5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

5.1 Discussion

NRC

"The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware." 10 CFR 51.53(c)(3)(iv)

While U.S. Nuclear Regulatory Commission (NRC) regulations do not require that an applicant's environmental report contain analyses of the impacts of those environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware [10 CFR 51.53(c)(3)(i)]. The purpose of this requirement is to alert the NRC staff to such information, so the staff can determine whether to seek the Commission's approval to waive or suspend application of the rule with respect to the affected generic analysis. NRC has explicitly indicated, however, that an applicant is not required to perform a site-specific validation of *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) conclusions (NRC 1996, pg. C9-13, Concern Number NEP.015).

South Carolina Electric and Gas Company (SCE&G) expects that new and significant information would include:

- Information that identifies a significant environmental issue not covered in the GEIS and codified in the regulation, or

- Information that was not covered in the GEIS analyses and that leads to an impact finding different from that codified in the regulation.

NRC does not specifically define the term "significant." For the purpose of its review, SCE&G used guidance available in Council on Environmental Quality (CEQ) regulations. The National Environmental Policy Act (NEPA) authorizes CEQ to establish implementing regulations for federal agency use. NRC requires license renewal applicants to provide NRC with input, in the form of an environmental report, that NRC will use to meet NEPA requirements as they apply to license renewal (10 CFR 51.10). CEQ guidance provides that federal agencies should prepare environmental impact statements for actions that would significantly affect the environment (40 CFR 1502.3), focus on significant environmental issues (40 CFR 1502.1), and eliminate from detailed study issues that are not significant [40 CFR 1501.7(a)(3)]. The CEQ guidance includes a lengthy definition of "significantly" that requires consideration of the context of the action and the intensity or severity of the impact(s) (40 CFR 1508.27). SCE&G expects that moderate or large impacts, as defined by NRC, would be significant. Chapter 4 presents the NRC definitions of "moderate" and "large" impacts.

The new and significant assessment process that SCE&G used during preparation of this license renewal application included: (1) interviews with SCE&G subject experts on the validity of the conclusions in the GEIS as they relate to Virgil C. Summer Nuclear Station (VCSNS), (2) an extensive review of documents related to environmental issues at VCSNS, (3) correspondence with state and federal agencies to determine if the agencies had concerns not addressed in the GEIS, (4) a review of internal procedures for reporting to the NRC events that could have environmental impacts, and (5) credit for the oversight provided by inspections of plant facilities by state and federal regulatory agencies.

No new and significant information regarding the environmental impacts of VCSNS license renewal was identified.

5.2 References

NRC (U.S. Nuclear Regulatory Commission). 1996. Public Comments on the Proposed 10 CFR 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response. Volume 1 and 2. NUREG-1529. Washington, D.C. May.

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

The environmental impacts of renewing the Virgil C. Summer Nuclear Station (VCSNS) operating license have been reviewed an determined to be small for all resource categories. As a consequence, no mitigation measures are recommended. Chapter 4 incorporates by reference U.S. Nuclear Regulatory Commission (NRC) findings for the 52 Category 1 issues that apply to VCSNS, all of which have impacts that are small (Table 4-2). The rest of Chapter 4 analyzes Category 2 issues, all of which are either not applicable or have impacts that would be small. Table 6-1 identifies the impacts that VCSNS license renewal would have on resources associated with Category 2 issues.

6.2 Mitigation

NRC

"The report must contain a consideration of alternatives for reducing adverse impacts...for all Category 2 license renewal issues...." 10 CFR 51.53(c)(3)(iii)

"The environmental report shall include an analysis that considers and balances...alternatives available for reducing or avoiding adverse environmental effects...." 10 CFR 51.45(c) as adopted by 10 CFR 51.53(c)(2)

All impacts of license renewal at VCSNS are small and would not require mitigation. Current operations include mitigation and monitoring activities that would continue during the term of the license renewal. South Carolina Electric & Gas Company (SCE&G) performs routine mitigation and monitoring activities to ensure the safety of workers, the public, and the environment. These activities include the radiological environmental monitoring program, continuous emissions monitoring, effluent chemistry monitoring, effluent toxicity testing, and monitoring the water quality of Monticello Reservoir.

6.3 Unavoidable Adverse Impacts

NRC

The environmental report shall discuss "[a]ny adverse environmental effects which cannot be avoided should the proposal be implemented;" 10 CFR 51.45(b)(2) as adopted by 10 CFR 51.53(c)(2)

This environmental report adopts by reference NRC findings for applicable Category 1 issues, including discussions of any unavoidable adverse impacts (Table 4-2). SCE&G examined 21 Category 2 issues and identified the following unavoidable adverse impacts of license renewal:

- Some fish are impinged on the traveling screens at the intake structures.
- Some larval fish and shellfish are entrained at the intake structures.
- For purposes of analysis, SCE&G assumed that license renewal would require 60 additional workers, which would create an additional 177 indirect jobs. A total of 237 direct and indirect jobs (213 in the four counties in which the majority of workers reside) would be created. The demand for 213 housing units in the four counties in which the majority of the current VCSNS workers reside would result in small impacts to housing availability, transportation infrastructure, and public utilities that could be characterized as adverse, but would not be significant.

Although license renewal would result in some unavoidable adverse impacts, they would be small and would not noticeably alter any important attribute of the affected resources.

6.4 Irreversible and Irretrievable Resource Commitments

NRC

The environmental report shall discuss "[a]ny irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." 10 CFR 51.45(b)(5) as adopted by 10 CFR 51.53(c)(2)

The continued operation of VCSNS for the license renewal term will result in irreversible and irretrievable resource commitments, including the following:

- nuclear fuel, which is consumed in the reactor and converted to radioactive waste;
- the land required to dispose of spent nuclear fuel, low-level radioactive wastes generated as a result of plant operations, and water treatment wastes (e.g., sludge) generated as a result of normal industrial operations;
- elemental materials that will become radioactive; and
- materials used for the normal industrial operations of the plant that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

6.5 Short-term Use versus Long-term Productivity of the Environment

NRC

The environmental report shall discuss "[t]he relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity...." 10 CFR 51.45(b)(4) as adopted by 10 CFR 51.53(c)(2)

The current balance between short-term use and long-term productivity at the VCSNS site was established when the station began operating in the early 1980s. Final Environmental Statements (USAEC 1973; NRC 1981) evaluated the impacts of constructing and operating VCSNS in rural Fairfield County, South Carolina. Some 8,000 acres were acquired from private landowners for the development of the VCSNS site, a cooling pond (Monticello Reservoir), a recreational lake (Monticello Subimpoundment), transmission line rights-of-way, and buffer areas. Most of this land was used in the creation of Monticello Reservoir (6,500 acres) and its subimpoundment (300 acres). Approximately 370 acres became the developed (facilities) portion of the VCSNS site (see Section 2.4). Approximately 125 acres were committed to transmission line rights of way. An additional 890 acres south and east of Monticello Reservoir were left in their natural state, pine forest and mixed pine-hardwood forest.

Of the land that became Monticello Reservoir, 82 percent was forested and 17 percent was farmland/pastureland (SCE&G 1978, pg. 2.1-16). All the land that was cleared, graded, and used for the VCSNS facilities and powerblock area was forested prior to development of the site. Most upland areas that were not inundated by Monticello Reservoir could be reforested or converted to agricultural use (dairy or cattle farming) after VCSNS is decommissioned. However, decisions on the ultimate disposition of these lands have not yet been made. Continued operation for an additional 20 years would not alter this conclusion.

6.6 References

NRC (U.S. Nuclear Regulatory Commission). 1981. *Final Environmental Statement Related to the Operation of Virgil C. Summer Nuclear Station Unit 1*, South Carolina Electric and Gas Company, Office of Nuclear Reactor Regulation, Washington, D.C.

SCE&G (South Carolina Electric & Gas Company). 1978. *Virgil C. Summer Nuclear Station Operating License Environmental Report* (Volume 1). October 1978.

USAEC (United States Atomic Energy Commission). 1973. *Final Environmental Statement Related to Operation of Virgil C. Summer Nuclear Station Unit 1*, South Carolina Electric & Gas Company, Directorate of Licensing. Washington, D.C.

TABLE 6-1
ENVIRONMENTAL IMPACTS RELATED TO LICENSE RENEWAL AT VCSNS

No.	Issue	Environmental Impact
	Surface Water Quality, Hydrology, and Use (for all plants)	
13	Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	**Small.** Evaporative losses from Monticello Reservoir would be less than 1 percent of the mean annual flow of the Broad River and would have little or no effect on the Broad River and its riparian ecological communities.
	Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)	
25	Entrainment of fish and shellfish in early life stages	**Small.** SCE&G has a current NPDES permit which constitutes compliance with CWA Section 316(b) requirements to provide best available technology to minimize entrainment.
26	Impingement of fish and shellfish in early life stages	**Small.** SCE&G has a current NPDES permit which constitutes compliance with CWA Section 316(b) requirements to provide best available technology to minimize impingement.
27	Heat shock	**Small.** SCE&G has a CWA Section 316(a) variance for facility-specific thermal discharge limits.
	Groundwater Use and Quality	
33	Groundwater use conflicts (potable and service water, and dewatering; plants that use > 100 gpm)	**None.** This issue does not apply because VCSNS does not use groundwater for potable or service water; dewatering operations remove much less than 100 gpm.
34	Groundwater use conflicts (plants using cooling towers or cooling ponds withdrawing make-up water from a small river)	**Small.** The water in Parr Reservoir would distribute any loss due to evaporative cooling from Monticello Reservoir in such a way as to be insignificant to the alluvial aquifer.
35	Groundwater use conflicts (Ranney wells)	**None.** This issue does not apply because VCSNS does not use Ranney wells.
39	Groundwater quality degradation (cooling ponds at inland sites)	**Small.** There is no indication that groundwater quality has been degraded by the operation of VCSNS or its cooling pond. Concentrations of common ions, minerals, and solids are higher in local groundwater than in Monticello Reservoir, suggesting little potential for the cooling pond to degrade groundwater.
	Terrestrial Resources	
40	Refurbishment impacts	**None.** No impacts are expected because VCSNS will not undertake refurbishment.
	Threatened or Endangered Species	
49	Threatened or endangered species	**Small.** Numbers of bald eagles using the Parr Reservoir-Monticello Reservoir system have increased since VCSNS was originally licensed. Construction and operation of the station have had no adverse effect on eagles, and may have had a beneficial effect by expanding foraging and nesting areas. Impacts over the license renewal term would be similar and largely positive. No other threatened or endangered species is known to occur at VCSNS or along its transmission corridors.

TABLE 6-1 (Continued)
ENVIRONMENTAL IMPACTS RELATED TO LICENSE RENEWAL AT VCSNS

No.	Issue	Environmental Impact
		Air Quality
50	Air quality during refurbishment (nonattainment and maintenance areas)	**None.** No impacts are expected because VCSNS will not undertake refurbishment.
		Human Health
57	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	**Small.** The thermal characteristics of the VCSNS discharge and the absence of a seed source or inoculant are such that plant operations should not stimulate growth or reproduction of thermophilic organisms.
59	Electromagnetic fields, acute effects (electric shock)	**Small.** The largest modeled induced current under the VCSNS transmission lines would be less than 5.0 milliamperes. Therefore, the VCSNS transmission lines conform to the National Electric Safety Code® provisions for preventing electric shock from induced current.
		Socioeconomics
63	Housing impacts	**Small.** NRC concluded that housing impacts would be small in medium and high population areas having no growth control measures. VCSNS is located in a medium population area that does not have growth control measures.
65	Public services: public utilities	**Small.** Any increase in public water requirements from 237 new households would not impinge on the water supplies of the affected communities.
66	Public services: education (refurbishment)	**None.** No impacts are expected because VCSNS will not undertake refurbishment.
68	Offsite land use (refurbishment)	**None.** No impacts are expected because VCSNS will not undertake refurbishment.
69	Offsite land use (license renewal term)	**Small.** No plant-induced changes to offsite land use are expected from license renewal. Impacts from continued operation would be positive.
70	Public services: transportation	**Small.** Any additional employees (up to 60) would be less than the typical refueling outage workforce of 600-800 people. Existing access roads are adequate to support this outage traffic. The impact of up to 60 additional workers would be small.
71	Historic and archaeological resources	**Small.** Continued operation of VCSNS would not require construction at the site or new transmission lines. Therefore, license renewal would not adversely affect historic or archaeological resources.
		Postulated Accidents
76	Severe accidents	No SAMA candidates were found to be cost-beneficial.

7.0 ALTERNATIVES TO THE PROPOSED ACTION

NRC

The environmental report shall discuss "[A]lternatives to the proposed action...." 10 CFR 51.45(b)(3), as adopted by reference at 10 CFR 51.53(c)(2).

"...The report is not required to include discussion of need for power or the economic costs and economic benefits of...alternatives to the proposed action except insofar as such costs and benefits are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation...." 10 CFR 51.53(c)(2).

"...While many methods are available for generating electricity, and a huge number of combinations or mixes can be assimilated to meet a defined generating requirement, such expansive consideration would be too unwieldy to perform given the purposes of this analysis. Therefore, NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources and only electric generation sources that are technically feasible and commercially viable...." (NRC 1996a, Section 8.1, pg. 8-1)

"...The consideration of alternative energy sources in individual license renewal reviews will consider those alternatives that are reasonable for the region, including power purchases from outside the applicant's service area...." (NRC 1996b, Section II.H, page 66541, column 3)

Chapter 7 evaluates alternatives to Virgil C. Summer Nuclear Station (VCSNS) Unit 1 license renewal. The chapter identifies actions that South Carolina Electric & Gas Company (SCE&G) might take, and associated environmental impacts, if the U.S. Nuclear Regulatory Commission (NRC) did not renew the plant operating license. The chapter also addresses some of the actions that SCE&G has considered, but would not take, and identifies the bases for determining that such actions would be unreasonable.

The alternatives discussion is divided into two categories, "no action" and "alternatives that meet system generating needs." In considering the level of detail and analysis that it should provide for each category, SCE&G relied on the NRC decision-making standard for license renewal:

"...the NRC staff, adjudicatory officers, and Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable." [10 CFR 51.95(c)(4)].

The discussion that follows is intended to provide sufficient information to clearly indicate whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action. Providing additional detail or analysis serves no function if it only brings to light additional adverse impacts of alternatives to license renewal. This approach is consistent with regulations of the Council on Environmental Quality, which provide that the consideration of alternatives (including the proposed action) should enable reviewers to evaluate their comparative merits (40 CFR 1500-1508). Chapter 7 provides sufficient detail about alternatives to establish the basis for necessary comparisons to the Chapter 4 discussion of impacts from the proposed action and support NRC decision making.

In characterizing environmental impacts of alternatives, SCE&G has used the same definitions of "small," "moderate," and "large" that are presented in the introduction to Chapter 4.

7.1 No-Action Alternative

SCE&G is using "no-action alternative" to refer to a scenario in which the NRC does not renew the VCSNS operating license. Components of this alternative include replacing the generating capacity of VCSNS and decommissioning the facility, as described below.

Presently, VCSNS generates two-thirds of its electricity for SCE&G. An additional one-third is generated for Santee Cooper. The SCE&G share is approximately 18 percent of the electricity that SCE&G provides to more than 500,000 residential and business customers (SCANA 2001a and 2001b). SCE&G believes that any alternative would be unreasonable if it did not include replacing the VCSNS capacity. Replacement could be accomplished by (1) building new generating capacity, (2) purchasing power from outside the SCE&G service area, or (3) reducing power requirements through demand reduction. Section 7.2.1 describes each of these alternatives in detail, and Section 7.2.2 describes environmental impacts from feasible alternatives.

The *Generic Environmental Impact Statement* (GEIS) (NRC 1996a, pg. 7-1) defines decommissioning as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use and termination of the license. NRC-evaluated decommissioning options include immediate decontamination and dismantlement (DECON), and safe storage of the stabilized and defueled facility (SAFSTOR) for a period of time, followed by decontamination and dismantlement. Regardless of the option chosen, decommissioning must be completed within a 60-year period. Under the no-action alternative, SCE&G would continue operating VCSNS until the current license expires, then initiate decommissioning activities in accordance with NRC requirements. The GEIS describes decommissioning activities based on an evaluation of a larger reactor (the "reference" pressurized-water reactor is the 1,175-megawatt electrical (MWe) Trojan Nuclear Plant). This description bounds decommissioning activities that SCE&G would conduct at VCSNS.

As the GEIS notes, NRC has evaluated environmental impacts from decommissioning. NRC-evaluated impacts include: occupational and public radiation dose; impacts of waste management; impacts to air and water quality; and ecological, economic, and socioeconomic impacts. NRC indicated in Section 4.4 of the generic environmental impact statement on decommissioning (NRC 1988) that the environmental effects of greatest concern (i.e., radiation dose and releases to the environment) are substantially less than the same effects resulting from reactor operations. SCE&G adopts by reference the NRC conclusions regarding environmental impacts of decommissioning.

SCE&G notes that decommissioning activities and their impacts are not discriminators between the proposed action and the no-action alternative. SCE&G will have to decommission VCSNS regardless of the NRC decision on license renewal; license renewal would only postpone decommissioning for another 20 years. The NRC has established in the GEIS that the timing of

decommissioning operations does not substantially influence the environmental impacts of decommissioning. SCE&G adopts by reference the NRC findings (10 CFR 51 Appendix B, Table B-1, Decommissioning) to the effect that delaying decommissioning until after the renewal term would have small environmental impacts. The discriminators between the proposed action and the no-action alternative lie within the choice of generation replacement options to be part of the no-action alternative. Section 7.2.2 analyzes the impacts from these options.

Decommissioning impacts under the no-action alternative would not be substantially different from those occurring following license renewal, as identified in the GEIS (NRC 1996a) and in the generic environmental impact statement on decommissioning (NRC 1988, Section 4.4). These impacts would be temporary and would occur at the same time as the impacts from meeting system generating needs.

7.2 Alternatives that Meet System Generating Needs

Decisions regarding reasonable alternatives for meeting electrical demands in South Carolina are made primarily by two entities, utilities and the Public Service Commission of South Carolina (PSC). The current mix of power generation options in South Carolina is one indicator of what these entities believe to be feasible alternatives within the state. In 2000, South Carolina's electric utility industry had a total generating capacity of 17.7 gigawatts-electric. A gigawatt is one million kilowatts. This capacity includes units fueled by coal (34 percent); nuclear (37 percent); oil (5 percent); gas (4 percent); and hydroelectric (20 percent). Approximately 1.0 gigawatt electric (5 percent of the state's generating capability) was from non-utility sources (EIA 2002, Table 17). Non-utility generators also use a variety of energy sources.

Based on 2000 utilization data, South Carolina utilities relied heavily on nuclear-powered and coal-powered generating plants for meeting electrical demand. Approximately 56 percent of the electricity used in South Carolina was generated by nuclear-powered plants, followed by coal (43 percent), hydroelectric (0.5 percent), oil (0.3 percent), and gas (0.2 percent) (EIA 2001a, Tables A8, A9, A10, A11, A12, and A13).

The difference between capacity and utilization is the result of preferential usage. For example, nuclear power plants represented 37 percent of utilities' installed capability, but produced 56 percent of the electricity generated by utilities. This reflects South Carolina's preferential reliance on nuclear energy as a base-load generating source. Figures 7-1 and 7-2 below illustrate South Carolina's utility generating capabilities and utilization, respectively.

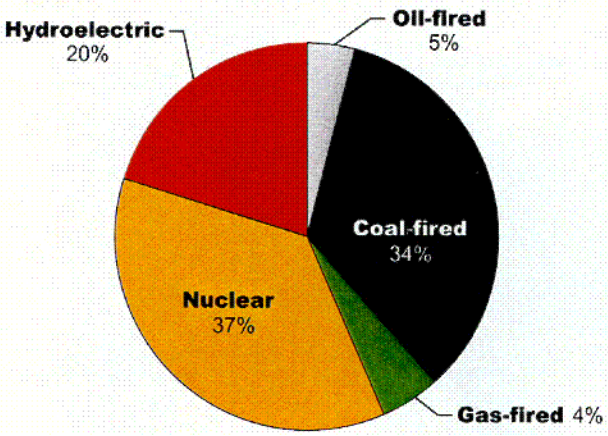

Figure 7-1. South Carolina Utility Generating Capability, 2000

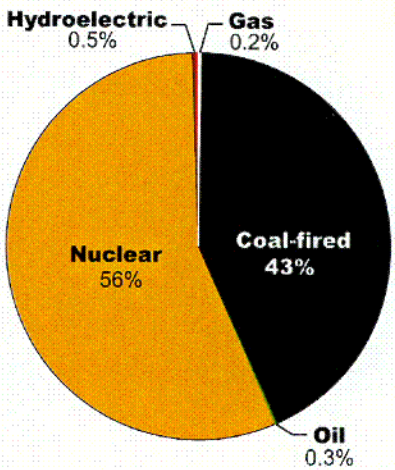

Figure 7-2. South Carolina Utility Generation Utilization, 2000

C01

Figure 7-3 illustrates the 2000 SCE&G energy capacity mix. Fourteen (14) percent of SCE&G's capacity comes from nuclear, 59 percent from coal, 17 percent from hydroelectric, natural gas provides 8 percent, and other resources provide 2 percent (SCANA 2001a).

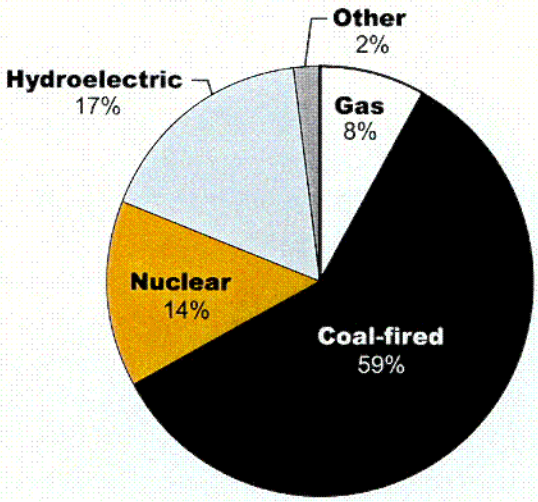

Figure 7-3. SCE&G Energy Capacity

Figure 7-4 illustrates the 2000 SCE&G utilization by fuel type. Nuclear power generated 22 percent, coal generated 77 percent, gas and oil generated 1 percent, and hydroelectric generated 4 percent (SCANA 2001a).

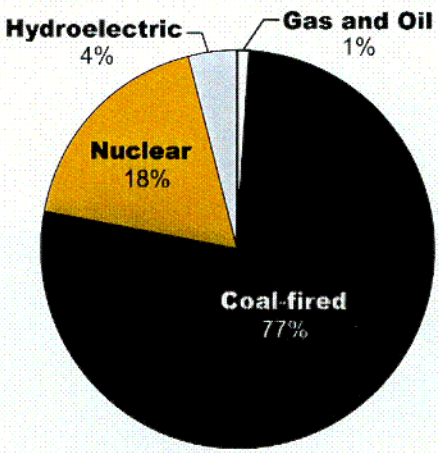

Figure 7-4. SCE&G Utilization by Fuel Type

C02

Like the State of South Carolina as a whole, SCE&G's utilization reflects a preference for nuclear energy as a base-load generating source, and the difference is offset by diminished reliance on hydroelectric units, which are dependent on weather (rainfall). Nuclear energy represented 14 percent of SCE&G's installed capacity but produced 18 percent of the electricity generated by SCE&G. Hydroelectric power represents 17 percent of SCE&G's installed capacity, but produces 4 percent of the energy generated by the utility (SCANA 2001a).

7.2.1 Alternatives Considered

Technology Choices

SCE&G routinely conducts evaluations of alternative generating technologies. Based on these internal reviews, SCE&G identified candidate technologies that would be capable of replacing the net base-load capacity (966 MWe) of the nuclear unit at VCSNS (see Section 3.1.1). For consideration of alternatives, the SCE&G evaluation focuses on the 966 MWe capacity.

Based on these evaluations, it was determined that feasible new plant systems to replace the capacity of the VCSNS nuclear unit are limited to pulverized-coal and gas-fired combined-cycle units for base-load operation. This conclusion is borne out by the generation utilization information in the introduction of Section 7.2 that identifies coal as the most heavily utilized non-nuclear generating technology in South Carolina. The high cost of oil has prompted a steady decline in its use for electricity generation. Manufacturers now have large standard sizes of combined-cycle gas turbines that are economically attractive and suitable for high-capacity base-load operation. For the purposes of the VCSNS license renewal environmental report, SCE&G has therefore limited its analysis for new generating capacity alternatives to the technologies it considers feasible: pulverized coal- and gas-fired units. SCE&G chose to evaluate combined-cycle turbines in lieu of simple-cycle turbines because the combined-cycle option is a more economical option. The benefits of lower operating costs for the combine-cycle option outweigh its increased capital costs.

