APPENDIX E

Applicant's Environmental Report
Subsequent Operating License Renewal License Stage
Virgil C. Summer Nuclear Station

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Abbreviations, Acronyms, and Symbols

§	Section
°C	degrees Celsius
°F	degrees Fahrenheit
AADT	average annual daily traffic
ABFOST	Auxiliary Boiler Fuel Oil Storage Tank
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
APE	area of potential effect
AQCR	air quality control region
AREOR	annual radiological environmental operating report
ARERR	annual radioactive effluent release report
AST	aboveground storage tank
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BTA	best technologies availablle
BTEX	benzene, toluene, ethybenzene, xylenes
CAA	Clean Air Act
CCWS	component cooling water system
CDF	core damage frequency
CDP	Census Designated Place
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent

CSA	Combined Statistical Area
CST	condensate storage tank
CWA	Clean Water Act (Federal Water Pollution Control Act)
CZMP	Coastal Zone Management Program
dBA	A-weighted decibels
DBA	design basis accident
DE	Dominion Energy
DESC	Dominion Energy South Carolina
DMR	Discharge Monitoring Report
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSM	demand-side management
EAB	Exclusion Area Boundary
ECCS	emergency core cooling system
EF	emergency feedwater system
EFH	essential fish habitat
EIA	U.S. Energy Information Administration
EMF	electromagnetic fields
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ER	environmental report
ESA	Endangered Species Act
ESF	engineered safety features
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FLEX	Flexible coping strategies
FPP	free-phase product
FPPA	Farmland Protection Policy Act

FSAR	final safety analysis report
FW	Flood and Wind
FY	fiscal year
GEIS	NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GHG	greenhouse gas
GPI	Groundwater Protection Initiative
gpd	gallons per day
gpm	gallons per minute
GWPP	Ground Water Protection Program
GWPS	gaseous waste processing system
HABS	Historic American Buildings Survey
HAP	hazardous air pollutant
HAPC	habitat areas of particular concern
I-26	Interstate 26
IPA	integrated plant assessment
IPEEE	individual plant examination of external events
IRP	integrated resource plan
ISFSI	independent spent fuel storage installation
KCAE	Columbia weather station
km	kilometer
kV	kilovolt
LCJMWS	Lexington County Joint Municipal Water and Sewer Commission
LERF	large early release frequency
LLMW	low-level mixed waste
LLRW	low-level radioactive waste
LLW	low-level waste
LOCA	loss of coolant accident
LOS	level of service

LQG	large quantity generator
LRA	license renewal application
LWPS	liquid waste processing system
m	meters
mA	milliamperes
mb	short-period body wave magnitude (earthquakes)
MB	maximum benefit
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant levels
MDCT	mechanical draft cooling tower
MEI	maximum exposed individual
mg/L	milligram per liter
MGD	million gallons per day
MGM	million gallons per month
MGY	million gallons of water per year
MM	Modified Mercalli intensity (seismic intensity scale)
MMBtu	million British thermal units
mph	miles per hour
mrad	millirad
mrem	millirem
msl	mean sea level
mSv	millisievert
MW	megawatt
MWD/MTU	megawatt days per metric ton uranium
MWe	megawatts electric
MWh	megawatt hours
MWt	megawatts thermal
N/A	not available/not applicable
NAAQS	national ambient air quality standards

NAVD88	North American Vertical Datum 1988
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NETL	National Energy Technical Laboratory
NGCC	natural gas-fired combined cycle
NHPA	National Historic Preservation Act
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NSA	New South Associates
NSSS	nuclear steam supply system
NWI	National Wetlands Inventory
NWS	National Weather Service
ODCM	offsite dose calculation manual
OL	operating license
OSHA	Occupational Safety and Health Administration
OWS	Offsite Water Treatment Facility
Pb	lead
pc/h	passenger cars per hour
PCB	polychlorinated biphenyl
pCi/l	picoCuries per liter

PD	police department
PILOT	payments in lieu of tax
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
PM	particulate matter
PORV	Power Operated Relief Valve
PRA	probabilistic risk assessment
PV	photovoltaic
PWR	pressurized water reactor
PYSL	post yolk-sac larvae
rad	radiation absorbed dose
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
ROL	renewed operating license
ROW	right-of-way / rights of way
SAMA	severe accident mitigation alternative
Santee-Cooper	South Carolina Public Service Authority
SAR	safety analysis report
SC	South Carolina
SC-213	South Carolina Highway 213
SC-215	South Carolina Highway 215
SCDAH	South Carolina Department of Archives and History
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCDOT	South Carolina Department of Transportation
SCE&G	South Carolina Electric and Gas Company
SCPSC	Public Service Commission of South Carolina

SDWA	Safe Drinking Water Act
SEIS	Supplemental environmental impacat
SHPO	state historic preservation office (or officer)
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMITTR	surveillance, monitoring, inspections, testing, trending, and recordkeeping
SMR	small modular reactor
SNF	spent nuclear fuel
SO_2	sulfur dioxide
SO_x	sulfur oxides
SOARCA	state-of-art reactor consequence analysis
SPCC	spill prevention, control, and countermeasure
SPUT	special purpose utility permits
SSA	sole source aquifer
SSC	systems, structures, and components
SW	service water
SWP	service water ponds
SWPPP	stormwater pollution prevent plan
SWS	service water system
SU	standard units
TEDE	total effective dose equivalent
TRC	total residual chlorine
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tanks

VCSNS	Virgil C. Summer Nuclear Station
VOC	volatile organic compound
WMA	wildlife management area
YOY	young-of-year
YSL	yolk-sac larvae

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E1.0 INTRODUCTION

E1.1 PURPOSE OF AND NEED FOR ACTION

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Dominion Energy (DE) operates Virgil C. Summer Nuclear Station (VCSNS) Unit 1 located on the Monticello Reservoir in Fairfield County, South Carolina, pursuant to NRC operating license (OL) NPF-12. (NRC. 2004a, NRC. 2004b) Based on a license renewal application (LRA) submitted in 2002, the NRC issued a renewed OL (ROL) in 2004, providing authorization to operate for an additional 20 years beyond the original 40-year licensed operating term (NRC. 2004a). The Unit 1 ROL expires on August 6, 2042 (NRC. 2004a).

DE has prepared this environmental report (ER) in conjunction with its application to the NRC for a subsequent license renewal (SLR) of the VCSNS OL, as provided by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application—Environmental Information [10 CFR 54.23]
- Title 10, Energy, CFR, Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)]

The NRC has defined the purpose and need for the proposed action, renewal of the OLs for nuclear power plants such as VCSNS, as follows (NRC. 2013a):

> The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decision-makers, such as state, utility, and, where authorized, federal agencies (other than the NRC). Unless there are findings in the safety review required by the Atomic Energy Act or the National Environmental Protection Act (NEPA) environmental review that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.

The ROL would allow an additional 20 years of operation for the VCSNS unit beyond its current licensed operating period. The subsequent license for VCSNS Unit 1 ROL would expire at midnight August 6, 2062. DE has prepared Table E1.1-1 to verify conformance with regulatory requirements.

Table E1.1-1 indicates the sections in the VCSNS SLR ER that respond to each requirement of 10 CFR 51.53(c) and 10 CFR 51.45.

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 1 of 4)

Description	Requirement	ER Section(s)
Environmental Report—General Requirements [10 CFR 51.45]		
Description of the proposed action	10 CFR 51.45(b)	E2.1
Statement of the purposes of the proposed action	10 CFR 51.45(b)	E1.1
Description of the environment affected	10 CFR 51.45(b)	E3.0
Impact of the proposed action on the environment	10 CFR 51.45(b)(1)	E4.0
Adverse environmental effects which cannot be avoided should the proposal be implemented	10 CFR 51.45(b)(2)	E6.3
Alternatives to the proposed action	10 CFR 51.45(b)(3)	E2.6, E7.0, and E8.0
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)	E6.5
Irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented	10 CFR 51.45(b)(5)	E6.4
Analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects	10 CFR 51.45(c)	E2.6, E4.0, E7.0, and E8.0
Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and description of the status of compliance with these requirements	10 CFR 51.45(d)	E9.1
Status of compliance with applicable environmental quality standards and requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements	10 CFR 51.45(d)	E9.5

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 2 of 4)

Description	Requirement	ER Section(s)
Alternatives in the report including a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements	10 CFR 51.45(d)	E9.7
Information submitted pursuant to 10 CFR 51.45(b) through (d) and not confined to information supporting the proposed action but also including adverse information	10 CFR 51.45(e)	E4.0, E6.3, E7.0, E9.3, and E9.5
Operating License Renewal Stage [10 CFR 51.53(c)]		
Description of the proposed action including the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21. The report must describe in detail the affected environment around the plant, the modifications directly affecting the environment or any plant effluents, and any planned refurbishment activities	10 CFR 51.53(c)(2)	E2.1, E2.3, E2.4, E3.0, and E4.0
Analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for applicable Category 2 issues, as discussed below	10 CFR 51.53(c)(3)(ii)	E2.3 and E4.0
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.5.9
Groundwater Resources		
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.5.15
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute [gpm])	10 CFR 51.53(c)(3)(ii)(C)	E4.5.14

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 3 of 4)

Description	Requirement	ER Section(s)
Groundwater quality degradation (plants with cooling ponds at inland sites)	10 CFR 51.53(c)(3)(ii)(D)	E4.5.18
Radionuclides released to groundwater	10 CFR 51.53(c)(3)(ii)(P)	E4.5.19
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	E4.6.9
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	E4.6.12
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.6.19
Terrestrial Resources		
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.6.6
Effects on terrestrial resources (non-cooling system impacts)	10 CFR 51.53(c)(3)(ii)(E)	E4.6.1
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat	10 CFR 51.53(c)(3)(ii)(E)	E4.6.23
Historic and Cultural Resources		
Historic and cultural resources	10 CFR 51.53(c)(3)(ii)(K)	E3.8 and E4.7
Human Health		
Microbiological hazards to the public (plants that use cooling ponds, lake, or canals, or that discharge to a river)	10 CFR 51.53(c)(3)(ii)(G)	E4.9.4
Electric shock hazards	10 CFR 51.53(c)(3)(ii)(H)	E4.9.7

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements (Sheet 4 of 4)

Description	Requirement	ER Section(s)
Environmental Justice		
Minority and low-income populations	10 CFR 51.53(c)(3)(ii)(N)	E3.11.2 and E4.10.1
Cumulative Impacts		
Cumulative impacts	10 CFR 51.53(c)(3)(ii)(O)	E4.12
Postulated Accidents		
Severe accidents	10 CFR 51.53(c)(3)(ii)(L)	E4.15
All Plants		
Consideration of alternatives for reducing adverse impacts for all Category 2 license renewal issues	10 CFR 51.53(c)(3)(iii)	E4.0 and E6.2
New and significant information regarding the environmental impacts of license renewal of which the applicant is aware	10 CFR 51.53(c)(3)(iv)	E4.0 and E5.0

E1.2 ENVIRONMENTAL REPORT SCOPE AND METHODOLOGY

NRC regulations for domestic licensing of nuclear power plants require reviews of environmental impacts from renewing an OL. NRC regulation 10 CFR 51.53(c) requires that an applicant for license renewal submit with its application a separate document entitled "Applicant's Environmental Report—Operating License Renewal Stage." In determining what information to include in the VCSNS SLR applicant's ER, DE relies on NRC regulations and the following supporting documents to provide additional insight into the regulatory requirements:

- *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC. 2013a), and referenced information specific to transportation (NRC. 1999)
- NRC supplemental information in the *Federal Register* notice for the 2013 final rule updating 10 CFR 51 (78 FR 37282)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses* (NRC. 1996a)
- Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications* (NRC. 2013b)

The NRC included in 10 CFR 51 the list of 78 NEPA issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to Subpart A of 10 CFR 51, Table B-1). Chapter E4.0 lists the 78 issues from 10 CFR 51, Subpart A, Appendix B, Table B-1 and identifies the section in this ER in which DE addresses each applicable issue.

E1.3 VIRGIL C. SUMMER NUCLEAR STATION LICENSEE AND OWNERSHIP

VCSNS is jointly owned by DE, operator and two-thirds owner of the plant, and the South Carolina Public Service Authority (Santee Cooper), owner of the remaining one-third (NRC. 2004a). Dominion Energy South Carolina (DESC), formerly South Carolina Electric & Gas Company (SCE&G), is a wholly owned subsidiary of Dominion Energy, Inc. (DE. 2019) As an American power and energy company headquartered in Richmond, Virginia, DE is involved in providing reliable, affordable, clean energy to 13 states. (DE. 2022a) The DE nuclear power program produces a safe, zero-emissions, highly reliable form of renewable energy. (DE. 2022a)

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E2.0 PROPOSED ACTION AND DESCRIPTION OF ALTERNATIVES

E2.1 THE PROPOSED ACTION

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the proposed action. The proposed action is to renew for a second time, and for an additional 20-year period, the OL for VCSNS Unit 1, which would preserve the option for DE to continue operating VCSNS and provide reliable baseload power for the proposed SLR operating term. For VCSNS Unit 1, the proposed action would extend the OL from August 6, 2042, to August 6, 2062.

DE does not anticipate any license renewal-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. The relationship of refurbishment to license renewal is described in Section E2.3.

Changes to surveillance, monitoring, inspections, testing, trending, and recordkeeping (SMITTR) would be implemented as a result of the 10 CFR Part 54 aging management review for VCSNS. Potential SMITTR activities are described in Section E2.4. There are no plans associated with SLR to modify the facility or its administrative controls other than the procedures necessary to implement the aging management programs described in the integrated plant assessment (IPA).

E2.2 GENERAL PLANT INFORMATION

A license renewal applicant's ER must contain a description of the proposed action, including the applicant's plans to modify the facility or its administrative control procedures. This report must describe in detail the affected environment around the plant and the modifications directly affecting the environment or any plant effluents. [10 CFR 51.53(c)(2)]

The principal structures at VCSNS are the nuclear island structures within the Protected Area fence (the Reactor Building, Auxiliary Building, Fuel Handling Building, Intermediate Building, Control Building, Service Building, Turbine Building, Diesel Generator Building, independent spent fuel storage installation [ISFSI], Service Water Intake Structure, and Circulating Water Intake Structure), and the potable water supply and treatment (e.g., Offsite Water Supply) (DE. 2023a, Section 1.2.3.2). Figure E3.1-1 shows VCSNS features including the nuclear island in the figure insert and the Exclusion Area Boundary (EAB).

The Exclusion Area encompasses parts of the Monticello Reservoir and the Fairfield Pumped Storage Facility. DE has acquired, by purchase, all land within the site boundary. (DE. 2023a, Section 2.1.2) Licensees, DE and Santee Cooper, have the authority to determine all activities, including exclusion or removal of personnel and property from the Exclusion Area. DE and Santee Cooper maintain absolute ownership of all land contained within the site boundary/EAB. Mineral

rights within this area are jointly owned by DE and Santee Cooper and are under the control of DE as manager of the plant. (DE. 2023a, Section 2.1.2.1).

E2.2.1 REACTOR AND CONTAINMENT SYSTEMS

As shown in Figure E3.1-1, VCSNS is a single unit (Unit 1) plant with a domed concrete containment building. The plant includes a pressurized water reactor (PWR) nuclear steam supply system (NSSS) designed and furnished by Westinghouse Electric Corporation and a turbine generator, designed and furnished by General Electric Corporation (DE. 2023a, Section 1.1.2). It achieved initial criticality in October 1982 and began commercial operation in January 1983 (SCE&G. 2002, Section 3.1.1).

The NSSS consists of a PWR, reactor coolant system, and associated auxiliary fluid systems. The reactor coolant system is arranged as three closed reactor coolant loops connected in parallel to the reactor vessel. Each loop contains a reactor coolant pump and steam generator. (DE. 2023a, Section 1.2.3.3) The thermal energy of the steam generated by the three loops is converted to electrical energy through the tandem compound, 1800 rpm generator (DE. 2023a, Section 10.1).

The NSSS is designed for a rated power output of 2,912 megawatts thermal (MWt), which is the license application rating, with an equivalent plant net electrical output of approximately 950 megawatts electric (MWe) (DE. 2023a, Section 1.1.4). The Maximum Dependable Capacity is currently listed at 966 MWe (net). Containment and engineered safety features are designed and evaluated for operation based upon an Engineered Safety Design Rating and Licensed Power Level of 2,900 MWt in the core (DE. 2023a, Section 1.1.4).

The reactor core is comprised of VANTAGE + fuel assemblies arranged in a checkered, low-leakage core loading pattern (DE. 2023a, Section 4.1). The fuel is loaded in three core regions. New fuel is introduced into the outer region and moved inward during successive refueling and removed from the inner region to spent fuel storage (DE. 2023a, Section 1.2.3.3).

There are 264 fuel rods, or variations of fuel rods and filler rods, 24 guide thimble tubes, and 1 instrumentation thimble tube arranged within a supporting structure to form a fuel assembly (DE. 2023a, Section 4.2.1.2).

The fuel rods are mechanically joined in a square array to form a fuel assembly. The fuel rods are supported in intervals along their length by grid assemblies which maintain the lateral spacing between the rods throughout the design life of the assembly. The grid assembly consists of an "egg-crate" arrangement of interlocked straps. The straps contain spring fingers and dimples for fuel rod support as well as coolant mixing vanes. The fuel rods consist of uranium dioxide ceramic cylindrical pellets contained in slightly cold worked zirconium alloy tubing which is plugged and seal-welded at the ends to encapsulate the fuel. All fuel rods are pressurized with helium during fabrication to reduce stresses and strains in order to increase fatigue life. (DE. 2023a, Section 4.1)

The core will have sufficient reactivity to produce the design power level and lifetime without exceeding the control capacity or shutdown margin. Maximum rod burnup is limited per the core design process to 62,000 megawatt days per metric ton of uranium (MWD/MTU). VCSNS is currently licensed for maximum enrichment of 5% U-235, which is reduced to 4.95% to allow for tolerances. DE does not anticipate this limit to change during the license renewal period.

Containment is provided by the Reactor Building, a reinforced concrete structure. The Reactor Building is comprised of a flat foundation mat, cylindrical wall, and shallow dome roof. The foundation mat and cylindrical wall are reinforced with conventional mild steel reinforcing. The cylindrical wall is prestressed in the vertical and horizontal directions by a post-tensioning system. The shallow dome roof is prestressed by a three-way post-tensioning system. The inside surface of the Reactor Building is lined with a carbon steel liner to ensure a high degree of leak tightness under operating and accident conditions. (DE. 2023a, Section 1.1.3) The Reactor Building also provides a barrier against the escape of fission products should a Loss of Coolant Accident (LOCA) occur (DE. 2023a, Section 1.2.3.4.1).

E2.2.2 MAINTENANCE, INSPECTION, AND REFUELING ACTIVITIES

Various programs and activities at the site maintain, inspect, test, and monitor the performance of plant equipment and are detailed throughout the final safety analysis report (FSAR). Maintenance of plant safety-related structures, systems, and components is performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances (for example, skills normally possessed by qualified maintenance personnel may not require detailed step-by-step delineation in a written procedure) which conform to applicable codes, standards, specifications, criteria, etc. When appropriate sections of related vendor manuals, instructions, or approved drawings with acceptable tolerances do not provide adequate guidance to assure the required quality of work, an approved written maintenance procedure is provided.

Maintenance procedures are sufficiently detailed that qualified workers can perform the required functions without direct supervision. Written procedures, however, cannot address all contingencies, and therefore contain a degree of flexibility appropriate to the activities for which each is applicable.

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation of a nuclear power plant. Some of the maintenance activities conducted at VCSNS include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and public safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of a major component.

Scheduled refueling outages commonly have a duration of an average of 33 to 40 days, depending on the workload. An additional 850 workers are on site during a typical refueling outage. For VCSNS, one refueling outage is scheduled for every 18 months.

E2.2.3 COOLING AND AUXILIARY WATER SYSTEMS

VCSNS operates as a once-through cooling plant that withdraws from and discharges to a cooling pond, Monticello Reservoir. (NRC. 2004b, Section 2.1.3)

The circulating water system provides cooling water to the main and auxiliary condensers (DE. 2023a, Section 1.2.3.9.7). Auxiliary water systems include the Turbine Building closed-cycle cooling water system, service water system (SWS), the component cooling water system (CCWS), the demineralized water system, the potable water system and supply, the fire water system, the Condensate Storage Facilities, and the reactor makeup water supply system (DE. 2023a, Section 9.2).

E2.2.3.1 Circulating Water System

The main cooling system at VCSNS is the circulating water system. It is designed to remove 6.67×10^9 Btu/hr of heat from the main and auxiliary condensers as well as the turbine auxiliaries. As shown in Figure E2.2-2, cooling water is drawn from the plant's cooling pond, Monticello Reservoir, at a rate of approximately 769 million gallons per day (MGD) (1,190 cubic feet per second [cfs]), passed through the condensers once, and ultimately returned to Monticello Reservoir. The intake structure, located along the south shoreline of the Reservoir, has three pump bays, each with two entrances. Each entrance is 13 feet wide and 25.5 feet high, extending from the bottom of the Pump House to the bottom of the skimmer wall. The entrances are each equipped with vertical traveling screens (mesh size 0.4 x 3.5 inches) and two sets of trash racks of conventional design. (NRC. 2004b, Section 2.1.3)

After leaving the condensers, circulating water moves via a 12-foot-diameter pipe from the plant to a semi-enclosed discharge bay. From the bay, the heated effluent moves through a 1,000-foot-long discharge canal to Monticello Reservoir. The discharge canal directs the discharge flow (heated effluent) to the northeast. A 2,600-foot-long jetty prevents the recirculation of the heated water. (NRC. 2004b, Section 2.1.3)

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

evaporation from the cooling pond (Monticello Reservoir) and as a receiving stream for discharges from the cooling pond. (NRC. 2004b, Section 2.1.3)

E2.2.3.2 Turbine Building Closed-Cycle Cooling Water System

The Turbine Building closed-cycle cooling water system provides cooling water to components associated with the steam and power conversion system. The source water is Monticello Reservoir via the raw water system. The energy is dissipated to the atmosphere by a wet surface industrial 2-cell cooling tower located just outside the protection area fence north of the ISFSI (Figure E3.1-1). System components include a wet surface industrial cooling tower, two 100% capacity tower spray pumps, four cooling tower fans, two 100% capacity closed-cycle cooling pumps, two 100% capacity closed-cycle cooling booster pumps, various equipment coolers, and a head tank. Chemical injection and blowdown are provided to maintain the quality of the spray water. The blowdown is directed to the Monticello Reservoir through the circulating water discharge canal. Under normal operation, one of the two cooling water pumps circulates treated water through the cooling tower coils transferring the heat removed from the various components to the spray water and then to the atmosphere by evaporation of the spray water in the air stream produced by cooling tower fans. The dispersant and anti-fouling chemicals added to the cooling tower raw water are sufficiently diluted to ensure negligible effect on the environment. Cooling tower effluents, including salt drift and chemical discharges, will have negligible effect on plant structures and systems. (DE. 2023a, Section 10.4.10 and Table 10.4-9)

E2.2.3.3 Service Water System and Ultimate Heat Sink

The SWS is designed to provide sufficient redundant and independent capacity to ensure that cooling water is available to safety systems and components necessary to achieve and maintain a safe shutdown from normal plant operation or following a design basis accident (DE. 2023a, Section 9.2.1.1). The SWS provides water from the Service Water Pond (SWP) for cooling of the emergency diesel generators, component cooling heat exchangers, Heating Ventilating and Air Conditioning mechanical water chiller condensers, and the Service Water (SW) Pump House cooling coils. The system also cools the Reactor Building cooling units under post-accident or high containment pressure conditions, loss of non-Class 1E power, and loss of industrial cooling water or during testing. In addition, this system is the backup water source for the emergency feedwater system (EF) and CCWS. (DE. 2023a, Section 9.2.1)

The SWP, a safety class impoundment constructed in a small arm of Monticello Reservoir, serves as the water source for the SWS and performs ultimate heat sink functions under various conditions. The SWP is created by three earthen dams and the west site embankment areas which are designed and constructed to meet the most severe natural phenomena. The intake for the SW is located along the northwest shoreline of the pond on the west embankment. The SWS discharge

structure is along the southwest edge of the pond on the west embankment. (DE. 2023a, Sections 2.4.8 and 9.2.5) The water balance for the SWP is presented in Figure E2.2-2. Effluent from the SWS is returned to the SWP by the two independent loops. Motorized valves at the pump discharge and check valves at the system discharge prevent siphoning of the SWP back into the system in the event of a major line rupture within the plant (DE. 2023a, Section 9.2.1.2).

The SWP is connected to the Monticello Reservoir through an interconnecting pipe system between the circulating water intake structure and the SW intake structure. Piping is installed so that the flow path is interrupted if Monticello Reservoir is drawn down below elevation 415' coincident with the isolation valve being open for some unforeseen reason. The volume of water in the SWP below elevation 415' is adequate to ensure safe shutdown of the plant and continued cooling for a minimum of 30 days. The SW pumps are vertical, wet pit pumps housed in the SW intake structure and are supplied with water from the SWP. The minimum required submergence, to the bottom of the suction bells, for the SW pumps is 5 feet. At minimum SWP level, the available submergence to the bottom of the suction bell is approximately 21 feet. (DE. 2023a, Section 9.2.1.3)

During normal plant operation, one of three SW pumps is in service at all times. A second SW pump may be run to limit biofouling in the inactive loop and is available for emergency use. The third SW pump is provided as an installed spare and its circuit breaker(s) is racked out. The spare pump can be aligned in parallel with the running SW pump in either loop through crossover connections. In the event of malfunction of the running SW pump, the spare pump is manually started to replace the running pump. The automatic start capability of the SW pumps is not used. (DE. 2023a, Section 9.2.1.2) During normal operation, and a postulated LOCA, one SW pump operates to supply up to 16,800 gpm of water at temperatures up to 95 degrees Fahrenheit (°F). This flow is adequate to provide sufficient cooling to one SWS loop. (DE. 2023a, Section 9.2.1.3) A biocide injection system was installed in the SWS for organic fouling control. A chemical injection system was installed to treat the SWS for corrosion and silt disposition. Effluent from the SWS is returned to the SWP. (DE. 2023a, Section 9.2.1.2)

Each SW pump has a corresponding traveling screen, screen wash system, and screen control system. The screen wash system takes its water supply from the corresponding SW pump discharge header. Screen wash is provided using only the SW pump's discharge. This has been found to provide adequate screen wash force. (DE. 2023a, Section 9.2.1.2)

The diesel generator cooler in the operating SWS loop receives cooling water flow continuously, even though the diesel is not in operation. The plant fire protection system serves as a standby means of cooling the diesel generators. (DE. 2023a, Section 9.2.1.2)

Provisions are made to supply SW to the EF through remotely operated valves if required (DE. 2023a, Section 9.2.1.2).

E2.2.3.4 Component Cooling Water System

The CCWS serves as an intermediate, closed loop cooling system to transfer heat from components important to safety including those which may contain radioactive or potentially radioactive fluids to the SWS. These components are the residual heat removal pumps, residual heat removal heat exchangers, charging pump gear/oil coolers, and component cooling water pump motors. (DE. 2023a, Section 9.2.2)

The CCWS is also utilized during normal plant operation to transfer heat from various systems and components that are not important to safety. Use of the CCWS precludes release radioactivity in the event of malfunction of one of the nonessential components. Operation of the CCWS is required during all phases of normal plant operation, including startup through cold shutdown, and refueling, as well as during emergency operation following a LOCA. (DE. 2023a, Section 9.2.2)

The CCWS consists of two independent loops, providing 100% redundancy in the supply of cooling water for the safety-related systems, and a common supply for the nonessential systems. The emergency core cooling system (ECCS) components supplied with cooling water by the CCWS are parts of redundant, independent systems served by redundant, independent CCWS loops. Thus, upon loss of one CCWS cooling loop, or portion thereof, cooling water remains available to the redundant component in each of the safety-related systems. (DE. 2023a, Section 9.2.2.2)

A surge tank maintains adequate net positive suction head to each component cooling pump, provides makeup water to each loop as needed, and provides compensation for fluid thermal expansion. The bottom half of the tank is partitioned such that each half serves one CCWS loop. Thus, a loss of water in one loop does not affect the other loop. Isolation and independency of the loops is thereby maintained. (DE. 2023a, Section 9.2.2.2)

Cooling water is demineralized and treated with corrosion inhibiting chemicals and an alkaline agent. Demineralized makeup water is automatically supplied to each compartment of the surge tank. An operator actuated chemical injection system prepares and injects chemical additives into the CCWS water as needed. (DE. 2023a, Section 9.2.2.2)

A connection to the pump suction piping for each loop is provided from the SWS for emergency makeup water supply to the CCWS. Emergency makeup is provided when leakage is in excess of the maximum demineralized water makeup rate of 50 gpm, or when normal makeup is not available. (DE. 2023a, Section 9.2.2.2)

E2.2.3.5 Demineralized Water Makeup System

The demineralized water system is composed of the cycle makeup pretreatment system, which clarifies and filters raw water from the Monticello Reservoir, and the cycle makeup demineralization system, which demineralizes water from the cycle makeup pretreatment system for distribution to

the NSSS, the secondary (turbine) cycle, and for other miscellaneous uses. (DE. 2023a, Section 9.2.3)

In the cycle makeup pretreatment system, raw water from Monticello Reservoir is treated with a suitable flocculant to precipitate suspended matter, remove color, and adjust pH. The clarified water is filtered through automatic gravity filters, enters a 10,000-gallon filtered water break tank, and is pumped into a 1-million-gallon filtered storage tank. The filtered water is then pumped to miscellaneous pump seals, industrial cooler makeup, and through carbon filters to cycle makeup demineralization system. The carbon filters remove organic matter as well as objectionable taste and odor. A portion of the carbon filter effluent serves as sterile water makeup for potable water service. The sterile water system includes provision for chemical treatment to disinfect and control the alkalinity of the system. (DE. 2023a, Section 9.2.3.2)

The cycle makeup demineralization system purifies water from the cycle makeup pretreatment system. Rated capacity of the cycle makeup demineralization system is 375 gpm (per train) and is based upon 1.5% rated steam flow. (DE. 2023a, Section 9.2.3.2)

Two trains of demineralizer units are used. Each train includes a cation unit, anion unit, and a mixed bed polishing unit. During normal operation, one train is in service, the other on standby or undergoing regeneration. The demineralized water is stored in a 500,000-gallon tank and pumped to the following major use points: (DE. 2023a, Section 9.2.3.2)

- To a vacuum degasifier for primary plant cycle makeup (recycle makeup water system)
- To miscellaneous nuclear related uses, such as resin sluicing and component cooling water makeup
- To the main condenser for secondary cycle makeup
- To laboratories and sampling rooms
- To Auxiliary Steam System Condensate Return Unit

Regeneration of the demineralizer units is accomplished automatically after pushbutton initiation, using dilute sulfuric acid and dilute sodium hydroxide solution. Regenerant wastes are discharged to the neutralization waste basin for neutralization with sulfuric acid and sodium hydroxide. Neutralized wastes are pumped to Monticello Reservoir through the circulating water discharge. (DE. 2023a, Section 9.2.3.2)

E2.2.3.6 Potable and Sanitary Water Systems

VCSNS pumps and treats raw water from the Monticello Reservoir at the Offsite Water Treatment Facility (OWS) producing both potable water for use at VCSNS and filter process water for Unit 1 and is not connected to a municipal system (SCE&G. 2002, Section 2.10.1). The OWS is located onsite along the plant's access road as shown in Figure E3.1-1. The facility has separate treatment

trains for the potable water supply and filter process water but shares the same raw water intake and pumping system and waste stream discharge system. Treatment processes for sanitary water are by flocculation and ultrafiltration. Treatment for the potable water consists of pretreatment by flocculation, followed by ultrafiltration and reverse osmosis membranes, and then remineralization and pH control treatment. The process water handling and disposal is through gravity in a retention basin with the supernatant discharged to Monticello Reservoir and accumulated solids in the basin sent offsite for disposal as necessary. Discharges are made back to Monticello Reservoir at the OWS Discharge located approximately 600 feet north of the OWS under National Pollutant Discharge Elimination System (NPDES) General Permit for Water Treatment Plant Dischargers, SCG646000.

E2.2.3.7 Condensate Storage Facilities

The condensate storage system is designed to ensure that a reserve of condensate quality water is dedicated for use by the EF. To accomplish this function, the condensate storage tank (CST) is designed to provide the EF a sufficient amount of water to refill the steam generators to no-load program level plus the amount required to replenish the steam released from the steam generators through the Main Steam Safety Valves and Power Operated Relief Valves (PORVs). (DE. 2023a, Section 9.2.6.1)

The system consists of one CST, with a capacity of 500,000 gallons of condensate, and the associated makeup and distribution systems. The CST is located outside, adjacent to the Water Treatment Building. Of the CST capacity, 160,054 gallons is reserved for use by the EF. This reserve is the volume between the bottom of the condensate to condenser nozzle and the top of the emergency feedwater suction nozzle. It is maintained by having the tank connections, except those required for instrumentation, emergency feedwater pump suction, chemical analysis, and tank drainage, above the level providing 160,054 gallons to the EF. The tank is field fabricated of carbon steel, lined with an inert material. A check valve in the drain line of the tank is provided to allow for nitrogen sparging as a method of controlling CST water oxygen levels. (DE. 2023a, Section 9.2.6.2)

Makeup to the CST is supplied from the 500,000-gallon demineralized water storage tank (DE. 2023a, Section 9.2.6.2).

Emergency feedwater pump recirculation lines also return water to the CST when the EF is used during startup or any time an emergency feedwater pump is in a recirculating mode (DE. 2023a, Section 9.2.6.2).

E2.2.3.8 Reactor Makeup Water Supply System

The reactor makeup system provides for storage of tritiated, but not aerated, recycled primary coolant grade water (DE. 2023a, Section 9.2.7).

The reactor makeup water supply system is designed to perform the following functions (DE. 2023a, Section 9.2.7.1):

- Supply water to the chemical and volume control system.
- Supply makeup water to the spent fuel pool at a rate of 150 gpm.
- Provide a backup water supply for spray cooling in the pressurizer relief tank, capable of supplying 150 gpm.
- Provide a water supply for makeup to and flushing of reactor auxiliary systems.
- Provide storage capacity equal to or greater than the total 84,000-gallon capacity of the recycle holdup tanks for recycling primary coolant grade water produced in the boron recovery system and liquid waste processing system (LWPS).

The initial supply of primary coolant grade water is provided by the demineralized makeup water system. Subsequent primary grade makeup water requirements are satisfied from the 100,000-gallon capacity reactor makeup water storage tank. The principal source of makeup water in the reactor makeup water storage tank is the demineralized water system using the system vacuum degasifier transfer pumps. The boron recovery system evaporators and the LWPS evaporators are a secondary source of makeup water in the reactor makeup water storage tank when in operation. This water contains tritium. Therefore, its use is limited to reactor auxiliary systems containing radioactive fluid. (DE. 2023a, Section 9.2.7.2)

E2.2.3.9 Fire Protection System

The water extinguishing portions of VCSNS's fire protection system, which also includes other extinguishing agents, are supplied by an underground yard fire main loop installed around VCSNS. The supply source of the water in the system is the Monticello Reservoir. The loop was sized in accordance with the recommended 12-inch size in order to furnish the anticipated water requirements of the Nuclear Energy Liability Property Insurance Association, "Revised Specifications for Fire Protection of New Plant", NELPIA File No. NS-202, and is provided in accordance with National Fire Protections Association Codes, NFPA 24, "Standard for Outside Protection." Valves are provided to isolate portions of the fire main for maintenance or repairs without shutting off the entire system.

The fire service piping is separate from most domestic and sanitary water service piping so that the fire main loop is independent from these other water services and does not impact and is not impacted by these other systems. The 100% capacity electric fire pump or 100% capacity diesel engine driven fire pump is designed to provide sufficient flow and pressure to the largest fire protection system demand plus 1,000 gpm for hose streams for some areas of VCSNS. The fire service piping minorly interfaces with the filtered water system. Two filtered water pumps serve as the primary means to maintain fire service water system pressure. A back-flow preventer is installed

in the filtered water supply line to prevent fire service water from contaminating the filtered water system. The filtered water supply is available during operation and plant outages and the jockey fire pump serves as a secondary or backup fire service pressure maintenance source. For areas of the plant containing safety-related equipment, these pumps also provide fire service water at sufficient flow and pressure to the largest fire protection system demand for sprinklers, hose streams, and backup emergency diesel generator cooling.

The fire protection water requirement for the two-hour flow for the largest fire protection system operating (3896.0 gpm) results in a requirement of 467,520 gallons, which is negligible considering the size of Monticello Reservoir. Failure of the fire water supply/distribution system will not affect the ability of the reservoir to satisfy the needs of the plant due to the independent supply and arrangement of the system.

E2.2.4 METEOROLOGICAL MONITORING PROGRAM

The purpose of the operational meteorological monitoring program for VCSNS is to provide meteorological data useful in the estimation of short-term diffusion characteristics to plant personnel on a timely basis and a database of certain meteorological information for the assessment of plant operational impacts. The meteorological instrumentation accuracies for primary measurements meet the recommendations stated in Regulatory Guide 1.23. (DE. 2023a, Section 2.3.3.2)

There is one meteorological tower at VCSNS. The tower location is depicted in Figure E3.1-1. The onsite meteorological tower is located at approximately the same elevation as the Reactor Building and far enough away from plant structures such that their influence on observed conditions is small. Both of these conditions contribute to the representativeness of the observed data for describing atmospheric dispersion conditions from the Reactor Building to the site boundary and the low population zone. (DE. 2023a, Section 2.3.3.2)

Parameters to be measured on a continuing basis for the operation estimation of diffusion characteristics onsite include differential temperature, wind speed, wind direction, and precipitation. Meteorological system data is stored on the integrated plant computer system. (DE. 2023a, Section 2.3.3.2)

The integrated plant computer system, located in the Control Building Computer Room, is used to acquire the meteorological data from the weather station, located at the meteorological tower. This computer performs data acquisition, averaging, display, and trending (short-term). Permanent historical storage of data is performed on the general data processing computers located in the Auxiliary Service Building Computer Room, to which the integrated plant computer system is linked. (DE. 2023a, Section 2.3.3.2)

Wind and temperature sensors are installed on a 62-meter self-supporting meteorological tower. A dewpoint sensor is installed separately next to the base of the tower. A precipitation sensor is installed on a 4-foot pedestal near the tower. A barometric sensor is installed in a data processor at the base of the tower. Two instrument elevators (primary and backup), with 8-foot instrument booms are installed on the tower, each providing a full set of wind and temperature measurements. The environmentally capable digital weather system processor is located at the base of the tower. The tower is located about 1,500 feet west of the reactor complex at elevation 438'. The tower mounted sensors are as follows: (DE. 2023a, Section 2.3.3.2.3)

- At 61 meters above ground level, the upper wind sensor and upper temperature sensor for the 10–61-meter differential temperature measurement are mounted on an 8-foot boom attached to the instrument elevator.
- At 40 meters above ground level, the upper temperature sensor for the 10–40-meter differential temperature measurement is mounted on an 8-foot boom attached to the instrument elevator.
- At 10 meters above ground level, the lower wind sensor and lower temperature sensor for the 10–61-meter and the 10–40-meter differential temperature measurements are mounted on an 8-foot boom attached to the instrument elevator.

To assure data quality and accuracy, the weather instruments are calibrated in accordance with the approved plant procedures. Manual field calibrations will be conducted in accordance with technical specification requirements. The procedures include the inspection of tower hardware, electronic component calibration when required, and verification of data communications. (DE. 2023a, Section 2.3.3.2.4)

Normal service includes various operation checks to reasonably assure 90% data recovery. A preventive maintenance schedule has been established for the purpose of performing routine instrument servicing and calibration. (DE. 2023a, Section 2.3.3.2.4)

The calibration of the meteorological system is performed when required according to the accepted nuclear industry practices. The instrumentation used to calibrate the meteorological system (where applicable) has been maintained such that their recordings can be traced to the National Bureau of Standards. These procedures and test instrument qualities ensure the quality of the meteorological measurements obtained from VCSNS. In addition to the calibration of the meteorological system, operational procedures are enforced for daily and biweekly checks. (DE. 2023a, Section 2.3.3.2.4)

These online calibration verification programs, periodic calibrations, biweekly calibration checks, and daily checks ensure that the measurements of the meteorological variables at VCSNS are valid. Further verification that the procedures for the maintenance, data collection, and data reduction are in accordance with the recommendations of Regulatory Guide 1.23 is demonstrated by the greater than 90% data recovery for primary variables. (DE. 2023a, Section 2.3.3.2.4)

Regional and site meteorology and air quality are presented in detail in Section E3.3. Meteorological parameters monitored at VCSNS are listed in Table E2.2-1.

E2.2.5 POWER TRANSMISSION SYSTEM

E2.2.5.1 In-Scope Transmission Lines

Based on NRC Regulatory Guide 4.2 (NRC. 2013b, Section 2.2), transmission lines subject to evaluation of environmental impacts for license renewal are those that connect the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system, and power lines that feed the plant from the grid during outages. In-scope transmission lines are further clarified in the GEIS as being those lines that would not remain energized if the plant's license were not renewed.

In-scope transmission lines are those from the Turbine Building to the 230-kilovolt (kV) switchyard and a 115-kV line. The area between the Turbine Building and the switchyard is within the Exclusion Area and inaccessible to the public, as shown in Figure E2.2-1.

The VCSNS 230-kV switchyard has a single bus, single breaker arrangement, with three main bus sections. The center section is designated bus section 3, the east section designated bus section 1, and the west section designated bus section 2. The Parr 115-kV engineered safety features (ESF) line terminates in a bay in bus section 3, crosses over bus section 3 with rigid bus construction, and continues to VCSNS. (DE. 2023a, Section 8.1)

The regional transmission system supplies offsite AC power for operating the ESF buses as well as for startup and shutdown of the plant. Two separate sources of offsite power are provided for the Class 1E electric system, which is in compliance with Regulatory Guide 1.32. One source is the transmission grid terminating at the VCSNS 230-kV switchyard bus, which feeds the plant through a step-down transformer. The second source is from the existing Parr Generating Complex over a 115-kV transmission line. This source is connected to the plant through onsite step-down transformers and a separate regulating transformer. These two sources have sufficient separation and isolation, so that loss of VCSNS output would not degrade either of the sources below their acceptable voltage limit. Thus, loss of the plant output, in conjunction with an accident, would not result in a degraded voltage condition on either source. Likewise, loss of a line or generation on the 115-kV network would not cause a degraded condition on the Emergency Auxiliary Transformer which is fed power from the 230-kV bus. No single event such as an insulator or bushing failure, transformer failure, transmission line tower failure, line breakage, or similar event can cause simultaneous disruption of both sources. (DE. 2023a, Section 8.2.1)

The 230-kV ESF line extends from the Turbine Building and terminates at VCSNS Switchyard bus section 3. This transmission line is 384 feet long. The 230-kV Generator Output transmission line

extends from the Turbine Building and terminates at VCSNS Switchyard bus section 1. This transmission line is 391 feet long.

The 230-kV circuit breakers associated with the plant main transformer and emergency auxiliary transformers, as well as the circuit switches associated with the ESF transformers, are controlled from, and provide indication in, the control room. Also, the 230-kV circuit breakers can be tripped at the circuit breaker control panels mounted on the circuit breaker structures. (DE. 2023a, Section 8.2.1)

Manually operated disconnect switches are provided for the 230-kV circuit breakers to isolate each from the bus and associated lines. These disconnect switches permit testing and maintenance of each circuit breaker on an individual basis while allowing the 230-kV substation to remain energized. Testing and maintenance are performed periodically in accordance with DE procedures. (DE. 2023a, Section 8.2.1)

As shown in Figure E2.2-1, the 115-kV ESF transmission line extends from Parr Generating Complex to VCSNS. Within the Parr 115-kV substation are gas-fired combustion turbines that, in combination with the substation, form the Parr Generating Complex. The Parr Hydro plant is connected to the Parr 115-kV substation via a 115/13.2-kV tap changing transformer, but it is not considered part of the Parr Generating Complex even with its close proximity. The 115-kV ESF line extends 2.6 miles from the Parr 115-kV substation to the vicinity of the Parr 230-kV substation (retired) and then to VCSNS. An approximate 600-foot segment of this line is routed from above ground to an underground duct back and then returns to above ground routing, as shown in Figure E2.2-1. This underground segment eliminates the crossing of the 115-kV line over 230-kV transmission lines near the Parr Substation. (DE. 2023a, Section 8.2.1.2)

The 115-kV ESF line terminates at the 230-kV switchyard in a rigid bus construction for the crossover of the 230-kV middle bus section (Bus 3). The 115-kV bus has no connection to the 230-kV bus. Therefore, any problems associated with the 230-kV bus do not affect the 115-kV bus. The rigid bus construction offers high reliability by eliminating the possibility of line dropping at this crossover point. (DE. 2023a, Section 8.2.1)

E2.2.5.2 Vegetation Management Practices

The in-scope transmission lines between the Turbine Building and the switchyard are within the VCSNS EAB as shown in Figure E2.2-1. The Parr ESF 115-kV transmission line extends outside of the VCSNS EAB. VCSNS has procedures in place that govern line clearing specifications and herbicide management on transmission rights-of-way (ROW).

E2.2.5.3 Avian Protection

DE promotes protection of migratory, and threatened and endangered birds through a corporate avian protection plan. The plan adheres to three federal statutes that afford protection to nearly all native avian species relevant to the industry: The Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and the Endangered Species Act (ESA). The guidance provides procedures on how DE employees are to respond to encounters, including:

- What to do about a bird nest on the property
- What to do about dead or injured birds
- How to manage nuisance birds, including Canada geese
- How to specifically comply with bald eagle protections, such as by following DE's large bird nest protocol
- How to construct or retrofit structures to avoid bird mortality

DE incorporates guidelines from industry standards to create more avian-safe distribution poles and lines throughout its electric distribution system. In addition, the transmission lines are considered for high visibility to avoid bird collisions and the towers are considered to deter nesting. DE is also in the process of implementing the installation of plastic coils on power lines to help wildlife avoid getting entangled.

E2.2.5.4 Public

In-scope transmission lines are located within the Protected Area and the Owner-Controlled Area and are not accessible to the public. Therefore, no induced shock hazards would exist for the public. Additionally, electrical design engineering and maintenance procedures adhere to all applicable sections of the National Electrical Safety Code (NESC) for clearance to prevent and minimize electrical shock hazards.

E2.2.5.5 Plant Workers

NUREG-1437 suggests that occupational safety and health hazard issues are generic to all types of electricity generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC. 2013a, Section 3.9.5.1).

DE maintains safety-specific policies for all work conducted at electrical transmission locations.

E2.2.6 RADIOACTIVE WASTE MANAGEMENT SYSTEM

Radioactive waste management at VCSNS is accomplished through the use of three interrelated systems: LWPS, gaseous waste processing system (GWPS), and solid waste disposal system (DE. 2023a, Section 1.2.3.10).

Waste handling systems have been incorporated in the plant design for retention and/or processing of radioactive wastes resulting from normal operation. Controls and monitoring are provided to ensure that Appendix I of 10 CFR 50 is satisfied. The plant is also designed such that radioactive releases during accidents would not exceed the limits of 10 CFR 100.11 or 10 CFR 50.67. (DE. 2023a, Section 3.1.2.6)

E2.2.6.1 Liquid Waste Systems

The LWPS primarily collects and processes potentially radioactive wastes for release to the environment. The LWPS consists of five collection systems: the waste holdup tank; the floor drain tank; the laundry and hot shower tank; the excess LWPS (the excess waste holdup tank and the decontamination pit collection tank); and the laboratory drain system, wastewater treatment and spent resin processing. Provisions are made to sample and analyze fluids before they are discharged. Based on the laboratory analysis, these wastes are either released under controlled conditions via the penstocks of the Fairfield Pumped Storage Facility or retained for further processing with eventual release to the circulating discharge canal or the Fairfield Pumped Storage Facility penstocks. Alternatively, the liquid waste may be reused in the plant. (DE. 2023a, Section 11.2.2, Figures 11.2-1 and 11.2-3)

The bulk of the radioactive liquids discharged from the reactor coolant system are processed by the reactor grade demineralizer system. This limits input to the LWPS and results in processing of relatively small quantities of generally low activity level wastes. (DE. 2023a, Section 11.2.2)

The LWPS does not include provisions for processing secondary system wastes. The segregation of primary and secondary side wastes is maintained since ammonia from the secondary could result in the loss of LWPS demineralizer efficiency, and condenser inleakage could lead to undesirable chemical inclusion in the LWPS. Additionally, the mixing of low activity wastes (secondary side) with those of higher activity (primary side) should be avoided, since a large volume of contaminated water is produced. The present design, which segregates primary and secondary wastes, minimizes the amount of water which must be processed by discharging low activity wastes directly, where permissible, with no treatment. (DE. 2023a, Section 11.2.2)

In the event of equipment faults of moderate frequency, the LWPS is capable of processing up to 1 gpm of primary coolant leakage with no change in system operation. As a practical upper limit of system operation, the LWPS can process 25 gpm not including laundry type of effluents which are normally discharged without processing. This liquid may be collected in either the floor drain tank or waste holdup tank or in both tanks. (DE. 2023a, Section 11.2.2)

Instrumentation and control necessary for the operation of the LWPS are located on a control board in the Auxiliary Building. Any alarm on this control board is relayed to the main control board in the Control Room. (DE. 2023a, Section 11.2.2)

E2.2.6.1.1 Waste Holdup Tank

The 10,000-gallon waste holdup tank is provided to collect both reactor and non-reactor grade water, which enters the LWPS via equipment leaks and drains, valve leakoffs, pump seal leakoffs, tank overflows, Reactor Building sump flows, and other tritiated and aerated water sources. (DE. 2023a, Section 11.2.2.1)

Deaerated tritiated water inside the Reactor Building from sources such as valve leakoffs, which is collected in the reactor coolant drain tank, need not enter the waste holdup tank. These sources may be routed directly to the recycle holdup tanks for processing. (DE. 2023a, Section 11.2.2.1)

The basic composition of the liquid collected in the waste holdup tank is normally boric acid and water with some radioactivity. Liquid collected in this tank is normally processed through the wastewater system (Duratek demineralizers) and released to the environment under controlled conditions. (DE. 2023a, Section 11.2.2.1)

Liquid wastes are released from the waste monitor tanks through penstocks of the Fairfield Pumped Storage Facility. The discharge valve is interlocked with a process radiation monitor and closed automatically when the radioactivity concentration in the liquid discharge exceeds a preset limit. The waste monitor tanks act as a reservoir for storing waste which is to be released from the LWPS to the Fairfield Pumped Storage Facility. Prior to entering these tanks, the liquid may pass through a waste monitor tank demineralizer and a waste monitor tank filter, if required for additional cleanup. (DE. 2023a, Section 11.2.2.1)

Normally the waste monitor tank demineralizer and filter are bypassed. A sample is taken and, after analysis, the results are logged and the liquid is discharged. Liquid waste discharge flow and volume are recorded. (DE. 2023a, Section 11.2.2.1)

E2.2.6.1.2 Floor Drain Tank

The 10,000-gallon floor drain tank is provided to collect non-reactor grade (non-recyclable) liquid wastes. These include floor drains, equipment drains containing non-reactor grade water, and other non-reactor grade sources. Normally, water is collected in the floor drain tank, which can then be sent directly to the waste monitor tank without processing and subsequently discharged. If there is activity in the floor drain tank liquid and it is such that the discharge limits cannot be met without cleanup, the liquid may be processed through the wastewater system (Duratek demineralizers) and released under controlled conditions via the penstocks of the Fairfield Pumped Storage Facility. (DE. 2023a, Section 11.2.2.2)

Non-recyclable reactor coolant leakage normally enters the floor drain tank from system leaks in the Auxiliary Building via the floor drains. This liquid is not reused because it is diluted and contaminated by non-reactor grade water entering the floor drain tank from other sources. Sources

of water include fan cooler leaks, secondary side steam and feedwater leaks, component cooling water leaks, and decontamination water. (DE. 2023a, Section 11.2.2.2)

E2.2.6.1.3 Laundry and Hot Shower Tank

Laundry and hot shower drains normally need no treatment for removal of radioactivity. This water is transferred to waste monitor tank number 2 via the laundry and hot shower filter. A sample is taken, and, after analysis, the results are logged, and the water is discharged if the activity level is below acceptable limits. (DE. 2023a, Section 11.2.2.3)

E2.2.6.1.4 Excess Liquid Waste Processing System

The excess LWPS consists of two storage tanks, the excess waste holdup tank, and the decontamination pit collection tank (DE. 2023a, Section 11.2.2.4).

The excess waste holdup tank is used to accept excess liquid waste from the floor drain tank, laundry, hot shower tank, and waste holdup tank when these tanks are filled to capacity. The liquid from this tank can be released directly to the environment via the waste monitor tank or processed through the Duratek demineralizers prior to release from the plant. (DE. 2023a, Section 11.2.2.4)

The decontamination pit collection tank collects liquid from the Fuel Handling Building sumps, the Radiological Maintenance Building drains, excess waste holdup tank sump, excess waste holdup area sump, and decontamination pit drains. If the activity in this tank liquid is such that the discharge limits cannot be met with cleanup, the liquid is processed through the Duratek demineralizers and released under controlled conditions via the penstocks of the Fairfield Pumped Storage Facility. (DE. 2023a, Section 11.2.2.4)

The system also normally receives liquid waste from the normal and post-accident sampling system waste pump. In addition, the Turbine Building floor drain system discharge will be directed to the excess LWPS when excessive radioactive discharge is detected by radiation monitor number RM-L8. (DE. 2023a, Section 11.2.2.4)

E2.2.6.1.5 Laboratory Drain System

The laboratory drain system consist of three sinks in the radiochemical laboratory and two sinks in the sample room (DE. 2023a, Section 11.2.2.5).

In the radiochemical laboratory spent reactor coolant samples, equipment rinse water and other non-reactor grade fluids are disposed of in the two sinks that drain to the floor drain tank. No liquids or wastes are intentionally disposed of in the sink that drains to the chemical drain tank. (DE. 2023a, Section 11.2.2.5)

In the sample room, excess sample purges of reactor grade water and excess reactor coolant samples are drained from one sink to the waste holdup tank for processing. The other sink is used

for draining non-reactor grade fluids to the nuclear blowdown holdup tank. (DE. 2023a, Section 11.2.2.5)

E2.2.6.1.6 Waste From Spent Resin

The spent resin sluice portion of the LWPS consists of a spent resin storage tank, a spent resin sluice pump, and a spent resin sluice filter. The purpose of this system is to transport spent resin to the spent resin storage tank without generating large volumes of waste liquid. This is accomplished by reusing the sluice water for subsequent resin sluicing operations. The spent resin storage tank provides a collection point for spent resin to allow for decay of short-lived radionuclides before disposal. The tank is designed so that sufficient pressure can be applied in the gas space of the tank to push resin out and to the solid waste disposal unit. (DE. 2023a, Section 11.2.2.6)

E2.2.6.1.7 Wastewater System

The wastewater system (Duratek demineralizers) is provided to process radioactive waste prior to release to the environment. The liquid waste stream enters one of the five pressure vessels that contain media for cleanup of the liquid waste. The system consists of five demineralizers loaded with charcoal, cation, anion, or mixed bed resin as determined based on isotopic characteristics of the wastewater. Supplemental demineralizers are also used as necessary to further reduce radioactivity to meet plant effluent goals. (DE. 2023a, Section 11.2.3.1.4.1)

E2.2.6.2 Gaseous Waste System

The GWPS is designed to remove fission product gases from the reactor coolant in the volume control tank. The system is also designed to collect gases from the boron recycle, reactor coolant drain tank, recycle holdup tanks, and reactor vessel. The system has the capacity for long term storage. (DE. 2023a, Section 11.3.1)

Under normal operation, the annual releases due to leakage and routine releases from the GWPS will be sufficiently low such that site boundary doses will be a small fraction of regulation requirements (DE. 2023a, Section 11.3.1). The major input to the GWPS during normal operation is taken from the gas space in the volume control tank (DE. 2023a, Section 11.3.2).

The GWPS consists mainly of a closed loop comprised of two waste gas compressors (one in use and one in standby), two catalytic hydrogen recombiners (one in use and one in standby), and gas decay tanks to accumulate the fission product gases. The routing of piping containing radioactive gases is either through shielded cubicles or behind shield slabs. (DE. 2023a, Sections 11.3.2, 11.3.3.1.1, and 11.3.3.1.2)

There are eight waste gas decay tanks, six are used during normal operation while the remaining two are used for shutdown and startup (DE. 2023a, Section 11.3.3.1.3).

During normal power operation, nitrogen gas is continuously circulated around the loop by one of the two compressors. Fresh hydrogen gas is charged to the volume control tank where it is mixed with fission gases which are stripped from the reactor coolant into the tank gas space. The contaminated hydrogen gas is then vented from the tank into the circulating nitrogen stream to transport the fission gases into the GWPS. The resulting mixture of nitrogen-hydrogen-fission gas is pumped by the compressor to the recombiner where enough oxygen is added to reduce the hydrogen to a low residual level by oxidation to water vapor on a catalytic surface. After the water vapor is removed, the resulting gas stream is circulated to the waste gas decay tanks and back to the compressor suction to complete the loop circuit. (DE. 2023a, Section 11.3.4.3)

E2.2.6.3 Solid Waste System

The solid waste system is designed to package and/or solidify radioactive wastes for shipment to an approved offsite burial facility in accordance with applicable Department of Transportation (DOT), NRC, and State Regulations. The system conforms to 10 CFR 20 and 10 CFR 50 requirements by providing shielding so that radiation exposure of operating personnel and the public is within acceptable limits. Solid waste packaging is accomplished in an area located on the ground floor (elevation 436') of the Auxiliary Building. (DE. 2023a, Section 11.5.1)

Radioactive waste packaged includes spent resins, used filter cartridges, radioactive hardware, and compacted waste such as rags, paper, clothing, etc. (DE. 2023a, Section 11.5.2).

The input to the solid waste system consists of several radioactive waste storage tanks containing primary spent resins, reactor grade demineralizer spent resins, non-reactor grade demineralizer spent resins, and nuclear blowdown spent resins and the associated valves, piping, and pumps. These components are located in the Auxiliary Building. Secondary side condensate polisher resin may also be handled by the solid waste system. (DE. 2023a, Section 11.5.3.1).

Radwaste solidification, when required, is accomplished using approved equipment and process control program. Liquid waste contained in the reactor grade and non-reactor grade demineralizer is recirculated using their respective pumps and a sample is taken. This sample is used in the process control program to determine pH adjustment, waste/binder ration, and for the purpose of test solidification. Liquid waste is transferred to the fill head and into the liner located in the solidification area. (DE. 2023a, Section 11.5.3.1)

Primary and Secondary spent resins are transferred from their respective holdup tanks to either a disposable liner in the solidification area or a liner in the truck bay. A process shield or a DOT cask may be used when activity or exposure dictates. The resins may then be either solidified or dewatered for shipment. Dewater return is routed to the Excess Liquid Waste Holdup Tank, the Decontamination Pit Collection Tank, or the Floor Drain Tank. (DE. 2023a, Section 11.5.3.1)

E2.2.6.4 Spent Nuclear Fuel

Fuel rods that have exhausted a certain percentage of their fuel and are removed from the reactor core for disposal are called spent fuel. VCSNS removed spent fuel from the reactor vessel by a refueling machine and placed in the fuel transfer system carriage. The fuel transfer system moves the spent fuel from the refueling canal to the transfer canal. The spent fuel is removed from the transfer system carriage in the transfer canal and placed in the spent fuel storage rack in the spent fuel pool. After a decay period, the spent fuel is removed from the spent fuel racks and loaded into a cask for removal from the Fuel Handling Building to the ISFSI. (DE. 2023a, Section 1.2.3.7)

VCSNS has established an ISFSI located approximately 500 feet west of the Unit 1 Fuel Handling Building. The ISFSI concrete pad has a capacity for 98 vertical spent fuel storage casks. Spent Fuel Dry Cask Storage operations at VCSNS are conducted under a general license in accordance with Subpart K of 10 CFR 72. The ISFSI is designed to store the spent fuel generation for 80 years of operation. (DE. 2023a, Section 9.1.5.1)

E2.2.6.5 Ultimate Disposal Operations

VCSNS uses a process control program to establish and maintain a set of process parameters which provide reasonable assurance that packaged radioactive wastes meet 10 CFR 20, 61, and 71, state regulations, burial ground requirements, and other requirements governing the disposal of radioactive waste.

The process control program is applicable to all wastes classified as Class A, Class B, and Class C (in accordance with 10 CFR 61) which are to be disposed of in a radioactive waste disposal site.

VCSNS has contracts with Alaron Nuclear Services, UniTech Services Group, and EnergySolutions - Barnwell Processing Facility for the processing and disposal of all radiologically contaminated material. Amount and types of radioactive waste are reported annually to the NRC via the annual radioactive effluent release report (ARERR).

Low-level radioactive waste (LLRW) is classified as Class A, Class B, Class C, or greater than Class C. Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated components. Classes B and C wastes constitute a low percentage by volume of the LLRW generated and are stored onsite in the radwaste yard. Disposal of greater than Class C waste is the responsibility of the federal government.

VCSNS is a generator of mixed waste from operations. When generated, low-level mixed waste (LLMW) is managed by procedures that meet the requirement of the South Carolina Department of Health and Environmental Control's (SCDHEC) Hazardous Waste Management Regulations. In 2021, VCSNS generated approximately 314.05 gallons of mixed waste/used oil. Mixed waste is currently stored onsite at RCA RMB 436. VCSNS has a conditional exemption for LLMW in

accordance with 40 CFR 266, Subpart N. When necessary, VCSNS has procedures for shipping mixed waste in accordance with federal and state regulations.

E2.2.7 NONRADIOACTIVE WASTE MANAGEMENT SYSTEM

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. The SCDHEC is authorized by the Environmental Protection Agency (EPA) to implement the RCRA in South Carolina.

VCSNS generates nonradioactive waste as a result of plant maintenance, cleaning, and operational processes that occur at the site. Over the previous 5 years, 2017–2021, VCSNS experienced three occurrences that generated wastes that are not part of normal operation. These occurrences were a sulfuric acid tank leak in 2018, used oil with high halogen content (benzene) in 2021, and a used cooking oil release in 2021. Table E2.2-2 provides the amount of nonradioactive hazardous, nonhazardous, and recycled wastes generated at VCSNS from 2016–2021. Nonradioactive waste commonly generated at VCSNS includes steel cans, mixed metals, acid batteries, used motor oil, antifreeze, fluorescent tubes, rechargeable batters, and used oil filters. VCSNS also has plans to implement a wood recycling program.

VCSNS is classified by the EPA and the SCDHEC as a Large Quantity Generator (LQG) of hazardous waste. This means that VCSNS generates 1,000 kilograms per month or more of hazardous waste or more than 1 kilogram per month of acutely hazardous waste. (EPA. 2022a)

DE maintains a list of approved waste vendors used to manage and dispose of hazardous, nonhazardous, and recyclable waste.

