small farms, and the introduction of the railroad made this a leading area for the cotton market. In recent years, emphasis has been on the manufacturing, trade, and government sectors. More specifically, manufacturing is the number one sector for Fairfield and Newberry Counties (34.2 percent and 41.3 percent, respectively). Trade (28 percent) and government services (29.7 percent) are the largest sectors for Lexington and Richland Counties (CCEDA 1998). Although agriculture played a more significant role in the past, it is no longer a dominant force in the regional economy.

Columbia, the State capital, is located in Richland County. Nineteen Fortune 500 companies and 41 company headquarters can be found in Columbia. Columbia's top employers in the public sector include Federal, State, and local government, Fort Jackson, and the University of South Carolina. Top employers in the private sector include SCE&G, Richland Memorial Hospital, Blue Cross and Blue Shield of South Carolina, Computer Sciences Corporation (formerly Policy Management Systems), and Bell South (Realty World America 2002). The major private employers in Fairfield County include V.C. Summer, Uniroyal Goodrich, Standard Products, Isola USA, Fuji Copian, Plastech Engineered Products, Salant, Wal-Mart, Lang Mekra, and Gividi USA. These 11 companies employed approximately 2835 people in 2002. Mack Truck, which employed 1300 workers during peak operations in the late 1990s, recently shut down its Fairfield County operations (CCEDA 2002). Government employs about 1030, and 250 work at the hospital. Since nearly 11,000 residents in Fairfield County are in the civilian labor force, and employees commute to these major employers from outside the county, it can be surmised that most county residents work in other pursuits and smaller businesses. For example, nearly 1200 list retail trade as a household occupation in the 2000 census. Private wage and salary workers compose about 78 percent of the labor pool, government

accounts for about 18 percent, and those who are self-employed another 5 percent. This is nearly consistent with the state as a whole, where 78 percent are private wage and salary workers, 16 percent government workers, and 6 percent are self-employed (USCB 2000). Table 2-14 lists the major employers in Fairfield County.

Most of the retail and service establishments in Fairfield County are located in the incorporated areas of Winnsboro and Ridgeway where the population is sufficiently concentrated to support business activities. Most of the industrial plants are located in or near Winnsboro, and newer

Table 2-14. Major Employers in Fairfield County, South Carolina

Employer	Product	Number of Employees
Fairfield County Schools	government	700
V.C. Summer	power plant	625
Ben Arnold-Sunbelt Beverage Co.	bottler	372
Uniroyal Goodrich Tire Co.	tire cords	317
Standard Products Co.	automotive trim	302
Fairfield Memorial Hospital	medical services	250
Isola USA	printed circuit boards	238
Fairfield County	government	235
Fuji Copian Corp.	typewriter cassettes	209
Plastech Engineered Products Co.	molded automotive plastics	200
Salant Corporation	textiles and clothing	200
Wal-Mart	retail	170
Lang Mekra	truck mirrors	138
Town of Winnsboro	government	96
Gividi USA	fiberglass computer parts	64

Source: CCEDA 2002, Fairfield County Chamber of Commerce 2002

development occurs at the Walter Brown Industrial Park near Interstate 77 (Fairfield County 1997). While the trend is toward diversification in the manufacturing base, major employment in Fairfield County continues to be in the government, services, and retail sectors. An example of this is the October 2002 announcement that Infinity Health Foods will move into a previously occupied manufacturing facility on SC 321 and will employ up to 100 people over the next five years (CCEDA 2002). V.C. Summer has been and will continue to be a major employer located in Fairfield County, provided that it is relicensed and continues operations.