Mixture

The NRC indicated in the GEIS that, while many methods are available for generating electricity and a huge number of combinations or mixes can be assimilated to meet system needs, such expansive consideration would be too unwieldy given the purposes of the alternatives analysis. Therefore, NRC determined that a reasonable set of alternatives should be limited to analysis of single discrete electrical generation sources and only those electric generation technologies that are technically reasonable and commercially viable (NRC 1996a, pg. 8-1). Consistent with the NRC determination, SCE&G has not evaluated mixes of generating sources.

Deregulation

Efforts to deregulate the electric utility industry began with passage of the National Energy Policy Act of 1992 (EPACT). Provisions of this act required electric utilities to allow open access to their transmission lines and encouraged development of a competitive wholesale market for electricity. EPACT did not mandate competition in the retail market, leaving that decision to the states (NEI 2000).

In 1996, the Federal Energy Regulatory Commission (FERC) issued Orders 888 and 889, which opened transmission access to non-utilities and required utilities to share information about available transmission capacity. On December 20, 1999, FERC issued Order 2000 requiring utilities to participate in Regional Transmission Organizations (RTOs). In response to Order 2000, SCE&G is pursuing an agreement with a transmission organization for operation of SCE&G transmission assets.

Over the past few years, deregulation of the electric utility industry has received considerable attention in South Carolina. In 1997, the General Assembly began considering a number of bills that would deregulate the retail electricity market. The Senate Judiciary Committee named a 19-member task force to study the restructuring issue in 1998, and the House Utility Subcommittee has been studying the issue since 1997 (CP&L 2000). While South Carolina's General Assembly has not adopted any restructuring legislation, it continues to debate the issue.

If the electric power industry in South Carolina is deregulated, retail competition would likely replace the electric utilities' mandate to serve the public, and all electricity customers in the state would be able to choose among competing power suppliers, including those located out of state (Chilton et al. 1997). As such, electric generation would be based on the customers' needs and preferences, the lowest price, or the best combination of prices, services, and incentives.

This potential major source of competition for construction and operation of power plants would affect the selection of alternatives for VCSNS license renewal. With the prospect of hundreds of suppliers being licensed to sell electricity in South Carolina, SCE&G could not control demand and would not remain competitive if it offered extensive conservation and load modification incentives. The PSC would probably ensure that the operation of generating units of incumbent utilities would not inhibit the development of competition within the State. Therefore, it is not clear that the PSC would grant SCE&G the authority to construct new generating units to replace VCSNS, if its license was not renewed. However, regardless of the entity that constructed and operated the replacement power sources, certain environmental parameters would be constant among replacement power sources. Therefore, it is appropriate and instructive for SCE&G to discuss the impacts of reasonable alternatives to VCSNS.

Alternatives

The following sections present fossil-fuel-fired generation (Section 7.2.1.1) and purchased power (Section 7.2.1.2) as reasonable alternatives to license renewal. Section 7.2.1.3 discusses reduced demand and presents the basis for concluding that it is not a reasonable alternative to license renewal.

7.2.1.1 Construct and Operate Fossil-Fuel-Fired Generation

SCE&G analyzed locating hypothetical new coal- and gas-fired units at the existing VCSNS site. This approach could minimize environmental impacts by building on previously disturbed land and by making the most use possible of existing facilities, such as transmission lines, roads and parking areas, office buildings, and the cooling system. Locating hypothetical units at the existing VCSNS site has been applied to the gas-fired units. However, coal-fired units could be built at the Cope Station, the site of a new state-of-the art coal-fired unit. This site was designed to accommodate two additional units in the future if needed. Co-locating at the Cope Station site would have environmental benefits similar to locating at the VCSNS and would improve the use of existing facilities designed specifically for coal-fired generation. Accordingly, the coal-fired alternative was defined as construction at the Cope Station near Bamberg, South Carolina.

For comparability, gas- and coal-fired units of equal electric power and capacity factors were selected. A scenario of, for example, two units with a net capacity of 483 MWe each could be assumed to replace the 966 MWe VCSNS net capacity. However, SCE&G's experience indicates that, although customized unit sizes can be built, using standardized sizes is more economical. For example, the coal-fired Cope unit of 430 MWe gross capacity operates at a net output of 408 MWe (PSC 2000, pg. 51), and two units nearly identical to the existing unit could be built. Accordingly, SCE&G evaluated constructing two 408 MWe net coal-fired units. The number and the net power of the gas-fired units were set equal to those of the coal-fired units. Although this provides less capacity than the existing unit, it ensures against overestimating environmental impacts from the alternatives. The shortfall in capacity could be replaced by other methods (see Mixture in Section 7.2.1).

It must be emphasized, however, that these are hypothetical scenarios. There are no plans for such construction at VCSNS or at the Cope Station.

Coal-Fired Generation

NRC has evaluated coal-fired generation alternatives for the Calvert Cliffs Nuclear Power Plant (NRC 1999a, Section 8.2.1) and for the Oconee Nuclear Station (NRC 1999b, Section 8.2.1). For Oconee, NRC analyzed 2,500-MWe of coal-fired generation capacity. SCE&G has reviewed the NRC analysis, believes it to be sound, and notes that it analyzed more generating capacity than the 816 MWe net (i.e., two 408 MWe units) discussed in this analysis. In defining the coal-fired alternative, SCE&G has used the Cope Station unit- and South Carolina-specific input and has scaled from the NRC analysis, where appropriate.

Table 7-1 presents the basic coal-fired alternative emission control characteristics. SCE&G based its emission control technology and percent control assumptions on alternatives that the U.S. Environmental Protection Agency (EPA) has identified as being available for minimizing emissions (EPA 1998). For the purposes of the analysis, it was assumed that coal and calcium hydroxide would be delivered by rail via the rail line that is used for the existing Cope Station unit.

Gas-Fired Generation

SCE&G has chosen to evaluate gas-fired generation, using combined-cycle turbines, because it has determined that the technology is mature, economical, and feasible. This is evidenced by SCE&G's plans to consider simple-cycle and combined-cycle gas-fired turbines to meet projected energy needs and the construction of combined-cycle units as part of the Urquhart Repowering Project (SCE&G 2000). Unit sizes in the planned range (408 MW) are available and economical. Therefore, SCE&G has analyzed 816 MW of net power, consisting of two 408-MW gas-fired units located on VCSNS property. Table 7-2 presents the basic gas-fired alternative characteristics. SCE&G would ensure gas availability through its parent company SCANA Corporation.

7.2.1.2 Purchased Power

SCE&G has evaluated conventional and prospective power supply options that could be reasonably implemented before the current VCSNS license expires in 2022. Because South Carolina is a net exporter of power, SCE&G assumes that in-state power could be purchased. However, in order to purchase replacement capacity for VCSNS (966 MWe net), new construction would probably be required.

SCE&G assumes that the generating technology used to produce purchased power would be one of those that NRC analyzed in the GEIS. For this reason, SCE&G is adopting by reference the GEIS description of the alternative generating technologies as representative of the purchased power alternative. Of these technologies, simple-cycle combustion turbines or combined-cycle facilities fueled by natural gas are the most cost effective. There has been a corresponding decreased incentive for using boilers fired by coal or residual oil.

Although purchased power could provide replacement power for VCSNS, new construction would be required. SCE&G concluded that it would not be economically or environmentally preferable to purchase power.

Factors that lead to this conclusion include the following:

- The existing power transmission infrastructure currently lacks capacity to import additional power to replace VCSNS capacity from outside the current SCE&G marketing area. The construction of an additional high-capacity [e.g., 500 kilovolt (kV)] transmission line would be required.

- To ensure its continued capability to meet customer demands of reliable and affordable power, SCE&G would limit the amount of power it imports. Under customary import restrictions, it is unlikely that SCE&G could purchase the power generated by VCSNS from the generation market.

- Utility generators providing power to SCE&G would need to increase their capacity with new power units. As described above, the most cost-effective alternative for providing base-load power capacity is large, standard design combined-cycle facilities fueled primarily by natural gas. In light of SCE&G's current focus on becoming "the best provider of customer-driven energy products and services in the southeast" (SCANA 2000, pg. 2), SCE&G would clearly prefer to build its own gas-fired combustion turbines.

- The purchase of power from a non-utility generator would be less economical than SCE&G building its own facility. Non-utility generators have comparable construction and finance costs. A non-utility generator would be expected to make a profit on the sale of electricity and capacity. The additional costs to SCE&G would be passed on to SCE&G customers.

- The State of South Carolina is considering legislation that would deregulate the retail electricity market. If enacted, this legislation would allow non-utility generators to compete directly with utility companies for

the retail power market. This would decrease non-utility generators' incentive to provide wholesale power to utility companies, reducing the availability of power for SCE&G purchase.

7.2.1.3 Reduce Demand

In the past, SCE&G has offered demand-side management (DSM) programs that either conserve energy or allow the Company to reduce customers' load requirements during periods of peak demand. SCE&G's DSM programs fall into three categories:

Conservation Programs

- Educational programs that encourage the wise use of energy.

Energy Efficiency Programs

- Discounted residential rates for Good Cents homes and homes that meet specific energy efficiency standards.
- Home Energy Check Program to provide residential energy audits and encourage efficiency upgrades.
- Incentive Programs that encourage customers to replace old, inefficient appliances or equipment with new high-efficiency appliances or equipment.

Load Management Programs

- Standby Generator Program – encourages customers to let SCE&G switch loads to the customer's standby generators during periods of peak demand.
- Interruptible Service Program – encourages customers to allow blocks of their load to be interrupted during periods of peak demand.
- Real Time Pricing – encourages customers to discontinue usage during specific times.

South Carolina electric and natural gas utilities submit annual reports to the South Carolina Public Service Commission describing their DSM programs and activities. Over the past few years, SCE&G and other electric utilities have been scaling back their DSM programs and this trend is expected to continue (South Carolina Energy Office 2002). The market conditions that provided the initial support for utility-sponsored conservation and load

management efforts during the late 1970s and early 1980s, can be broadly characterized by:

1. increasing long-term marginal prices for capacity and energy production resources;

2. projecting increasing demand for electricity across the nation;

3. general agreement that conditions (1) and (2) would continue for the foreseeable future;

4. limited competition in the generation of electricity;

5. economies of scale in the generation of electricity, which supported the construction of large central power plants; and

6. the use of average embedded cost as the basis for setting electricity prices within a regulated context.

These market and regulatory conditions would undergo dramatic changes in a deregulated market. Changes that have significantly impacted the cost-effectiveness of utility-sponsored DSM, can be described as follows:

1. a decline in generation costs, due primarily to technological advances that have reduced the cost of constructing new generating units (e.g., combustion turbines); and

2. national energy legislation which has encouraged wholesale competition through open access to the transmission grid, as well as state legislation designed to facilitate retail competition.

Consistent with (1) and (2) above, the utility planning environment features lower capacity and lower energy prices than during earlier periods, shorter planning horizons, lower reserve margins, and increased reliance on market prices to direct utility resource planning. These have greatly reduced the number of cost-effective DSM alternatives.

Other significant changes include:

- The adoption of increasingly stringent national appliance standards for most major energy-using equipment and the adoption of energy efficiency requirements in state building codes. These mandates have further reduced the potential for cost-effective utility-sponsored measures.

- In states that are currently transitioning into deregulation, third parties are increasingly providing energy services and products in competitive markets at prices that reflect their value to the customer. Market conditions can be expected to continue this shift among providers of cost-effective load management.

DSM programs, which are primarily directed toward load management, are not an effective substitute for large base-load units operating at high capacity factors, including VCSNS.

7.2.2 Environmental Impacts of Alternatives

This section evaluates the environmental impacts from reasonable alternatives to VCSNS license renewal: coal-fired generation, gas-fired generation, and purchased power. Purchased power may not be economically feasible for SCE&G but it is a reasonable alternative under NEPA.

7.2.2.1 Coal-Fired Generation

The NRC evaluated environmental impacts from coal-fired generation alternatives in the GEIS (NRC 1996a, Section 8.3.9). The NRC concluded that construction impacts could be substantial, due in part to the large land area required (which can result in natural habitat loss) and the large workforce needed. NRC pointed out that siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts; similar reductions would occur through construction at the Cope Station. NRC identified major adverse impacts from operations as human health concerns associated with air emissions, waste generation, and losses of aquatic biota due to cooling water withdrawals and discharges.

The coal-fired alternative that SCE&G has defined in Section 7.2.1.1 would be located at Cope Station. As noted previously, the Cope Station site was designed to accommodate two additional units in the future, if needed.

Air Quality

Air quality impacts of coal-fired generation are considerably different from those of nuclear power. A coal-fired plant would emit sulfur oxides, nitrogen oxides (NO_x), particulate matter, and carbon monoxide, all of which are regulated pollutants. As Section 7.2.1.1 indicates, SCE&G has assumed a plant design equivalent to the existing Cope Station unit that would minimize air emissions through a combination of boiler technology and post-combustion

pollutant removal. SCE&G estimates the coal-fired alternative emissions to be as follows:

Sulfur oxides = 6,249 tons per year

Nitrogen oxides = 642 tons per year

Carbon monoxide = 642 tons per year

Particulates:

Total suspended particulates = 113 tons per year

PM_{10} (particulates having a diameter of less than 10 microns) = 26 tons per year

Table 7-3 shows how SCE&G calculated these emissions.

In 1999, emissions of sulfur dioxide and NO_x from South Carolina's generators ranked 15th and 30th nationally, respectively (EIA 2001b). No South Carolina generators were cited in the Clean Air Act Amendments of 1990 to begin compliance in 1995 with stricter emission controls for sulfur dioxide (SO_2) and nitrogen oxides (NO_x). However, it is likely that South Carolina's Public Service Commission will need to design a State Implementation Plan for reducing ground-level ozone in response to a proposal released by the U.S. Environmental Protection Agency in October 1998.

NRC did not quantify coal-fired emissions, but implied that air impacts would be substantial. The NRC noted that adverse human health effects from coal combustion have led to important federal legislation in recent years and that public health risks, such as cancer and emphysema, have been associated with coal combustion. The NRC also mentioned global warming and acid rain as potential impacts. However, sulfur oxide emission allowances, NO_x emission offsets, low NO_x burners, overfire air, fabric filters or electrostatic precipitators, and scrubbers are regulatorily-imposed mitigation measures. As a consequence, the coal-fired alternative would have moderate impacts on air quality; the impacts would be clearly noticeable, but would not destabilize air quality in the area.

Waste Management

SCE&G concurs with the GEIS assessment that the coal-fired alternative would generate substantial solid waste. The coal-fired plant would annually consume approximately 2,570,000 tons of coal having an ash content of

8.8 percent (Tables 7-1 and 7-3). After combustion, most (99.9 percent) of this ash, approximately 230,000 tons per year, would be collected and disposed of onsite. In addition, approximately 170,000 tons of scrubber sludge would be disposed of onsite each year (based on annual calcium hydroxide usage of nearly 95,000 tons). SCE&G estimates that ash and scrubber waste disposal over the 40-year plant life would require approximately 210 acres (a square area with sides of approximately 3,000 feet). The Cope site is 1,700 acres. While only half this waste volume and land use would be attributable to the 20-year license renewal period alternative, the total numbers are pertinent as a cumulative impact.

It is believed that with proper siting coupled with current waste management and monitoring practices, waste disposal at the Cope site would not destabilize any resources. There would be space within the site footprint for this disposal. After closure of the waste site and revegetation, the land would be available for other uses. For these reasons, waste disposal for the coal-fired alternative would have moderate impacts; the impacts of increased waste disposal would be clearly noticeable, but would not destabilize any important resource and further mitigation would be unwarranted.

Other Impacts

Construction of the powerblock and coal storage area would impact some land area and associated terrestrial habitat. Because most of this construction would be in previously disturbed areas, impacts would be minimal. For the most part, visual impacts would be consistent with the industrial nature of the site. The (525 foot) exhaust stack would be visible from the Edisto River and for several miles in every direction, however. As with any large construction project, some erosion and sedimentation and fugitive dust emissions could be anticipated, but would be minimized by using best management practices. Construction debris from clearing and grubbing could be disposed of onsite and municipal waste disposal capacity would be available. Socioeconomic impacts from the construction workforce would be minimal, because worker relocation would not be expected due to the site's proximity to Columbia, South Carolina; Charleston, South Carolina; and Augusta, Georgia. Cultural resource impacts would be unlikely, due to the assumed previously disturbed nature of the site.

Impacts to aquatic resources and water quality would be minimal due to the plant's closed-loop cooling system that recycles condenser water and withdraws makeup from four onsite groundwater wells. Although the Cope Station was designed to use the Edisto River as the source of its makeup water,

it has in recent years relied on groundwater for makeup. The South Fork of the Edisto River is used as a backup supply only.

The additional stacks, boilers, and rail deliveries would increase the visual impact of the existing site. Socioeconomic impacts would result from a decrease in the operational workforce from approximately 600 employees at VCSNS and an increase in the operational workforce at Cope Station (doubling, to approximately 140 employees). These impacts would be small to moderate, due to Cope Station's proximity to large metropolitan areas (Columbia, Charleston, and Augusta).

Other construction and operation impacts would be small. In most cases, the impacts would be detectable, but they would not destabilize any important attribute of the resource involved. Due to the minor nature of these other impacts, mitigation would not be warranted beyond that mentioned.

7.2.2.2 Gas-Fired Generation

NRC evaluated environmental impacts from gas-fired generation alternatives in the GEIS, focusing on combined-cycle plants. Section 7.2.1.1 presents SCE&G's reasons for defining the gas-fired generation alternative as a combined-cycle plant on the VCSNS site. Land-use impacts from gas-fired units on VCSNS would be less than those of the coal-fired alternative at the Cope Station site due to construction on the existing site and a smaller facility footprint. There would, however, be land use impacts associated with the construction of a new natural gas pipeline (see Other Impacts). A smaller workforce could have adverse socioeconomic impacts. Human health effects associated with air emissions would be of concern. Aquatic biota losses due to cooling water withdrawals would be offset by the concurrent shutdown of the nuclear facility.

The NRC has evaluated the environmental impacts of constructing and operating four 440-MW combined-cycle gas-fired units as an alternative to a nuclear power plant license renewal (NRC 1996a). This analysis is for a generating capacity approximately two times the VCSNS gas-fired alternatives analysis, because SCE&G would install two 424 MW gross units. SCE&G has adopted the rest of the NRC analysis with necessary South Carolina- and SCE&G-specific modifications noted.

Air Quality

Natural gas is a relatively clean-burning fossil fuel; the gas-fired alternative would release similar types of emissions, but in lesser quantities, than the coal-

fired alternative. Control technology for gas-fired turbines focuses on NO_x emissions. SCE&G estimates the gas-fired alternative emissions to be as follows:

- Sulfur oxides = 88 tons per year
- NO_x = 332 tons per year
- Carbon monoxide = 435 tons per year
- Filterable Particulates = 130 tons per year (all particulates are PM_{10})

Table 7-4 shows how SCE&G calculated these emissions.

The Section 7.2.2.1 discussion of regional air quality and Clean Air Act requirements is also applicable to the gas-fired generation alternative. NO_x effects on ozone levels, sulfur dioxide allowances, and NO_x emission offsets could all be issues of concern for gas-fired combustion. While gas-fired turbine emissions are less than coal-fired boiler emissions, and regulatory requirements are less stringent, the emissions are still substantial. Emissions from the gas-fired alternative located at VCSNS would noticeably alter local air quality, but would not destabilize regional resources. Air quality impacts would therefore be moderate, but substantially smaller than those of coal-fired generation.

Waste Management

Gas-fired generation would result in almost no waste generation, producing minor (if any) impacts. Therefore, gas-fired generation waste management impacts would be small.

Other Impacts

As noted previously, building the gas-fired alternative on the existing VCSNS site would reduce some construction-related impacts. NRC estimated in the GEIS that 110 acres would be needed for a plant site; this much previously disturbed acreage is available at VCSNS, reducing loss of terrestrial habitat. Aesthetic impacts, erosion and sedimentation, fugitive dust, and construction debris impacts would be similar to the coal-fired alternative, but smaller because of the reduced site size. The GEIS estimates a work force of 150 for operation of these units. The reduction in work force (relative to the existing VCSNS work force) would result in adverse socioeconomic impacts. These impacts would be small to moderate and would be mitigated by the site's

proximity to the large metropolitan areas of Columbia, Charleston, and Augusta.

It would, however, be necessary to upgrade existing South Carolina Pipeline Corporation (a wholly-owned subsidiary of SCANA Corporation) natural gas lines to provide the necessary firm quantities of gas for these combined-cycle base-load units. This would probably involve construction of a new 24-inch dedicated pipeline from South Carolina Pipeline Corporation facilities in Aiken, South Carolina to VCSNS, a distance of some 70 miles. Natural gas would be supplied by Southern Natural Gas (Sonat), which has a terminal in Aiken adjacent to the South Carolina Pipeline Corporation facilities. South Carolina Pipeline Corporation would likely route this new pipeline along existing utility rights-of-way. It would be necessary to widen the existing corridors to accommodate a new pipeline. The South Carolina Public Service Commission has no set-back standards for intra-state natural gas pipelines; companies involved in natural gas transmission and distribution determine right-of-way widths based on site-specific factors (e.g., soils, topography, populations of rare plants and animals, land use in surrounding areas, existing surface and sub-surface utilities) and safety considerations. Rights-of-way for large (24-inch diameter and larger) natural gas pipelines are generally 75 to 100 feet wide during construction, with a permanent width of approximately 50 feet (FERC 2000). Detailed engineering studies would be necessary to determine the increased width of the transmission corridors.

Construction of a new 24-inch pipeline would require widening the existing transmission corridors and could require re-routing through previously-undisturbed areas. Impacts would include disturbance of wildlife from noise and movement of pipeline workers and heavy equipment during construction, as well as potential impacts to water quality from erosion and sedimentation. These impacts would be temporary and limited to the construction phase of the project. Best construction management practices and soil conservation measures would be employed to limit soil loss and potential impacts to down-gradient surface water and wetlands. Some undetermined amount of wildlife habitat would be permanently lost with the widening of the transmission corridors. In addition, cultural resources could be disturbed in the course of building the pipeline (unlikely) and widening the right-of-way (more likely). Impacts would be mitigated by pre-construction surveys and consultations with the SHPO.

7.2.2.3 Purchased Power

As discussed in Section 7.2.1.2, SCE&G assumes that the generating technology used under the purchased power alternative would be one of those that NRC analyzed in the GEIS. SCE&G is also adopting by reference the NRC analysis of the environmental impacts from those technologies. Under the purchased power alternative, therefore, environmental impacts would still occur, but would be located elsewhere within the state. There is no evidence to suggest that out-of-state imports would be required.

The purchased power alternative would include constructing up to 200 miles of high voltage (i.e., 500 kV) transmission lines to get power from the remote locations in South Carolina to the SCE&G network. Most of the transmission lines could probably be routed along existing rights-of-way. The environmental impacts of constructing up to 200 miles of transmission lines would be moderate. As indicated in the introduction to Section 7.2.1.1, the environmental impacts of construction and operation of new coal- or gas-fired generating capacity for purchased power at a previously-undisturbed greenfield site would exceed those of the gas-fired alternative located on the VCSNS site or the coal-fired alternative located at Cope Station.

7.3 References

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TABLE 7-1
COAL-FIRED ALTERNATIVE

Characteristic	Basis
Unit size = 408 MW ISO rating net[a]	Chosen as equal to existing Cope Station unit
Unit size = 430 MW ISO rating gross[a]	Chosen as equal to existing Cope Station unit
Number of units = 2	Calculated to be < VCSNS Unit gross capacity of approximately 1,000 MW
Boiler type = tangentially fired, dry-bottom	Minimizes nitrogen oxides emissions (EPA 1998, Table 1.1-3 Page 1.1-17).
Fuel type = bituminous, pulverized coal	Typical for coal used in South Carolina
Fuel heating value = 12,783 Btu/lb	1998 value for coal used in South Carolina (EIA 2000, Table 28)
Fuel ash content by weight = 8.8 percent	1998 value for coal used in South Carolina (EIA 2000, Table 28)
Fuel sulfur content by weight = 1.28 percent	1998 value for coal used in South Carolina (EIA 2000, Table 28)
Uncontrolled NO_x emission = 9.7 lb/ton Uncontrolled CO emission = 0.5 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, pre-NSPS with low- NO_x burner (EPA 1998, Table 1.1-3 Page 1.1-17)
Heat rate = 10,200 Btu/KWh	Typical for coal-fired, single cycle steam turbines (EIA 2000, page 45)
Capacity factor = 0.85	Typical for large coal-fired units (SCE&G experience)
NO_x control = low NO_x burners, overfire air and selective catalytic reduction (95 percent reduction)	Best available and widely demonstrated for minimizing NO_x emissions (EPA 1998, Table 1.1-2 Page 1.1-14).
Particulate control = fabric filters (baghouse-99.9 percent removal efficiency)	Best available for minimizing particulate emissions (EPA 1998, Page 1.1-6 and -7)
SO_x control = Spray drying (dry scrubber-calcium hydroxide [90 percent removal efficiency])	Best available for minimizing SO_x emissions (EPA 1998, Table 1.1-1 Page 1.1-13)

a. The difference between "net" and "gross" is electricity consumed onsite.