Currently the following vendors are utilized at VCSNS:

- Ecoflo
- Call2Recycle
- Interstate Battery

Table E2.2-1 Meteorological Parameters

Parameter	Tower (Elevation Level)
Delta T	(61–10) meters
Wind Speed	10 meters, 61 meters
Wind Direction	10 meters, 61 meters
Precipitation	4-foot pedestal near the tower

(DE. 2023a, Section 2.3.3.2.3)

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Table E2.2-2 VCSNS Nonradioactive Waste Types (in pounds) 2016–2021

2016									
Hazardous Waste	Non-Hazardous Waste	Steel Cans	Other/Mixed Metal	Lead-Acid Batteries	Used Motor Oil	Antifreeze	Fluorescent Tubes	Rechargeable Batteries	Used Oil Filters
32,795	5,066	850	200	3,540	99,323	4,492	680	3,499	1,200
2017									
Hazardous Waste	Non-Hazardous Waste	Steel Cans	Other/Mixed Metal	Lead-Acid Batteries	Used Motor Oil	Antifreeze	Fluorescent Tubes	Rechargeable Batteries	Used Oil Filters
47,179	49,855	--	--	95	5,060	--	285	9,675	1,400
2018									
Hazardous Waste	Non-Hazardous Waste	Steel Cans	Other/Mixed Metal	Lead-Acid Batteries	Used Motor Oil	Antifreeze	Fluorescent Tubes	Rechargeable Batteries	Used Oil Filters
770,217	41,607	1,804	--	26,924	7,160	860	361	53	800
2019									
Hazardous Waste	Non-Hazardous Waste	Steel Cans	Other/Mixed Metal	Lead-Acid Batteries	Used Motor Oil	Antifreeze	Fluorescent Tubes	Rechargeable Batteries	Used Oil Filters
9,497	40,660	4,280	4,202	34,043	--	--	50	8	--
2020									
Hazardous Waste	Non-Hazardous Waste	Steel Cans	Other/Mixed Metal	Lead-Acid Batteries	Used Motor Oil	Antifreeze	Fluorescent Tubes	Rechargeable Batteries	Used Oil Filters
14,512	14,200	850	150	9,958	605	--	50	--	1,200
2021									
Hazardous Waste	Non-Hazardous Waste	Steel Cans	Other/Mixed Metal	Lead-Acid Batteries	Used Motor Oil	Antifreeze	Fluorescent Tubes	Rechargeable Batteries	Used Oil Filters
19,497	68,700	7,728	187	11,628	1,260	--	857	22	812

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Figure E2.2-1 VCSNS In-Scope Transmission Lines

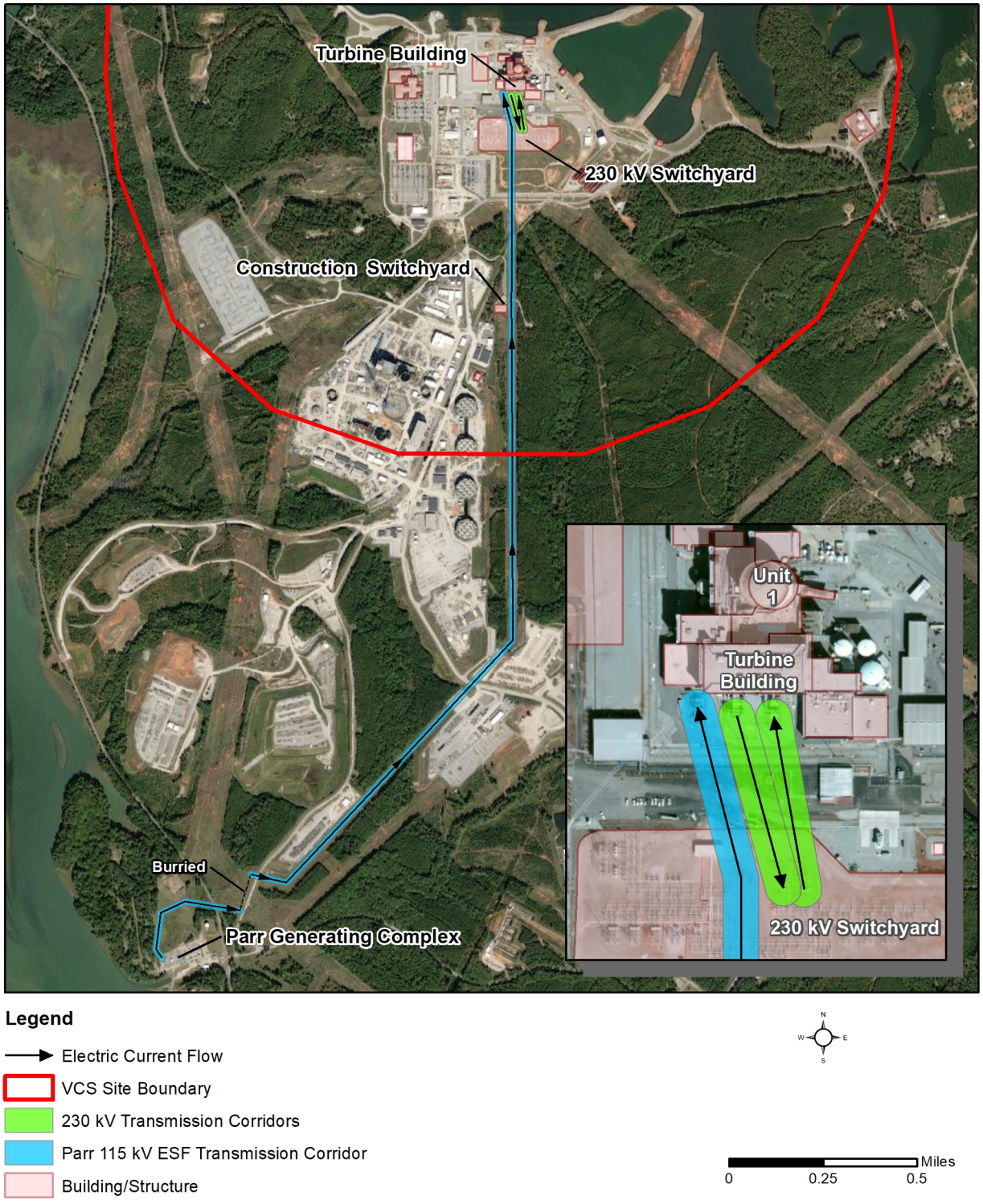
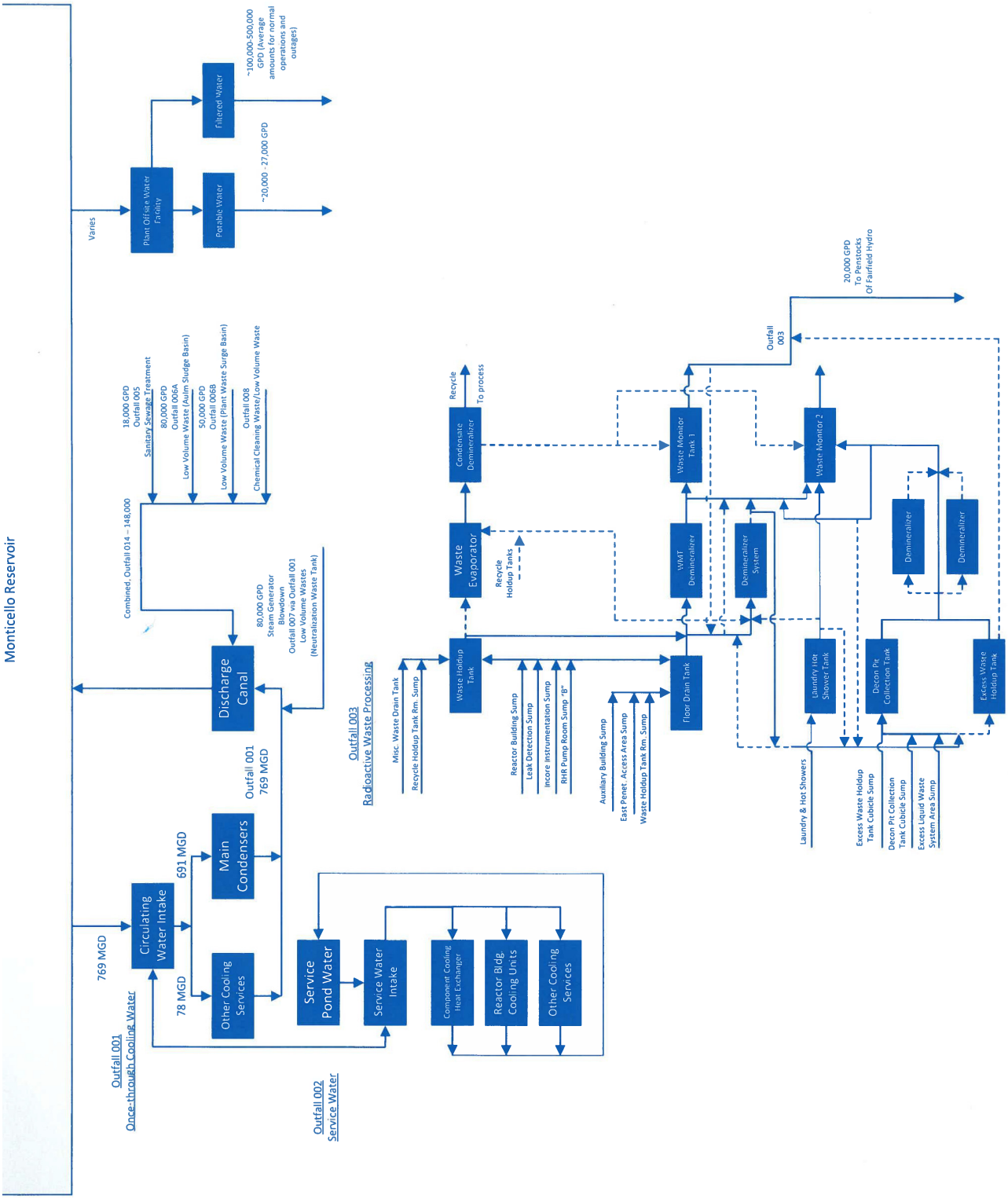


Figure E2.2-2 VCSNS Water Balance Diagram



E2.3 REFURBISHMENT ACTIVITIES

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plan to modify the facility or its administrative control procedures as described in accordance with Section (§) 54.21. If SLR-related refurbishment is planned at a facility, the applicant's ER would include analysis for environmental impacts of the proposed refurbishment activity. [10 CFR 51.53(c)(3)(ii)].

The incremental aging management activities implemented to allow operation of a nuclear power plant during a renewal term are assumed to fall under one of two broad categories. One of these categories involves refurbishment actions, which usually occur infrequently, and possibly only once in the life of the plant, for any given item. The other category is SMITTR actions, most of which are repeated at regular intervals and schedules. (NRC. 2013a, Section 2.1.1)

The NRC requirements for the renewal of OLs for nuclear power plants include preparation of an IPA [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to aging management review. The objective of the IPA is to determine whether the detrimental effects of aging could preclude certain SSCs from performing in accordance with the current licensing basis during the additional 20 years of operation requested in the SLR application (SLRA). An example of an SSC subject to aging is the reactor vessel.

The VCSNS IPA, which DE conducted under 10 CFR 54, which is described in the body of the SLRA, has identified no SLR-related refurbishment or replacement actions needed to maintain the functionality of SSCs, consistent with the current licensing basis, during the proposed SLR operating term. DE does not anticipate the continued operation of VCSNS to result in any environmental impact greater than SMALL.

E2.4 PROGRAMS AND ACTIVITIES FOR MANAGING THE EFFECTS OF AGING

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plans to modify the facility or its administrative control procedures as described in accordance with § 54.21. This report must describe in detail the modifications directly affecting the environment or any plant effluents.

The programs for managing the effects of aging on certain structures and components within the scope of SLR at the site are described in the body of the SLRA (see Appendix B of the VCSNS SLRA). The evaluation of structures and components required by 10 CFR 54.21 identified the activities necessary to manage the effects of aging on structures and components during the proposed SLR term.

E2.5 EMPLOYMENT

The non-outage workforce at the VCSNS site consists of approximately 989 persons, including 613 permanent full-time employees and an additional 376 long-term contract workers. Approximately 92% of the employees reside in the counties of Lexington, Richland, Newberry, and Fairfield, with the balance of the employees living in various other locations. Table E2.5-1 summarizes the residential distribution of VCSNS staff. Besides hiring replacement personnel as needed to maintain licensed operator positions, there are no plans to add additional permanent employees. Additionally, there are no plans to add permanent staff to support SMITTR activities and there are no planned SLR-related refurbishment activities during the SLR term.

During refueling outages, which usually last approximately 33–40 days, there are typically an additional 850 contract employees onsite. Refueling and maintenance outages for VCSNS are on an 18-month cycle.

Table E2.5-1 VCSNS Permanent Employee Residence Information, March 2022 (Sheet 1 of 2)

State	County	City/Town	Full-Time Employees
Connecticut (1)	New London (1)	East Lyme	1
North Carolina (2)	Carteret (1)	Atlantic	1
	Mecklenburg (1)	Charlotte	1
South Carolina (608)	Aiken (2)	Graniteville	1
		Wagener	1
	Barnwell (1)	Williston	1
	Berkeley (2)	Moncks Corner	1
		Summerville	1
	Calhoun (1)	Gaston	1
	Chesterfield (1)	Ruby	1
	Clarendon (1)	Manning	1
	Darlington (1)	Hartsville	1
	Dillon (1)	Lake View	1
	Dorchester (2)	Ridgeville	1
		Summerville	1
	Fairfield (45)	Blair	10
		Jenkinsville	7
		Monticello	1
		Ridgeway	8
		Winnsboro	19
	Greenwood (1)	Hodges	1
	Kershaw (9)	Camden	1
		Elgin	4
		Lugoff	4
	Lancaster (2)	Indian Land	1
		Lancaster	1
	Laurens (3)	Clinton	1
		Joanna	1
		Mountville	1
	Lexington (254)	Cayce	1
		Chapin	137
		Columbia	42
		Gaston	2
		Gilbert	8
		Leesville	5

Table E2.5-1 VCSNS Permanent Employee Residence Information, March 2022 (Sheet 2 of 2)

State	County	City/Town	Full-Time Employees
		Lexington	46
		Pelion	1
		Swansea	2
		West Columbia	10
	Newberry (95)	Little Mountain	21
		Newberry	20
		Peak	1
		Pomaria	17
		Prosperity	36
	Orangeburg (6)	Eutawville	1
		North	3
		Orangeburg	2
	Richland (171)	Blythewood	25
		Columbia	44
		Elgin	1
		Hopkins	2
		Irmo	96
		Lexington	1
		Little Mountain	2
	Saluda (3)	Batesburg	1
		Ridge Spring	1
		Saluda	1
	Spartanburg (2)	Landrum	1
		Woodruff	1
	Union (3)	Carlisle	2
		Union	1
	Williamsburg (1)	Hemingway	1
	York (1)	Fort Mill	1
Tennessee (1)	Lancaster (1)	Erwin	1
Virginia (1)	Chesterfield (1)	Midlothian	1
		Total	**613**

(USPS. 2022; USCB. 2021)

Note: VCSNS employee place of residence is for permanent full-time staff and does not include a breakdown for long-term contract staff, nor temporary refueling outage workers. Long-term contract staff settlement patterns are assumed to generally follow the county settlement patterns indicated by the permanent VCSNS staff.

E2.6 ALTERNATIVES TO THE PROPOSED ACTION

The proposed action as described in Section E2.1 is for the NRC to renew the VCSNS OL for an additional 20 years. Because the NRC decision is to renew or not renew the existing VCSNS OL, the only fundamental alternative to the proposed action is the no-action alternative, which would result in the NRC not renewing the VCSNS OL. VCSNS supplies electricity to the southwestern portion of South Carolina, with a service area that includes both Columbia and Charleston and extends to the southwestern border and Atlantic coastline. Given that VCSNS provides a significant block of long-term baseload capacity for this service territory, it is reasonable to assume that the decision not to renew the VCSNS license would involve replacement of its 966 MWe (net) of generation. DE has considered a range of replacement power alternatives from which to select the alternatives to be further analyzed for replacement of VCSNS baseload power generation.

E2.6.1 ALTERNATIVES EVALUATION PROCESS

DE developed the following set of evaluation criteria to review VCSNS replacement alternatives:

- Alternatives evaluated in this ER would need to be capable of providing 966-MWe (net) power beyond VCSNS's current license term to meet future system generating needs.
- Alternatives evaluated in this ER would need to provide adequate levels of baseload generation for reliable electricity availability for DE's service area.
- Alternatives considered are to be fully operational by 2042 when the current VCSNS OL expires. This would require the permitting, construction of the facility, and connection to the grid be completed prior to this date.
- Alternatives are to be electricity-generating sources that are technically feasible and commercially viable.

E2.6.2 ALTERNATIVES CONSIDERED

Using a screening process based on the above criteria, DE evaluated the full range of alternatives considered in the GEIS in light of the need to meet the criteria. Consideration of generation options is also undertaken annually by DE for preparation of its integrated resource plan (IRP), so this screening and selection of generating options to meet the power demands of DE's customers was relied upon for evaluating replacement alternatives for VCSNS. A detailed alternatives discussion is presented in Chapter E7.0.

The following generation sources were selected as reasonable replacement alternatives based on capability to provide reliable baseload power:

- Natural Gas Alternative –
  - Natural gas combustion turbine located at the abandoned Units 2/3 site

- New Nuclear Alternative –
  - Small modular reactor located at the abandoned Units 2/3 site
- Combination Alternative 1 –
  - Natural gas combustion turbine located at the abandoned Units 2/3 site
  - Solar panels with lithium-ion battery storage located at the abandoned Units 2/3 site
  - Solar panels with lithium-ion battery storage located offsite
- Combination Alternative 2 –
  - Small modular reactor located at the abandoned Units 2/3 site
  - Solar panels with lithium-ion battery storage located at the abandoned Units 2/3 site

The alternatives selected as reasonable replacement baseload generation alternatives are presented in Section E7.2.1.

DE determined the following generating alternatives were not considered reasonable replacements in comparison to renewal of the VCSNS OL. Solar generation is included in the list as an unreasonable discrete alternative but is a component of the combination alternative identified above.

- Purchased power
- Other DE plant reactivation or extended service life
- Conservation and energy efficiency measures
- Wind
- Solar
- Geothermal
- Hydropower
- Biomass
- Fuel cells
- Ocean wave and current energy
- Petroleum-fired plants
- Coal-fired plants

The alternatives not selected as reliable baseload generation for replacing the VCSNS generation are presented in Section E7.2.2. Alternatives for reducing environmental impacts are addressed in Section E7.3.

E3.0 AFFECTED ENVIRONMENT

VCSNS is a joint project between DE, operator, and two-thirds owner of the plant, and Santee Cooper, owner of the remaining one-third (Section E1.3). The site is located approximately 1 mile east of the Broad River and adjacent to the Monticello Reservoir in Fairfield County, South Carolina. (DE. 2023a, Sections 1.1 and 2.1) Plant property associated with the site boundary comprises approximately 2,200 acres. The Fairfield Pumped Storage Facility, also owned by DE, is located on site. (DE. 2023a, Sections 1.1 and 2.1)

E3.1 LOCATION AND FEATURES

VCSNS is located on the southern shore of the Monticello Reservoir in Fairfield County, South Carolina. The coordinates for VCSNS Unit 1 are latitude 34° 17' 54.1" North and longitude 81° 18' 54.6" West (DE. 2023a, Section 2.1). The VCSNS site is approximately 3 miles northwest of Jenkinsville, the nearest community, and 14 miles southwest of the county seat of Winnsboro. The nearest population center and state capital is Columbia, South Carolina, approximately 26 miles southeast of VCSNS. (USCB. 2022a) Figure E3.1-1 shows the VCSNS site boundary, facility structures, switchyard, EAB, and the Fairfield Pumped Storage Facility. Topographic features adjacent to VCSNS and within the site boundary are shown on Figure E3.1-2.

E3.1.1 VICINITY AND REGION

The vicinity of VCSNS is defined as the area within a 6-mile radius of the Unit 1 reactor center point. As seen in Figure E3.1-3, the vicinity includes portions of Fairfield, Newberry, and Richland Counties. A discussion of county and regional demography, with information on population projections through the VCSNS period of extended operation, is provided in Section E3.11. Table E3.11-1 provides a list of cities and towns located within a 50-mile radius of VCSNS. As of 2020, there were two cities within 50 miles with a population of over 25,000, Columbia and Rock Hill, with Columbia having a population of over 100,000.

Fairfield County, South Carolina, falls within the Columbia Metropolitan Statistical Area inside the Columbia-Orangeburg-Newberry Combined Statistical Area (CSA) (USCB. 2020). As presented in Table E3.11-2, Fairfield County's 2020 population was 20,948, a 12.6% decrease from the 2010 population of 23,956 (USCB. 2022b). The largest city in Fairfield County is Winnsboro, with a population of 3,215, as of 2020. Jenkinsville is the community closest to the plant, with a population of 40, as of 2020. (USCB. 2022a)

Newberry County, South Carolina, is a Micropolitan Statistical Area within the Columbia-Orangeburg-Newberry CSA (USCB. 2020). Table E3.11-2 presents Newberry County's 2020 population as 37,719, an approximately 0.6% increase from the 2010 population of 37,508

(USCB. 2022b). Newberry County's largest city is Newberry, with a population of 10,691, as of 2020 (USCB. 2022c).

Richland County, South Carolina, differs significantly in size and socioeconomics from Newberry and Fairfield. With a population of 416,147, it is the most populous county in the region and the home of South Carolina's capital city, Columbia, which is also the region's largest city, with a population of 136,632. (USCB. 2022a) Richland County is part of the Columbia Metropolitan Statistical Area within the Columbia-Orangeburg-Newberry CSA (USCB. 2020).

The VCSNS site is located within the easternmost component of the Piedmont physiographic province (SCDHEC. 2021a). The topography of the area consists of gently rolling hills and ridges, with surface elevations ranging from 200' to 600' above mean sea level (msl). The area surrounding VCSNS is sparsely populated and rural, with forestry being the principal land use. (DE. 2023a, Sections 2.1.1 and 2.3.1.2)

The region of VCSNS is defined as the area within a 50-mile radius of the Unit 1 reactor center point. As seen in Figure E3.1-4 and described in Table E3.11-2, all or parts of 22 counties are located within the 50-mile radius of VCSNS. Twenty-one of these counties are in South Carolina, and one is in North Carolina (note that there is a Union County in both South Carolina and North Carolina within the 50-mile radius.) As seen in Figures E3.1-3 and E3.1-4, the Monticello and Parr Shoals Reservoirs, Broad River, Lake Murray, Wateree Lake, and Lake Greenwood are the predominant physical features within the region.

Interstate 26 (I-26) runs northwest to southeast across South Carolina, providing access to communities along the transportation corridor and through Newberry and Lexington County southwest of the plant. Access to VCSNS is via State Highway SC-215/213 and local road Bradham Blvd., east of the plant (SCE&G. 2002, Section 2.10.2). Regional bus routes run northwest up I-26 with stops in and between Newberry, northwest of the plant, and southeast into Columbia, as well as north and south along Interstate 77, with stops between the region just south of Winnsboro (east of VCSNS) and Columbia (southeast of VCSNS). While several communities in the area have public transportation, there is no public bus service or rail system providing access to VCSNS. (BTS. 2022) Amtrak rail passenger service is available in the region; the closest station to VCSNS is in Columbia, South Carolina (Amtrak. 2022). No railroads or natural gas pipelines traverse the VCSNS site. A Norfolk-Southern rail line running between Columbia and Spartanburg passes west of the VCSNS site along the east side of the Broad River (NS. 2022; SCE&G. 2010, Section 2.2). Rail access is provided to VCSNS via a spur which leads off the main line from a switch southwest of the site (DE. 2023a, Section 2.2.1.2). A natural gas pipeline serving the Parr Combustion Turbines is approximately 0.8 miles south of the site. In addition to transmission corridors owned and operated by DE, Duke Energy has two 230-kV transmission lines in a ROW that traverses the site near the western boundary. (SCE&G. 2010, Section 2.2)

The Summers Station Heliport is located onsite and is the only heliport or airfield within approximately 10 miles of VCSNS. The nearest full-service airport to VCSNS is Columbia Metropolitan Airport, located in Columbia, South Carolina. (AirNav. 2022)

VCSNS is not located on or near a waterway. Though the site is on the southern tip of the Monticello Reservoir and approximately 1 mile east of the Broad River, neither the river at this location nor the reservoir are considered navigable by the U.S. Army Corps of Engineers. The Broad River near the site is not used for commercial transportation, nor is it a part of the U.S. Inland Waterway System. There are no deepwater seaports or freshwater ports in the region. No railroads or natural gas pipelines traverse the VCSNS site. (SCE&G. 2002, Section 2.2)

E3.1.2 STATION FEATURES

The VCSNS site occupies approximately 2,200 acres and includes southern portions of the Monticello Reservoir and the Fairfield Pumped Storage Facility. The terrain associated with VCSNS consists of low rolling hills carved by creeks and drainages (SCE&G. 2002, Section 2.2.1).

The principal structures at VCSNS are identified in Section E2.2. The VCSNS site boundary, which also serves as the site EAB, Protected Area fence perimeter, and site facilities are depicted in Figure E3.1-1. DE and Santee Cooper maintain absolute ownership of all land contained within the site boundary/EAB. Mineral rights within this area are jointly owned by DE and Santee Cooper and are under the control of DE as manager of the plant. DE also retains the right to maintain control of both plant and non-plant related activities within the Exclusion Area. (DE. 2023a, Section 2.1)

There are no commercial, institutional, recreational, or residential structures within the site boundary/EAB. A 68' ROW has been granted through the Exclusion Area for a 115-kV transmission line owned by Duke Power Company. Terms of this agreement provide for the licensees to retain authority to determine all activities within the Exclusion Area. The only activities within the Exclusion Area that are unrelated to plant operation include those related to the Fairfield Pumped Storage Facility, whose personnel are limited to employees of DE and therefore are subject to administrative controls by the company. (DE. 2023a, Section 2.1)

The Exclusion Area is not and will not be traversed by other than wholly-owned land accesses. The closest primary public road, SC-215/213, lies approximately 6,800 feet east of the Reactor Building centerline and is outside the Exclusion Area. The Broad River is approximately 6,050 feet west of the Reactor Building and is outside the Exclusion Area. The southern portion of the Monticello Reservoir lies within the Exclusion Area. (DE. 2023a, Section 2.1)

The closest railroad not owned by DE and Santee Cooper lies approximately 5,850 feet to the southwest on the outside edge of the site boundary. Licensees own and maintain some railroad facilities within the Exclusion Area. These facilities are used for receipt and shipment of carload freight to and from VCSNS in accordance with an agreement between Southern Railway Company

and the licensees. The licensees are the sole authority for control and operation of these rail facilities. (DE. 2023a, Section 2.1)

E3.1.3 FEDERAL, NATIVE AMERICAN, STATE, AND LOCAL LANDS

As shown in Figures E3.1-5 and E3.1-6, there are a variety of national, state, and local parks, and recreational and wildlife management areas (WMAs), located in the VCSNS 50-mile region. As identified in Table E3.1-1, there are publicly managed lands found within the 6-mile vicinity of VCSNS, both in Fairfield County. A discussion of outdoor recreational opportunities located in the vicinity of VCSNS is in Section E3.9.7. There are no public parks located within the VCSNS site boundary.

There are no federal or state recognized Native American Indian Tribes with reservations or identified lands located within the VCSNS 50-mile region, although the Beaver Creek State Designated Tribal Statistical Area lies just outside the region to the south (NCSL. 2022; USCB. 2021). There are three military installations located within the VCSNS region: Ft. Jackson, McEntire Joint National Guard Base, and North Air Force Auxiliary Field (USDA. 2021a; USDOT. 2021).

E3.1.4 FEDERAL AND NON-FEDERAL RELATED PROJECT ACTIVITIES

The site of the canceled Units 2 and 3 project is involved in an approximately 3-year project wherein Santee Cooper intends to sell components, equipment, and materials for use at offsite projects and locations. Once sold, the items would be removed from the site. Following the project, the site would enter an approximately 3-year salvage period to sell materials (e.g., scrap metal) and equipment. There are no set dates for the completion of the project or the beginning of future phases.

The Units 2 and 3 construction site has also undergone closeout of stormwater permits for temporary basins. These basins have been converted to permanent basins and are maintained as such. There are no plans to close these basins or restore the land they occupy. There are no plans for site restoration beyond the previous temporary basin restoration project.

Between July and September of 2020, a decommissioning of a former firing range adjacent to the Broad River took place in the VCSNS vicinity. Soil in exceedance of the removal action level for lead (Pb) of 800 milligrams per kilogram was removed from the site. The site was then backfilled and hydroseeded. A notice of termination for the NPDES land disturbance permit was filed in July 2021. The decommissioning work on the firing range has been completed.

VCSNS has determined that the current onsite ISFSI pad has enough capacity to store spent nuclear fuel (SNF) through an 80-year period of operation, and therefore no expansion is required

or planned. If ISFSI expansion were needed, it would likely occur on already disturbed land and would cause no significant environmental impact.

Table E3.1-1 Publicly Managed Lands Totally or Partially Within a 6-Mile Radius of VCSNS[a]

Land	Type	County
Francis Marion and Sumter National Forests	Federal	Fairfield
Lake Monticello Park	Local	Fairfield

a. Table list is based on available public information and includes lands totally or partially located within a 6-mile radius of VCSNS.

(FC. 2022a; USDA. 2021a)

Figure E3.1-1 VCSNS Plant Layout

Figure E3.1-2 VCSNS Area Topography

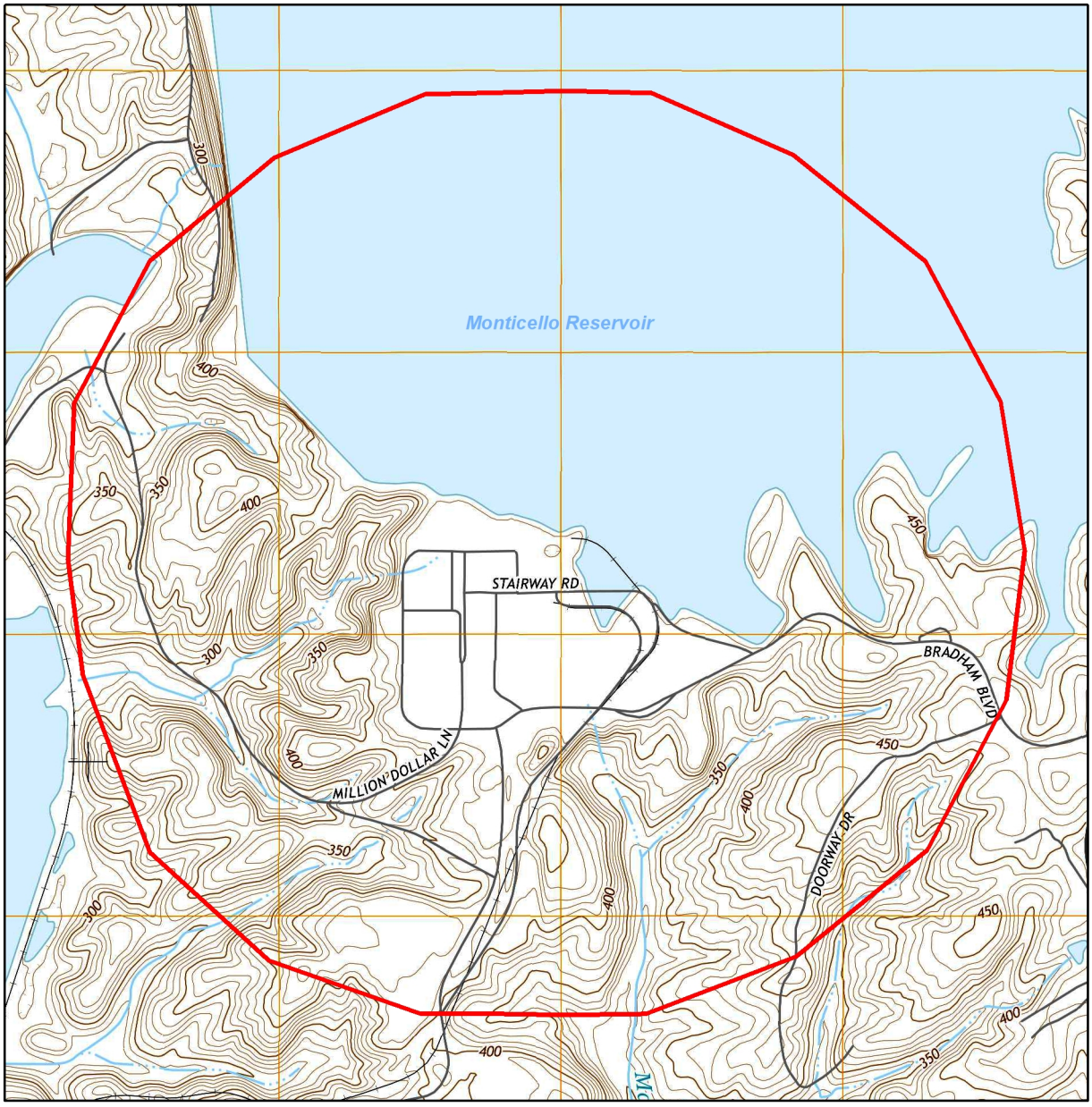


Figure E3.1-3 VCSNS Site and 6-Mile Radius

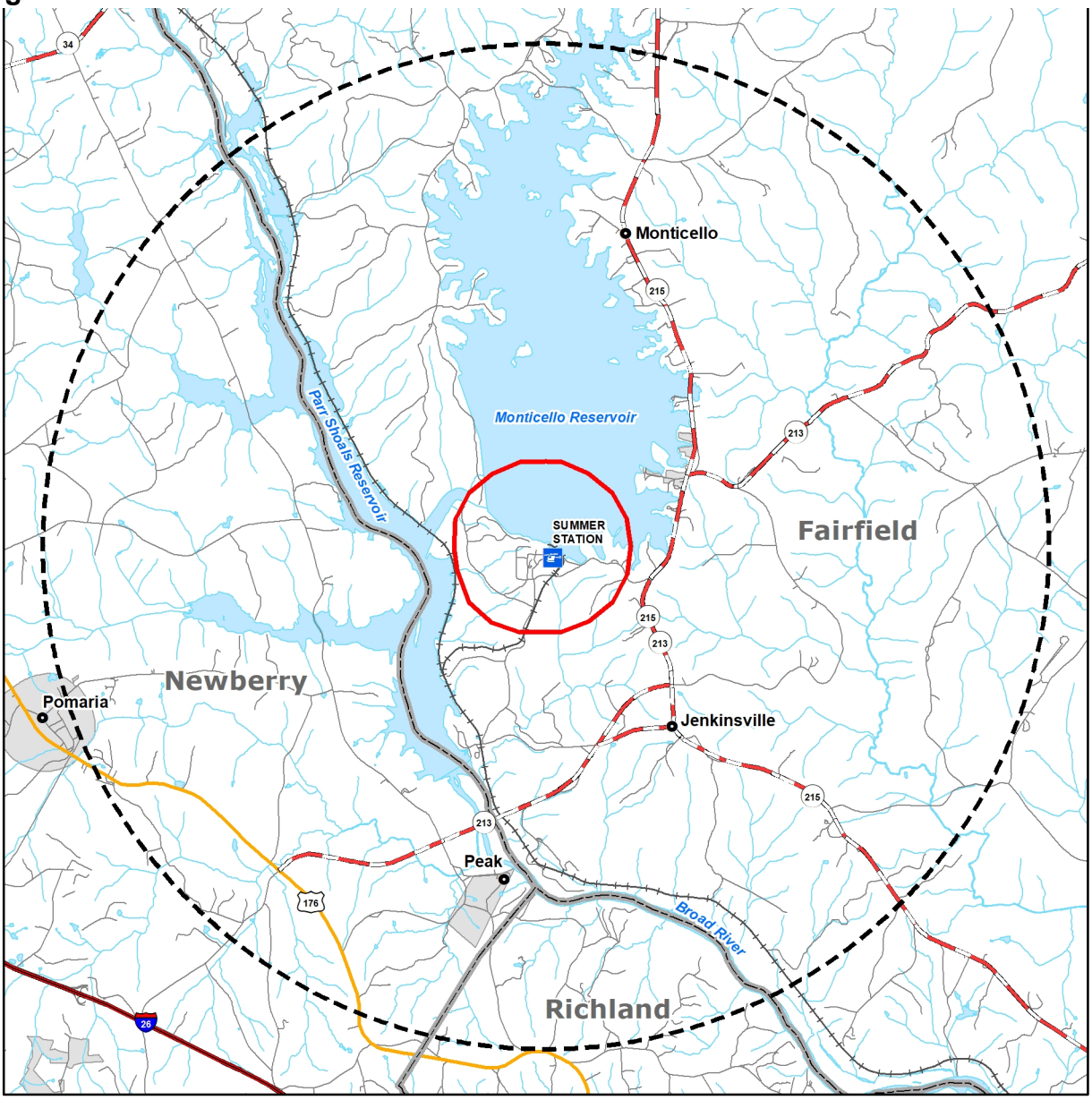


Figure E3.1-4 VCSNS Site and 50-Mile Radius

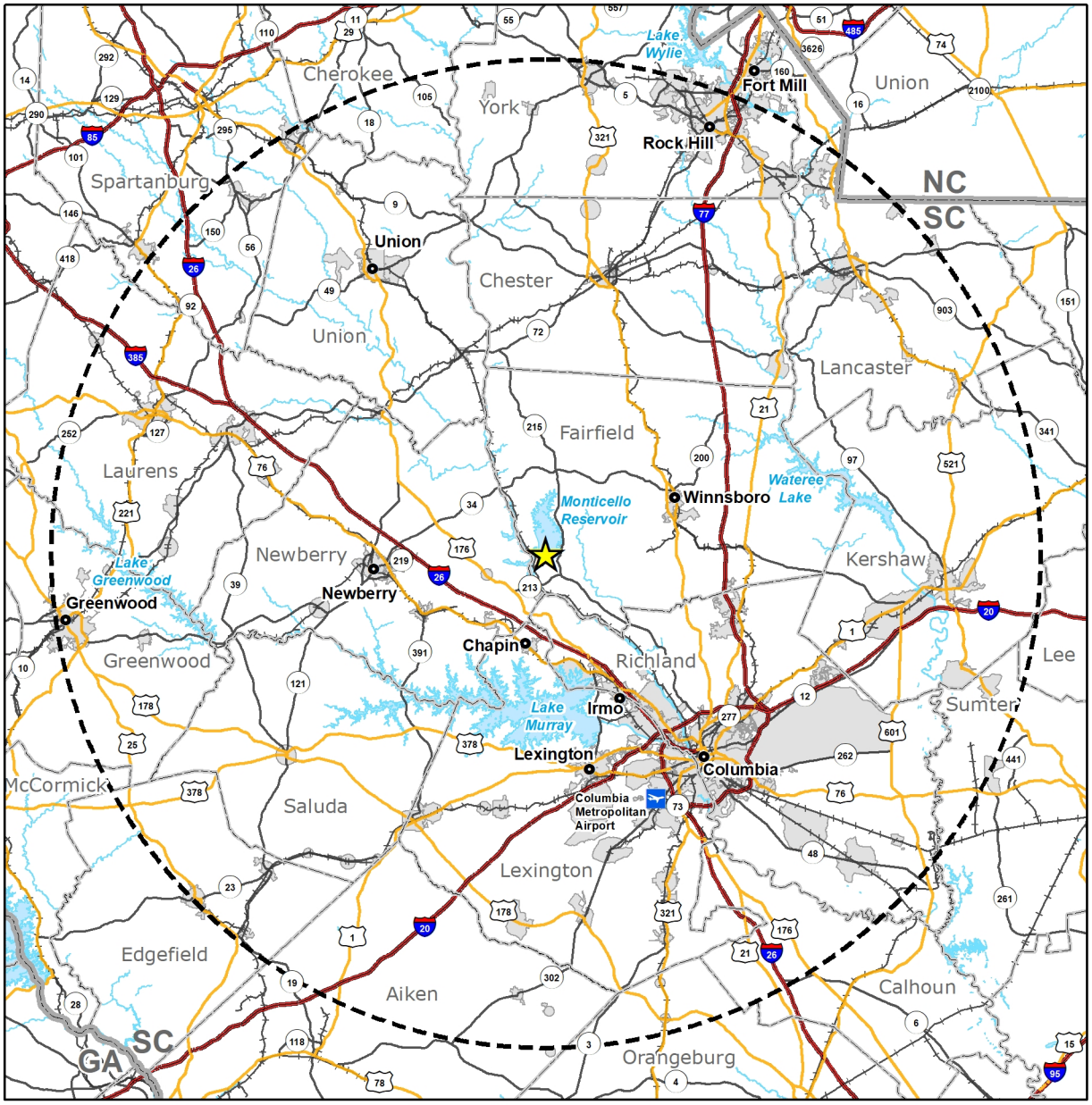


Figure E3.1-5 Federal, State, and Local Lands within a 6-Mile Radius of VCSNS

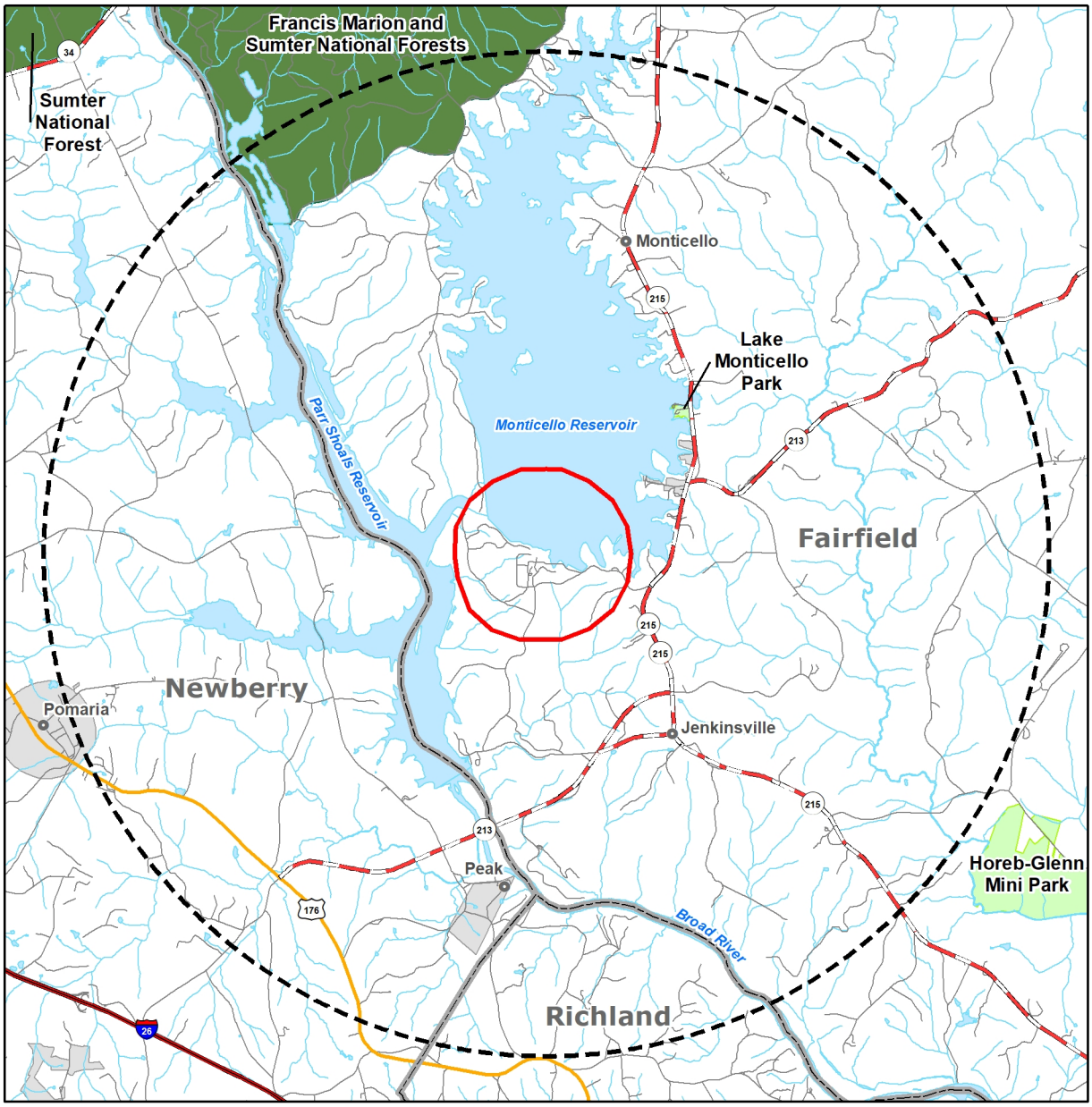
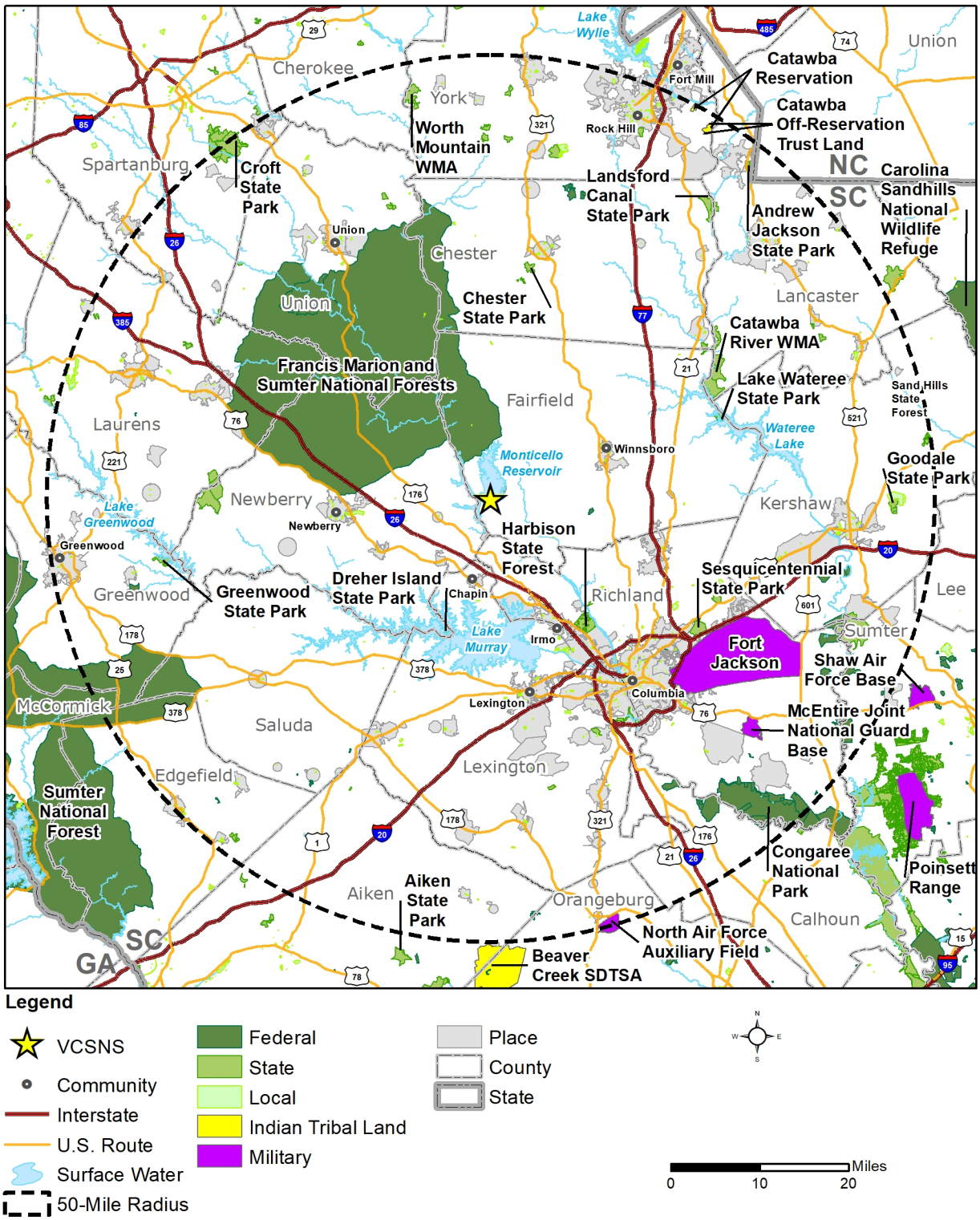


Figure E3.1-6 Federal, State, and Local Lands within a 50-Mile Radius of VCSNS



E3.2 LAND USE AND VISUAL RESOURCES

Land use descriptions focus on Fairfield, Lexington, Newberry, and Richland Counties, South Carolina, because, as described in Section E2.5, approximately 92% of the permanent VCSNS workforce resides in these counties, and because VCSNS pays taxes to Fairfield County.

E3.2.1 ONSITE LAND USE

VCSNS is located in Fairfield County, South Carolina, on the southern shores of the Monticello Reservoir. The site encompasses approximately 2,200 acres and includes southern portions of the reservoir and the Fairfield Pumped Storage Facility. The power generation area, associated roads, parking lots, and maintained grass areas occupy approximately 370 acres of the VCSNS site (SCE&G. 2002). The remainder of the site is comprised of the Monticello Reservoir, forested areas, transmission line ROWs, and portions of the developed area associated with the Unit 2 and Unit 3 construction site. The area surrounding VCSNS is rural and sparsely populated, with Jenkinsville, South Carolina, being the nearest community at approximately 3 miles southeast of the site. As described in Table E3.11-1, Columbia, South Carolina (the state capital), is the largest population center in the region and is approximately 26 miles southeast of VCSNS.

The Monticello Reservoir is the predominant onsite feature and, as shown in Table E3.2-1 and illustrated in Figure E3.2-1, the largest land use/land cover category within the VCSNS site boundary is open water, which covers approximately 37.7% of the site. Developed (low/medium/high intensity) land use/land cover categories account for approximately 24% of the VCSNS site, followed by evergreen forest and shrub/scrub with 19% and 6.9%, respectively. The remaining land use/land cover categories found onsite account for approximately 12.4%. (MRLC. 2021)

VCSNS is zoned as an Industrial District (I-1) according to the Fairfield County Zoning Map and the Land Management Ordinance which was adopted February 27, 2012. This district accommodates individual lots or business park settings, industrial and related wholesaling, distribution, warehousing, processing, office, and administrative uses and promotes land use compatibility with the aid of performance standards. Hydro, fossil fuel, and electric power generation are permitted uses within this district. (FC. 2022b; FC. 2022c)

E3.2.2 OFFSITE LAND USE

As described in Section E3.1, the vicinity (6-mile radius) surrounding VCSNS includes portions of Fairfield, Newberry, Lexington, and Richland Counties. The land use/land cover categories within the vicinity of VCSNS are illustrated in Figure E3.2-2. The area surrounding VCSNS is characterized by rural development, small farms, and forests dominating the area. As seen in Table E3.2-2, evergreen forest is the largest land use/land cover category at approximately 40.6%.

The next largest land use/land cover categories in the vicinity are mixed forests (15.3%), open water (13.3%), and deciduous forest (7.6%). Developed land use/land cover categories account for 5.1%, with the remaining land use/land cover categories found within the vicinity of VCSNS comprising approximately 18.1%. (MRLC. 2021)

Fairfield County occupies approximately 439,218 acres of land, of which 73,082 acres (approximately 16.6%) are proportioned to farmland. The 2017 Census of Agriculture reports that the county had a total of 228 farms, with an average farm size of 321 acres. Approximately 161 farms produce crops, with the primary crops reported as forage (4,238 acres), wheat (240 acres), corn for grain (230 acres), sorghum for grain (15 acres), oats (12 acres), and orchards (5 acres). Other agricultural uses of farmland within the county include woodlands (51,442 acres; 175 farms), pasturelands (10,606 acres; 132 farms), and permanent pasture and rangeland (7,572 acres; 132 farms). Livestock is also an important product in the county, with livestock commodities such as cattle and calves (81 farms), layers (19 farms) hogs and pigs (7 farms), sheep and lambs (7 farms), and broilers and other meat-type chickens (1 farm) reported. (USDA. 2021b)

Lexington County occupies approximately 447,398 acres of land, of which 102,585 acres (approximately 22.9%) are proportioned to farmland. According to the 2017 Census of Agriculture, the county had a total of 1,137 farms, with an average farm size of 90 acres. Approximately 690 farms produce crops, with the primary crops reported as forage (13,350 acres), corn for grain (6,784 acres), soybeans (2,898 acres), cotton (1,595 acres), peanuts (1,284 acres), wheat for grain (692 acres), sorghum for grain (330 acres), orchards (222 acres), oats (111 acres), potatoes (3 acres), and sweet potatoes (2 acres). Other agricultural uses of farmland within the county include woodlands (32,154 acres; 739 farms), pasturelands (18,873 acres; 691 farms), and permanent pasture and rangelands (13,972 acres; 602 farms). Livestock commodities such as cattle and calves (323 farms), layers (190 farms), broilers and other meat-type chickens (74 farms), hogs and pigs (52 farms), and sheep and lambs (29 farms) were also reported for the county. (USDA. 2021b)

Newberry County occupies approximately 403,228 acres of land, of which 94,810 acres (approximately 23.5%) are proportioned to farmland. According to the 2017 Census of Agriculture, the county had a total of 607 farms, with an average farm size of 156 acres. Approximately 436 farms produce crops, with the primary crops reported as forage (13,111 acres), soybeans (3,089 acres), corn for silage or greenchop (2,869 acres), wheat for grain (1,774 acres), corn for grain (1,227 acres), oats (218 acres), orchards (95 acres), potatoes (2 acres) and sweet potatoes (1 acre). Other agricultural uses of farmland within the county include woodlands (35,451 acres; 427 farms), pasturelands (27,719 acres; 426 farms), and permanent pasture and rangelands (22,116 acres; 356 farms). Livestock commodities such as cattle and calves (293 farms), layers (111 farms), hogs and pigs (26 farms), sheep and lambs (25 farms), and broilers and other meat-type chicken (14 farms) were also reported for the county. (USDA. 2021b)

Richland County occupies approximately 484,572 acres of land, of which 52,401 acres (approximately 10.8%) is proportioned to farmlands. The 2017 Census of Agriculture reports that the county had a total of 440 farms, with an average farm size of 119 acres. Approximately 262 farms produce crops, with the primary crops reported as corn for grain (6,692 acres), forage (3,571 acres), soybeans (2,843 acres), wheat (1,581 acres), orchards (79 acres), oats (67 acres), and sunflower seed (3 acres). Other agricultural uses of farmland within the county include woodlands (20,364 acres; 270 farms), pasturelands (5,493 acres; 243 farms), and permanent pasture and rangelands (3,652 acres; 230 farms). Livestock is also an important product in the county, with livestock commodities such as layers (81 farms), cattle and calves (67 farms), hogs and pigs (21 farms), sheep and lambs (11 farms), and broilers and other meat-type chicken (8 farms) reported. (USDA. 2021b)

The South Carolina Local Government Comprehensive Planning Enabling Act of 1994 (S.C. Code Title 6, Chapter 29) and subsequent amendments allows local governments to create a planning commission for the purpose of undertaking a continuing planning program for the physical, social, and economic growth, development, and redevelopment of the area within the local government's jurisdiction. The planning commission has the authority to prepare and periodically revise comprehensive plans and programs as well as prepare and recommend measures for implementing the plan by the appropriate governing bodies. Plans and programs must be designed to promote public health, safety, morals, prosperity, and the general welfare as well as efficiency and economy of its area of jurisdiction. Comprehensive plans are required to address specific planning elements based upon careful comprehensive surveys and studies of existing conditions and probable future development and include recommendations for implementing the plans. Required planning elements include:

- Population
- Economic Development
- Natural Resources
- Cultural Resources
- Community Facilities
- Housing
- Land Use
- Transportation
- Priority Investment

All planning elements must express the planning commission's recommendations to the appropriate governing bodies regarding efficient use of public funds, future growth, development, and redevelopment of its area of jurisdiction, and consideration of the fiscal impact on property

owners. Section 6-29-720 of the South Carolina code requires zoning and development regulations be made in accordance with the comprehensive plan. Comprehensives plans, or elements of it, are to be reviewed as often as necessary, but no less than once every 5 years, and must be updated at least every 10 years. (SCL. 2022)

Comprehensive plans are in place for Fairfield, Lexington, Richland, and Fairfield Counties, and reflect the planning efforts of county governments, as well as public involvement in the planning process (CLSC. 2022; FC. 2021; NCSC. 2022; RCSC. 2015).

The Fairfield County Comprehensive Plan, 2021, was adopted by ordinance by the Fairfield County Council on February 14, 2011, and represents a blueprint for development of the county to 2021. The plan identifies challenges and issues facing the county and prescribes appropriate responses, as well as serves as a basis for regulating land use and the development process. The plan is also intended to guide development and change to meet existing and anticipated needs and conditions; contribute to a healthy and pleasant environment; balance growth and stability; reflect economic potentialities and limitations; and protect investments to the extent reasonable and feasible. (FC. 2021)

Historically, forest and forest-related land uses have been the predominant land uses within Fairfield County. The county's 1997 Comprehensive Plan reported that forest, which includes public, commercial, and non-commercial forests as well as farm woodlands, accounted for 87% of land use within the county. Only 2% was attributed to developed or urban land uses, with most centered in and around the town of Winnsboro and additional urban concentrations found in Ridgeway, in the Mitford community, and along the shores of Wateree Lake. Not much has changed since the 1997 plan as according to the current plan, forests and woodlands comprise over 80% of the land area followed by farmland at 12%, and urban and other land uses accounting for the remainder of the area. Though it is anticipated there will be some change to existing land uses due to growth in population and development, the growth is expected to be slow and at a low rate. (FC. 2021)

The Lexington County Council initiated a "Grow with Us Lexington County" process in early 2020 to update its comprehensive plan, which was originally adopted in 1999. The process involves a five-phase approach which includes project initiation, community assessment and envisioning, growth alternative evaluation, plan development, and plan adoption. The Planning Commission has released several drafts of the comprehensive plan for public hearings, with the latest draft released in April 2022. Prior to the draft comprehensive plan, Lexington County used a blend of zoning systems, unrelated to growth control, to implement land use policies. As the county's pace of growth has increased, this blended system approach has proven to be a limited tool for guiding growth to appropriate areas and away from areas that are priorities for protection. A reevaluation by Lexington County of its development processes resulted in the inclusion of a Future Land Use and

Character Map in the new comprehensive plan to guide future changes to zoning regulations and help achieve the preferred pattern of development for the county. (CLSC. 2022)

Chapter 156 of the Newberry County Council Code of Ordinance incorporates the Comprehensive Plan by reference as part of Title XV, Land Usage ordinances. The Comprehensive Plan serves to guide the unincorporated areas of Newberry County in each element of the plan for development in accordance with existing and future needs and for all those purposes set forth in the S.C. Code Section 6-29-310 et seq, as amended. The land use element of the comprehensive plan is implemented through Zoning Ordinance to promote public health, safety, morals, convenience, order, appearance, prosperity, and general welfare of Newberry County. (NCSC. 2022)

The Richland County Comprehensive Plan was adopted March 17, 2015, and serves as a guide for the type of character that the citizens of the county want to protect and create, establishes specific strategies for creating uniquely urban, suburban, and rural communities, and reassesses the priority areas for capital improvements and public investments. The county has five planning areas known as the Beltway, North Central, Northeast, Northwest, and Southeast planning areas and were established to better address the broad range of planning issues. (RCSC. 2015)

Richland County has a wide range of development patterns which includes a mix of rural, suburban, and urban land uses. As of 2014, agriculture and other working lands are the dominant land uses, accounting for nearly 50% of the land area within the county, with 18% attributed to tax exempt lands such as national and state forest, parks, and other civic structures and areas, and 10% attributed as undeveloped. Much of the new development has occurred within unincorporated portions of the county, with a focus primarily in the Northeast and Northwest planning areas on formerly undeveloped lands near the state capital of Columbia, South Carolina. The development pattern indicates that growth is spreading outward, away from Columbia and into further reaches of the county. Protecting the uniquely rural and agricultural character of Richland County from the encroachment of development while supporting suburban development has led to recent updates to the Richland County Land Development Code and the inclusion of the Open Space Code. The Open Space Code provides incentives for conservation subdivision designs that protect important natural areas and farmlands. Additionally, the comprehensive plan's Future Land Use Map reflects the current vision for Richland County and provides the framework for urban redevelopment, for the development of neighborhoods, commercial and employment centers, and rural lands and rural environmental preservation. The Future Land Use map also provides guidance when making decisions about zoning and infrastructure investments by identifying the type and character of development that should occur in specific areas. The comprehensive plan was developed concurrently with the update to the City of Columbia's Comprehensive Plan to coordinate land planning in areas of common interest or shared boundaries and encourage a cohesive development pattern in these areas. (RCSC. 2015).

E3.2.3 VISUAL RESOURCES

As presented in Section E3.1, VCSNS is located on the southern shores of the Monticello Reservoir in Fairfield County, South Carolina. Figure E3.1-1 shows the building site layout and site boundary in association with the Monticello Reservoir and the Parr Shoals Reservoir. The surrounding area is sparsely populated with forestry representing the most extensive land use within the vicinity followed by agriculture. The nearest resident to VCSNS is located approximately 1.04 miles east southeast from the site center point. (DE. 2021a)

Predominant visual features at VCSNS include the Reactor Containment Building, Auxiliary Buildings, Control Building, Turbine Building, Diesel Generator Building, and transmission corridors. The tallest structure onsite is the Reactor Containment Building which is approximately 166 feet in height. The area surrounding VCSNS is primarily forest, open water, and farmlands with small residential areas and communities interspersed. Though views of VCSNS are offered from the Monticello Reservoir, portions of SC 215, and lands along the eastern shore of the reservoir, the surrounding forest and general topography of the area provide visual screening and limits the visibility of the entire facility to adjacent communities. (NRC. 2004b) There are no plans for refurbishment that would create new visual impacts during the proposed SLR operating term. Therefore, VCSNS would continue to have minimal visual impact on the neighboring residents, communities, SC 215, and the Monticello Reservoir.

Table E3.2-1 Land Use/Land Cover, VCSNS Site

Category	Acres	Percent
Open Water	835.1	37.7
Developed, Open Space	76.9	3.5
Developed, Low Intensity	91.0	4.1
Developed, Medium Intensity	152.6	6.9
Developed, High Intensity	209.3	9.5
Barren Land (Rock/Sand/Clay)	29.8	1.4
Deciduous Forest	58.0	2.6
Evergreen Forest	421.2	19.0
Mixed Forest	54.0	2.4
Shrub/Scrub	153.0	6.9
Grassland/Herbaceous	73.8	3.3
Pasture/Hay	54.5	2.5
Woody Wetlands	1.8	0.1
Emergent Herbaceous Wetlands	2.4	0.1
Total	**2,213.5[(a)]**	**100.0**

(MRLC. 2021)

Note: Acreages are based on the Multi-Resolution Land Characteristics Consortium (MRLC) land use/land cover data. These data are presented in a raster (pixel-based) format. Because of their square geographies, they do not exactly match the VCSNS site boundary. This geographic variation creates a small difference between the total acreage reported in Table E3.2-1 compared to the VCSNS site boundary acreage stated throughout the ER.