V.C. Summer pays annual property taxes to Fairfield County. These taxes fund Fairfield County operations, including the Fairfield County Public Schools. The county's operating budget includes the coroner, assessor, auditor, sheriff, detention center, road maintenance, solid waste, emergency management, social services, veterans affairs, and recreation facilities. For the years 1995 to 2000, V.C. Summer property taxes provided between about 41 percent and 50 percent of Fairfield County's total property tax revenue and approximately the same percentage of Fairfield County's total operating budget. The trend has been downward during this time. Residential property taxes have increased modestly during this time as well. Other sources of revenue include various fees and fines, State aid, inventory taxes, and motor carrier taxes (Johnson 2002).

Schools in South Carolina are funded primarily with the property tax. The Fairfield County School District derived $11.4 million from taxes paid by V.C. Summer in 2002. This equates to almost 40 percent of the district's $29.5 million budget. Table 2-15 compares V.C. Summer's tax payments to Fairfield County tax revenue and operating budgets.

The South Carolina Legislature is studying the issue of electric power industry deregulation. The effects of deregulation are not yet fully known but could affect tax payments by utilities to the counties. Any changes to V.C. Summer tax rates due to deregulation would, however, be independent of license renewal.

2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known and potential historic and archaeological resources at V.C. Summer and the immediate surrounding area.

2.2.9.1 Cultural Background

The area around V.C. Summer is rich in prehistoric and historic Native American and historic Euro-American resources. Recent literature provided adequate background information for the area. Consequently, only a brief summary is provided here. Prehistoric period overviews for

Table 2-15. Fairfield County Property Tax Revenues, Property Taxes Paid by V.C. Summer, and Fairfield County Operating Budget 1995 to 2000

Year	Total Fairfield County Property Tax Revenues[a] (excluding debt)	Property Tax Paid by V.C. Summer	Percent of Total Property Taxes	Operating Budget for Fairfield County[a] (excluding debt)
1995	23,338,821	11,671,000	50	23,096,221
1996	24,472,690	12,324,000	50	24,387,997
1997	25,256,855	12,629,000	50	25,234,991
1998	26,730,639	12,943,000	48	26,795,321
1999	27,772,061	12,529,000	45	27,508,743
2000	29,604,792	12,272,000	41	29,540,322

a. SCE&G 2002a.

South Carolina are provided by U.S. National Park Service (2003) and South Carolina Indians (2002). Historic period overviews for South Carolina are provided by Edgar (1998) and Milling (1969).

Prehistoric Period

The prehistoric Native American occupation of the region around V.C. Summer includes four general periods: Paleoindian period (about 10,000 to 8000 BC), the Archaic period (about 8000 to 1000 BC), the Woodland period (about 1000 BC to 900 AD), and the Mississippian and late prehistoric period (about 900 to 1500 AD). This late prehistoric period is a transitional period in which initial contacts were made with Europeans and cultural changes associated with subsequent European settlement of the area took place.

The prehistoric periods were marked by initial reliance on big game hunting for subsistence, followed by increased use of smaller game animals and plant foods in the Archaic period. Major environmental changes in the Archaic period led to an increasingly more sedentary lifestyle, primarily in riverine settings. Late in the Archaic period, more sedentary villages and an increased reliance on cultivated crops became the norm. The Woodland and Mississippian periods were characterized by larger base camps in the river valleys, with subsistence based on agriculture, hunting and gathering, and intergroup trade. The late prehistoric period is primarily identified by the introduction of European trade goods.

Native American Historic Period

At least 29 distinct groups of Indians lived in South Carolina, each having a separate dialect, many of these dialects being distinct languages. The common language families were Algonquian, Iroquoian, Muskogean, Siouan, and Yuchi. The Eno and Shakori Indians, now extinct tribes, lived in the area of present-day Fairfield County. The Catawba, Pee Dee, Chicora, Edisto, Santee, and Chicora-Waccamaw tribes are all still present in South Carolina as are many descendants of the Cherokee. By 1750, the smaller Indian tribes throughout South Carolina disappeared, probably merging with larger groups, such as the Catawba and Cherokee of South Carolina or the Creeks of Georgia. In 1830, the Indian Removal Act was passed by the United States government. In 1838, the Cherokee Indians were forced to leave their eastern homeland and travel to Indian Territory in Oklahoma. In 1993, the Catawba Tribe received its Federal recognition status. Today, the Catawba Tribe is the only Federally recognized tribe in the State of South Carolina and numbers 1200 individuals living in the vicinity of Rock Hill, South Carolina.