Btu = British thermal unit
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
KWh = kilowatt hour
NSPS = New Source Performance Standard
Lb = pound
MW = megawatt
NO_x = nitrogen oxides
SO_x = sulfur oxides

TABLE 7-2
GAS-FIRED ALTERNATIVE

Characteristic	Basis
Unit size = 408 MW ISO rating net:[a] Two 135 MW-combustion turbines and a 138 MW-heat recovery boiler	Manufacturer's standard size gas-fired combined cycle plant
Unit size = 424 MW ISO rating gross:[a] Two 140.5 MW-combustion turbines 143 MW-heat recovery boiler	Calculated based on 4 percent onsite power
Number of units = 2	Calculated to be ≤ VCSNS unit gross capacity of approximately 1,000 MW
Fuel type = natural gas	Assumed
Fuel heating value = 1,037 Btu/ft^3	1998 value for gas used in South Carolina (EIA 1999)
Fuel sulfur content = not available SO_x emission = 0.0034 lb/MMBtu	SO_x = 0.94S. When sulfur content is not available, use SO_x = 0.0034 lb/MMBTU (EPA 2000, Table 3.1-2a, Page 3.1-11)
NO_x control = selective catalytic reduction (SCR)	Best available for minimizing NO_X emissions (EPA 2000, Table 3.1 Database)
Fuel NO_x content = 0.0128 lb/MMBtu	Typical for large SCR-controlled gas fired units (EPA 2000, Table 3.1 Database)
Fuel CO content = 0.0168 lb/MMBtu	Typical for large SCR-controlled gas fired units (EPA 2000, Table 3.1-2 Page 3.1-8)
Heat rate = 8,200 Btu/Kwh	Typical for combined cycle gas-fired turbines (EIA 1997, page 106)
Capacity factor = 0.85	Typical for large gas-fired base load units

a. The difference between "net" and "gross" is electricity consumed onsite.

Btu = British thermal unit
ft^3 = cubic foot
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
Kwh = kilowatt hour
MM = million
MW = megawatt
SO_x = sulfur oxides
NO_x = nitrogen oxides

TABLE 7-3
AIR EMISSIONS FROM COAL-FIRED ALTERNATIVE

Parameter	Calculation	Result
Annual coal consumption	$2 \times 432\ \text{MW} \times \frac{10{,}200\ \text{Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\ \text{kW}}{\text{MW}} \times \frac{\text{lb}}{12{,}783\ \text{Btu}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times 0.85 \times \frac{24\ \text{hr}}{\text{day}} \times \frac{365\ \text{day}}{\text{yr}}$	2,569,546 tons of coal per year
SO_2[a,c]	$\frac{38 \times 1.28\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times (1 - 90/100) \times \frac{2{,}569{,}546\ \text{tons}}{\text{yr}}$	6,249 tons SO_2 per year
NO_x[b, c]	$\frac{9.7\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times (1 - 95/100) \times \frac{2{,}569{,}546\ \text{tons}}{\text{yr}}$	642 tons NO_x per year
CO[c]	$\frac{0.5\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times \frac{2{,}569{,}546\ \text{tons}}{\text{yr}}$	642 tons CO per year
TSP[d]	$\frac{10 \times 8.8\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times (1 - 99.9/100) \times \frac{2{,}569{,}546\ \text{tons}}{\text{yr}}$	113 tons TSP per year
PM_{10}[d]	$\frac{2.3 \times 8.8\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times (1 - 99.9/100) \times \frac{2{,}569{,}546\ \text{tons}}{\text{yr}}$	26 tons PM_{10} per year

a. EPA 1998, Table 1.1-1.
b. EPA 1998, Table 1.1-2.
c. EPA 1998, Table 1.1-3.
d. EPA 1998, Table 1.1-4.

CO = carbon monoxide
NO_x = oxides of nitrogen
PM_{10} = particulates having diameter less than 10 microns
SO_2 = sulfur oxides
TSP = total suspended particulates

TABLE 7-4
AIR EMISSIONS FROM GAS-FIRED ALTERNATIVE

Parameter	Calculation	Result
Annual gas consumption	$2\text{ units} \times \frac{424\text{ MW}}{\text{unit}} \times \frac{8{,}200\text{ Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\text{ kW}}{\text{MW}} \times 0.85 \times \frac{\text{ft}^3}{1{,}037\text{ Btu}} \times \frac{24\text{ hr}}{\text{day}} \times \frac{365\text{ day}}{\text{yr}}$	49,966,810,230 ft^3 per year
Annual Btu input	$\frac{49{,}966{,}810{,}230\text{ ft}^3}{\text{yr}} \times \frac{1{,}037\text{ Btu}}{\text{ft}^3} \times \frac{\text{MM Btu}}{10^6\text{Btu}}$	51,815,582 MMBtu per year
SO_2[a]	$\frac{0.0034\text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{51{,}815{,}582\text{ MMBtu}}{\text{yr}}$	88 tons SO_2 per year
NO_x[b]	$\frac{0.0128\text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{51{,}815{,}582\text{ MMBtu}}{\text{yr}}$	332 tons NO_x per year
CO[b]	$\frac{0.0168\text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{51{,}815{,}582\text{ MMBtu}}{\text{yr}}$	435 tons CO per year
TSP[a]	$\frac{0.005\text{ lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\text{ lb}} \times \frac{51{,}815{,}582\text{ MMBtu}}{\text{yr}}$	130 tons filterable TSP per year
PM_{10}[a]	$\frac{130\text{ tons TSP}}{\text{yr}}$	130 tons filterable PM_{10} per year

a. EPA 2000, Table 3.1-1.
b. EPA 2000, Table 3.1-2.

CO = carbon monoxide
NO_x = oxides of nitrogen
PM_{10} = particulates having diameter less than 10 microns
SO_2 = sulfur oxides
TSP = total suspended particulates

8.0 COMPARISON OF ENVIRONMENTAL IMPACTS OF LICENSE RENEWAL WITH THE ALTERNATIVES

NRC

"...To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form;" 10 CFR 51.45(b)(3) as adopted by 51.53(c)(2)

Chapter 4 analyzes environmental impacts of V. C. Summer Nuclear Station (VCSNS) license renewal and Chapter 7 analyzes impacts from renewal alternatives. Table 8-1 summarizes environmental impacts of the proposed action (license renewal) and the alternatives, so the reader can compare them. The environmental impacts compared in Table 8-1 are those that are either Category 2 issues for the proposed action, license renewal, or are issues that the *Generic Environmental Impact Statement* (GEIS) (NRC 1996) identified as major considerations in an alternatives analysis. For example, although the U. S. Nuclear Regulatory Commission (NRC) concluded that air quality impacts from the proposed action would be small (Category 1), the GEIS identified major human health concerns associated with air emissions from alternatives (Section 7.2.2). Therefore, Table 8-1 compares air impacts among the proposed action and the alternatives. Table 8-2 is a more detailed comparison of the alternatives.

8.1 References

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS). Volumes 1 and 2. NUREG-1437. Washington, DC. May.

TABLE 8-1
IMPACTS COMPARISON SUMMARY

Impact	Proposed Action (License Renewal)	No-Action Alternative			
		Base (Decommissioning)	With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Land Use	SMALL	SMALL	SMALL	MODERATE	MODERATE
Water Quality	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	SMALL to MODERATE
Ecological Resources	SMALL	SMALL	SMALL	MODERATE	SMALL to MODERATE
Threatened or Endangered Species	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	MODERATE	SMALL	SMALL to MODERATE
Socioeconomics	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Waste Management	SMALL	SMALL	MODERATE	SMALL	SMALL to MODERATE
Aesthetics	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Cultural Resources	SMALL	SMALL	SMALL	SMALL	SMALL

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

TABLE 8-2
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
VCSNS license renewal for 20 years, followed by decommissioning	Decommissioning following expiration of current VCSNS license. Adopting by reference, as bounding VCSNS decommissioning, GEIS description (NRC 1996, Section 7.1)	New construction at an existing site, Cope Station	New construction at the VCSNS site	Would involve construction of new generation capacity in the state. Adopting by reference GEIS description of alternate technologies (Section 7.2.1.2)
		Use existing rail spur.	Construct 70 miles of gas pipeline along existing rights-of-way to the extent practicable. Widen rights-of-way to accommodate new 24-inch pipeline.	Assumed construction of up to 200 miles of transmission lines
		Use existing switchyard and transmission lines.	Use existing switchyard and transmission lines	
		Two 408-MW tangentially-fired, dry bottom units; capacity factor 0.85	Two 424-MW units; each consisting of two 140.5-MW combustion turbines and a 143-MW heat recovery boiler; capacity factor 0.85	
		Existing closed-cycle Cope Station cooling water system with Edisto River water as back-up	Existing VCSNS intake/ discharge canal system	
		Pulverized bituminous coal, 12,783 Btu/pound; 10,200 Btu/kWh; 8.8% ash; 1.28% sulfur; 9.7 lb/ton nitrogen oxides; 2,569,546 tons coal/yr	Natural gas, 1,037 Btu/ft^3; 8,200 Btu/kWh; 0.0034 lb sulfur/MMBtu; 0.0128 lb NO_x/MMBtu; 49,996,810,230 ft^3 gas/yr	

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	**With Gas-Fired Generation**	**With Purchased Power**
		Low NO_x burners, overfire air (95% NO_x reduction efficiency). Dry scrubber – calcium hydroxide desulfurization system (90% SO_x removal efficiency); 95,000 tons limestone/yr Fabric filters or electrostatic precipitators (99.9% particulate removal efficiency)	Low NO_x burners, selective catalytic reduction with overfire air	
600 workers		70 additional workers (Section 7.2.2.1)	150 workers (Section 7.2.2.2)	
		Land Use Impacts		
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 52, 53)	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – Cope site was designed to accommodate two additional units and could use existing rail lines and transportation corridors. Twenty years of ash and scrubber waste disposal would require 105 acres of forested land (Section 7.2.2.1).	MODERATE – 110 acres for facility at VCSNS location; pipeline would be routed along existing rights-of-way when practicable. Would be necessary to widen existing rights-of-way (Section 7.2.2.2).	MODERATE – Most transmission facilities could be constructed along existing transmission corridors (Section 7.2.2.3). Adopting by reference GEIS description of land use impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Water Quality Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 3, 5, 6, 7-12). Two Category 2 groundwater issues not applicable (Section 4.5, Issue 33; and Section 4.7, Issue 35). Evaporative loss from cooling pond would have minimal effect on biological communities (Section 4.1, Issue 13) and aquifer recharge (Section 4.6, Issue 34) or groundwater degradation (Section 4.8, Issue 39).	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 89).	SMALL – Construction impacts minimized by use of best management practices. Operational impacts minimized by use of existing close-loop system that recycles cooling water and withdraws makeup water from onsite wells (Section 7.2.2.1).	SMALL – Reduced cooling water demands, inherent in combined-cycle design (Section 7.2.2.2) Construction of pipeline could cause temporary erosion and sedimentation in streams crossed by right of way (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of water quality impacts from alternate technologies (NRC 1996, Section 8.2)
Air Quality Impacts				
SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 51). Category 2 issue not applicable (Section 4.11, Issue 50).	SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issue 88)	MODERATE – • 6,249 tons SO_x/yr • 642 tons NO_x/yr • 642 tons CO/yr • 113 tons TSP/yr • 26 tons PM_{10}/yr (Section 7.2.2.1)	MODERATE – • 88 tons SO_x/yr • 332 tons NO_x/yr • 435 tons CO/yr • 130 tons PM_{10}/yr[a] (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of air quality impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Ecological Resource Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 15-24, 28-30, 41-48). One Category 2 issue not applicable (Section 4.9, Issue 40). VCSNS holds a current NPDES permit, which constitutes compliance with Clean Water Act Section 316(b) (Section 4.2, Issue 25; Section 4.3, Issue 26) and 316(a) (Section 4.4, Issue 27)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 90)	SMALL – 105 acres of forested land could be required for ash/sludge disposal over 20-year license renewal term (Section 7.2.2.1).	MODERATE – Construction of new pipeline would require widening of existing right-of-way, with noise disturbance during construction and permanent loss of wildlife habitat (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of ecological resource impacts from alternate technologies (NRC 1996, Section 8.2)
Threatened or Endangered Species Impacts				
SMALL – Only one threatened or endangered species (bald eagle) is known to occur in the vicinity of the site or along transmission corridors, and no impacts have been observed to date (Section 4.10, Issue 49).	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats.
Human Health Impacts				
SMALL – Category 1 issues (Table 4-2, Issues 56, 58, 61, 62). Risk from microbiological organisms minimal due to low discharge temperatures (Section 4.12, Issue 57). Risk due to transmission-line induced currents minimal due to conformance with code (Section 4.13, Issue 59)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 86)	MODERATE – Adopting by reference GEIS conclusion that risks such as cancer and emphysema from emissions are likely (NRC 1996, Section 8.3.9)	SMALL – Adopting by reference GEIS conclusion that some risk of cancer and emphysema exists from emissions (NRC 1996, Table 8.2)	SMALL to MODERATE – Adopting by reference GEIS description of human health impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Socioeconomic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 64, 67). Two Category 2 issues not applicable (Section 4.16, Issue 66 and Section 4.17.1, Issue 68). Location in medium population area with limited growth controls minimizes potential for housing impacts. (Section 4.14, Issue 63). Plant contribution to county tax base is significant, and continued plant operation would benefit county (Section 4.17.2, Issue 69). Capacity of public water supply and transportation infrastructure minimizes potential for related impacts (Section 4.15, Issue 65 and Section 4.18, Issue 70)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 91)	SMALL to MODERATE – Reduction in permanent work force at VCSNS could adversely affect surrounding counties (Section 7.2.2.1).	SMALL to MODERATE – Reduction in permanent work force at VCSNS could adversely affect surrounding counties (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of socioeconomic impacts from alternate technologies (NRC 1996, Section 8.2)
Waste Management Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 77-85)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 87)	MODERATE – 230,000 tons of coal ash and 170,000 tons of scrubber sludge would require 105 acres over 20-year license renewal term. Industrial waste generated annually (Section 7.2.2.1).	SMALL – Almost no waste generation (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of waste management impacts from alternate technologies (NRC 1996, Section 8.2)

TABLE 8-2 (Continued)
IMPACTS COMPARISON DETAIL

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Aesthetic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 73, 74)	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – The coal-fired power block and the (525 foot) exhaust stack would be visible from the Edisto River from a moderate offsite distance (Section 7.2.2.1).	SMALL – Steam turbines and stacks (approximately 200 feet tall) would create visual impacts comparable to those from existing VCSNS facilities (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of aesthetic impacts from alternate technologies (NRC 1996, Section 8.2)
Cultural Resource Impacts				
SMALL – SHPO consultation minimizes potential for impact (Section 4.19, Issue 71)	SMALL – Not an impact evaluated by GEIS (NRC 1996, Section 7.3)	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site (Section 7.2.2.1)	SMALL– Widening ROW to accommodate new pipeline could impact cultural resources, if present. But impacts would be mitigated by pre-construction surveys and consultation with SHPO. (Section 7.2.2.2).	SMALL – Adopting by reference GEIS description of cultural resource impacts from alternate technologies (NRC 1996, Section 8.2)

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. MODERATE Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

Btu = British thermal unit
ft^3 = cubic foot
gal = gallon
GEIS = Generic Environmental Impact Statement (NRC 1996)
kWh = kilowatt hour
lb = pound
MM = million
MW = megawatt
NO_X = nitrogen oxide
PM_{10} = particulates having diameter less than 10 microns
SHPO = State Historic Preservation Officer
SO_x = sulfur dioxide
TSP = total suspended particulates
yr = year

a. All TSP for gas-fired alternative is PM_{10}.

9.0 STATUS OF COMPLIANCE

9.1 Proposed Action

NRC

"The environmental report shall list all Federal permits, licenses, approvals and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection...." 10 CFR 51.45(d) as adopted by 10 CFR 51.53(c)(2)

9.1.1 General

Table 9-1 lists environmental authorizations that South Carolina Electric & Gas Company (SCE&G) has obtained for current Virgil C. Summer Nuclear Station (VCSNS) operations. In this context, SCE&G uses "authorizations" to include any permits, licenses, approvals, or other entitlements. SCE&G expects to continue renewing these authorizations during the current license period and through the U.S. Nuclear Regulatory Commission (NRC) license renewal period. Based on the new and significant information identification process described in Chapter 5, VCSNS is in compliance with applicable environmental standards and requirements.

Table 9-2 lists additional environmental authorizations and consultations that would be conditions precedent to NRC renewal of the VCSNS license to operate. As indicated, SCE&G anticipates needing relatively few such authorizations and consultations. Sections 9.1.2 through 9.1.5 discuss some of these items in more detail.

9.1.2 Threatened or Endangered Species

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed or proposed for listing as threatened or endangered. Depending on the action involved, the Act requires consultation with the U.S. Fish and Wildlife Service (FWS) regarding effects on non-marine species, the National Marine Fisheries Service (NMFS) for marine species, or both. FWS and NMFS have issued joint procedural regulations at 50 CFR 402, Subpart B, that address consultation, and FWS maintains the joint list of threatened and endangered species at 50 CFR 17.

Although not required by federal law or NRC regulation, SCE&G has chosen to invite comment from federal and state agencies regarding potential effects that VCSNS license renewal might have. Appendix C includes copies of SCE&G correspondence with FWS

and the South Carolina Department of Natural Resources (SCDNR). SCE&G did not consult with NMFS because species under the auspices of NMFS are not found in the vicinity of VCSNS.

9.1.3 Coastal Zone Management Program

The federal Coastal Zone Management Act (16 USC 1451 et seq.) imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. VCSNS, located in Fairfield County, is not within the South Carolina coastal zone (Code Laws of South Carolina, Section 48-39-10) and, due to its distance (approximately 90 miles) from the coastal zone, is not expected to affect the South Carolina coastal zone. Coastal zone management requirements are not applicable to VCSNS license renewal.

9.1.4 Historic Preservation

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking to, prior to issuing the license, take into account the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any State Historic Preservation Officer (SHPO) to substitute state review for Committee review (35 CFR 800.7). Although not required of an applicant by federal law or NRC regulation, SCE&G has chosen to invite comment by the South Carolina SHPO. Appendix E includes a copy of SCE&G correspondence with the SHPO regarding potential effects that VCSNS license renewal might have on historic or cultural resources. Based on the SCE&G submittal and other information, the SHPO concurred with SCE&G's conclusion that continued operation of VCSNS would have no effect on historic properties, noting that "these (continuing) operations are usually not associated with new construction or expansion of plant boundaries."

9.1.5 Water Quality (401) Certification

Federal Clean Water Act (CWA) Section 401 requires that applicants for a federal license to conduct an activity that might result in a discharge into navigable waters provide the licensing agency a certification from the state that the discharge will comply with applicable CWA requirements (33 USC 1341). NRC has indicated in its *Generic Environmental Impact Statement for License Renewal* (NRC 1996) that issuance of a National Pollutant Discharge Elimination System (NPDES) permit implies certification by the state. SCE&G is applying to NRC for license renewal to continue VCSNS operations. Appendix B contains excerpts from the VCSNS NPDES permit.

Consistent with the GEIS, SCE&G is providing the VCSNS NPDES permit as evidence of state water quality (401) certification.

9.2 Alternatives

NRC

"...The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements." 10 CFR 54.45(d) as adopted by 10 CFR 51.53(c)(2)

The coal, gas, and purchased power alternatives discussed in Section 7.2.1 probably could be constructed and operated to comply with all applicable environmental quality standards and requirements. SCE&G notes that increasingly stringent air quality protection requirements could make the construction of a large fossil-fueled power plant infeasible in many locations. SCE&G also notes that the U.S. Environmental Protection Agency has revised requirements that could affect the design of cooling water intake structures for new facilities (EPA 2001) and has proposed requirements that could affect modifications at existing facilities (EPA 2002). These requirements could necessitate construction of cooling towers for the coal- and gas-fired alternatives if surface water were used for cooling.

9.3 References

Code of Laws of South Carolina. Section 48-39-10. Chapter 39. Coastal Tidelands and Wetlands. Available at http://www.lpitr/state/sc/us/code/t48c039/htm. Accessed June 20, 2000.

EPA (U.S. Environmental Protection Agency). 2001. "National Pollutant Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities; Final Rule." *Federal Register.* Vol. 66, No. 243. December 18.

EPA (U.S. Environmental Protection Agency). 2002. "National Pollutant Discharge Elimination System: Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Proposed Rule." *Federal Register.* Vol. 67, No. 68. April 19.

NRC (U.S. Nuclear Regulatory Commission). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS). Volumes 1 and 2. NUREG-1437. Washington, DC. May.

TABLE 9-1
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT VCSNS OPERATIONS

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal Requirements to License Renewal					
U. S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011, et seq.), 10 CFR 50.10	License to operate	NPF-12	Issued on 8/6/82 Expires on 8/6/22	Operation of Unit 1
U.S. Environmental Protection Agency (EPA); South Carolina Department of Health and Environmental Control (SCDHEC) – Bureau of Water	Clean Water Act (33 USC Section 1251 et seq.); Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10, et seq.)	Individual Discharge Permit	SC0030856	Issued on 10/1/97 Expires on 9/30/02	Contains effluent limits for VCSNS discharges to Monticello Reservoir and the Broad River
SCDHEC- Bureau of Air Quality	Pollution Control Act (Sections 48-1-50[5] and 48-1-110[a]; Code of Laws of South Carolina (Regulation 61-62)	Conditional Major Permit	CM-1000-0012	Issued on 8/10/99 Expires on 7/31/04	Establishes emissions limits
SCDHEC – Division of Radioactive Waste Management, Bureau of Land and Waste Management	Atomic Energy and Radiation Control Act (S.C. Code of Laws, Sections 13-7-40, et seq.)	Radioactive Material License	No. 517, Amendment 02	Issued on 9/30/99 Expires on 9/30/04	Authorizes storage of radioactive material in three steam generators removed from service in 1994.

TABLE 9-1 (CONTINUED)
ENVIRONMENTAL AUTHORIZATIONS FOR CURRENT VCSNS OPERATIONS

Agency	Authority	Requirement	Number	Issue or Expiration Date	Activity Covered
Federal Requirements to License Renewal					
SCDHEC – Division of Waste Management	South Carolina Radioactive Waste Transportation and Disposal Act (S.C. Code of Laws 13-7-110 et seq.).	Radioactive Waste Transport Permit	0163-39-02	Issued 12/18/01 Expires 12/31/02	Authorizes shipment of radioactive waste to licensed collecting/processing facilities within state of South Carolina.
Tennessee Dept. of Environment and Conservation – Division of Radiological Health	Tennessee Code Annotated 68-202-206	License to Ship Radioactive Material	T-SC001-LO2	Issued 1/1/02 Expires 12/31/02	Authorizes shipment of radioactive waste to licensed disposal/processing facilities within state of Tennessee.

CFR = Code of Federal Regulations
SCDHEC = Department of Health and Environmental Control
EPA = U.S Environmental Protection Agency

TABLE 9-2
ENVIRONMENTAL AUTHORIZATIONS FOR VCSNS LICENSE RENEWAL

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	License renewal	Environmental Report submitted in support of license renewal application
U.S. Fish and Wildlife Service (FWS)	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires federal agency issuing a license to consult with FWS
South Carolina Department of Archives and History	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer (SHPO). SHPO has concurred that license renewal will not affect any sites listed or eligible for listing
SCDHEC – Bureau of Water	Clean Water Act Section 401 (33 USC 1341)	Certification of compliance with state water quality standards	Discharges during license renewal term

APPENDIX A

NRC NEPA ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS

South Carolina Electric & Gas Company (SCE&G) has prepared this Environmental Report in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. NRC included in the regulation a list of National Environmental Policy Act issues for license renewal of nuclear power plants. Table A-1 lists these 92 issues and identifies the section in which SCE&G addressed each issue in the Environmental Report. For expediency, SCE&G has assigned a number to each issue and uses the issue numbers throughout the Environmental Report.