Table E3.2-2 Land Use/Land Cover, 6-Mile Radius of VCSNS

Category	Acres	Percent
Open Water	9,647.5	13.3
Developed, Open Space	2,103.0	2.9
Developed, Low Intensity	712.8	1.0
Developed, Medium Intensity	462.4	0.6
Developed, High Intensity	459.7	0.6
Barren Land (rock/sand/clay)	132.5	0.2
Deciduous Forest	5,491.4	7.6
Evergreen Forest	29,402.4	40.6
Mixed Forest	11,092.8	15.3
Shrub/Scrub	4,576.0	6.3
Grassland/Herbaceous	3,013.9	4.2
Pasture/Hay	2,448.6	3.4
Cultivated Crops	390.7	0.5
Woody Wetlands	2,288.7	3.2
Emergent Herbaceous Wetlands	215.5	0.3
Total	**72,437.7**	**100.0**

(MRLC. 2021)

Figure E3.2-1 Land Use/Land Cover, VCSNS Site

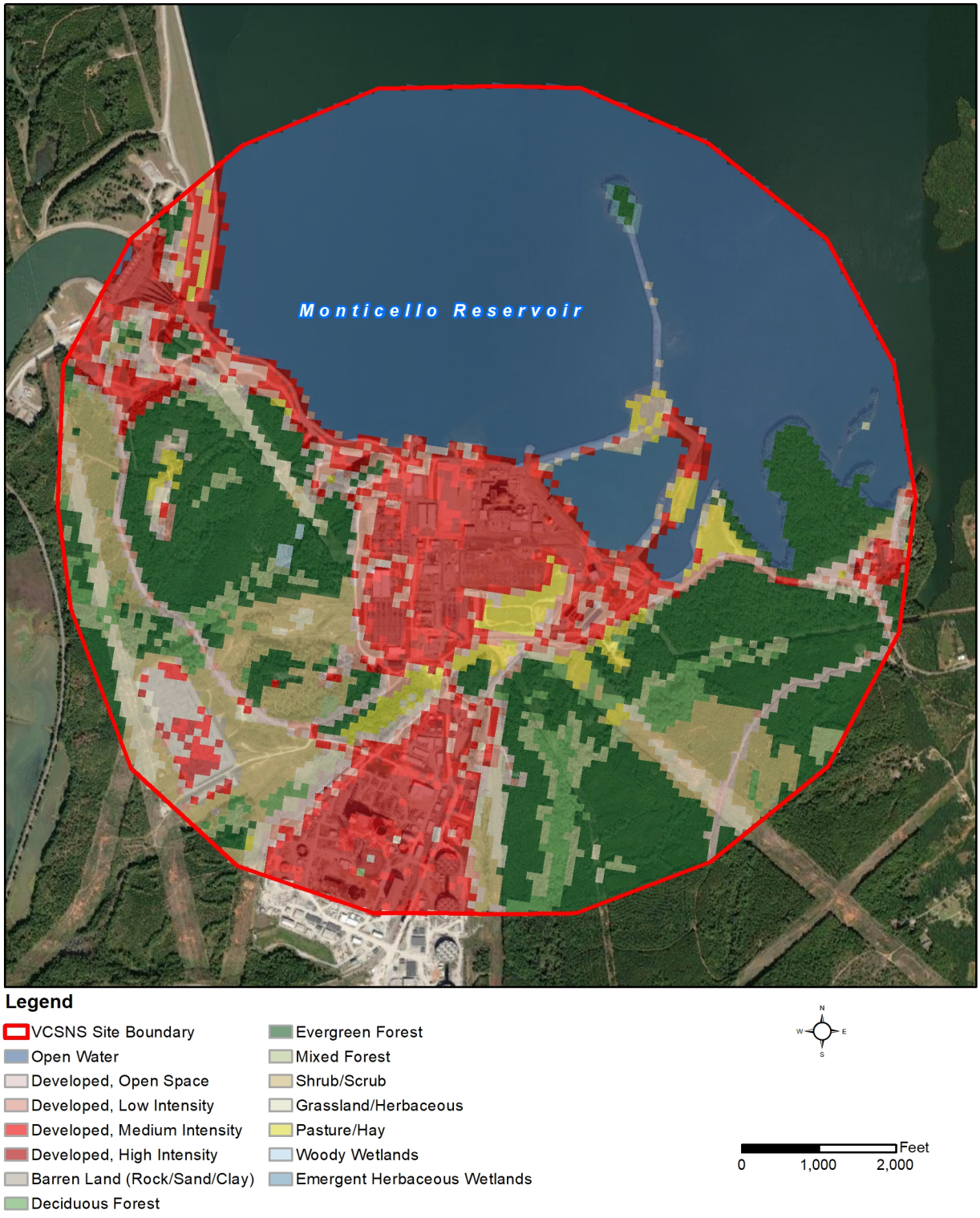
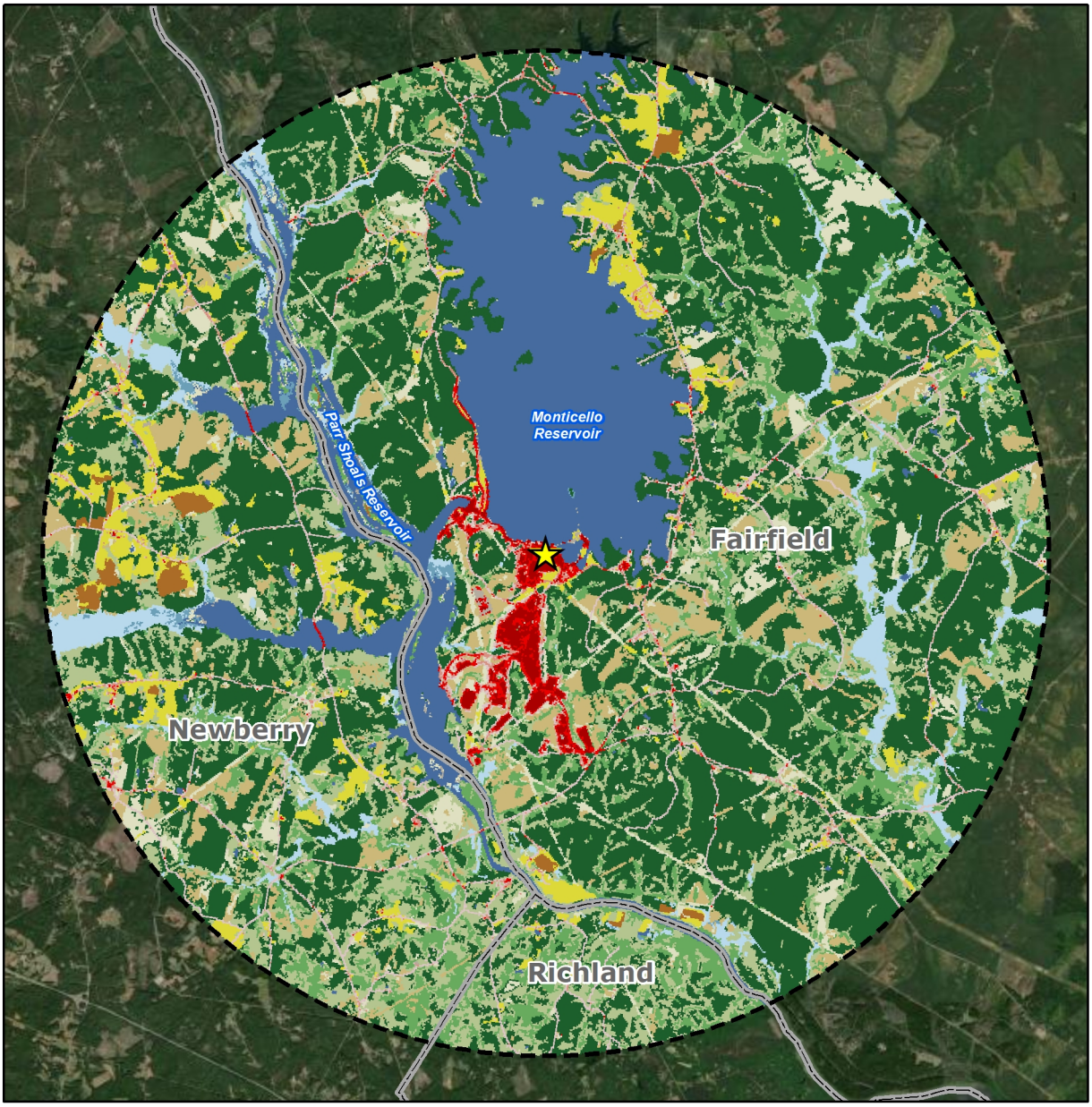


Figure E3.2-2 Land Use/Land Cover, 6-Mile Radius of VCSNS



E3.3 METEOROLOGY AND AIR QUALITY

The meteorology, climate, and air quality of VCSNS were previously evaluated during the VCSNS Unit 1 license renewal approval processes (NRC. 2004b, Section 2.2.4). VCSNS is located in Fairfield County, South Carolina, approximately 26 miles northwest of Columbia, South Carolina. A high-level overview of the plant layout is provided in Figure E3.1-1.

Climatological data presented below have been provided to represent a range of meteorological conditions considered typical for the VCSNS site region. The Columbia weather station (KCAE) is the closest first-order National Weather Service (NWS) data collection station to VCSNS with a significant period of meteorological data, and thus has been used to describe the representative climatic conditions. Columbia climatological information has been used in previous VCSNS licensing environmental reviews, thus making its continued use appropriate for comparison. (NRC. 2004b, Section 2.2.4)

E3.3.1 GENERAL CLIMATE

Columbia is centrally located within the state of South Carolina and lies on the Congaree River near the confluence of the Broad and Saluda Rivers. The surrounding terrain is rolling, sloping from about 350 feet above sea level in northern Columbia to about 200 feet in the southeastern part of the city. The climate is relatively temperate, but the terrain offers little moderating effect on the summer heat. (NCDC. 2022a)

Long summers are prevalent with warm weather usually lasting from sometime in May into September. In summer, the Bermuda high is the greatest single weather factor influencing the area. This permanent high more or less blocks the entry of cold fronts so that many stall before reaching central South Carolina. The southwestern flow around the offshore Bermuda high pressure supplies moisture for summer thunderstorms. There are relatively few breaks in the heat during midsummer. The typical summer has about six days with 100 degrees or more. Thunderstorm activity usually shows a decided increase during June, decreasing about the first of September. Fall is the most pleasant time of the year because rainfall during the late fall is at an annual minimum, while the sunshine is at a relative maximum. The first fall freeze is normally in early November. (NCDC. 2022a)

The Appalachian Mountain chain, some 150 miles to the northwest, frequently retards the approach of unseasonable cold weather in the winter. Winters are mild with the cold weather usually lasting from late November to mid-March. On rare occasions in winter, Arctic air masses push southward as far as central South Carolina and cause some of the coldest temperatures. Disruption of activities from snowfall is unusual, and more than three days of sustained snow cover is rare. (NCDC. 2022a)

In spring, the temperature varies from an occasional cold snap in March to generally warm and pleasant temperatures in May. While tornadoes are infrequent, they occur most often in the spring. Hailstorms are also infrequent, with the annual incidence at a maximum in spring and early summer. The average occurrence of the final annual spring freeze is very late March. (NCDC. 2022a)

About once or twice a year, passing tropical storms produce strong winds and heavy rains. The incidence of these storms is greatest in September, although they represent a possible threat from midsummer to late fall. Damage from tropical storms is usually minor in the Columbia area. (NCDC. 2022a)

Like the Columbia weather station, the VCSNS site is situated on terrain consisting of rolling hills. Climatological records for Columbia, South Carolina, are generally representative of VCSNS. (NCDC. 2022a; NRC. 2004b) For detailed meteorological information about VCSNS meteorology, see Section E3.3.2.

E3.3.2 METEOROLOGY

E3.3.2.1 Wind Direction and Speed

As listed in Table E3.3-2, the prevailing wind at the VCSNS site is from the south-southwest to west during the majority of the year and from the north-northeast to northeast during the months of September and October. The average annual wind speed is 6.8 miles per hour (mph).

For the Columbia NWS station, the 49-year period of record data shows the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 240 degrees (i.e., from the west-southwest). Monthly prevailing winds are from the west-southwest during the majority of the year, except for during the months of September and October where the prevailing wind is from the north-northwest to northeast. As listed in Table E3.3-1, the mean wind speed over the past 37-year period of record was 6.1 mph. A maximum three-second wind speed of 75 mph was recorded in April 2011. (NCDC. 2022a)

Mean monthly wind speeds at the VCSNS site are provided in Table E3.3-2, based on a 30-year record (1992–2021) of measurements from the lower level (32.8 feet above ground level) of the onsite meteorological monitoring system. Annual wind rose diagrams for the period 2017–2021 are provided in Figures E3.3-1, E3.3-2, E3.3-3, E3.3-4, and E3.3-5.

E3.3.2.2 Temperature

Representative regional temperature averages and extremes are available from the Columbia monitoring station. The local climate data summary for the Columbia area indicates that the mean daily maximum temperature is highest during July (92.5°F) and decreases to the seasonal low in January (56.6°F). The Columbia area experiences normal temperatures above 90°Fapproximately

72 days per year from April through October. The highest temperature of record (109°F) occurred in June 2012. The mean daily minimum temperature is above 50°F from April through October and is at its lowest in January, when the mean daily minimum decreases to 33.9°F. Record low temperatures less than 0°F have been recorded in January, with below freezing temperatures normally occurring approximately 48 days per year from October through April. The lowest temperature of record in Columbia is -1°F, occurring in January 1985. (NCDC. 2022a) Monthly and annual daily mean temperature data and temperature extremes for the Columbia area are summarized in Table E3.3-3.

Average temperatures at VCSNS are 45°F in January and 83°F in July, with annual extremes of approximately 11°F low and 104°F high. Monthly and annual daily mean temperature data and temperature extremes for the VCSNS site are summarized in Table E3.3-4. On average, VCSNS has slightly lower temperatures than Columbia. (NCDC. 2022a)

E3.3.2.3 Precipitation

As noted in Table E3.3-6, precipitation in the VCSNS vicinity is generally evenly distributed throughout the year, ranging from 3.0–4.6 inches per month. The precipitation pattern is similar to the Columbia Airport station where precipitation peaks in June through September. Precipitation data was taken from the Winnsboro, South Carolina, weather station. (NCDC. 2022b)

The precipitation records of normal rainfall totals for the Columbia area indicate that precipitation of 0.01 inches or more occurs on average for 108 days per year, with seven or more days per month receiving at least some precipitation. The annual average precipitation at the Columbia station is 44.69 inches per year. Precipitation recorded at the weather station is relatively well-distributed throughout the year with a mean of approximately 3 or more inches falling during most months. The highest seasonal precipitation occurs during the summer (approximately 22% falling in July and August), which also coincides with record events where more than 6 inches have occurred in a 24-hour period. There is considerable variability in total monthly amounts from year to year. While the summer months may experience significant rainfall events, those months can also be very dry. Droughts have been experienced but are usually of short duration. Normal regional precipitation and extremes are presented in Table E3.3-5. The maximum 24-hour precipitation total recorded at Columbia, 8.74 inches, occurred in October 2015. Columbia received a record minimum monthly rainfall total (0.00 inches) in October 1963. (NCDC. 2022a)

Review of data collected for the period from 1992–2021 indicates that the average monthly precipitation is highest in August (4.6 inches) and is lowest in April (3.0 inches) (Table E3.3-6). The Winnsboro weather station data also indicate that while significant rainfall may occur in some years during June to September, these months can also receive very little precipitation. Based on data collected over the 30-year period, the VCSNS vicinity receives approximately 0.8 inches more precipitation per year than Columbia. (NCDC. 2022b)

E3.3.2.4 Snow and Glaze

In the Columbia area, winters are mild with daytime temperatures going below freezing, during the daylight hours, a few times during a normal year. Columbia receives an average of approximately 1.5 inches of snow per year. Since 1992, annual snowfall has ranged from as little as 0 inches in 2 years to 8.9 inches (2009–2010). (NCDC. 2022a) Snowfall at the site is not recorded by VCSNS.

E3.3.2.5 Relative Humidity and Fog

The closest available fog data for the VCSNS region are from the NWS Columbia observation station. The local climatological data for Columbia indicate an average of 18.5 days per year of heavy fog. Heavy fog is defined by the NWS as fog which reduces visibility to 0.25 miles or less. (NCDC. 2022a) Fog at the site is not recorded by VCSNS.

E3.3.2.6 Severe Weather

E3.3.2.6.1 Thunderstorms

Climatological records show that the area is subject to occasional storms, including destructive winds. (NRC. 2004b, Section 2.2.4) Thunderstorms are frequent during the late spring and summer months, with the greatest occurrence during the month of July. The mean number of days with thunderstorms in each month for Columbia is provided in Table E3.3-7. Based on National Centers for Environmental Information (NCEI) records, Fairfield County, South Carolina, has recorded 255 significant thunderstorm events since 1950, with most of the thunderstorms occurring in June, July, and August and Newberry County, South Carolina, has recorded 330 significant thunderstorm events since 1950, with most of the thunderstorms occurring in June, July, and August. (NCEI. 2022).

E3.3.2.6.2 Tornadoes

Tornadoes are infrequent in this region and are generally small when they occur. (NRC. 2004b, Section 2.2.4) Based on NCEI records, a total of 27 tornadoes have been recorded in Fairfield County, South Carolina, since 1983. The records show that the intensity of the storms was limited to EF0, F0, F1, and F2 with one exception of an F3 and F4 that occurred on March 28, 1984. Newberry County, South Carolina, has recorded 38 tornadoes since 1957. The records show that the intensity of the storms was limited to EF0, F0, F1, EF1, F2, and EF2 apart from several F3 tornadoes occurring on December 13, 1973; March 28, 1984; and November 22, 1992. There was an F4 tornado on March 15, 2008. (NCEI. 2022)

E3.3.2.6.3 Hurricanes

Most years, one or more tropical storms affect the site; however, VCSNS is sufficiently far inland that the winds associated with these storms are below hurricane force. (NRC. 2004b, Section 2.2.4) Since VCSNS has been operating, many former hurricanes, downgraded to tropical storms, have tracked within 60 nautical miles of the plant. One hurricane, Hurricane Hugo, remained a hurricane as it tracked within 60 nautical miles of the plant. Hurricane Hugo made landfall as a Category 4 hurricane and had downgraded to a Category 2 hurricane as it passed by VCSNS on September 22, 1989. (NOAA. 2022a)

E3.3.2.7 Atmospheric Stability

Atmospheric stability is a meteorological parameter that describes the dispersion characteristics of the atmosphere. It can be determined by the difference in temperature between two heights. A seven-category atmospheric stability classification scheme (ranging from A for extremely unstable to G for extremely stable) based on temperature differences is set forth in the NRC's Regulatory Guide 1.23, Revision 1 (NRC. 2007). When the temperature decreases rapidly with height (typically during the day when the sun is heating the ground), the atmosphere is unstable and atmospheric dispersion is greater. Conversely, when temperature increases with height (typically during the night as a result of the radiative cooling of the ground), the atmosphere is stable, and dispersion is more limited. The stability category between unstable and stable conditions is D (neutral), which would occur typically with higher wind speeds and/or higher cloud cover, irrespective of day or night. (NRC. 2013c, Section 2.9.1.4)

Based on a four-year average (2017, 2018, 2020, 2021), onsite temperature difference data recorded at VCSNS indicate that stable atmospheric conditions (E to G) occurred about 32.8% of the time and unstable conditions (A to C) occurred about 33.9% of the time. The remaining observations (about 33.3%) fell into the neutral (D) category. Stability class distributions at VCSNS covering the period 2017–2021, excluding 2019, are presented in Table E3.3-8. (SCE&G. 2018a; SCE&G. 2019a; DE. 2021b; DE. 2022b)

E3.3.3 AIR QUALITY

E3.3.3.1 Clean Air Act Nonattainment Maintenance Areas

The Clean Air Act (CAA) was established in 1970 [42 USC § 7401 et seq.] to reduce air pollution nationwide. The EPA has developed primary and secondary national ambient air quality standards (NAAQS) under the provisions of the CAA. The EPA classifies air quality within an air quality control region (AQCR) according to whether the region meets or exceeds federal primary and secondary NAAQS. An AQCR or a portion of an AQCR may be classified as being in attainment or nonattainment, or it may be unclassified for each of the six criteria pollutants: carbon monoxide

(CO), Pb, nitrogen dioxide, particulate matter ($PM_{2.5}$, fine particulates; and PM_{10}, coarse particulates), ozone, and sulfur dioxide (SO_2).

Emissions from nonradiological air pollution sources, including the criteria pollutants, are controlled through compliance with federal, state, and local regulations. Nonattainment areas are areas where the ambient levels of criteria air pollutants in the air are designated as exceeding the limits set forth in federal, state, and local regulations. Attainment areas are areas that do not exceed the limits or cannot be classified (depending on the pollutant and other factors). A maintenance area is an area that formerly exceeded the attainment limits but currently does not exceed the attainment limits. (EPA. 2022b)

The VCSNS site is located in the Columbia Intrastate AQCR (40 CFR 81.108). There are five additional AQCRs within 50 miles of the site. These are the Metropolitan Charlotte Intrastate AQCR (40 CFR 81.75), the Greenville-Spartanburg Intrastate AQCR (40 CFR 81.106), the Greenwood Intrastate AQCR (40 CFR 81.107), the Camden-Sumter Intrastate AQCR (40 CFR 81.110), and the Augusta (Georgia)-Aiken (South Carolina) Interstate AQCR (40 CFR 81.114). There are two ACQRs that lie between 50 and 62 miles of the site. These are the Eastern Mountain Intrastate AQCR (40 CFR 81.147) and the Florence Intrastate AQCR (40 CFR 81.109).

As of April 30, 2022, all the counties within 62 miles of the site are in attainment. There are four counties in the Metropolitan Charlotte Intrastate AQCR designated as maintenance areas. These counties include Gaston, Mecklenburg, and Union Counties, North Carolina, and York County, South Carolina. All of these counties are designated as maintenance areas for 8-hour Ozone (2008). Mecklenburg County, North Carolina is also designated as a maintenance area for CO (1971). (EPA. 2022b)

Figure E3.3-6 illustrates maintenance areas defined under the CAA, as amended, within a 65-mile radius of VCSNS. There are no areas designated in 40 CFR, Part 81, Subpart D, as mandatory Class I federal areas in which visibility is an important value within 100 miles of VCSNS (NRC. 2004b). Given the minor nature of air emissions associated with operations of VCSNS, the distances to any Class I federal area are sufficiently far as to not warrant concern.

E3.3.3.2 Air Emissions

Diesel generators, boilers, and other activities and facilities associated with the VCSNS site emit various nonradioactive air pollutants to the atmosphere. As described in the 2004 SEIS, VCSNS originally had an air permit (CM-1000-0012) for the site (NRC. 2004b). Since the 2004 SEIS was written, many of the emission sources have changed by replacement or decommissioning. In 2012, VCSNS requested and has received an exemption from the requirement to obtain an air permit based on South Carolina Regulation 61-62.1 Section II Part B.2.f.i, ii, and h. The regulation exempts emergency power generators with a capacity of less than 150 kW and generators of greater than 150 kW rated capacity used only for emergencies and are operated a total of

500 hours per year or less for testing and maintenance. The state regulation also allows an exemption to emissions sources on the site if the total uncontrolled potential to emit less than 5 tons per year of particulates, SO_2, nitrogen oxides (NO_x), and CO, and a total of less than 1,000 lbs per month of volatile organic compounds (VOCs). (SCDHEC. 2019a) A list of estimated diesel generator emissions at VCSNS is provided in Table E3.3-9. The emission sources at VCSNS include power generators, an auxiliary boiler used during outages, and other miscellaneous sources such as storage tanks and a paint booth. There are no annual reporting requirements for VCSNS.

As presented in Section E2.3, no license renewal-related refurbishment or other license renewal-related construction activities have been identified. In addition, DE's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel pumps) that would affect VCSNS's current air emissions program. Therefore, no increase or decrease of air emissions is expected over the proposed SLR operating term.

Studies have shown that the amount of ozone generated by even the largest industry transmission lines in operation (765 kV) would be insignificant (NRC. 2013a, Section 4.3.1.1). As presented in Section E2.2.5, the in-scope transmission lines at VCSNS are 230 kV and 115 kV. Therefore, the amount of ozone generated from in-scope transmission lines is anticipated to be minimal.

E3.3.4 GREENHOUSE GAS EMISSIONS

No data exist for mobile emission sources at VCSNS such as visitors and delivery vehicles. Therefore, DE calculated greenhouse gas (GHG) emissions in carbon dioxide equivalent (CO_2e) on those direct (stationary and portable combustion sources in Table E3.3-9 and indirect (workforce commuting) plant activities where information was readily available. GHG emissions generated at VCSNS are presented in Table E3.3-10. Based on AP-42 emission factors, an additional estimated 466 metric tons of CO_2e are emitted from the auxiliary boiler during an outage.

The global warming potential for blended refrigerants ranges from zero to several thousand times the global warming potential of carbon dioxide (CO_2) (EPA. 2022b). As presented in Section E9.5.2.3, DE maintains a program to manage stationary refrigeration appliances at VCSNS to recycle, recapture, and reduce emissions of ozone-depleting substances and is in compliance with Section 608 of the CAA. Therefore, DE did not include potential emissions as the result of leakage, servicing, repair, and disposal of refrigerant equipment in Table E3.3-10.

Table E3.3-1 Regional Wind Conditions, Columbia (KCAE), South Carolina

	Period of Record[a]	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean speed (mph)	37	6.6	6.9	7.3	7.5	6.6	6	5.7	5.1	5.5	5.3	5.2	5.8	6.1
Prevailing direction (degrees from)	49	250	260	250	250	250	240	240	240	20	40	260	260	240
Max three-second speed (mph)	25	49	62	55	75	71	59	75	64	55	48	47	51	75
Max speed year of occurrence		2010	2020	2014	2011	2006	2019	2007	2002	2011	2019	2010	2012	Apr. 2011

a. In years.

(NCDC. 2022a)

Table E3.3-2 VCSNS Wind Conditions (1992–2021)

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean speed (mph)	6.8	7.2	7.6	7.4	6.8	6.3	5.9	6.1	7.3	6.9	6.9	6.7	6.8
Prevailing direction (degrees from)	260	260	260	210	210	230	220	210	40	30	250	260	220

Note: Recorded wind measurements, lower level, for January 1992 through December 2021.

Table E3.3-3 Regional Temperatures, Columbia (KCAE), South Carolina

	Period of Record[a]	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean daily maximum (^{o}F)	73	56.6	60.5	67.9	76.8	84.1	89.8	92.5	90.9	85.6	76.7	67.2	58.9	75.6
Highest daily maximum (^{o}F)	73	84	84	91	94	101	109	107	107	101	101	90	83	109
Year of occurrence		1975	2014	1974	1986	2019	2012	1952	2007	1954	1954	1961	1978	June 2012
Mean daily minimum (^{o}F)	73	33.9	36.4	42.8	50.8	59.7	67.4	71.2	70.3	64.4	51.7	41.4	35.7	52.1
Lowest daily minimum (^{o}F)	73	-1	5	4	26	34	44	54	53	40	23	12	4	-1
Year of occurrence		1985	1973	1980	2007	1963	1984	1951	1969	1967	1952	1970	1958	Jan 1985

a. In years.

(NCDC. 2022a)

Table E3.3-4 VCSNS Site Temperatures, 1992–2021

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Monthly average (^{o}F)[(a)]	45.1	50.1	57.1	65.6	73.5	80.1	82.9	81.9	76.7	66.8	55.9	49.3	65.2
Highest daily maximum (^{o}F)	78.1	80.5	85.8	89.5	95.9	103.3	101.8	104.3	95	96	81.3	78.6	104.3
Year of occurrence	1999	1993	1995	2003	1999	2012	2012	2007	2016	2011	1995	1993	2007
Lowest daily minimum (^{o}F)	10.5	12.1	19.2	29.7	42.7	13.7	58.3	58.3	47.9	30.1	22.9	16.7	10.5
Year of occurrence	1994	1996	1996	1996	1996	2002	1992	1999	2001	2001	1993	2010	1994

a. Calculated average of all temperature measurements for each month and of all measurements for the period 1992–2021.

Note: Neither ambient temperature nor precipitation are required to be reviewed or archived during plant operation. As such, the data present high variability when compared with other data sources. The data presented here have been adjusted by removing anomalies via comparison to other data sources, such as the Columbia Airport weather station.

Table E3.3-5 Regional Precipitation (inches), Columbia (KCAE), South Carolina

	Period of Record[a]	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Normal monthly precipitation	30	3.58	3.61	3.73	2.62	2.97	4.69	5.46	5.26	3.54	3.17	2.74	3.22	44.59
Maximum monthly precipitation	73	9.26	8.68	10.89	6.85	9.39	14.81	17.46	16.72	8.78	14.46	7.2	9.31	17.46
Year occurred		1978	1961	1973	1979	2002	1973	1991	1949	1953	2015	1957	2019	July 1991
Maximum 24-hour	73	3.15	3.69	3.59	3.66	5.57	5.44	5.81	7.66	6.23	8.74	2.81	4.16	8.74
Year occurred		1993	1962	1960	1956	1967	1973	1959	1949	1953	2015	2009	2019	Oct. 2015
Minimum monthly precipitation	73	0.84	0.87	0.56	0.29	0.29	0.49	0.57	0.22	0.07	Trace	0.41	0.32	0.07
Year occurred		1981	1976	1985	1994	1951	2002	1977	1997	2005	1963	1973	1955	Sep. 2005

a. In years.

(NCDC. 2022a)

Table E3.3-6 Winnsboro Precipitation Records (1992–2022)

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Normal monthly precipitation (in.)	4	3.7	3.9	3	3.1	4.1	4.3	4.6	3.8	3.3	3.1	4.1	45.4
Maximum monthly precipitation (in.)	7.5	8.1	9.6	5.8	8.2	10.6	11.2	9.6	10.8	14.6	8.5	8.3	14.6
Year occurred	1998	2020	2003	2022	2016	2006	2012	2013	2004	2015	1992	2009	2015
Minimum monthly precipitation (in.)	1.3	1.2	0.9	0.7	0.1	1	0.6	1.2	0.1	0	0.7	1.1	0
Year occurred	2011	2009	2006	2021	2015	1993	1995	2017	2005	2000	2021	2004	2000

(NCDC. 2022a)

Table E3.3-7 Regional Thunderstorms, Columbia (KCAE), South Carolina

Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
0.9	1.3	2.5	3.5	5.9	9.3	12	9.2	3.6	1.2	1	0.4	50.8

(NCDC. 2022a)

Table E3.3-8 VCSNS Stability Class Distributions

Percent Frequency of Occurrence by Stability Class							
Year	**Pasquill Stability Class[a]**						
	A	**B**	**C**	**D**	**E**	**F**	**G**
2017	6.6	8.2	11.5	38.0	22.0	7.9	5.7
2018	6.8	9.5	13.1	38.1	21.5	6.7	4.3
2020	18.5	9.5	11.4	31.0	18.6	6.7	4.2
2021	18.1	10.3	12.0	26.1	17.6	9.0	7.0
2017–2021	**12.5**	**9.4**	**12.0**	**33.3**	**19.9**	**7.6**	**5.3**

(SCE&G. 2018a, SCE&G. 2019a; DE. 2020a; DE. 2021a; DE. 2022b)

a. Classes are as follows (NRC. 2007, Table 1):

Class A: Extremely unstable

Class B: Moderately unstable

Class C: Slightly unstable

Class D: Neutral

Class E: Slightly stable

Class F: Moderately stable

Class G: Extremely stable

Table E3.3-9 VCSNS Maximum Insignificant Air Emissions

Description	Count	kWh/Year	CO_2e (Metric Tons)
5100kW Emergency Diesel Generators	2	5,100,000	1,291
300kW to 750kW Diesel Generators/Equipment	10	2,230,710	565
80kW to 150kW Diesel Generators	16	656,143	166
1kW to 5.5kW Portable Generators	45	111,950	28

Note: Assumes all generators are used 500 hours per year. CO_2e emissions estimated using EPA's Emission Factors for Greenhouse Gas Inventories Table 1.
(EPA. 2022c)

Table E3.3-10 VCSNS Greenhouse Gas Emissions Inventory Summary

Carbon Dioxide Equivalent (CO_2e) Emissions, Metric Tons	
Emission Source	
Combustion sources[(a)]	2,484
Workforce commuting[(b)]	4,284
TOTAL	6,768

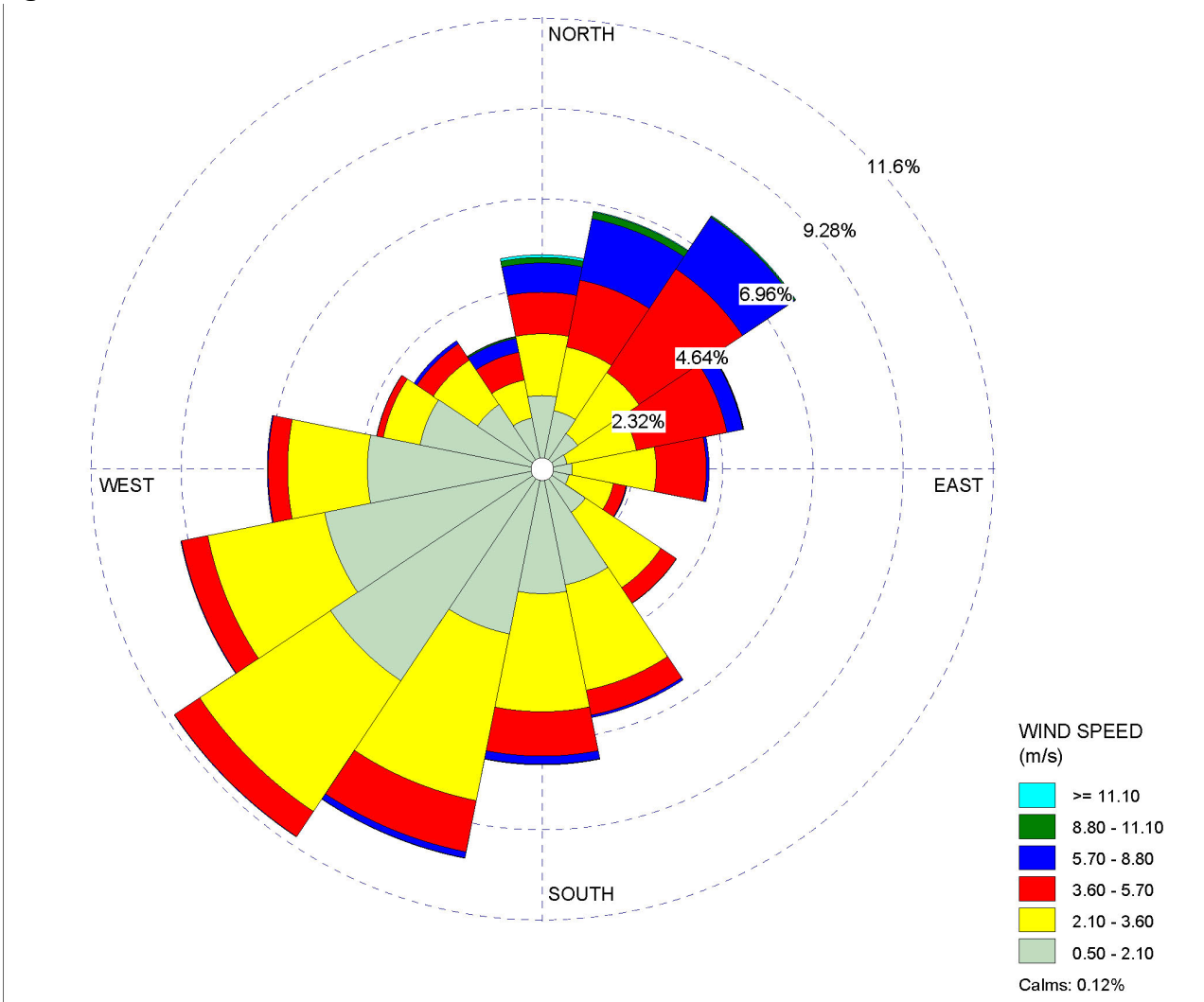
GHG calculated emissions are based on the following:

a. Fuel usage for combustion sources shown on Table E3.3-9; EPA Compilation of Air Pollutant Emissions factors (AP-42).

b. Workforce commuting calculations are based on:

1. Statistical information from U.S. Census Bureau indicates that 6.69% of South Carolina workers in the transportation and warehouse and utilities industry carpool to work (USCB. 2022c). The number of VCSNS employees as of March 2022 was 989. Utilizing the 6.69% USCB carpool statistic, a value of 923 passenger vehicles per day was utilized.
2. Based on the EPA's Greenhouse Gas Equivalencies Calculator, the CO_2e/year to be 4,284 metric tons for 923 vehicles (EPA. 2022d).
3. Carbon dioxide equivalent or CO_2e means the number of units of another greenhouse gas that has the same global warming effect as a single unit of carbon dioxide.
4. As an example, 25 metric tons of carbon dioxide emissions has the equivalent global warming effect as a single metric ton of methane emissions (based on Table A-1 to Subpart A of 40 CFR Part 98).

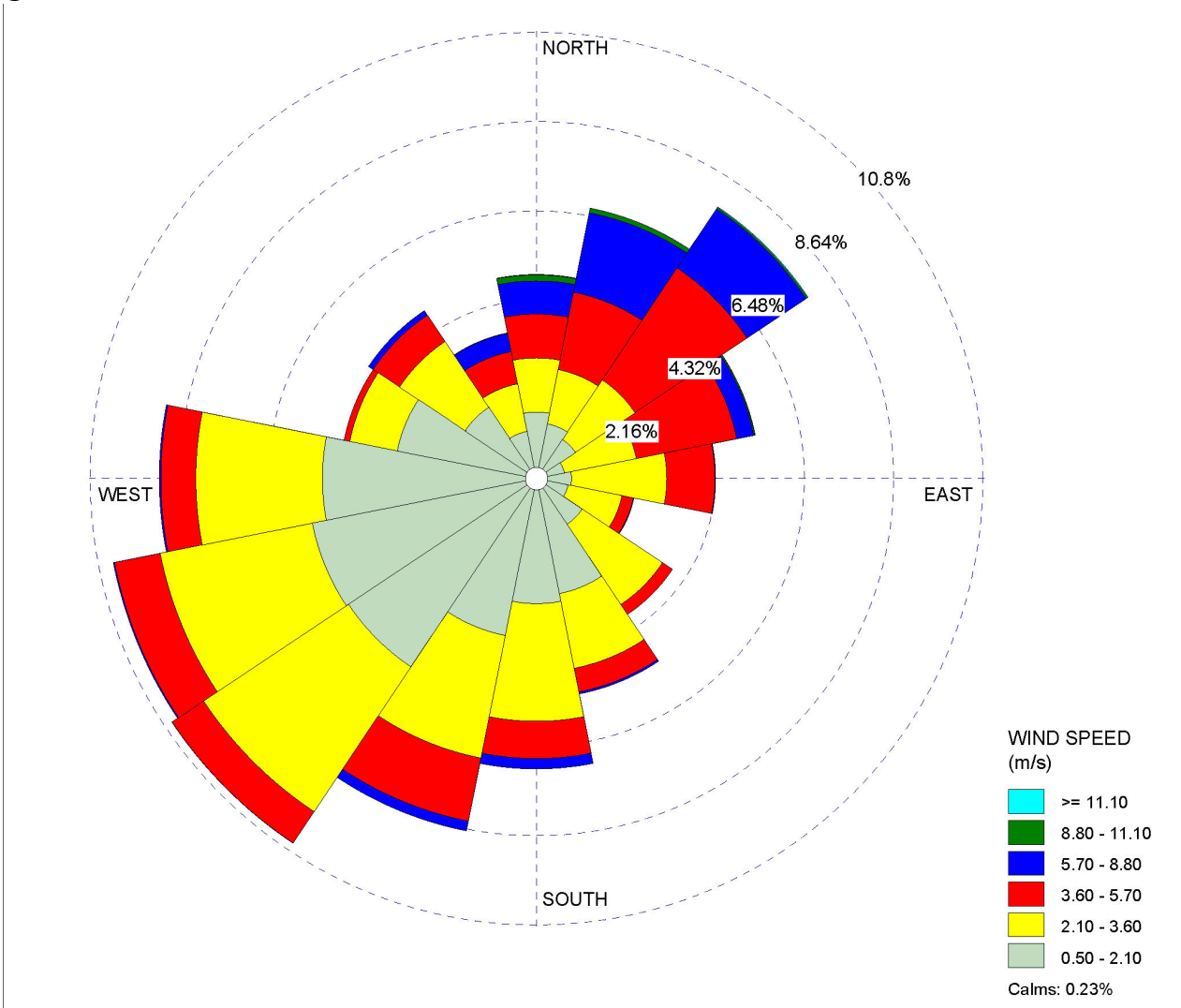
Figure E3.3-1 2017–2021 VCSNS Wind Rose



COMMENTS:	DATA PERIOD: **Start Date: 1/1/2017 - 00:00** **End Date: 12/31/2021 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **0.12%**	TOTAL COUNT: **43425 hrs.**	
	AVG. WIND SPEED: **2.71 m/s**	DATE: **6/23/2022**	PROJECT NO.: **ENERCON 2022**

WRPLOT View - Lakes Environmental Software

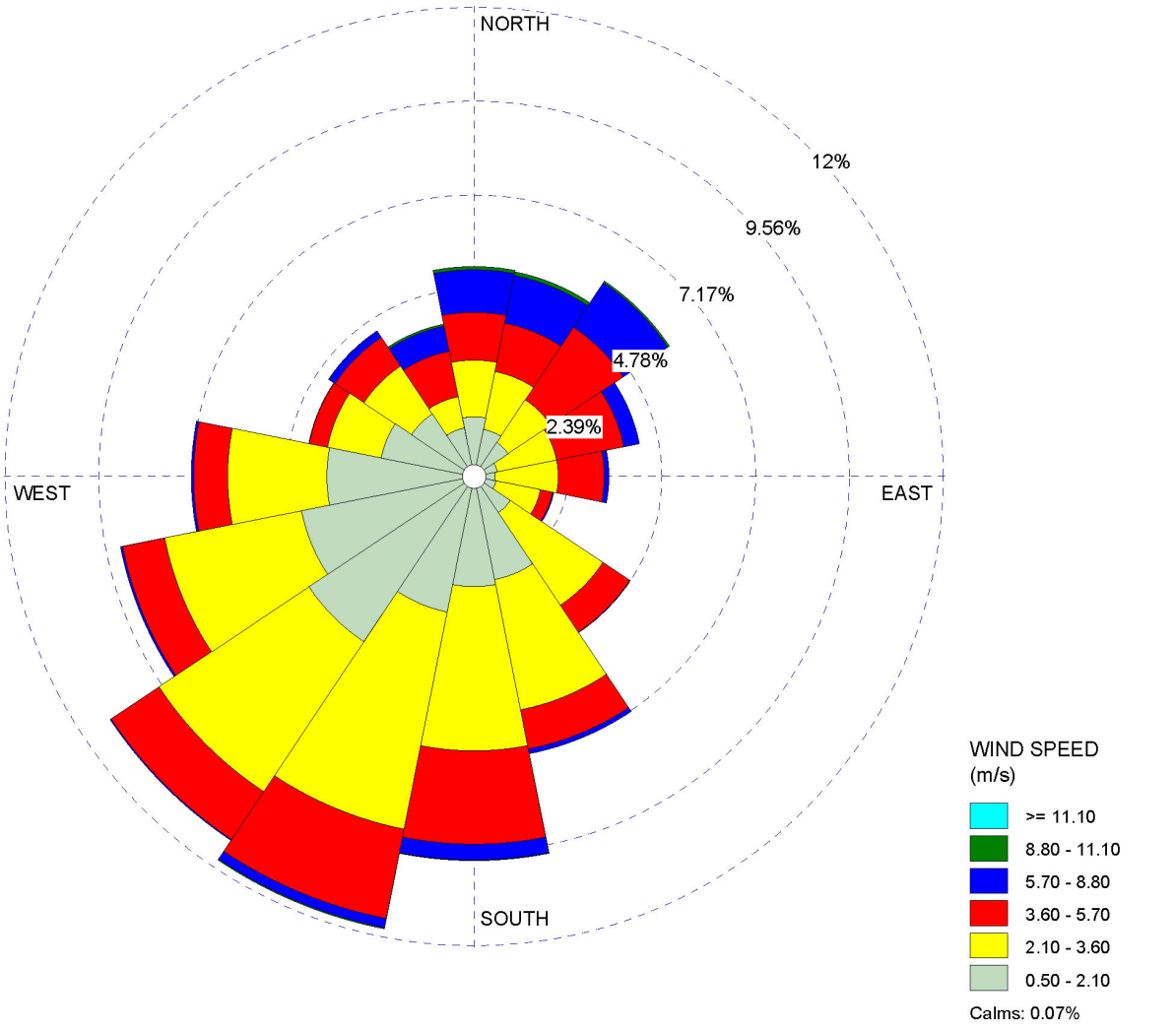
Figure E3.3-2 2017–2021 VCSNS Winter Wind Rose



COMMENTS: Winter	DATA PERIOD: **Start Date: 1/1/2017 - 00:00** **End Date: 12/31/2021 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **0.23%**	TOTAL COUNT: **10775 hrs.**	
	AVG. WIND SPEED: **2.75 m/s**	DATE: **6/23/2022**	PROJECT NO.: **ENERCON 2022**

WRPLOT View - Lakes Environmental Software

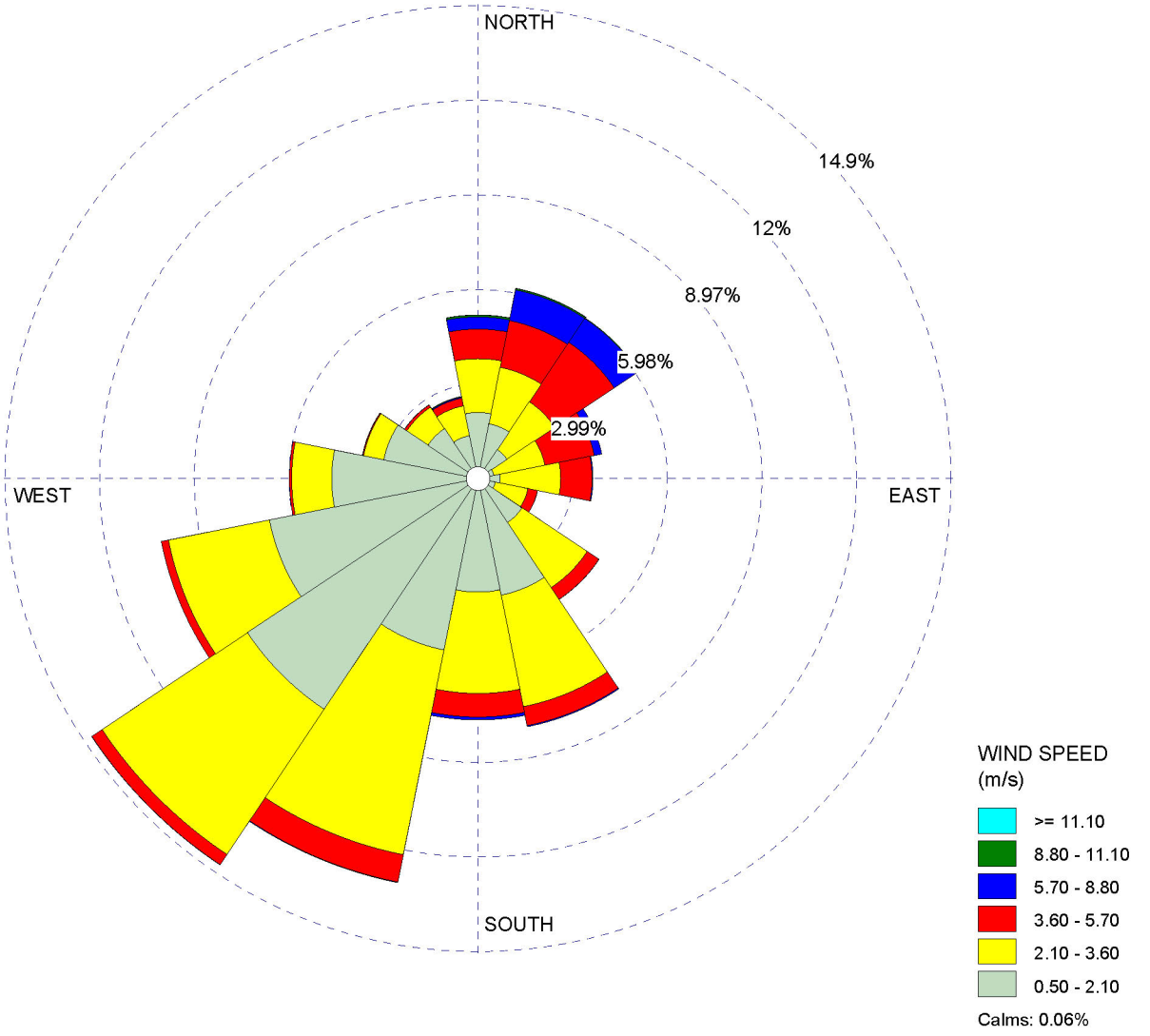
Figure E3.3-3 2017–2021 VCSNS Spring Wind Rose



COMMENTS: Spring	DATA PERIOD: **Start Date: 3/1/2017 - 00:00** **End Date: 5/31/2021 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **0.07%**	TOTAL COUNT: **11003 hrs.**	
	AVG. WIND SPEED: **2.89 m/s**	DATE: **6/23/2022**	PROJECT NO.: **ENERCON 2022**

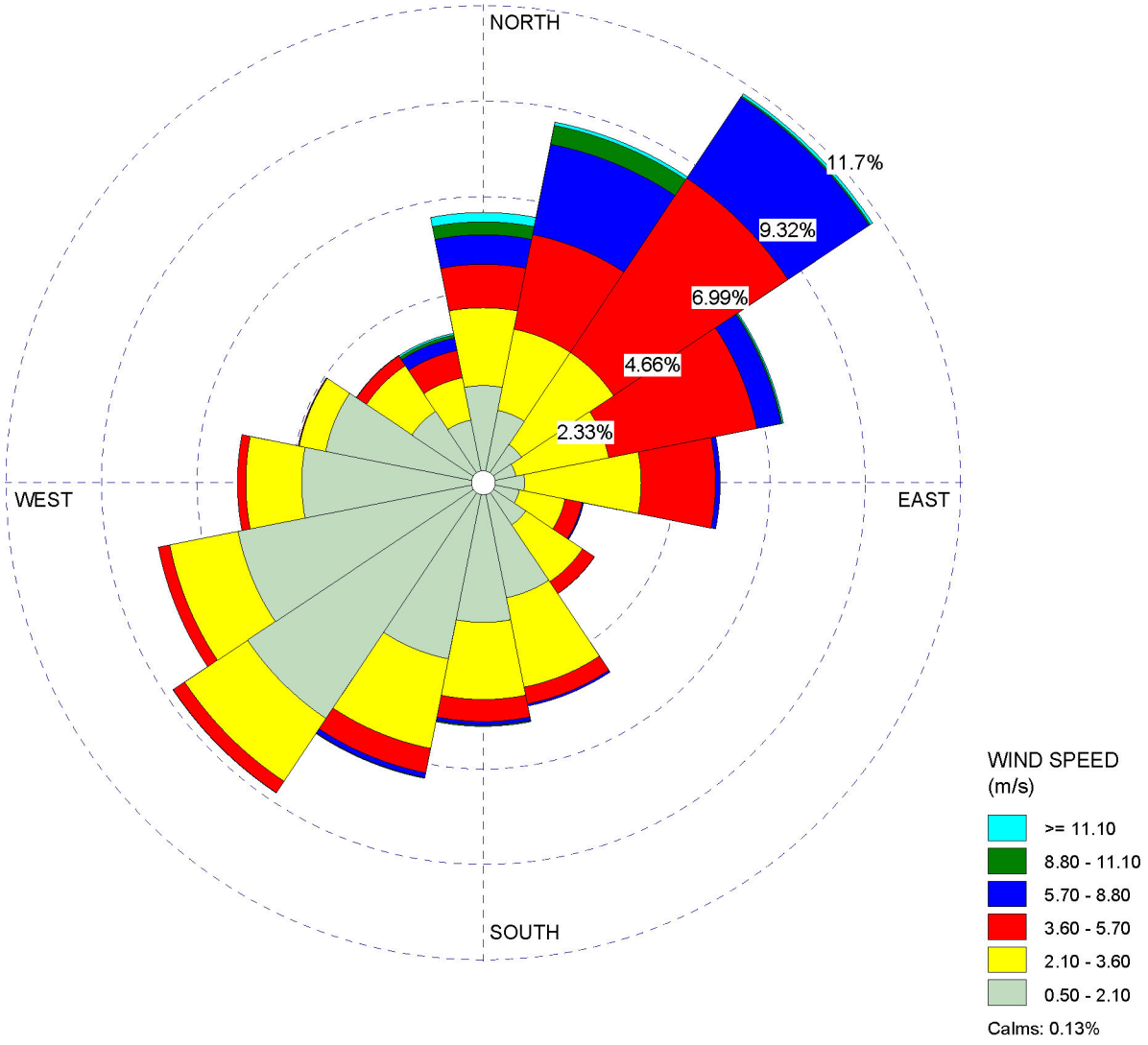
WRPLOT View - Lakes Environmental Software

Figure E3.3-4 2017–2021 VCSNS Summer Wind Rose



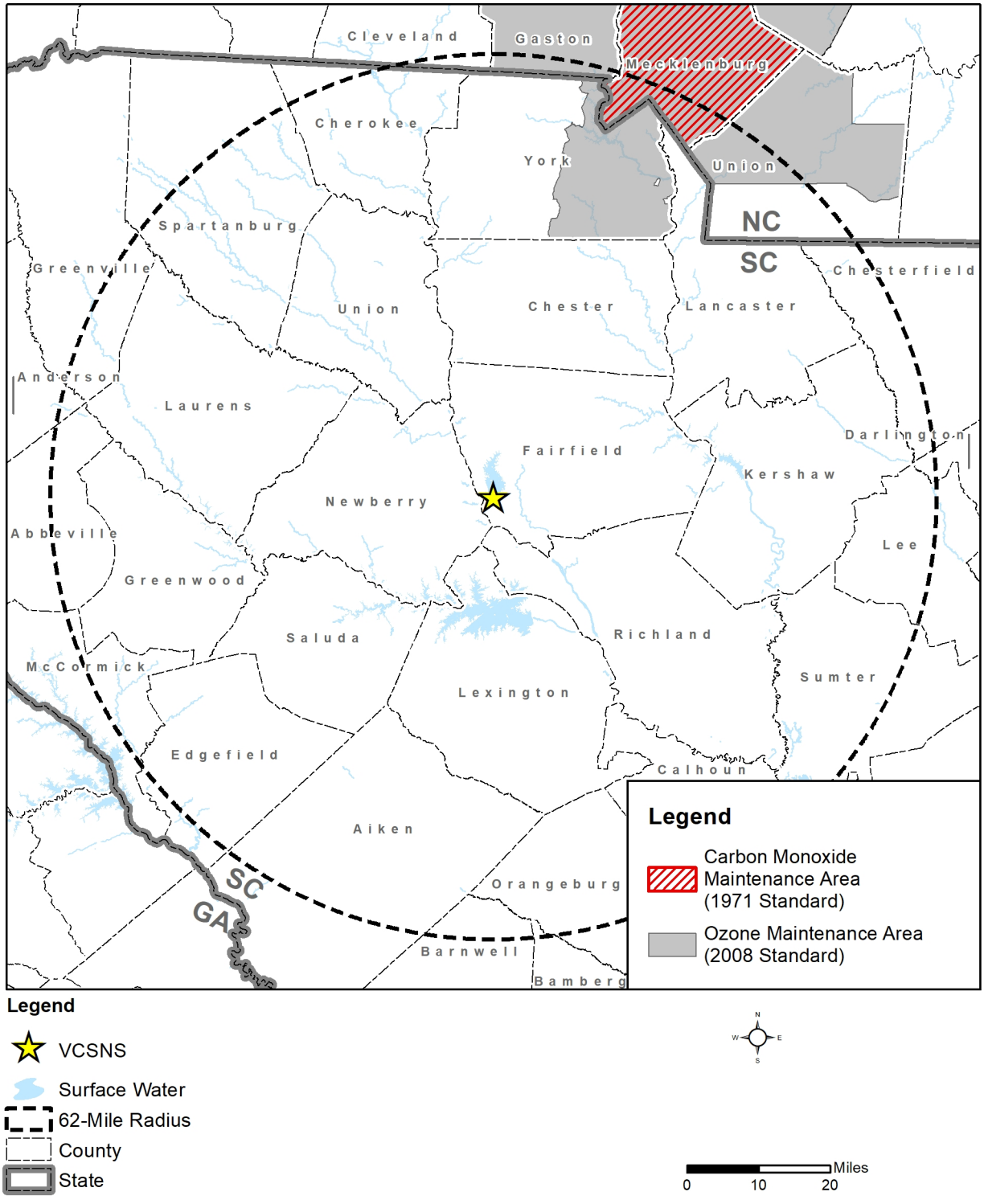
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
Summer	**Start Date: 6/1/2017 - 00:00** **End Date: 8/31/2021 - 23:00**	MODELER:	
	CALM WINDS: **0.06%**	TOTAL COUNT: **10790 hrs.**	
	AVG. WIND SPEED: **2.39 m/s**	DATE: **6/23/2022**	PROJECT NO.: **ENERCON 2022**

Figure E3.3-5 2017–2021 VCSNS Fall Wind Rose



VIMENTS: II	DATA PERIOD: **Start Date: 9/1/2017 - 00:00** **End Date: 11/30/2021 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **0.13%**	TOTAL COUNT: **10857 hrs.**	
	AVG. WIND SPEED: **2.80 m/s**	DATE: **6/23/2022**	PROJECT NO.: **ENERCON 2022**

Figure E3.3-6 Nonattainment and Maintenance Areas, 62-Mile Radius of VCSNS



E3.4 NOISE

Noise is produced at VCSNS from industrial plant operations and site activities. Industrial background noise at VCSNS is generally from operation of pumps turbines, generators, switchyard equipment, transformers, cooling tower, and loudspeakers.

VCSNS is located in a sparsely populated, largely rural area, with forests and small farms composing the dominant land use. (NRC. 2004b, Section 2.1) The lands at VCSNS are designated for industrial development in the Fairfield County Comprehensive Plan, which states that these lands are intended to encourage industrial growth and make effective use of the County's resources. These are the only industrial lands in western Fairfield County. The lands surrounding Monticello Reservoir are designated by the Plan for Residential Conservation and Development and Rural Development. Several commercial clusters are also depicted along SC 215 near VCSNS on the Comprehensive Land Use and Development Plan. The Fairfield Comprehensive Plan observes the unfulfilled development potential of Monticello Reservoir and designated it for Resource Preservation. (NRC. 2004b, Section 2.2.1)

The Fairfield County noise ordinance identifies specific sound levels for non-residential areas of 75 A-weighted decibels (dBA) as a daytime level and 70 dBA as a nighttime level as measured from the nearest property line occupied by the complainant. (FC. 2019)

In accordance with the Occupational Safety and Health Administration (OSHA) and 29 CFR 1910.95 requirements, noise exposure surveys are routinely recorded and documented by VCSNS Health and Safety. Sound level measurements are recorded near noise sources at employee workstations or in common work areas to better understand potential sources of noise and exposure in monitored work areas. Common work areas that are surveyed are the Auxiliary Building, Circulating Water Intake, Potable Water Storage Building, Control Building, Diesel Generator Building, Intermediate Building, Reactor Building, SW Pump House, Turbine Building, and Water Treatment Building. Based on a 2013 noise exposure survey, it was determined that the loudest onsite facilities are the Auxiliary Building (100.5 dBA) and the Diesel Generator Building when the engines are running (109.1 dBA). Noise levels at VCSNS are anticipated to remain the same as under current operating conditions during the proposed SLR term.

The nearest residence is located approximately within 1.04 miles east-southeast of the plant. (DE. 2022c) This distance makes it unlikely that noise generated by the plant would negatively impact the public. This is further substantiated by the fact that there have been no noise complaints by the public over the last 5 years (2018–2022).

In August 2019, VCSNS had an occupational noise assessment conducted. The purpose of the noise assessment was to determine compliance with applicable federal and state regulations and industry guidelines. Twelve employees wore personal noise dosimetry during routine work processes in the Mechanical Maintenance, Chemistry, HP, Electrical, I & C, Rad Waste,

Maintenance, and Turbine areas of the facility. The assessment concluded that none of the monitored employees were exposed to noise above the OSHA permissible exposure limits. In addition, none of the monitored employees were exposed to noise above OSHA action level. Only one monitored employee working in Mechanical Maintenance was exposed to noise above the noise peak level of 140 dBA.

DE has a robust Hearing Conservation Program that is applicable to all employees permanently assigned to nuclear stations and are exposed to sound levels of 85 dBA or higher time weighted average. The program maintains compliance with OSHA standards, Occupational Noise Exposure, 29 CFR 1910.95 and 29 CFR 1926.52. The program ensures that hearing protection be available to anyone whose work requires entry into a posted area or involves exposure to a high noise environment. Within 6 months of employment, a baseline audiogram is performed, with a new audiogram obtained annually. Employees are trained in the Hearing Conservation Program during the annual and baseline audiometric testing to ensure they understand the effects of noise on hearing and the purpose of hearing protection. The Hearing Conservation Program also contains a procedure that outlines the responsibilities of the plant and personnel.