Euro-American Historic Period

South Carolina is one of the 13 original colonies. The Spanish and French explorers arrived in the area in the 16th century and found the land inhabited by many small tribes of Native Americans, the largest were the Cherokees and the Catawbas. The first European settlements failed. In 1670, an English settlement was established on the coast near present-day Charleston. The colony was divided in 1710 into South Carolina and North Carolina. Settlers from the British Isles, France, and other parts of Europe built plantations throughout the coastal low country. African slaves were brought into the colony in large numbers to provide labor for the plantations, and by 1720 they formed the majority of the population. The port city of Charleston became an important center of commerce and culture. The interior was slowly settled by small farmers and traders, who pushed the dwindling tribes to the west.

South Carolina was one of the richest colonies in America by the time of the American Revolution. More Revolutionary War battles were fought in South Carolina than any other state. South Carolina ratified the United States Constitution on May 23, 1788, becoming the eighth state to enter the Union.

Early settlement of Fairfield County in the mid 1700s brought cotton to the county, and it remained the main crop until depletion of the soil and the industry was brought to a halt in the 1920s. Granite deposits in the county led to the early development of quarrying. In December 1832, Winnsboro was incorporated as a town.

2.2.9.2 Historic and Archaeological Resources at V.C. Summer

Historic and archaeological site file searches were conducted at the South Carolina Master File in the South Carolina Department of Archives and History to identify cultural resources that might be present at V.C. Summer. In addition, record searches were conducted for nearby locations to gain perspective on the types of historic resources that may be present in the previously undeveloped and unsurveyed portions of V.C. Summer.

The Final Environmental Statement (AEC 1973) for the construction of V.C. Summer listed three historic sites in the vicinity. At that time, it was determined that none of the sites were "endangered" by V.C. Summer. Additionally, four archaeological sites were discovered within or near the boundary of the site and a recommendation was made by Dr. Robert L. Stephenson, State Archaeologist, that the area be surveyed and that two of the known sites be excavated (AEC 1973).

In 1972, SCE&G funded an archaeological survey that was conducted by a team from the University of South Carolina Institute of Archaeology and Anthropology. The archaeological survey was conducted to assess the nature and distribution of the sites present and to assess the effect of the Parr Hydroelectric Project on historic and archaeological resources. The Parr Hydroelectric Project included (1) elevation of the Parr Reservoir Dam, raising the level of the Parr Reservoir, (2) construction of a series of dams on Frees Creek to create the upper reservoir for a new pumped-storage facility and supply cooling water for V.C. Summer, and (3) construction of the FPSF and V.C. Summer.

The Institute of Archaeology and Anthropology team identified 27 additional sites and performed the excavation of two others. Approximately five sites were covered by water when Monticello Reservoir was filled in 1978 and are now inaccessible; the remaining sites lie along the banks of Monticello and Parr Reservoirs. Periods represented included the Early Archaic, Middle Archaic, Woodland, Mississippian, and Early Historic (SCE&G 2002a).

Since the publication of the 1973 Final Environmental Statement, 41 sites have been added to the National Register of Historic Places (NRHP) for Fairfield County. Ten of these sites fall within a 9.6-km (6-mi) radius of V.C. Summer. Twenty-eight sites have been added to the NRHP for Newberry County. Four of these sites fall within a 9.6-km (6-mi) radius of V.C. Summer. No sites listed on the National Register of Historic Places fall within a 1.6-km (1-mi) radius of V.C. Summer.