TABLE A-1
VIRGIL C. SUMMER NUCLEAR STATION ENVIRONMENTAL REPORT DISCUSSION OF LICENSE RENEWAL NEPA ISSUES[a]

Issue		Category	Section of this Environmental Report
1.	Impacts of refurbishment on surface water quality	1	4.0
2.	Impacts of refurbishment on surface water use	1	4.0
3.	Altered current patterns at intake and discharge structures	1	4.0
4.	Altered salinity gradients	1	4.0
5.	Altered thermal stratification of lakes	1	4.0
6.	Temperature effects on sediment transport capacity	1	4.0
7.	Scouring caused by discharged cooling water	1	4.0
8.	Eutrophication	1	4.0
9.	Discharge of chlorine or other biocides	1	4.0
10.	Discharge of sanitary wastes and minor chemical spills	1	4.0
11.	Discharge of other metals in waste water	1	4.0
12.	Water use conflicts (plants with once-through cooling systems)	1	4.0
13.	Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	2	4.1
14.	Refurbishment impacts to aquatic resources	1	4.0
15.	Accumulation of contaminants in sediments or biota	1	4.0
16.	Entrainment of phytoplankton and zooplankton	1	4.0
17.	Cold shock	1	4.0
18.	Thermal plume barrier to migrating fish	1	4.0
19.	Distribution of aquatic organisms	1	4.0
20.	Premature emergence of aquatic insects	1	4.0
21.	Gas supersaturation (gas bubble disease)	1	4.0
22.	Low dissolved oxygen in the discharge	1	4.0
23.	Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	1	4.0
24.	Stimulation of nuisance organisms (e.g., shipworms)	1	4.0
25.	Entrainment of fish and shellfish in early life stages for plants with once-through and cooling pond heat dissipation systems	2	4.2
26.	Impingement of fish and shellfish for plants with once-through and cooling pond heat dissipation systems	2	4.3
27.	Heat shock for plants with once-through and cooling pond heat dissipation systems	2	4.4
28.	Entrainment of fish and shellfish in early life stages for plants with cooling-tower-based heat dissipation systems	1	4.0
29.	Impingement of fish and shellfish for plants with cooling-tower-based heat dissipation systems	1	4.0
30.	Heat shock for plants with cooling-tower-based heat dissipation systems	1	4.0
31.	Impacts of refurbishment on groundwater use and quality	1	4.0
32.	Groundwater use conflicts (potable and service water; plants that use < 100 gpm)	1	4.0
33.	Groundwater use conflicts (potable, service water, and dewatering; plants that use > 100 gpm)	2	4.5

TABLE A-1 (CONT'D)
VIRGIL C. SUMMER NUCLEAR STATION
ENVIRONMENTAL REPORT DISCUSSION OF
LICENSE RENEWAL NEPA ISSUES[a]

Issue		Category	Section of this Environmental Report
34.	Groundwater use conflicts (plants using cooling towers withdrawing make-up water from a small river)	2	4.6
35.	Groundwater use conflicts (Ranney wells)	2	4.7
36.	Groundwater quality degradation (Ranney wells)	1	4.0
37.	Groundwater quality degradation (saltwater intrusion)	1	4.0
38.	Groundwater quality degradation (cooling ponds in salt marshes)	1	4.0
39.	Groundwater quality degradation (cooling ponds at inland sites)	2	4.8
40.	Refurbishment impacts to terrestrial resources	2	4.9
41.	Cooling tower impacts on crops and ornamental vegetation	1	4.0
42.	Cooling tower impacts on native plants	1	4.0
43.	Bird collisions with cooling towers	1	4.0
44.	Cooling pond impacts on terrestrial resources	1	4.0
45.	Power line right-of-way management (cutting and herbicide application)	1	4.0
46.	Bird collisions with power lines	1	4.0
47.	Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	4.0
48.	Floodplains and wetlands on power line right-of-way	1	4.0
49.	Threatened or endangered species	2	4.10
50.	Air quality during refurbishment (non-attainment and maintenance areas)	2	4.11
51.	Air quality effects of transmission lines	1	4.0
52.	Onsite land use	1	4.0
53.	Power line right-of-way land use impacts	1	4.0
54.	Radiation exposures to the public during refurbishment	1	4.0
55.	Occupational radiation exposures during refurbishment	1	4.0
56.	Microbiological organisms (occupational health)	1	4.0
57.	Microbiological organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river)	2	4.12
58.	Noise	1	4.0
59.	Electromagnetic fields, acute effects (electric shock)	2	4.13
60.	Electromagnetic fields, chronic effects	NA[b]	4.0
61.	Radiation exposures to public (license renewal term)	1	4.0
62.	Occupational radiation exposures (license renewal term)	1	4.0
63.	Housing impacts	2	4.14
64.	Public services: public safety, social services, and tourism and recreation	1	4.0
65.	Public services: public utilities	2	4.15
66.	Public services: education (refurbishment)	2	4.16
67.	Public services: education (license renewal term)	1	4.0
68.	Offsite land use (refurbishment)	2	4.17.1
69.	Offsite land use (license renewal term)	2	4.17.2

TABLE A-1 (CONT'D)
VIRGIL C. SUMMER NUCLEAR STATION
ENVIRONMENTAL REPORT DISCUSSION OF
LICENSE RENEWAL NEPA ISSUES[a]

Issue		Category	Section of this Environmental Report
70.	Public services: transportation	2	4.18
71.	Historic and archaeological resources	2	4.19
72.	Aesthetic impacts (refurbishment)	1	4.0
73.	Aesthetic impacts (license renewal term)	1	4.0
74.	Aesthetic impacts of transmission lines (license renewal term)	1	4.0
75.	Design basis accidents	1	4.0
76.	Severe accidents	2	4.20
77.	Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	1	4.0
78.	Offsite radiological impacts (collective effects)	1	4.0
79.	Offsite radiological impacts (spent fuel and high-level waste disposal)	1	4.0
80.	Nonradiological impacts of the uranium fuel cycle	1	4.0
81.	Low-level waste storage and disposal	1	4.0
82.	Mixed waste storage and disposal	1	4.0
83.	Onsite spent fuel	1	4.0
84.	Nonradiological waste	1	4.0
85.	Transportation	1	4.0
86.	Radiation doses (decommissioning)	1	4.0
87.	Waste management (decommissioning)	1	4.0
88.	Air quality (decommissioning)	1	4.0
89.	Water quality (decommissioning)	1	4.0
90.	Ecological resources (decommissioning)	1	4.0
91.	Socioeconomic impacts (decommissioning)	1	4.0
92.	Environmental justice	NA[b]	2.11

a. Source: 10 CFR 51, Subpart A, Appendix A, Table B-1. (Issue numbers added to facilitate discussion.)
b. Not applicable. Regulation does not categorize this issue.
NEPA = National Environmental Policy Act.

APPENDIX B

NPDES PERMIT

The NPDES permit for Virgil C. Summer Nuclear Station is approximately 75 pages long. Only the cover page, providing the authority to discharge to Monticello Reservoir and the Broad River, and pages related to the Section 316(a) variance and Section 316(b) determination are provided.

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health
and Environmental Control

National Pollutant Discharge Elimination System Permit

for Discharge to Surface Waters

This Permit Certifies That

SCE&G Virgil C. Summer Nuclear Station

has been granted permission to discharge from a facility located at

Jenkinsville, Fairfield County, South Carolina

to receiving waters named
Monticello Reservoir and Broad River

accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 *et seq.*, 1976), Regulation 61-9 and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq.*, the "Act."

Marion F. Sadler, Jr., Director
Industrial, Agricultural, and Storm Water Permitting Division
Bureau of Water

Issued:*September 29, 1997*

Expires:*September 30, 2002*

Effective: *October 1, 1997*

Permit No.: *SC0030856*

Page 7

2.0 mg/l (max)

5. Human Health: 0.05 mg/l
6. Detection Limit: 0.01 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for manganese will be proposed.

Flouride
1. Form 2C Value: 0.123 mg/l
2. Previous Permit: none
3. Effluent Guidelines: Not applicable
4. Water Quality Criteria: none
5. Drinking Water MCL: 4.0 mg/l
6. Detection Limit: 0.01 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for flouride will be proposed.

Sulfate
1. Form 2C Value: 6.14 mg/l
2. Previous Permit: none
3. Effluent Guidelines: Not applicable
4. Water Quality Criteria: none
5. Drinking Water MCL: 250 mg/l
6. Detection Limit: 0.005 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for sulfate will be proposed.

Nitrate-nitrite
1. Form 2C Value: 0.36 mg/l
2. Previous Permit: none
3. Effluent Guidelines: Not applicable
4. Water Quality Criteria: none
5. Drinking Water MCL: 10 mg/l
6. Detection Limit: 0.02 mg/l
7. Conclusion: Based upon sampling data and reasonable potential procedures, no limit for nitrate-nitrite will be proposed.

1. 316(a)

The thermal component of the discharge from this facility is subject to compliance with South Carolina Water Classifications and Standards (Reg. 61-68). Section D.(8)(a) of the standards stipulates that the water temperature of all Class A waters "shall not be increased more than 5°F(2.8°C) above natural temperature conditions or exceed a maximum of 90°F(32.2°C) as a result of the discharge of heated liquids," unless a different temperature standard has been established, a mixing zone has been established, or a Section 316(a) determination under the Federal Clean Water Act (the Act) has been completed. Section 316(a) of the Act allows the permitting authority to impose alternative and less stringent thermal limitations after demonstration that the water quality standards limitations are more

stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving water.

On April 7, 1975, as a part of permitting activities of the original NPDES permit, SCE&G provided information to support its request that alternative thermal effluent limitations be allowed under Section 316(a) of the Act. In April 30, 1976, a determination was made that the permittee had submitted adequate information to demonstrate that the alternative limitations for the thermal component of the discharge would assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the Monticello Reservoir. The alternate maximum discharge temperature for Outfall 001 is 45°C(113°F). A maximum thermal plume temperature of 32.2°C(90°F) and temperature rise of 1.66°C(3.0°F) is also imposed.

On July 1, 1984 a continuation of the 316(a) variance was allowed by the reissuance of the NPDES permit. On January 3, 1989, a request to continue the variance was included as part of the application for reissuance of the NPDES Permit. To support the request, the permittee has indicated there has been no change in facility operation and no change in the biological community. A tentative determination was made that continuation of the 316(a) variance was appropiate in the reissuance of this permit.

On April 3, 1997, the permittee submitted an application for reissuance of the permit. A request to continue the 316(a) variance was included as part of the application. On June 19, 1997, the Department determined that continuance was appropriate.

2. Section 316(b)

Section 316(b) of the Act requires that the location, design, construction, and capacity of a cooling water intake structure reflect the best technology available for minimizing environmental impact.

On April 19, 1985, a determination was made, in a accordance with Section 316(b) of the Act, that the location, design, construction, and capacity of the cooling water intake structure(s) reflects the best technology available for minimizing adverse environmental impact. This determination was based on information submitted by SCE&G in a 316(b) Demonstration (March 1977).

Outfall 002

Outfall 002 consists of house service water for cooling of emergency generators, cooling heat exchangers and reactor building cooling units and is discharged at

APPENDIX C

SPECIAL-STATUS SPECIES CORRESPONDENCE

SCE&G
A SCANA COMPANY

January 19, 2001
RC-01-0003

Ms. Julie Holling
Data Manager
Wildlife and Freshwater Fisheries Division
South Carolina Heritage Trust Program
South Carolina Dept. of Natural Resources
P.O. Box 167
Columbia, SC 29202

Dear Ms. Holling:

Stephen A. Byrne
Vice President
Nuclear Operations
803 345 4622

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
LISTED SPECIES AND IMPORTANT HABITATS

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station, which expires in August 2022. SCE&G intends to submit this application for license renewal in August 2002. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act" (10 CFR 51.53). The NRC will consult with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act and may also seek your assistance in the identification of important species and habitats in the project area. By contacting you in advance, we hope to identify any issues that need to be addressed or information required to expedite the NRC's consultation.

South Carolina Electric & Gas Co
Virgil C. Summer Nuclear Station
P O Box 88
Jenkinsville, South Carolina
29065

803.345 4344
803.345 5209
www scana com

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) and associated transmission lines since 1982. Summer Station is in Fairfield County, South Carolina, approximately 15 miles southwest of the town of Winnsboro and approximately 26 miles northwest of Columbia (latitude 34.295833; longitude 81 320278) (see Figure 2-1) The plant lies on the south shore of Monticello Reservoir (see Figure 2-2), which serves as its cooling water source and heat sink The Summer Station property (Figure 2-3) is defined as the area within approximately one mile of the reactor building and includes the southern portion of Monticello Reservoir. It totals approximately 2,200 acres.

SCE&G, which owns two-thirds of the plant, built eight transmission lines for the specific purpose of connecting Summer Station to the regional transmission system (see Figure 3-3). South Carolina Public Service Authority (commonly referred to as "Santee Cooper"), owner of the remaining one-third of the plant, built two additional lines to connect to the regional grid. Beginning at Summer Station, the SCE&G lines

Ms. Julie Holling, SCDNR
Page 2 of 2

generally run in a southerly direction, with five terminations very near Summer Station; one near Aiken, South Carolina; and two near Columbia (see Figure 3-2). The Santee Cooper lines run roughly east and west to substations near Blythewood and Newberry, South Carolina, respectively.

SCE&G is committed to the conservation of significant natural habitats and protected species, and believes that operation of Summer Station and its transmission lines since 1982 has had no adverse impact on any threatened or endangered species. Only one listed species, the bald eagle, is known to occur in the vicinity of Summer Station. Bald eagles are commonly observed foraging around Monticello Reservoir, Parr Reservoir, and on the Broad River downstream of Parr Shoals dam. There were two active bald eagle nests on Parr Reservoir in 1999-2000, one on the Cannons Creek arm of the reservoir (approximately 2 miles east of the station) and one on the Hellers Creek arm of the reservoir (approximately 4 miles northeast of the station).

SCE&G has no plans to alter current operations over the license renewal period. Any maintenance activities necessary to support license renewal would be limited to previously-disturbed areas. No major expansion of existing facilities is planned, and no additional land disturbance is anticipated in support of license renewal. As a consequence, we believe that operation of the plant, including maintenance of the transmission lines, over the license renewal period (an additional 20 years) would not adversely affect any threatened or endangered species. Although SCE&G has not identified any rare plants in the transmission corridors, control of woody vegetation in these corridors could provide habitat for rare plants and animals that depend on open conditions (grassland and bog-type habitats) that are maintained by regular mowing and selective application of approved herbicides.

We would appreciate your providing us with any information you may have about any State or Federally listed species or ecologically significant habitats that may occur on the 2,200-acre Summer Station site or along associated transmission corridors by March 1, 2001. This will enable us to meet our application preparation schedule. We will include a copy of this letter and your response in the license renewal application that we submit to the NRC. Please inform Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review this action.

Very truly yours,

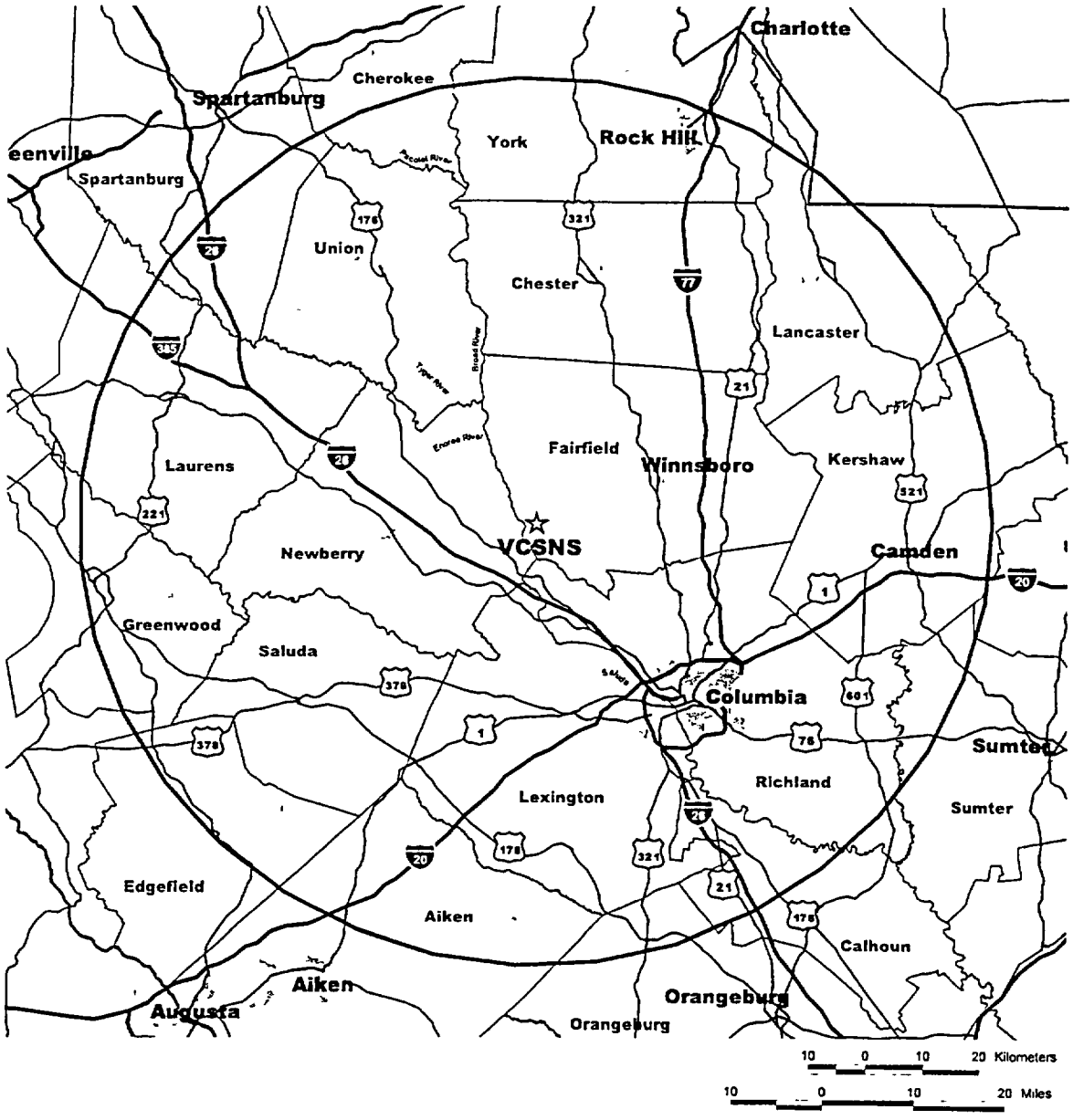
Stephen A. Byrne

SES/SAB

attachments

c: R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0003)

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

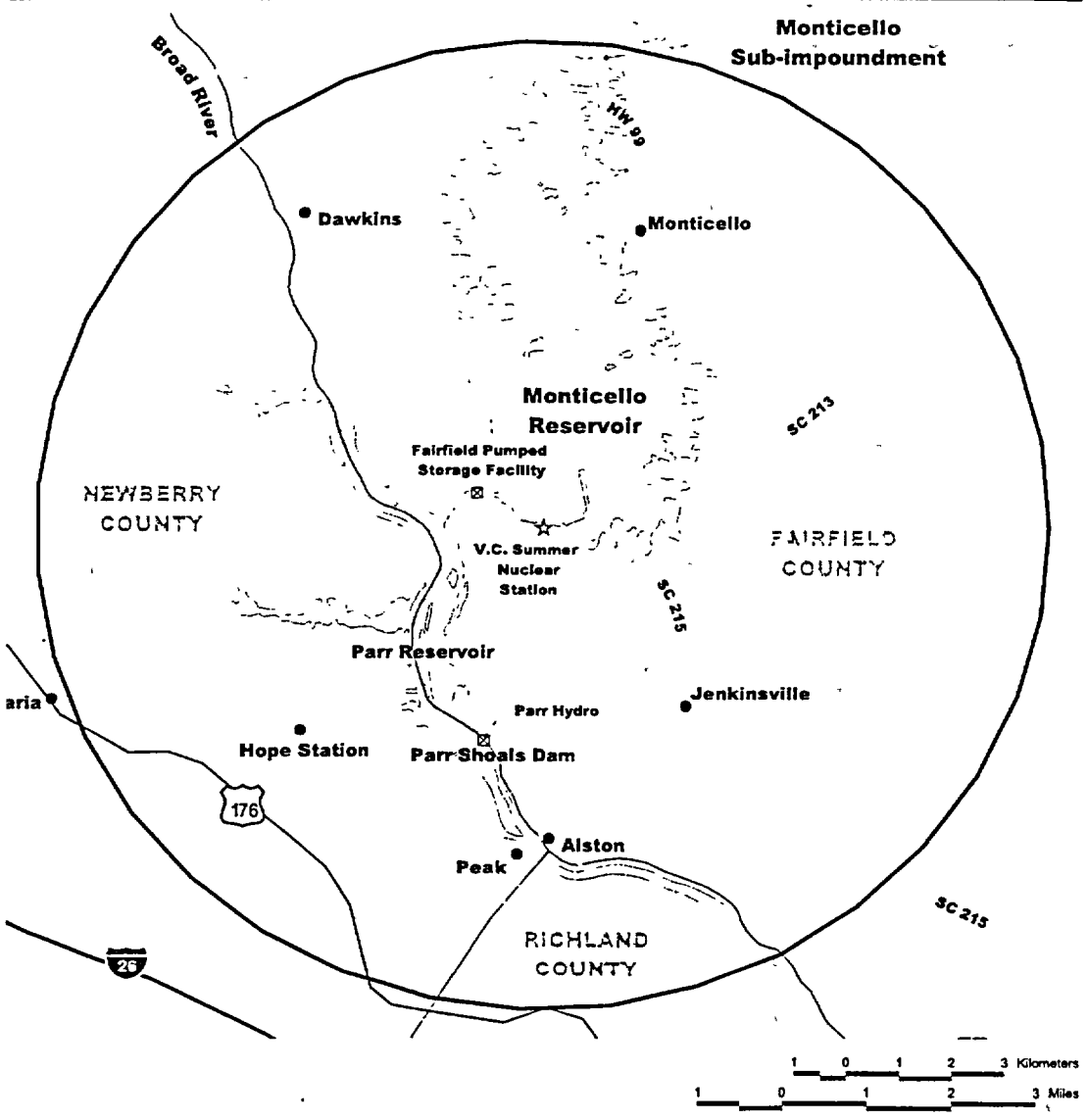


LEGEND

- V C. Summer Nuclear Station
- 50 mile radius of V C Summer
- Interstates
- Major roads
- County Boundaries
- State Boundary
- Lakes and Rivers
- Major Urban Areas

FIGURE 2-1
V.C. Summer Nuclear Station,
50-Mile Locational Vicinity Map
LICENSE RENEWAL APPLICATION

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND
- Six mile radius of V.C. Summer
- Interstates
- Major roads
- Minor roads
- County Boundaries
- Lakes and Rivers

FIGURE 2-2
V.C. Summer Nuclear Station,
6-Mile Vicinity Map
LICENSE RENEWAL APPLICATION

DRAFT
ENVIRONMENTAL REPORT FOR LICENSE RENEWAL
VIRGIL C. SUMMER NUCLEAR STATION

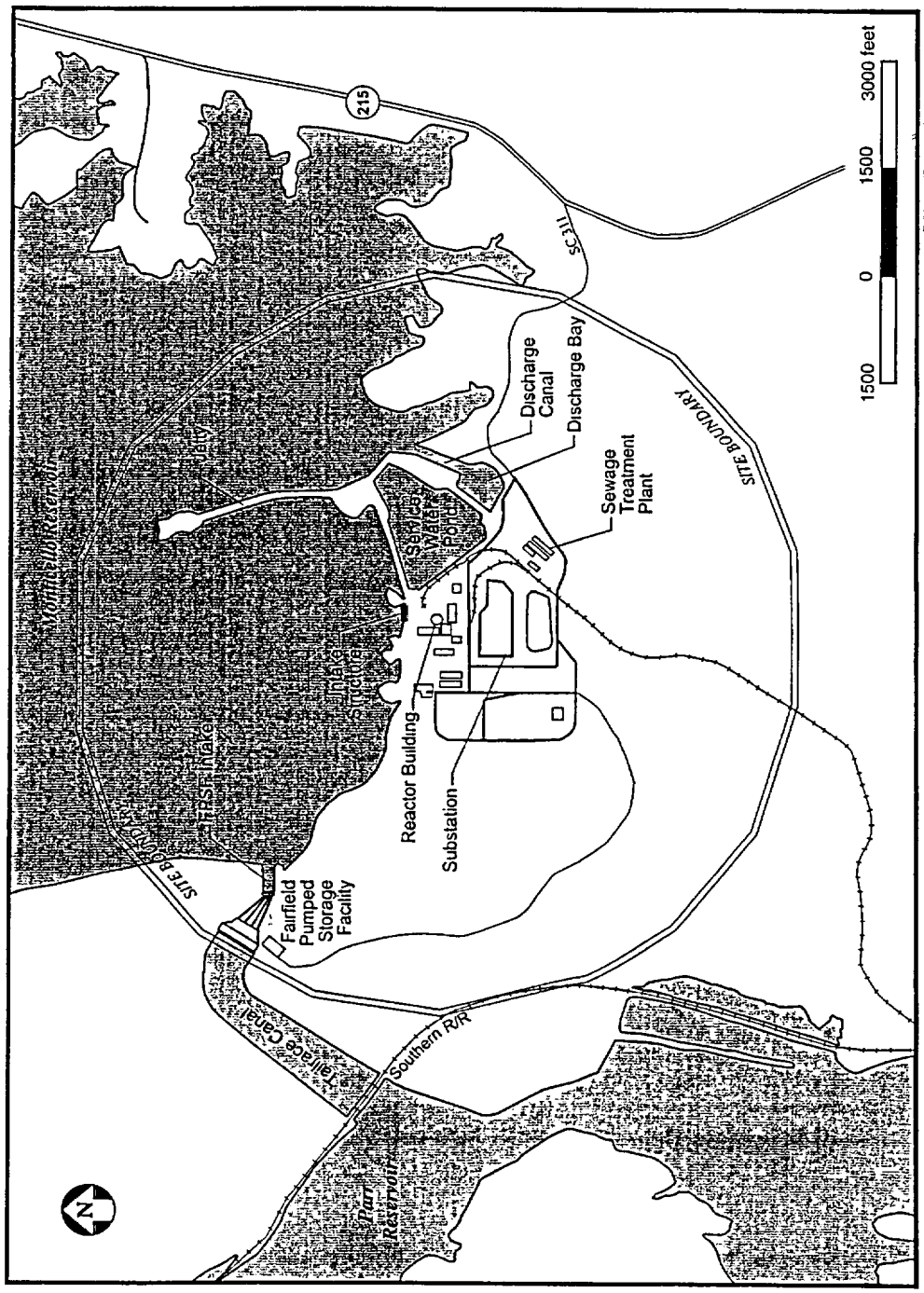


Figure 2-3. South Carolina Electric & Gas Company, Virgil C Summer Nuclear Station Site Area Map.