E3.5 GEOLOGIC ENVIRONMENT

E3.5.1 REGIONAL GEOLOGY

VCSNS is within the Piedmont physiographic province (Figure E3.5-1). From northwest to southeast, the region within 200 miles of the VCSNS site includes portions of five physiographic provinces: the Appalachian Plateau (the "Cumberland Plateau" at the latitude of the site region), Valley and Ridge, Blue Ridge, Piedmont, and Coastal Plain. (SCE&G. 2011, Section 2.5.1.1.1) The surface of the Piedmont province consists of elevated, gently rolling hills separated on the northwest from the intensely folded and faulted Appalachian Mountains by intervening hills of the Blue Ridge province and overlapped on the southeast by sediments of the Coastal Plain province. The Piedmont province is essentially a dissected peneplain and is characterized by northeast-southwest trending belts of crystalline metamorphic and plutonic rocks. Piedmont rocks in general were found under various different combinations of geothermal and pressure conditions and represent a complex succession of geologic events. (DE. 2023a, Section 1.2.1.5)

Only a small sliver of the Appalachian Plateau lies within 200 miles of the VCSNS site. The Appalachian Plateau physiographic province includes the western part of the Appalachian Mountains, stretching from New York to Alabama. The Appalachian Plateau surface slopes gently to the northwest. The Appalachian Plateau physiographic province is underlain by unmetamorphosed sedimentary rocks of Permian to Cambrian age. These strata are generally sub-horizontal to gently folded and exhibit relatively little deformation. (SCE&G. 2011, Section 2.5.1.1.1.1)

The Valley and Ridge physiographic province extends from New York to southern Alabama. It ranges between 25 and 75 miles wide. The northwestern boundary of the Valley and Ridge province is marked by a topographic escarpment known as the Allegheny Front in Pennsylvania and the Cumberland Escarpment in Tennessee and Virginia. This physiographic province is underlain by a folded and faulted sequence of Paleozoic sedimentary rocks. The characteristic linear valleys and ridges of this province are the result of differential weathering and erosion of different rock types. The eastern boundary of the Valley and Ridge province marks a change from folded, lesser-deformed Paleozoic sedimentary rocks to more penetratively deformed Precambrian rocks in the Blue Ridge. (SCE&G. 2011, Section 2.5.1.1.1.2)

The Blue Ridge province extends from Pennsylvania to northern Georgia and varies from about 30 to 75 miles wide. Elevations are highest in North Carolina and Georgia with several peaks in North Carolina exceeding 5,900 feet msl. The province is a metamorphosed basement/cover sequence that has been complexly folded, faulted, penetratively deformed, and intruded. These rocks record multiple late Proterozoic to late Paleozoic deformation events (extension and compression) associated with the formation of the Iapetus Ocean and the Appalachian orogen. The Blue Ridge province consists of a series of westward-vergent thrust sheets, including gneisses, plutons, and metavolcanic and metasedimentary rift sequences, as well as continental and platform deposits. The Blue Ridge-Piedmont fault system thrust the entire Blue Ridge province northwest over Paleozoic sedimentary rock of the Valley and Ridge province during the Alleghenian orogeny. The Blue Ridge province reaches its greatest width in the southern Appalachians. The east-facing Blue Ridge Escarpment, averaging 1,000 to 1,650 feet in elevation, separates the highlands of the Blue Ridge from the lower relief Piedmont province in the southern Appalachians. The eastern Blue Ridge is separated from the Inner Piedmont by the Brevard fault zone. (SCE&G. 2011, Section 2.5.1.1.1.3)

The Piedmont physiographic province extends southwest from New York to Alabama. It is a seaward-sloping plateau varying in width from about 10 miles in southeastern New York to almost 125 miles in South Carolina. Elevation of the inland boundary ranges from about 200 feet in New Jersey to over 1,800 feet msl in South Carolina. (SCE&G. 2011, Section 2.5.1.1.1.4)

South Carolina lies principally within two major physiographic provinces: the Piedmont, underlain by a complex sequence of deformed crystalline rocks, and the Coastal Plain, underlain by younger relatively undisturbed sediments. Regional deformation during and at the end of the Paleozoic Era, accompanied by periods of igneous intrusion, resulted in consolidation, folding, faulting, and metamorphism of the Piedmont rocks, which were originally deposited as a thick sequence of sediments. (DE. 2023a, Section 2.5.1.1)

The Piedmont province is underlain by at least 15,000 feet of a meta-sedimentary sequence of deformed rocks of late Precambrian to early Paleozoic age, with mantle Precambrian gneiss estimated to be 1,100 million years old. The crystalline rocks of the Piedmont province are

unconformably overlain by the sedimentary rocks of the Coastal Plain province to the southeast and are bordered on the northwest by rocks of the Blue Ridge province. Elongated Triassic basins containing unmetamorphosed, nearly flat-lying sedimentary rocks occur within the Piedmont from the South Carolina-North Carolina line northward. These basins trend parallel to the Appalachian's regional northeast-southwest trending structures. Isolated basins of Triassic sedimentary rocks have also been identified within Piedmont-type crystalline rock underlying the Coastal Plain from the Georgia-South Carolina line northward. Pre-orogenic mafic intrusives and pre- and post-orogenic granitic plutons and diabase dikes are common. The geologic belts within the Piedmont differ from each other predominantly by the degree of change in the original rocks. Modifications that resulted from folding, regional metamorphism, and igneous intrusions are reflected in the presently exposed rocks. (DE. 2023a, Section 2.5.1.1.2)

The Piedmont rocks generally consist of gneisses, amphibolites, schists, and other metamorphic rocks (country rocks) that are intruded by massive igneous materials of predominantly granitic character. Various types of migmatite border the major granitic plutons. The pre-metamorphic and possible mafic character of these rocks has been largely obscured by injection of quartzofeldspathic dikes and sills, and in partial or complete assimilation of large areas of the original country rocks. Near the eastern edge of the Piedmont in South Carolina, a thick sequence of metamorphosed shales, siltstones, and volcanic rocks crop out in the Carolina Slate Belt. Although the exact age of these rocks is uncertain, they appear to be equivalent in age to some of the lower Paleozoic rocks encountered in the Valley and Ridge physiographic province west of the Piedmont. (DE. 2023a, Section 2.5.1.1.2)

Rocks of the Piedmont have been deformed, apparently under a more confined environment than the Appalachians to the west. As a result of confinement, metamorphism of varying grades has accompanied regional Piedmont folding, resulting in greater mobility and a corresponding lessening of shear forces in the rocks. The Appalachian region is strongly deformed. Southeastward from this region to the Coastal Plain, the deformation decreases and relatively few displacements of regional magnitude occur. Results of seismic profiling in the region yielded evidence that the crystalline rocks of the southern Appalachians are an allochthonous thrust sheet 6 to 15-kilometer (km) thick, which have been thrust some 260-km to the west and overlie relatively flat-lying and undeformed sedimentary rocks that cover an extensive area of the central and southern Appalachians. Along the Coastal Plain, a probable basement upwarping expressed as a broad northwest-southwest trending anticlinal feature, runs through Cape Fear, North Carolina. This broad upwarping has been referred to as the Cape Fear Arch and is bordered by the Salisbury Embayment to the northeast and the Georgia Embayment to the southeast. These embayments are broad sediment-filled basement flexures located 150 miles or more from VCSNS. (DE. 2023a, Section 2.5.1.1.3)

The Piedmont is generally covered by a deep mantle of residual soils derived by the in-place weathering of the underlying rock. The soil profile is typically characterized by an upper silty and

clayey horizon overlying saprolite, which grades with depth to decomposed rock and unweathered rock. Soil strengths typically increase with depth. Transported soils are restricted to surficial veneers of alluvium near present-day streams and isolated deposits of colluvium on lower slopes of some hills. (DE. 2023a, Section 1.2.1.5)

The VCSNS site is in the Central Piedmont, about 20 miles northwest of the Fall Line that separates the Piedmont and Coastal Plain provinces (SCE&G. 2011, Section 2.5.1.1.1). Within the VCSNS site region, the Piedmont physiographic province is divided based on its geologic history and lithology into different lithotectonic associations: the Piedmont Zone and the Carolina Zone. (SCE&G. 2011, Section 2.5.1.1.1.4)

The Piedmont Zone comprises the Inner Piedmont and the terranes that make up the Eastern Blue Ridge. The Inner Piedmont block is a fault-bounded, composite thrust sheet with metamorphic complexes of different tectonic affinities. Rocks within the Inner Piedmont block include gneisses, schists, amphibolites, sparse ultramafic bodies, and intrusive granitoids. The Carolina Zone is part of a late Precambrian-Cambrian composite arc terrane, exotic to North America, that accreted either during the Late Ordovician to Silurian or during the Middle Devonian to Early Mississippian. It consists of felsic to mafic metaigneous and metasedimentary rock. The Piedmont Zone and the Carolina Zone are separated by a series of faults collectively called the Central Piedmont shear zone, which is a late Paleozoic ductile thrust located approximately 15 miles northwest of the VCSNS site. (SCE&G. 2011, Section 2.5.1.1.1.4)

The rocks of the Carolina Zone are unconformably overlain by the sediments of the Atlantic Coastal Plain physiographic province southeast of the Fall Line (SCE&G. 2011, Section 2.5.1.1.1.4). The Atlantic Coastal Plain extends southeastward from the Fall Line to the coastline and southwestward from Cape Cod, Massachusetts to south-central Georgia, where it merges with the Gulf Coastal Plain. The Atlantic Coastal Plain is a low-lying, gently rolling terrain developed on a wedge-shaped seaward-dipping section of Cretaceous, Tertiary, and Quaternary age non-metamorphosed, unconsolidated, and semi-consolidated sedimentary rocks that thickens toward the coast. At the latitude of the VCSNS site, sediment thickness increases from 0 feet at the Fall Line to more than 2,500 feet at the South Carolina coastline. Topographic relief is generally less than a few hundred feet and the topographic gradient is usually less than about 5 feet per mile. (SCE&G. 2011, Section 2.5.1.1.1.5)

The VCSNS site is located east of the Central Piedmont shear zone in the Charlotte Terrane of the Carolina Zone. The Charlotte Terrane is the westernmost terrane of the Carolina Zone. The Charlotte Terrane is dominated by Neoproterozoic to Early Paleozoic plutonic rocks that intrude a suite of mainly metaigneous rocks. All country rock of the Charlotte Terrane was penetratively deformed during the Late Proterozoic to Early Cambrian, thereby producing axial plane cleavage and foliation. The Charlotte Terrane also contains numerous granitic and gabbroic intrusions dating to about 300 Ma. (SCE&G. 2011, Section 2.5.1.1.1.4)

A number of Mesozoic rift basins are located within the VCSNS site region. The basins are grabens or half-grabens bounded by normal faults on one or both sides formed in response to the continental rifting that broke up the supercontinent, Pangaea, and formed the Atlantic Ocean basin. Rift basins are locally exposed in the Piedmont province, generally buried beneath Cretaceous and younger Atlantic Coastal Plain sediments, and some rift basins are located offshore. (SCE&G. 2011, Section 2.5.1.1.1.6)

E3.5.2 SITE GEOLOGY

Topography of the general area is characterized by gently to steeply rolling hills and generally well-drained mature valleys that ultimately empty into the Broad River. Superimposed on the topography of the general area are scattered erosional gullies, possibly resulting from past agricultural practices. Maximum topographic relief in the general area is approximately 250 feet. Drainage follows either a dendritic or trellised pattern, the former sometimes indicating plutonic activity, the latter reflecting either a joint system (approximately N30W, N45E and N67E) or the site area strike (N40E to N75E). The Broad River and its larger tributaries have developed a relatively narrow floodplain with occasional, poorly formed natural levees. Alluvial deposits consisting of clays and sands range in thickness from a few inches to several feet. (DE. 2023a, Section 2.5.1.2.1.1)

VCSNS lies within the Charlotte Terrane, a region characterized by Neoproterozoic to early Paleozoic plutonic rocks that intrude a suite of mainly metaigneous rocks. Within the site area, geologic units can be subdivided into three major rock categories. The first and oldest major rock category consists of amphibolite-grade metamorphic rocks. The second category consists of felsic plutonic rocks that intrude the amphibolite-grade metamorphic rocks. The third and youngest category consists predominantly of mafic rocks associated with Mesozoic diabase dikes that intrude the other two major rock types. (SCE&G. 2011, Section 2.6.2)

VCSNS overlies complex zones of crystalline rocks, including migmatites in transitional areas between metamorphic rocks and injected igneous bodies (DE. 2023a, Section 1.2.1.5). The site is located within the Winnsboro plutonic complex, a granitoid plutonic complex that includes abundant xenoliths of older surrounding greenschist- and amphibolite-facies metamorphic rocks. The felsic Winnsboro plutonic complex intruded the metamorphic country rock, which is composed primarily of interlayered and folded gneiss and amphibolite. Lithologic contacts and foliations in the metamorphic rocks exhibit a predominant northeast-striking structural grain and are interpreted to represent metamorphosed rocks of igneous, volcanic, and sedimentary origin. (SCE&G. 2011, Section 2.6.2)

A geologic map of the VCSNS site is depicted in Figure E3.5-2. The Carboniferous plutonic rocks at the VCSNS site are composed primarily of granodiorite dated about 300 Ma with a range of igneous rock compositions and textures, including quartz diorite, migmatite, and pegmatite dikes. The youngest rock type in the VCSNS site exists as a series of steeply dipping diabase dikes that were

emplaced during the Mesozoic extension associated with rifting of the Atlantic Ocean. A relatively thick weathering profile is developed on the bedrock units of the VCSNS site. The thickness of residual soil and saprolite ranges from several feet to several tens of feet. Locally, alluvium is present along the Broad River, within Frees Creek, and in the flatter segments of smaller drainages and erosion gullies. (SCE&G. 2011, Section 2.6.2)

Within the VCSNS site area, three major rock categories are identified, each containing a further division of individual rock facies. The most prevalent category consists predominantly of granitic rocks (granodiorite and quartz diorite) associated with the Winnsboro plutonic complex. The second consists of amphibolite grade metamorphic rocks (biotite and hornblende gneiss and amphibolite schist) associated with the Carolina Zone. The third category consists of migmatitic rocks associated with margin contacts and multiphase plutonism. (SCE&G. 2011, Section 2.5.1.2.3):

- Granodiorite and quartz diorite are the most encountered rocks in the site area. Rocks of the Winnsboro plutonic complex are of Carboniferous age.
- Amphibolite-grade metaigneous and metasedimentary rocks of the Carolina Zone encountered within the site area include biotite and hornblende gneiss and amphibolite schist. These rocks are likely Cambrian or older in age.
- Migmatites are the least encountered rocks in the site area. Migmatite composition ranges from granitic to dioritic with crystal sizes ranging from aphanitic to phaneritic. Textures include flow structures that range from anastomosing to laminar resembling gneissic banding. Inclusions are often present including granitic (plutonic), gneissic (country rock), and basaltic clasts. Brecciation of the inclusions is common.

Columnar geologic cross sections are shown in Figures E3.5-3a, E3.5-3b, and E3.5-3c. (It should be noted that the water table elevations depicted in the geologic cross sections were recorded in July and August 2022 and post-date dewatering activities, which are described in Section E3.6.2.3.) The U.S. Geological Survey (USGS) online map of the geology of South Carolina maps Cambrian or Neoproterozoic metamorphosed granite and granodiorite bedrock underlying the VCSNS site (USGS. 2022a).

E3.5.3 SOILS

E3.5.3.1 Onsite Soils and Geology

Residual soils overlie the parent bedrock; the soils range in thickness from about 40–85 feet in borings drilled in the VCSNS area. The soils grade from usually clayey and silty soils near the ground surface, where the weathering has been greatest, to dense sandy silt and silty sand saprolites at depth. (DE. 2023a, Section 2.5.2.2.2)

Soil units that occur within the VCSNS property boundary are described in detail in Table E3.5-1 and shown in Figure E3.5-4. They are also summarized below. (USDA. 2022):

- Cecil sandy clay loam, 2–6% slopes, moderately eroded
- Cecil sandy clay loam, 6–10% slopes, moderately eroded
- Chewacla loam, 0–2% slopes, frequently flooded
- Hiwassee sandy loam, 2–6% slopes
- Hiwassee sandy loam, 6–10% slopes, eroded
- Hiwassee sandy clay loam, 2–6% slopes, eroded
- Hiwassee sandy clay loam, 6–10% slopes, eroded
- Iredell fine sandy loam, 1–6% slopes
- Madison sandy loam, 2–6% slopes, eroded
- Madison sandy clay loam, 10–25% slopes, eroded
- Mecklenburg sandy clay loam, 6–10% slopes, eroded
- Pacolet sandy loam, 10–25% slopes
- Pacolet-Cecil sandy loams, 7–15% slopes, eroded
- Toccoa loam
- Wateree-Rion complex, 15–40% slopes
- Wilkes sandy loam, 6–15% slopes
- Wilkes sandy loam, 15–40% slopes
- Winnsboro sandy loam, 2–6% slopes

Prior to and during construction, subsurface field investigations were performed at VCSNS. The plant site and surrounding area were initially blanketed by moderately thick residual soil derived by weathering of underlying rock. In the SWP bottom, some alluvial soils were in evidence. The upper 5 to 10 feet of natural soil usually were principally stiff clayey soils (silty clay and clayey silt) containing variable quantities of sand. Surficial alluvium, where present, appeared to be loose sand and/or silty soils. Below the surface zone was saprolite defined as rock that has weathered in place to a soil consistency but retains diagnostic properties of the parent rock. The saprolite was medium dense to dense silty sand and/or sandy silt that exhibits a slight to low plasticity because of weak cementation. The saprolite generally became denser with depth grading into rock. (DE. 2023a, Section 2.5.4.10.1.2)

During construction, VCSNS was excavated to bedrock in the reactor area. The plant site was then backfilled with Zone I, II, and III fill materials to the ground elevation of 436 feet msl. Zone I fill material is a reddish clayey soil, Zone II material is a red to light tan sandy silt, and Zone III material

is a structural backfill material, consisting of a sound durable crushed stone. Zone I and II materials were derived from residual soils and saprolite excavated from the site during construction and were used as the primary backfill at the plant. Zone II materials were the predominant fill in areas of the plant site farther from the main plant buildings. Zone III materials were previously encountered primarily in borings drilled close to the Reactor Building and main plant buildings at thicknesses ranging from 3 to 23 feet. The fill materials are underlain by saprolite of varying thicknesses ranging from 0 to 40 feet. The saprolite is composed of sandy silt, clayey silt, and silty clay. The base of the saprolite ranges from 8 feet below land surface at the southwestern portion of the site to approximately 89 feet at the northern end of the site.

E3.5.3.2 Erosion Potential

Because VCSNS has been operational since the early 1970s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture (USDA), all soil units listed in Table E3.5-1 subject to erosion have a slight to moderate erosion potential, except for Pacolet sandy loam, Wateree-Rion complex, Wilkes sandy loam, and Winnsboro sandy loam, which have severe erosion potential. These soils comprise 42.65% of the mapped area, including areas underlying plant structures. (USDA. 2022). However, as described in Section E3.5.3.1, the reactor area was excavated to bedrock during construction.

For construction of the nuclear facilities, the site was cleared, grubbed, stripped of topsoil and organic material, and graded. The plant site area was graded to an approximate elevation of 435 feet (finished grade), requiring the removal of very little overburden material at the northeastern portion of the plant site and up to a maximum of approximately 65 feet of overburden at the southwestern portion. For a number of the principal plant structures, excavations to and into rock were required for construction of the foundations. These excavations varied in depth to a maximum of approximately 100 feet below finished grade. (DE. 2023a, Section 2.5.4.10.1.1)

VCSNS maintains and implements a Stormwater Pollution Prevention Plan (SWPPP) that identifies potential sources of pollution reasonably expected to affect the quality of stormwater and identifies best management practices (BMPs) that will be used to prevent or reduce the pollutants in stormwater discharges. These practices, as they relate to erosion, include a sediment and erosion control program, a site-wide storm water drainage system, gravel surfaces in industrial areas to provide infiltration and reduced sediment transport, and vegetated filters at industrial activity boundaries to provide sediment and erosion control. If spills or other areas of concern are identified, additional BMPs will be included to address each situation.

E3.5.3.3 Prime Farmland Soils

The USDA's Natural Resources Conservation Service maps show that approximately 31.19% of the site is considered prime farmland, prime farmland if drained and not flooded during the growing season, or farmland of statewide importance. These areas are mapped throughout the VCSNS site including under the Monticello Reservoir. (USDA. 2022) These areas would most likely still be considered prime farmland even though they are part of the property owned jointly by DE (two-thirds ownership) and Santee Cooper (one-third ownership). Even if areas of the property are designated prime farmland, VCSNS would not be subject to the Farmland Protection Policy Act (FPPA) because the act does not include federal permitting or licensing for activities on private or nonfederal lands. Soil units designated as prime farmland are identified in Table E3.5-1.

E3.5.4 SEISMIC HISTORY

The magnitude of a seismic event is described by two methods: the Modified Mercalli (MM) intensity scale and the Richter magnitude scale. The MM intensity is an estimate of the amount of damage caused at a site by an earthquake. The Richter magnitude scale is an approximate measure of the total amount of energy released by an earthquake. Accurate locations for earthquake epicenters have been available since the installation of modern seismographs in the region. Without seismographs, earthquakes were described using the MM intensity.

On a regional scale, the upper few kilometers of Piedmont rocks are extensively folded and moderately faulted. The sub-basement is relatively flat-lying and undisturbed. (DE. 2023a, Section 2.5.2.2.1)

There are no capable faults within 5 miles of VCSNS. The closest fault that could be considered capable is the Belair Fault, which is located approximately 75 miles southwest of VCSNS near Augusta, Georgia. Preliminary investigation of this fault indicates that movement has probably occurred within the last 50 million years. Studies are continuing to accurately determine the age of last movement. There is no known seismic activity associated with this feature. (DE. 2023a, Section 2.5)

The closest known regional faulting is a normal fault in the Lake Murray area that is considered to be a splay of the Eastern Piedmont (Goat Rock) Fault, the southwestern-most faulting in the Eastern Piedmont System. This structure has recently been extended such that the probable closest approach to VCSNS is about 13 miles to the south. The fault trends southwest from Lake Murray. Evidence indicates that this fault has been inactive since at least the end of the Triassic Period (about 200 million years). (DE. 2023a, Section 2.5.2.2.1)

A north-south trending normal fault has recently been postulated in the Chapin, South Carolina, area based on geologic mapping that is part of a program funded by the USGS Earthquake Hazards Division. The fault has a north-south orientation and displaces metamorphic rocks of the

Carolina Slate Belt in a down-to-the-east fashion. The fault roughly parallels Wateree Creek from just north of Hilton, South Carolina, to about the Broad River, where it has a slightly northwest orientation. Field work is continuing in this area, and at present, the closest approach of this structure is about 4 to 5 miles south of VCSNS. No evidence at present demonstrates any recency of movement on this structure. (DE. 2023a, Section 2.5.2.2.1)

Northeast of VCSNS, a northeast-trending thrust fault, the Gold Hill Fault, has been identified. This fault has been inactive since the Paleozoic Era (at least 300 million years). The Gold Hill Fault has recently been extended southward into South Carolina. The closest approach of the Gold Hill Fault extension to VCSNS is approximately 40 miles to the northeast. (DE. 2023a, Section 2.5.2.2.1)

The latest tectonic episode in the Piedmont has been determined by recent radiometric dating to have occurred about 200 million years ago and is represented by late- or post-Triassic diabase dikes. No younger tectonism has been identified in the Piedmont. (DE. 2023a, Section 2.5.1.1)

There are numerous joints in the rocks, and small displacements have occurred along shears. Detailed geologic studies at the site and radiometric dating of rock samples from site excavations show latest movements along the shears occurred no later than 45 million years ago, and probably occurred 150 to 300 million years ago. (DE. 2023a, Section 1.2.1.5) No physical evidence was uncovered during geologic investigations of the surficial or subsurface materials at VCSNS that would indicate any correlation between historical earthquake activity and site geologic structure. (DE. 2023a, Section 2.5.2.3)

Minor shearing is present in the bedrock underlying VCSNS. The maximum net displacement observed is no greater than 7 feet. The shears are not an integral part of any known fault system. However, the orientation of the shears is consistent with the regional joint pattern. The shears do not penetrate through the soil profile to the ground surface. The results of radiometric age determinations indicate that movement along the shears could not have occurred later than 45 million years ago, and, in all probability, the shears have been inactive since 150 to 300 million years before present. (DE. 2023a, Section 2.5)

Within 200 miles of VCSNS, there are four principal areas of concentrated seismicity. Three of these (the Middleton-Place Summerville, Bowman, and Adams Run seismic zones) are in the Charleston, South Carolina, area. The fourth area is the Eastern Tennessee Seismic Zone. (SCE&G. 2011, Section 2.5.1.1.3.2)

The largest historical earthquake was the 1886 MM Intensity X Charleston event, which dominates the seismic history of the east coast. The largest earthquake within a 50-mile radius was the 1913 MM VI-VII Union County event located about 35 miles northwest of VCSNS. The closest shock to the site was the 1945 MM Intensity VI event located approximately 5 miles west-southwest of the site. (DE. 2023a, Section 2.5) As a result of this earthquake and the relatively high risk in the Charleston area, government agencies have funded numerous investigations to identify the source

of the earthquake and recurrence history of large magnitude events in the region. The source of the 1886 earthquake has not been definitively attributed to any particular fault. (SCE&G. 2011, Section 2.5.1.1.3.2.1)

The Eastern Tennessee Seismic Zone is one of the most active seismic zones in eastern North America. It is located in the Valley and Ridge province of eastern Tennessee, approximately 175 miles northwest of VCSNS. The Eastern Tennessee Seismic Zone is about 185 miles long and 30 miles wide and has not produced a damaging earthquake. Despite its high rate of activity, the largest known earthquake was magnitude 4.6. (SCE&G. 2011, Section 2.5.1.1.3.2.2)

Correlation between seismic events and the existence of the shears cannot be made. The possibility of reactivation of the shears or the inducement of significant earthquake activity related to impoundment of Monticello Reservoir is remote. No physical evidence was found because of the geologic and seismic investigations performed that would indicate adverse behavior of the surficial and subsurface geologic materials to seismic events. (DE. 2023a, Section 2.5)

Epicenter locations of seismic events greater than intensity IV/magnitude 3.0 within a 200-mile (323-km) radius of VCSNS from 1970 through January 20, 2023, are listed in Table E3.5-2 and shown in Figure E3.5-5. Seven of the seismic events were within 50 miles of VCSNS. The maximum magnitude of these seven events was 3.6. Two of these events were reported as rock bursts; the remaining seismic events were reported as earthquakes. (USGS. 2021; USGS. 2023)

The USGS's national seismic hazard map shows that VCSNS is in a region with a 2% in 50 year (once in 2,500 years) probability of exceeding a peak ground acceleration between 0.28 and 0.4g (USGS. 2015).

Table E3.5-1 Onsite Soil Unit Descriptions (Sheet 1 of 5)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
CnB2	Cecil sandy clay loam, 2-6% slopes, moderately eroded	The Cecil component makes up 0.10% of the map unit. Slopes are 2-6%. This component is on summits, shoulders, and backslopes. The parent material consists of residuum weathered from gneiss and/or granite. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is not reported. Available water to a depth of 7.0 inches is moderate. This soil is not flooded. It is not ponded. The frost-free period is 180–280 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2e. The soil does not meet hydric criteria. Erosion potential is slight.	All areas are prime farmland
CnC2	Cecil sandy clay loam, 6-10% slopes, moderately eroded	The Cecil component makes up 1.27% of the map unit. Slopes are 6-10%. This component is on backslopes and shoulders. The parent material consists of residuum weathered from gneiss and/or residuum weathered from granite. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is medium. Available water to a depth of 8.4 inches is moderate. This soil is not flooded. It is not ponded. The frost-free period is 180–280 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 4e. The soil does not meet hydric criteria. Erosion potential is moderate.	All areas are prime farmland
Cw	Chewacla loam, 0-2% slopes, frequently flooded	The Chewacla component makes up 5.01% of the map unit. Slopes are 0-2%. This component is on toe slopes. The parent material is alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is low. This soil is frequently flooded. It is not ponded. The frost-free period is 180–280 days. Depth to the water table is about 6–24 inches. Non-irrigated land capacity classification is 4w. The soil does not meet hydric criteria. Erosion potential is slight.	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
HsB	Hiwassee sandy loam, 2-6% slopes	The Hiwassee component makes up 1.32% of the map unit. Slopes are 0-1%. This component is on stream terraces. The parent material consists of clayey ancient alluvium derived from granite and gneiss. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is low. Available water to a depth of 8.1 inches is moderate. This soil is not flooded. It is frequently ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 2e. The soil does not meet hydric criteria. Erosion potential is slight.	All areas are prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions (Sheet 2 of 5)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
HsC	Hiwassee sandy loam, 6-10% slopes	The Hiwassee component makes up 2.00% of the map unit. Slopes are 6-10%. This component is on stream terraces. The parent material consists of clayey ancient alluvium derived from granite and gneiss. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is not reported. Available water to a depth of 8.1 inches is moderate. This soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria. Erosion potential is moderate.	Farmland of statewide importance
HwB2	Hiwassee sandy clay loam, 2-6% slopes, eroded	The Hiwassee component makes up 15.62% of the map unit. Slopes are 2-6%. This component is on stream terraces. The parent material consists of clayey ancient alluvium derived from granite and gneiss. Depth to a restrictive layer is greater than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is low. Available water to a depth of 8.2 inches is moderate. This soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity classification is 3e. The soil does not meet hydric criteria. Erosion potential is slight.	Farmland of statewide importance
HwC2	Hiwassee sandy clay loam, 6-10% slopes, eroded	The Hiwassee component makes up 5.78% of the map unit. Slopes are 6-10%. This component is on stream terraces. The parent material consists of clayey ancient alluvium derived from granite and gneiss. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is medium. Available water to a depth of 8.2 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4e. The soil does not meet hydric criteria. Erosion potential is moderate.	Not prime farmland
IdB	Iredell fine sandy loam, 1-6% slopes	The Iredell component makes up 2.01% of the map unit. Slopes are 1-6%. This component is on hillslopes. The parent material consists of clayey residuum weathered from diorite, gabbro, hornblende gneiss, or hornblende schist. Depth to a restrictive layer is 20–40 inches to paralithic bedrock. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is low. Runoff class is very high. Available water to a depth of 5.5 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is about 12–24 inches. Non-irrigated land capacity classification 2e. The soil does not meet hydric criteria. Erosion potential is moderate.	Farmland of statewide importance

Table E3.5-1 Onsite Soil Unit Descriptions (Sheet 3 of 5)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
MaB	Madison sandy loam 2-6% slopes	The Madison component makes up 2.89% of the map unit. Slopes are 2-6%. This component is on hillslopes. The parent material consists of clayey residuum weathered from granite and gneiss. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is low. Available water to a depth of 8.4 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 2e. This soil does not meet hydric criteria. Erosion potential lis slight.	All areas are prime farmland
MdC2	Madison sandy clay loam, 6-10% slopes, eroded	The Madison component makes up 8.42% of the map unit. Slopes are 6-10%. This component is on hillslopes. The parent material consists of clayey residuum weathered from granite and gneiss. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Available water to a depth of 8.5 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4e. The soil does not meet hydric criteria. Erosion potential is moderate.	Not prime farmland
MdE2	Madison sandy clay loam, 10-25% slopes, eroded	The Madison component makes up 11.83% of the map unit. Slopes are 10-15%. The component is on hillslopes. The parent material consists of clayey residuum weathered from granite and gneiss. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is medium. Available water to a depth of 8.5 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 6e. The soil does not meet hydric criteria. Erosion potential is moderate.	Not prime farmland
MkC2	Mecklenburg sandy clay loam, 6-10% slopes, eroded	The Mecklenburg component makes up 0.12% of the map unit. Slopes are 6-10%. The component is on hillslopes. The parent material consists of clayey residuum weathered from basic metamorphic rocks. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low to moderately high. Runoff class is medium. Available water to a depth of 7.8 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 4e. The soil does not meet hydric criteria. Erosion potential is moderate.	Not prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions (Sheet 4 of 5)

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
PaE	Pacolet sandy loam, 10-25% slopes	The Pacolet component makes up 15.49% of the map unit. Slopes are 10-25%. The component is on interfluves. The parent material consists of residuum weathered from granite and/or residuum weathered from gneiss. Depth to a restrictive layer is more than 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high to high. Runoff class is not reported. Available water to a depth of 8.1 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 180–280 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 6e. The soil does not meet hydric criteria. Erosion potential is severe.	Not prime farmland
To	Toccoa loam	The Toccoa component makes up 0.56% of the map unit. Slopes are 0-2%. The component is on floodplains. The parent material consists of loamy alluvium. Depth to a restrictive layer is more than 80 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is high. Runoff class is very low. Available water to a depth of 6.7 inches is moderate. The soil is occasionally flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is about 30 to 60 inches. Non-irrigated land capacity is 2w. The soil does not meet hydric criteria. Erosion potential is slight.	Prime farmland if protected from flooding or not frequently flooded during the growing season
WaF	Wateree-Rion complex, 15-40% slopes	The Wateree-Rion component makes up 6.17% of the map unit. Slopes are 15-40%. The component is on hillslopes. The parent material consists of clayey residuum weathered from granite and gneiss. Depth to a restrictive layer is 20–40 inches to paralithic bedrock and 40–79 inches to lithic bedrock. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is very low to moderately low. Runoff class is medium. Available water to a depth of 2.6 inches is very low. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 7e. The soil does not meet hydric criteria. Erosion potential is severe.	Not prime farmland
WkD	Wilkes sandy loam, 6-15% slopes	The Wilkes component makes up 5.48% of the map unit. Slopes are 6-15%. The component is on hillslopes. The parent material consists of clayey residuum weathered from hornblende schist, hornblende gneiss, diorite, or gabbro. Depth to a restrictive layer is 10–40 inches to paralithic bedrock and 40–79 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is very low to moderately low. Runoff class is medium. Available water to a depth of 3.6 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 6e. The soil does not meet hydric criteria. Erosion potential is severe.	Not prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions (Sheet 5 of 5)

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
WkF	Wilkes sandy loam, 15-40% slopes	The Wilkes component makes up 15.52% of the map unit. Slopes are 15-40%. The component is on hillslopes. The parent material consists of clayey residuum weathered from hornblende schist, hornblende gneiss, diorite, or gabbro. Depth to a restrictive layer is 10 to 40 inches to paralithic bedrock and 40–79 inches to lithic bedrock. The natural drainage class is well drained. Water movement in the most restrictive layer is very low to moderately low. Runoff class is high. Available water to a depth of 3.6 inches is low. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 7e. The soil does not meet hydric criteria. Erosion potential is severe.	Not prime farmland
WnB	Winnsboro sandy loam, 2-6% slopes	The Winnsboro component makes up 0.42% of the map unit. Slopes are 2-6%. The component is on hillslopes. The parent material consists of clayey residuum weathered from gneiss and schist containing intrusions of diorite, hornblende, or gabbro. Depth to a restrictive layer is 40–79 inches to paralithic bedrock. The natural drainage class well drained. Water movement in the most restrictive layer is moderately low to moderately high. Runoff class is low. Available water to a depth of about 8.0 inches is moderate. The soil is not flooded. It is not ponded. The frost-free period is 176–223 days. Depth to the water table is more than 80 inches. Non-irrigated land capacity is 2e. The soil does not meet hydric criteria. Erosion potential is moderate.	Farmland of statewide importance

(USDA. 2022)

a. See Figure E3.5-4 for map unit symbols.

Table E3.5-2 Historic Seismic Events of Magnitude 3.0 or Greater within 200 Miles of VCSNS (1970–2023)[a] (Sheet 1 of 4)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from VCSNS (miles/km)	Approximate Location
7/13/1971	6:42	34.76	-82.98	3.7 lg	100/161	5 km E of West Union, South Carolina
2/3/1972	18:11	33.306	-80.582	4.36 mw	80/129	10 km ESE of Bowman, South Carolina
10/30/1973	17:58	35.75	-84	3.4 lg	182/293	2 km WSW of Maryville, Tennessee
11/30/1973	2:48	35.799	-83.962	4.7 mb	182/293	1 km NE of Alcoa, Tennessee
8/2/1974	3:52	33.872	-82.488	4.3 mb	73/118	8 km N of Lincolnton, Georgia
10/28/1974	6:33	33.79	-81.92	3 ml	49/79	0 km E of Edgefield, South Carolina
11/4/1974	22:00	33.73	-82.22	3.7 ml	65/104	1 km WSW of Modoc, South Carolina
11/22/1974	0:25	32.9	-80.145	4.7 mb	117/189	10 km SSW of Ladson, South Carolina
12/3/1974	3:25	33.95	-82.5	3.6 ml	72/115	3 km SW of Willington, South Carolina
11/25/1975	10:17	34.873	-82.958	3.2 lg	101/163	2 km SE of Salem, South Carolina
9/13/1976	13:54	36.604	-80.81	3.3 lg	161/259	10 km NNE of Lowgap, North Carolina
12/27/1976	1:57	32.223	-82.463	3.7 lg	157/253	0 km NNE of Higgston, Georgia
1/18/1977	13:29	33.069	-80.199	3 lg	106/171	6 km NNW of Summerville, South Carolina
7/27/1977	17:03	35.42	-84.417	3.5	192/309	6 km E of Englewood, Tennessee
8/24/1977	23:20	33.392	-80.692	3.1	71/115	4 km N of Bowman, South Carolina
12/15/1977	14:16	32.923	-80.22	3	113/183	9 km SSW of Centerville, South Carolina
8/13/1979	0:18	35.243	-84.375	3.7	185/299	15 km SSW of Tellico Plains, Tennessee
8/25/1979	20:31	34.929	-82.971	3.7	103/167	4 km N of Salem, South Carolina
9/12/1979	1:24	35.587	-83.901	3.2	171/276	16 km SW of Townsend, Tennessee
6/10/1980	18:47	35.447	-82.879	3	118/191	10 km SSE of Clyde, North Carolina
6/25/1980	13:02	35.779	-84.046	3.3	185/298	4 km S of Louisville, Tennessee
4/9/1981	2:10	35.476	-82.073	3 mblg	91/147	13 km ENE of Lake Lure, North Carolina
5/5/1981	16:21	35.33	-82.43	3.5 mblg	95/153	2 km NNE of Barker Heights, North Carolina
6/3/1981	15:54	36.205	-81.651	3 mblg	132/213	2 km ESE of Boone, North Carolina
2/28/1982	22:33	32.936	-80.138	3 mblg	115/186	6 km SSW of Ladson, South Carolina
1/26/1983	9:07	32.728	-83.375	3.5 mblg	160/258	5 km NNW of Jeffersonville, Georgia
3/24/1983	21.47	35.345	-82.462	3.2 mblg	97/156	0 km E of Balfour, North Carolina

Table E3.5-2 Historic Seismic Events of Magnitude 3.0 or Greater within 200 Miles of VCSNS (1970–2023)[a] (Sheet 2 of 4)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from VCSNS (miles/km)	Approximate Location
7/8/1983	14:29	35.544	-84.152	3.3 mblg	182/293	9 km ESE of Vonore, Tennessee
11/6/1983	4:02	32.937	-80.159	3.3 md	115/185	6 km S of Centerville, South Carolina
2/14/1984	15:54	36.121	-83.735	3.7 md	185/299	4 km SW of Blaine, Tennessee
3/17/1984	18:26	35.814	-84.033	3 ml	186/299	1 km ESE of Louisville, Tennessee
8/30/1984	11:26	35.56	-84.34	3.2 md	192/309	4 km NNE of Madisonville, Tennessee
10/22/1984	13:58	36.36	-81.672	3.1 mblg	143/230	15 km N of Boone, North Carolina
2/13/1986	6:35	34.81	-82.94	3 md	99/159	9 km SSE of Salem, South Carolina
3/27/1987	2:29	35.57	-84.21	4.2 md	186/299	3 km SE of Vonore, Tennessee
7/10/1987	19:04	36.103	-83.817	3.6 md	188/303	7 km NW of Mascot, Tennessee
7/10/1987	21:48	36.1	-83.82	3.3 md	188/303	7 km WNW of Mascot, Tennessee
9/22/1987	12:23	35.623	-84.311	3.3 mblg	192/310	7 km WNW of Vonore, Tennessee
12/11/1987	22:53	34.244	-82.628	3 mblg	75/121	4 km NNE of Lowndesville, South Carolina
1/8/1988	20:07	35.275	-84.201	3.3 md	177/285	12 km SE of Tellico Plains, Tennessee
1/22/1988	20:57	32.935	-80.157	3.3 md	115/185	6 km S of Centerville, South Carolina
2/16/1988	10:26	36.561	-82.304	3.3 mblg	165/266	3 km NNE of Blountville, Tennessee
2/17/1988	19:37	35.366	-83.853	3.5 mblg	161/260	1 km ENE of Lake Santeetlah, North Carolina
11/13/1990	10:22	32.947	-80.136	3.2 md	115/185	4 km SSW of Ladson, South Carolina
9/24/1991	2:21	35.711	-84.095	3.3 md	185/298	6 km SE of Friendsville, Tennessee
1/2/1992	23:21	33.946	-82.465	3.2 md	70/113	2 km S of Willington, South Carolina
8/21/1992	11:31	33.05	-80.116	4.1 mb	110/177	1 km NE of Sangaree, South Carolina
1/1/1983	0:08	35.877	-82.09	3 md	117/188	4 km SSW of Spruce Pine, North Carolina
8/8/1993	4:24	33.633	-81.595	3.2 mblg	48/78	14 km NE of Aiken, South Carolina
2/11/1994	21:40	36.8	-82	3.4 ml	176/284	10 km NNW of Abingdon, Virginia
4/17/1995	8:45	32.947	-80.068	3.9 mblg	117/189	5 km SW of Goose Creek, South Carolina
6/25/1995	19:36	36.747	-81.452	3.1 mb	168/271	4 km SW of Sugar Grove, Virginia
7/5/1995	9:16	35.366	-84.212	3.7 mblg	180/290	7 km E of Tellico Plains, Tennessee
7/7/1995	16:01	36.515	-81.873	3.1 mblg	155/250	7 km NW of Mountain City, Tennessee

Table E3.5-2 Historic Seismic Events of Magnitude 3.0 or Greater within 200 Miles of VCSNS (1970–2023)[a] (Sheet 3 of 4)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from VCSNS (miles/km)	Approximate Location
7/30/1997	7:29	36.436	-83.509	3.8 mblg	192/309	5 km ESE of Tazewell, Tennessee
4/13/1998	4:56	34.61	-80.466	3.5 mb	52/85	8 km WSW of Jefferson, South Carolina
6/4/1998	21:31	35.479	-80.821	3.2 mblg	86/138	3 km SSE of Davidson, North Carolina
1/18/2000	17:19	32.993	-83.214	3.5 mblg	141/227	8 km S of Hardwick, Georgia
4/13/2001	11:36	36.53	-83.34	3 md	191/308	10 km W of Sneedville, Tennessee
7/26/2001	0:26	36.0008333	-83.5536667	3.2 mlg	172/277	11 km S of New Market, Tennessee
11/8/2002	8:29	32.422	-79.95	3.5 mblg	151/243	24 km SSE of Kiawah Island, South Carolina
11/11/2002	18.39	32.404	-79.936	4 mb	152/246	26 km SSE of Kiawah Island, South Carolina
3/18/2003	1:04	33.689	-82.888	3.5 mblg	99/160	11 km S of Rayle, Georgia
5/5/2003	5:53	33.055	-80.19	3.1 md	107/172	4 km NNW of Summerville, South Carolina
7/13/2003	15:15	32.335	-82.144	3.6 mblg	143/230	6 km N of Cobbtown, Georgia
12/22/2003	18:50	32.924	-80.157	3 md	115/186	8 km S of Centerville, South Carolina
7/20/2004	4:13	32.972	-80.248	3.1 md	110/177	7 km WSW of Centerville, South Carolina
12/23/2004	1:54	35.4293333	-84.2041667	3 md	181/292	11 km NE of Tellico Plains, Tennessee
8/24/2005	22:09	35.8795	-82.7951667	3.7 md	137/221	3 km ESE of Hot Springs, North Carolina
4/10/2006	22:29	35.3623333	-84.4801667	3.3 md	194/312	5 km NE of Etowah, Tennessee
5/10/2006	7:17	35.533	-84.396	3.2 md	194/313	3 km WNW of Madisonville, Tennessee
6/15/2006	19:57	35.5121667	-83.2033333	3.4 md	135/218	9 km W of Maggie Valley, North Carolina
9/22/2006	6:22	34.4923333	-79.692	3.4 mlg	93/150	4 km WSW of Blenheim, South Carolina
9/25/2006	0:44	34.5401667	-79.3748333	3.7 mlg	112/180	7 km W of Rowland, North Carolina
12/18/2006	3:34	35.356	-84.3508333	3.3 md	187/301	5 km W of Tellico Plains, Tennessee
8/4/20007	5:04	35.4865	-82.0873333	3 md	92/149	12 km ENE of Lake Lure, North Carolina
12/16/2008	7:42	33.0881667	-80.1346667	3.6 mlg	107/173	5 km N of Sangaree, South Carolina
12/17/2008	19:05	36.0501667	-83.5918333	3.3 mlg	176/284	6 km SSW of New Market, Tennessee
4/4/2009	15:45	33.2146667	-83.2023333	3.1 md	131/212	15 km N of Milledgeville, Georgia
8/1/2009	8:38	35.0635	-84.2923333	3.2 mlg	177/285	8 km ENE of Ducktown, Tennessee
8/29/2009	5:37	33.033	-80.1586667	3.2 mlg	109/176	2 km NE of Summerville, South Carolina

Table E3.5-2 Historic Seismic Events of Magnitude 3.0 or Greater within 200 Miles of VCSNS (1970–2023)[a] (Sheet 4 of 4)

Earthquake Date	Local Time	Latitude	Longitude	Magnitude	Distance from VCSNS (miles/km)	Approximate Location
8/31/2009	9:07	35.778	-84.1238333	3.3 md	189/304	2 km NNE of Friendsville, Tennessee
12/6/2009	19:27	33.0293333	-83.0108333	3.2 mlg	131/211	4 km WNW of Deepstep, Georgia
4/20/2010	4:28	35.7251667	-84.001	3.3 mlg	181/291	4 km SW of Maryville, Tennessee
12/3/2011[b]	6:12	37.13	-81.932	3.1 mblg	198/318	8 km NW of Raven, Virginia
11/24/2012	6:03	35.9186667	-83.5011667	3 mlg	166/268	7 km NE of Sevierville, Tennessee
2/14/2014	22:23	33.8166667	-82.092	4.1 mw	55/89	12 km ENE of Parksville, South Carolina
2/16/2014	15:23	33.8301667	-82.0656667	3 mw	53/86	13 km WNW of Edgefield, South Carolina
3/19/2014	17.38	32.9978333	-80.1778333	3 mlg	111/178	0 km WNW of Centerville, South Carolina
12/15/2014	1:44	36.059	-81.5195	3 md	121/196	13 km NNW of Cedar Rock, North Carolina
6/20/2017	10:14	33.4275	-82.0168333	3.2 mlg	72/116	6 km SW of Augusta, Georgia
4/29/2018	17:32	36.2968333	-83.3895	3.1 md	180/291	10 km WSW of Bean Station, Tennessee
12/15/2018	23:12	36.0383333	-83.6955	3.01 md	180/290	5 km ESE of Mascot, Tennessee
3/5/2019	15:56	36.2955	-83.7356667	3.37 md	194/312	7 km NE of Maynardville, Tennessee
8/9/2020	7:07	36.4743333	-81.0865	5.1 mw	150/242	4 km SE of Sparta, North Carolina
9/27/2021	17:21	32.944	-80.154	3.27 md	114/184	South Carolina
12/27/2021	14:18	34.1825	-80.7196667	3.3 mlg	34/56	5 km SSW of Lugoff, South Carolina
5/2/2022	0.32	34.1588333	-80.731	3.25 md	34/55	5 km ESE of Elgin, South Carolina
6/18/2022	3:05	32.4525	-82.1405	3.9 mw	135/218	7 km E of Stillmore, Georgia
6/26/2022	0:31	34.1666667	-80.7246667	3.4 mw	34/56	6 km E of Elgin, South Carolina
6/29/2022	13:43	34.1668333	-80.7286667	3.5 mw	34/55	6 km E of Elgin, South Carolina
6/29/2022	18:03	34.1653333	-80.727	3.6 mw	34/56	6 km E of Elgin, South Carolina

(USGS. 2021; USGS. 2023)

a. All seismic events within 200 miles (323 km) with a magnitude of greater than 3.0 through January 20, 2023.
b. Seismic events caused by rock bursts
mb = Short-period body wave
mblg, mb_lg, lg, mlg = Short-period surface wave
md = Duration
ml = Local
mw = Moment W-phase

Figure E3.5-1 Physiographic Provinces Associated with VCSNS

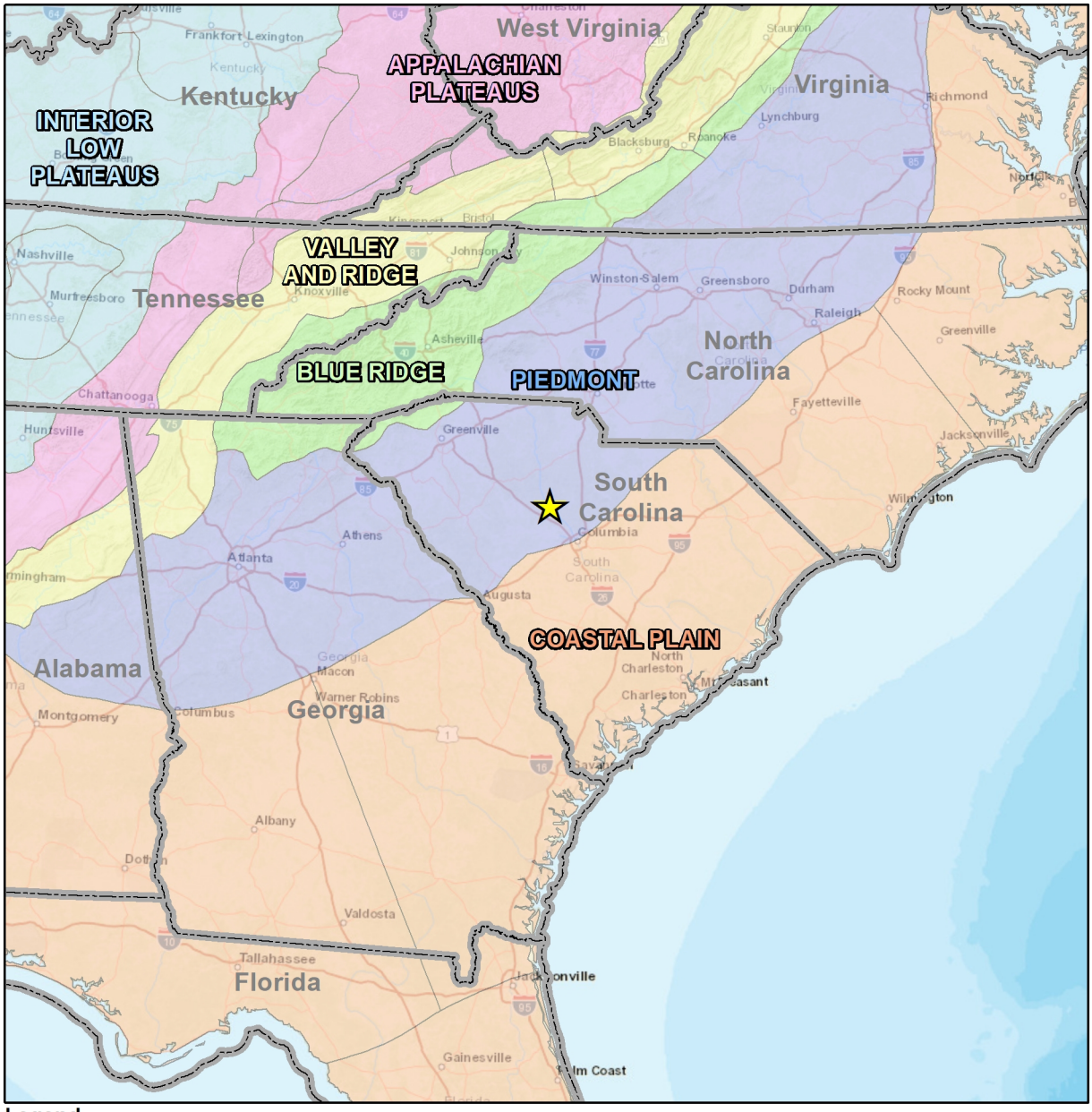


Figure E3.5-2 Surficial Geology Map, VCSNS Property

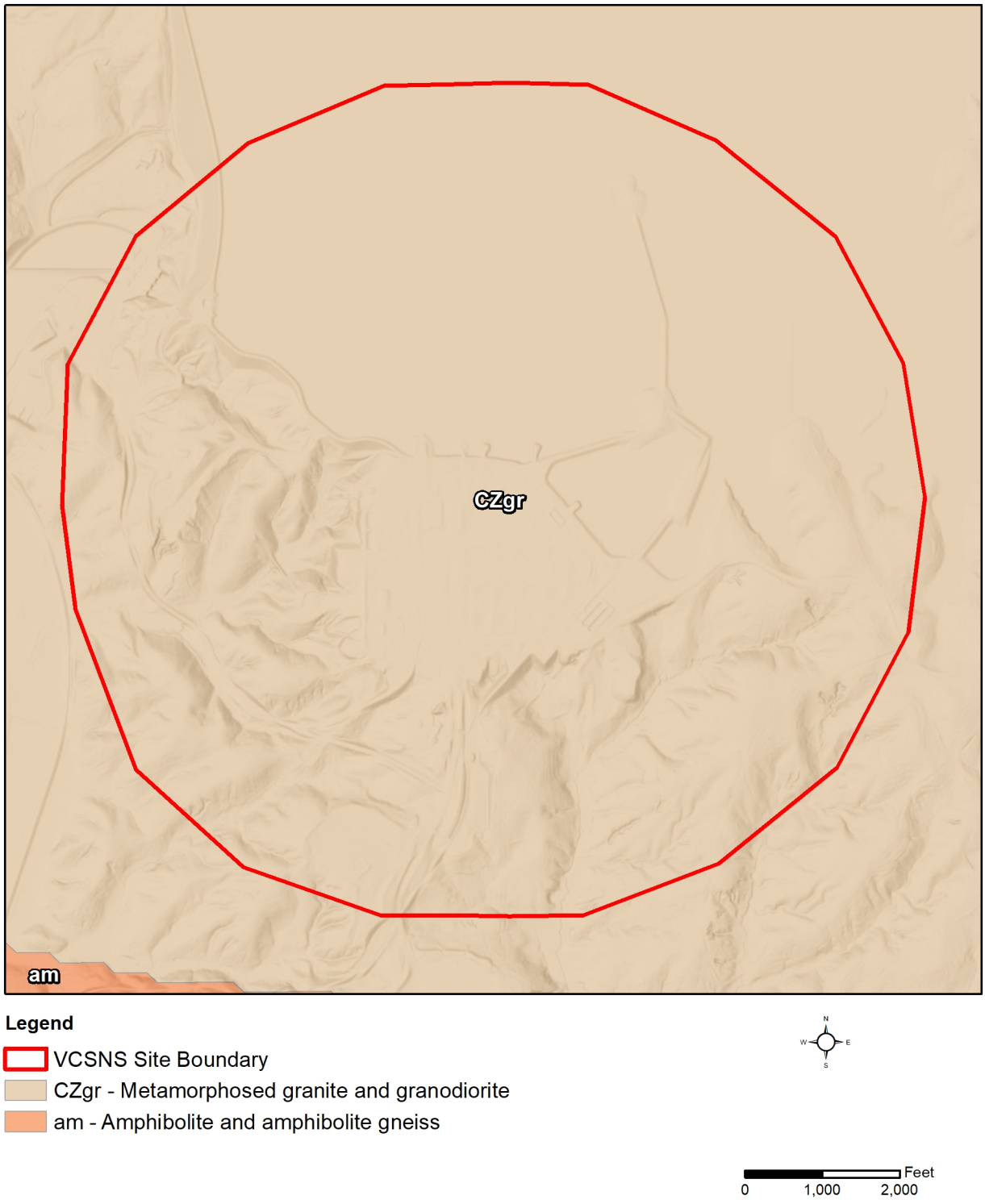


Figure E3.5-3a Hydrological Cross-Section Locations on VCSNS

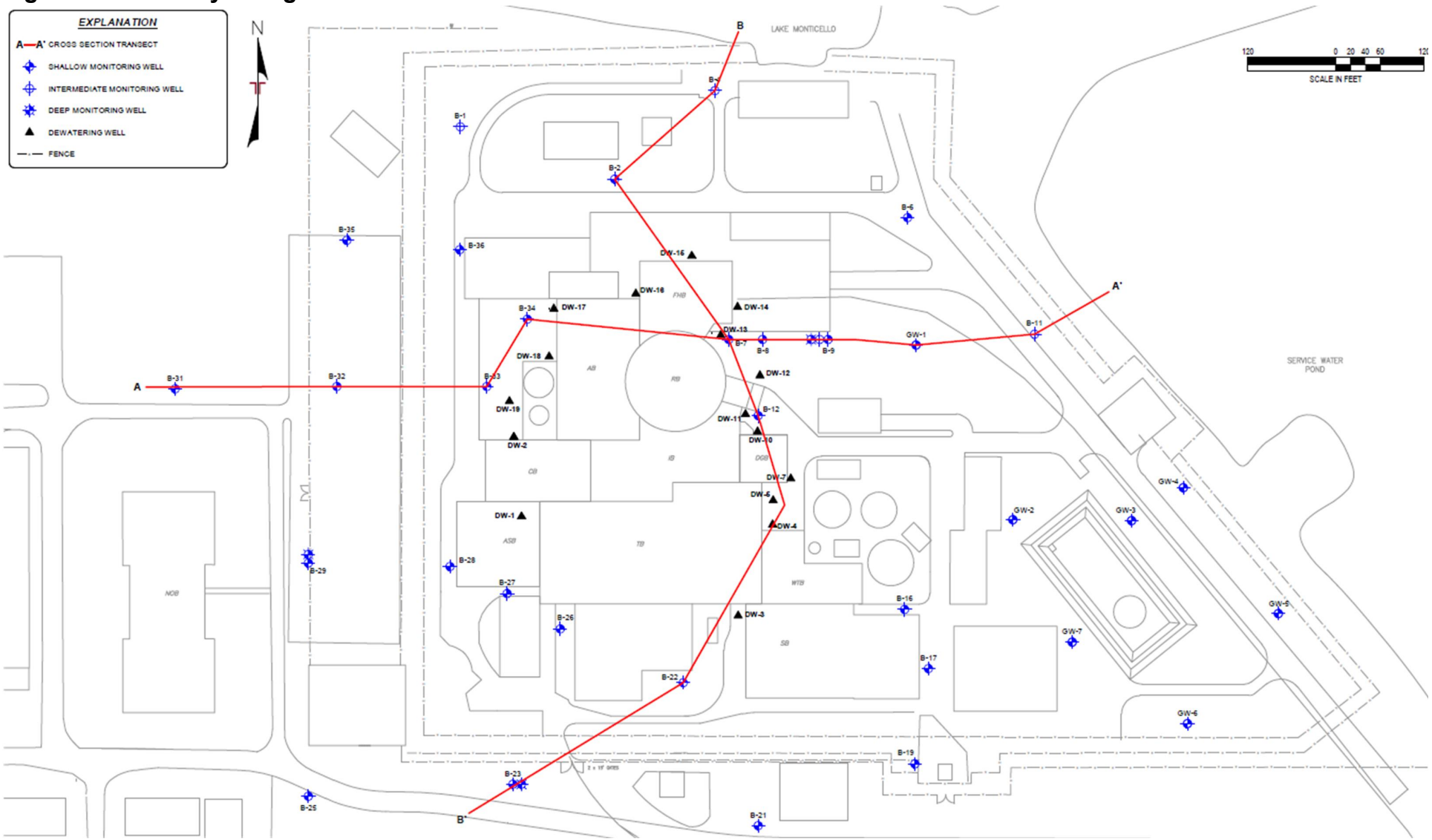


Figure E3.5-3b Cross-Section A-A'

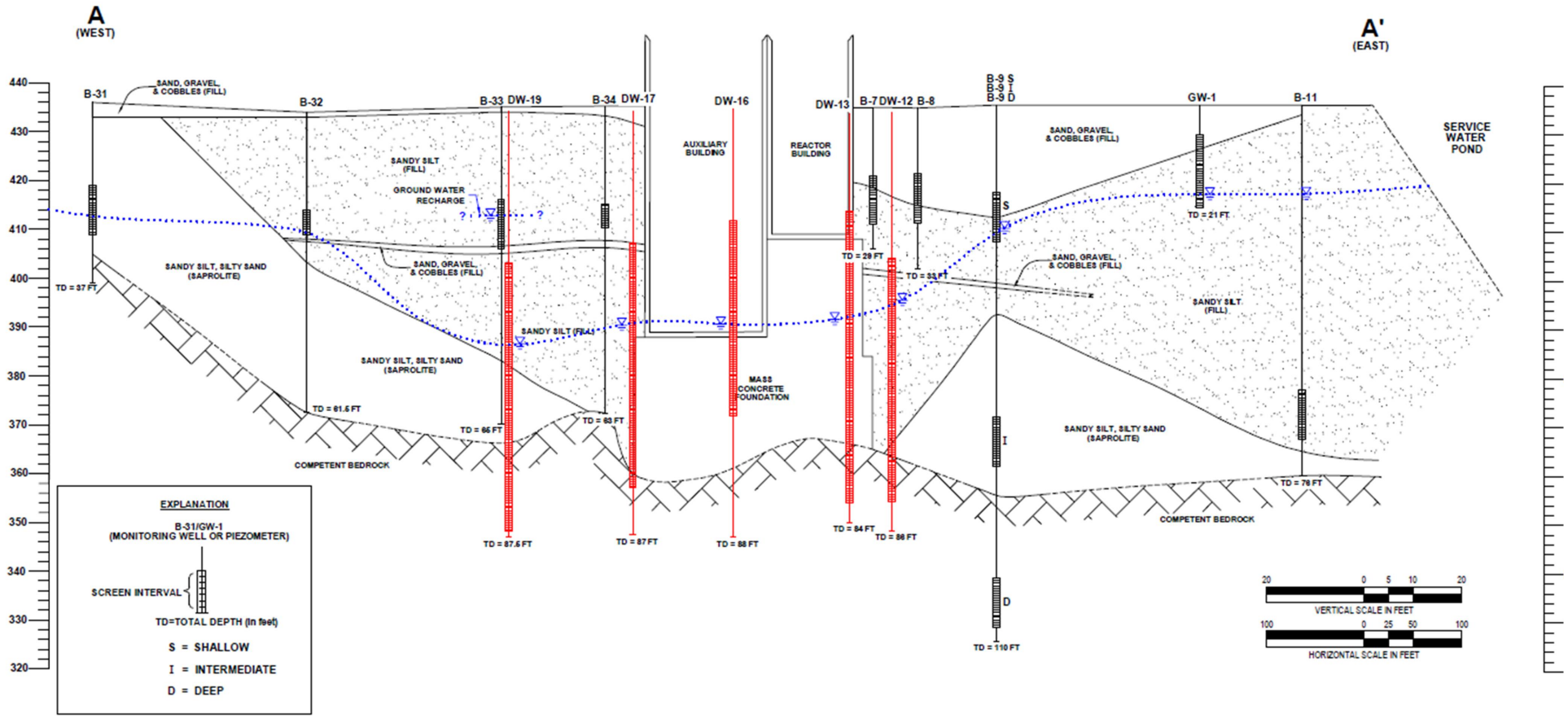


Figure E3.5-3c Cross-Section B-B'

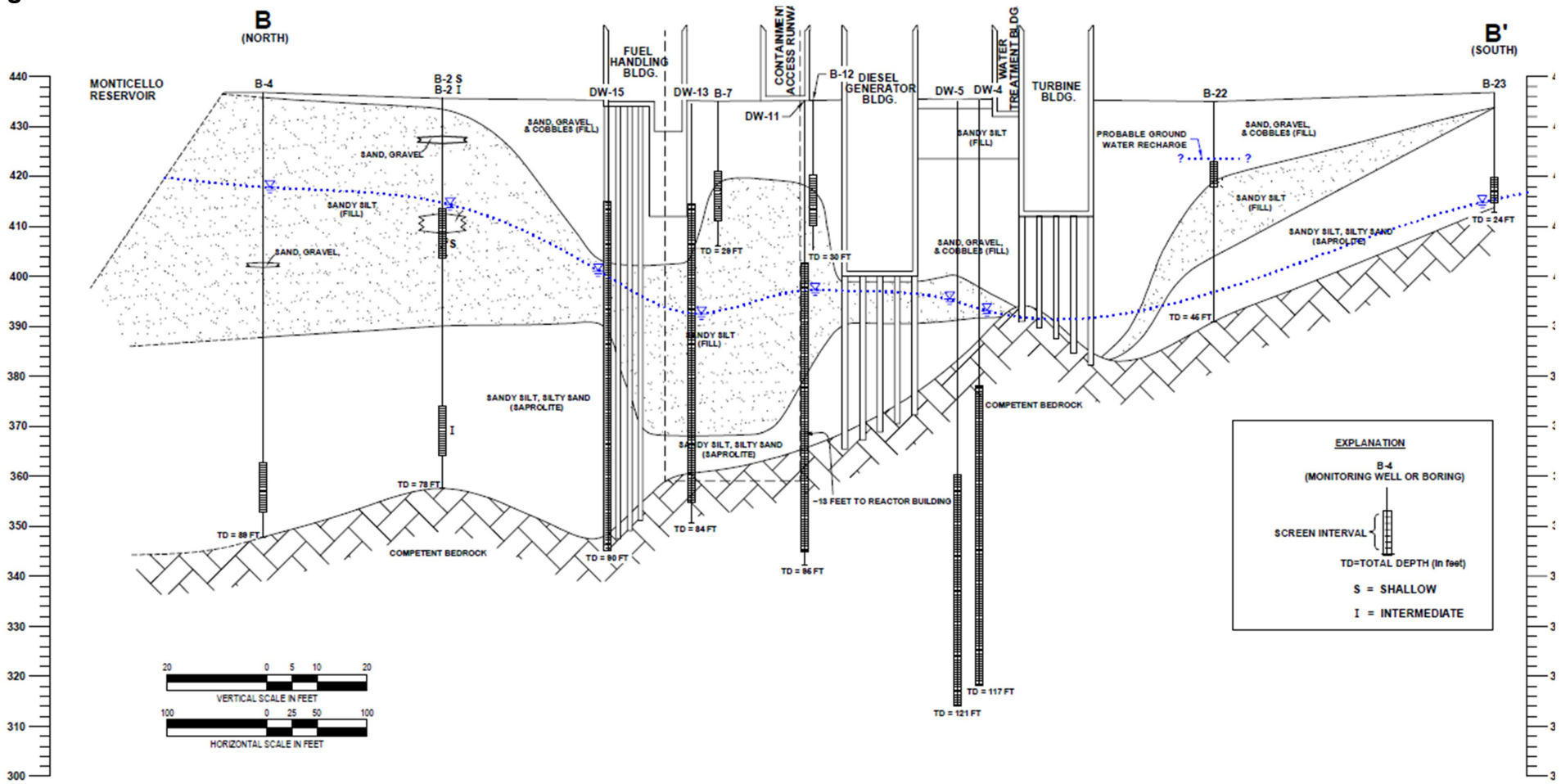


Figure E3.5-4 Distribution of Soil Units, VCSNS Property

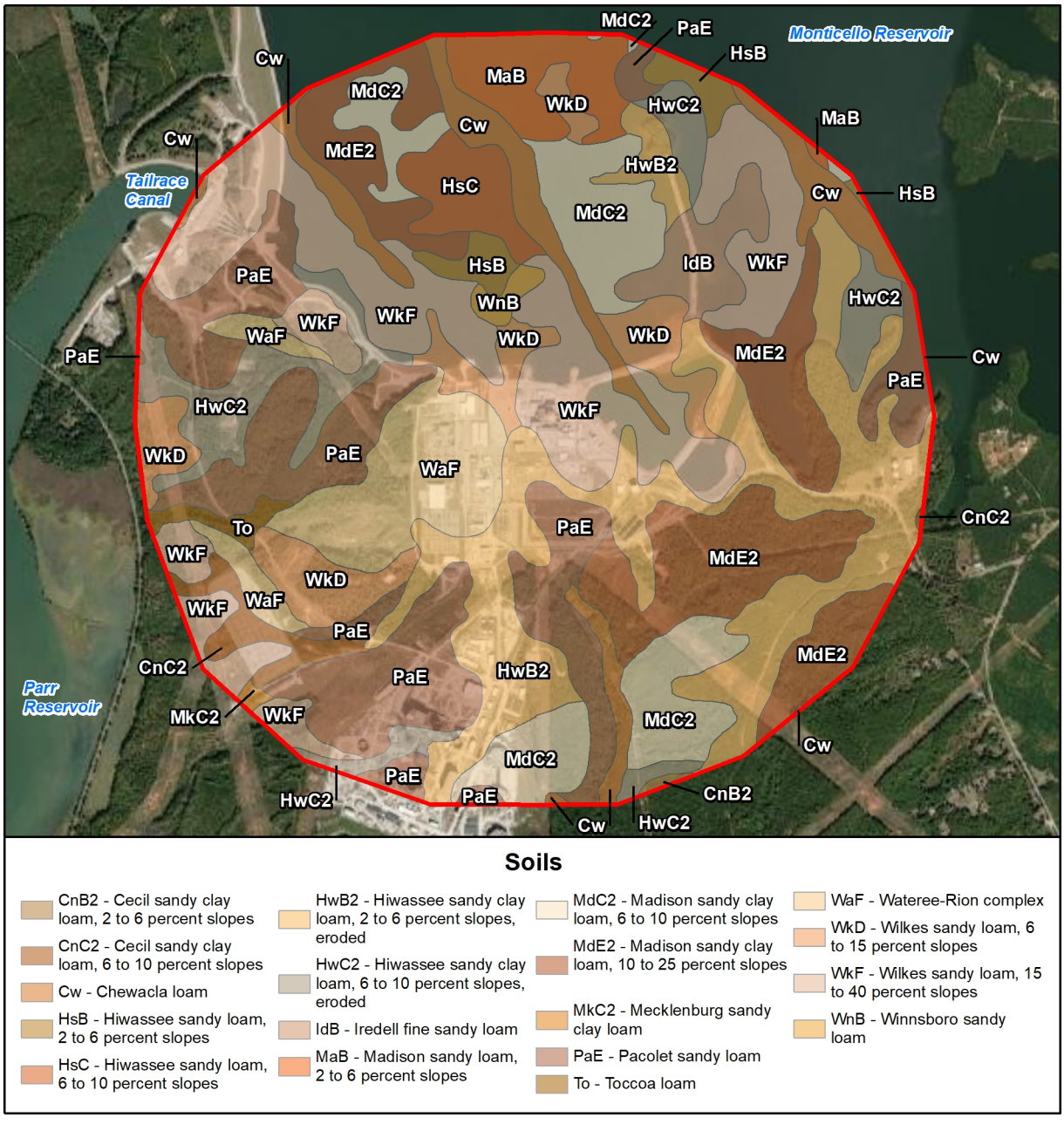
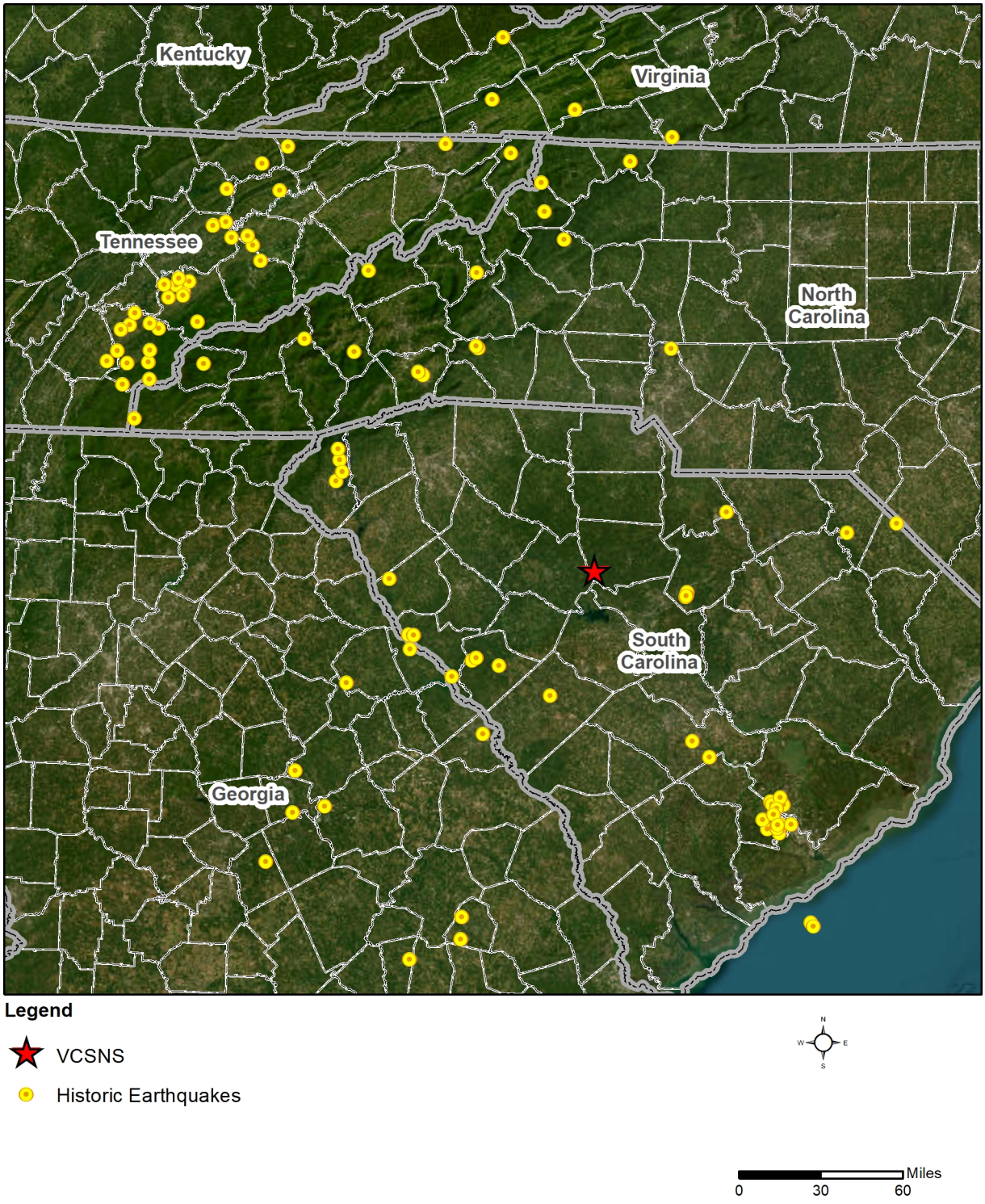


Figure E3.5-5 Historic Seismic Events, 1970–2023



E3.6 WATER RESOURCES

E3.6.1 SURFACE WATER RESOURCES

VCSNS is in Fairfield County, South Carolina, approximately 15 miles west of Winnsboro and 26 miles northwest of Columbia (SCE&G. 2002, Section 2.1). The Broad River, Parr Reservoir, and Monticello Reservoir are the primary hydrologic features with which the plant interacts. The Broad River flows in a northwest-to-southeast direction approximately 1 mile west of VCSNS and serves as the boundary between Fairfield County to the east and Newberry County to the west. (SCE&G. 2002, Section 2.1) The Parr Reservoir is located approximately 1 mile west of VCSNS on the Broad River (DE. 2023a, Section 2.4.1.2.2). VCSNS is situated on a hilltop at an average elevation of 435 feet msl, about 180 feet above the Broad River floodplain (DE. 2023a, Section 2.4.1.1) on the south shore of the Monticello Reservoir (SCE&G. 2002, Section 2.1), as shown in Figure E3.6-1.