There are two other historic sites within a 9.6-km (6-mi) radius of V.C. Summer that are not listed on the National Register of Historic Places but are protected by SCE&G. One is the Mayo family cemetery, which is in a wooded area approximately 4.0 km (2.5 mi) south of V.C. Summer on land that is owned by SCE&G but is not part of V.C. Summer property. This

small family plot contains headstones dating back to 1895. The other historic site, approximately 2.4 km (1.5 mi) southwest of V.C. Summer, is a large monument erected in 1943 by the Daughters of the American Revolution marking the grave of General John Pearson, a Fairfield County native who served with distinction in the Revolutionary War. This monument is in a wooded area on land that is not part of V.C. Summer property, but is maintained as a buffer zone around the site. SCE&G's Forestry Operations group is familiar with these sites, which are marked on their timber inventory and land cover maps, and takes appropriate measures to protect them when conducting forest management activities in the vicinity of either historic site (SCE&G 2002a).

2.2.10 Related Federal Project Activities and Consultations

The staff reviewed the possibility that activities of other Federal agencies might impact the renewal of the operating license for V.C. Summer. Any such activities could result in cumulative environmental impacts and the possible need for the Federal agency to become a cooperating agency for preparation of this supplemental environmental impact statement (SEIS).

The Federal Power Commission (which became FERC) issued a license (Project Number 1894) to SCE&G on June 30, 1974, for the Parr Hydroelectric Project, which consisted of a set of related actions (elevation of Parr Shoals Dam, enlargement of Parr Reservoir, construction of FPSF, impoundment of Frees Creek for Monticello Reservoir). The Federal Power Commission prepared an environmental impact statement for this major Federal license that evaluated potential environmental impacts of this action, including the inundation of 3784 ha (9350 ac) of land (eliminating farmland, timber, wildlife habitat, and 25 homes) and enhanced recreational opportunities provided by the public recreational facilities at the expanded Parr Reservoir and new Monticello Reservoir. The Federal Power Commission concluded that the loss of 3784 ha (9350 ac) of farmland and wildlife habitat was significant (Federal Power Commission 1974), but that, with prudent evaluation and selection of construction methods and project operation, no serious cumulative adverse environmental impacts were foreseen. FPSF began commercial operation in 1978, four years before V.C. Summer. The FERC license for the Parr Hydroelectric Project, including FPSF, expires on June 30, 2020. Under current rules, SCE&G will have to file a notice of intent with FERC by the year 2015 declaring whether or not it intends to seek a new license for the hydroelectric project. At least two years before the current FERC license expires (i.e., prior to June 30, 2018), SCE&G will have to file an application for a new license.

Federal activities within the 80-km (50-mi) radius of V.C. Summer include the Sumter National Forest managed by the U.S. Department of Agriculture, the Congaree Swamp National Monument managed by the U.S. Department of Interior, and the Army's 20,800-ha (52,000-ac)

Fort Jackson southeast of Columbia. The 8800-ha (22,000-ac) Congaree Swamp hosted nearly 110,000 visitors in FY2001. Fort Jackson employs 3900 civilians and is the largest and most active Initial Entry Training Center in the United States Army, training 19,000 each year. Fort Jackson has added several new schools and training institutions, including the Soldier Support Institute, the Chaplains Center and School, and the U.S. Department of Defense Polygraph Institute. Shaw Air Force Base is located in Sumter, South Carolina, outside of the Central Midlands Region but also within the 80-km (50-mi) area.

The staff determined that there were no Federal projects or activities in the vicinity of V.C. Summer that would result in cumulative impacts or would make it desirable for another Federal agency to become a cooperating agency for preparing this SEIS.

The NRC is required under Section 102(c) of the National Environmental Policy Act of 1969 (NEPA 1969) to consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in the subject matter of the SEIS. NRC is consulting with the U.S. Fish and Wildlife Service and the South Carolina State Historic Preservation Office. Consultation correspondence is included in Appendix E.

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