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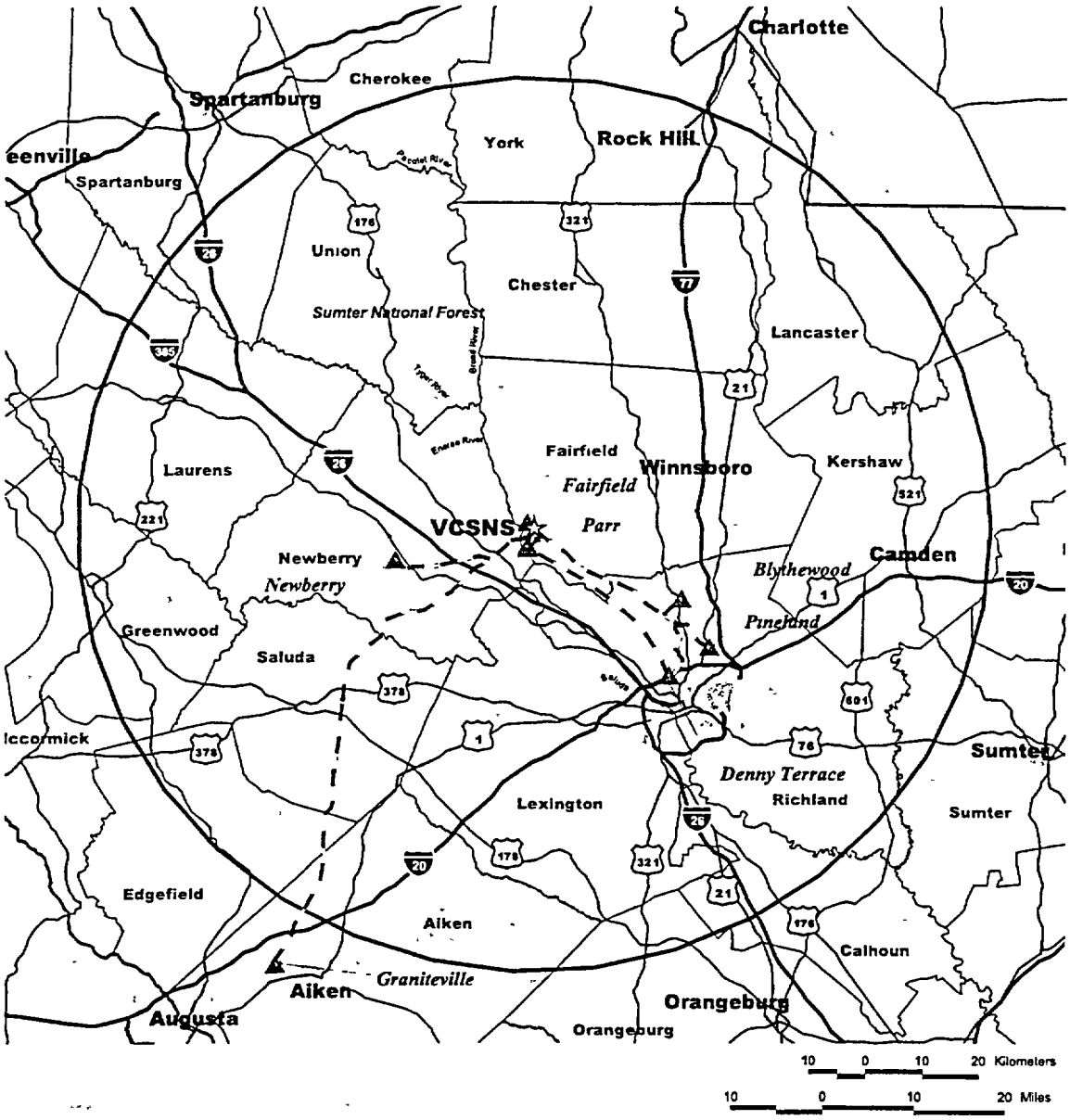
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

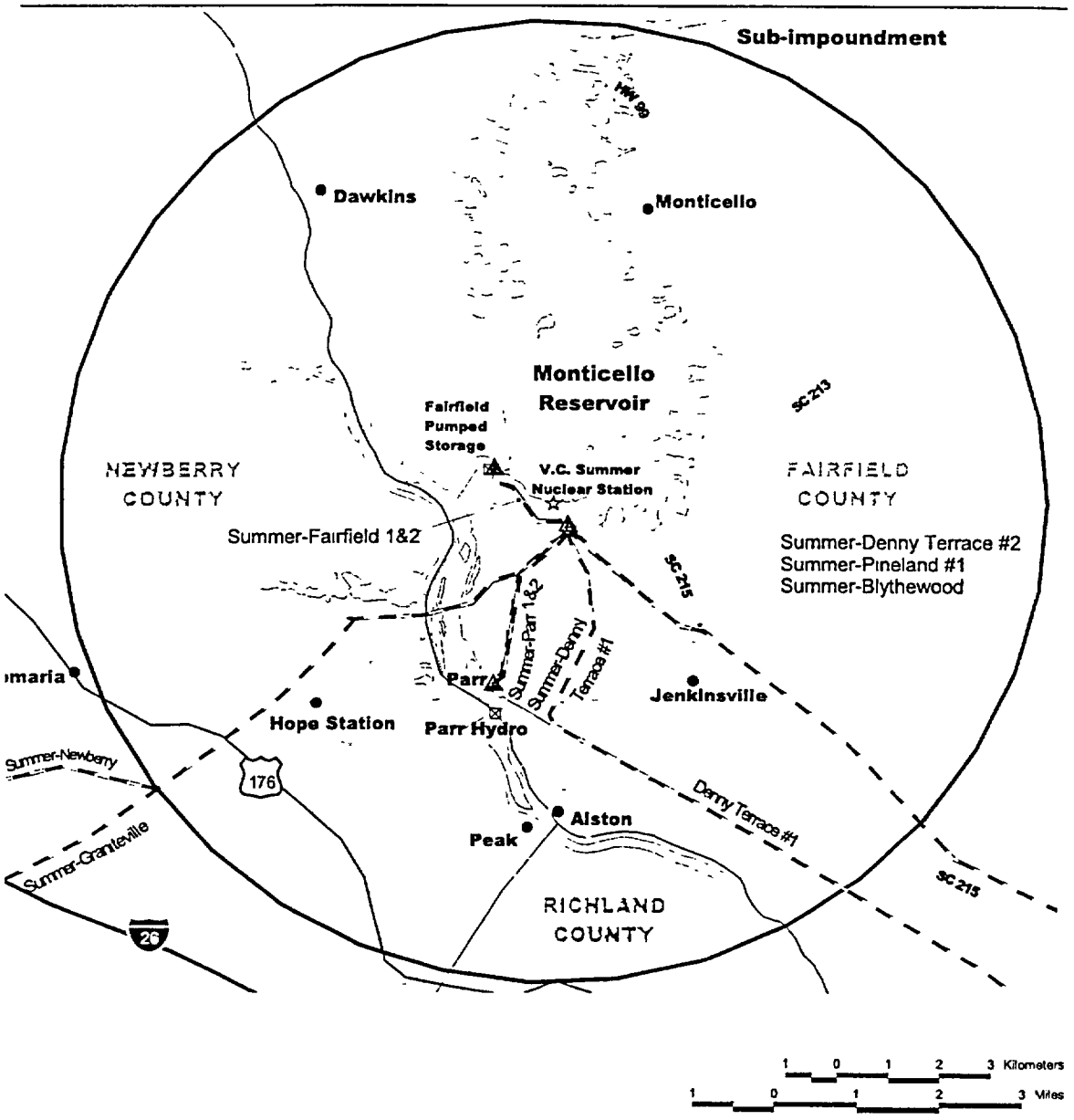


LEGEND

- V C Summer Nuclear Station
- Substations
- Transmission Lines
- 50 mile radius of V C Summer
- Interstates
- Major roads
- County Boundaries
- State Boundary
- Lakes and Rivers
- National Forests

FIGURE 3-2
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND

- Substations
- Transmission Lines
- Six mile radius of V C Summer
- Interstates
- Major roads
- Minor roads
- County Boundaries
- Lakes and Rivers

FIGURE 3-3
V.C. Summer Nuclear Station,
6-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

2-20-01, 12 58PM, ,345 4355 # 2/ 6

South Carolina Department of
Natural Resources

Paul A. Sandifer, Ph.D.
Director
William S. McTeer
Deputy Director for
Wildlife and
Freshwater Fisheries

February 15, 2001

Stephen A. Byrne, Vice President, Nuclear Operations
SCE&G, Virgil C. Summer Nuclear Station
P.O. Box 88
Jenkinsville, SC 29065

RE: Virgil C. Summer Nuclear Station License Renewal
Request for Information on Listed Species and Important Habitats

Dear Mr. Byrne,

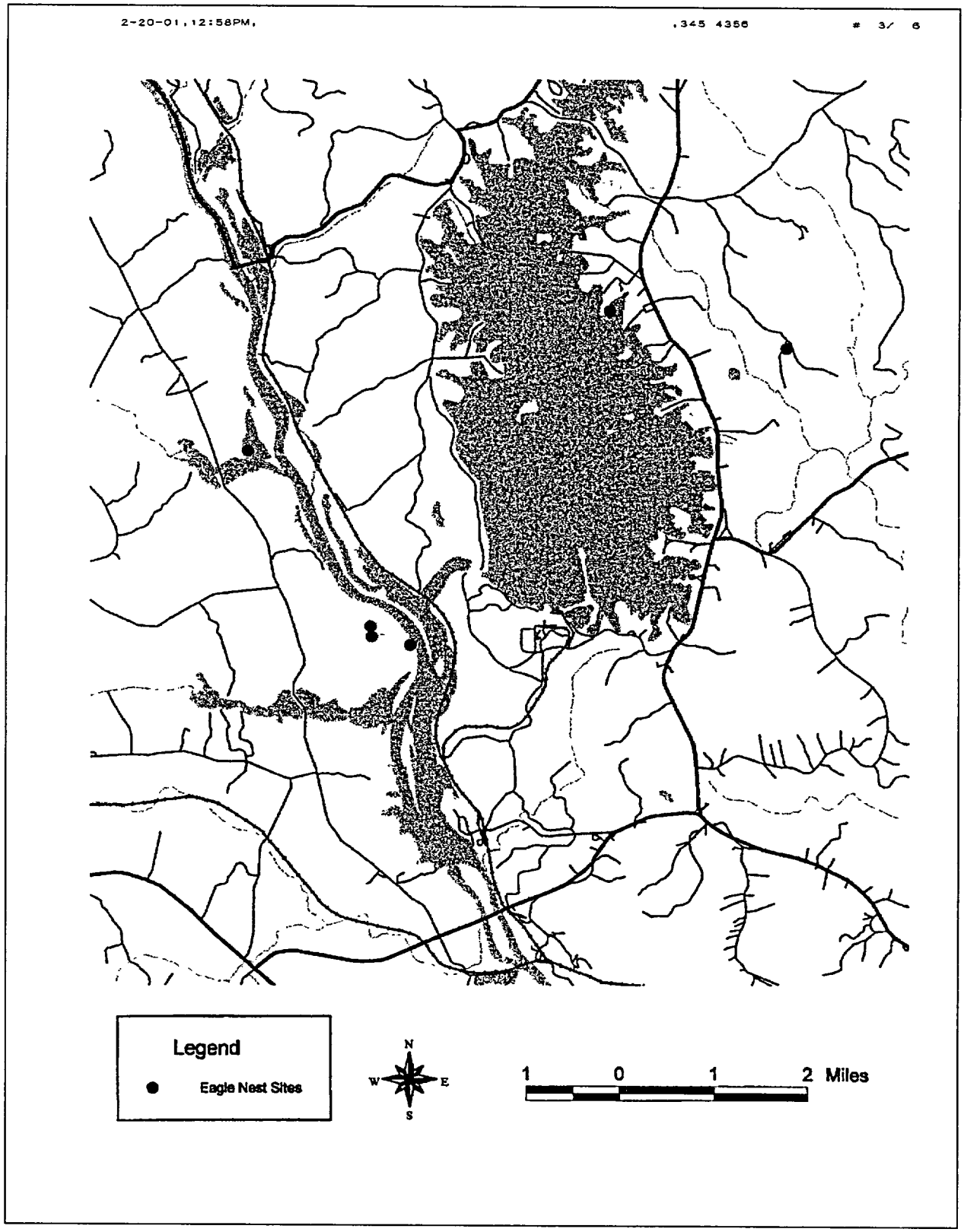
I have checked our database, and there are no occurrences of any federally or state threatened or endangered species within one mile of the project area. There are a number of known Bald Eagle nesting sites within a five mile radius. I've included a map indicating those locations for your information. Please understand that our database does not represent a comprehensive biological inventory of the state. Field work remains the responsibility of the investigator.

As an indication of other potential occurrences in the area, I have enclosed the lists of rare and endangered species for Fairfield, Newberry, and Richland counties. The highlighted ones are of legal significance. The remaining species on the list are of concern in the state.

If you need additional assistance, please contact me by phone at 803/734-3917 or by e-mail at JulieH@scdnr.state.sc.us.

Sincerely,

Julie Holling
SC Department of Natural Resources
Heritage Trust Program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3/ 6
Legend
Eagle Nest Sites
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RARE, THREATENED, AND ENDANGERED SPECIES OF FAIRFIELD COUNTY

STATUS	GRANK.	SRANK.	SCIENTIFIC NAME	COMMON NAME
ANIMALS				
SC	G3	S?	ETHEOSTOMA COLLIS	CAROLINA DARTER
FT/SE	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
SC	G5	S?	PYGANODON CATARACTA	EASTERN FLOATER
SC	G5	S4	SCIURUS NIGER	EASTERN FOX SQUIRREL
SC	G4	S?	VILLOSA DELUMBIS	EASTERN CREEKSHELL
PLANTS				
SC	G2G3	S?	ASTER GEORGIANUS	GEORGIA ASTER
SC	G4	S?	CAREX OLIGOCARPA	EASTERN FEW-FRUIT SEDGE
SC	G4	S?	DIRCA PALUSTRIS	EASTERN LEATHERWOOD
RC	G5	S1	FRASERA CAROLINIENSIS	COLUMBO
SC	G3	S2	ISOETES PIEDMONTANA	PIEDMONT QUILLWORT
SC	G4	S?	MINUARTIA UNIFLORA	ONE-FLOWER STITCHWORT
SC	G5	S?	OSMORHIZA CLAYTONII	HAIRY SWEET-CICELY
SC	G5	S1	PHILADELPHUS HIRSUTUS	STREAMBANK MOCK-ORANGE
SC	G4	S?	SCUTELLARIA PARVULA	SMALL SKULLCAP
NC	G3	S2	SEDUM PUSILLUM	GRANITE ROCK STONECROP

RARE, THREATENED, AND ENDANGERED SPECIES OF LEXINGTON COUNTY

STATUS...	GRANK...	SRANK..	SCIENTIFIC NAME	COMMON NAME.....
ANIMALS				
FT/SE	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
SC	G2	S?	HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE
SC	G5	S2	MICRURUS FULVIUS	EASTERN CORAL SNAKE
FE/SE	G3	S2	PICOIDES BOREALIS	RED-COCKADED WOODPECKER
SC	G5	S4	SCIURUS NIGER	EASTERN FOX SQUIRREL
SC	G5	S?	SEMINATRIX PYGAEA	BLACK SWAMP SNAKE
PLANTS				
SC	G5T3T4	S1	ANDROPOGON PERANGUSTATUS	NARROW LEAVED BLUESTEM
SC	G4?	S?	ARISTIDA CONDENSATA	PIEDMONT THREE-AWNED GRASS
SC	G4	S1	ASPLENIUM PINNATIFIDUM	LOBED SPLEENWORT
SC	G4G5	S?	BURMANNIA BIFLORA	NORTHERN BURMANNIA
SC	G4	S1	CAREX COLLINSII	COLLINS' SEDGE
SC	G4G5	S1S2	CHRYSOMA PAUCIFLOSCULOSA	WOODY GOLDENROD
SC	G3G5	S?	COREOPSIS GLADIATA	SOUTHEASTERN TICKSEED
SC	G5	S1	EUONYMUS ATROPURPUREUS	WAHOO
SC	G4	S?	GAYLUSSACIA MOSIERI	WOOLLY-BERRY
NC	G2Q	S2	HYMENOCALLIS CORONARIA	SHOALS SPIDER-LILY
SC	G4	S?	HYPERICUM NITIDUM	CAROLINA ST. JOHN'S-WORT
SC	G4	S3	ILEX AMELANCHIER	SARVIS HOLLY
SC	G3G4	S?	LIATRIS MICROCEPHALA	SMALL-HEAD GAYFEATHER
SC	G?	S?	LOBELIA SP 1	LOBELIA
SC	G3	S?	LYCOPUS COKERI	CAROLINA BUGLEWEED
SC	G5	S?	MENISPERMUM CANADENSE	CANADA MOONSEED
RC	G3	S2	MYRIOPHYLLUM LAXUM	PIEDMONT WATER-MILFOIL
SC	G3G5	S?	NOLINA GEORGIANA	GEORGIA BEARGRASS
SC	G3	S?	OXYPOLIS TERNATA	PIEDMONT COWBANE
SC	G4	S?	PITYOPSIS PINIFOLIA	PINE-LEAVED GOLDEN ASTER
SC	G5	S1S2	POLYGALA NANA	DWARF MILKWORT
SC	G5	S1	RHYNCHOSPORA ALBA	WHITE BEAKRUSH
SC	G3G4	S?	RHYNCHOSPORA INUNDATA	DROWNED HORNEDRUSH
	G3	SR	RHYNCHOSPORA LEPTOCARPA	
SC	G4	S?	RHYNCHOSPORA STENOPHYLLA	CHAPMAN BEAKRUSH
SC	G5	S?	RORIPPA SESSILIFLORA	STALKLESS YELLOWCRESS
SC	G3G4	S2	SAGITTARIA ISOETIFORMIS	SLENDER ARROW-HEAD
SC	G3	S1	SARRACENIA RUBRA	SWEET PITCHER-PLANT
SC	G4G5	S?	SCIRPUS SUBTERMINALIS	WATER BULRUSH
NC	G1G2	S1	SPOROBOLUS TERETIFOLIUS	WIRE-LEAVED DROPSEED
SC	G4T2T3	S1	STYLISMA PICKERINGII VAR PICKERINGII	PICKERING'S MORNING-GLORY
SC	G3?	S?	TRIDENS CAROLINIANUS	CAROLINA FLUFF GRASS
NC	G4G5T1	S1	VACCINIUM CRASSIFOLIUM SSP SEMPERVIRENS	RAYNER'S BLUEBERRY
SC	G3	S?	XYRIS CHAPMANII	CHAPMAN'S YELLOW-EYED GRASS

RARE, THREATENED, AND ENDANGERED SPECIES OF NEWBERRY COUNTY

STATUS..	GRANK..	SRANK...	SCIENTIFIC NAME.....	COMMON NAME.....
ANIMALS:				
SC	G1	S1	DISTOCAMBARUS YOUNGINERI	A CRAYFISH
SC	G2G3	S?	ELLIPTIO LANCEOLATA	YELLOW LANCE
FT/SE	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
SC	G5	S3?	URSUS AMERICANUS	BLACK BEAR
PLANTS:				
SC	G4	S?	DIRCA PALUSTRIS	EASTERN LEATHERWOOD
SC	G5?	S?	EUPATORIUM FISTULOSUM	HOLLOW JOE-PYE WEED
RC	G5	S1	FRASERA CAROLINIENSIS	COLUMBO
SC	G5	S?	HETERANTHERA RENIFORMIS	KIDNEYLEAF MUD-PLANTAIN
SC	G5	S?	LIPARIS LILIIFOLIA	LARGE TWAYBLADE
RC	G4	S1	MAGNOLIA PYRAMIDATA	PYRAMID MAGNOLIA
RC	G3	S1	MONOTROPSIS ODORATA	SWEET PINESAP
SC	G5T5	S?	VIOLA PUBESCENS VAR LEIOCARPON	YELLOW VIOLET

SCE&G
A SCANA COMPANY

January 19, 2001
RC-01-0004

Mr. Roger Banks
Field Supervisor
U.S. Fish and Wildlife Service
P O. Box 12559
217 Fort Jackson Road
Charleston, SC 29202

Dear Mr Banks:

Stephen A. Byrne
Vice President
Nuclear Operations
803 345 4622

Subject: VIRGIL C SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
LISTED SPECIES AND IMPORTANT HABITATS

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station, which expires in August 2022. SCE&G intends to submit this application for license renewal in August 2002. As part of the license renewal process, the NRC requires license applicants to "assess the impact of the proposed action on threatened or endangered species in accordance with the Endangered Species Act" (10 CFR 51.53). The NRC will consult with your office under Section 7 of the Endangered Species Act to determine if any listed species or critical habitat occurs in the project area By contacting you in advance, we hope to identify any issues that need to be addressed or information required to expedite the NRC's consultation.

South Carolina Electric & Gas Co
Virgil C Summer Nuclear Station
P O Box 88
Jenkinsville, South Carolina
29065

803 345 4344
803 345 5209
www.scana.com

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) and associated transmission lines since 1982. Summer Station is in Fairfield County, South Carolina, approximately 15 miles southwest of the town of Winnsboro and approximately 26 miles northwest of Columbia (latitude 34 295833; longitude 81.320278) (see Figure 2-1). The plant lies on the south shore of Monticello Reservoir (see Figure 2-2), which serves as its cooling water source and heat sink The Summer Station property (Figure 2-3) is defined as the area within approximately one-mile of the reactor building and includes the southern portion of Monticello Reservoir. It totals approximately 2,200 acres

SCE&G, which owns two-thirds of the plant, built eight transmission lines for the specific purpose of connecting Summer Station to the regional transmission system (see Figure 3-3). South Carolina Public Service Authority (commonly referred to as "Santee Cooper"), owner of the remaining one-third of the plant, built two additional lines to connect to the regional grid Beginning at Summer Station, the SCE&G lines generally run in a southerly direction, with five terminations very near Summer Station; one near Aiken, South Carolina, and two near Columbia (see Figure 3-2)

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

Mr. Roger Banks, USFWS
Page 2 of 2

The Santee Cooper lines run roughly east and west to substations near Blythewood and Newberry, South Carolina, respectively.

SCE&G is committed to the conservation of significant natural habitats and protected species, and believes that operation of the station and its transmission lines since 1982 has had no adverse impact on any threatened or endangered species. Only one Federally-listed species, the bald eagle, is known to occur in the vicinity of Summer Station. Bald eagles are commonly observed foraging around Monticello Reservoir, Parr Reservoir, and on the Broad River downstream of Parr Shoals dam. There were two active bald eagle nests on Parr Reservoir in 1999-2000, one on the Cannons Creek arm of the reservoir (approximately 2 miles east of the station) and one on the Hellers Creek arm of the reservoir (approximately 4 miles northeast of the station)

SCE&G has no plans to alter current operations over the license renewal period Any maintenance activities necessary to support license renewal would be limited to previously disturbed areas. No major expansion of existing facilities is planned, and no additional land disturbance is anticipated in support of license renewal. As a consequence, we believe that operation of Summer Station, including maintenance of the transmission lines, over the license renewal period (an additional 20 years) would not adversely affect any threatened or endangered species.