The Broad River basin dominates the central Piedmont of South Carolina. It is the third largest basin in the state, representing 12.2% of its area and encompassing 3,800-square miles. (SCDNR. 2013) The Broad River originates on the eastern slope of the Blue Ridge Mountains near Lake Lure, North Carolina, and flows 220 miles southeast to South Carolina before joining the Saluda River at Columbia, South Carolina, to form the Congaree River. Major tributaries to the Broad River include the Pacolet, Tyger, and Enoree Rivers, all of which enter the Broad River from the west. The Broad River in South Carolina is entirely within the Piedmont physiographic province, which is an area of gently rolling to hilly terrain with relatively broad stream valleys; elevations range from 376 to 1,000 feet msl. For most of its length in South Carolina, the Broad River flows through agricultural and forested land, including the Sumter National Forest, which bounds the river for some 30 miles above the Parr Reservoir. (SCE&G. 2002, Section 2.2) Near VCSNS, the Broad River is about 2,000 feet wide with depths ranging from a few feet to around 15 feet (DE. 2023a, Section 2.4.1.2.1).

Monticello Reservoir was built in the Frees Creek valley to serve as the upper pool for the Fairfield Pumped Storage Facility and the source of makeup cooling water for VCSNS (NRC. 2004b, Section 2.2.2). The Parr Reservoir serves as the lower reservoir for the Fairfield Pumped Storage Facility. As part of the Fairfield Pumped Storage Facility operations, water is released from the Monticello Reservoir through the Fairfield Pumped Storage Facility to the Parr Reservoir to generate electricity during peak demand periods. Water is then pumped during off-peak demand periods from the Parr Reservoir to the Monticello Reservoir to maintain the level of the upper reservoir. (SCE&G. 2010, Section 2.3.3.1.5)

The daily cycle of operation at the Fairfield Pumped Storage Facility transfers up to 29,000 acre-feet per day or 9.5×10^9 gallons per day (gpd) between the Parr and Monticello Reservoirs. Operations vary, depending on the season and system needs. In summer, the Fairfield

Pumped Storage Facility generally pumps water from Parr Reservoir to Monticello Reservoir between the hours of 11:00 p.m. and 8:00 a.m. and generates power by releasing water between the hours of 10:00 a.m. and 11:00 p.m. In winter, the Fairfield Pumped Storage Facility generally pumps water from Parr Reservoir to Monticello Reservoir between 11:00 p.m. and 6:00 a.m. and generates power between the hours of 6:00 a.m. and 1:00 p.m. Fairfield Pumped Storage Facility is normally operated seven days a week. As a result of Fairfield Pumped Storage Facility operations, Parr Reservoir is subject to daily fluctuations in water level of as much as 10 feet, but the daily average is approximately 4 feet. These water level fluctuations can expose and then re-inundate up to 2,550 acres of Parr Reservoir with each cycle of pump-back and release of water. The amount of water pumped from and returned to Parr Reservoir daily represents as much as 88% of its total volume. (SCE&G. 2002, Section 2.2)

Parr Reservoir is formed by Parr Dam, located about 2.5 miles southwest of VCSNS (DE. 2023a, Section 2.4.1.2.2). Parr Dam was constructed in 1914 with a surface area of 1,850 acres as the water source for the Parr Hydro plant, a 15-megawatt (MW) hydroelectric facility, located approximately 26 miles upstream of the confluence of the Broad and Saluda Rivers (SCE&G. 2002, Section 2.2). In 1977, the Parr Reservoir was enlarged to approximately 4,400 acres by raising the level of the dam by 9 feet to support the development of the Fairfield Pumped Storage Facility. Parr Reservoir assumed a dual function, providing water for both the Parr Hydro plant and the Fairfield Pumped Storage Facility. (SCE&G. 2002, Section 2.1) Parr Dam is a 2,715-foot-long approximately 45-foot-high structure, having a 2,000-foot-long concrete gravity spillway section with 9-foot-high spillway crest gates, with a crest elevation of 266 feet. The dam is joined on the westerly end by an earth dike about 300 feet long and on the easterly end by a 300-foot-long integral powerhouse section, a 90-foot-long concrete non-overflow section, and a 25-foot-long earth fill section. (DE. 2023a, Section 2.4.1.2.2)

Monticello Reservoir has a drainage area of about 17 square miles and is formed by the Frees Creek Dams. The main Frees Creek Dam has a maximum height of 180 feet and a crest length of approximately 5,000 feet. Three smaller saddle dams have lengths of 3,400 feet, 1,700 feet, and 900 feet, with maximum heights from 50 to 90 feet. The dams have crest elevations of 434 feet msl and are of earth fill construction with appropriate riprap protection. Due to the size of these structures, Frees Creek channel is submerged to an average depth of 70 feet in the vicinity of VCSNS. (DE. 2023a, Section 2.4.1.2.2)

Monticello Reservoir has a surface area of about 6,800 acres and a storage volume of about 400,000 acre-feet at normal maximum water surface elevation, 425 feet msl. The maximum daily withdrawal for generating purposes is 29,000 acre-feet, lowering the pool to elevation 420.5 feet msl and reducing the surface area to approximately 6,500 acres. Pumping operations during periods of off-peak power demand refill the reservoir. (DE. 2023a, Section 2.4.1.2.2) Fairfield Pumped Storage Facility operations can cause water levels in the Monticello Reservoir to fluctuate

as much as 4.5 feet daily, from 420.5 feet msl to 425 feet msl. Daily elevation changes vary, depending on system needs. The average depth is 59 feet, and the maximum depth is approximately 126 feet. (SCE&G. 2002, Section 2.2)

Cooling water is drawn from the Monticello Reservoir at a rate of approximately 1,143 cfs, passed through the condensers, and ultimately returned to the Monticello Reservoir. The primary consumption of water from the Monticello Reservoir by the nuclear plant is only attributable to evaporative loss. The theoretical maximum loss of cooling system water to evaporation is 22 cfs for VCSNS. Ultimately, these losses are made up from water acquired from the Parr Reservoir on the Broad River. Water is withdrawn from Monticello Reservoir for potable use and other non-cooling-related uses at VCSNS. This water is treated at the water treatment plant prior to use. (NRC. 2004b, Section 2.2.2)

As described in Sections E2.2.3 and E2.2.3.1, the circulating water system provides cooling water to the main and auxiliary condensers. Cooling water is withdrawn from Monticello Reservoir, passed through the condensers, and ultimately returned to Monticello Reservoir. The intake structure, located along the south shoreline of the reservoir, has three pump bays, each with two entrances. Each entrance is 13 feet wide and 25.5 feet high, extending from the bottom of the Pump House to the bottom of a skimmer wall. The entrances are each equipped with vertical travelling screens and two sets of trash racks. (SCE&G. 2002, Section 3.1.2.1)

The Turbine Building closed-cycle cooling water system was installed in 1996 to provide cooling for certain plant loads that were previously handled by the circulating water system. The Turbine Building closed-cycle cooling water system supplies cooling water to equipment associated with the turbine, generator, and other non-nuclear systems in the Turbine Building. This system uses a closed-cycle cooling tower with fans and cooling coils to reject waste heat to the atmosphere. The cooling tower is located approximately 500 feet northwest of the Reactor Building. Makeup water to the cooling tower spray water basin is provided from the raw water system. Blowdown goes to the Monticello Reservoir through the circulating water discharge canal. (SCE&G. 2002, Section 3.1.1)

The USGS gauging station 02160990 in the Parr Reservoir, aka Parr Shoals Reservoir, is located upstream of the Parr Dam about 2.5 miles southwest of VCSNS (DE. 2023a, Section 2.4.1.2.2). Table E3.6-1 presents monthly water levels for the Parr Shoals Reservoir in 2021 along with long-term mean, maximum, and minimum water levels for November 1994 through December 2021 (USGS. 2022b). As described in Section E3.6.3.1, water levels in the Monticello Reservoir fluctuate as much as 10 feet as a result of Fairfield Pumped Storage Facility operations. Water levels in the Monticello Reservoir are monitored on the control board and on the plant computer. An annunciator alarms when the water level is above 427 feet msl or below 419 feet msl, ensuring that water levels remain within the permitted range.

A safety class impoundment was constructed in a small arm of the Monticello Reservoir to supply water for the SWS under normal and emergency operating conditions. It is possible to safely shut down the nuclear plant at any time using only the SWP without any reliance upon Monticello Reservoir. (DE. 2023a, Section 2.4.8) This impoundment is formed by the north, east, and south dams and the west embankment. The three dams and the west embankment are Seismic Category 1 structures. The north, east, and south dams have a crest elevation of 438 feet msl and crest lengths of 1,500 feet, 1,150 feet, and 765 feet, respectively. The crest of the west embankment is at elevation 435 feet msl, coinciding with the adjoining plant yard grade, and is about 1,900 feet long. (DE. 2023a, Section 2.4.1.2.2)

The SW intake is located along the northwest shoreline of the SWP on the west embankment. It provides adequate water from either the SWP or Monticello Reservoir. Cooling water enters the intake chamber from the SWP through a tunnel, or from the reservoir through a pipe from the Circulating Water Intake Structure by opening the normally closed isolation valve. A discharge structure for the SWS is on the southwest edge of the SWP along the west embankment. (DE. 2023a, Section 2.4.8) The SWP is hydraulically connected with Monticello Reservoir by the interconnecting pipe that extends from the Service Water Intake Structure to the Circulating Water Intake Structure. This pipe allows Monticello Reservoir to supply makeup water to the SWP by opening a normally closed isolation valve. In the event of loss of Monticello Reservoir coincident with the isolation valve being open, the invert elevation at the high point of the interconnecting pipe limits the drop in SWP level to elevation 415 feet. (DE. 2023a, Section 2.5.6.1)

Monticello Reservoir is hydrologically connected by a conduit that passes under the Highway 99 causeway to a smaller 300-acre body of water known as the Monticello Subimpoundment. This smaller subimpoundment is managed for recreational boating and fishing. (SCE&G. 2002, Section 2.2)

E3.6.1.1 Potential for Flooding

VCSNS is not susceptible to flooding from the Broad River due to its relative height above the river. Plant grade is approximately 10 feet above the maximum operating level of Monticello Reservoir, which is at elevation 425 feet msl. Protection of safety-related structures, exterior access, equipment, and systems against flooding from the Monticello Reservoir is provided through the location, arrangement, and design of the above with respect to the shoreline and possible storm-generated waves. (DE. 2023a, Section 2.4.1.1) Potential flooding due to tsunamis and ice conditions are not applicable due to the location of VCSNS and the historical lack of significant ice cover in the region (DE. 2023a, Section 2.4.1.2.2).

The climate of the VCSNS vicinity is temperate and there is no record of ice effects. Broad River temperature data are available at Carlisle, 21 miles north of VCSNS, Richtex, 14 miles south of VCSNS, and at the former Parr Steam Plant intake. These data indicate that a minimum monthly

mean temperature in the low 40s (°F) occurs in December and in January. Besides the remote chances of natural ice formation, the ambient surface water temperature of the Monticello Reservoir and the SWP are increased due to the discharge of waste heat from plant cooling water. For example, in winter months, the SWP surface temperatures are about 11°F warmer than the ambient water temperatures, preventing ice formation and the possibility of blockage and forces on the plant intake structures. (DE. 2023a, Section 2.4.7)

The USGS operates, or has operated, various stream flow gauging stations on the Broad River upstream and downstream of the Parr Reservoir. Three stations near VCSNS are Alston (station 2161000), Richtex (station 2161500), and Carlisle (station 2156500). (SCE&G. 2010, Section 2.3.1.1.1)

- Alston is approximately 1.2 miles downstream of the Parr Shoals Dam. Stream flow measurements at this station began in October 1896; they were discontinued in December 1907 and started again in October 1980. The maximum recorded mean daily flow was 130,000 cfs and the maximum peak flow was 140,000 cfs, both measured on June 7, 1903. (SCE&G. 2010, Section 2.3.1.1.1) Between 2017 and 2021, the highest stream flow was 123,000 cfs on February 8, 2020 (USGS. 2022c).
- Richtex is approximately 10.2 miles downstream of the Parr Shoals Dam. The station was discontinued in 1983. There are stream flow data at this station from October 1925 to September 1928 and from October 1930 to September 1983. The highest flood of record had a peak discharge of 228,000 cfs on October 3, 1929. (SCE&G. 2010, Section 2.3.1.1.1)
- Carlisle is located approximately 24.6 miles upstream of VCSNS. Stream flow measurements at this station began in 1938. The maximum recorded mean daily flow was 114,000 cfs and the maximum peak flow was approximately 123,000 cfs, both measured on October 7, 1976. (SCE&G. 2010, Section 2.3.1.1.1) Between 2017 and 2021, the highest stream flow was 86,700 cfs on February 8, 2020 (USGS. 2022d).

The historical flow data indicate two flood seasons: one from January to April and the other from July to October. Floods during the latter period are generally associated with hurricanes and have usually been of greater magnitude than those occurring from January to April. The major historical floods were measured at the Richtex and Alston gauging stations and corresponding discharges and water levels at Parr Shoals Dam were estimated by multiplying the recorded flow values at Richtex and Alston stations by the ratio of the respective drainage areas. (SCE&G. 2010, Section 2.3.1.2)

The VCSNS site includes part of the Monticello and Parr Reservoirs. Based on Federal Emergency Management Agency (FEMA) data, the reservoirs are mapped as Zone A, corresponding to the 100-year floodplain (listed as without base flood elevation). The VCSNS plant site, however, is mapped as Zone X, an area of minimal flood hazard (Figure E3.6-2). (FEMA. 2022).

The plant is designed to withstand, without loss of the capability to protect the public, the additional loadings imposed by the most severe earthquakes, flooding conditions, winds, ice, or other natural phenomena that could conservatively be estimated to occur in the vicinity of VCSNS (DE. 2023a, Section 1.2.2.2)

The onsite storm drainage system, discussed in Section E3.6.1.2.2, is not credited to provide flood protection from the local intense precipitation event. With the storm drainage system blocked, runoff would build up on the surface of VCSNS until it flows overland to lower elevations. In the power block area, this flow direction is toward the SWP. (DE. 2023a, Section 2.4.3.1.3) The NRC required additional assessment of this flood causing mechanism at VCSNS based on the lessons learned from the Fukushima Dai-ichi accident (NRC. 2020a). A Focused Evaluation (FE) for External Flooding was prepared for the VCSNS site in 2017. Permanent modifications were proposed for site flooding remediation to protect key safety functions building areas that could adversely impact key structures, systems, and components. It was also determined that flooding of the Monticello Reservoir, combined with the storm surge or wind/wave run-up, would not impact any structures that contain key structures, systems, and components due to protection provided by the north berm, which separates VCSNS structures from the Monticello Reservoir. (SCE&G. 2017) The NRC later concluded that the mandated safety enhancements had been implemented at VCSNS and that no further regulatory decision-making was required related to the Fukushima lessons learned. (NRC. 2020a)

E3.6.1.2 Surface Water Discharges

E3.6.1.2.1 NPDES-Permitted Outfalls

Chemical additives approved by the SCDHEC are used to control pH, scale, and corrosion in the circulating water system, and ton control biofouling of plant equipment. The current NPDES wastewater permit (SC0030856) authorizes discharges from 9 outfalls: 3 external (Outfalls 001, 003, and 014) and 6 internal (Outfalls 004, 005, 06A, 06B, 007, and 008). The current NPDES permit for the OWS (currently Permit No. SCG646000, formerly Permit No. SCG646072 Version 3.2) authorizes effluent limitations to the Monticello Reservoir. Both permits expire in 2027. The NPDES external outfalls are depicted in Figure E3.6-3. The effluent limits associated with the internal and external outfalls are listed in Table E3.6-2.

Non-contact cooling water and low volume waste are monitored and discharged to the Monticello Reservoir via NPDES Outfalls 001 and 014, and low volume waste and non-chemical metal cleaning waste is discharged to the Broad River/Parr Reservoir via NPDES Outfall 003, in accordance with the VCSNS wastewater NPDES Permit No. SC0030856. Outfalls 001 and 014 discharge into the Monticello Reservoir discharge canal, approximately 10 feet below the full reservoir level of 425 feet msl. Outfall 003 discharges into the penstocks of the Fairfield Pumped

Storage Facility at the Broad River. This discharge point is located approximately one-half of a mile from the northwest corner of the plant.

Sanitary sludge generated from sanitary wastewater treatment at Outfall 005 was previously permitted for offsite disposal, as described in Section E3.6.1.2.3; however, sanitary sludge disposal is not required during the current permit period. Alum sludge from the former alum sludge basin, previously monitored at Outfall 006, was permitted to be land applied to a 2-acre onsite location at a maximum rate of 750,000 gallons per application once per year. Sludge was removed from the former alum sludge basin in the fall of 2018. Approval to dispose of alum sludge is not required during the current permit period. Outfall 006 is no longer a permitted outfall.

Groundwater monitoring is a requirement of NPDES Permit No. SC0030856 for six groundwater monitoring wells (GW-8A, GW-9, GW-12, GW-13A, GW-15A, and GW-17) for multiple parameters on a semiannual basis. These six wells are located around the central sewage and process Waste Treatment Facility. Groundwater quality is discussed in Section E3.6.4.2.

Twenty-one outfalls are listed in the NPDES General Permit for Water Treatment Plant Discharges for the OWS under Permit No. SCG646000. The OWS uses reverse osmosis and is described further in Section E3.6.3.1. The outfall numbers are used to distinguish sampling requirements under S.C. Regulations 61-68 and 61-69 for Water Classifications and Standards and Classified Waters, respectively. Of the 21 outfalls listed in the permit, five of them apply to the VCSNS OWS. These outfalls and the associated sampling requirements are listed in Table E3.6-2. The water treatment plant discharge to the Monticello Reservoir is through the OWS outfall (Figure E3.6-3). The water treatment plant discharge consists of treated filter backwash water, sedimentation basin washdown water, and decant water.

E3.6.1.2.2 Stormwater Runoff

The current onsite drainage system for VCSNS consists of engineered and natural drainage systems. VCSNS is located approximately 1 mile east of the Broad River and 2.5 miles northeast of Parr Dam on an irregularly shaped ridge about 180 feet above the Broad River floodplain. The ridge is the natural drainage divide between Frees Creek to the north and Mayo Creek to the south. Besides these two creeks, the plant site area is laced with numerous other drainage swales that feed into the Broad River. (DE. 2023a, Section 2.4.12.1)

Most stormwater associated with electric generating activities with the highest potential of runoff contamination are treated at the Waste Treatment Facility, which is covered under NPDES Permit No. SC0030856. In addition, OWS outfalls, which are retention ponds that discharge to the Monticello Reservoir, are covered under NPDES Permit No. SCG646000 (Section E3.6.1.2.1). Stormwater runoff from the remaining 107.5 acres with industrial activity at the VCSNS site is covered under the NPDES general stormwater permit for industrial activities (SCR000000), coverage No. SCR004134. Stormwater runoff from these areas is collected in seven storm

drainage systems consisting of catch basins, drop inlets, curb inlets, junction boxes, and yard inlets. The storm drainage systems discharge to unnamed tributaries of the Broad River and to Mayo Creek, which also discharges to the Broad River, via stormwater outfalls (SW12, SW13, and SWSW). There are no permitted effluent limits associated with these outfalls.

Roof drains discharge directly into the storm drainage system and are designed for an average intensity of 6 inches per hour. If the underground storm drainage system becomes blocked, roof drainage will overflow from the inlets at grade and become part of the surface runoff flow. Holes (scuppers) are provided at various locations to allow overflow during locally intense precipitation of more than 6 inches per hour. The roof edge blocking and gravel stops are provided and designed so that maximum ponding, at a few locations, is 4 inches. The roofs are designed to withstand this water accumulation. (DE. 2023a, Section 2.4.3.1.3)

As described in Section E3.6.3.2, water pumped from the non-safety dewatering system is discharged to the local storm drainage system, where it is conveyed by storm sewers to the south and west, away from Monticello Reservoir. This water ultimately enters tributaries of the Broad River. (DE. 2023a, Section 2.4.13.2.7)

DE also maintains and implements a SWPPP for outfalls associated with the general industrial NPDES permit (SCR000000). The SWPPP identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. DE collects monthly samples at the nine outfalls specified in NPDES Permit No. SC0030856, as described in Section E3.6.1.2.1.

E3.6.1.2.3 Sanitary Wastewaters

Sanitary waste is collected by a drainage system that terminates at an onsite sanitary disposal facility (DE. 2023a, Section 1.2.3.8.4). The sanitary wastewater system consists of two dosing tanks, an aeration basin with six aerators, two sand filters, two chlorination basins, and two dechlorination basins. The system treats sanitary (domestic) wastewater. Following primary treatment in an aeration lagoon and secondary treatment through sand filters, the sewage treatment wastewater is moved to a contact chamber for chlorination. The wastewater is then dechlorinated before being mixed with other plant waste streams and eventually discharged to the discharge canal. (SCE&G. 2010, Section 2.3.3.1.5) The treated wastewater is discharged to the Monticello Reservoir through the Circulating Water Discharge Canal via internal NPDES Outfall 005. The effluent from this outfall is combined with the effluents from Outfalls 06A, 06B, and 008, forming Outfall 014.

E3.6.1.2.4 Dredging

No periodic maintenance dredging has occurred at VCSNS and no dredging activities in the vicinity of the intake and discharge are anticipated. If the need for dredging arises, VCSNS will obtain the appropriate permits. No in-water or shoreline work related to VCSNS Unit 1 operations has been conducted in the last 5 years and none is planned.

E3.6.1.2.5 Compliance History

As presented in Chapter E9.0, VCSNS received the following notices of violation (NOVs) and/or permit exceedances in 2017–2022 associated with VCSNS.

- SCDHEC issued a September 3, 2019, warning letter and returned the 2019 Discharge Monitoring Report (DMR) under NPDES Permit No. SCG646072. The warning letter identified that a concentration was missing and that the monitoring period listed was incorrect and requested VCSNS that the DMR be corrected and returned within three days of receipt of the letter. A corrected DMR was submitted to SCDHEC, which responded in a letter dated September 11, 2019, that the DMR had been corrected and the concentration for mercury was added as requested.
- SCDHEC issued VCSNS a May 25, 2021, NOV for the December 2020 DMR monitoring period under NPDES Permit No. SCG646072. The daily maximum total suspended solids limit was exceeded, and the total manganese monthly average and daily maximum were not reported. SCDHEC did not require further action because explanations of the cited violations were submitted.
- SCDHEC issued VCSNS a May 24, 2021, letter listing violations encountered during a routine underground storage tank (UST) inspection conducted that day. The letter alleged that VCSNS failed to complete the three-year spill bucket containment test and the three-year overfill inspection for Tank 6. The spill bucket testing issue was resolved on October 29, 2021, and the overfill protection testing issue was resolved on February 11, 2022. SCDHEC responded in an email dated February 16, 2022, that the testing data had been received and compliance was achieved.
- SCDHEC issued VCSNS a November 18, 2021, NOV, regarding NPDES Permit No. SCG646072 because total residual chlorine (TRC) analysis was not conducted by a South Carolina certified laboratory. DE emailed SCDHEC on November 9, 2021, explaining that although the laboratory's certification for TRC had mistakenly lapsed, VCSNS chemistry passed an annual water pollution proficiency test, and the laboratory will reapply for certification for this analyte. SCDHEC issued a Notice of Enforcement Conference/Notice of Alleged Violation on January 6, 2022, regarding NPDES Permit No. SCG646072 for failure to use a South Carolina certified laboratory for TRC analysis for

several periods between June 2018 and July 2021 and issued Consent Order 22-024-W on April 21, 2022, for this failure. SCDHEC closed the consent order on May 5, 2022, stating that the consent order requirements were satisfied in a letter dated May 12, 2022. SCDHEC also approved the laboratory certification application for TRC analysis in a letter dated September 16, 2022.

- The December 2021 DMR for NPDES Permit No. SC0030856 reported an exceedance of the pH maximum for Outfall 014. As listed in Table E3.6-2, the monthly pH permit limits from Outfall 014 between November and March are 6.0-8.5 standard units (SU). A grab sample was collected with pH of 8.8 SU. VCSNS believed that result to be from cross contamination from a used sampling cup. Another sample was collected the same day using a new sampling cup with pH readings of 8.36 and 8.39 SU. SCDHEC did not issue an NOV for the pH limit exceedance because this was the first occurrence for that parameter within a 12-month period.
- SCDHEC issued VCSNS NOV AI-0005261 on April 6, 2022, regarding NPDES Permit No. SCG646072. At Outfall 08A, the TRC daily maximum and monthly averages were exceeded as reported in the January 2022 DMR. SCDHEC requested a written response to the NOV. DE responded to SCDHEC in a letter dated April 20, 2022, stating that the exceedance was likely due to interference from the presence of oxidized manganese. VCSNS took the following measures to ensure permit compliance: running aerators days before discharging the basins to lower potential residual chlorine, and adding dechlorination tablets to the continuous chlorine monitoring system. In addition, DE noted that VCSNS personnel obtained at least one sample from both retention basins prior to the January discharge. The samples were analyzed for TRC using the same analytical method, and the results were less than the SCDHEC Practical Quantitation Limit (PQL) of 0.05 mg/L. Following the January 2022 event, there were no discharges from this outfall for February or March. TRC was not detected in samples collected from this outfall in April 2022. It should be noted, however, that the TRC monitoring requirement in the 2022 OWS NPDES permit (Permit No. SCG646000) does not include TRC discharge limits. VCSNS is required to monitor and report monthly average and daily maximum TRC concentrations, as listed in Table E3.6-3.
- Pertaining to NPDES Permit No. SCG646072, the monthly average total suspended solids limit was exceeded at Outfall 06A in March 2022. The daily maximum (98 mg/L) was not exceeded; however, the monthly average limit of 30 mg/L was exceeded because one sample was collected in March with a result of 32.6 mg/L. VCSNS believed the exceedance to be a result of an algae bloom. There has been no correspondence from SCDHEC regarding this permit exceedance.

E3.6.1.2.6 Lake Water Temperatures Reporting

As mentioned in Section E3.6.1, the Monticello Reservoir serves as the cooling reservoir for Unit 1. VCSNS measures cooling water discharge and intake water temperatures and the raw data are averaged for each month. The averaged values for the 2017–2021 discharge and intake water temperatures are plotted in Figures E3.6-4 and E3.6-5, respectively.

One of the factors that affect water quality in reservoirs is thermal stratification. Some reservoirs become thermally stratified in the summer when solar energy warms the surface water, leaving the bottom portions of the reservoir cooler. A thermal mixing zone evaluation was conducted in 2012 as part of the NPDES wastewater permit renewal application (SC0030856) to support a decision maintaining the current temperature limits for VCSNS. An addendum was conducted in 2014 after SCDHEC requested additional models. A three-dimensional Computational Fluid Dynamics (CFD) model was used due to the complexity of the basin and channel dynamics at VCSNS. To maintain 113°F as a daily maximum discharge limit year-round, additional modeling runs were done using the highest and lowest ambient temperatures from 10 years of temperature data for the Monticello Reservoir. In all cases calculated, the thermal plumes due to the cooling water discharge remain entirely or predominantly to the east of the island that separates the VCSNS Cooling Water Intake Structure and discharge. The thermal plumes did not approach the Fairfield Pumped Storage Facility intake, the VCSNS Unit 1 Cooling Water Intake Structure, or the northern reach of Monticello Reservoir. (SCE&G. 2018b)

Per South Carolina Regulation 61-68, Section E.12.c, the weekly average water temperature of all freshwater lakes shall not be increased more than 5°F above natural conditions and shall not exceed 90°F from thermal discharges unless a different temperature standard has been established, a mixing zone has been established, or a Section 316(a) determination under the Clean Water Act (CWA) has been completed. (SCDHEC. 2022a) Worst-case scenarios were modeled in summer and winter conditions. In summer, ambient reservoir and discharge temperatures are expected to be greatest, allowing evaluation of thermal plume mixing characteristics and spatial dimensions in the context of the 90°F temperature criterion. In winter, the differential between the plume and ambient temperatures are expected to be greatest, allowing evaluation of thermal plume mixing characteristics and spatial dimensions in the context of the 5°F differential temperature criterion. The results of the evaluation indicated that the 90°F plume has a larger impact than the 5°F difference plume. The maximum thermal plume extents were modeled as follows:

- In the summer, when the reservoir is at high surface elevation and the Fairfield Storage is generating, a plume of 90°F would have an extent of 4,775 feet by 3,705 feet with a maximum volume of 1,790 acre-feet.

- In winter, when the reservoir is at low surface elevation and the Fairfield Pumped Storage Facility is pumping to Monticello Reservoir, the 5°F differential plume would have an extent of 4,219 feet by 3,325 feet with a maximum volume of 1,148 acre-feet.

VCSNS submitted addenda in February 2014 and November 2018. The modeling results presented in the addenda also supported the daily maximum discharge temperature of 113°F being maintained in accordance with a 2022 NPDES permit reissuance.

E3.6.2 GROUNDWATER RESOURCES

E3.6.2.1 Groundwater Aquifers

The region within a 20-mile radius of VCSNS lies within the Piedmont physiographic province, except for a small portion to the southeast near Columbia, which is in the Coastal Plain physiographic province (DE. 2023a, Section 2.4.13.1.1).

The Piedmont physiographic province is characterized by a limited groundwater supply due to the dense crystalline rock underlying the area. However, some smaller municipalities have wells that can adequately meet water demands. (SCE&G. 2010, Section 2.5.2.7.1)

In the Coastal Plain physiographic province, there are two major regional aquifer systems. The lower regime is referred to as the Cretaceous aquifer system and it is estimated that it can provide 5 billion gpd throughout its known extent. The upper regime is variously referred to as the water table aquifer, the Tertiary aquifer system, the principal artesian aquifer, the limestone aquifer, or the Floridan aquifer. Yields from these systems could support water systems requiring nearly 3 MGD. Consequently, counties in the Coastal Plain physiographic province obtain their water from groundwater. (SCE&G. 2010, Section 2.5.2.7.1)

The bedrock underlying the Piedmont physiographic province principally consists of Paleozoic crystalline metamorphics and igneous intrusives. Information on the bedrock sequence is not detailed because there are few outcrops, these being confined somewhat preferentially to the more deeply entrenched drainages and some prominent knobs of resistant rock. The metamorphic and igneous rocks weather to overburden soils of clayey, silty, and sandy composition. The character of the overburden is related to the type of bedrock and degree of weathering. The overburden thickness ranges up to 100 feet or more but varies considerably from place to place depending on degree of incision of drainages and bedrock composition. (DE. 2023a, Section 2.4.13.1.1)

Recharge to these formations is principally by infiltration of precipitation falling on the upland areas. A small portion of the water percolates to perched water zones or deeper into the water table in the lower soils and the underlying jointed bedrock. The groundwater table, in general, follows the land surface but with more subdued relief. Groundwater discharges as visible seeps and springs and/or percolates through the ground into creeks and streams. Some groundwater is discharged via wells,

but the amount pumped is very small because the formations generally are not pervious enough to sustain well yields greater than a few gallons per minute. (SCE&G. 2010, Section 2.3.1.2.2)

The site groundwater ultimately flows into the Broad River. The estimated rate of flow is expected to be up to 1 foot/day on the steeper ridge flanks. Observations of water levels at VCSNS indicated that the groundwater table at and around the site occurs at depths ranging from approximately 20 to 90 feet (elevation 350 feet msl to 420 feet msl) below the original ground surface, generally in jointed bedrock. Local lenses or perched water in soil, indicated by seepage high on the ridge flanks. Groundwater levels measured in existing wells within about 2 miles of VCSNS range from 22 to 90 feet in depth. The overburden soils release water slowly to the lower, more pervious saprolitic and jointed rocks. As a result of this storage effect, yields of wells and flows of springs remain rather constant and are sustained during periods of deficient moisture. (DE. 2023a, Section 2.4.13.2.3)

The Monticello Reservoir is the source of process and domestic water for Unit 1. However, groundwater is pumped from wells to lower the water table and reduce the amount of seepage from the Monticello Reservoir into below-grade portions of the buildings. (SCE&G. 2010, Section 2.3.2.1.2) Pumped water is discharged into the storm drainage system, where it is conveyed by storm sewers ultimately to the Broad River (DE. 2023a, Section 2.4.13.2.7). This dewatering system is discussed further in Section E3.6.3.2.

E3.6.2.2 Hydraulic Properties

The groundwater flow at VCSNS prior to construction of Monticello Reservoir was toward Frees Creek and the Broad River at a rate of approximately 1 foot/day. The groundwater gradient varied from 0.005 foot/foot along the ridges to 0.07 foot/foot along the steeper sections of the valley walls. After construction and filling of the reservoir, the local groundwater level would have been raised, steepening the gradient, and reversing the groundwater flow direction from the Frees Creek drainage basin. The flow of groundwater ultimately would still be toward the Broad River via Terrible Creek, Mayo Creek, or Little River valleys at a rate of approximately 1 foot/day. The low permeability of the surrounding soils and bedrock in the vicinity of the reservoir limits the amount of groundwater from the impoundment. (SCE&G. 2002, Section 2.3)

Laboratory permeability tests have been performed on selected samples obtained from borings drilled near VCSNS structures. Permeability tests performed on silty sand to sandy silt soil samples obtained below the surficial clayey zone indicate a permeability ranging from 3.35×10^{-1} to 4.8×10^{-4} feet/day. A test performed on a sample of the surficial clayey soils indicates a permeability of 6.8×10^{-2} feet/day. These tests indicate vertical permeabilities of the site soils. Field permeability tests have been performed in various soil and rock horizons in borings located in the SWP. Field permeabilities on soils, saprolites, and partially decomposed rock ranged from 5.9 to

5.1 x 10^{-3} feet/day, with higher values obtained locally in the valley bottom along the north dam grout curtain. (DE. 2023a, Section 2.4.13.2.4)

During construction, the VCSNS plant site was excavated to bedrock in the reactor area. The plant site was backfilled with fill materials to 436 feet msl elevation. Zone I, II, and III fill materials are described in Section E3.5.3.1. Horizontal hydraulic conductivities of the Zone 1 and Zone II fill and the saprolite average 2.6 feet/day (9.2 x 10^{-4} cm/sec). The hydraulic conductivity of the Zone III fill is estimated from grain size analyses to be 16 ft/day (5.6 x 10^{-3} cm/sec). The hydraulic conductivity of the bedrock was measured at 1.2 feet/day (4.2 x 10^{-4} cm/sec). The average linear horizontal groundwater velocity prior to the startup of the expanded dewatering system was calculated at 0.07 feet/day for Zones I & II fill, 1.3 feet/day for Zone III fill, and 0.33 feet/day for saprolite.

The groundwater gradient in the saprolite/shallow bedrock zone ranges from 0.001 to 0.003 foot/foot on top of the ridge and it is steeper (0.037 to 0.05 foot/foot) on the ridge flanks. The groundwater gradient in the deep bedrock zone ranges from 0.0085 to 0.0094 foot/foot on top of the ridge and it is steeper (0.022 to 0.11 foot/foot) on the ridge flanks. (SCE&G. 2010, Section 2.3.1.2.3.2.1)

Slug tests were conducted in saprolite and partially weathered rock. The range of hydraulic conductivity values was from 0.0017 feet/day to 18 feet/day with a geometric mean of 0.62 feet/day. Deep bedrock hydrostratigraphic zone tests gave a range of hydraulic conductivity from 0.0088 feet/day to 0.38 feet/day with a geometric mean for this zone of 0.07 feet/day. (SCE&G. 2010, Section 2.3.1.2.3.3)

Laboratory test results were conducted on residual soil and saprolite. The range in calculated porosity for residual soil was from 0.465 to 0.631 with an arithmetic mean porosity of 0.527. The range in porosity for saprolite is from 0.401 to 0.632 with an arithmetic mean porosity of 0.49. There were no direct estimates of specific yield; however, considering the composition of the overburden soils (clayey, silty, and sandy materials), a reasonable specific yield is 20% to 25%. (SCE&G. 2010, Section 2.3.1.2.3.3)

Described further in Section E3.6.4.2.2, hydraulic conductivity near the SWP was measured at 0.030 feet/day with an effective porosity of 0.15, a hydraulic gradient of 0.0053, and a velocity of 0.0011 feet/day.

E3.6.2.3 Potentiometric Surfaces

The potentiometric surface at VCSNS is largely controlled by the dewatering system. The dewatering system consisted of two dewatering wells (DW-1 and DW-2) in operation in 2003. Fourteen additional dewatering wells began operation in 2008. Three of the dewatering wells were installed in bedrock. The remaining dewatering wells were screened in fill materials, saprolite, and

partially weathered rock. The dewatering wells maintain a relatively constant water level programmed in the controller.

Water levels were measured in site monitoring wells on July 31, 2008, prior to the startup of the expanded dewatering system. Depth to groundwater generally ranged from 10 to 15 feet below land surface. These depths correspond to approximate site elevations of 426 to 421 feet msl. This relatively shallow water table is due to the proximity of the Monticello Reservoir and the SWP. The depth to groundwater at the Waste Treatment Facility generally ranged from 21 to 35 feet below land surface. These depths correspond to approximate site elevations of 415 to 403 feet. The predominant groundwater flow direction in the shallow aquifer was from east to west-southwest, with an average horizontal hydraulic gradient of 0.02 ft/ft. Since VCSNS is located near the Monticello Reservoir dam and elevations of creeks and natural drainage areas are lower than the water in Monticello Reservoir, groundwater generally flowed toward the west-southwest toward the creeks.

Water levels were measured in site monitoring wells on August 13, 2009, approximately one year after the startup of the expanded dewatering system. The water level depths in the dewatering wells ranged from 33.24 feet to 62.55 feet. These depths correspond to approximate site elevations of 402 feet to 372 feet. Water level depths in monitoring wells closest to the dewatering wells ranged from 15.72 to 26.54 feet, or 419.59 feet to 409.16 feet. Groundwater flowed in a radial pattern toward the dewatering wells in the vicinity of the dewatering wells. Groundwater flowed south from the Monticello Reservoir to the dewatering wells, west from the SWP, and north from the transformer area.

A groundwater gauging event was conducted on July 29 and August 4, 2022. Dewatering lowered water level elevations below target building foundations, including the Auxiliary Building and the Reactor Building. Review of historical data since the pumping was initiated indicates these levels have stabilized. The predominant groundwater flow direction in the shallow aquifer is from east to west-southwest, with an average horizontal hydraulic gradient of 0.02 ft/ft. Elevations of creeks and natural drainage areas are lower than the water level in the Monticello Reservoir: therefore, groundwater flows from the Monticello Reservoir and the SWP toward the creeks. Mounding effects were observed in the vicinity of monitoring locations B-22 and B-36. The cause of the observed mounding was investigated by analyzing groundwater samples collected from select monitoring wells for a corrosion inhibitor used at the facility. No indications of the additives were detected in the samples collected, indicating the observed mounding is likely the result of surface water drainage leaking from a breach in the adjacent stormwater drainage system.

A potentiometric surface map of the shallow groundwater is provided as Figure E3.6-7. This map is based on groundwater level data collected during the July and August 2022 gauging event, described above, as part of the Nuclear Energy Institute's (NEI's) groundwater protection initiative

(GPI) program, which is discussed in Section E3.6.2.4. Water level elevations from this gauging event are also shown in geologic cross sections in Figures E3.5-3b and E3.5-3c.

E3.6.2.4 Groundwater Protection Program

In May 2006, the NEI implemented the GPI, an industry-wide voluntary effort to enhance nuclear power plant operators' management of groundwater protection. (NEI. 2007).

Industry implementation of the GPI identifies actions to improve licensee management and response to instances when the inadvertent release of radioactive substances may result in detectable levels of plant-related materials in subsurface soils and water, and also describes communication of those instances to external stakeholders. Aspects addressed by the initiative include site hydrology and geology, site risk assessment, onsite groundwater monitoring, and remediation. In August 2007, NEI published updated guidance on implementing the GPI as NEI 07-07, "Industry Ground Water Protection Initiative - Final Guidance Document" (NEI. 2007). This guidance was further updated in February 2019. The purpose of NEI 07-07 is to improve the management of situations involving inadvertent radiological releases that get into groundwater and to improve communications with external stakeholders to enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment. (NEI. 2019a) The initiative sets forth voluntary requirements for evaluating and monitoring SSCs with a high risk of impacting groundwater. Additionally, the guidance specifies reporting requirements for onsite groundwater sample results that exceed radiological environmental monitoring program (REMP) reporting thresholds and that all onsite groundwater results are reported in either the ARERRs or annual radiological environmental operating reports (AREORs).

DE has implemented a Ground Water Protection Program (GWPP). After a recent review of VCSNS's GWPP, DE added additional groundwater monitoring wells to ensure their GWPP is in accordance with the Electric Power Research Institute (EPRI) Guideline for Implementing a Groundwater Protection Program at Nuclear Power Plants. This initiative was developed to ensure timely and effective management of situations involving inadvertent releases of licensed material to groundwater. VCSNS reviewed the plant historical records for spills and evaluated SSCs, work practices, and potential for releases. The GWPP was developed based on the locations and depths of the identified SSCs and site hydrogeology (site conceptual model). The GWPP includes 21 wells installed prior to 2022 (11 water table wells and 10 dewatering wells) to further evaluate SSCs and to replace some wells that were damaged, dry, or did not meet EPRI standards for a GWPP.

The following current monitoring wells are included in the GWPP to evaluate potential impact from the nine VCSNS SSCs.

SSC Location	SSC Description	Current Monitoring Wells
Upgradient/Background		B-6
SSC-1	Liquid radwaste. Discharge line between Auxiliary Building and Penstock, and Manhole #5.	B-2S, B-36
SSC-2	Condensate storage tank	DW-7
SSC-3	Spent fuel	DW-2, DW-18, DW-19
SSC-4	Waste treatment facility settling ponds	GW-15A, GW-8A, GW-9, GW-12, GW-13A
SSC-5 and SSC-6	SSC-5 Fuel transfer tube joint penetration SSC-6 Spent fuel pool liner	DW-13, DW-14, DW-15, DW-16, DW-17, DW-18
SSC-8 and SSC-9	SSC-8 Turbine Building sump and discharge line to waste treatment facility SSC-9 Condensate backwash receiver tank discharge to waste treatment facility	B-22, B-23, B-26

DE updated the VCSNS Offsite Dose Calculation Manual (ODCM) and environmental sampling requirements in 2022 after installing additional wells, as described above. VCSNS has a Radiological Environmental Surveillance Program and a Supplemental Radiological Environmental Surveillance Program. The supplemental program is flexible and used to evaluate and modify the ODCM, as needed. The wells in the following table are sampled quarterly for gamma isotopic and tritium analysis. Four of the onsite wells listed in the following table are not included in the GWPP (P2, P5, DW-3, and GW-16).

Well ID	Radiological Program
B-2	Surveillance
B-6	Surveillance
DW-13	Surveillance
DW-7	Surveillance
DW-2	Supplemental Surveillance

Well ID	Radiological Program
DW-19	Surveillance
B-36	Surveillance
GW-8A	Supplemental Surveillance
GW-9	Surveillance
GW-12	Surveillance
GW-13A	Surveillance
GW-15A	Supplemental Surveillance
DW-14	Supplemental Surveillance
DW-15	Supplemental Surveillance
DW-16	Supplemental Surveillance
DW-17	Supplemental Surveillance
DW-18	Supplemental Surveillance
B-23	Supplemental Surveillance
DW-3	Supplemental Surveillance
GW-16	Supplemental Surveillance
Environmental lab garden	Surveillance
P2	Surveillance
P5	Surveillance
Old nuclear training center	Surveillance

Figure E3.6-6 shows locations of the VCSNS groundwater monitoring wells with construction details presented in Table E3.6-3. Two of the wells included in the Radiological Environmental Surveillance Program are located offsite and are not included in Figure E3.6-6 or Table E3.6-3. These wells are "Environmental lab garden" located 1 mile east-southeast of VCSNS and "Old nuclear training center" located 2.6 miles south-southeast of VCSNS. Groundwater quality is discussed in Section E3.6.4.2.

E3.6.2.5 Sole Source Aquifers

A sole source aquifer (SSA), as defined by the EPA, is an aquifer that supplies at least 50% of the drinking water consumed by the area overlying the aquifer, and there is no reasonably available alternative drinking water source should the aquifer become contaminated. The SSA program was

created by the U.S. Congress as part of the Safe Drinking Water Act and allows for the protection of these resources. (EPA. 2022e)

VCSNS is located in EPA Region 4, which has oversight responsibilities for the public water supply in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and six Tribal nations. The EPA has designated three aquifers in Region 4 as SSAs, none of which are located in South Carolina. The nearest SSA, the Volusia-Floridan aquifer, is located approximately 325 miles south of VCSNS. Therefore, VCSNS's property is not situated over any of these designated SSAs. (EPA. 2022e)

E3.6.3 WATER USE

E3.6.3.1 Surface Water Use

As described in Section E3.6.1, the nearest bodies of water to VCSNS are the Parr Reservoir and the Monticello Reservoir, which serve as the lower and upper pools, respectively, of the Fairfield Pumped Storage Facility.

Downstream of VCSNS, surface water is withdrawn by a number of municipalities and industries. The single largest downstream surface water user is the City of Columbia, located approximately 28 miles from VCSNS. Columbia has an average daily use of 23 million gallons with all the municipal water obtained from the Broad River. (DE. 2023a, Section 2.4.1.2.3)

All of the water used by VCSNS is withdrawn from Monticello Reservoir. Makeup water for Monticello Reservoir is obtained from the Parr Reservoir on the Broad River. (SCE&G. 2002, Section 3.1.2.2) The Monticello Reservoir has a drainage area of approximately 17.4 square miles. It was formed by the Frees Creek dams, which include a main dam, referred to as Dam B, and three smaller saddle dams, referred to as Dams A, C, and D. These dams were constructed at the same time as Unit 1 and Fairfield Pumped Storage Facility to create the Monticello Reservoir, which serves as the source of cooling water for Unit 1 and as the upper reservoir for the Fairfield Pumped Storage Facility. The Monticello Reservoir has a surface area of approximately 6,800 acres and a storage volume of approximately 400,000 acre-feet at normal maximum water surface elevation 425 feet NGVD29 or 424.3 feet North American Vertical Datum 1988 (NAVD88). SCE&G. 2010, Section 2.3.1.1.4)

Average ambient evaporation from the Monticello Reservoir was estimated to be about 65 acre-feet per day (33 cfs) with an additional 44 acre-feet per day (22 cfs) latent evaporation from condenser water. The total evaporation rate of 55 cfs corresponds to an average daily evaporation loss of 109 acre-feet. On a mean annual basis, most of the evaporation loss from the Monticello Reservoir is offset by precipitation. There is no evidence of significant seepage from the Monticello Reservoir. The main outlet of the Monticello Reservoir is the intake of the Fairfield Pumped Storage Facility. As a result of the Fairfield Pumped Storage Facility operations, the Parr Reservoir is subject to daily

fluctuations in water level of as much as 10 feet, but the daily average is approximately 4 feet. These water level fluctuations can expose and then inundate again up to 2,550 acres of the Parr Reservoir with each cycle of pumping and generation (release of water). The amount of water pumped from and returned to the Parr Reservoir daily represents as much as 88% of its total volume. Similarly, Fairfield Pumped Storage Facility operations can cause water levels in the Monticello Reservoir to fluctuate as much as 4.5 feet daily, from 420.5 feet to 425.0 feet NGVD29 (419.8 feet to 424.3 feet NAVD88). Daily elevation changes vary, depending on system needs. (SCE&G. 2010, Section 2.3.1.1.4)

No systematic current measurements exist for the Monticello Reservoir. Near the Fairfield Pumped Storage Facility, intake flows are influenced by the operation of the storage facility, as water is discharged into the Monticello Reservoir during the night and withdrawn during the day. Near Unit 1, flows are influenced by the operation of the cooling water intake and outfall. (SCE&G. 2010, Section 2.3.1.1.4)

The SWP is constructed in a small arm of Monticello Reservoir to perform ultimate heat sink functions under various conditions (DE. 2023a, Section 9.2.5). The SWP supplies water for the SWS under normal and emergency operating conditions. The intake for the SWS is located along the northwest shoreline of the pond on the west embankment. The intake structure provides water from either the SWP or Monticello Reservoir through an interconnecting pipe and isolation valve. A discharge structure for this system is provided along the southwest edge of the pond and also on the west embankment. (DE. 2023a, Section 9.2.5.2)

The interconnecting pipe permits the SWP to be supplied from Monticello Reservoir. For normal operating conditions, the Monticello Reservoir and SWP levels will fluctuate between elevations 420.5 and 425 feet msl. For a water elevation of 425 feet msl, the SWP has a volume of 1,408 acre-feet and a surface area of approximately 41 acres. (DE. 2023a, Section 2.4.1.2.2)

The demineralized water makeup system pretreats and demineralizes water from the Monticello Reservoir and provides for storage of demineralized water for primary and secondary plant makeup. Potable water is obtained from the system following pretreatment but prior to demineralization. The potable water system serves sanitary plumbing fixtures, showers, laundry, and emergency eye wash units. An alternate source of potable water is also obtained from the OWS. The main purpose of the OWS is to provide forced flow distribution of filtered and potable water to support operational water needs for VCSNS Unit 1. The OWS treats water from the adjacent Monticello Reservoir. Wastewater generated in the production of filtered and potable water is discharged from the OWS retention basins by either gravity drain and/or pump back to the Monticello Reservoir. (DE. 2023a, Section 1.2.3.8.4)

Portions of Fairfield, Newberry, and Richland County lie within 6 miles of VCSNS. The largest user of surface water is Fairfield County, with Richland and Newberry following, respectively. In both

Fairfield and Richland Counties, the largest users of surface water are the hydroelectric and thermoelectric power industries, respectively. Newberry County's surface water is primarily used for public water supplies. (SCE&G. 2010, Section 2.3.2.2.2)

VCSNS is permitted to withdraw water from the Monticello Reservoir by Permit No. 20PN001, issued in 2014, from two sources: S01 and S02. The maximum withdrawal at S01 is 26,194.76 million gallons per month (MGM) and the maximum withdrawal at S02 is 49.1 MGM (26,243.86 MGM total). The average surface water withdrawal rate for VCSNS in 2021 was reported as 565.7 MGD and averaged 599.67 MGD from 2017 through 2021 (Table E3.6-4a). A summary of monthly surface water withdrawals reported by VCSNS from 2017–2021 is included as Table E3.6-4b.

In 2015, total surface water withdrawals in Fairfield County were reported as 608.24 MGD, of which 606.46 MGD was used for power generation. Excluding power generation, surface water use for Fairfield County in 2015 was reported as 1.70 MGD. The total surface water withdrawals in Newberry County to the west were reported as 7.73 MGD, of which 6.56 MGD was withdrawn for public supply, with the remainder for agricultural uses. The total surface water withdrawals for Richland County to the south were reported as 64.1 MGD, of which 58.45 MGD was withdrawn for public and industrial supply with 4.86 MGD for power generation. (USGS. 2022e) A summary of surface water use in Fairfield, Newberry, and Richland Counties is presented in Table E3.6-6.

E3.6.3.2 Groundwater Use

Groundwater within 20 miles of VCSNS is primarily used for individual households and for livestock. Within 2 to 20 miles of VCSNS, there are approximately 100 sites that have at least one groundwater well that has been reported for municipal, industrial, or domestic purposes. (SCE&G. 2010, Section 2.3.2.1.1)

Groundwater is not used for VCSNS plant operations. (DE. 2023a, Section 2.4.13.1.3) The jointed bedrock within the vicinity of VCSNS does not provide a good aquifer for municipal and industrial water wells. Drinking water at VCSNS is provided by surface water from the Monticello Reservoir. The quality of groundwater is acceptable for most uses; however, high iron content is found in some supplies. (SCE&G. 2010, Section 2.3.3.2)

The groundwater table generally follows the land surface. The depth to the water table is governed by topography, and the direction of movement is, therefore, toward streams located in the lower elevations. Within 20 miles of VCSNS, water supply wells range from 62–365 feet deep, but commonly are less than 200 feet deep, with yields of 10 gpm or less. Yields of up to 55 gpm have been reported in a small fraction of the region's wells. The depth to groundwater in the vicinity of VCSNS is typically from 20–90 feet, generally in jointed bedrock. There are no springs or groundwater wells downgradient from VCSNS. (SCE&G. 2002, Section 2.3)

There is no onsite use of groundwater as drinking water. The only nearby public water supply is the Jenkinsville Water Company. Three of its five wells are within approximately 2 miles of the VCSNS site boundary, but more than 2 miles from the center point. (DE. 2023a, Section 2.4.13.2.2)

Following impoundment of the Monticello Reservoir, full pool elevation for both the reservoir and the SWP has been 425 feet msl. The proximity of the Monticello Reservoir and the SWP resulted in a raised water table throughout the site and a reversal from natural groundwater flow. There was a persistent issue with groundwater intrusion into some plant buildings at elevations below the groundwater table. In 2003, a dewatering feasibility study and hydrogeology characterization study was conducted. (DE. 2023a, Section 2.4.13.2.7)

In 2008, a non-safety dewatering system was installed near VCSNS structures experiencing water intrusion issues. The system consists of 16 wells installed at depths ranging from 85 to 180 feet. Most well heads are located within an underground concrete vault and include a submersible pump, level transmitter, and controller to automatically regulate well drawdown levels to a predetermined setpoint. Well yield depends on permeability of local resident soils and was the basis for pump sizing. Level setpoints were largely determined from water intrusion into nearby structures. (DE. 2023a, Section 2.4.13.2.7) A review of groundwater conditions was performed in August 2009 and found subsurface flows toward the installed dewatering wells in all directions. Generally, groundwater was flowing south from Monticello Reservoir, west from the SWP, and north from the Transformer Area. Groundwater intrusion into plant structures had been mitigated and groundwater depth maintained in the installed wells ranged from 402-372 feet msl. (DE. 2023a, Section 2.4.13.2.7)

Three counties lie within 6 miles of VCSNS: Fairfield County, Newberry County, and Richland County. The largest user of groundwater is Richland County, with Newberry and Fairfield following, respectively. In Richland County, industry is the largest consumer of groundwater, followed by public water suppliers. Newberry County's groundwater use is primarily for irrigation of crops and public water supply. Fairfield County's groundwater use is primarily for public water supply. (SCE&G. 2010, Section 2.3.2.1.2)

In 2015, groundwater withdrawals in Fairfield County were reported as 0.85 MGD with 0.61 MGD withdrawal for domestic supply, 0.18 MGD for public supply, and 0.06 MDG for mining. The total groundwater withdrawals in Newberry County were reported as 1.53 MGD, of which 1.36 MGD was withdrawn for domestic supply, 0.13 MGD for irrigation, 0.02 MGD for public supply, and 0.02 MGD for aquaculture. The total groundwater withdrawals in Richland County were reported as 10.29 MDG, of which 6.24 MGD withdrawal for domestic supply, 1.87 MGD for industrial supply, 1.52 MGD for public supply, 0.47 MGD for mining, and the remaining for irrigation and agricultural purposes. (USGS. 2022e) Groundwater use in Fairfield, Newberry, and Richland Counties is summarized in Table E3.6-6.

A list of 41 offsite groundwater wells within a 2-mile radius of the VCSNS site center point is depicted in Figure E3.6-8 and the wells are described in Table E3.6-7. These wells are used as domestic water supply wells. The closest well to VCSNS is a domestic water well located approximately 1.1 miles from VCSNS. These private wells were identified within 2 miles of VCSNS by interviewing residents (DE. 2023a, Section 2.4.13.2.2). Where available, the reported well depths ranged from 65 to 365 feet deep. (DE. 2023a, Table 2.4-8)

E3.6.4 WATER QUALITY

E3.6.4.1 Surface Water Quality

The CWA Section 305(b) requires each state to report to the EPA every two years on the condition of its surface waters, and Section 303(d) requires each state to report on its impaired water bodies (those not meeting water quality standards). Segments of the Broad River within Fairfield and Newberry Counties are listed in SCDHEC's 2018 303(d) list of impaired waters for the Broad River (SCDHEC. 2018a).

- Beaver Creek at SR 95, Broad River, Fairfield County, HUC 03050160401, macroinvertebrate
- McClure's Creek at SC-215 6.7 miles southeast of Carlisle, HUC 03050160401, Fairfield County, macroinvertebrate
- Hellers Creek at SR 97, HUC 030501060402, Newberry County, macroinvertebrate
- Monticello Lake – lower impoundment between large islands, HUC 030501060403, Fairfield County, pH
- Monticello Lake 1.7 miles northwest of Monticello, HUC 030501060403, Fairfield County, pH
- Monticello Lake 3.5 miles north of Jenkinsville, HUC 030501060403, Fairfield County, pH
- Monticello Reservoir approximately 0.8 mile southwest of Lake Monticello East Landing, HUC 030501060403, Fairfield County, pH
- Cannon Creek at Oxner Road, HUC 030501060404, Newberry County, macroinvertebrate
- Parr Reservoir 4.8 km north of dam, upstream Monticello Reservoir, HUC 030501060406, Fairfield County, total phosphorus
- Parr Reservoir approximately 0.7 mile north-northwest of B-346 and approximately 0.9 mile southeast of mouth of Hellers Creek, HUC 030501060406, Fairfield County, total phosphorus
- Parr Reservoir approximately 0.25 mile east-northeast of the end of Mayer Windmill Drive, HUC 030501060406, Newberry County, total phosphorus

- Unnamed tributary to Rocky Creek at Cooper Holmes Road, HUC 030501060406, Fairfield County, e. Coli
- Winnsboro Bridge below plant outfall, HUC 030501060504, Fairfield County, copper
- Jackson Creek at S-20-54, 5 miles west of Winnsboro, HUC 030501060504, Fairfield County, macroinvertebrate
- Crims Creek at SC 213, HUC 030501060701, Newberry County, macroinvertebrate
- Broad River at So. railroad trestle, 0.5 miles due south of SC 213, HUC 030501060703, Fairfield County, copper

The SCDHEC draft 2020 and 2022 Integrated Report 303(d) list does not include the unnamed tributary to Rocky Creek at Cooper Holmes Road. However, the following additional impaired waters are listed: (SCDHEC. 2022b)

- Monticello Reservoir, approximately 1.04 miles south-southeast of Lake Monticello West landing, HUC 030501060403, Fairfield County, pH
- Lake Monticello, just off island junction of berms/roads, HUC 030501060403, Fairfield County
- Lake Monticello, in cove located halfway between ends of Lighted Lane and Fireside Drive, HUC 030501060403, Fairfield County, pH
- Broad River, at SC 34,14 miles northeast of Newberry, HUC 030501060406, Fairfield County, turbidity

Development of total maximum daily load implementation plans for the Broad River was approved in 2005 for fecal coliform at some of these locations. There are no approved total maximum daily loads for the Monticello Reservoir.

The known permitted discharges to the Broad River are limited to those from the existing unit. Outfall 003 (NPDES Permit No. SC0030856) includes low volume waste and non-chemical metal cleaning waste discharged to the Broad River/Parr Reservoir. These sources and permitted discharge limits are described in the NPDES permit. Outfall 012 discharges to the Broad River/Parr Reservoir under the NPDES General Permit for Stormwater Discharges Associated with Industrial Activity (coverage No. SCRNE0516). VCSNS is in compliance with its NPDES permits, discussed in Section E3.6.1.2.1, and does not contribute to these impairments. As part of the Supplemental REMP, discussed in Section E3.6.2.4, surface water samples are collected at some onsite locations and are analyzed for tritium and gamma isotopes. Only one detection was reported in one surface water sample collected in 2017 through 2021: tritium was detected in an outfall within the VCSNS site boundary at 1,430 pCi/L, which is far below the EPA maximum contaminant level (MCL) of 20,000 pCi/L. (SCE&G. 2018c; SCE&G. 2019b; DE. 2020b; DE. 2021a; DE. 2022c)

As described in Section E3.6.1, the Monticello Reservoir provides once-through cooling water to Unit 1 and acts as the upper reservoir for the Fairfield Pumped Storage Facility, and the Parr Reservoir serves as the lower reservoir for the Fairfield Pumped Storage Facility. Makeup water for the Monticello Reservoir is supplied from the Parr Reservoir. As part of the Fairfield Pumped Storage Facility operations, water is released from the Monticello Reservoir through the Fairfield Pumped Storage Facility to Parr Reservoir to the Monticello Reservoir to maintain the level of the upper reservoir. Over time, the water quality of the Monticello Reservoir is expected to be basically that of the Broad River because of the cycling and mixing of water. Monticello Reservoir waters are relatively low in concentrations of common ions, low in hardness, and low in dissolved solids and conductivity. There is no indication that evaporative losses associated with the operation of Unit 1 have increased concentrations of common ions, minerals, or solids in the Monticello Reservoir water. (SCE&G. 2010, Section 2.3.3.1.5)

Vertical profiles of Monticello Reservoir are measured at four sites: the Unit 1 intake area, the discharge area, the OWS intake area, and uplake toward the northern end of the reservoir. As part of the Federal Energy Regulatory Commission (FERC) relicensing effort for the Parr Hydroelectric Project, 10 years of water quality data were compiled for the period January 2003 through December 2012. In addition, SCDHEC monitors water quality of the reservoir at two permanent stations, and in some years, at four other stations. SCDHEC has collected grab samples at different frequencies depending on the sampling site and the year. Sampling parameters include temperature, dissolved oxygen, turbidity, pH, biological oxygen demand, alkalinity, nitrogen, phosphorus, fecal coliform, organic carbon, and metals. Monitoring data collected near the Unit 1 intake and in uplake locations indicate the following water quality trends for Monticello Reservoir.

- Surface water temperatures range from about 9 degrees Celsius (°C) during the winter to 32°C during the summer. Through the spring and mid-summer, temperatures at depths of 15 meters (m) are up to 6.7°C cooler than the surface, while at other times of the year, little variation with depth is observed. The maximum temperatures observed have not exceeded the numeric criterion for freshwaters (32.2°C, 90°F) per South Carolina Regulation 61-68, described in Section E3.6.1.2.6.
- Dissolved oxygen values typically range from 5 to 8 milligrams per liter (mg/L) in the summer months to up to 12 to 15 mg/L in the winter months. These values fall within the numeric criteria for freshwaters (daily average of 5.0 mg/L, low of 4.0 mg/L). Dissolved oxygen values below 5.0 mg/L have occasionally been measured during the summer in the deepest part of the water column at the uplake site.
- Specific conductivity typically ranges from 80.0 to 120.0 microSiemens per centimeter at all monitoring sites at all depths in the reservoir.

- The pH values at the sites near VCSNS Unit 1 intake and discharge are consistently around 7.5, ranging from 6.8 to 8.0. The numeric criterion for freshwaters is a range of 6.0 to 8.5. The values measured at the uplake site tend to be more alkaline, ranging up to 8.5 to 8.7. Throughout the lake, the pH decreases at increasing depths.
- Analyses of metals in surface water samples collected quarterly in years from 1999 to 2012 reported results below quantification limits for most metals or detection at low concentrations, indicating support of aquatic life use.

One factor controlling the survival and growth of thermophilic organisms in the Monticello Reservoir is the disinfection of the Unit 1 sewage treatment plant effluent. This reduces the likelihood that a seed source of inoculant will be introduced into the Unit 1 discharge canal or the Monticello Reservoir. (SCE&G. 2010, Section 2.3.3.1.5)

Dissolved oxygen in the Monticello Reservoir is relatively high throughout the year except for the deeper waters in late summer. These deep waters do not mix with the upper layers of water due to their lower temperatures and higher densities; therefore, they become oxygen depleted. The pH in the Monticello Reservoir is generally neutral, ranging from 5.8 to 8.9 SU. Specific conductance values for the Monticello Reservoir vary slightly, ranging from 94 to 142 micromhos per centimeter. (SCE&G. 2010, Section 2.3.3.2)

E3.6.4.2 Groundwater Quality

Jointed bedrock is not a good aquifer for municipal and industrial water wells. The quality of groundwater is acceptable for most uses. (DE. 2023a, Section 2.4.13.2.6) Groundwater in the vicinity of VCSNS is highly mineralized because of prolonged contact with, and solution of, rock minerals, and, as a result, is generally higher than local surface waters in hardness, dissolved solids, and conductivity. (SCE&G. 2010, Section 2.3.3.1.5)

In addition to the GWPP and the radiological surveillance programs described in Section E3.6.2.4, the groundwater monitoring programs at VCSNS include the auxiliary boiler fuel oil storage tank (ABFOST) and the sewage and wastewater treatment facilities areas.

Groundwater monitoring is required in the ABFOST area, which is located near the SWP. The ABFOST consists of one 500,000-gallon aboveground storage tank (AST) containing No. 2 fuel oil located within a secondary containment basin. During installation of a survey monument in 1978, an underground supply line to the AST was punctured, releasing an estimated 500 to 1,000 gallons of No. 2 fuel oil. Studies were completed between 1987 and 1992 to determine the extent of groundwater impact. Corrective actions have been in place since 1993, including a Petrotrap™ passive recovery device installed in well GW-3 in 1993 and two aggressive fluid vapor recovery (AFVR) events in 2002 and 2016. An annual groundwater sampling program has been in place since 2013 in the ABFOST area to sample three wells: GW-2 (downgradient), GW-3 (adjacent to

the ABFOST area), and GW-4 (upgradient). Wells are sampled annually for the VOCs benzene, toluene, ethylbenzene, xylenes (BTEX), and naphthalene, and the five polynuclear aromatic hydrocarbons: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and dibenzo(a,h)anthracene. The groundwater flow direction is primarily southward toward GW-2 at a low rate of 0.4 feet/year. Free-phase product (FPP) has consistently been measured in well GW-3; therefore, groundwater samples are not collected from this well. The extent of the BTEX plume is confined to the GW-3 and GW-4 area. Benzene and naphthalene have been detected above their MCLs of 5 µg/L and 0.14 µg/L, respectively, in groundwater samples collected from upgradient monitoring well GW-4. None of the constituents have been detected in downgradient well GW-2 above their respective MCLs. A trend analysis of VOCs detected in GW-4 since 2014 through 2022 indicates that total VOC concentrations are decreasing in this well.

As described in Section E3.6.1.2.1, groundwater monitoring is a requirement of NPDES Permit No. SC0030856 for six groundwater monitoring wells (GW-8A, GW-9, GW-12, GW-13A, GW-15A, and GW-17) located around the central sewage and process wastewater treatment facility. Groundwater samples are collected semiannually and are analyzed for ammonia, metals (Pb and iron), total dissolved solids, pH, conductivity, chloride, sulfate, nitrate, total organic carbon, and VOCs. The following list is a summary of the sampling results provided in 2017 through 2021.

- Consistently since 2017, iron concentrations have fluctuated. Iron was detected over its MCL of 300 µg/L during each sampling event in at least one well and up to five wells.
- Pb concentrations have fluctuated. Pb was detected over its MCL of 15 µg/L in March 2020 in well GW-17 at 16.7 µg/L.
- In 2017 through 2021, pH was consistently low.
- The MCL for nitrate is 10 mg/L. Nitrate was detected above its MCL during each sampling event between 2017 and 2021 in wells GW-9 and/or GW-17 at concentrations between 10.2 mg/L and 46.5 mg/L.
- Two VOCs were detected during the September 2019 sampling event. Chloroform was detected in well GW-12 at 0.50 µg/L. Acetone was detected in wells GW-8A and GW-15A at 14.4 µg/L and 11.3 µg/L, respectively. There are no MCLs for acetone and chloroform. VOCs were not detected above laboratory detection limits during the other sampling events.

An evaluation of historical leaks and spills was conducted during the 2020 review of the GWPP. Tritium below the EPA MCL for drinking water (20,000 pCi/L) was detected in four of the five NPDES monitoring wells. The Turbine Building sump, which discharges to the sanitary waste collection sump, (DE. 2023a, Section 9.3.3.2) was the apparent source of this activity. The Turbine Building sump collects secondary system leakage and is known to contain low levels of radioactivity. The wastewater treatment facility settling ponds are unlined and tritium was detected

in the surrounding groundwater monitoring wells; however, the groundwater from this area is not a source of drinking water.

As reported in the AREORs for years 2017 through 2021, tritium has been detected within the VCSNS boundary in two areas: well GW-16 near the sanitary and wastewater treatment facility 2017 through 2021, and in dewatering wells DW-14 through DW-16 in 2019. All tritium detections were below the EPA MCL of 20,000 pCi/L. These results are described further in Section E3.6.4.2.1.

No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in wells sampled in 2017 through 2021 (SCE&G. 2018c; SCE&G. 2019b; DE. 2020b; DE. 2021a; DE. 2022c),

E3.6.4.2.1 History of Radioactive Releases

Low-level radioactive gases, liquids, and solids are routine byproducts of nuclear power plant operation. Radioactive waste management systems, commonly called radwaste systems, collect, process, and either recycle or dispose of these radioactive materials. The design and operation of the radwaste systems are regulated by the NRC. As part of normal operation of the plant, radioactive material must sometimes be discharged to the environment. Such discharges are also regulated by the NRC, and submittal of annual reports to the NRC detailing the amounts and compositions of radwaste discharged intentionally or accidentally from their facilities is required. The EPA has a separate regulation that limits the radioactivity of drinking water. This regulation sets a maximum allowed concentration for each radionuclide in drinking water, including a maximum radioactivity concentration of 20,000 pCi/L for tritium, a radioactive form of hydrogen produced by power plants.

There were no abnormal releases reported in 2017 through 2021 (SCE&G. 2018a; SCE&G. 2019a; DE. 2020a; DE. 2021b; DE. 2022b). As described in Section E3.6.4.2, tritium has been historically detected in well GW-16 as a result of a leak from the Turbine Building sump. Well GW-16 is a shallow monitoring well used to monitor contaminants around the wastewater treatment facility (DE. 2022c). Between 2017 and 2022, tritium detections in this well ranged from 1,010 pCi/L in 2018 to 2,800 pCi/L in 2020, far below the EPA MCL of 20,000 pCi/L (SCE&G. 2018c; SCE&G. 2019b; DE. 2020b; DE. 2021a; DE. 2022c). Tritium detections in 2017 through 2022 do not show an increasing trend in GW-16. Over the period 2017 through 2022, tritium was detected in well GW-13A during one sampling event in 2019 at 341 pCi/L. GW-13A is also used to monitor contaminants around the wastewater treatment facility.

Tritium was detected in dewatering well DW-15, located north of the Fuel Handling Building adjacent to the radwaste pad trench, in May 2018 at 6,230 pCi/L. Tritium was not detected in this well prior to the May 2018 sample. In response to this detection, DW-15 was temporarily deenergized, and samples were collected weekly for the rest of the year from DW-15 and adjacent

dewatering wells DW-14 and DW-16. Tritium was detected in DW-14 and DW-16 in 2018 at maximum concentrations of 1,330 pCi/L and 1,290 pCi/L, respectively, far below the EPA MCL of 20,000 pCi/L. Subsequent tritium detections in DW-15 showed decreasing activity. Well function was restored in January 2019. (SCE&G. 2019b) In 2019, tritium was detected in the dewatering wells at the following maximum concentrations: DW-14 at 769 pCi/L, DW-15 at 3,140 pCi/L, and DW-16 at 410 pCi/L. However, tritium was not detected above the minimum detectable activity (MDA) in these three dewatering wells in May 2019 or during subsequent monitoring events through 2022. (DE. 2020b; DE. 2021a; DE. 2022c)

These dewatering wells drain outside the protected area through a stormwater drainage system. All monthly composite samples collected in 2018 and 2019 at the discharge point did not contain detectable levels of tritium. (DE. 2020b; SCE&G. 2019b)

A specific cause of the detected tritium was not identified; however, the most likely source was a backflow from the radwaste pad trench located north of the Fuel Handling Building following contamination of the trench from use of a hose that was pulled for use from an area where it was stored near a tritiated source. Because tritium results in these dewatering wells remain below the MDA, tritium impact was likely the result of a single event rather than a continuous source. Tritium was not detected in any other monitoring wells at VCSNS over the period 2017 through 2022.

E3.6.4.2.2 History of Nonradioactive Releases

As discussed in Section E3.6.4.2, the ABFOST is a 500,000-gallon AST containing No. 2 fuel oil within a secondary containment basin located near the SWP. There was a release in 1978 when an underground supply line was punctured during installation of a survey monument. After years of investigation and remediation, SCDHEC requested an annual groundwater monitoring plan in 2013. Groundwater samples are collected annually for BTEX and five PAHs. FPP has consistently been detected in groundwater monitoring well GW-3 at thicknesses ranging from 1 to 3.5 feet with an increasing trend in 2020 and 2021. Benzene and naphthalene have been detected in well GW-4 above the MCL consistently since 2014. Annual ABFOST groundwater monitoring reports have been submitted to SCDHEC. The extent of the groundwater plume has been contained within the GW-3 and GW-4 area due to low soil permeability. Groundwater gradient was measured southward, away from the Monticello Reservoir.

Based on review of VCSNS records from 2017–2021, there have been three inadvertent nonradioactive releases, described below. There are no ongoing remediation activities for the releases.

- On June 8, 2020, VCSNS reported a transmission fluid spill of 1–2 ounces released to the Monticello Reservoir to the SCDHEC as a four-hour non-emergency notification. The spill was a result of a hydraulic hose leak during equipment testing. This spill did not violate any

NRC regulations or reporting criteria. There was no impact on the health and safety of the public or plant personnel.

- On September 8, 2021, there was an overflow of the Nuclear Operations Building Lift Station (LS-3) to SCDHEC as a 4-hour non-emergency notification. The lift station overflow was due to a broken discharge pipe from Pump 1 to the common discharge header. The overflow was contained in the valve vault, basin gravel, and the nearby concrete surface. None of the overflow reached any storm drains or waters of the state. This release did not exceed any NRC regulations or reporting criteria. There was no impact on the health and safety of the public or plant personnel. VCSNS contacted SCDHEC to clarify notification requirements. SCDHEC communicated that overflows of over 500 gallons that do not reach waters of the state do not require notification. VCSNS retracted the event notification because it was determined that the lift station overflow did not exceed any federal, state, or local reporting criteria or violate any permits.
- On November 16, 2021, the reactor was manually tripped due to a main transformer fault that released mineral oil. The oil was mixed with a large amount of water from the transformer's suppression system, which surpassed the capacity of the plant's oil/water separator. The oil/water separator sump level transferred the mixture to internal NPDES Outfall 06B, which drains to Outfall 014, and an oil sheen was observed at Outfall 014. Less than 50 gallons of mineral oil was estimated to have entered the Monticello Reservoir. The oil was contained with booms and cleaned up. The EPA National Response Center and SCDHEC were notified.

Table E3.6-1 Parr Shoals Reservoir Water Levels (November 1994 through December 2021)

Month	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2021	261.71	261.53	262.05	262.46	261.68	261.75	261.44	260.60	261.90	260.47	261.07	262.30	261.53
MEAN	261.54	261.52	261.82	261.71	261.46	261.50	261.50	261.40	261.25	261.40	261.64	261.65	261.53
MAX	262.89	263.30	263.14	262.85	262.31	262.19	262.57	262.18	262.60	262.70	263.24	263.09	--
	2005	2004	2010	2014	2009	2017	2009	2005	2009	2015	2009	2004	--
MIN	260.10	260.13	260.10	260.85	260.48	260.41	260.68	260.29	260.25	259.54	259.83	260.07	--
	1998	1998	1997	1995	1995	1999	1995	1999	2007	2007	2007	1994	--

(USGS. 2022b)

Table E3.6-2 NPDES Water Quality Monitoring Program (Sheet 1 of 5)

Outfall	Description	Parameter	Permit Requirement	Frequency
001	Once-through non-contact cooling water and low volume waste regulated at internal Outfalls 004 and 007	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Record continuously
		pH	6.0–8.5 SU	Monthly grab
		Discharge Temperature	Monitor and report monthly average; 113°F daily maximum	Record continuously
		Intake Temperature	No limit, monitor and report monthly average and daily maximum in °F	Record continuously
01A[(a)]	Aluminum-based coagulants and discharging to freshwaters Treated filter backwash water, sedimentation basin wash down water, and decant water	Flow	No limit, monitor and report monthly average and daily maximum in MGD	Weekly
		Total Suspended Solids	30 mg/L limit, monthly average; 60 mg/L limit, daily maximum	Quarterly grab
		Total Aluminum	No limit, monitor and report monthly average and daily maximum	Quarterly grab
		Total Phosphorus	No limit, monitor and report monthly average and daily maximum	Quarterly grab
		pH	6.0–8.5 SU	Monthly grab
003	Low volume and non-chemical metal cleaning waste	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly estimate
		pH	6.0–9.0 SU	Monthly grab
		Total Suspended Solids	30 mg/L limit, monthly average; 100 mg/L limit, daily maximum	Monthly grab
		Oil and Grease	15 mg/L limit, monthly average; 20 mg/L limit, daily maximum	Monthly grab

Table E3.6-2 NPDES Water Quality Monitoring Program (Sheet 2 of 5)

Outfall	Description	Parameter	Permit Requirement	Frequency
004	Low volume waste	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly calculation
		Total Suspended Solids	30 mg/L limit, monthly average; 100 mg/L limit, daily maximum	Monthly grab
		Oil and Grease	15 mg/L limit, monthly average; 20 mg/L limit, daily maximum	Monthly grab
005	Sanitary wastewater	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly instantaneous
		Biochemical Oxygen Demand	30 mg/L limit, monthly average; 45 mg/L limit, daily maximum	Monthly 24-hour composite
		Total Suspended Solids	30 mg/L limit, monthly average; 45 mg/L limit, daily maximum	Monthly 24-hour composite
		E. coli	126/100 mg/L limit, monthly average; 349/100 mg/L limit, daily maximum	Monthly grab
05A[(a)]	Reverse osmosis and discharging to freshwaters Treated filter backwash water, sedimentation basin wash down water, decant water	Flow	No limit, monitor and report monthly average and daily maximum in MGD	Weekly
		Total Suspended Solids	30 mg/L limit, monthly average; 60 mg/L limit, daily maximum	Quarterly grab
		Total Iron	No limit, monitor and report monthly average and daily maximum	Monthly grab
		Total Manganese	No limit, monitor and report monthly average and daily maximum	Monthly grab
		Total Phosphorus	No limit, monitor and report monthly average and daily maximum	Monthly grab
		pH	6.0–8.5 SU	Monthly grab

Table E3.6-2 NPDES Water Quality Monitoring Program (Sheet 3 of 5)

Outfall	Description	Parameter	Permit Requirement	Frequency
06A[(a)]	Whole effluent toxicity limitations and monitoring requirements discharging to freshwaters Treated filter backwash water, sedimentation, basin wash down water, decant water	Whole Effluent Toxicity, Acute Testing	No monthly average, daily maximum of 0%	24-hour composite
06A	Low volume waste	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly instantaneous
		Total Suspended Solids	30 mg/L limit, monthly average; 100 mg/L limit, daily maximum	Monthly grab
		Oil and Grease	15 mg/L limit, monthly average; 20 mg/L limit, daily maximum	Monthly grab
06B	Low volume waste	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly instantaneous
		Total Suspended Solids	30 mg/L limit, monthly average; 98 mg/L limit, daily maximum	Monthly grab
		Oil and Grease	15 mg/L limit, monthly average; 19 mg/L limit, daily maximum	Monthly grab
007	Low volume waste	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly instantaneous
		Total Suspended Solids	30 mg/L limit, monthly average; 100 mg/L limit, daily maximum	Monthly grab
		Oil and Grease	15 mg/L limit, monthly average; 20 mg/L limit, daily maximum	Monthly grab

Table E3.6-2 NPDES Water Quality Monitoring Program (Sheet 4 of 5)

Outfall	Description	Parameter	Permit Requirement	Frequency
07A[(a)]	Ion exchange and reverse osmosis discharging to all water classifications Treated filter backwash water, sedimentation basin wash down water, and decant water	Total Arsenic	No limit, monitor and report monthly average and daily maximum	Quarterly composite
		Total Barium	No limit, monitor and report monthly average and daily maximum	Quarterly composite
		Total Cadmum	No limit, monitor and report monthly average and daily maximum	Quarterly composite
		Total Copper	No limit, monitor and report monthly average and daily maximum	Quarterly composite
		Total Mercury	No limit, monitor and report monthly average and daily maximum	Annual grab
		Total Selenium	No limit, monitor and report monthly average and daily maximum	Quarterly composite
		Total Zinc	No limit, monitor and report monthly average and daily maximum	Quarterly composite
		Temperature (effluent)	No limit, monitor and report monthly average and daily maximum	Monthly grab
		Salinity (effluent)	No limit, monitor and report monthly average and daily maximum	Quarterly grab
008	Low volume waste, non-chemical metal cleaning waste, and chemical metal cleaning wastes	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Monthly instantaneous
		Total Suspended Solids	30 mg/L limit, monthly average; 100 mg/L limit, daily maximum	Monthly grab
		Oil and Grease	15 mg/L limit, monthly average; 20 mg/L limit, daily maximum	Monthly grab
		Total Copper	1.0 mg/l limit, monthly average and daily maximum	Monthly grab
		Iron	1.0 mg/l limit, monthly average and daily maximum	Monthly grab

Table E3.6-2 NPDES Water Quality Monitoring Program (Sheet 5 of 5)

Outfall	Description	Parameter	Permit Requirement	Frequency
09A[a]	Total residual chlorine limits for all water classifications Treated filter backwash water, sedimentation basin wash down water, and decant water	Total Residual Chlorine	No limit, monitor and report monthly average and daily maximum in mg/L	Monthly grab
014	Internal Outfalls 005, 06A, 06B, and 008	Flow Rate	No limit, monitor and report monthly average and daily maximum in MGD	Record continuously
		pH	6.0–8.5 SU	Monthly grab
		Ceriodaphnia dubia Chronic Whole Effluent Toxicity @CTC = 100%	No limit, monitor and report monthly average and daily maximum in percent	Grab once per 5 years
		Ceriodaphnia dubia LC50 – 48-hour Acute	No limit, monitor and report daily minimum	Calculated once per 5 years
		Ceriodaphnia dubia IC25 – 7-day Chronic	No limit, monitor and report daily minimum	Calculated once per 5 years

a. Outfall permitted under NPDES Permit No. SCG646000 for the OWS discharging through OWS Outfall 001, which is not described in the permit. All other outfalls are permitted under NPDES Permit No. SC0030856.

Table E3.6-3 VCSNS Groundwater Monitor Well Details (Sheet 1 of 3)

Well	Well Diameter[a]	Elevations (feet msl)					Well Construction Material
		Top of Casing	Top of Filter[b]	Top of Screen[b]	Bottom of Screen[b]	Bottom of Filter[b]	
B-1	2	435.39	400.9	398.4	388.4	382.4	PVC
B-2I	2	435.60	377.6	374.1	364.1	357.6	PVC
B-2S	2	435.58	415.6	413.6	403.6	403.6	PVC
B-4	2	436.81	366.8	362.8	352.8	347.8	PVC
B-6	2	435.38	423.1	421.1	411.1	406.1	PVC
B-7	2	435.05	422.9	421.4	411.4	401.9	PVC
B-8	2	434.94	352.9	339.9	329.9	326.9	PVC
B-9D	6/2	436.92	373.4	371.4	361.4	355.4	PVC
B-9I	2	435.41	420.7	417.7	407.7	407.7	PVC
B-9S	2	435.70	378.8	377.1	367.1	359.6	PVC
B-11	2	435.59	–	–	–	–	PVC
B-11I	2	435.59	–	–	–	–	PVC
B-12	2	435.19	422.4	420.2	410.2	405.2	PVC
B-13	1	435.26	–	–	–	–	PVC
B-14	1	435.57	–	–	–	–	PVC
B-16	2	435.38	419.4	415.9	405.9	405.4	PVC
B-17	1	434.66	–	–	–	–	PVC
B-19	2	435.44	420.4	418.4	408.4	408.4	PVC
B-20	2	434.97	–	–	–	–	PVC
B-21	1	434.46	–	–	–	–	PVC
B-22	1	435.02	–	–	–	–	PVC
B-23S	1	436.15	None	412.8	409.8	None	PVC
B-23D	6/2	436.79	–	–	–	–	PVC
B-24	2	437.20	–	–	–	–	PVC
B-25	2	436.62	–	–	–	–	Grouted
B-26	1	435.87	–	–	–	–	Grouted
B-27	1	435.75	–	–	–	–	PVC
B-28	2	435.67	418.7	416.7	406.7	406.7	PVC
B-29I	2	435.63	425.6	420.6	410.6	404.6	PVC
B-29D	6/2	438.21	None	410.7	406.2	None	PVC
B-31	2	436.04	421	419	409	399	PVC
B-32	1	434.06	–	–	–	–	PVC
B-33	2	435.11	418.1	416.1	406.1	405.1	PVC

Table E3.6-3 VCSNS Groundwater Monitor Well Details (Sheet 2 of 3)

Well	Well Diameter[a]	Elevations (feet msl)					Well Construction Material
		Top of Casing	Top of Filter[b]	Top of Screen[b]	Bottom of Screen[b]	Bottom of Filter[b]	
B-34	1	435.31	–	–	–	–	PVC
B-35	2	434.34	413.8	411.3	401.3	401.3	PVC
B-36	2	434.85	448.4	445.9	435.9	435.9	PVC
DW-1	6	436.43	–	–	–	–	–
DW-2	6	436.36	–	–	–	–	–
DW-3	6.25	434.9	–	–	–	–	Open Hole
DW-4	6.25	435.2	–	–	–	–	Open Hole
DW-5	6.25	435.0	–	–	–	–	Open Hole
DW-7	6	434.9	–	–	–	–	Stainless
DW-10	6	434.6	–	–	–	–	Stainless
DW-11	6	435.2	–	–	–	–	Stainless
DW-12	6	434.8	–	–	–	–	Stainless
DW-13	6	434.5	–	–	–	–	Stainless
DW-14	6	435.1	–	–	–	–	Stainless
DW-15	6	435.0	–	–	–	–	Stainless
DW-16	6	435.4	–	–	–	–	Stainless
DW-17	6	434.9	–	–	–	–	Stainless
DW-18	6	435.2	–	–	–	–	Stainless
DW-19	6	434.9	–	–	–	–	Stainless
GW-1	2	438.83	–	–	–	–	–
GW-2	2	437.49	–	–	–	–	–
GW-3	2	438.18	–	–	–	–	–
GW-4	2	438.01	–	–	–	–	–
GW-5	2	438.21	–	–	–	–	–
GW-6	2	437.43	–	–	–	–	–
GW-7	2	438.01	–	–	–	–	–
GW-8A	2	–	–	–	–	–	–
GW-9	2	438.37	–	–	–	–	–
GW-10	2	438.37	–	–	–	–	–
GW-11	2	437.66	–	–	–	–	–
GW-12	2	438.58	–	–	–	–	–
GW-13A	2	–	–	–	–	–	–
GW-15A	2	–	–	–	–	–	–

Table E3.6-3 VCSNS Groundwater Monitor Well Details (Sheet 3 of 3)

Well	Well Diameter[a]	Elevations (feet msl)					Well Construction Material
		Top of Casing	Top of Filter[b]	Top of Screen[b]	Bottom of Screen[b]	Bottom of Filter[b]	
GW-16	–	–	–	–	–	–	–
GW-17	2	–	–	–	–	–	–
P-2	–	–	–	–	–	–	–
P-5	–	–	–	–	–	–	–

a. Measured in inches.
b. Measured in inches.
c. Dashed cells indicate data were not reported.

Table E3.6-4a VCSNS Yearly Surface Water Withdrawal Summary – Monticello Reservoir

Year	Monthly Maximum		Monthly Average		Monthly Minimum		Yearly Total	
	MGM	gpm_a	MGM	gpm_a	MGM	gpm_a	MGY	MGD
2017	22,921.13	513,466.17	19,677.39	449,451.59	5,936.88	132,994.62	236,128.72	646.93
2018	22,915.60	513,365.27	19,733.78	450,758.86	5,431.40	121,671.05	236,805.34	648.78
2019	22,918.12	514,060.78	22,484.64	513,350.01	20,699.03	512,664.55	269,815.70	739.22
2020	22,915	513,328.85	19,785.37	450,170.68	8,202.29	189,867.82	237,424.43	648.70
2021	22,915.90	513,349.01	19,084.27	436,164.15	4,752.04	106,452.51	229,011.28	627.43
2017–2021	22,921.13	514,060.78	20,153.09	459,979.06	4,752.04	106,452.51	241,837.09	662.21

MGY = millions of gallons per year

MGD = millions of gallons per day

MGM = millions of gallons per month

gpm_a = average gallons per minute for the month

Table E3.6-4b VCSNS Monthly Surface Water Withdrawal Summary – Monticello Reservoir (Sheet 1 of 2)

Month	Total Monthly Intake (MGM)	Total Monthly Intake (gpm)
January 2017	22,921.13	513,466.17
February 2017	20,701.17	513,421.88
March 2017	22,919.97	513,440.19
April 2017	6,662.23	154,218.29
May 2017	5,936.88	132,994.62
June 2017	21,441.73	496,336.34
July 2017	22,916.41	513,360.44
August 2017	22,428.56	502,431.90
September 2017	22,181.46	513,459.72
October 2017	22,920.16	513,444.44
November 2017	22,180.26	513,431.94
December 2017	22,918.76	513,413.08
January 2018	22,913.80	513,301.88
February 2018	20,696.75	513,312.20
March 2018	22,915.60	513,342.20
April 2018	22,177.38	513,365.27
May 2018	22,915.30	513,335.48
June 2018	22,175.58	513,323.60
July 2018	22,914.20	513,310.84
August 2018	22,913.60	513,297.39
September 2018	22,174.28	513,293.51
October 2018	5,431.40	121,671.05
November 2018	6,662.58	154,226.38
December 2018	22,914.90	513,326.52
January 2019	22,918.12	513,398.79
February 2019	20,699.03	513,368.87
March 2019	22,885.35	512,664.55
April 2019	22,176.76	513,350.84
May 2019	22,914.71	513,322.28
June 2019	22,175.73	513,327.19
July 2019	22,914.93	513,327.22
August 2019	22,915.54	513,340.84
September 2019	22,176.42	513,343.05

Table E3.6-4b VCSNS Monthly Surface Water Withdrawal Summary – Monticello Reservoir (Sheet 2 of 2)

Month	Total Monthly Intake (MGM)	Total Monthly Intake (gpm)
October 2019	22,916.32	513,358.41
November 2019	22,207.43	514,060.78
December 2019	22,915.37	513,337.24
January 2020	22,914.10	513,308.69
February 2020	21,435.51	513,302.44
March 2020	22,914.09	513,308.47
April 2020	8,202.29	189,867.82
May 2020	17,838.81	399,614.92
June 2020	22,174.48	513,298.15
July 2020	22,198.86	497,286.29
August 2020	20,649.07	462,568.77
September 2020	14,788.86	342,334.72
October 2020	19,218.28	430,517.03
November 2020	22,174.78	513,305.09
December 2020	22,915.00	513,328.85
January 2021	22,530.58	504,717.29
February 2021	19,966.81	495,208.58
March 2021	22,915.90	513,349.01
April 2021	22,175.72	513,326.85
May 2021	22,915.73	513,345.21
June 2021	20,879.57	483,323.38
July 2021	22,914.64	513,320.79
August 2021	22,914.86	513,325.72
September 2021	21,845.99	505,694.21
October 2021	4,752.04	106,452.51
November 2021	9,913.72	229,484.26
December 2021	15,285.72	342,422.04

MGM = millions of gallons per month

gpm = gallons per minute for the month

Table E3.6-5 Surface Water Usage Summary in MGD, 2015

Category	Fairfield County	Newberry County	Richland County
Public Supply	1.70	6.56	29.92
Domestic, Self-Supplied	0.00	0.00	0.0
Industrial, Self-Supplied	0.00	0.00	28.53
Irrigation	0.00	0.51	0.59
Livestock	0.08	0.60	0.04
Aquaculture	0.00	0.06	0.16
Mining	0.00	0.00	0.00
Power Generation (Thermoelectric)	606.46	0.00	4.86
Total	**608.24**	**7.73**	**64.1**

(USGS. 2022e)

Table E3.6-6 Groundwater Usage Summary in MGD, 2015

Category	Fairfield County	Newberry County	Richland County
Public Supply	0.18	0.02	1.52
Domestic, Self-Supplied	0.61	1.36	6.24
Industrial, Self-Supplied	0.00	0.00	1.87
Irrigation	0.00	0.13	0.13
Livestock	0.00	0.00	0.02
Aquaculture	0.00	0.02	0.04
Mining	0.06	0.00	0.47
Power Generation (Thermoelectric)	0.00	0.00	0.00
Total	**0.85**	**1.53**	**10.29**

(USGS. 2022e)

Table E3.6-7 Offsite Water Wells within 2 Miles of VCSNS Center Point (Sheet 1 of 2)

Well ID	Distance[(a)] (miles)	Depth (ft)	Use Description	Aquifer Name
21	1.1	Not Reported	Domestic	Not Reported
20	1.1	300+	Domestic	Not Reported
19	1.3	207	Domestic	Not Reported
23	1.3	365	Domestic	Not Reported
40	1.4	Not Reported	Domestic	Not Reported
17	1.4	185	Domestic	Not Reported
18	1.4	168	Domestic	Not Reported
16	1.5	185	Domestic	Not Reported
11	1.5	Not Reported	Domestic	Not Reported
24	1.5	115	Domestic	Not Reported
14	1.5	Not Reported	Domestic	Not Reported
13	1.5	Not Reported	Domestic	Not Reported
15	1.5	Not Reported	Domestic	Not Reported
10	1.5	Not Reported	Domestic	Not Reported
12	1.5	Not Reported	Domestic	Not Reported
26	1.5	65	Domestic	Not Reported
9	1.5	Not Reported	Domestic	Not Reported
7	1.5	Not Reported	Domestic	Not Reported
25	1.5	104	Domestic	Not Reported
6	1.5	Not Reported	Domestic	Not Reported
8	1.6	Not Reported	Domestic	Not Reported
28	1.6	Not Reported	Domestic	Not Reported
29	1.6	235	Domestic	Not Reported
5	1.6	141	Domestic	Not Reported
30	1.6	Not Reported	Domestic	Not Reported
39	1.7	Not Reported	Domestic	Not Reported
4	1.7	Not Reported	Domestic	Not Reported
31	1.7	Not Reported	Domestic	Not Reported
33	1.7	76	Domestic	Not Reported
32	1.7	Not Reported	Domestic	Not Reported
27	1.8	75	Domestic	Not Reported
3	1.8	Not Reported	Domestic	Not Reported
38	1.8	Not Reported	Domestic	Not Reported
35	1.8	Not Reported	Domestic	Not Reported

Table E3.6-7 Offsite Water Wells within 2 Miles of VCSNS Center Point (Sheet 2 of 2)

Well ID	Distance[a] (miles)	Depth (ft)	Use Description	Aquifer Name
37	1.8	220	Domestic	Not Reported
34	1.8	265	Domestic	Not Reported
36	1.9	65	Domestic	Not Reported
43	1.9	65	Domestic	Not Reported
2	2.0	Not Reported	Domestic	Not Reported
41	2.0	355	Domestic	Not Reported
1	2.0	Not Reported	Domestic	Not Reported

(DE. 2023a, Table 2.4-8)
a. Distance is from the VCSNS center point and rounded to the nearest tenth of a mile. Wells listed are limited to those within a 2-mile radius from the site center point.

Figure E3.6-1 Vicinity Hydrological Features

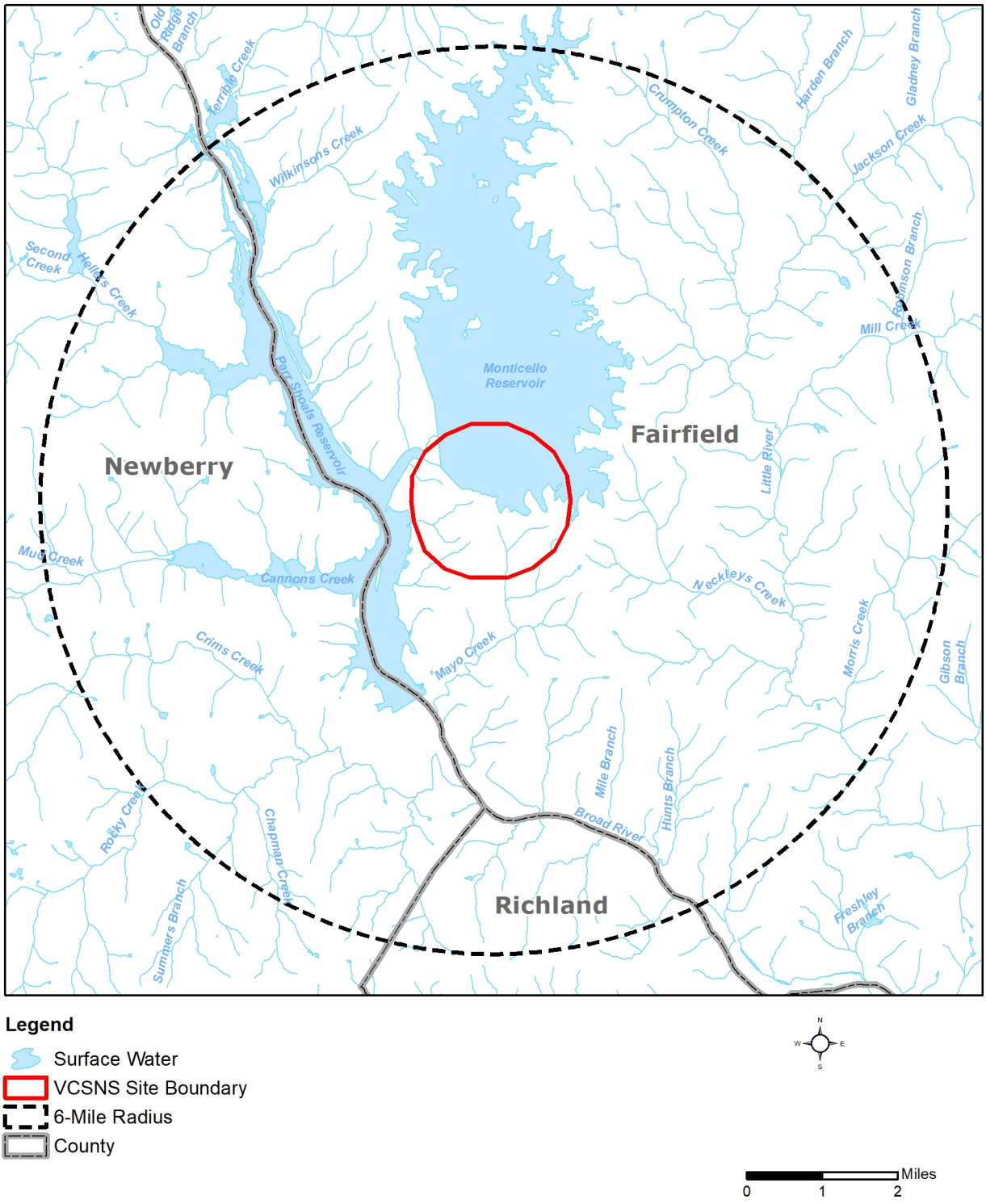


Figure E3.6-2 FEMA Floodplain Zones at VCSNS

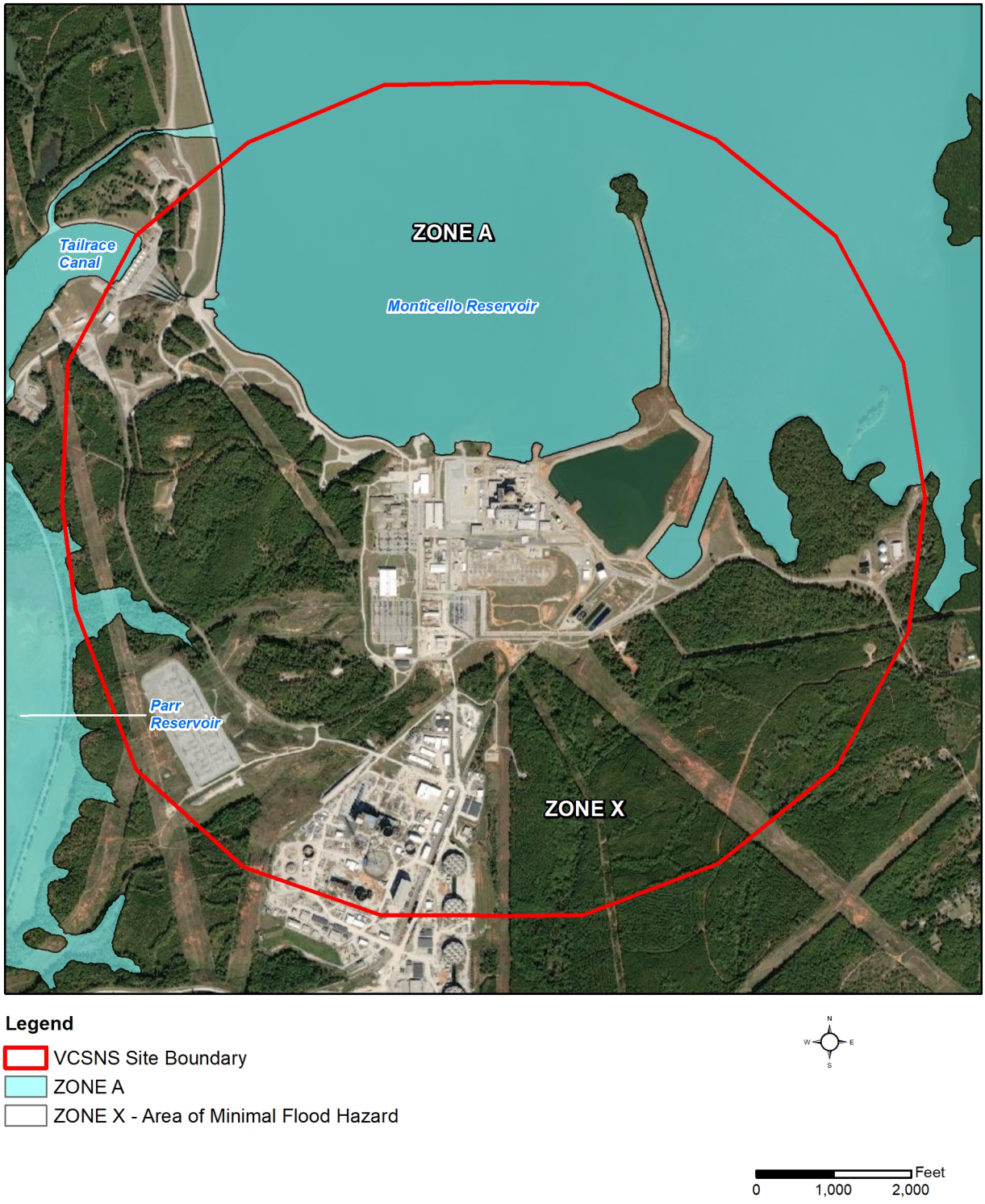


Figure E3.6-3 NPDES Outfalls

Figure E3.6-4 Average Discharge Temperatures

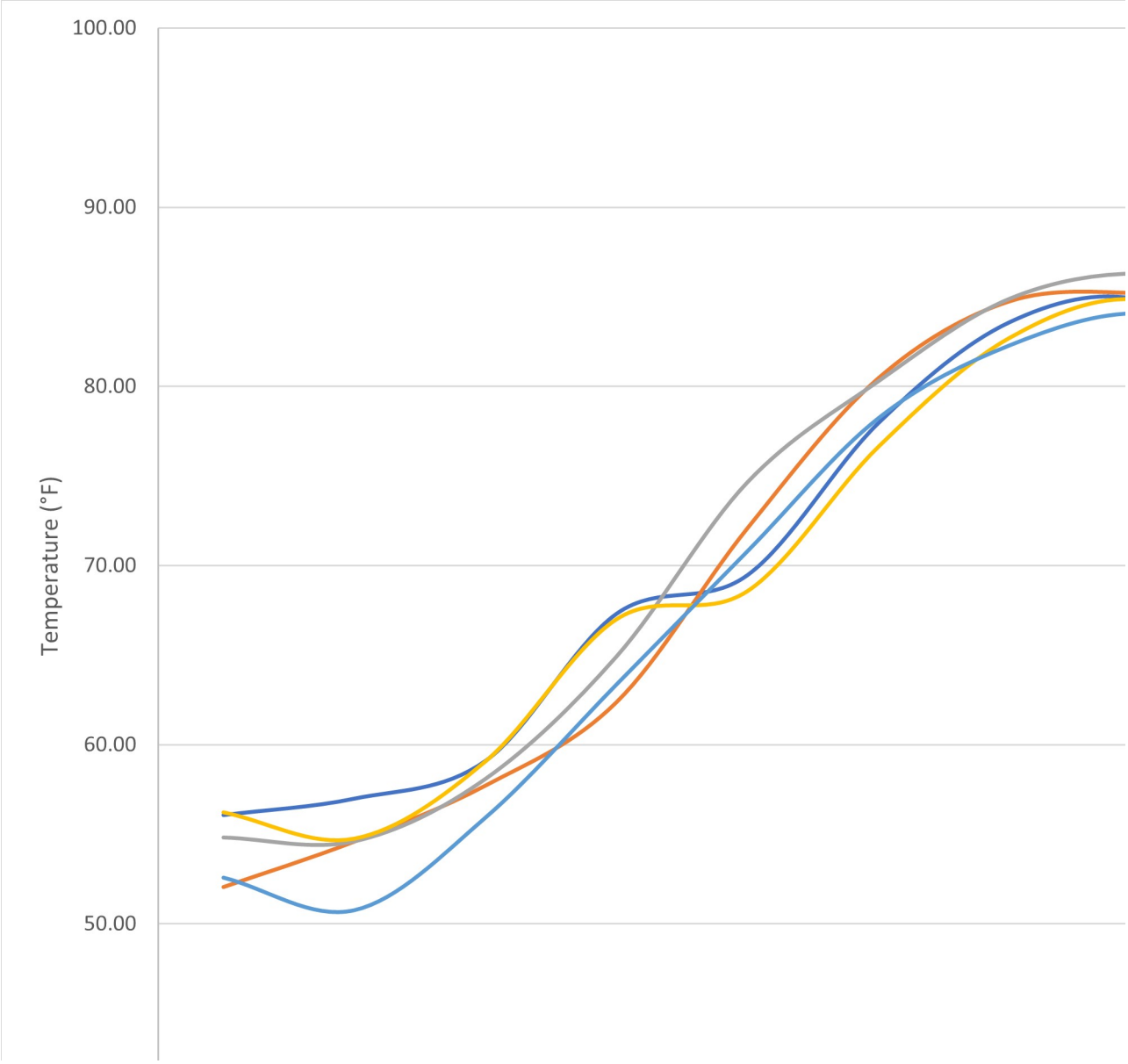


Figure E3.6-5 Average Intake Temperatures

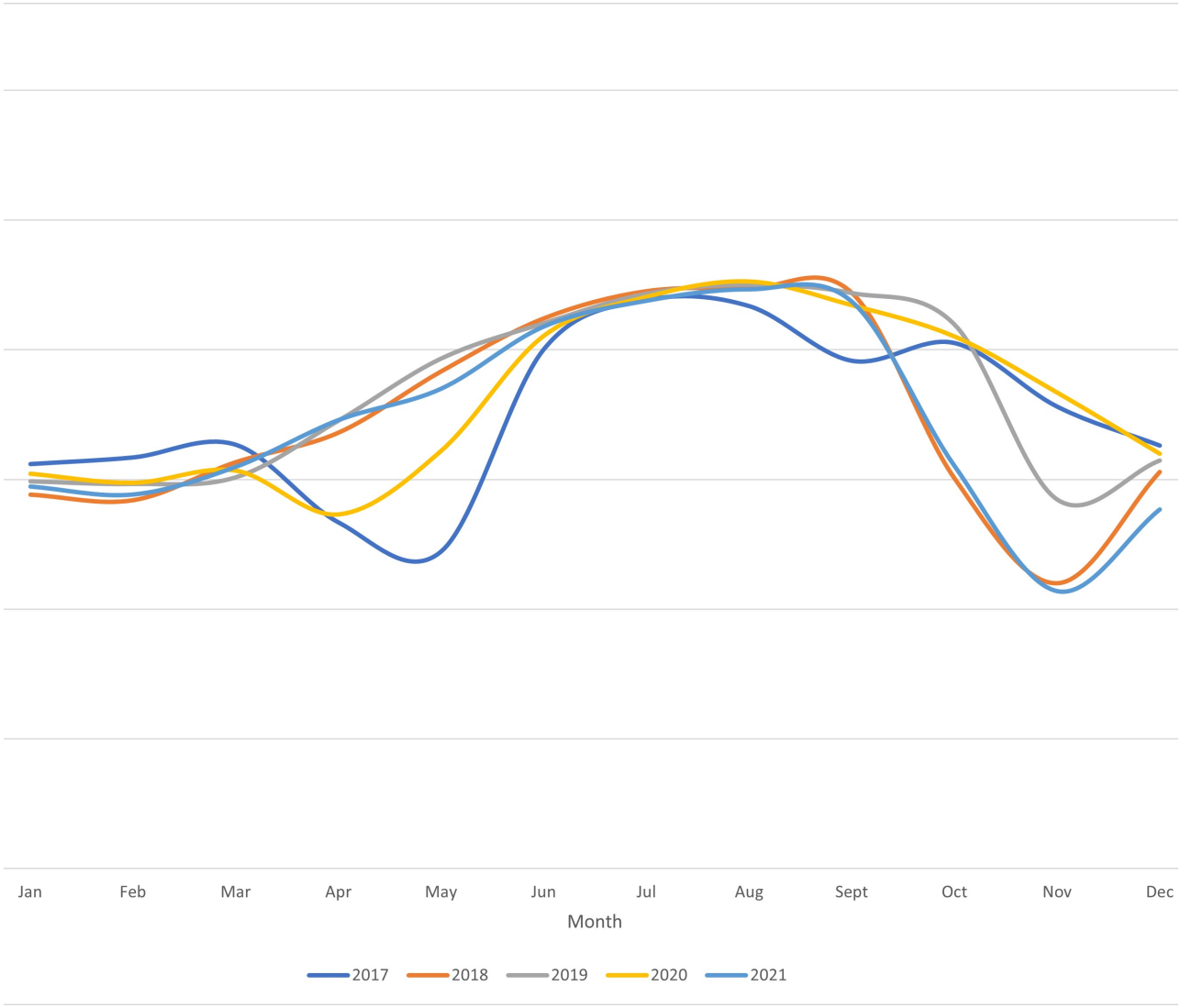


Figure E3.6-6 Onsite Wells

Legend

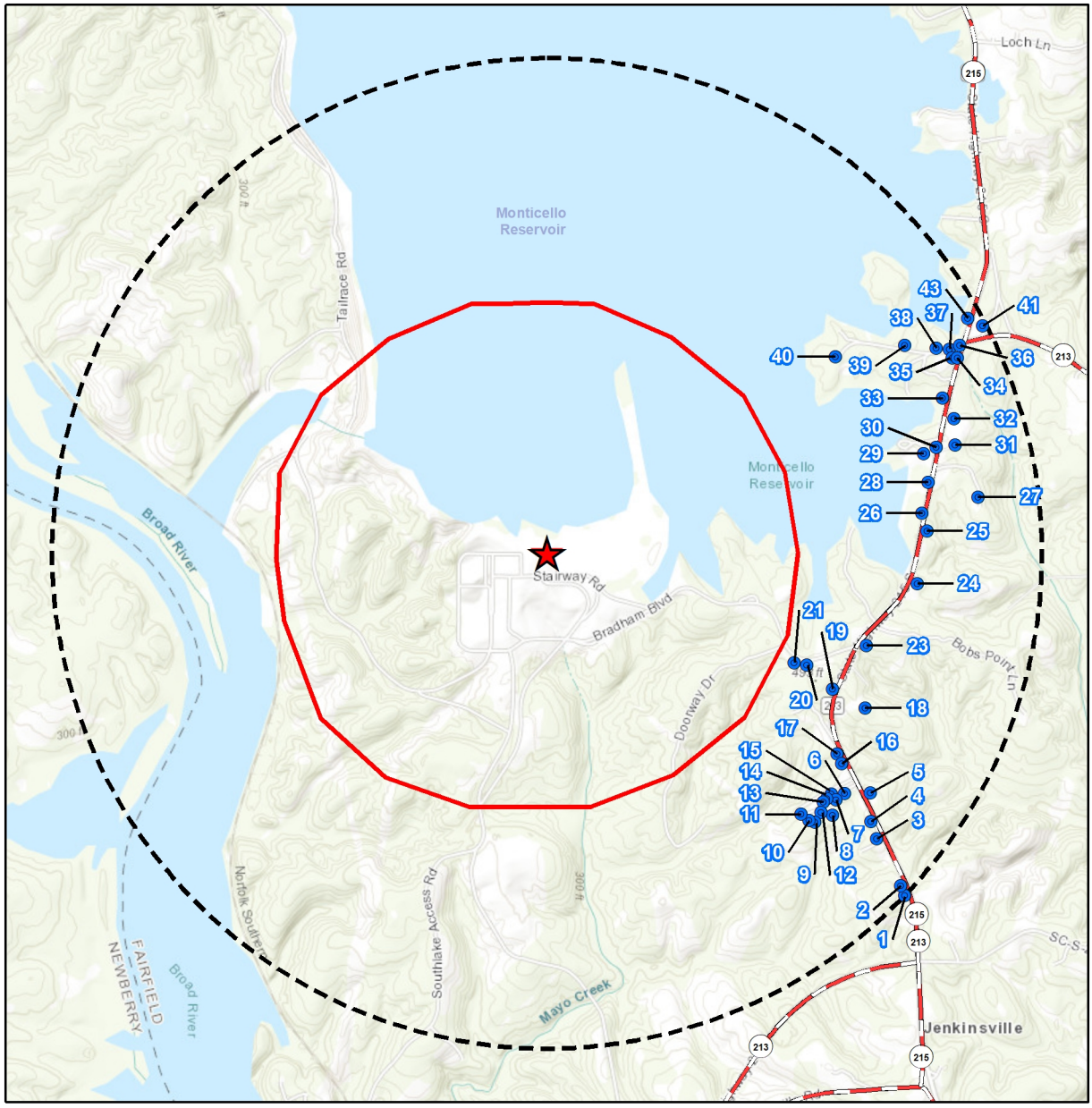
- Shallow Monitoring Well Location
- Intermediate Monitoring Well Location
- Deep Monitoring Well Location
- Proposed Monitoring Well Location
- Dewatering Well Location

N
W
E
S

Feet
0 100 200

Figure E3.6-7 Potentiometric Map July 29, August 4, and August 5, 2022

Figure E3.6-8 Offsite Water Wells within 2 Miles of VCSNS Center Point



E3.7 ECOLOGICAL RESOURCES

Regional ecology is greatly influenced by the geomorphic and physiographic characteristics of the region. Soils determine the basic fertility of the region which, in turn determines the types of plants that may grow there. The plants that are present greatly influence the types and number of animals that reside in the region. Soil types also greatly influence the basic fertility of aquatic ecosystems and the species present. Climatological factors such as temperature, day length, and precipitation further define the plants and animals that may live in a locale.

E3.7.1 AQUATIC COMMUNITIES

This section describes the aquatic environment and biota near the VCSNS site and other areas potentially affected by the continued operation of VCSNS. It includes a description of the aquatic ecosystems at or near the site, a description of representative important species that are present or are expected to occur, and the location of state parks, critical habitats, or other areas carrying special designations.

The VCSNS site is located within the Broad River Basin (SCDNR. 2013). Aquatic communities in the vicinity of the VCSNS site are influenced by the hydrology and water quality of the Broad River and movement of water between the Broad River/Parr Reservoir and Monticello Reservoir. VCSNS lies on the south shore of the Monticello Reservoir, which serves as its cooling water source and heat sink. (DE. 2023a, Section 2.4.1.2.2)

E3.7.1.1 Broad River Basin

The Broad River Basin dominates the central Piedmont Region of South Carolina. The basin encompasses all or parts of 11 South Carolina counties, including all of Cherokee, Spartanburg, and Union Counties and portions of Chester, Fairfield, Greenville, Laurens, Lexington, Newberry, Richland, and York Counties. This is the 3rd largest basin in the State, representing 12.2% of its area and encompassing 3,800-square miles. Land use in the basin is mainly comprised of forested land (~60%) and agricultural land (~24%), followed by scrub/shrub land, forested wetland, urban land, and barren land. (SCDHEC. 2007)

The Broad River, with its headwaters originating in North Carolina, constitutes the main stem of this large drainage system. Average annual flow of the Broad River ranges from about 1,500 cfs near the North Carolina border to more than 6,000 cfs at the confluence with the Saluda River at Columbia. This main-stem river reflects streamflow characteristics typical of Piedmont streams that depend primarily on precipitation and surface runoff to support flow. The Broad River typically receives from several hundred to about 1,000 cfs from each of its three main tributaries, the Pacolet, Tyger, and Enoree Rivers. (SCDNR. 2013)

Surface water development has been extensive in the Broad River basin. Most of this development has been for the production of hydroelectric power, although several large reservoirs have been built to provide municipal water supplies. VCSNS is located on Monticello Reservoir in Fairfield County, about 26 miles northwest of Columbia, and is the only thermoelectric power plant in the basin. (SCDNR. 2013)

E3.7.1.2 Broad River and Parr Reservoir

The Broad River originates on the eastern slope of the Blue Ridge Mountains near Lake Lure in North Carolina and flows southeast into South Carolina before joining the Saluda River at Columbia, South Carolina, to form the Congaree River. A portion of the Broad River is diverted into the Broad River Canal in Columbia before flowing into the Congaree River. In May of 1991, a 15-mile stretch of the Broad River from Ninety-Nine Islands Dam to the confluence with the Pacolet River was officially designated by the South Carolina General Assembly as a State Scenic River. (SCDNR. 2013, SCDHEC. 2007)

The Parr Reservoir is located approximately 1 mile west of VCSNS on the Broad River (DE. 2023a, Section 2.4.1.2.2). Parr Reservoir was built on the Broad River. The reservoir which was constructed in 1914 for hydroelectric power has a surface area of 4,400 acres. The reservoir provides cooling water for steam-electric generating facilities and provided cooling water to the experimental Parr Nuclear Power Plant during the 1960s. In 1976, the dam was heightened 9 feet for conjunctive use with the Monticello Reservoir and provides water for the Fairfield Pumped Storage Facility on Lower Frees Creek. (SCDNR. 2013)

E3.7.1.2.1 Water Quality

The USGS operates and maintains gauging stations on the Broad River upstream and downstream of Parr Reservoir. Data recorded from the Broad River near the Jenkinsville station were reviewed for the year 2019 when the dataset for both temperature and dissolved oxygen was complete for all months of the year. Temperature and dissolved oxygen levels vary seasonally, and show an inverse relationship, with high temperatures associated with relatively low dissolved oxygen levels and low temperatures associated with relatively high dissolved oxygen levels. Temperatures in 2019 ranged from 9.48°C in January to 29.23°C in July, with corresponding dissolved oxygen concentrations of 10.87 mg/L and 5.96 mg/L. (USGS. 2022f)

There are two SCDHEC monitoring stations along Parr Reservoir. Water quality at the monitoring stations was last reported in the 2018 SCDHEC report which noted that recreational uses were fully supported at both sites. At both the uplake and downlake site, aquatic life uses were not supported due to total phosphorus excursions. (SCDHEC. 2018b) A comprehensive report for the Broad River basin prepared by the SCDHEC in 2007 noted that there was a significant increasing trend in

five-day biochemical oxygen demand. Fish tissue samples from Parr Reservoir indicated no advisories at the time. (SCDHEC. 2007)

E3.7.1.2.2 Aquatic Communities

The South Carolina Department of Natural Resources (SCDNR) completed a comprehensive aquatic resources inventory of the Broad River between 2000 and 2002. This included evaluation of the condition of 312 km of riparian habitat along the Broad River and sampling for fish. Approximately 87% of the riparian area was in good condition, 12% was marginal, and 1% was considered to be in poor condition. Poor bank stability was observed above Parr Shoals Reservoir. (SCDNR. 2003)

A total of 16,752 fish, comprising of 51 species and nine families were sampled. Fish species sampled included the following: gizzard shad, threadfin shad, greenfin shiner, whitefin shiner, fieryblack shiner, eastern silvery minnow, thicklip chub, Santee chub, bluehead chub, spottail shiner, yellowfin shiner, sandbar shiner, northern hogsucker, smallmouth buffalo, silver redhorse, shorthead redhorse, v-lip redhorse, striped jumprock, brassy jumprock, snail bullhead, white catfish, flat bullhead, channel catfish, margined madtom, eastern mosquitofish, white perch, redbreast sunfish, green sunfish, pumpkinseed, warmouth, bluegill, redear sunfish, smallmouth bass, largemouth bass, fantail darter, tessellated darter, seagreen darter, and Piedmont darter. (SCDNR. 2003)

The species most commonly collected were redbreast sunfish, whitefin shiner, and silver redhorse. Species richness and diversity tended to be higher at downstream locations. Species composition was comparable to that of similar-sized southern Piedmont rivers. No federally listed threatened or endangered species were collected.