We would appreciate your providing us with any information you may have about any threatened or endangered species or ecologically significant habitats that may occur on the 2,200-acre Summer Station site or along associated transmission corridors by March 1, 2001. This will enable us to meet our application preparation schedule We will include a copy of this letter and your response in the license renewal application that we submit to the NRC. Please call Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review the proposed action.

Very truly yours,

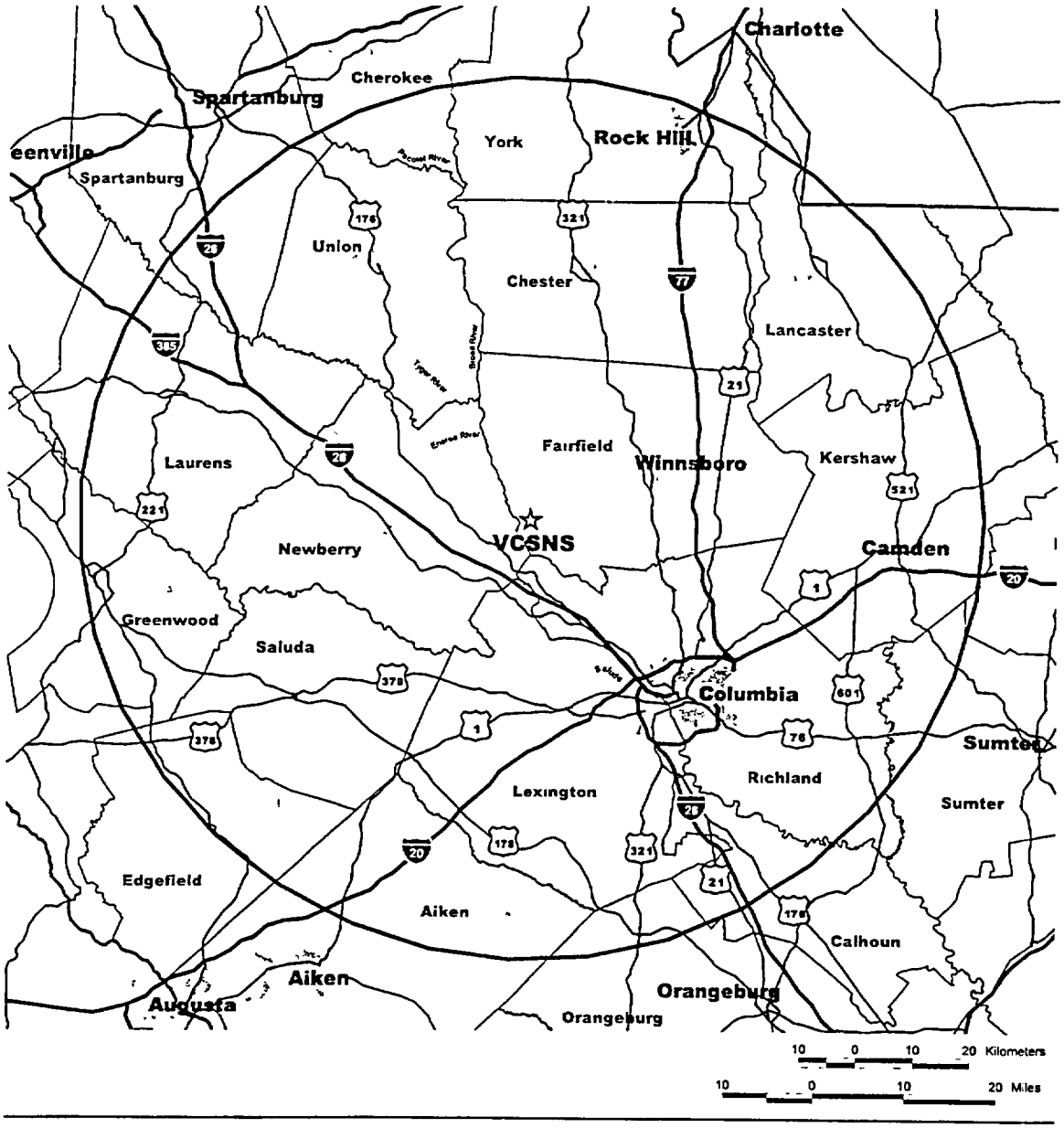
Stephen A. Byrne

SES/SAB

attachments

c. R. B. Clary (800)
W. R. Higgins (830)
P. R Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0004)

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

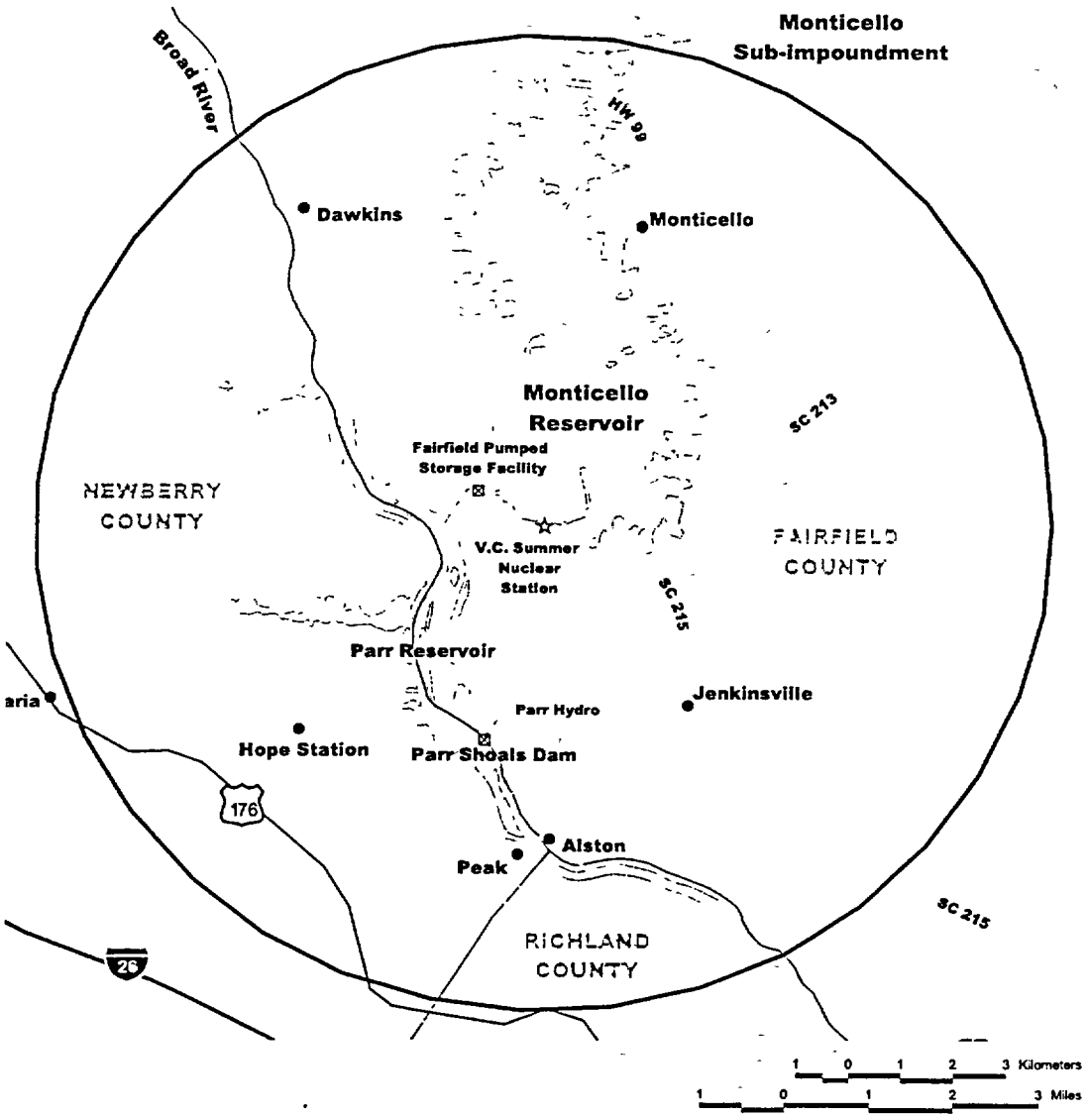


LEGEND

- ☆ V C Summer Nuclear Station
- 50 mile radius of V C Summer
- Interstates
- Major roads
- County Boundaries
- State Boundary
- Lakes and Rivers
- Major Urban Areas

FIGURE 2-1
V.C. Summer Nuclear Station,
50-Mile Locational Vicinity Map
LICENSE RENEWAL APPLICATION

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND
- Six mile radius of V.C. Summer
- Interstates
- Major roads
- Minor roads
- County Boundaries
- Lakes and Rivers

FIGURE 2-2
V.C. Summer Nuclear Station,
6-Mile Vicinity Map
LICENSE RENEWAL APPLICATION

DRAFT
ENVIRONMENTAL REPORT FOR LICENSE RENEWAL
VIRGIL C. SUMMER NUCLEAR STATION

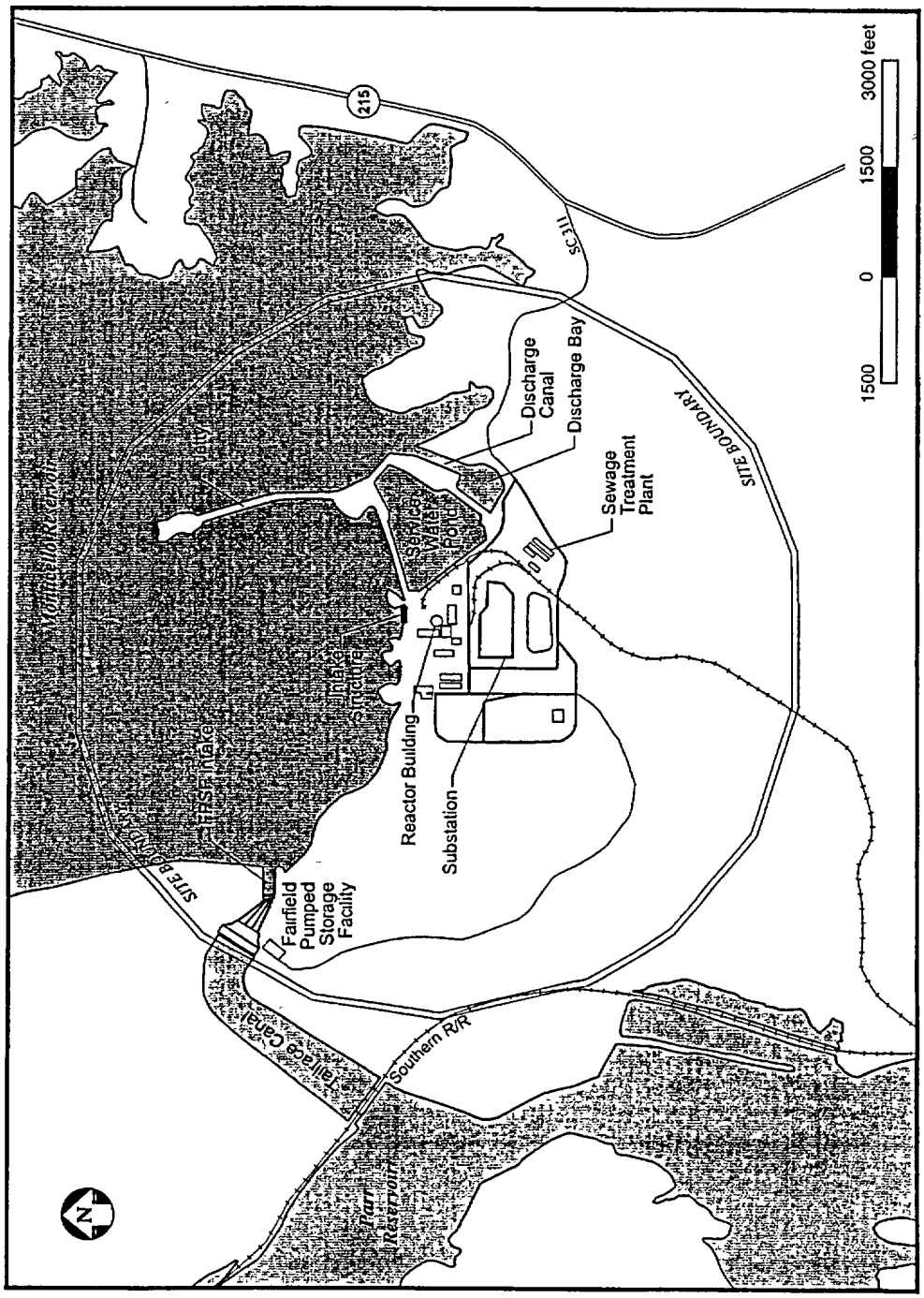
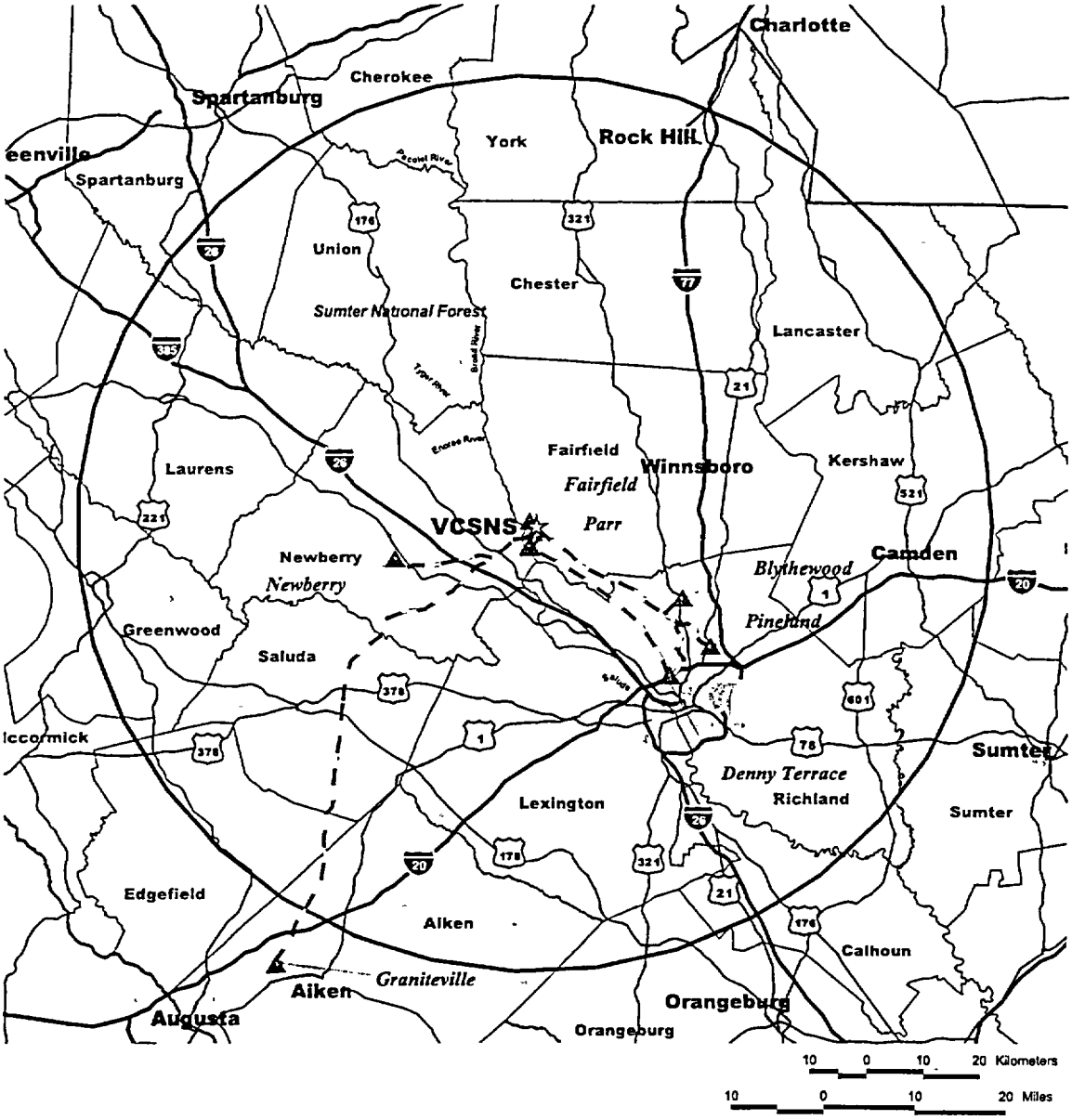


Figure 2-3. South Carolina Electric & Gas Company, Virgil C. Summer Nuclear Station Site Area Map.

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION

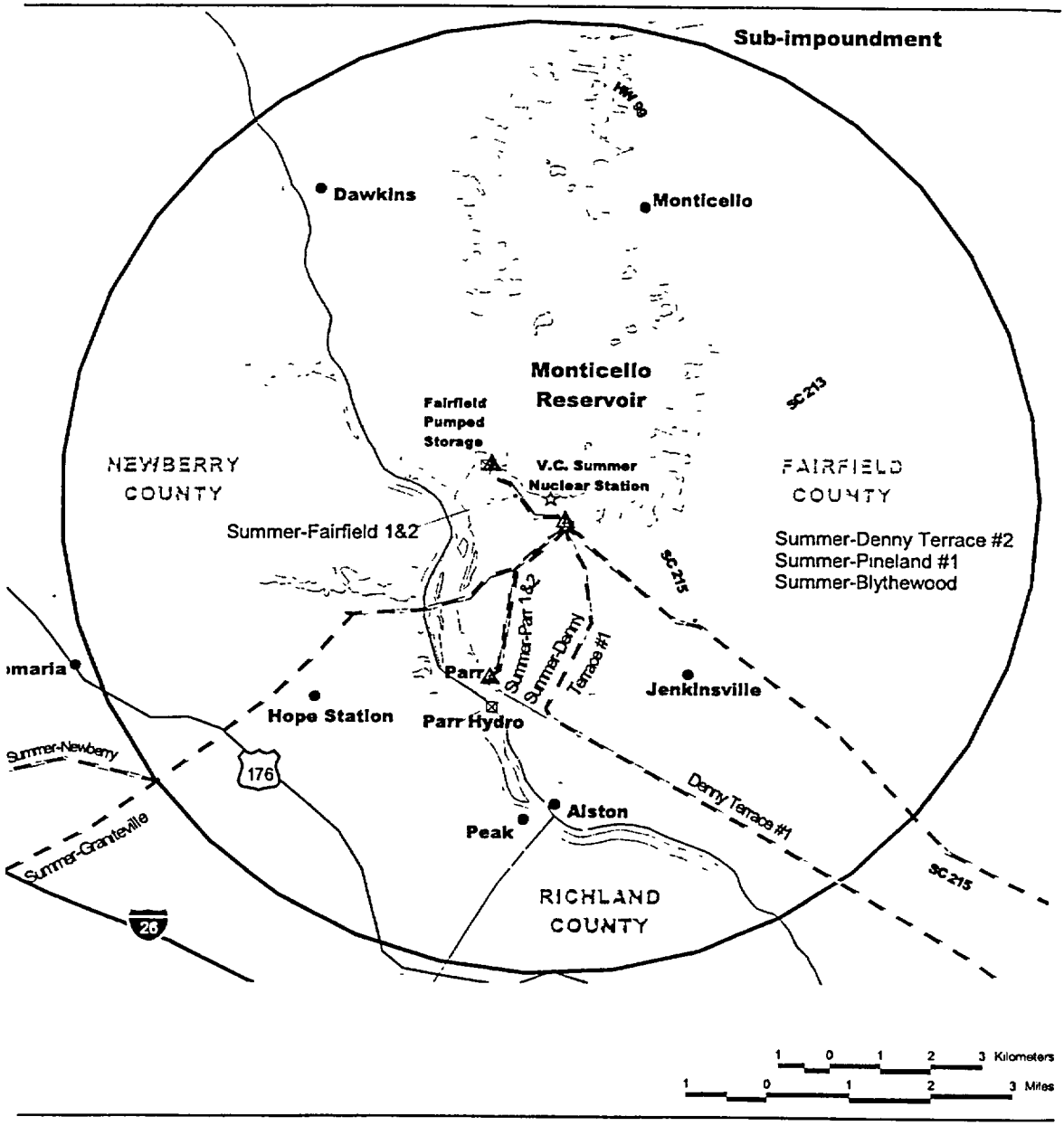


LEGEND

- ☆ V C Summer Nuclear Station
- ▲ Substations
- Transmission Lines
- 50 mile radius of V C Summer
- Interstates
- Major roads
- County Boundaries
- State Boundary
- Lakes and Rivers
- National Forests

FIGURE 3-2
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND

- Substations
- Transmission Lines
- Six mile radius of V C. Summer
- Interstates
- Major roads
- Minor roads
- County Boundaries
- Lakes and Rivers

FIGURE 3-3
V.C. Summer Nuclear Station,
6-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

-----Original Message-----
From: Lori_Duncan@fws.gov [mailto:Lori_Duncan@fws.gov]
Sent: Thursday, March 15, 2001 12:45 PM
To: ssummer@scana.com
Cc: Steve_Gilbert@fws.gov; Jason_Ayers@fws.gov
Subject: Virgil C. Summer Nuclear Station License Renewal

Please find attached a Word Perfect document with the Federally listed and candidate species and species of concern for South Carolina. Please use this list to aid you in analyzing potential impacts your project may have on these species. Thank you.

(See attached file: listetcsc.wpd)

Lori A.W. Duncan
U.S. Fish and Wildlife Service
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
(843) 727-4707 ext. 21
(843) 727-4218 fax
lori_duncan@fws.gov

South Carolina Distribution Records of
Endangered, Threatened, Candidate and Species of Concern
March 8, 2001

E Federally endangered
T Federally threatened
P Proposed in the Federal Register
CH Critical Habitat
C The U.S. Fish and Wildlife Service or the National Marine Fisheries Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list these species
S/A Federally protected due to similarity of appearance to a listed species
SC Federal Species of concern. These species are rare or limited in distribution but are not currently legally protected under the Endangered Species Act.
* Contact the National Marine Fisheries Service for more information on this species

These lists should be used only as a guideline, not as the final authority The lists include known occurrences and areas where the species has a high possibility of occurring. Records are updated continually and may be different from the following

County	Common Name	Scientific Name	Status	Occurrence
Abbeville				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Georgia aster	*Aster georgianus*	C	Known
Aiken				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Relict trillium	*Trillium reliquum*	E	Known
	Piedmont bishop-weed	*Ptilimnium nodosum*	E	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Bog spicebush	*Lindera subcoriacea*	SC	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Pickering's morning-glory	*Stylisma pickeringii var. pickeringii*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
Allendale				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Possible
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known
	Savannah lilliput	*Toxolasma pullus*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Anderson				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Carolina darter	*Etheostoma collis*	SC	Known
Bamberg				
	Wood stork	*Mycteria americana*	E	Possible
	Red-cockaded woodpecker	*Picoides borealis*	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	Chapman's sedge	*Carex chapmanii*	SC	Known
Barnwell				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Possible
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Pondberry	*Lindera melissifolia*	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Piedmont bishop-weed	*Ptilimnium nodosum*	E	Known
	American chaffseed	*Schwalbea americana*	E	Possible
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Bog spicebush	*Lindera subcoriacea*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Creeping St John's wort	*Hypericum adpressum*	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Sandhills milk-vetch	*Astragalus michauxii*	SC	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known
Beaufort				
	West Indian manatee	*Trichechus manatus*	E	Known
	Finback whale	*Balaenoptera physalus**	E	Known
	Humpback whale	*Megaptera novaeangliae**	E	Known
	Northern right whale	*Eubaleana glacialis**	E	Known
	Sei whale	*Balaenoptera borealis**	E	Known
	Sperm whale	*Physeter catodon**	E	Known
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Piping plover	*Charadrius melodus*	T/PCH	Known
	Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
	Leatherback sea turtle	*Dermochelys coriacea**	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Green sea turtle	*Chelonia mydas**	T	Known
	Flatwoods salamander	*Ambystoma cingulatum*	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known

County	Common Name	Scientific Name	Status	Occurrences
Beaufort (cont.)	Pondberry	*Lindera melissifolia*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Chaff-seed	*Schwalbea americana*	E	Known
	Dusky shark	*Carcharhinus obscurus**	C	Possible
	Sand tiger shark	*Odontaspis taurus**	C	Possible
	Night shark	*Carcharinus signatus**	C	Possible
	Speckled hind	*Epinephelus drummondhayi**	C	Possible
	Jewfish	*E. itijara**	C	Possible
	Warsaw grouper	*E. nigritus**	C	Possible
	Nassau grouper	*E. striatus**	C	Possible
	Cupgrass	*Eriochloa michauxii*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
Berkeley				
	West Indian manatee	*Trichechus manatus*	E	Possible
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Flatwoods salamander	*Ambystoma cingulatum*	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Pondberry	*Lindera melissifolia*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaff-seed	*Schwalbea americana*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	Chapman's sedge	*Carex chapmanii*	SC	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Incised groovebur	*Agrimonia incisa*	SC	Known
	Least trillium	*Trillium pusillum var. pusillum*	SC	Known
	Pineland plantain	*Plantago sparsiflora*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Sun-facing coneflower	*Rudbeckia heliopsidis*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Calhoun				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Possible
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Least trillium	*Trillium pusillum var. pusillum*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Charleston				
	West Indian manatee	*Trichechus manatus*	E	Known
	Finback whale	*Balaenoptera physalus**	E	Known
	Humpback whale	*Megaptera novaeangliae**	E	Known
	Northern right whale	*Eubaleana glacialis**	E	Known
	Sei whale	*Balaenoptera borealis**	E	Known
	Sperm whale	*Physeter catodon**	E	Known
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Bachman's warbler	*Vermivora bachmanii*	E	Known
	Wood stork	*Mycteria americana*	E	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Piping plover	*Charadrius melodus*	T/CH	Known
	Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
	Leatherback sea turtle	*Dermochelys coriacea**	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Green sea turtle	*Chelonia mydas**	T	Known
	Flatwoods salamander	*Ambystoma cingulatum*	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Sea-beach amaranth	*Amaranthus pumilus*	T	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Pondberry	*Lindera melissifolia*	E	Possible
	Chaff-seed	*Schwalbea americana*	E	Known
	Dusky shark	*Carcharhinus obscurus**	C	Possible
	Sand tiger shark	*Odontaspis taurus**	C	Possible
	Night shark	*Carcharinus signatus**	C	Possible
	Speckled hind	*Epinephelus drummondhayi**	C	Possible
	Jewfish	*E itijara**	C	Possible
	Warsaw grouper	*E. nigritus**	C	Possible
	Nassau grouper	*E striatus**	C	Possible
	Bachman's sparrow	*Aimophila aestivalis*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Island glass lizard	*Ophisaurus compressus*	SC	Known
	Incised groovebur	*Agrimonia incisa*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
	Venus' fly-trap	*Dionaea muscipula*	SC	Known
Cherokee				
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Known
	Georgia aster	*Aster georgianus*	C	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
Chester				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Possible
	Georgia aster	*Aster georgianus*	C	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Chesterfield				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Carolina heelsplitter	*Lasmigona decorata*	E	Known
	Carolina dropseed	*Sporobolus sp1*	SC	Known
	Pine or Gopher snake	*Pituophis melanoleucus*	SC	Known
	Spring-flowering goldenrod	*Solidago verna*	SC	Known
	Well's pixie-moss	*Pyxidanthera brevifolia*	SC	Known
	Wire-leaved dropseed	*Sporobolus teretifolius*	SC	Known
Clarendon				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaff-seed	*Schwalbea americana*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	Creeping St. John's wort	*Hypericum adpressum*	SC	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
Colleton				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Piping plover	*Charadrius melodus*	T/PCH	Known
	Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
	Leatherback sea turtle	*Dermochelys coriacea**	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Green sea turtle	*Chelonia mydas**	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Pondberry	*Lindera melissifolia*	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Dusky shark	*Carcharhinus obscurus**	C	Possible
	Sand tiger shark	*Odontaspis taurus**	C	Possible
	Night shark	*Carcharinus signatus**	C	Possible
	Speckled hind	*Epinephelus drummondhayi**	C	Possible
	Jewfish	*E. itijara**	C	Possible
	Warsaw grouper	*E. nigritus**	C	Possible
	Nassau grouper	*E. striatus**	C	Possible
	Carolina bird-in-a-nest	*Macbridea caroliniana*	SC	Known
	Crested fringed orchid	*Pteroglossaspis ecristata*	SC	Known
	Island glass lizard	*Ophisaurus compressus*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Darlington (cont.)				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Georgia lead-plant	*Amorpha georgiana var. georgiana*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Sandhills milkvetch	*Astragalus michauxii*	SC	Known
	Spring-flowering goldenrod	*Solidago verna*	SC	Known
	Well's pixie-moss	*Pyxidanthera brevifolia*	SC	Known
	White false-asphodel	*Tofieldia glabra*	SC	Known
Dillon				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
	Pine barrens bonneset	*Eupatorium resinosum*	SC	Known
Dorchester				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Possible
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Pondberry	*Lindera melissifolia*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Bog asphodel	*Narthecium americanum*	C	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Least trillium	*Trillium pusillum var. pusillum*	SC	Known
	Pineland plantain	*Plantago sparsiflora*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
Edgefield				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Carolina heelsplitter	*Lasmigona decorata*	E	Known
	Miccosukee gooseberry	*Ribes echinellum*	T	Possible
	Relict trillium	*Trillium reliquum*	E	Known
	Georgia aster	*Aster georgianus*	C	Known
	Brook floater	*Alasmidonta varicosa*	SC	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known
Fairfield				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Georgia aster	*Aster georgianus*	C	Known
	Carolina darter	*Etheostoma collis*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Florence				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Chaffseed	*Schwalbea americana*	E	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Georgia lead-plant	*Amorpha georgiana var. georgiana*	SC	Known
	Ovate catchfly	*Silene ovata*	SC	Known
Georgetown				
	West Indian manatee	*Trichechus manutus*	E	Known
	Finback whale	*Balaenoptera physalus**	E	Known
	Humpback whale	*Megaptera novaeangliae**	E	Known
	Northern right whale	*Eubaleana glacialis**	E	Known
	Sei whale	*Balaenoptera borealis**	E	Known
	Sperm whale	*Physeter catodon**	E	Known
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Wood stork	*Mycteria americana*	E	Known
	Piping plover	*Charadrius melodus*	T/PCH	Known
	Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
	Leatherback sea turtle	*Dermochelys coriacea**	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Green sea turtle	*Chelonia mydas**	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Sea-beach amaranth	*Amaranthus pumilus*	T	Known
	Pondberry	*Lindera melissifolia*	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Chaffseed	*Schwalbea americana*	E	Possible
	Dusky shark	*Carcharhinus obscurus**	C	Possible
	Sand tiger shark	*Odontaspis taurus**	C	Possible
	Night shark	*Carcharinus signatus**	C	Possible
	Speckled hind	*Epinephelus drummondhayi**	C	Possible
	Jewfish	*E. itijara**	C	Possible
	Warsaw grouper	*E. nigritus**	C	Possible
	Nassau grouper	*E. striatus**	C	Possible
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Bachman's sparrow	*Aimophia aestivalis*	SC	Known
	Carolina pygmy sunfish	*Elassoma boehlkei*	SC	Known
	Carolina grass-of-parnassus	*Parnassia caroliniana*	SC	Known
	Dune bluecurls	*Trichostema sp 1*	SC	Known
	One-flower balduina	*Balduina uniflora*	SC	Known
	Pineland plantain	*Plantago sparsiflora*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Reclined meadow-rue	*Thalictrum subrotundum*	SC	Known
	Wire-leaved dropseed	*Sporobolus teretifolius*	SC	Known
	Venus' fly-trap	*Dionaea muscipula*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Greenville				
	Bog turtle	*Clemmys muhlenbergii*	T S/A	Known
	Swamp-pink	*Helonias bullata*	T	Known
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Known
	Small whorled pogonia	*Isotria medeoloides*	T	Known
	Bunched arrowhead	*Sagittaria fasciculata*	E	Known
	Mountain sweet pitcher-plant	*Sarracenia rubra ssp. jonesii*	E	Known
	White irisette	*Sisyrinchium dichotomum*	E	Known
	Rock gnome lichen	*Gymnoderma lineare*	E	Known
	White fringeless orchid	*Platanthera integrilabia*	C	Known
	Green salamander	*Aneides aeneus*	SC	Known
	Oconee-bells	*Shortia galacifolia*	SC	Known
	Piedmont ragwort	*Senecio millefolium*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
	Southern Appalachian woodrat	*Neotoma floridana haematoreia*	SC	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
Greenwood				
	Carolina heelsplitter	*Lasmigona decorata*	E	Known
Hampton				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Wood stork	*Mycteria americana*	E	Known
	Eastern indigo snake	*Drymarchon corais couperi*	T	Possible
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Boykin's lobella	*Lobelia boykinii*	SC	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Chapman's sedge	*Carex chapmanii*	SC	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Pine or Gopher snake	*Pituophis melanoleucus*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
Horry				
	West Indian manatee	*Trichechus manutus*	E	Known
	Finback whale	*Balaenoptera physalus**	E	Known
	Humpback whale	*Megaptera novaeangliae**	E	Known
	Northern right whale	*Eubaleana glacialis**	E	Known
	Sei whale	*Balaenoptera borealis**	E	Known
	Sperm whale	*Physeter catodon**	E	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Known
	Piping plover	*Charadrius melodus*	T/PCH	Known

County	Common Name	Scientific Name	Status	Occurrences
Horry (cont.)				
	Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
	Leatherback sea turtle	*Dermochelys coriacea**	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Green sea turtle	*Chelonia mydas**	T	Possible
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Sea-beach amaranth	*Amaranthus pumilus*	T	Known
	Pondberry	*Lindera melissifolia*	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Chaff-seed	*Schwalbea americana*	E	Known
	Dusky shark	*Carcharhinus obscurus**	C	Possible
	Sand tiger shark	*Odontaspis taurus**	C	Possible
	Night shark	*Carcharinus signatus**	C	Possible
	Speckled hind	*Epinephelus drummondhayi**	C	Possible
	Jewfish	*E itijara**	C	Possible
	Warsaw grouper	*E. nigritus**	C	Possible
	Nassau grouper	*E. striatus**	C	Possible
	Dwarf burhead	*Echinodorus parvalus*	SC	Known
	Carolina grass-of parnassus	*Parnassia caroliniana*	SC	Known
	Crested fringed orchid	*Pteroglossaspis ecristata*	SC	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Harper's fimbristylis	*Fimbristylis perpusilla*	SC	Known
	One-flower balduina	*Balduina uniflora*	SC	Known
	Pickering's morning-glory	*Stylisma pickeringii var pickeringii*	SC	Known
	Piedmont cowbane	*Oxypolis ternata*	SC	Known
	Pine or Gopher snake	*Pituophis melanoleucus*	SC	Known
	Pineland plantain	*Plantago sparsiflora*	SC	Known
	Pondspice	*Litsea astivalis*	SC	Known
	Venus' fly-trap	*Dionaea muscipula*	SC	Known
	Well's Pyxie Moss	*Pyxidanthera barbulata var. barbulata*	SC	Known
	White false-asphodel	*Tofieldia glabra*	SC	Known
	Wire-leaved dropseed	*Sporobolus teretifolius*	SC	Known
Jasper				
	West Indian manatee	*Trichechus manutus*	E	Known
	Finback whale	*Balaenoptera physalus*	E	Known
	Humpback whale	*Megaptera novaeanqliae*	E	Known
	Right whale	*Eubaleana glacialis*	E	Known
	Sei whale	*Balaenoptera borealis*	E	Known
	Sperm whale	*Physeter catodon*	E	Known
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Wood stork	*Mycteria americana*	E	Known
	Piping plover	*Charadrius melodus*	T	Possible
	Eastern indigo snake	*Drymarchon corais couperi*	T	Possible
	Kemp's ridley sea turtle	*Lepidochelys kempii**	E	Known
	Leatherback sea turtle	*Dermochelys coriacea**	E	Known
	Loggerhead sea turtle	*Caretta caretta*	T	Known
	Green sea turtle	*Chelonia mydas**	T	Possible

County	Common Name	Scientific Name	Status	Occurrences
Jasper (cont.)	Flatwoods salamander	*Ambystoma cingulatum*	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Pondberry	*Lindera melissifolia*	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Chaff-seed	*Schwalbea americana*	E	Known
	Dusky shark	*Carcharhinus obscurus**	C	Possible
	Sand tiger shark	*Odontaspis taurus**	C	Possible
	Night shark	*Carcharinus signatus**	C	Possible
	Speckled hind	*Epinephelus drummondhayi**	C	Possible
	Jewfish	*E. itijara**	C	Possible
	Warsaw grouper	*E. nigritus**	C	Possible
	Nassau grouper	*E. striatus**	C	Possible
	Bachman's sparrow	*Aimophila aestivalis*	SC	Known
	Creeping St Johns-wort	*Hypericum adpressum*	SC	Known
	Crested fringed orchid	*Pteroglossaspis ecristata*	SC	Known
	Florida pine snake	*Pituophis melanoleucus*	SC	Known
	Mimic glass lizard	*Ophisaurus mimicus*	SC	Known
	Pine or Gopher snake	*Pituophis melanoleucus*	SC	Known
	Pineland plantain	*Plantago sparsiflora*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known
Kershaw				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Carolina heelsplitter	*Lasmigona decorata*	E	Known
	Michaux's sumac	*Rhus michauxii*	E	Known
	Georgia aster	*Aster georgianus*	C	Known
	Carolina pygmy sunfish	*Elassoma boehlkei*	SC	Known
	One-flower stitchwort	*inuartia uniflora*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
	White-false-asphodel	*Tofieldia glabra*	SC	Known
	White-wicky	*Kalmia cuneata*	SC	Known
	Wire-leaved dropseed	*Sporobolus teretifolius*	SC	Known
Lancaster				
	Carolina heelsplitter	*Lasmigona decorata*	E	Known
	Little amphianthus	*Amphianthus pusillus*	T	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Schweinitz's sunflower	*Helianthus schweinitzii*	E	Known
	Black-spored quillwort	*Isoetes melanospora*	E	Known
	Brook floater	*Alasmidonta varicosa*	SC	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
Laurens				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Georgia aster	*Aster georganus*	C	Known

County	Common Name	Scientific Name	Status	Occurrences
Lee				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaffseed	*Schwalbea americana*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
Lexington				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Smooth coneflower	*Echinacea laevigata*	E	Possible
	Schweinitz's sunflower	*Helianthus schweinitzii*	E	Known
	Pickering's morning-glory	*Stylisma pickeringii var. pickeringii*	SC	Known
	Piedmont cowbane	*Oxypolis ternata*	SC	Known
	Rayner's blueberry	*Vaccinium crassifolium ssp sempervirens*	SC	Known
	Shoal's spider-lily	*Hymenocallis coronaria*	SC	Known
Marion				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Wood stork	*Mycteria americana*	E	Possible
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyii*	E	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known
Marlboro				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Possible
	Canby's dropwort	*Oxypolis canbyi*	E	Possible
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Pickering's morning-glory	*Stylisma pickeringii var.* pickeringii	SC	Known
	Spring-flowering goldenrod	*Solidago verna*	SC	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known
McCormick				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Carolina heelsplitter	*Lasmigona decorata*	E	Known
	Miccosukee gooseberry	*Ribes echinellum*	T	Known
	Georgia aster	*Aster georgianus*	C	Known
	Brook floater	*Alasmidonta varicosa*	SC	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
	Yellow lampmussel	*Lampsilis cariosa*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Newberry				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Saluda crayfish	*Distocambarus younginen*	SC	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
Oconee				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Small whorled pogonia	*Isotria medeoloides*	T	Known
	Persistent trillium	*Trillium persistens*	E	Known
	Georgia aster	*Aster georgianus*	C	Known
	Brook floater	*Alasmidonta varicosa*	SC	Known
	Fort mountain sedge	*Carex amplisquama*	SC	Known
	Fraser loosestrife	*Lysimachia fraseri*	SC	Known
	Green salamander	*Aneides aeneus*	SC	Known
	Hellbender	*Cryptobranchus alleganiensis*	SC	Known
	Manhart's sedge	*Carex manhartii*	SC	Known
	Oconee-bells	*Shortia galacifolia*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Southern appalachian woodrat	*Neotoma floridana haematoreia*	SC	Known
	Sun-facing coneflower	*Rudbeckia heliopsidis*	SC	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
Orangeburg				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Flatwoods salamander	*Ambystoma cingulatum*	T	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known
	Florida pine snake	Pituophis melanoleucus mugitus	SC	Known
	Gopher frog	*Rana capito*	SC	Known
	Incised groovebur	*Agrimonia incisa*	SC	Known
	Pondspice	*Litsea aestivalis*	SC	Known
	Southeastern myotis	*Myotis austroriparius*	SC	Known
Pickens				
	Bald eagle	*Haliaeetus leucocephalus*	T	Possible
	Bog turtle	*Clemmys muhlenbergii*	T S/A	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Possible
	Black-spored quillwort	*Isoetes melanospora*	E	Known
	Mountain sweet pitcher-plant	*Sarracenia rubra ssp. jonesii*	E	Known
	Georgia aster	*Aster georgianus*	C	Known
	Alexander's rock aster	*Aster avitus*	SC	Known
	Fort Mountain sedge	*Carex amplisquana*	SC	Known
	Green salamander	*Aneides aeneus*	SC	Known
	Oconee-bells	*Shortia galacifolia*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Pickens				
(cont.)	Biltmore greenbrier	Smilax biltmoreana	SC	
	Manhart sedge	*Carex manhartii*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Southern appalachian woodrat	*Neotoma floridana haematoreia*	SC	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
Richland				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Smooth coneflower	*Echinacea laevigata*	E	Known
	Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Georgia aster	*Aster georgianus*	C	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Bog spicebush	*Lindera subcoriacea*	SC	Known
	Carolina bogmint	*Macbridea caroliniana*	SC	Known
	Carolina darter	*Etheostoma collis*	SC	Known
	Creeping St. John's wort	*Hypericum adpressum*	SC	Known
	False coco	*Pteroglossaspis ecristata*	SC	Known
	Purple balduina	*Balduina atropurpurea*	SC	Known
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	SC	Known
	Rayner's blueberry	*Vaccinium crassifolium ssp. empervirens*	SC	Known
	Sandhills milk-vetch	*Astragalus michauxii*	SC	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
	Southern hognose snake	*Heterodon simus*	SC	Known
	White false-asphodel	*Tofieldia glabra*	SC	Known
Saluda				
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Little amphianthus	*Amphianthus pusillus*	T	Known
	Piedmont bishop-weed	*Ptilimnium nodosum*	E	Known
	Creeping St John's wort	*Hypericum adpressum*	SC	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Savannah lilliput	*Toxolasma pullus*	SC	Known
Spartanburg				
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
Sumter				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaff-seed	*Schwalbea americana*	E	Known
	Dwarf burhead	*Echinodorus parvulus*	SC	Known
	Awned meadowbeauty	*Rhexia aristosa*	SC	Known
	Boykin's lobelia	*Lobelia boykinii*	SC	Known

County	Common Name	Scientific Name	Status	Occurrences
Union				
	Georgia aster	*Aster georgianus*	C	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
	Sweet pinesap	*Monotropsis odorata*	SC	Known
Williamsburg				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Wood stork	*Mycteria americana*	E	Possible
	Red-cockaded woodpecker	*Picoides borealis*	E	Known
	Shortnose sturgeon	*Acipenser brevirostrum**	E	Known
	Canby's dropwort	*Oxypolis canbyi*	E	Known
	Chaff-seed	*Schwalbea americana*	E	Known
York				
	Bald eagle	*Haliaeetus leucocephalus*	T	Known
	Little amphianthus	*Amphianthus pusillus*	T	Known
	Schweinitz' sunflower	*Helianthus schweinitzii*	E	Known
	Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Possible
	Georgia aster	*Aster georgianus*	C	Known
	Carolina darter	*Etheostoma collis*	SC	Known
	Shoals spider-lily	*Hymenocallis coronaria*	SC	Known
	Sun-facing coneflower	*Rudbeckia heliopsidis*	SC	Known

APPENDIX D

MICROBIOLOGICAL ORGANISMS CORRESPONDENCE

SCE&G
A SCANA COMPANY

January 19, 2001
RC-01-0005

Dr. John F. Brown
State Toxicologist
S.C. Dept. of Health and Environmental Control
Division of Health Hazard Evaluation
2600 Bull Street
Columbia, SC 29212

Dear Dr. Brown:

Stephen A. Byrne
Vice President
Nuclear Operations
803.345.4622

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
THERMOPHILIC MICROORGANISMS

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station. This application would provide for an additional 20 years of operation beyond the current license term, which ends in the year 2022.

As part of the license renewal process, the NRC requires license applicants to provide "...an assessment of the impact of the proposed action {license renewal} on public health from thermophilic organisms in the affected water" (10 CFR 51.53). The NRC regulations state that "these organisms are not expected to be a problem at most operating plants" but state further that "without site-specific data, it is not possible to predict the effects generically."

South Carolina Electric & Gas Co
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, South Carolina
29065

803.345.4344
803.345.5209
www.scana.com

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) since 1982. The plant lies on the south shore of Monticello Reservoir, in Fairfield County, approximately 26 miles northwest of Columbia. Summer Station's cooling system is a once-through system (no recirculation of cooling water) that withdraws from and discharges to a cooling reservoir (Monticello Reservoir). Discharge limits and monitoring requirements for Summer Station are set forth in NPDES Permit No. SC0030856, issued by the South Carolina Department of Health and Environmental Control (SCDHEC) in September 1997, and subsequent permit modifications dated April 1, 1998 and April 1, 2000.

SCE&G requests any information that SCDHEC may have compiled on the occurrence of thermophilic microorganisms in Monticello Reservoir in the vicinity of Summer Station, including results of any monitoring or special studies that might have been conducted by SCDHEC or its subcontractors. We are particularly interested in determining if there is a concern about the possible presence of *Naegleria fowleri* in the Reservoir. We would appreciate your sending us a letter by March 1, 2001 detailing any concerns you may have about thermophilic

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

microorganisms and potential public health effects over the license renewal term in order that we might meet our application preparation schedule. Please call Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review the proposed action.

Very truly yours,

Stephen A. Byrne

SES/SAB

c: R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0005)

D H E C
PROMOTE PROTECT PROSPER
Mills/Jarrett Complex
Box 101106
Columbia, SC 29211-0106

February 13, 2001

Mr. Stephen A. Byrne
Vice President
Nuclear Operations
SCE&G
Virgil C. Summer Nuclear Station
PO Box 88 (M.C. 830)
Jenkinsville, SC 29065-0088

Dear Mr. Byrne:

SUBJECT: RESPONSE RE VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL REQUEST FOR INFORMATION ON THERMOPHILIC MICROORGANISMS

Thank you for your attached letter of January 19, 2001 requesting results of any monitoring or special studies that might have been conducted on thermophilic microorganisms in the Monticello Reservior in Fairfield County, South Carolina. Also, you request any concerns that DHEC may have regarding thermophilic microorganisms and potential public health effects.

In regard to the first request, I am not aware of any monitoring or special studies performed by DHEC on stated reservoir. I would refer you to Mr. Jeffrey P. DeBessonet, PE, Director of Water Facilities Permitting, Division of Industrial, Agricultural, & Stormwater, Bureau of Water, DHEC/EQC, 2600 Bull Street, Columbia, S.C. 29201 whose telephone number is (803) 898-4157. He should be aware of any studies that may have been done on stated reservoir.

While some microorganisms associated with thermal water discharges, especially related to air conditioning cooling towers, have been demonstrated to have deleterious human health effects, these events have occurred rarely and none have been identified with heated water sources associated with nuclear power plants, to my knowledge.

Pathogenic species of Legionella bacteria and Naegleria amoeba have been identified in heated cooling waters associated with nuclear plants. In most cases, the heated waters showed a very small increase

(approximately 10-fold) over unheated source waters, but were substantially higher in source waters in a few cases.

The most likely exposure to Legionella aerosol would be to workers within the plant. This would not impact the general public beyond the plant boundaries. A similar exposure possibility exists for Naegleria amoeba, with slightly greater exposure potential for swimmers.

The potential public health hazard from pathogenic microorganisms whose abundance might be promoted by artificial warming of recreational waters is largely theoretical and not substantiated by available data. There is some justification for providing appropriate respiratory and dermal protection for workers regularly exposed to known contaminated water, but there seems no significant health threat to off-site persons near such heated recreational waters. Routine monitoring for pathogenic microorganisms could be established if suspicious illnesses arose or if there were significant community concerns. Please contact me at (803) 896-9723 if you desire additional discussion of this matter.

Sincerely,

John F. Brown, DVM, PhD
State Toxicologist

APPENDIX E

CULTURAL RESOURCES CORRESPONDENCE

January 19, 2001
RC-01-0006

SCE&G®
A SCANA COMPANY

Ms. Elizabeth Morton
State Historic Preservation Office Representative
Central Midlands Region
South Carolina Department of Archives and History
The South Carolina Archives & History Center
8301 Parklane Road
Columbia, SC 29223

Dear Ms. Morton:

Stephen A. Byrne
Vice President
Nuclear Operations
803 345 4622

Subject: VIRGIL C. SUMMER NUCLEAR STATION LICENSE RENEWAL
REQUEST FOR INFORMATION ON
HISTORIC / ARCHAEOLOGICAL RESOURCES

South Carolina Electric and Gas Company (SCE&G) is preparing an application to the U S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station, which expires in August 2022. SCE&G intends to submit this application for license renewal in August 2002. As part of the license renewal process, the NRC requires license applicants to "assess whether any historic or archaeological properties will be affected by the proposed project." The NRC may also request an informal consultation with your office at a later date under Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470) and Federal Advisory Council on Historic Preservation regulations (36 CFR 800). By contacting you early in the application process, we hope to identify any issues that need to be addressed or any information your office may need to expedite the NRC consultation.