SCE&G monitored water quality and aquatic communities in the Broad River, Parr Reservoir, and Monticello Reservoir from mid-1978 through 1984 to assess the impacts of Fairfield Pumped Storage Facility and VCSNS site operations. The results of the study showed that Parr Reservoir fish collections were dominated numerically in 1983 and 1984 by 12 common warm water species. Approximately 44% of fish collected were centrarchids (e.g., bluegill, pumpkinseed, redear sunfish, largemouth bass), while 43% were clupeids (gizzard shad and threadfin shad). Gizzard shad and bluegill accounted for the greatest biomass, with 20.9 and 3.4 kilograms/hectare, respectively. Species composition was essentially the same in preoperational (1978–1982) and operational (1983–1984) periods, with collections dominated by centrarchids (sunfish), clupeids (shad), and ictalurids (catfish and bullheads). The species composition was typical of warm, shallow southeastern reservoirs. The fish community of Parr Reservoir appeared to be largely unaffected by operations of VCSNS. (SCE&G. 2002, Section 2.2)

More recent studies were conducted for the FERC relicense in 2015 for the Parr and Monticello Reservoirs. Results from this study showed that the Parr Reservoir supports 30 warmwater species

of fish. Dominant species here included gizzard shad, blue catfish, bluegill, channel catfish, and white perch. Important game fish species such as largemouth bass, black crappie, and smallmouth bass (to a lesser extent) are also abundant in the Parr Reservoir. Table E3.7-1 provides a list of fish species recorded in the Parr Reservoir. (Kleinschmidt. 2018)

E3.7.1.3 Monticello Reservoir

Monticello Reservoir is approximately 6 miles long, has a surface area of 6,800 acres, and a volume of 431,000 acre-feet. The average depth is 59 feet, and the maximum depth is approximately 126 feet. The lake was built in 1977 to supply cooling water to the VCSNS and to serve as the upper-storage reservoir of the Fairfield pumped-storage hydroelectric facility. During periods of peak electrical demand, water is drained through generating turbines from Monticello Reservoir into Parr Reservoir; during periods when electricity demand is low, part of the VCSNS site's output is used to pump water back into Monticello Reservoir. (SCDNR. 2013, Section 2.2)

E3.7.1.3.1 Water Quality

SCDHEC monitors water quality of the reservoir at two permanent stations, and in some years, at four other stations. SCDHEC has collected grab samples at different frequencies depending on the sampling site and the year. Sampling parameters include temperature, dissolved oxygen, turbidity, pH, biological oxygen demand, alkalinity, nitrogen, phosphorus, fecal coliform, organic carbon, and metals. Monitoring data collected near the Unit 1 intake and in uplake locations indicate the following water quality trends for Monticello Reservoir.

- Surface water temperatures range from about 9°C during the winter to 32°C during the summer. Through the spring and mid-summer, temperatures at depths of 15 m are up to 6.7°C cooler than the surface, while at other times of the year, little variation with depth is observed. The maximum temperatures observed have not exceeded the numeric criterion for freshwaters (32.2°C).
- Dissolved oxygen values typically range from 5–8 mg/L in the summer months to up to 12–15 mg/L in the winter months. These values fall within the numeric criteria for freshwaters (daily average not less than 5.0 mg/L, low of 4.0 mg/L). Dissolved oxygen values below 5.0 mg/L have occasionally been measured during the summer in the deepest part of the water column at the uplake site.
- Specific conductivity typically ranges from 80.0–120.0 microSiemens per centimeter at all monitoring sites at all depths in the reservoir.
- The pH values at the sites near VCSNS Unit 1 intake and discharge are consistently around 7.5, ranging from 6.8 to 8.0. The numeric criterion for freshwaters is a range of 6.0 to 8.5. The values measured at the uplake site tend to be more alkaline, ranging up to 8.5 to 8.7. Throughout the lake, the pH decreases at increasing depths.

- Analyses of metals in surface water samples collected quarterly in years from 1999–2012 reported results below quantification limits for most metals or detection at low concentrations, indicating support of aquatic life use.

Dissolved oxygen in the Monticello Reservoir is relatively high throughout the year except for the deeper waters in late summer. These deep waters do not mix with the upper layers of water due to their lower temperatures and higher densities; therefore, they become oxygen depleted. The pH in the Monticello Reservoir is generally neutral, ranging from 5.8 to 8.9 SU. Specific conductance values for the Monticello Reservoir vary only slightly, ranging from 94–142 micromhos per centimeter. (SCE&G. 2010)

The SCDHEC publishes fish consumption advisories for lakes, streams, and rivers in South Carolina. Currently there are no fish consumption advisories for the Monticello Reservoir (SCDHEC. 2022c).

E3.7.1.3.2 Aquatic Communities

Fish Community

A comprehensive survey of the fish community in Monticello Reservoir was conducted in 1983 and 1984 in support of the CWA Section 316(a) Demonstration for VCSNS. The fish community was dominated by centrarchids (55% of fish captured) and clupeids (28% of fish captured). Smaller numbers of ictalurids (7%), catastomids (5%), and percids (3%) were also captured. The species composition and relative abundance of Monticello Reservoir fish changed very little from 1978 through 1984. In all preoperational and operational years, centrarchids ranked first in abundance and clupeids ranked second. There was no indication that VCSNS operations had an effect on fish populations in Monticello Reservoir. (SCE&G. 2002, Section 2.4) In the late 1980s, a number of limited fish kills (generally involving small catfish) occurred in the VCSNS discharge bay in late summer and early fall. SCE&G set up a monitoring program to help identify the cause of the fish kills. Investigations revealed that the fish kills were associated with relatively high discharge temperatures and Monticello Reservoir drawdowns (through the operation of the Fairfield Pumped Storage Facility). It was determined that reservoir drawdown reduced the inflow of cooler water (from the main body of the reservoir) along the bottom of the discharge canal and into the discharge bay. Reduction or loss of this inflow allowed water temperatures to rise rapidly and kill fish inhabiting the discharge bay. Since the reservoir level was subject to daily fluctuation with the operation of the Fairfield Pumped Storage Facility, fish kills recurred as high reservoir levels (following pumpback operations) allowed more cool water inflow and recolonization of the discharge canal and bay. (SCE&G. 2002, Section 2.4)

SCE&G took several actions over the 1991–1993 period to reduce the frequency and severity of fish kills (SCE&G Environmental Services 1994, pg. 2). In 1991, an elevated area (an old roadbed) was removed from the discharge canal by dredging. This initially appeared to have ameliorated the

fish kills, but a major fish kill in August 1992 indicated that removal of the roadbed had not completely solved the problem. In September 1992, Monticello Reservoir drawdown was limited to 422.5 feet msl to prevent further fish kills (SCE&G. 2002, Section 2.2).

SCE&G dredged the entire length of the discharge canal in July and August of 1993 to allow more cool water inflow at low reservoir levels. The dredging of the discharge canal altered circulation patterns and increased cool water inflow such that temperature at the bottom of the discharge bay in summer remained significantly (10–15 degrees) cooler than end-of-pipe discharge temperatures. Fish kills ceased once the dredging of the discharge canal was completed. The discharge bay and canal were monitored intensively over the summers of 1994 and 1995, and no fish kills were observed (SCE&G. 2002, Section 2.4).

More recent studies conducted for the FERC relicense in 2015 documented 26 fish species as occurring in Monticello Reservoir. Fish assemblages found in Monticello Reservoir are similar to those found in Parr Reservoir, with gizzard shad, blue catfish, bluegill, channel catfish, and white perch being among the dominant species. Table E3.7-2 provides a list of fish species recorded in the Monticello Reservoir (Kleinschmidt. 2018).

Currently, the SCDNR manages the Monticello Reservoir for recreational fishing. Popular sport fish in Monticello Reservoir include catfish species, largemouth bass, black and white crappies, white bass, bluegill, redear, and redbreast (SCDNR. 2022a).

Ichthyoplankton Community

Surveys of ichthyoplankton in Monticello Reservoir adjacent to the VCSNS site were conducted in 1984, in 2008 and 2009 and again in 2016 and 2017 as part of the entrainment monitoring in support of the CWA Section 316(a) Demonstration for VCSNS. The ichthyoplankton community in 2016 was composed of seven families which were identical to the families collected in the 2008–2009 ichthyoplankton study for Units 2 and 3. The results indicate that threadfin and young-of-year (YOY) gizzard shad make up the limnetic forage fish community of Monticello Reservoir as in other southeastern U.S. reservoirs. In 2016, larval clupeids comprised 86.0% of all ichthyoplankton estimated to be entrained. In the 1984 study, the mean larval density (during seven months of ichthyoplankton collections) was 53.9 larvae/100 m^3 at the surface and 11.8 larvae/ 100 m^3 at mid-depth at a station that was a short distance from the 2016 sampling station. These densities exceed those observed in the 2016–2017 surveys though threadfin shad, the dominant species in this study, was not observed in 1983–1984. Centrarchids were the second most entrained fish family in 2016. The sunfish, bass, and crappie members of this family typically spawn near shore during spring (crappie and bass) and summer (sunfish) with the male constructing a nest and guarding the young.

Freshwater Mussel Community

In 2015, a freshwater mussel survey within the Monticello Reservoir was conducted as part of the FERC relicensing coordination for the Parr Hydro Project. The survey results indicate that at least six freshwater mussel species occur in Monticello Reservoir which include Carolina Lance (*Elliptio angustata*), Eastern Floater (*Pyganadon cataracta*), Florida Pondhorn (*Uniomerus carolinianus*), Paper Pondshell (*Utterbackia imbecillis*), Eastern Creekshell (*Villosa delumbis*) and Carolina Creekshell (*Villosa vaughaniana*). (TOE. 2016)

Monticello Subimpoundment Aquatic Communities

Monticello Reservoir is hydrologically connected (by a conduit that passes under the Highway 99 causeway) to a smaller 300-acre body of water known as the Monticello Subimpoundment. This smaller subimpoundment is managed for recreational boating and fishing by SCE&G and SCDNR. SCE&G maintains the property, which includes boat launch, swimming, and picnic facilities. SCDNR manages the subimpoundment's fisheries by setting creel and size limits on fish (SCE&G. 2002, Section 2.2).

Surveys of the subimpoundments fishery were last conducted in 1984. At that time, the fish community of the subimpoundment was characterized by relatively low species richness (12 species collected in 1983 and 1984), with collections dominated by gizzard shad and centrarchids (e.g., bluegill, redear sunfish, black crappie, and largemouth bass). The Monticello Subimpoundment continues to be a popular fishing spot for local fishermen (SCE&G. 2002, Section 2.2).

E3.7.2 TERRESTRIAL AND WETLAND COMMUNITIES

The VCSNS site consists of generation and maintenance facilities, laydown areas, parking lots, roads, and mowed grass. Some 125 acres are dedicated to transmission line ROWs. A large portion of the site also consists of forested areas (approximately 890 acres). (SCE&G. 2002, Section 2.2)

This section identifies terrestrial and wetland ecological resources and describes species composition and other structural and functional attributes of terrestrial biotic assemblages that could be affected by the continued operation and maintenance of the facilities.

E3.7.2.1 Physiographic Province

VCSNS is located within the Piedmont physiographic province of the United States. This province extends from Alabama to southern New York, including parts of Georgia, South Carolina, North Carolina, Virginia, West Virginia, Pennsylvania, and New Jersey. It consists of highly complex metamorphic and igneous rocks that have been thoroughly weathered to produce a surface of

minimum relief. Historically, this province has been a source of coal, gold, granite, and marble. (NPS. 2018)

E3.7.2.2 Ecoregion

VCSNS is located within the Southern Outer Piedmont and the Carolina Slate Belt ecoregions of the Piedmont ecoregion. The Southern Outer Piedmont ecoregion consists of mostly irregular plains, pine (mostly loblolly and shortleaf), and mixed oak forest is found in less heavily altered areas. Gneiss, schist, and granite are typical rock types, covered with deep saprolite and mostly red, clayey subsoils.

The Carolina Slate Belt ecoregion extends from southern Virginia, across the Carolinas, and into Georgia. Some parts are rugged, such as the Uwharrie Mountains, and many areas are distinguished by trellised drainage patterns. Silty and silty clay soils, such as the Georgeville and Herndon series, are typical. Streams tend to dry up and water yields to wells are low, as this region contains some of the lowest water-yielding rock units in the Carolinas. (Griffith, et al. 2002)

A brief description of Piedmont regional ecosystems is provided below.

E3.7.2.2.1 Upland Pine

Many upland pine forest communities in the Piedmont Ecoregion are artifacts of past or current silvacultural practices. Such monocultural stands of loblolly (*Pinus taeda*) or Virginia pine (*P. virginiana*), are typically characterized by dense, closed canopy forests with little to no understory and low diversity in the herbaceous layer. In contrast, naturally occurring upland pine communities may consist of open, mixed species stands of loblolly (*P. taeda*), Virginia (*P. virginiana*) and shortleaf pine (*P. echinata*). A sparse canopy layer permits enough light penetration to sustain occasional shrub thickets composed of blueberries (*Vaccinium*), hawthorns (*Crataegus*), and other woody perennials. Open grassy savannas dominated by big bluestem (*Andropogon*) and little bluestem (*Schizachyrium*) sprawl throughout this landscape and may carry the occasional wildfire. (SCDNR. 2015a)

E3.7.2.2.2 Mesic Forest

Mesic forests are typically associated with water bodies and natural levies where overflow accumulates during periods of high rainfall. This habitat type may have been more common in the Ecoregion prior to sedimentation from erosion processes during the 'Dust Bowl' era. This habitat is typically characterized by closed canopy hardwood forests with *Nyssa biflora*, *Acer rubrum*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*. The understory may be dense to sparse but typically composed of smaller tree species and infrequently shrubs. Where understory is sparse to absent, a rich herbaceous layer may be found with numerous springtime ephemerals such as *Trillium spp.* and *Arisaema spp.* (SCDNR. 2015a)

E3.7.2.2.3 Rock Outcrops

Rock outcrops of widely varying sizes and slopes occur throughout the region. Slopes range from nearly horizontal to nearly vertical. The more extensive and exposed outcrops have their own characteristic vegetation and habitat features. Vegetation ranges from none (bare rock) to a mosaic of herbaceous plant, shrub, and tree-dominated communities. Early successional trees, such as eastern red cedar (*Juniperus virginiana*) and Virginia pine (*Pinus virginiana*) are common on these sites. Crevices and ledges can only provide habitats for larger plants once sufficient soil has accumulated. Vegetative communities are relatively unstable. A cliff or dome may also have a significant area of wet seepage zones. (SCDNR. 2015a)

E3.7.2.2.4 River Bottoms

River bottoms or "bottomland forests" consist of hardwood-dominated woodlands with moist soils that are usually associated with major river floodplains. Characteristic tree species include sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), laurel oak (*Quercus laurifolia*), cherrybark oak (*Quercus pagoda*), and American holly (*Ilex opaca)*. A subtype dominated by bald cypress (*Taxodium distichium*) and water tupelo (*Nyssa aquatica*) occurs on lower elevation sites but is not as prevalent as in the broader floodplains of the coastal plain. Compared to the coastal plain, the floodplains of major rivers in the Piedmont are confined by topography to relatively narrow corridors. (SCDNR. 2015a)

E3.7.2.2.5 Piedmont Small Stream Forest

Piedmont small stream forests are distinguished from forest communities on larger floodplains because of differences between the scales of the ecosystems. In smaller floodplains, the levees, sloughs, and ridges are largely absent or poorly developed. Flooding regime is also more variable between small watersheds than larger ones. Soils are various alluvial types that are seasonally or intermittently flooded. The forest has an open to dense understory or shrub layer and a sparse to dense herb layer. The canopy has a mixture of bottomland and mesophytic trees including river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), American elm (*Ulmus americana*), hackberry (*Celtis laevigata*), green ash (*Fraxinus pennsylvanica*), and red maple (*Acer rubrum*). (SCDNR. 2015a)

E3.7.2.2.6 Cove Forest

Cove forests are botanically diverse, well-developed hardwood forests occurring on scattered rich, and generally small, sites (less than 200 acres). These forests usually occur on protected bluffs in association with small stream forests or river bottoms. No single species tends to dominate. Shrub species are usually numerous, and the herbaceous flora is fairly rich, with many spring ephemerals. The canopy and understory are composed of hardwoods including beech (*Fagus grandifolia*), tulip

poplar (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), white oak (*Quercus alba*), northern red oak *(Q. rubra*), black oak (*Q. velutina*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), southern sugar maple (*A. saccharum*), basswood (*Tilia heterophylla*), ironwood (*Carpinus caroliniana*), flowering dogwood (*Cornus florida*), American holly (*Ilex opaca*), witch-hazel (*Hamamelis virginiana*), and hop-hornbeam (*Ostrya virginiana*). (SCDNR. 2015a)

E3.7.2.2.7 Depressions

While Piedmont depressions, or high ponds, may occasionally be referred to as Carolina bays, they do not necessarily share the same geological history and may play host to an entirely different vegetative community. Often characterized by perched water tables over clay basins, high ponds are usually dependent on rainfall and may be associated with an out-flowing stream channel during periods of heavy precipitation. Frequently converted for agricultural purposes, these fishless waters play an important role in the reproductive cycle of many pond breeding amphibians. Their relative isolation also tends to coincide with specialized emergent plant communities which may include uncommon herbaceous species such as Harperella (*Ptilimnium nodosum*) and Pink tickseed (*Coreopsis rosea*). (SCDNR. 2015a)

E3.7.2.2.8 Upland Mixed Forest

Occurring throughout the state but most characteristic of rolling uplands in the Piedmont, oak-hickory forest is a widely distributed community that varies from site to site. Occurring in highly fragmented stands, later successional stages tend to be made up of a diverse assemblage of hardwoods, primarily oaks and hickories, as co-dominants in combination with pines. Understory, shrub, and herbaceous layers are present in varying degrees, represented by diverse woody and non-woody species. Vegetation on most sites consists of early- to mid-successional managed stands of pine and pine-hardwood forest. The understory in pure pine stands is often open, but in mixed or older stands, it is dominated by the hardwoods characteristic of the site. Common pine species of the Piedmont include shortleaf (*Pinus echinata*) and loblolly (*P. taeda*), with the former better adapted to dry, fine textured upland soils and loblolly achieving maximum growth on deep soils with good moisture and drainage. (SCDNR. 2015a)

E3.7.2.2.9 Grassland and Early Successional Habitats

As in other ecoregions, a variety of grassland and early successional habitats are present, either as transitional vegetation following forest disturbances or as managed areas. Early successional habitats are generally characterized by tree canopy coverage that is sparse or absent and herbaceous groundcover comprised of annual forbs, perennial bunchgrasses, and variable coverage of shrubs and small trees. A variety of open landcover types represents this category and can include native prairies, savannas, old field sites, open canopy gaps, shrub-scrub thickets,

recently cleared forests, field borders, grassed waterways, and filter strips. Lawns, golf courses, pastures, hay fields, crop fields, airports and various urban open spaces are sometimes included in this habitat type but lack the floristic and structural diversity to be considered high quality, early successional habitat. Early successional habitat types have declined dramatically over the past 70 years primarily due to changing agricultural practices, forest succession, fire suppression, and urban/suburban encroachment. A large portion of existing early-successional habitat occurs on privately-owned lands (SCDNR. 2015a).

E3.7.2.3 Terrestrial Vegetation

Approximately 40% of the VCSNS site is primarily consisting of evergreen forest, deciduous forest, mixed forest, shrub/scrub habitat, pastures, woody wetlands, and herbaceous wetlands (MRLC. 2021).

Forested areas within the VCSNS site were managed by SCANA Services Forestry Operations group, but timber was not routinely harvested. Timber was harvested in the past to remove diseased trees and trees damaged by tornadoes and windstorms. Once timber was removed, the areas were replanted with tree species appropriate to the terrain, soils, and drainage characteristics of a site. Dry upland areas were normally replanted in improved loblolly pine. (SCE&G. 2002, Section 2.4)

E3.7.2.4 Wetlands

Wetlands are defined as areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (USACE. 1999). The U.S. Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory (NWI), which integrates digital map data along with other resource information to produce current information on the status, extent, characteristics, and functions of wetland, riparian, and deepwater habitats in the United States. Based on a review of USFWS NWI maps of the site (USFWS. 2022a), there are approximately 12,454 acres of wetlands within a 6-mile radius of VCSNS composed of the following types (Figure E3.7-1):

- Freshwater emergent wetlands covering approximately 186 acres (1.5% of total wetland habitat)
- Freshwater forested/shrub wetlands covering approximately 1,695 acres (13.6% of total wetland habitat)
- Freshwater ponds covering approximately 183 acres (1.5% of total wetland habitat)
- Lakes covering approximately 9,513 acres (76.4% of total wetland habitat)
- Riverine waters covering approximately 875 acres (7.0% of total wetland habitat)

The VCSNS property is bound by Monticello Reservoir on the northern boundary. Based on the NWI data (USFWS. 2022a), a total of 837 acres of wetlands, lakes, ponds, and riverine waters are mapped on the VCSNS site (Figure E3.7-2). Based on the NWI data, the following wetland water types are located on the VCSNS site:

- Freshwater forested/shrub wetlands covering approximately 4.0 acres (0.5% of total wetland habitat)
- Freshwater ponds covering approximately 3.35 acres (0.4% of total wetland habitat)
- Lakes covering approximately 818.5 acres (97.75% of total wetland habitat)
- Riverine waters covering approximately 11.4 acres (1.36% of total wetland habitat)

E3.7.2.5 Terrestrial Animal Communities

The terrestrial community at VCSNS consists of forested areas interspersed with development. Wildlife species found, primarily within the forested areas, are those typically found in the Piedmont ecological landscape. Terrestrial fauna species likely to be observed in Fairfield, Newberry, and Richland Counties are listed in Table E3.7-3. Terrestrial species that are federally and/or state listed as endangered or threatened and known to occur in the vicinity of VCSNS are discussed in detail in Section E3.7.8.

Terrestrial wildlife species found in the forested portions of the VCSNS site are those typically found in the Piedmont forests of South Carolina. Wildlife characteristically found in the pine forests and mixed pine-hardwoods of the Piedmont include toads (e.g., Fowler's toad), lizards (e.g., Carolina anole, fence lizard, various skinks), snakes (e.g., black racer, rat snake, ringneck snake), songbirds (e.g., cardinal, bluejay, towhee, various warblers), birds of prey (e.g., red-tailed hawk, red-shouldered hawk), and a number of mammal species (e.g., gray squirrel, eastern cottontail, raccoon, white-tailed deer). (SCE&G. 2002, Section 2.4)

Bird populations on the VCSNS site include year-round residents, seasonal residents, and transients (birds stopping briefly during migration). Bird populations on the site are representative of those found in the region. While there are resident bird populations, the region also serves as a pass-through area for semi-annual migrations of neotropical birds that may range between South America and Canada, as well as seasonal migrations of waterfowl. The VCSNS site is located within the Atlantic Flyway, a major migratory route for birds during the spring and fall. Migrating birds often fly these routes at night and land to rest early in the morning. Before dawn they seek out suitable habitat, called stopovers, in which to feed and avoid predators. Large natural barriers such as mountains and deserts, or large bodies of water, create especially crowded stopovers. These stopovers are very important because the flight over the barrier would mean a long stretch without any opportunity to stop for food, rest, or cover. Numerous species of migratory birds likely use the project corridor during the spring and fall migrations, as summer residents, and as winter visitors.

According to the USFWS, 14 bird species have the potential to occur in the vicinity of the VCSNS site: American kestrel (*Falco sparverius Paulus*), bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*Coccyzus erythropthalmus*), Cerulean warbler (*Dendroica cerulea*), eastern whip-poor-will (*Antrostomus vociferus*), Henslow's sparrow (*Ammodramus henslowii*), Kentucky warbler (*Oporornis formosus*), lesser yellowlegs (*Tringa flavipes*), Prairie warbler (*Dendroica discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), swallow-tailed kite (*Elanoides forficatus*), and wood thrush (*Hylocichla mustelina*). (USFWS. 2023a)

As part of the FERC relicensing process, waterfowl surveys of Monticello Reservoir, Parr Reservoir, and the downstream reach of the Broad River were conducted from 2015 to 2017. During 2015 and early 2016, 9 species were observed on Monticello Reservoir, and 11 species in the Parr Reservoir. During late 2016 and early 2017, 10 species were documented using the Monticello Reservoir and 11 species were documented at Parr Reservoir. Species documented include Canada goose (*Branta canadensis*), Snow goose (*Chen caerulescens*), mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), American wigeon (*Anas americana*), blue-winged teal (*Anas discors*), northern shoveler (*Anas clypeata*), wood duck (*Aix sponsa*), ring-necked duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), bufflehead (*Bucephala albeola*), hooded merganser (*Lophodytes cucullatus*), and American coot (*Fulica americana*). (Kleinschmidt. 2018)

E3.7.2.6 Transmission Lines

Physical features (e.g., length, width, route) of each of the in-scope transmission lines are described in Section E2.2.5.1 and depicted on Figure E2.2-1. The in-scope transmission lines between the Turbine Building and the switchyard lie completely within the VCSNS industrial area. The Parr ESF 115-kV transmission line extends outside of the VCSNS EAB and crosses vegetated areas.

The in-scope transmission lines do not cross areas designated as critical habitat for federally listed species nor do they cross any state or federal parks, wildlife refuges, or WMAs.

The risk of collision with in-scope transmission lines poses a potential threat to migratory birds. DE has an avian protection plan and maintains records of bird collisions with transmission lines at the VCSNS site. Between 2018–2022, there have been no recorded bird collisions associated with in-scope transmission lines.

DE has procedures regarding maintenance of vegetation under the in-scope transmission lines at the VCSNS site. These include procedures for line clearing specifications, trimming of trees, and cutting of brush as well as removal of danger trees. DE also maintains procedures for the application of herbicides and pesticides to control vegetation under in-scope transmission lines. Control methods are based on environmental impact and anticipated effectiveness, along with site characteristics, security, economics, current land use, and other factors designed to comply with

the following industry standards: ANSI Z133.1-2012 safety requirements for arboricultural operations; OSHA 1910.269 electric power generation, transmission and distribution; ANSI A300 (Part 1) 2012 pruning for tree care operations–tree, shrub, and other woody plant maintenance–standard practices; and ANSI A300 (Part 7) 2012 IVM tree, shrub, and other woody plant maintenance standard practices (integrated vegetation management approach for electric utility ROWs).

E3.7.3 POTENTIALLY AFFECTED WATER BODIES

The major water resource on the VCSNS site is the Monticello Reservoir which receives its makeup water from Broad River (SCE&G. 2002, Section 3.1.2.2). VCSNS operates as a once-through cooling plant that withdraws from and discharges to its cooling pond, the Monticello Reservoir (NRC. 2004b, Section 2.1.3). Monticello Reservoir was built to supply cooling water to the VCSNS plant and to provide an upper reservoir for the Fairfield Pumped Storage Facility located on Parr Reservoir. Monticello Reservoir acts as the upper reservoir for the Fairfield Pumped Storage Facility, and the Parr Reservoir serves as the lower reservoir for the Fairfield Pumped Storage Facility. Makeup water for the Monticello Reservoir is supplied from the Parr Reservoir. As part of the Fairfield Pumped Storage Facility operations, water is released from the Monticello Reservoir through the Fairfield Pumped Storage Facility to Parr Reservoir to the Monticello Reservoir to maintain the level of the upper reservoir. Over time, the water quality of the Monticello Reservoir is expected to be basically that of the Broad River because of the cycling and mixing of water. Monticello Reservoir waters are relatively low in concentrations of common ions, low in hardness, and low in dissolved solids and conductivity. There is no indication that evaporative losses associated with the operation of Unit 1 have increased concentrations of common ions, minerals, or solids in the Monticello Reservoir water. (SCE&G. 2010)

Cooling water is drawn from Monticello Reservoir at a rate of approximately 1,143 cfs, passed through the condensers, and ultimately returned back to Monticello Reservoir. The intake structure, located along the south shoreline of the reservoir, has three pump bays, each with two entrances. The entrances are each equipped with vertical traveling screens (mesh size 1.0 x 0.89 cm [0.4 x 3.5 in.]).

VCSNS cannot operate without the intake and discharge of cooling water, which directly impacts Monticello Reservoir. The NRC is responsible for authorizing the operation of nuclear facilities, as well as approving any extension of an initial operating license through the license renewal process. Intake and discharge of water through the cooling water system would not occur but for the operation of the facility pursuant to a renewed license. The effects of the proposed federal action—the continued operation of VCSNS, which necessarily involves the removal and discharge of water from Monticello Reservoir—are therefore shaped by the NPDES permit issued to the plant. Surface water used at VCSNS is withdrawn from the Monticello Reservoir and governed by water

appropriation limits in Surface Water Withdrawal Permit No. 20PN001. VCSNS may withdraw a maximum of 26,243.86 MGM of water from the Monticello Reservoir from two intakes: the Circulating Water Intake Structure, and the OWS. The estimated amount of water to be discharged totals 24,955.55 MGM via NPDES Outfalls 001 and 014 to the Monticello Reservoir, and 0.16 MGM to the Broad River via NPDES Outfall 003. While the Monticello Reservoir withdrawals are primarily used for condenser cooling, a small portion of the withdrawal is used for the SW system, potable water, and fire protection (Sections E3.6.3.1 and E2.2.3.8).

E3.7.4 ENTITIES OF SPECIAL ECOLOGICAL INTEREST

E3.7.4.1 Parr Reservoir Waterfowl Management Area

The Parr Reservoir WMA comprises a stretch of the Broad River between South Carolina Highway SC-34 and the Parr Hydro Facility, which dams the river to create the Parr Reservoir.

The SCDNR may designate sections of WMAs as Designated Waterfowl Management Areas. On Designated Waterfowl Areas, no species other than waterfowl may be taken during waterfowl hunts. The Parr Reservoir WMA is designated a Category II Waterfowl Area. Category II areas are generally lower quality habitat, less intensively managed, and hold lower concentrations of waterfowl. They are open for first come-first served hunting on designated days during the regular waterfowl season. (SCDNR. 2021; SCDNR. 2022b)

E3.7.4.2 Monticello Reservoir Waterfowl Management Area

The Monticello Reservoir WMA is composed of most of the Monticello Reservoir outside of the VCSNS site area in the southeast. This property is not owned by SCDNR but is part of its leased lands management program.

The SCDNR may designate sections of WMAs as Designated Waterfowl Management Areas. On Designated Waterfowl Areas, no species other than waterfowl may be taken during waterfowl hunts. The Monticello Reservoir WMA is designated a Category II Waterfowl Area. Category II areas are generally lower quality habitat, less intensively managed, and hold lower concentrations of waterfowl. They are open for first come-first served hunting on designated days during the regular waterfowl season. (SCDNR. 2016a; SCDNR. 2021; SCDNR. 2022b)

E3.7.4.3 Sumter National Forest–Enoree Ranger District

The Enoree Ranger District is comprised of approximately 165,795 acres in Chester, Fairfield, Laurens, Newberry, and Union Counties. It is a part of the Sumter National Forest and is managed by the U.S. Forest Service within the USDA. It is managed for multiple use which includes timber, water, wildlife, and recreation. The wildlife habitat on the National Forest is cooperatively managed by the U.S. Forest Service and the SCDNR. All of this land is within the WMA program administered

by the SCDNR, and it is available for public hunting, fishing, and other allowable outdoor recreational opportunities. (SCDNR. 2016b; SCDNR. 2022b)

Within the Enoree Ranger District there are special areas managed for waterfowl that include the Duncan Creek Waterfowl Management Area in Laurens County, Enoree River Waterfowl Management Area in Newberry County and Dunaway and Tyger River Waterfowl Management Areas in Union County. There are also public dove fields. (SCDNR. 2016b; SCDNR. 2022b)

Many other areas within the forest such as closed roads, fire lines, wildlife openings and utility ROWs are planted with wildlife foods, are maintained in an open state for habitat diversity, and are managed to maintain and improve wildlife habitat. Forested areas that consist of predominantly thinned pine stands are prescribed burned periodically to reduce fuel buildup to minimize the danger of wildfire and also to enhance wildlife habitat. (SCDNR. 2016b; SCDNR. 2022b)

Several rivers, lakes, and ponds are found on the Enoree Ranger District and where fishing is allowed. Boat ramps exist at some of these areas. Seasonal camping during hunting season is available at several hunt camps throughout the area and the Woods Ferry Recreation Area in Chester County is open for camping and picnicking year-around. Four public rifle ranges are within the Enoree Ranger District. (SCDNR. 2016b; SCDNR. 2022b)

E3.7.5 INVASIVE SPECIES

DE does not maintain procedures to monitor or record invasive at the VCSNS site. The aquatic and terrestrial invasive species discussed here are those that have been recorded in Fairfield, Newberry, and Richland Counties and were retrieved through publicly available resources.

E3.7.5.1 Invasive Aquatic Plants

E3.7.5.1.1 Alligatorweed

Alligatorweed (*Alternanthera philoxeroides*) is an emergent or rooted floating plant native to South America and introduced in the United States around 1900 via ballast water. It has hollow stems which can grow to 3 feet tall. Leaves are opposite, thick, elliptical, and up to 4 inches long. Flowers are white and clover-like. Fruits are tiny and single-seeded. Alligatorweed invades aquatic areas and adjoining uplands, forming thick mats that can displace native vegetation and wildlife habitat, clog waterways, restrict oxygen levels of water, increase sedimentation, interfere with irrigation, and prevent drainage. (CISEH. 2018a)

E3.7.5.1.2 Brazilian Waterweed

Brazilian waterweed (*Egeria densa*) is a submersed aquatic plant native to South America and introduced to the United States in the late 1800s as an aquarium plant. Leaves are finely serrated, less than an inch long, and occur in whorls of three to six. Flowers are white, three petaled, and

bloom above the water's surface. It reproduces vegetatively from special double nodes which break away and bud. Brazilian waterweed invades both still and flowing water ecosystems including lakes, ponds, ditches, and rivers. It can form dense stands that crowd out native vegetation and reduce the area's value as fish habitat. It can also interfere with recreational activities such as fishing and swimming. There are no records of the species occurring in Fairfield, Newberry, and Richland Counties. (CISEH. 2018b; EDDMapS. 2022; EDDMapS. 2023)

E3.7.5.1.3 Brittleleaf Naiad

Brittleleaf naiad (*Najas minor*) is an herbaceous, aquatic annual with stems that can grow 4-7.75 inches long. Leaves are dark green, opposite, and thread-like. Flowers are minute, and male and female flowers are separated, with male flowers more distal. Fruits are spindle-shaped purple seeds. Brittleleaf naiad has the ability to form thick stands that can cover or clog a lake or stream. It is extremely brittle, which allows it to fragment and get moved via boats, waterfowl, and river channels. Waterfowl readily eat and move this plant from waterbody to waterbody. (CISEH. 2018c; EDDMapS. 2022)

E3.7.5.1.4 Eurasian Watermilfoil

Eurasian watermilfoil (*Myriophyllum spicatum*) is a submersed aquatic plant native to Europe, Asia, and northern Africa. The plants are rooted, and the stems grow up to the water surface reaching 3–10 feet. Leaves are bright green, whorled, and finely dissected, giving the plant a feathery appearance. Female flowers are basal and lack petals and sepals. Male flowers are distal with four pink petals. Fruit is small, globular, and indehiscent, containing four seeds. Eurasian watermilfoil forms dense mats of leaves restricting light availability, leading to a decline in the diversity and abundance of native macrophytes. It displaces the native species of watermilfoil and reduces habitats for fish spawning and feeding. (CISEH. 2018d; EDDMapS. 2022)

E3.7.5.1.5 European Water Chestnut

European water chestnut (*Trapa natans*) is a rooted, floating plant native to Europe and Asia. It was first observed in the United States in Massachusetts in the late 1800s. It forms dense, floating mats. Surface leaves grow from a rosette, and are toothed, triangular, and alternate. Submerged leaves are feathery. Flowers are small and four-petaled. Fruit is nut-like with long, sharp barbed spines. The dense, floating mats restrict light availability, reduce the oxygen content, and displace other emergent and floating vegetation. They also limit boating, fishing, swimming, and other recreational activities. (CISEH. 2018e; EDDMapS. 2022)

E3.7.5.1.6 Hydrilla

Hydrilla (*Hydrilla verticillate*) is a submersed, rooted aquatic plant believed to be native to Asia or Africa. It was first introduced into North America as an aquarium plant in the 1950s. Plants can survive in depths up to 40 feet in water. Leaves are 0.2 to 0.8 inches long, serrated, and occurred in whorled bunches. The midribs of the leaves are reddish, and their undersides have small, raised teeth. Only individuals with female flowers have been recorded in the United States. The plant reproduces vegetatively from bud-like structures. Hydrilla forms dense mats that can restrict native vegetation, irrigation, recreation, hydroelectric production, and water flow. It can invade most slow-moving or still water systems. (CISEH. 2018f; EDDMapS. 2022)

E3.7.5.1.7 Water Primrose

Water primrose (*Ludwigia grandiflora*) is an emergent perennial aquatic plant native to South America and parts of North America. Leaves are rounded to elliptical, growing from a hairy stem. Flowers are large, yellow, 1 to 2 inches with five to six petals. Fruit is a cylindrical capsule with five chambers. Water primrose can also reproduce vegetatively from fragments. It grows quickly, covers large areas and forms very dense mats which can significantly alter habitats by outcompeting native species, reducing water oxygen levels, and blocking light. (CISEH. 2018g; EDDMapS. 2022)

E3.7.5.2 Invasive Aquatic Animals

Aquatic animals from the SCDNR Aquatic Invasive Species Management Plan (SCDNR. 2008) with a presence in Fairfield, Newberry, and Richland Counties include the following species.

E3.7.5.2.1 Asian Clam

The Asian clam (*Corbicula fluminea*) is a small, light-colored bivalve distinguished by its finely serrated lateral teeth. Native to southeast Asia, Africa, and eastern Australia, it was first recorded in the United States in the Columbia River near Knappton, Washington, in 1938. It has since spread to 46 states. It can self-fertilize, reproducing rapidly. The Asian clam has been known to clog pipes and equipment in power and water facilities. They compete with native species for food and habitat, and can alter the benthic substrate, uprooting native mussels. (Foster, et al. 2022)

E3.7.5.2.2 Japanese Mystery Snail

The Japanese mystery snail (*Cipangopaludina japonica*) is a large freshwater snail, about 3 inches in length. The shell is light brown to olive green, with a sharply pointed spire. Native to southeast Asia, the Japanese mystery snail was first introduced into North America in the 1890s, possibly as a food item, and has spread throughout the United States, possibly by water garden hobbyists. The Japanese mystery snail broods it young, rather than lays eggs. It is generally found in lakes, ponds, or slow-flowing rivers with sandy to muddy substrates often in densely vegetated areas. It has a

negative impact on native snail populations and is regarded as a nuisance by fishermen. (Dillon, et al. 2019; SERC. 2022)

E3.7.5.2.3 Common Carp

The common carp (*Cyprinus carpio*) is a brassy green-goldfish, about 3 feet in length, with two barbels on its upper jaw. Native to Eurasia, it was introduced to the United States in the 1800s as a food source and is now recorded in all states but Alaska. It inhabits lakes, ponds, and rivers, brackish-water estuaries, backwaters, and bays, and is most abundant in turbid, sluggish streams. The common carp feeds by rooting around the substrate, dislodging vegetation and increasing turbidity, causing the deterioration of habitat for native species. They also prey on eggs of native fish. (SCDNR. 2015b; Nico, et al. 2022)

E3.7.5.2.4 Blue Catfish

The blue catfish (*Ictalurus furcatus*) is a large catfish, 20–45 inches, with a blueish back and sides and a humped back near the dorsal fin. Native to the Mississippi drainage, it was intentionally stocked for fishing in other areas, sometimes spreading when stocked ponds were flooded. It was first introduced into South Carolina in 1964 when it was stocked into Lake Marion. Blue catfish inhabit a variety of habitats, preferring rivers, and large creeks with moderate to swift current. They are highly omnivorous, and feed on clams, snails, aquatic insects, freshwater mussels, fish, small mammals, birds, turtles, and plant material. (SCDNR. 2008; SCDNR. 2015c; Fuller, et al. 2022a)

E3.7.5.2.5 Flathead Catfish

The flathead catfish (*Pylodictis olivaris*) is a mottled yellowish-brown catfish with a gray belly. It averages 15 to 45 inches in length, and has a wide, flat head, a projecting lower jaw, and pale tips on the tail fin. Native to the Mississippi drainage, the flathead catfish was intentionally stocked in other areas for fishing. It now occurs in most U.S. states, including South Carolina, where it was introduced into the lake systems in the 1960s. It is an ambush predator that feeds on live prey. Introduced flathead catfish prey heavily on sunfish, carp, bullhead, and crayfish, reducing the diversity and abundance of native species. (SCDNR. 2008; SCDNR. 2015d; Fuller, et al. 2022b)

E3.7.5.3 Invasive Terrestrial Plants

DE does not maintain procedures in place to monitor or record invasive species at the VCSNS site. The South Carolina Exotic Pest Plant Council has published a list of the most damaging invasive plant species in South Carolina (SCEPPC. 2014). The following are listed plant species with a known presence in Fairfield, Newberry, and Richland Counties reported by the Early Detection & Distribution Mapping System (EDDMapS. 2022).

E3.7.5.3.1 Autumn Olive

Autumn olive (*Elaeagnus umbellata*) is a nitrogen-fixing deciduous shrub with thorny branches. It grows from 3–20 feet tall. It is native to China and Japan and was introduced into North America in 1830 for use in wildlife habitat, mine reclamation, and shelterbelts. Leaves are alternate, bright green to gray green above and silver scaly beneath, 2–3 inches long. Flowers are small, yellowish, tubular, and occur in clusters. Fruits are round, red, juicy drupes which are finely dotted with silvery to silvery-brown scales. Autumn olive invades old fields, woodland edges, and other disturbed areas, forming a dense shrub layer which displaces native species and closes open areas. (CISEH. 2018h; EDDMapS. 2022)

E3.7.5.3.2 Bahiagrass

Bahiagrass (*Paspalum notatum*) is a deep-rooted, low-growing perennial native to South America. It was introduced to the United States for forage and erosion control. Stems usually reach 8 to 30 nches tall. Leaves are flat, folded, tough-textured, with blades 8 to 20 inches in length. Flowers are two to three seed heads. Bahiagrass can be a pest in native grasslands, hayfields, and lawns. Some cultivars of bahiagrass are often infected by the fungal disease ergot, which can produce toxic effects in horses and cattle. (Houck. 2009)

E3.7.5.3.3 Big Periwinkle

Big periwinkle (*Vinca major*) is an evergreen to semi-evergreen vine that trails up to 3 feet long. Native to Europe and western Asia, it was introduced to North America in the 1700s as an ornamental ground cover. Leaves are opposite, heart-shaped to triangular, glossy, and slightly thick, 1.5 to 2.5 inches long. Flowers are violet, blue-lavender, or white, with five spiraling petals. Fruit is slender and cylindrical, splitting open to release three to five seeds. Big periwinkle forms dense mats which displace native vegetation. (IPAUS. 2018a)

E3.7.5.3.4 Callery Pear (Bradford Pear)

Bradford pear (*Pyrus calleryana*) is deciduous tree that can grow up to 60 feet. It is a cultivar of Callery pear planted as an ornamental throughout the United States since the early 1900s. Though it cannot self-pollinate, it can hybridize to produce fertile fruit, resulting in trees seeding out into natural areas and becoming an invasive problem. Leaves are shiny, simple, and alternate, 2 to 3 inches long. Flowers are 1 inch, white, showy, and malodorous. Fruits are green to brown, round, and 0.5 inches in diameter. (CISEH. 2018i; EDDMapS. 2022)

E3.7.5.3.5 Chinese Privet

Chinese privet (*Ligustrum sinense*) is a semi-evergreen shrub or small tree that grows to 20 feet in height. Native to Europe and Asia, it was introduced into the United States in 1852 as an

ornamental. Leaves are opposite, oblong, and one to 2.4 inches long. Flowers are panicles of white to cream flowers. Fruits are spherical, dark purple to black, and 0.3 to 0.5 inches long. Chinese privet can also colonize via root sprouts. This species can form dense thickets, invading fields, fencerows, roadsides, forest understories, and riparian sites. It can shade out and exclude native understory species, perhaps even reducing tree recruitment. (CISEH. 2018j; EDDMapS. 2022)

E3.7.5.3.6 Chinese Wisteria

Chinese wisteria (*Wisteria sinensis*) is a deciduous woody vine capable of growing to a height of 40 feet. Native to China, it was introduced to the United States in 1816 for ornamental purposes. Leaves are alternate and pinnately compound. Flowers are lavender, purple, or white, occurring in long dangling clusters. Fruits are long, flat, hairy bean-like pods. Chinese wisteria can displace native vegetation and kill trees by girdling them, thereby altering the light availability to the forest floor. (IPAUS. 2018b)

E3.7.5.3.7 Japanese Honeysuckle

Japanese honeysuckle (*Lonicera japonica*) is a woody perennial, evergreen to semi-evergreen vine that can be found either trailing or climbing to over 80 feet in length. Native to eastern Asia, it was first introduced into North America in 1806 in Long Island, New York, as an ornamental, for erosion control and for wildlife habitat. Leaves are opposite, pubescent, oval and 1 to 2.5 inches long. Flowers are tubular, whitish pink to cream-yellow and grow from the axils of the leaves. Fruits are small, round, and shiny black. Japanese honeysuckle can girdle small saplings by twining around them and can form dense mats in the canopies of trees, shading everything below. (CISEH. 2018k; EDDMapS. 2022)

E3.7.5.3.8 Japanese Wisteria

Japanese wisteria (*Wisteria floribunda*) is a deciduous, woody vine capable of growing to a height of 35 feet. Native to Japan, it was introduced to North America around 1830 for ornamental purposes. Leaves are alternate and pinnately compound. Flowers are lavender, pink, or white, growing in dangling clusters up to 12 inches in length. Fruit is a brown, flat, hairy, bean-like pod, but the species primarily spreads vegetatively. Japanese wisteria can displace native vegetation and kill trees by girdling them, thereby altering the light availability to the forest floor. It has been recorded in Fairfield and Richland Counties. (IPAUS. 2018c)

E3.7.5.3.9 Mimosa

Mimosa (*Albizia julibrissin*) is a small tree, 10–50 feet in height, often growing multiple trunks. Native to Asia, it was introduced into the United States as an ornamental in 1745. Leaves are alternate, dark green and bi-pinnately compound, 5 to 8 inches long. Flowers are showy and

pompom-like, made of pink filaments 1.5 inches long, growing in panicles. Fruits are flat seed pods, 6 inches long. It can also form colonies by root sprouts. It is a strong competitor to native trees and shrubs in open areas or forest edges, where it forms dense stands that severely reduce the sunlight and nutrients available for other plants. (USDA. 2004; CISEH. 2018l)

E3.7.5.3.10 Queen Anne's Lace

Queen Anne's Lace (*Daucus carota*) is a biennial herb in the carrot family native to Europe and southwest Asia. Stems are hairy, hollow, and grooved, growing 2 to 4 feet in height. Leaves are basal, alternate, and deeply pinnately compound. Flowers are small, five-petaled, white and grow in terminal umbels. Fruits are small, brown, and dry with hooked spines. Queen Anne's Lace invades open waste ground, competing for resources with native grasses and forbs. Its leaves cause skin irritation in some people and cause cows to produce off-tasting milk after eating large quantities. (USDA. 2006a; CISEH. 2018m)

E3.7.5.3.11 Sericea Lespedeza

Sericea lespedeza (*Lespedeza cuneata*) is an upright semi-woody forb growing one or more gray-green hairy stems 3 to 6 feet in height. Native to Asia, it was introduced into the United States in the 1940s for use as forage, hay production, and erosion control. Leaves are alternate, three-lobed, hairy, and 0.5 to 1 inch in length. Flowers are creamy white with purple veins, growing in clusters of two to four. Fruit is a slightly flattened round pod with a single seed. Sericea lespedeza is an extremely aggressive invader of open areas and outcompetes native vegetation and develops extensive seed banks in the soil. (USDA. 2006b; CISEH. 2018n)

E3.7.5.3.12 Shrubby Lespedeza

Shrubby lespedeza (*Lespedeza bicolor*) is an upright semi-woody forb, 3 to 10 feet in height with many slender stems. Native to Asia, it was introduced into the Unites States in the late 1800s as an ornamental, and later used for erosion control and wildlife habitat. Leaves are elliptical, alternate, with three leaflets. Flowers are purple, less than 0.5 inches, and grow in clusters. Fruits are flat, indehiscent pods, each containing one seed. Shrubby lespedeza is an extremely aggressive invader of open areas, forming dense thickets which displace native vegetation. (Gucker. 2010; CISEH. 2018o)

E3.7.5.4 Invasive Terrestrial Animals

Invasive terrestrial animals of concern with a known presence in Fairfield, Newberry, and Richland Counties include the following.

E3.7.5.4.1 Asian Rock Pool Mosquito

The Asian rock pool mosquito (*Ochlerotatus japonicus*) is a relatively large mosquito with a black and white pattern. It can produce freeze - and desiccation-resistant eggs and develops where natural and artificial pools of water are found, including rock pools, tree holes, buckets, and tires. Native to Japan and Korea, the Asian rock pool mosquito was first detected in New York and New Jersey in 1998 and has spread to 31 states and Canada. It feeds on mammals, such as deer, chipmunks, and humans. It is an aggressive biter. It is a vector of West Nile Virus, and a carrier of Japanese encephalitis virus, Saint Louis encephalitis virus, and Dengue virus. (SCDNR. 2008; ECDC. 2014)

E3.7.5.4.2 Japanese Beetle

The Japanese beetle (*Popillia japonica*) is a bright metallic green beetle with copper-brown wing covers. Native to Japan, it was first detected in the United States in a nursery near Riverton, New Jersey, in 1916. It has since spread to most eastern states. The beetle is damaging in both its larva and adult forms. The larvae feed on the roots of grasses, damaging pastures, lawns, and golf courses. The adults are voracious eaters of leaves, fruit, and flowers, giving host plants a skeletonized look. They are known to feed on over 300 species of plants. Newberry and Richland Counties are considered to be infested with Japanese beetles, and are under quarantine, regulating the transport of articles such as soil, sod, tubers, plants, or any other articles that could spread the beetle. (Gorsuch. 2011; Gyeltshen, et al. 2019; CU. 2022a)

E3.7.5.4.3 Imported Red Fire Ant

Imported red fire ants (*Solenopsis invicta*) are native to South America, and were accidentally imported into Mobile, Alabama, in the 1930s. They have since spread to 13 states and Puerto Rico. Fire ants are aggressive and can sting repeatedly. Stings cause burning and itching, and cause pustules to form which may leave scars. In some people, stings may induce allergic reactions or anaphylactic shock. Queens can fly up to a mile on their own, and farther when carried by the wind or on vehicles. Entire colonies can be relocated in shipments of soil for nurseries. The federal Imported Fire Ant Quarantine was passed in 1958 in an effort to slow or prevent the artificial spread of imported fire ants. The state of South Carolina is entirely within the federal fire ant quarantine zone. The export of articles such as soil, baled hay and straw, plants with roots attached, and soil-moving equipment are regulated to prevent spread outside the quarantine zone. (UGA. 2016, SCDHEC. 2019b, CU. 2022b)

E3.7.6 PROCEDURES AND PROTOCOLS

VCSNS relies on administrative controls and other regulatory programs to ensure habitats and wildlife are protected as a result of a change in plant operations (i.e., water withdrawal increase,

new NPDES discharge point, wastewater discharge increase, air emissions increase), or prior to ground-disturbing activities. The administrative controls, as discussed in Section E9.5, involve reviewing the change, identifying effects, if any, on the environmental resource area (i.e., habitat and wildlife), establishing BMPs, modifying existing permits, or acquiring new permits as needed to minimize impacts. Existing regulatory programs that the site is subject to, as presented in Chapter E9.0, also ensure that habitats and wildlife are protected. These are related to programs such as the following: stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; and management of herbicide applications to ensure that the intended use will not adversely affect the environment.

E3.7.7 STUDIES AND MONITORING

E3.7.7.1 Impingement and Entrainment Monitoring

In accordance with the statutory guidelines set forth in the NPDES permit issued to DE for VCSNS, and to maintain compliance under Section 316(b) of the CWA, periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that VCSNS is utilizing the best technologies available (BTA) to reduce entrainment and impingement. The most recent NPDES permit for VCSNS was issued on August 9, 2022, with an expiration date of August 31, 2027. During the reissuance of this 2022 NPDES permit, DHEC reviewed the biological data and determined that the facility meets the BTA standards for impingement mortality and entrainment.

Entrainment monitoring and impingement studies took place at VCSNS during the following time periods:

- 1984–1985: Entrainment study conducted in support of the CWA 316(a) demonstration for VCSNS and is summarized in the 2004 GEIS for VCSNS (NRC. 2004b).
- 2005–2006: Impingement study conducted in support of the CWA 316(a) demonstration for VCSNS.
- 2008–2009: Entrainment study conducted at the proposed Units 2 and 3 Raw Water Intake Structure.
- 2016–2017: Entrainment study conducted at the Unit 1 Cooling Water Intake Structure.

The 2008–2009 and 2016–2017 entrainment studies and the 2005–2006 impingement study are discussed below.

E3.7.7.1.1 2008–2009 Entrainment Study

Ichthyoplankton (fish eggs and larvae) samples were collected in Monticello Reservoir to provide estimates of entrainment of ichthyoplankton at the proposed VCSNS Units 2 and 3 Raw Water

Intake Structure. The purpose of this study was to estimate the number of ichthyoplankton potentially lost due to withdrawal of makeup water from Monticello Reservoir.

Methodology

Ichthyoplankton samples were collected at two parallel transects in the vicinity of the proposed intake using 0.5 m-diameter, 0.300-millimeter mesh bongo nets fitted with calibrated flowmeters. Tow length was about 250 m and each side of the bongo net filtered at least 50 m^3. The two sides of the bongo net were composited in the field, resulting in samples that ranged in volume from 105 to 191 m^3. Samples were preserved in the field with 5% formalin. Sampling started in September 2008 and continued for 12 consecutive months. Samples were collected once per month from September 2008 through February 2009, twice per month from March through July 2009, and once in August 2009 for a total of 17 sampling events. This sampling regime was designed to reflect the reproductive behavior of resident fish species, all of which spawn in the spring and early summer. During each sampling event, samples were collected at the surface and mid-depth during both the day and night for a total of 68 samples collected during the study. Ichthyoplankton were then identified to the lowest practical taxon, usually species, and enumerated as to lifestage: egg, yolk-sac larvae (YSL), post yolk-sac larvae (PYSL), YOY, and yearling (age 1). No eggs were found in any samples and subsampling was not required for any species or lifestage.

Data were standardized to no./100 m^3 of water sampled. Monthly mean ichthyoplankton densities and 95% confidence intervals were calculated across depth and diel samples collected each month to provide water column and time-integrated estimate of densities. To estimate potential entrainment of ichthyoplankton on a monthly basis, monthly mean densities and their upper and lower 95% confidence limits (no./100 m^3) were multiplied by the estimated monthly water withdrawal rates (typical: 137.08 m^3/min; maximum: 222.58 m^3/min). These monthly estimates were then summed to provide annual estimates of entrainment under the two proposed water withdrawal rates. Although YOY and yearling fish were sometimes captured in the nets, which were towed at about 3 ft/sec, it is unlikely that they would be entrained at the proposed Raw Water Intake which would have a through screen velocity of 0.5 ft/sec.

Results

Fish larvae were found in samples from March through August of 2009. No fish eggs were collected in any samples. Prior to the first appearance of fish larvae in samples, a YOY catfish was captured in September 2008 and a YOY threadfin shad was captured in December 2008. Fish larvae first appeared in March 2009 samples and peaked in density in May at 125.15 organisms/100 m^3. After this peak, density decreased rapidly to 0.41/100 m^3 in August.

In March, threadfin shad YSL were numerically dominant (21.76/100 m^3), but small numbers of white perch, true percids (yellow perch and darters), and black crappie larvae were present. In April, substantial numbers of both YSL (17.97/100 m^3) and PYSL (14.72/100 m^3) threadfin shad

were collected as the YSL larvae from March matured into PYSL. White perch YSL (15.55/100 m^3) and PYSL (7.41/100 m^3) increased in abundance in April. By May, most threadfin shad larvae had developed into PYSL (98.27/100 m^3) but some YSL were still present (17.91/100 m^3). Densities of YSL (0.46/100 m^3) and PYSL (3.46/100 m^3) white perch decreased from their monthly high in April. In June, PYSL clupeids (28.00/100 m^3) were dominant and total density of fish larvae was markedly lower, approximately 25% of the total density in May. PYSL Lepomis sp. (1.42/100 m^3) and PYSL clupeids (1.35/100 m^3) were predominant in July. By August, total density of fish larvae was very low and only yearling blue catfish (0.21/100 m^3) and PYSL Lepomis sp. (0.21/100 m^3) and clupeids (0.20/100 m^3) were present.

For the 12-month sampling period, PYSL and YSL threadfin shad had the highest density and together with undetermined-stage threadfin shad composed approximately 71% of the total catch. White perch larvae were next in abundance with YSL and PYSL lifestages making up approximately 13% of the catch. The family Clupeidae, which was most likely a combination of threadfin shad and gizzard shad larvae, made up approximately 12% of the catch, not including the 71% noted above. All other species and lifestages combined made up less than 4% of the catch.

Estimates of potential entrainment were developed by multiplying ichthyoplankton densities by estimated monthly water withdrawal rates (typical: 137.08 m^3/min; maximum: 222.58 m^3/min). An estimated 15.3 million larvae would be entrained annually under the typical water withdrawal rate and 24.9 million under the maximum water withdrawal rate, based on 2008–2009 densities. The monthly pattern and species composition of entrainment estimates mirrored the monthly patterns in larval density because the estimates are the product of larval densities and a constant (the two water withdrawal rates). Entrainment is expected to be very low in the fall and winter (September through February), begin to increase in March, reach a peak in May, and decrease rapidly through August.

Entrainment estimates were highest for threadfin shad larvae, which made up 71% of all larvae potentially entrained, under typical (10.9 million larvae) and maximum (17.6 million larvae) water withdrawal rate scenarios. White perch entrainment estimates ranked second under typical (1.9 million larvae) and maximum (3.1 million larvae) water withdrawal rates. White perch larvae made up 13% of the total entrainment estimate. Clupeids were the third most abundant species potentially entrained under typical (1.8 million) and maximum water withdrawal rates (2.9 million). Clupeids were 12% of the total entrainment estimate.

Summary

Threadfin shad and gizzard shad together made up approximately 73% of all the larvae collected in Monticello Reservoir and the same percentage of the entrainment estimate. White perch were the next most abundant larvae, accounting for 13% of both the larvae collected and the entrainment estimate.

Dames and Moore (1985) conducted an ichthyoplankton study in Monticello Reservoir in 1983–1984 as part of the original 316(b) demonstration for VCSNS. In their study, total larval density was 53.9 larvae/100 m^3 at the surface and 11.8 larvae/100 m^3 at mid-depth at a station that was a short distance from our sampling stations. At both depths combined, gizzard shad (61.9/100 m^3; 94%) were the dominant larval species and white bass ranked second in abundance (3.1/100 m^3; 5%). These densities are higher than those observed in the current study and threadfin shad, the dominant species in this study, was not observed.

Based this current study, an estimated 15.3 million fish larvae would be entrained annually under typical operating conditions with 95% confidence limits of 2.2 million and 30.8 million. These confidence limits vary by a factor of about 15 and reflect seasonal variability. Annual variability is demonstrated by the differing results between the current study and the Dames and Moore (1985) study which reported ichthyoplankton densities an order of magnitude greater. Furthermore, threadfin shad, the dominant larval species in the current study was not reported by Dames and Moore (1985). The ichthyoplankton community of Monticello reservoir is dominated by very few species and therefore is potentially subject to high variability. A complete or partial failure to spawn, by a dominant species such as either threadfin shad or white perch due to natural causes, would result in low ichthyoplankton density and a similar reduction in potential entrainment. Considering the dynamic nature of the fish community in Monticello Reservoir, especially the possibility of further introductions of nonnative fish such as white perch, large variations in ichthyoplankton density and potential entrainment is to be expected.

E3.7.7.1.2 2005–2006 Impingement Study

The objective of the 2005–2006 impingement study was to: (1) characterize existing impingement at the VCSNS Cooling Water Intake Structure based on biweekly sampling conducted from July 12, 2005, through June 27, 2006; and (2) develop a preliminary estimate of annual impingement mortality occurring at the site, representative of the once-through cooling system in the absence of any structural or operational controls specifically intended to reduce impingement mortality.

Methods

Impingement monitoring of the Cooling Water Intake Structure traveling screens was conducted during July 12, 2005, through June 27, 2006, on a pre-established (biweekly) schedule resulting in 26 sampling events. Impingement samples were collected using the existing collection basket, which was modified to incorporate 3/8-inch wire mesh openings matching the opening size of the traveling screens. Each impingement sampling event represented a 24-hour collection period split into two approximately equal 12-hour samples. The "day sample" was typically initiated at 0600 hours and extended until 1800 hours on day one and the "night sample" was taken from 1800 hours on day one until the following morning at 0600 hours on day two.

The operation of the traveling screens during impingement sampling events involved cleaning the traveling screens prior to initiation of each sampling event by rotating the operable screens at least one full cycle to remove any accumulated debris and/or organisms. The screens were then stopped and left in a fixed position for each 12-hour sampling period. At the end of each 12-hour sampling period, operable screens were again rotated at least one full cycle allowing the spray wash system to convey impinged organisms and debris to the collection apparatus. Impingement samples were sorted by species and counted for each sample event yielding a total of 52 individual impingement samples.

Size distributions of impinged fish in each sample were determined by processing up to 100 representative individuals for each species. Fish were weighed (grams) and total length measured to the nearest millimeter. When more than 100 fish were encountered, up to 300 additional individuals of a given species were weighed as a batch. When more than 400 individuals of a given species were collected, only a batch weight was recorded, and the number estimated from the average weight of the individually processed fish and the enumerated batches.

In development of the calculation baseline estimate of annual impingement mortality for VCSNS, two estimates were determined: (1) using conventional spreadsheet calculation methods, and (2) using Monte Carlo simulation techniques.

Results

Impingement samples were collected using the existing debris collection basket, modified with 3/8-inch wire mesh openings to match the traveling screens. Samples were collected over 24-hour periods split into 12-hour day and night sub-samples.

Thirteen fish taxa (12 species and one hybrid), crayfish, and freshwater grass shrimp were collected in 52 total impingement samples. Fish species included shad (two species), catfish and bullheads (five species), white perch, bass, and sunfish (three species), and yellow perch. Threadfin shad numerically dominated the impingement samples (288 fish collected), comprising 50.2% of the total number of fish. Other abundant species in impingement samples were blue catfish (12.2%; 70 fish), channel catfish (11.8%; 68 fish), white perch (9.4%; 54 fish), and yellow perch (6.1%; 35 fish). White perch dominated impingement biomass, comprising 36.6% of the catch. No rare, threatened, or endangered species were impinged during the study.

The majority of impinged fish were sub-adult or YOY fish less than 6.7 inches in total length. The most abundant impinged fish, threadfin shad, were observed in size classes ranging from less than 1.5 inches to 4.7 inches in total length. Impingement rates peaked from late December through February, when threadfin shad were numerically dominant. Impingement rates were higher at night in 19 of the 26 sampling events.

Baseline Evaluation

Using direct replacement costs published by the American Fisheries Society, the value of all fish and shellfish impinged annually at VCSNS totals approximately $2,336. Threadfin shad, the numerically dominant species impinged represents a total replacement value of $505. Recreationally important species represent a total replacement value of $1,786.