South Carolina Electric & Gas Co
Virgil C Summer Nuclear Station
P O Box 88
Jenkinsville, South Carolina
29065

803 345 5209
803 635 1461

SCE&G has operated Virgil C. Summer Nuclear Station (Summer Station) and associated transmission lines since 1982. Summer Station is in Fairfield County, South Carolina, approximately 15 miles southwest of the town of Winnsboro and approximately 26 miles northwest of Columbia (latitude 34 295833; longitude 81 320278) (see Figure 2-1) The plant lies on the south shore of Monticello Reservoir (see Figure 2-2), which serves as its cooling water source and heat sink. The Summer Station property (Figure 2-3) is defined as the area within approximately one mile of the reactor building and includes the southern portion of Monticello Reservoir. It totals approximately 2,200 acres.

SCE&G, which owns two-thirds of the plant, built eight transmission lines for the specific purpose of connecting Summer Station to the regional transmission system (see Figure 3-3). South Carolina Public Service Authority (commonly referred to as "Santee Cooper"), owner of the remaining one-third of the plant, built two additional lines to connect to the regional grid Beginning at Summer Station, the SCE&G lines

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

Ms. Elizabeth Morton, SHPO
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generally run in a southerly direction, with five terminations very near Summer Station; one near Aiken, South Carolina; and two near Columbia (see Figure 3-2). The Santee Cooper lines run roughly east and west to substations near Blythewood and Newberry, South Carolina, respectively.

Using the National Register Information System (NRIS) on-line database, we have compiled a list of sites on the National Register of Historic Places within a 6-mile radius of the Summer Station property. In addition, a contractor spent several days at the S.C. Institute of Archaeology and Anthropology discussing the project with Institute staff and reviewing files on archeological sites in the project area. One site, designated FA 47 by the Institute of Archeology and Anthropology, lies between the access road (SC 311) to Summer Station and Monticello Reservoir. Based on the appearance of the area (mowed grass, for the most part), it is presumed to have been disturbed during construction of the station in the 1970s. We will provide all of this information to the NRC to aid in their evaluation of the license application.

SCE&G does not expect the operation of Summer Station through the license renewal term (an additional 20 years) to adversely affect cultural or historical resources in the area and region. SCE&G has no plans to alter current operations over the license renewal period. No major expansion of existing facilities is planned, and no major structural modifications have been identified for the purposes of supporting license renewal. No additional land disturbance is anticipated in support of license renewal.

We would appreciate your sending us a letter by March 1, 2001 detailing any concerns you may have about historic/archaeological properties in the area or confirming SCE&G's conclusion that operation of Summer Station over the license renewal term would have no effect on any historic or archaeological properties in South Carolina This will enable us to meet our application preparation schedule. SCE&G will include a copy of this letter and your response in the license renewal application that we submit to the NRC. Please call Mr. Stephen E. Summer at (803) 345-4252 if you have any questions or require any additional information to review the proposed action.

Very truly yours,

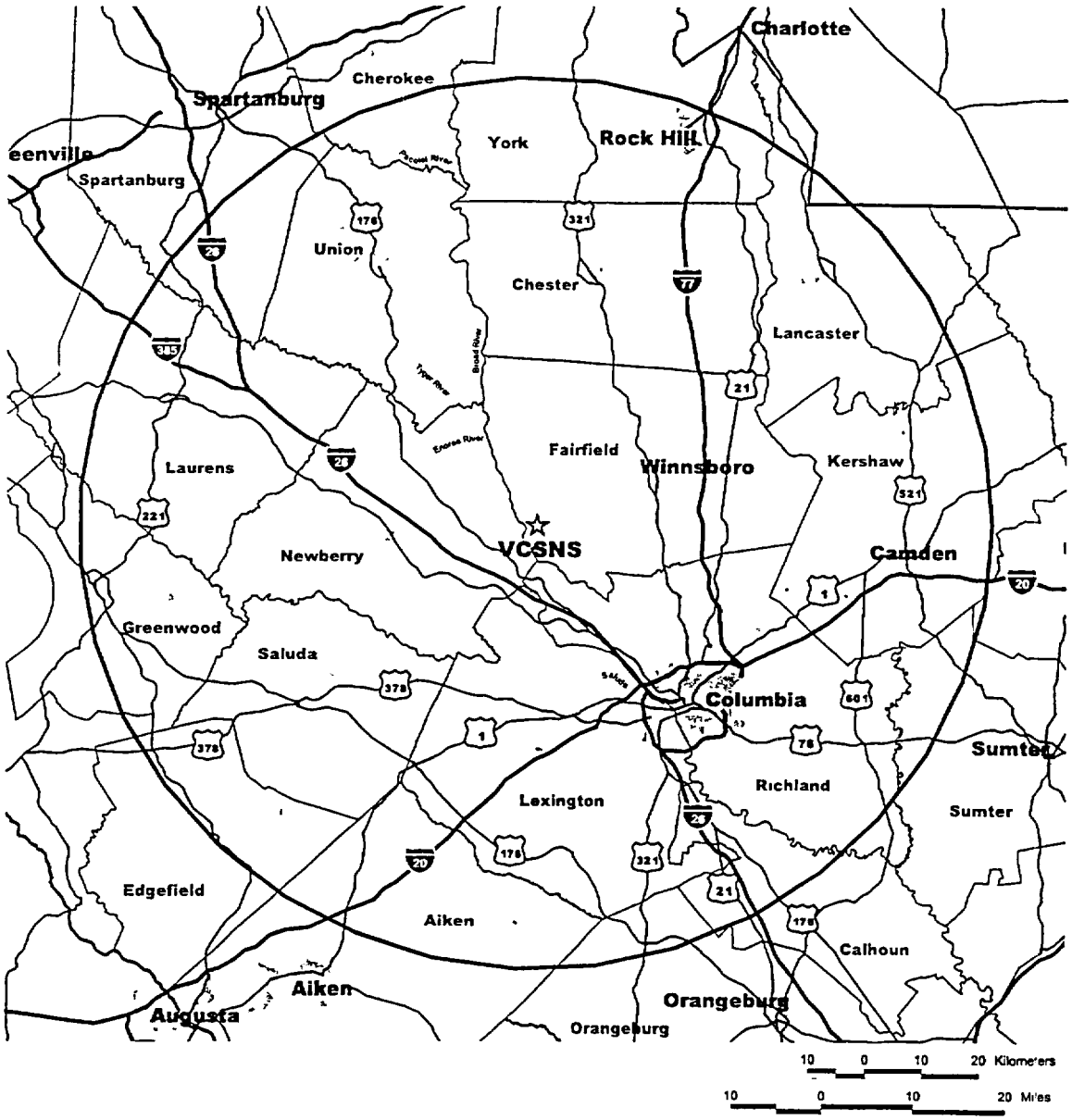
Stephen A. Byrne

SES/SAB

attachments

c R. B. Clary (800)
W. R. Higgins (830)
P. R. Moore (Tetra Tech NUS)
File (821.01)
DMS (RC-01-0006)

DRAFT
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND

- V C Summer Nuclear Station
- 50 mile radius of V C. Summer
- Interstates
- Major roads
- County Boundaries
- State Boundary
- Lakes and Rivers
- Major Urban Areas

FIGURE 2-1
V.C. Summer Nuclear Station,
50-Mile Locational Vicinity Map
LICENSE RENEWAL APPLICATION

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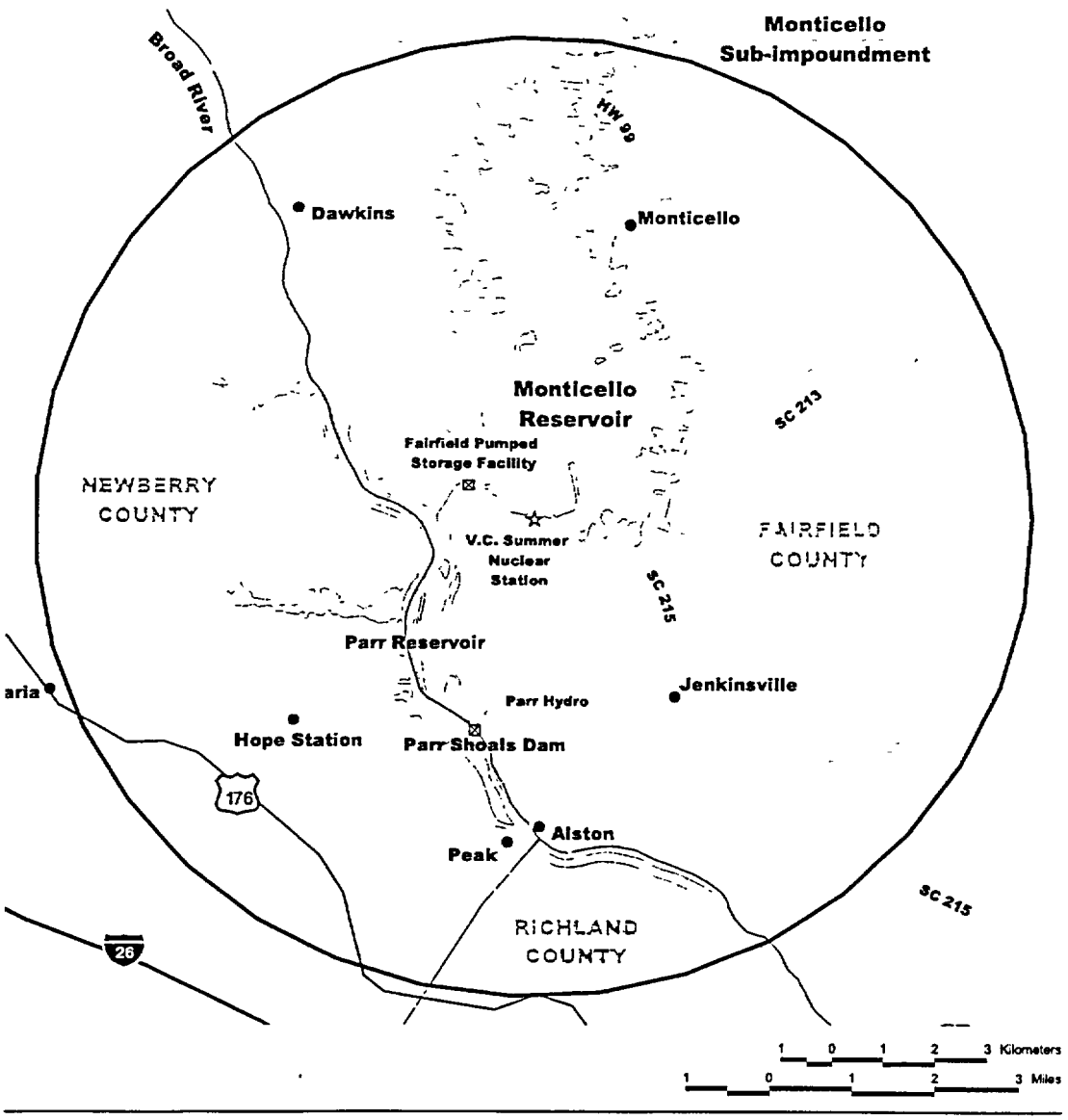
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND
- Six mile radius of V.C. Summer
- Interstates
- Major roads
- Minor roads
- County Boundaries
- Lakes and Rivers

FIGURE 2-2
V.C. Summer Nuclear Station,
6-Mile Vicinity Map
LICENSE RENEWAL APPLICATION

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ENVIRONMENTAL REPORT FOR LICENSE RENEWAL
VIRGIL C. SUMMER NUCLEAR STATION

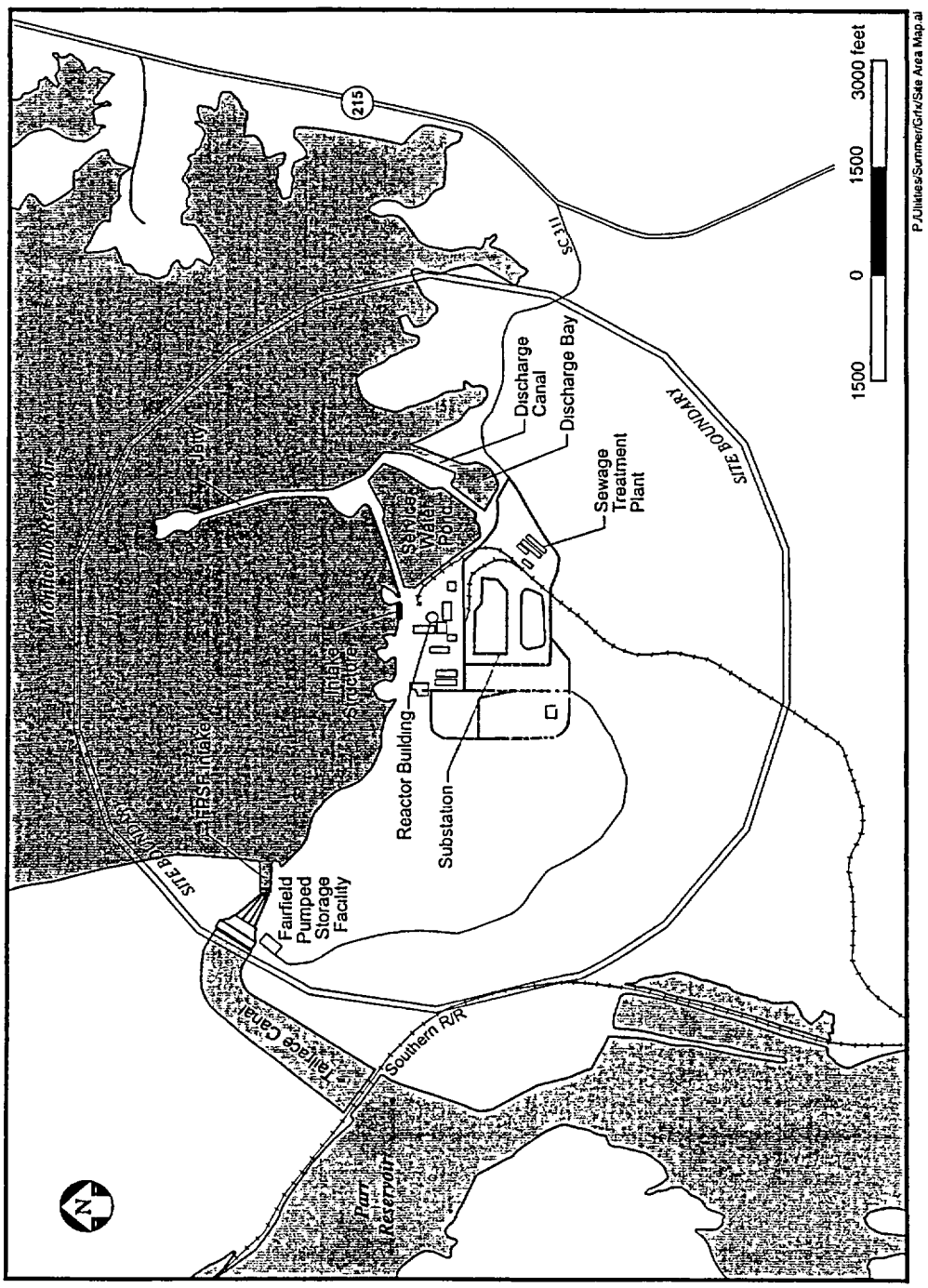

Figure 2-3. South Carolina Electric & Gas Company, Virgil C. Summer Nuclear Station Site Area Map.

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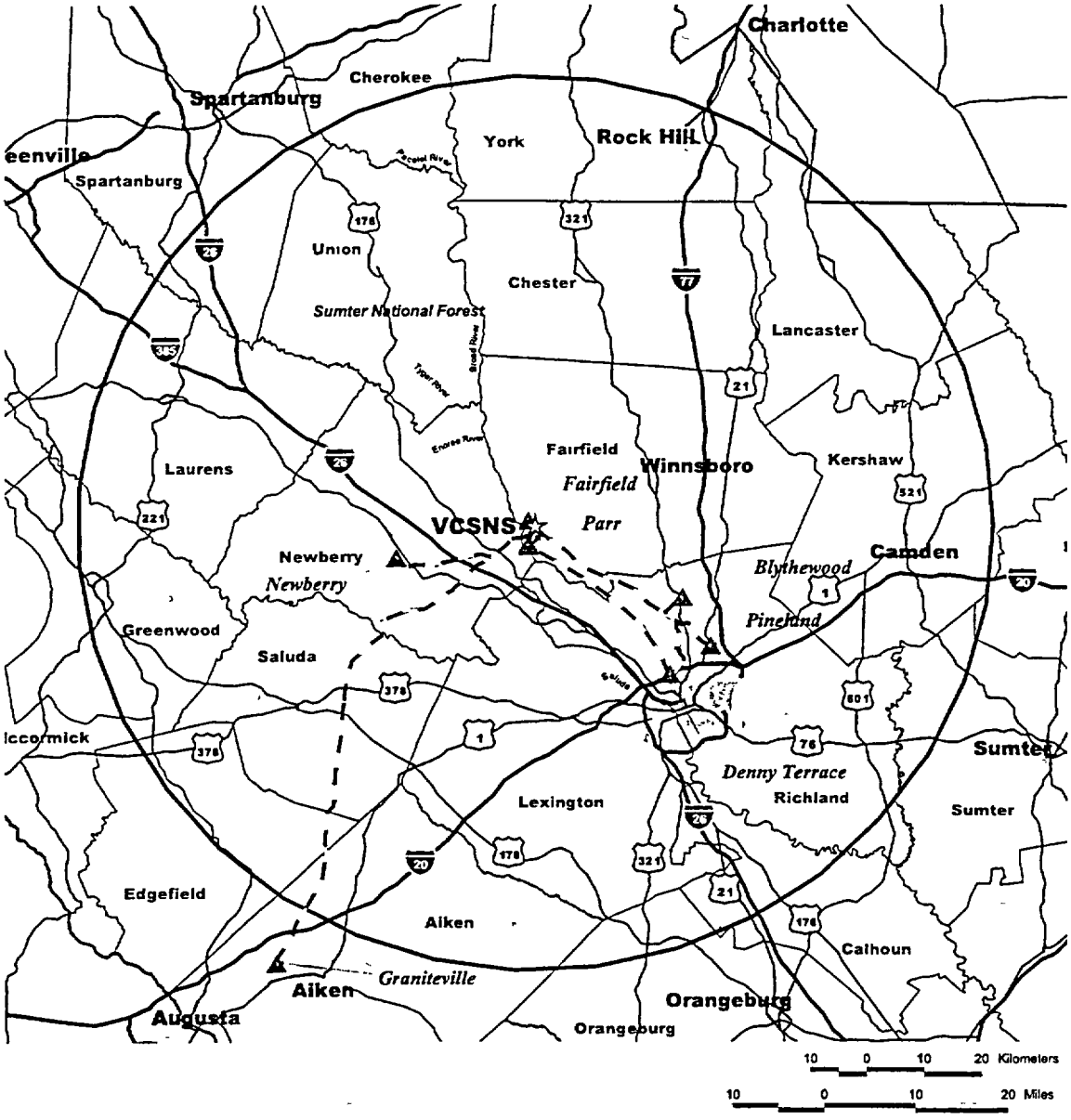
LICENSE RENEWAL APPLICATION
V.C. SUMMER NUCLEAR STATION



LEGEND

- V C Summer Nuclear Station
- Substations
- Transmission Lines
- 50 mile radius of V C Summer
- Interstates
- Major roads
- County Boundaries
- State Boundary
- Lakes and Rivers
- National Forests

FIGURE 3-2
V.C. Summer Nuclear Station,
50-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

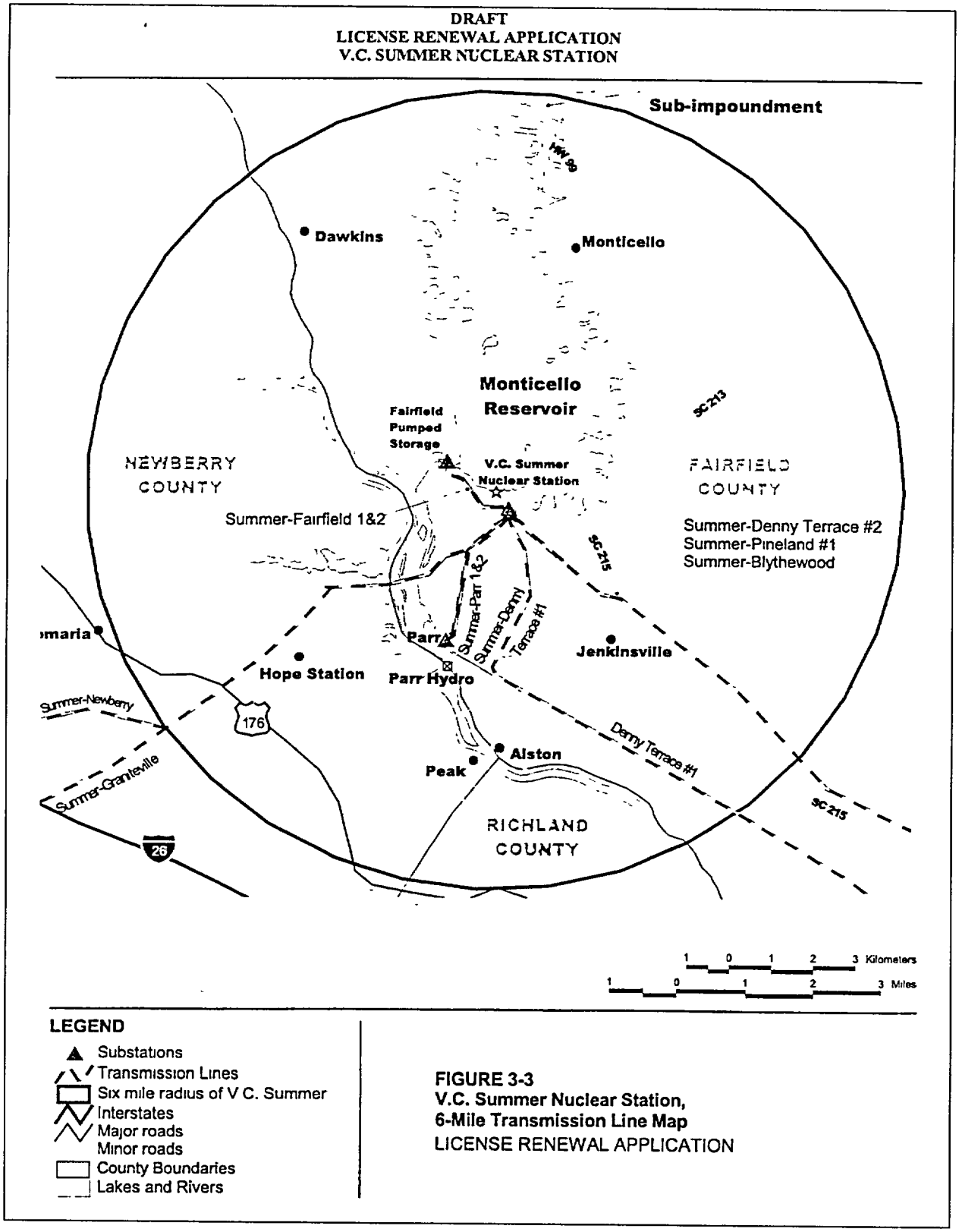


FIGURE 3-3
V.C. Summer Nuclear Station,
6-Mile Transmission Line Map
LICENSE RENEWAL APPLICATION

South Carolina Archives & History Center

January 29, 2001

Mr. Stephen A. Byrne
Vice President, Nuclear Operations
SC Electric & Gas Company
Virgil C. Summer Nuclear Station
PO Box 88
Jenkinsville, SC 29065

Re: Virgil C. Summer Nuclear Station License Renew

Dear Mr. Byrne:

Thank you for your letter of January 19, which we received on January 24, regarding the proposed license renewal for the Virgil C. Summer Nuclear Station in Fairfield County.

It has been our experience that the license renewal for the continuing operation of plants such as this one has no effect on historic properties. These operations are usually not associated with new construction or expansion of plant boundaries.

Your letter states that you have used the NRIS to compile a list of National Register properties within a six-mile radius of the Summer Station. We encourage a search of our GIS database as a source of more accurate, up-to-date information. I've enclosed a copy of the *Consultant's Guide to Survey & National Register Files, State Historic Preservation Office.*

Please call me at 896-6169 if you have questions or if I can be of further assistance.

Sincerely,

Nancy Brock, Coordinator
Review and Compliance Programs
State Historic Preservation Office

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