E3.7.7.1.3 2016–2017 Entrainment Study

Ichthyoplankton (fish eggs and larvae) samples were collected in Monticello Reservoir to provide estimates of ichthyoplankton entrainment for the VCSNS Unit 1 Cooling Water Intake Structure.

Methodology

Ichthyoplankton sampling was conducted in Monticello Reservoir within the area of hydraulic influence of the Unit 1 Cooling Water Intake Structure. Day and night samples were collected at both the surface (within the top 1 m of the water column) and mid-depth (estimated depth of 5 m). Sampling occurred twice per month between March 1 and August 31, 2016, and resulted in the collection of 48 samples. Sampling events were separated by a minimum of 7 days. Day sampling occurred at least 2 hours after sunrise and 2 hours before sunset and night sampling occurred at least 2 hours after sunset and 2 hours before sunrise. Tows were conducted perpendicular to the shoreline using paired 0.5 m diameter plankton bongo nets equipped with 0.300 millimeter mesh and calibrated flowmeters. The target volume for each side of the bongo was 50 m^3 and the two sides were composited for an approximate total volume of 100 m^3 per sample.

Ichthyoplankton densities were calculated with flowmeter data (providing actual volumes sampled) and the numbers counted in samples, which were then standardized to number/100 m^3. The numbers of ichthyoplankton entrained under plant operations were estimated by ichthyoplankton sample densities and the volumes of water withdrawals. In recognition of potential diel differences in day and night ichthyoplankton density and that day and night periods become unequal in duration during the summer season, daily entrainment abundance within each sample period was estimated by multiplying the diel-specific density estimate by the corresponding daily water withdrawal volumes and the daily proportion of time for the diel period. Annual entrainment abundance during the sampling period from March 1 through August 31, 2016, was estimated by summation of daily diel entrainment estimates across all fish taxa and life stages.

Results

Larval Fish Collections – Ichthyoplankton occurred in samples from March through August 2016, though numbers collected in those 2 months were the lowest observed. A total of 1,311 organisms comprising seven fish families were collected with over half (50.8%) occurring during the month of June. Larval fish (YSL, PYSL, or undetermined larval stage) dominated collections with only one egg (*Dorosoma* species) and five YOY catfish (blue and channel catfish) comprising other life

stages. No federal or state protected species were identified in ichthyoplankton samples, and none would be expected based on fish distribution data or the SCDNR Heritage Trust Program list for Fairfield County, South Carolina.

The ichthyoplankton was dominated by members of the Clupeid family (*Dorosoma* genus) which comprised over 86% of all organisms collected. Centrarchidae comprised 9.6%, Cyprinidae 1.6%, and the Catostomidae, Ictaluridae, Moronidae, and Percidae each comprised <1% of the total number collected.

Larval Density – Mean ichthyoplankton density was significantly higher during the night than during day throughout the study period. The dominant taxon and life stage in surface waters was *Dorosoma* species YSL while the PYSL were more abundant in midwater depth.

Larval densities also varied by month and closely followed the pattern observed for raw ichthyoplankton counts. Monthly average densities in March for individual species or fish families were generally low and ranged as high as 0.85/100 m^3 for carp and minnow family PYSL collected at night. A total of five fish families (Catostomidae, Centrarchidae, Clupeidae, Cyprinidae, and Moronidae) had ichthyoplankton life stages collected in March. All these families were collected during nighttime hours but only PYSL of *Dorosoma* species were collected during daylight. A general pattern observed throughout these collections was that nighttime numbers of collected individual species or fish families and nighttime densities typically exceeded those observed during daylight hours. The only egg collected throughout this 6-month survey belonged to a *Dorosoma* species collected in March at night. The only occurrence of black crappie and largemouth bass ichthyoplankton from the Centrarchidae family was in March.

Ichthyoplankton densities in April were as high as 15.90/100 m^3 for *Dorosoma* species post YSL collected at night. A total of four fish families (Catostomidae, Clupeidae, Cyprinidae, and Moronidae) had ichthyoplankton life stages in April. Densities were generally higher in April compared to March. The numbers of collected individual species or fish families were comparable between day and night sampling, although densities were generally higher at night. The only exception was quillback whose YSL and PYSL were only collected during daylight. The only occurrences of Chubsucker species and quillback larvae, family Catostomidae, were in March and April.

Ichthyoplankton densities in May were as high as 19.55/100 m^3 for *Dorosoma* species PYSL collected at night. Fish from three families (Centrarchidae, Clupeidae, and Cyprinidae) were collected in May. All these individual species or families were collected during nighttime hours but only YSL and PYSL of *Dorosoma* species were collected during daylight. In all instances during May, nighttime densities exceeded those measured during daytime. The first collections of *Lepomis* species (i.e., sunfish) occurred in May.

Ichthyoplankton densities were highest in June with *Dorosoma* species YSL at night (97.04/100 m^3) being the most abundant species and life stage. A total of three fish families (Centrarchidae, Clupeidae, and Ictaluridae) had ichthyoplankton life stages in June. All these families were collected during nighttime hours but only YSL and PYSL of *Dorosoma* species and PYSL of Lepomis species were collected during daylight. Nighttime densities in June exceeded daytime densities for all species and life stages. The first ictalurid species, blue catfish YOY, was collected in June.

Ichthyoplankton densities in July for collected individual species or families were as high as 10.85/100 m^3 for *Lepomis* species PYSL collected during the day. Fish from three families (Centrarchidae, Clupeidae, and Ictaluridae) were collected in July. All these individual species or families were collected during both daytime and nighttime hours with the exception of channel catfish YOY which were only collected at night. There was no clear trend indicating higher nighttime densities relative to daytime densities in July.

Ichthyoplankton densities in August for collected individual species or families were as high as 1.12/100 m^3 for *Lepomis* species PYSL collected during the day and were just slightly higher than those observed in March. A total of four fish families (Centrarchidae, Clupeidae, Ictaluridae, and Percidae) were collected in August. All these individual species or families were collected during nighttime hours but only PYSL of threadfin shad and PYSL of *Lepomis* species were collected during daylight. Lepomis species were collected from May through August, ictalurid species were collected from June through August, and the only collection of a darter species (Percidae family) was in August.

The most abundant family collected was the Clupeidae (*Dorosoma* species; gizzard shad, and threadfin shad) and they were collected in all months of the study, although densities were low in March and August. Densities were generally higher during the night. The second most abundant family was the Centrarchidae, and they were collected during March (black crappie and largemouth bass) and the summer months of May through August (the various sunfish species were probably dominated by bluegill). No federal or state protected species were identified in ichthyoplankton samples, and none would be expected based on fish distribution data or the SCDNR Heritage Trust Program list for Fairfield County, South Carolina.

Entrainment Estimates – The estimated number of ichthyoplankton entrained accounted for significant variation in diel ichthyoplankton densities near the Cooling Water Intake Structure, differences in the duration of day and night periods, and the amount of water withdrawn during those day and night periods. The total estimated number of ichthyoplankton entrained by VCSNS during 2016 was 78.1 million ichthyoplankton during the night and 27.3 million ichthyoplankton during the day. The estimated annual entrainment abundance from March 1 through August 31, 2016, was 105.4 million, with the highest entrainment abundance occurring in June being primarily attributed to *Dorosoma* larvae. The lower and upper bias-corrected 95% confidence limits for the

annual entrainment abundance were 89.7 million and 117.0 million, which were determined from the 0.32nd and 88.45th percentiles of the distribution of 10,000 bootstrap estimates.

Summary

The ichthyoplankton community in 2016 was composed of seven families and these were identical to the families collected in the 2008–2009 ichthyoplankton study for Units 2 & 3. Similar to past studies at Monticello Reservoir, members of the Clupeidae, or the herring and shad family, dominated the March through August 2016 ichthyoplankton collections and entrainment estimate. Threadfin and YOY gizzard shad make up the limnetic forage fish community of Monticello Reservoir and other southeastern U.S. reservoirs. In 2016, larval clupeids comprised 86.0% of all ichthyoplankton estimated to be entrained. The stability and consistency of the clupeid forage fish community over recent years is demonstrated by these same species making up 85% of all entrainable larvae collected and in the 2008–2009 study for VCSNS Units 2 and 3.

In the 1984 study conducted as part of the original 316(b) demonstration for VCSNS, the mean larval density (during seven months of ichthyoplankton collections) was 53.9 larvae/100 m^3 at the surface and 11.8 larvae/100 m^3 at mid-depth at a station that was a short distance from the 2016 sampling station. These densities exceed those observed in the current study though threadfin shad, the dominant species in this study, was not observed in 1983–1984.

It appears that once VCSNS became an operational baseload generating plant and its warm effluents were a consistent winter feature, the stability and consistency of the clupeid fish community was realized. The SCDNR has conducted fishery investigations of Monticello Reservoir since 1987 that have variously included cove rotenone sampling, trap netting, creel surveys, and nighttime meter netting for ichthyoplankton. Ichthyoplankton sampling in Monticello Reservoir in 1987, 1988, 1989, and 1997 has consistently demonstrated threadfin shad to dominate the age 0 clupeid prey base. These studies also noted that larval densities in Monticello Reservoir were relatively low compared to regional Catawba-Wateree Reservoirs and ascribed this observation to the relative infertility of Monticello Reservoir. High fecundity, multiple spawns per year, and good overwinter survival in thermally enriched waters have generally allowed threadfin shad to dominate clupeid forage fish communities. This domination has been documented at Monticello Reservoir for approximately the last three decades in studies.

Impingement data are in agreement with the high abundance of threadfin shad in Monticello Reservoir. The 2005–2006 Cooling Water Intake Structure impingement study at VCSNS found 50.2% of all impinged fish to be small threadfin shad with most of that impingement confined to the winter period from December through February. While numbers of impinged fish were not excessive, the sensitivity of some threadfin shad to cold winter temperatures was possibly demonstrated in that study. It should be noted that the naturally limited production of phytoplankton

and zooplankton during winter, especially in an infertile reservoir, and subsequent malnourishment may also have played a role in the observed impingement.

Centrarchids were the second most entrained fish family in 2016. The sunfish, bass, and crappie members of this family typically spawn near shore during spring (crappie and bass) and summer (sunfish) with the male constructing a nest and guarding the young. Due to this parental care, most entrainment collections of centrarchids are PSYL that have left the nest but still not of sufficient size to escape entrainment. Based on their preference for limnetic habitats as juveniles, bluegill and black crappie are the species most likely to be entrained at the VCSNS Cooling Water Intake Structure.

Based on the current study, an estimated 105.4 million ichthyoplankton would be entrained per year under typical operating conditions with 95% confidence limits of 89.7 million and 117.0 million. The ichthyoplankton community of Monticello Reservoir is dominated by one family of fish, the Clupeidae. The highly fecund threadfin shad is the sole species in that family that is being consistently entrained. Given their preference for warm water temperatures, their high reproductive capacity, short life span, and ability to quickly recolonize the reservoir, it is anticipated that a large winter kill event of this species would be undetectable one year later. However, a winter kill of threadfin shad is unlikely as the baseload operation of VCSNS would assure the generation of warm thermal effluents during even the severest of winters. The study notes that the operation of VCSNS assures the stability of the threadfin shad population, and all the Monticello Reservoir fish predators that feed upon it.

E3.7.7.2 Thermal Evaluation Study

A thermal mixing zone evaluation was conducted in 2012 as part of a NPDES renewal application to support a decision maintaining the current temperature limits for VCSNS. There are two effluent temperature limitations for Outfall 001: daily maximum temperature of 113°F measured "in pipe" prior to discharge, and a monthly average temperature of 90°F measured at the Fairfield Pumped Storage Facility intake structure, which is considered the mixing zone boundary. A three-dimensional CFD model was used due to the complexity of the basin and channel dynamics at VCSNS. The geometry of the Monticello Reservoir and discharge bay and canal in the CFD models included the Unit 1 discharge bay and canal, the Fairfield Pumped Storage Facility intakes, the backwater areas in the locality of the canal, and a section of the Monticello Reservoir extended approximately 1.6 miles north of the discharge structure. Worst-case scenarios for a 90°F plume, which would occur in summer, and a 5°F temperature difference between the background and discharge, which would be in winter, were considered for the CFD model. In the summer, when the reservoir is at high surface elevation and the Fairfield Pumped Storage Facility is generating, a plume of 90°F would have an extent of 4,775 feet by 3,705 feet with a maximum volume of 1,790 acre-feet. In winter, when the reservoir is at low surface elevation and the Fairfield Pumped

Storage Facility is pumping, the plume of 5°F difference would have an extent of 4,219 feet by 3,325 feet with a maximum volume of 1,148 acre-feet. The 90°F plume has a larger impact than the 5°F difference plume.

E3.7.7.3 Water Quality Monitoring

DE conducts monthly water quality monitoring to assess the condition of Monticello Reservoir. Water quality measurements include measuring depth, temperature, pH, specific conductance, and dissolved oxygen on a monthly basis (performed quarterly during 2019) at three locations within Monticello Reservoir:

- Uplake 16 – Located near the northern end of the reservoir
- Uplake 2 – Located in the channel near the circulating water intake for the VCSNS Unit 1
- Discharge 6 – Located just outside the northern end of the circulating water discharge canal for the VCSNS Unit 1

Water quality data collected in 2019 and 2020 reveal that Monticello Reservoir exhibits mixed thermal conditions at the southern end of the reservoir apart from the thermal plume from VCSNS (Discharge 6 site). There is no evidence of the thermal plume in the area near the VCSNS circulating water intake (Intake 2), nor at the uplake sampling location (Uplake 16). Water quality measurements reveal a thermally stratified environment at the uplake sampling location during warm weather months. Dissolved oxygen levels remain relatively high in Monticello Reservoir throughout the year except in deep water during the summer and autumn months. Near neutral pH conditions are typical throughout Monticello Reservoir, except for photosynthesis-induced pH elevation near the surface during the spring and summer months. Conductivity values are generally low and are consistent with historical Monticello Reservoir values. Data collected during 2019 and 2020 suggest that water quality in Monticello Reservoir is sufficient for supporting aquatic life.

E3.7.7.4 As-Needed Monitoring

Studies and monitoring at VCSNS occur as needed to comply with federal, state, and local regulatory requirements, as directed by the agencies, generally prior to new projects. Any monitoring that occurs is consistent with agency policies and procedures and performed under the guidance of the agency under which coordination is occurring.

E3.7.8 THREATENED, ENDANGERED, AND PROTECTED SPECIES, AND ESSENTIAL FISH HABITAT

The USFWS maintains current lists of threatened or endangered species on its website (USFWS. 2023a). The SCDNR also maintains county lists of state-protected plant and animal species on its website (SCDNR. 2022c). Species located onsite or potentially occurring within

Fairfield, Newberry, and Richland Counties that are listed as threatened or endangered by these agencies are described below and summarized in Table E3.7-4.

Compliance with all regulatory requirements associated with protected species would continue to be an administrative control practiced by DE for the licensed life of the VCSNS facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to any special status and protected species.

E3.7.8.1 Federally Listed Species

A total of eight species known in Fairfield, Newberry, and Richland Counties are federally protected under the ESA: West Indian manatee (*Trichechus manatus*), red-cockaded woodpecker (*Picoides borealis*), Carolina heelsplitter (*Lasmigona decorata*), American chaffseed (*Schwalbea americana*), Canby's dropwort (*oxypolis canbyi*), Michaux's sumac (*Rhus michauxii*), rough-leaved loosestrife (*Lysimachia asperulaefolia*), and smooth coneflower (*Echinacea laevigata*). Additionally, the monarch butterfly (*Danaus plexippus*) is federally listed as a candidate species. No critical habitats are designated for Fairfield, Newberry, and Richland Counties (USFWS. 2023a).

E3.7.8.1.1 West Indian Manatee

The West Indian manatee (*Trichechus manatus*) is federally listed as threatened. This species, *Trichechus manatus*, includes two distinct subspecies, the Florida manatee (*Trichechus manatus latirostris*) and the Antillean manatee (*Trichechus manatus manatus*). Manatees have large, seal-shaped bodies with paired flippers and a round, paddle-shaped tail. They are typically grey, but color can range from black to light brown. The muzzle is heavily whiskered and coarse, single hairs are sparsely distributed throughout the body. Adult manatees, on average, are about 9 feet long and weigh about 1,000 pounds. At birth, calves are between 3 and 4 feet long and weigh between 40 and 60 pounds. (USFWS. 2022b)

Historically, West Indian manatees were found along the U.S. Atlantic and Gulf of Mexico coasts, throughout the Caribbean, and as far south as Brazil's Atlantic coastline. However, due to hunting, habitat fragmentation and loss, and other factors, manatees have disappeared from various parts of their range. For example, manatee hunts were common until the early 1900s, and as a result the species is no longer found in Guadeloupe and other islands in the Lesser Antilles. (USFWS. 2022b)

Today manatees are found in the southeastern United States, eastern Mexico, Guatemala, Belize, Honduras, Costa Rica, Panamá, Nicaragua, Colombia, Venezuela, Guyana, Suriname, French Guiana, Brazil, Trinidad and Tobago, Jamaica, Cuba, Haiti, the Dominican Republic, Puerto Rico and in the Bahamas. (USFWS. 2022b)

The VCSNS site does not provide suitable habitat for the West Indian manatee. (USFWS. 2022b)

E3.7.8.1.2 Red-Cockaded Woodpecker

The red-cockaded woodpecker (*Picoides borealis*) is federally listed as endangered. Red-cockaded woodpeckers are small woodpeckers with a longish bill, black heads with white cheek patches, and black and white barring on their backs. Their underside is white, and they have black spots on their flanks. Males and females are similar, except males have a red streak of feathers, or cockade, behind the eye. (SCDNR. 2022d)

The range of the red-cockaded woodpecker extends from southeastern Oklahoma and Maryland to the Gulf Coast and central Florida. They inhabit mature pine forests that lack a hardwood understory, such as those maintained by sporadic wildfires. They are the only species of woodpecker that excavates nest cavities in living trees. They dig out cavities in older pines, typically ones infected with the red heart disease fungus, which makes the heartwood easier to excavate. (SCDNR. 2022d)

Red-cockaded woodpeckers live in family groups, called clans, of four to six individuals: the male and female and several helper birds, usually the male offspring. Helpers assist in incubating eggs, feeding the young, and digging tree cavities. Each member of the clan has its own roost cavity. Two to four white eggs are laid in spring, from late April to mid-May. Young hatch in 10 to 12 days and spend a little over 3 weeks in the nest. They feed on larvae, insects, and other arthropods, and occasionally on berries. (SCDNR. 2022d)

Red-cockaded woodpeckers inhabit large tracts of land with dense growth of trees and underbrush. Cavities are excavated in mature pines, generally more than 80 years old (USFWS. 2023b). Forested areas within the VCSNS site have been managed for timber in the past (SCE&G. 2002, Section 2.4), and therefore are unlikely to present suitable high-quality habitat for this species. While there have been observations of the species within 6 miles of the VCSNS site within the last 5-10 years based on the review of the SCDNR Tracked Species Distributions map, the current known range for the red-cockaded woodpecker does not overlap with the VCSNS site (SCDNR. 2022c; USFWS. 2023b).

E3.7.8.1.3 Carolina Heelsplitter

The Carolina heelsplitter (*Lasmigona decorata*) is federally listed as endangered. Carolina heelsplitters are medium-sized freshwater mussels endemic to the Carolinas. The shells are trapezoid-shaped, greenish brown to dark brown in color. They inhabit rivers and streams with stable bottoms, requiring well-oxygenated water with low amounts of pollution. They are filter feeders, siphoning food such as algae and bacteria from the water column. Larvae attach to the gills and fins of fish, which disperses the species up and downstream (USGS. 2022c).

There are no records of the Carolina heelsplitter as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (USGS. 2022c). Further, a freshwater mussel survey of the Monticello Reservoir conducted in 2015 did not find Carolina heelsplitter (TOE. 2016).

E3.7.8.1.4 American Chaffseed

American chaffseed (*Schwalbea americana*) is federally listed as endangered. American chaffseed is a perennial plant with tubular, purplish-yellow flowers. It occurs in open pine flatwoods, pitch pine lowland forests, seepage bogs, palustrine pine savannahs, and other grass- and sedge-dominated plant communities. Primary threats are habitat loss through housing development and road building and succession of its open habitat to woody vegetation due to fire suppression (NaS. 2022a).

There are no records of the American chaffseed as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (USFWS. 2022d).

E3.7.8.1.5 Canby's Dropwort

Canby's dropwort (o*xypolis canbyi*) is federally listed as endangered. Canby's dropwort is a perennial herb in the mint family. Flowers are small and white, sometimes tinged with red or pink. Leaves are quill-like. It is capable of reproducing vegetatively by underground rootstocks The species inhabits a variety of coastal plain communities, including pond cypress savannahs, the shallows and edges of cypress/pond pine ponds, sloughs, and wet pine savannas (SCDNR. 2022e).

There are no records of the Canby's dropwort as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (USFWS. 2022e).

E3.7.8.1.6 Michaux's Sumac

Michaux's sumac (*Rhus michauxii*) is federally listed as endangered. Michaux's sumac is a perennial shrub that grows to about 2 feet in height. Leaves are alternate and pinnately compound. Flowers are greenish-yellow, tiny, and clustered. Michaux's sumac occurs in sandy or rocky open woods. It is shade-intolerant and dependent upon some form of disturbance, such as fires, to maintain the open quality of its habitat. There are no records of the Michaux's sumac as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (NaS. 2022b).

E3.7.8.1.7 Rough-Leaved Loosestrife

Rough-leaved loosestrife (*Lysimachia asperulaefolia*) is federally listed as endangered. Rough-leaved loosestrife is a perennial herb with erect stems 30 to 60 centimeters tall. Leaves are deep yellow-green or blue-green, lustrous, and have three prominent veins. Flowers are yellow, usually with five petals, and grow in cylindrical, terminal racemes. The fruit is a capsule which splits

open to release one to two seeds. The species spreads vegetatively through underground rhizomes.

Rough-leaf loosestrife occurs most often in ecotones between longleaf pine uplands and pond pine pocosins in moist, sandy, or peaty soils with low vegetation that allows for abundant sunlight to the herb layer. It is endemic to the Coastal Plain and Sandhill regions of southeastern North Carolina and northern South Carolina. For recovery planning purposes, the extant populations are grouped into nine population centers isolated by loss of habitat between. The primary threat to rough-leaved loosestrife is loss of habitat to woody encroachment due to fire suppression. Other threats include destruction of habitat by development and agriculture (USFWS. 1995a).

There are no records of the rough-leaved loosestrife as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (USFWS. 2022f).

E3.7.8.1.8 Smooth Coneflower

Smooth coneflower (*Echinacea laevigata*) is federally listed as endangered. Smooth coneflower is a perennial herb in the aster family. It grows 2 to 5 feet in height. Flowers are purple to pink, showy and delicate, with drooping rays. Basal leaves are elliptical, 7.8 inches long, and rough to the touch. Midstem leaves are smaller and have short or no petioles. The fruit is a gray-brown, oblong achene. The species attracts bees in the spring for its nectar, and birds in the winter for its seeds (USFWS. 1995b, Fraser. 2022).

Smooth coneflower's current range is fragmented across parts of South Carolina, North Carolina, Georgia, and Virginia. It primarily occurs in openings in woods, such as cedar barrens and clear cuts, along roadsides and utility line ROWs, and on dry limestone bluffs. It requires full or partial sun. The primary threat to this species is habitat loss and degradation from the growth of woody vegetation as a result of prolonged fire suppression. Conversion of habitat to agriculture and/or silviculture, residential and industrial development, highway maintenance also threatens smooth coneflower (NaS. 2022c, USFWS. 2022g).

There are no records of the smooth coneflower as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (USFWS. 2022g).

E3.7.8.1.9 Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) is a candidate species, and not yet listed or proposed for listing. Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The black border has a double row of white spots, present on the upper side of the wings. (USFWS. 2022h)

During the breeding season, monarchs lay their eggs on milkweed host plants (primarily *Asclepias spp.*), and larvae emerge after 2–5 days. Larvae develop over a period of 9–18 days,

feeding on milkweed and sequestering toxic chemicals (cardenolides) as a defense against predators. The larva then pupates into a chrysalis before emerging 6–14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately 2–5 weeks; overwintering adults enter into reproductive diapause (suspended reproduction) and live 6–9 months. (USFWS. 2022h)

In eastern and western North America, monarchs undergo long-distance migration, and live for an extended period of time. This migration can take monarchs distances of over 3,000 km and last for over 2 months. In early spring, surviving monarchs mate at the overwintering sites before dispersing. The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again. (USFWS. 2022h)

Suitable habitat for the monarch butterfly is likely present in undeveloped portions of the VCSNS site that are not maintained by mowing. Additionally, suitable habitat is present in the vicinity of the VCSNS site.

E3.7.8.2 State-Listed Species

E3.7.8.2.1 Wood Stork

The wood stork (*Mycteria americana*) is state listed as endangered and federally listed as threatened. Wood storks are large, long-legged wading birds, about 50 inches tall, with a wingspan of 60−65 inches. Their plumage is white, except for black primaries and secondaries, and a short black tail. The head and neck are largely unfeathered and dark gray in color. The bill is black, thick at the base, and slightly decurved. (USFWS. 2022i)

The southeast United States breeding population of the wood stork declined from an estimated 20,000 pairs in the 1930s to about 10,000 pairs by 1960, and to a low of approximately 5,000 pairs in the late 1970s. Nesting primarily occurred in the Everglades. The generally accepted explanation for the decline of the wood stork is the reduction in food base (primarily small fish) necessary to support breeding colonies. This reduction is attributed to loss of wetland habitat as well as to changes in water hydroperiods from draining wetlands and changing water regimes by constructing levees, canals, and floodgates to alter water flow in south Florida. Wood storks have a unique feeding technique and require higher prey concentrations than other wading birds. Optimal water regimes for the wood stork involve periods of flooding, during which prey fish populations increase, alternating with dryer periods, during which receding water levels concentrate fish at higher densities coinciding with the stork's nesting season. Less significant factors known to affect nesting success include prolonged drought and flooding, raccoon predation on nests, and human disturbance of rookeries. (USFWS. 2022i)

Wood storks may have formerly bred in most of the southeastern United States and Texas. Currently, nesting is restricted to Florida, Georgia, and South Carolina. The wood stork is a highly colonial species usually nesting in large rookeries and feeding in flocks. Age at first breeding is 3 years but typically do so at 4 years. Nesting periods vary geographically. In south Florida, wood storks lay eggs as early as October and fledge in February or March. However, in north and central Florida, Georgia, and South Carolina, storks lay eggs from March to late May, with fledging occurring in July and August. Nests are frequently located in the upper branches of large cypress trees or in mangroves on islands. Several nests are usually located in each tree. Wood storks have also nested in manmade structures. Storks lay two to five eggs, and average two young fledged per successful nest under good conditions. (USFWS. 2022i)

The VCSNS site and the surrounding areas within 6 miles potentially present suitable habitat for the wood stork. There are no records of the wood stork as occurring on the VCSNS site. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last 10 to 20 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022c).

E3.7.8.2.2 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is a large raptor, with a wingspread of about 7 feet. Adults have a dark brown body and wings, white head and tail, and a yellow beak. Juveniles are mostly brown with white mottling on the body, tail, and undersides of wings. Adult plumage usually is obtained by the 6th year. Females are larger than males but otherwise similar in appearance. (USFWS. 2022j)

Bald eagles typically breed and winter in forested areas near large bodies of water. They select large, open, and accessible roost trees. Nests are massive, made from sticks, with other materials such as grasses, mosses, and corn stalks added as fillers, and finer material such as moss as lining. Bald eagles are opportunistic foragers. They consume carrion of fish, birds, and mammals extensively wherever encountered at sites that provide disturbance-free access from the ground. Bald eagles hunt from perches or while soaring over suitable habitat and attempt to take most prey on the wing (e.g., fish, waterfowl, small mammals) but success varies greatly. (USFWS. 2022j)

Bald eagles breed throughout much of Canada and Alaska, in addition to scattered sites across the lower 48 states, from California to the southeastern U.S. coast and Florida. Wintering covers most of the contiguous United States, with some year-round distribution in the northwest. Northern birds return to breeding grounds as soon as weather and food availability permit, generally between January and March. (USFWS. 2022j)

Some major threats to bald eagles include ingestion of contaminants, such as DDT which causes eggshell thinning, ingestion of Pb, collisions with stationary and moving objects, degradation of shoreline habitat, and disturbance at nest and roost sites. Throughout breeding range, populations have shown tremendous growth since the ban of DDT in 1972. In 1963, an estimated 417 breeding

pairs existed in the lower 48 states; they increased to more than 5,000 pairs in 1997, growth on average of almost 8% per year. (USFWS. 2022j)

Bald eagles are known to nest at the VCSNS site. There is at least one known eagle nest on the property at VCSNS and some within the adjoining Parr/Fairfield FERC project boundary. The SCDNR/USFWS was informed about a fledgling that spent some time on the ground and eventually flew off in April 2021. DE is not aware of any recurring monitoring conducted for bald eagle nests at VCSNS or adjacent properties. Activities on the VCSNS site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. VCSNS maintains a migratory bird special purpose utility permit (SPUT) authorized by the USFWS, which authorizes utilities to collect, transport, and temporarily possess migratory birds found dead on utility property, structures, and ROWs for avian mortality monitoring or disposal purposes. DE submits annual reports of all activities conducted under the SPUT to the USFWS.

Compliance with all regulatory requirements associated with this species will continue to be an administrative control practiced by DE for the licensed life of the VCSNS facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to bald eagles.

E3.7.8.2.3 Spotted Turtle

The spotted turtle (*Clemmys guttata*) is a small turtle, reaching lengths of 3.5 to 4.3 inches. They are black, with numerous yellow-orange dots on their carapace, head, and neck. In South Carolina, this species is known to occur on several tracts of public land including the Savannah River Site, Francis Marion National Forest, Webb Wildlife Center, and the Carolina Sandhills National Wildlife Refuge.

The spotted turtle is a semi-aquatic species that inhabits a variety of wetland types including small ponds, small streams, swamps, flooded forests, and other shallow bodies of water. Spotted turtles are most active during early spring when they can be observed occasionally basking on logs and other objects. Individuals, in particular males, will wander some distance from wetlands, especially during the spring. This species is difficult to find during the summer months and may undergo a period of summer dormancy (aestivation) in some areas.

The primary challenge facing the spotted turtle is collection for the pet trade. Habitat loss or alteration from draining and filling isolated wetlands, a preferred habitat of the spotted turtles, is also a threat (Bennett and Buhlmann. 2015a).

There are no records of the spotted turtle as occurring on the VCSNS site. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last 5 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022g).

E3.7.8.2.4 Southern Hognosed Snake

The southern hognosed snake (*Heterodon simus*) is state listed as threatened. The southern hognose snake is a tan-brown snake with darker blotches running down the back. It is the smallest of the hognose snakes, a group of snakes that possess a sharply upturned snout, believed to be an adaptation for burrowing. This species averages 14–20 inches in length.

The southern hognose snake has been documented from 15 counties in South Carolina. They are typically associated with the more xeric longleaf communities and can be found in the same habitat types that support gopher tortoise populations. The primary threat confronting this species is habitat loss by conversion for agriculture and/or loblolly pine plantations in South Carolina. The loss or degradation of longleaf pine habitat results in the loss of key components, such as stumpholes and open canopy conditions, required by the guild members. The introduction of fire ants throughout the southeastern United States has also been implicated as a potential reason for the apparent decline of the southern hognose snake (Bennett and Buhlmann. 2015b).

There are no records of the southern hognosed snake as occurring on the VCSNS site. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last 20–40 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022h).

E3.7.8.2.5 Carolina Pygmy Sunfish

The Carolina pygmy sunfish (*Elassoma boehlkei*) is state listed as threatened. It is a small secretive fish that ranges from 0.8 to 1.3 inches in length. It lacks a lateral line, has a relatively large eye, an upturned mouth, and a rounded caudal fin. Males of the species display alternating blue and black bars along their sides. The bars on the females alternate between dark brown and light brown. They inhabit slow-moving acidic waters of ponds, ditches, and streams. This species is generally associated with abundant aquatic vegetation and shallow water.

Only a few populations of Carolina pygmy sunfish have been identified in South Carolina. The isolation of this species makes it extremely vulnerable to development, pollution, and habitat alterations. Conservation efforts within South Carolina are critical to the global conservation of the species (Bettinger. 2015).

While there are no records of the Carolina pygmy sunfish as occurring on the VCSNS site, the species has been recorded to occur within 6 miles of the VCSNS site within the last 5–10 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022i).

E3.7.8.2.6 Pine Barrens Treefrog

The pine barrens treefrog (*Dryophytes andersonii*) is state listed as threatened. This species reaches lengths of 1.1 to 1.7 inches. They have a broad lavender stripe with a thin, white outline on

either side of the body. The concealed portions of the legs and inner thigh are bright orange with numerous yellow dots.

The pine barrens treefrog is found in the northern portion of South Carolina's Coastal Plain in the Sandhills Fall-line Ecoregion. It occurs in herb shrub bogs, pocosins and other related communities. Typical pine barrens treefrog habitat is found in transition zones on the downslope of sandhills where water percolates out of the soil in some sort of seepage zone. Currently, several pine barrens treefrog colonies exist along powerline and gas line ROWs, where mechanical vegetation control (e.g., mowing) keeps the vegetation low, maintaining the open habitat required by the species.

The primary threat facing this species is habitat loss due to fire suppression and herbicide application. Ditching and drainage of small, hillside wetlands or other alterations of these wetlands is a potential threat (Bennett and Buhlmann. 2015c).

There are no records of the pine barrens treefrog as occurring on the VCSNS site. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last 20–40 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022j).

E3.7.8.2.7 Carolina Gopher Frog

The Carolina gopher frog (*Lithobates capito*) is state listed as endangered. Carolina gopher frogs have robust, stocky bodies, 2.3–3.5 inches in length, with relatively short forelimbs, tapered snouts and a single lateral ridge down each side of the back. Their light-colored body is marked with dark brown or black blotches of various sizes and shapes. Males are smaller than females.

The primary habitat of gopher frogs is native xeric upland habitats, comprised mainly of longleaf pine and sandy substrates. Gopher frogs seek shelter in underground refuges, such as the burrows of gopher tortoises, after which they were named, and several species of small mammals, such as rodents, as well as under logs and in stump holes. Juvenile gopher frogs avoid closed-canopy habitat and select open-canopy habitat that has been maintained by fire. As a result of fire suppression, habitat loss and degradation, many wildlife species including the gopher frog associated with longleaf pine forests have declined. Gopher frogs breed in temporary or semipermanent (seasonally flooded) ponds but spend the majority of their lives in the burrows of surrounding terrestrial habitat (Sines. 2012).

While there are no records of the Carolina gopher frog as occurring on the VCSNS site, the species has been recorded to occur within 6 miles of the VCSNS site within the last 20 to 40 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022k).

E3.7.8.2.8 Rafinesque's Big-Eared Bat

The Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) is state listed as endangered. It is distinguishable from other bats in South Carolina by its large (1.25 inches) thin ears which, when laid back, are about half the length of the animal's body. Rafinesque's big-eared bat is gray/brown above and silvery below with thin and naked membranes on its wings and tail. Its wingspan ranges from 10 to 11 inches. This species can be differentiated from the federally endangered Townsend's big-eared bat primarily by its darker fur and hair that extends beyond the tips of the bat's toes.

Rafinesque's big-eared bats inhabit the southeastern United States, west to Louisiana and north to Kentucky and North Carolina. In South Carolina, they are permanent residents of the coastal plain and hibernate rather than move south during winter months. They characteristically roost in dilapidated buildings or tree cavities near water. The breeding season in this species extends from late fall to early winter. For the remainder of the winter and on to early spring, the bats hibernate. In some portions of their range, hibernating bats are found in caves, wells, and similar habitats. Males are solitary or gather in small groups during summer months, whereas females congregate in maternity colonies of up to 100 individuals. In May-June, females give birth to one hairless young, which can fly at three weeks of age and attains adult size by August or early September. Rafinesque's big-eared bats feed exclusively on moths but will eat other insects if moths are not available.

Rafinesque's big-eared bat is very sensitive to human activities and will abandon a roost if disturbed. Disturbance of maternity colonies is also a source of mortality since adults may abandon their young or drop them to the ground. Habitat loss and alteration have also contributed to the species' decline in the past decade. Large cavity trees used for roosting are increasingly scarce (SCDNR. 2020a).

There are no records of the Rafinesque's big-eared bat as occurring on the VCSNS site. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last 5 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022l).

E3.7.8.2.9 Shortnose Sturgeon

The shortnose sturgeon (*Acipenser brevirostrum*) is listed as endangered both at the federal and state levels. Shortnose sturgeons are generally brown in color with pink- or salmon-colored tones above that fade into white along the belly. They average 1–4 feet in length, weigh up to 50 pounds, and may live for approximately 20 years. Shortnose sturgeons lack the scutes, or small bony plates between the base of the anal fin and midlateral scutes. They feed on a diet of mussels, worms, small crustaceans, and insect larvae. Shortnose sturgeon prefer deep water and are often found in areas with soft substrate and a vegetated bottom. They spawn over submerged timber, scoured sand and clay, and gravel substrates (SCDNR. 2015e).

In South Carolina, there appear to be populations in the Savannah River, one or more of the rivers flowing into St. Helena Sound (Ashepoo, Combahee, and Edisto Rivers), the Cooper River, the Santee River, and one or more Winyah Bay rivers (Pee Dee, Waccamaw, and Black). There may also be a landlocked ("damlocked") population in the Santee-Cooper Lake System (Lakes Marion and Moultrie and tributary rivers). Little is known about the status of any of these populations (SCDNR. 2020b).

The aquatic resources on the VCSNS site do not provide suitable habitat for the shortnose sturgeon. Moreover, there are no records of the species within the VCSNS site. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last 5 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022m).

E3.7.8.3 Species Protected under the Bald and Golden Eagle Protection Act

Bald eagles are protected under the BGEPA. There is at least one known eagle nest on the property at VCSNS and some within the adjoining Parr/Fairfield FERC project boundary. DE has communicated with SCDNR/USFWS about a fledgling that spent some time on the ground and eventually flew off on its own.

Current and future bald eagle nests located on the VCSNS site would be subject to all protections under the BGEPA. The BGEPA was originally enacted in 1940 (16 U.S.C. 668-668c) and it prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles, including their parts, nests, eggs, or feathers. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts resulting from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment (USFWS. 2022k).

E3.7.8.4 Species Protected under the Migratory Bird Treaty Act

In addition to species protected under federal and state endangered species acts, there are numerous bird species protected under the MBTA that may visit VCSNS. The MBTA makes it illegal

for anyone to take, possess, import, export, transport, sell, purchase, barter or offer for sale, or purchase or barter, any migratory bird, or the parts, nests, or eggs of such a bird, except under the terms of a valid permit issued pursuant to federal regulations.

The VCSNS site is located in the Atlantic Flyway, one of four administrative flyways established in North America to facilitate management of migratory birds and their habitats (USFWS. 2022l). Numerous species of migratory birds likely use the project corridor during the spring and fall migrations, as summer residents, and as winter visitors.

According to the USFWS, 14 birds of conservation concern have the potential to occur in Fairfield, Newberry, and Richland Counties, South Carolina: American kestrel (*Falco sparverius Paulus*), bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*Coccyzus erythropthalmus*), Cerulean warbler (*Dendroica cerulea*), eastern whip-poor-will (*Antrostomus vociferus*), Henslow's sparrow (*Ammodramus henslowii*), Kentucky warbler (*Oporornis formosus*), lesser yellowlegs (*Tringa flavipes*), Prairie warbler (*Dendroica discolor*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), swallow-tailed kite (*Elanoides forficatus*), and wood thrush (*Hylocichla mustelina*) (USFWS. 2023a).

Suitable habitat is potentially present on the VCSNS site and in the immediate vicinity for all of the species listed above. Henslow's sparrow, lesser yellowlegs, and rusty blackbird occur as migrants through Fairfield, Newberry and Richland Counties and may utilize stop-over habitat available onsite or in the vicinity. These species are known to breed elsewhere. The other 11 migratory bird species are known to breed in Fairfield, Newberry, and Richland Counties (USFWS. 2023a). Bald eagles are known to nest at the VCSNS site. One osprey nest was observed on the Met Tower in 2021.

DE maintains a Migratory Bird Special Purpose Utility Permit (SPUT) permit authorized by the USFWS, which authorizes utilities to collect, transport, and temporarily possess migratory birds found dead on utility property, structures, and ROWs for avian mortality monitoring or disposal purposes. The permit also authorizes relocating active or inactive migratory bird nests (except threatened/endangered species and eagles). DE submits annual reports of all activities conducted under the SPUT to the USFWS. When necessary, a SCDNR biologist is consulted for appropriate handling of nest removal. The permit has an expiration date of March 31, 2024.

DE maintains a Migratory Bird permit from the SCDNR, approval which is subject to the SPUT permit from the USFWS. The permit has an expiration date of December 31, 2023.

E3.7.8.5 Essential Fish Habitat

Essential fish habitat (EFH) is defined under the Magnuson-Stevens Fishery Conservation and Management Act and refers to waters and substrate necessary for fish to spawn, breed, feed or grow to maturity. The National Oceanic and Atmospheric Administration (NOAA) is responsible for

identifying and describing EFH for sharks, tuna, and other highly migratory species that cross regional boundaries. NOAA only provides EFH for federally managed fish and invertebrates.

A review of the NOAA EFH was conducted to determine the location of EFH within 6 miles of VCSNS. No EFH is located within the vicinity of VCSNS nor were any EFH areas protected from fishing. As habitat areas of particular concern (HAPC) are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of VCSNS. (NOAA. 2022b)

Table E3.7-1 Fish Species Recorded in Parr Reservoir

Common Name	Scientific Name
Black crappie	*Pomoxis nigromaculatus*
Blue catfish	*Ictalurus furcatus*
Bluegill	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Flat bullhead	*Ameiurus platycephalus*
Flathead catfish	*Pylodictis olivaris*
Gizzard shad	*Dorosoma cepedianum*
Golden shiner	*Notemigonus chrysoleucas*
Highfin carpsucker	*Carpoides velifer*
Largemouth bass	*Micropterus salmoides*
Longnose gar	*Lepisosteus osseus*
Northern hogsucker	*Hypentelium nigricans*
Notchlip redhorse	*Moxostoma collapsum*
Pumpkinseed	*Lepomis gibbosus*
Quillback	*Carpoides cyprinus*
Redbreast sunfish	*Lepomis auritus*
Redear sunfish	*Lepomis microlophus*
Robust redhorse	*Moxostoma robustum*
Sandbar shiner	*Notropis scepticus*
Shorthead redhorse	*Moxostoma macrolepidotum*
Smallmouth bass	*Micropterus dolomieu*
Spottail shiner	*Notropis hudsonius*
Threadfin shad	*Dorosoma petenense*
Warmouth	*Lepomis gulosus*
White bass	*Morone chrysops*
White catfish	*Ameiurus catus*
White perch	*Morone americana*
Whitefin shiner	*Cyprinella nivea*
Yellow bullhead	*Amierus natalis*
Yellow perch	*Perca flavescens*

(Kleinschmidt. 2018)

Table E3.7-2 Fish Families and Species Recorded in Monticello Reservoir Since 1983

Family Name	
Centrarchids	
Clupeids	
Ictalurids	
Catastomids	
Percids	
Common Name	**Scientific Name**
Black crappie	*Pomoxis nigromaculatus*
Blue catfish	*Ictalurus furcatus*
Bluegill	*Lepomis macrochirus*
Channel catfish	*Ictalurus punctatus*
Flat bullhead	*Ameiurus platycephalus*
Gizzard shad	*Dorosoma cepedianum*
Golden shiner	*Notemigonus chrysoleucas*
Largemouth bass	*Micropterus salmoides*
Northern hogsucker	*Hypentelium nigricans*
Notchlip redhorse	*Moxostoma collapsum*
Pumpkinseed	*Lepomis gibbosus*
Quillback	*Carpoides cyprinus*
Redbreast sunfish	*Lepomis auritus*
Redear sunfish	*Lepomis microlophus*
Robust redhorse	*Moxostoma robustum*
Shorthead redhorse	*Moxostoma macrolepidotum*
Smallmouth bass	*Micropterus dolomieu*
Snail bullhead	*Ameiurus brunneus*
Spottail shiner	*Notropis hudsonius*
Threadfin shad	*Dorosoma petenense*
Warmouth	*Lepomis gulosus*
White catfish	*Ameiurus catus*
White perch	*Morone americana*
Whitefin shiner	*Cyprinella nivea*
Yellow bullhead	*Amierus natalis*
Yellow perch	*Perca flavescens*

(Kleinschmidt. 2018; SCE&G. 2002; SCDNR. 2022a)

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 1 of 14)

Common Name	Species Name
Amphibians	
American toad	*Bufo [Anaxyrus] americanus*
Barking treefrog	*Hyla gratiosa*
Bird-voiced treefrog	*Hyla avivoca*
Blackbelly salamander	*Desmognathus quadramaculatus*
Brimley's chorus frog	*Pseudacris brimleyi*
Brownback salamander	*Eurycea aquatica*
Bullfrog	*Rana [Lithobates] catesbeiana*
Carpenter frog	*Rana [Lithobates] virgatipes*
Chamberlain's dwarf salamander	*Eurycea chamberlaini*
Cope's gray treefrog	*Hyla chrysoscelis*
Dwarf blackbelly salamander	*Desmognathus folkertsi*
Dwarf salamander	*Eurycea quadridigitata*
Dwarf siren	*Pseudobranchus striatus*
Dwarf waterdog	*Necturus punctatus*
Eastern narrowmouth toad	*Gastrophryne carolinensis*
Eastern spadefoot toad	*Scaphiopus holbrookii*
Flatwood's salamander	*Ambystoma cingulatum*
Four-toed salamander	*Hemidactylium scutatum*
Fowler's toad	*Bufo [Anaxyrus] fowleri*
Gopher frog	*Rana [Lithobates] capito*
Greater siren	*Siren lacertina*
Green salamander	*Aneides aeneus*
Green treefrog	*Hyla cinerea*
Green/bronze frog	*Rana [Lithobates] clamitans*
Jordan's salamander	*Plethodon jordani*
Lesser siren	*Siren intermedia*
Little grass frog	*Pseudacris ocularis*
Mabee's salamander	*Ambystoma mabeei*
Many-lined salamander	*Stereochilus marginatus*
Marbled salamander	*Ambystoma opacum*
Mole salamander	*Ambystoma talpoideum*
Mud salamander	*Pseudotriton montanus*
Northern cricket frog	*Acris crepitans*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 2 of 14)

Common Name	Species Name
Northern/spotted dusky salamander	*Desmognathus fuscus/conanti*
Oak toad	*Bufo [Anaxyrus] quercicus*
Ocoee dusky salamander	*Desmognathus ocoee*
Ornate chorus frog	*Pseudacris ornata*
Pickerel frog	*Rana [Lithobates] palustris*
Pig frog	*Rana [Lithobates] grylio*
Pine barrens treefrog	*Hyla andersonii*
Pine woods treefrog	*Hyla femoralis*
Red salamander	*Pseudotriton ruber*
Red-spotted newt	*Notophthalmus viridescens*
River frog	*Rana [Lithobates] hecksheri*
Seal salamander	*Desmognathus monticola*
Shovelnose salamander	*Desmognathus marmoratus*
Slimy salamander	*Plethodon glutinosus complex*
Southern appalachian salamander	*Plethodon teyahalee*
Southern chorus frog	*Pseudacris nigrita*
Southern cricket frog	*Acris gryllus*
Southern dusky salamander	*Desmognathus auriculatus*
Southern leopard frog	*Rana [Lithobates] sphenocephala*
Southern toad	*Bufo [Anaxyrus] terrestris*
Southern two-lined salamander	*Eurycea cirrigera*
Spotted salamander	*Ambystoma maculatum*
Spring peeper	*Pseudacris crucifer*
Spring salamander	*Gyrinophilus porphyriticus*
Squirrel treefrog	*Hyla squirella*
Three-lined salamander	*Eurycea guttolineata*
Tiger salamander	*Ambystoma tigrinum*
Two-toed amphiuma	*Amphiuma means*
Upland chorus frog	*Pseudacris feriarum*
Webster's salamander	*Plethodon websteri*
Wood frog	*Rana [Lithobates] sylvatica*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 3 of 14)

Common Name	Species Name
Reptiles	
American alligator	*Alligator mississippiensis*
Banded water snake	*Nerodia fasciata*
Black racer	*Coluber constrictor*
Black swamp snake	*Seminatrix pygaea*
Bog turtle	*Glyptemys muhlenbergii*
Box turtle	*Terrapene carolina*
Broadhead skink	*Eumeces [Plestiodon] laticeps*
Brown snake	*Storeria dekayi*
Brown water snake	*Nerodia taxispilota*
Canebrake/timber rattlesnake	*Crotalus horridus*
Chicken turtle	*Deirochelys reticularia*
Coachwhip	*Masticophis flagellum*
Coal skink	*Eumeces [Plestiodon] anthracinus*
Common musk turtle	*Sternotherus odoratus*
Common snapping turtle	*Chelydra serpentina*
Copperhead	*Agkistrodon contortrix*
Coral snake	*Micrurus fulvius*
Corn snake	*Elaphe [Pantherophis] guttata*
Cottonmouth/water moccasin	*Agkistrodon piscivorus*
Eastern diamondback rattlesnake	*Crotalus adamanteus*
Eastern fence lizard	*Sceloporus undulatus*
Eastern garter snake	*Thamnophis sirtalis*
Eastern glass lizard	*Ophisaurus ventralis*
Eastern hognose snake	*Heterodon platirhinos*
Eastern kingsnake	*Lampropeltis getula*
Eastern mud turtle	*Kinosternon subrubrum*
Eastern ribbon snake	*Thamnophis sauritus*
Five-lined skink	*Eumeces [Plestiodon] fasciatus*
Florida cooter	*Pseudemys floridana*
Florida softshell	*Apalone ferox*
Glossy crayfish snake	*Regina rigida*
Gopher tortoise	*Gopherus polyphemus*
Green anole	*Anolis carolinensis*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 4 of 14)

Common Name	Species Name
Green water snake	*Nerodia floridana*
Ground skink	*Scincella lateralis*
Island glass lizard	*Ophisaurus compressus*
Mediterranean gecko	*Hemidactylus turcicus*
Milk snake/scarlet kingsnake	*Lampropeltis triangulum*
Mimic glass lizard	*Ophisaurus mimicus*
Mole kingsnake	*Lampropeltis calligaster*
Mud snake	*Farancia abacura*
Northern water snake	*Nerodia sipedon*
Painted turtle	*Chrysemys picta*
Pigmy rattlesnake	*Sistrurus miliarius*
Pine snake	*Pituophis melanoleucus*
Pine woods snake	*Rhadinaea flavilata*
Queen snake	*Regina septemvittata*
Rainbow snake	*Farancia erytrogramma*
Rat snake	*Elaphe [Pantherophis] obsoleta*
Red-bellied snake	*Storeria occipitomaculata*
Red-bellied water snake	*Nerodia erythrogaster*
Ringneck snake	*Diadophis punctatus*
River cooter	*Pseudemys concinna*
Rough earth snake	*Virginia striatula*
Rough green snake	*Opheodrys aestivus*
Scarlet snake	*Cemophora coccinea*
Six-lined racerunner	*Cnemidophorus [Aspidoscelis] sexlineatus*
Slender glass lizard	*Ophisaurus attenuatus*
Slider turtle	*Trachemys scripta*
Smooth earth snake	*Virginia valeriae*
Southeastern crowned snake	*Tantilla coronata*
Southeastern five-lined skink	*Eumeces [Plestiodon] inexpectatus*
Southern hognose snake	*Heterodon simus*
Spiny softshell	*Apalone spinifera*
Spotted turtle	*Clemmys guttata*
Striped mud turtle	*Kinosternon baurii*
Worm snake	*Carphophis amoenus*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 5 of 14)

Common Name	Species Name
Mammals	
American Beaver	*Castor canadensis*
Big brown bat	*Eptesicus fuscus*
American Black bear	*Ursus americanus*
Bobcat	*Lynx rufus*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Coyote	*Canis latrans*
Eastern red bat	*Lasiurus borealis*
Eastern small-footed bat	*Myotis leibii*
Evening bat	*Nycticeius humeralis*
Gray fox	*Urocyon cineroargenteus*
Hoary bat	*Lasiurus cinereus*
Little brown bat	*Myotis lucifugus*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Common Muskrat	*Ondatra zibethica*
Northern long-eared bat	*Myotis septentrionalis*
Northern yellow bat	*Lasiurus intermedius*
Virginia Opossum	*Didelphis virginiana*
Raccoon	*Procyon lotor*
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*
Red fox	*Vulpes vulpes*
River otter	*Lutra canadensis*
Seminole bat	*Lasiurus seminolus*
Silver-haired bat	*Lasionycteris noctivagans*
Southeastern bat	*Myotis austroriparius*
Southern fox squirrel	*Sciurus niger niger*
Spotted skunk	*Spilogale putorius*
Striped skunk	*Mephitis mephitis*
Tricolored bat	*Perimyotis subflavus*
White-tailed deer	*Odocoileus virginianus*
Wild hog	*NA*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 6 of 14)

Common Name	Species Name
Birds	
Acadian flycatcher	*Empidonax virescens*
American bittern	*Botaurus lentiginosus*
American black duck	*Anas rubripes*
American coot	*Fulica americana*
American crow	*Corvus brachyrhynchos*
American golden-plover	*Pluvialis dominica*
American goldfinch	*Spinus tristis*
American kestrel	*Falco sparverius*
American pipit	*Anthus rubescens*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
American white pelican	*Pelecanus erythrorhynchos*
American wigeon	*Mareca americana*
American woodcock	*Scolopax minor*
Anhinga	*Anhinga anhinga*
Bachman's sparrow	*Peucaea aestivalis*
Bald eagle	*Haliaeetus leucocephalus*
Baltimore oriole	*Icterus galbula*
Bank swallow	*Riparia riparia*
Barn owl	*Tyto alba*
Barn swallow	*Hirundo rustica*
Barred owl	*Strix varia*
Bay-breasted warbler	*Setophaga castanea*
Belted kingfisher	*Megaceryle alcyon*
Bicknell's thrush	*Catharus bicknelli*
Black tern	*Chlidonias niger*
Black vulture	*Coragyps atratus*
Black-and-white warbler	*Mniotilta varia*
Black-bellied plover	*Pluvialis squatarola*
Black-bellied whistling-duck	*Dendrocygna autumnalis*
Black-billed cuckoo	*Coccyzus erythropthalmus*
Blackburnian warbler	*Setophaga fusca*
Black-crowned night-heron	*Nycticorax nycticorax*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 7 of 14)

Common Name	Species Name
Blackpoll warbler	*Setophaga striata*
Black-throated blue warbler	*Setophaga caerulescens*
Black-throated green warbler	*Setophaga virens*
Blue grosbeak	*Passerina caerulea*
Blue jay	*Cyanocitta cristata*
Blue-gray gnatcatcher	*Polioptila caerulea*
Blue-headed vireo	*Vireo solitarius*
Blue-winged teal	*Spatula discors*
Blue-winged warbler	*Vermivora cyanoptera*
Bobolink	*Dolichonyx oryzivorus*
Bonaparte's gull	*Chroicocephalus philadelphia*
Broad-winged hawk	*Buteo platypterus*
Brown creeper	*Certhia americana*
Brown pelican	*Pelecanus occidentalis*
Brown thrasher	*Toxostoma rufum*
Brown-headed cowbird	*Molothrus ater*
Brown-headed nuthatch	*Sitta pusilla*
Buff-breasted sandpiper	*Calidris subruficollis*
Bufflehead	*Bucephala albeola*
Calliope hummingbird	*Selasphorus calliope*
Canada goose	*Branta canadensis*
Canada warbler	*Cardellina canadensis*
Canvasback	*Aythya valisineria*
Cape may warbler	*Setophaga tigrina*
Carolina chickadee	*Poecile carolinensis*
Carolina wren	*Thryothorus ludovicianus*
Caspian tern	*Hydroprogne caspia*
Cattle egret	*Bubulcus ibis*
Cedar waxwing	*Bombycilla cedrorum*
Cerulean warbler	*Setophaga cerulea*
Chestnut-sided warbler	*Setophaga pensylvanica*
Chimney swift	*Chaetura pelagica*
Chipping sparrow	*Spizella passerina*
Chuck-will's-widow	*Antrostomus carolinensis*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 8 of 14)

Common Name	Species Name
Cliff swallow	*Petrochelidon pyrrhonota*
Common gallinule	*Gallinula galeata*
Common goldeneye	*Bucephala clangula*
Common grackle	*Quiscalus quiscula*
Common ground dove	*Columbina passerina*
Common loon	*Gavia immer*
Common merganser	*Mergus merganser*
Common nighthawk	*Chordeiles minor*
Common redpoll	*Acanthis flammea*
Common tern	*Sterna hirundo*
Common yellowthroat	*Geothlypis trichas*
Connecticut warbler	*Oporornis agilis*
Cooper's hawk	*Accipiter cooperii*
Dark-eyed junco	*Junco hyemalis*
Dickcissel	*Spiza americana*
Double-crested cormorant	*Nannopterum auritum*
Downy woodpecker	*Dryobates pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe	*Sayornis phoebe*
Eastern screech-owl	*Megascops asio*
Eastern towhee	*Pipilo erythrophthalmus*
Eastern whip-poor-will	*Antrostomus vociferus*
Eastern wood-pewee	*Contopus virens*
Eurasian collared-dove	*Streptopelia decaocto*
European starling	*Sturnus vulgaris*
Evening grosbeak	*Coccothraustes vespertinus*
Field sparrow	*Spizella pusilla*
Fish crow	*Corvus ossifragus*
Forster's tern	*Sterna forsteri*
Fox sparrow	*Passerella iliaca*
Gadwall	*Mareca strepera*
Glossy ibis	*Plegadis falcinellus*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 9 of 14)

Common Name	Species Name
Golden eagle	*Aquila chrysaetos*
Golden-crowned kinglet	*Regulus satrapa*
Golden-winged warbler	*Vermivora chrysoptera*
Grasshopper sparrow	*Ammodramus savannarum*
Gray kingbird	*Tyrannus dominicensis*
Gray-cheeked thrush	*Catharus minimus*
Great blue heron	*Ardea herodias*
Great crested flycatcher	*Myiarchus crinitus*
Great egret	*Ardea alba*
Great horned owl	*Bubo virginianus*
Great shearwater	*Ardenna gravis*
Greater scaup	*Aythya marila*
Greater white-fronted goose	*Anser albifrons*
Greater yellowlegs	*Tringa melanoleuca*
Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Hairy woodpecker	*Dryobates villosus*
Harris's sparrow	*Zonotrichia querula*
Hermit thrush	*Catharus guttatus*
Herring gull	*Larus argentatus*
Hooded merganser	*Lophodytes cucullatus*
Hooded warbler	*Setophaga citrina*
Horned grebe	*Podiceps auritus*
Horned lark	*Eremophila alpestris*
House finch	*Haemorhous mexicanus*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Indigo bunting	*Passerina cyanea*
Kentucky warbler	*Geothlypis formosa*
Killdeer	*Charadrius vociferus*
King rail	*Rallus elegans*
Laughing gull	*Leucophaeus atricilla*
Least flycatcher	*Empidonax minimus*
Least sandpiper	*Calidris minutilla*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 10 of 14)

Common Name	Species Name
LeConte's sparrow	*Ammospiza leconteii*
Lesser scaup	*Aythya affinis*
Lesser yellowlegs	*Tringa flavipes*
Limpkin	*Aramus guarauna*
Lincoln's sparrow	*Melospiza lincolnii*
Little blue heron	*Egretta caerulea*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed dowitcher	*Limnodromus scolopaceus*
Long-tailed duck	*Clangula hyemalis*
Louisiana waterthrush	*Parkesia motacilla*
Magnolia warbler	*Setophaga magnolia*
Mallard	*Anas platyrhynchos*
Marbled godwit	*Limosa fedoa*
Marsh wren	*Cistothorus palustris*
Merlin	*Falco columbarius*
Mississippi kite	*Ictinia mississippiensis*
Monk parakeet	*Myiopsitta monachus*
Mourning dove	*Zenaida macroura*
Mourning warbler	*Geothlypis philadelphia*
Mute swan	*Cygnus olor*
Nashville warbler	*Leiothlypis ruficapilla*
Northern bobwhite	*Colinus virginianus*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Northern harrier	*Circus hudsonius*
Northern mockingbird	*Mimus polyglottos*
Northern parula	*Setophaga americana*
Northern pintail	*Anas acuta*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Northern saw-whet owl	*Aegolius acadicus*
Northern shoveler	*Spatula clypeata*
Northern waterthrush	*Parkesia noveboracensis*
Olive-sided flycatcher	*Contopus cooperi*
Orange-crowned warbler	*Leiothlypis celata*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 11 of 14)

Common Name	Species Name
Orchard oriole	*Icterus spurius*
Osprey	*Pandion haliaetus*
Ovenbird	*Seiurus aurocapilla*
Pacific loon	*Gavia pacifica*
Painted bunting	*Passerina ciris*
Palm warbler	*Setophaga palmarum*
Pectoral sandpiper	*Calidris melanotos*
Peregrine falcon	*Falco peregrinus*
Philadelphia vireo	*Vireo philadelphicus*
Pied-billed grebe	*Podilymbus podiceps*
Pileated woodpecker	*Dryocopus pileatus*
Pine siskin	*Spinus pinus*
Pine warbler	*Setophaga pinus*
Prairie warbler	*Setophaga discolor*
Prothonotary warbler	*Protonotaria citrea*
Purple finch	*Haemorhous purpureus*
Purple martin	*Progne subis*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-breasted merganser	*Mergus serrator*
Red-breasted nuthatch	*Sitta canadensis*
Red-cockaded woodpecker	*Dryobates borealis*
Red-eyed vireo	*Vireo olivaceus*
Redhead	*Aythya americana*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-necked grebe	*Podiceps grisegena*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-throated loon	*Gavia stellata*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aythya collaris*
Rock pigeon	*Columba livia*
Roseate spoonbill	*Platalea ajaja*
Rose-breasted grosbeak	*Pheucticus ludovicianus*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 12 of 14)

Common Name	Species Name
Ross's goose	*Anser rossii*
Royal tern	*Thalasseus maximus*
Ruby-crowned kinglet	*Corthylio calendula*
Ruby-throated hummingbird	*Archilochus colubris*
Ruddy duck	*Oxyura jamaicensis*
Rufous hummingbird	*Selasphorus rufus*
Rusty blackbird	*Euphagus carolinus*
Sanderling	*Calidris alba*
Sandhill crane	*Antigone canadensis*
Sandwich tern	*Thalasseus sandvicensis*
Savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
Scarlet tanager	*Piranga olivacea*
Sedge wren	*Cistothorus stellaris*
Semipalmated plover	*Charadrius semipalmatus*
Semipalmated sandpiper	*Calidris pusilla*
Sharp-shinned hawk	*Accipiter striatus*
Short-billed dowitcher	*Limnodromus griseus*
Short-eared owl	*Asio flammeus*
Snow goose	*Anser caerulescens*
Snowy egret	*Egretta thula*
Snowy owl	*Bubo scandiacus*
Solitary sandpiper	*Tringa solitaria*
Song sparrow	*Melospiza melodia*
Sora	*Porzana carolina*
Spotted sandpiper	*Actitis macularius*
Stilt sandpiper	*Calidris himantopus*
Summer tanager	*Piranga rubra*
Surf scoter	*Melanitta perspicillata*
Swainson's hawk	*Buteo swainsoni*
Swainson's thrush	*Catharus ustulatus*
Swainson's warbler	*Limnothlypis swainsonii*
Swallow-tailed kite	*Elanoides forficatus*
Swamp sparrow	*Melospiza georgiana*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 13 of 14)

Common Name	Species Name
Tennessee warbler	*Leiothlypis peregrina*
Tree swallow	*Tachycineta bicolor*
Tricolored heron	*Egretta tricolor*
Tufted titmouse	*Baeolophus bicolor*
Turkey vulture	*Cathartes aura*
Veery	*Catharus fuscescens*
Vesper sparrow	*Pooecetes gramineus*
Virginia rail	*Rallus limicola*
Western sandpiper	*Calidris mauri*
Western tanager	*Piranga ludoviciana*
White ibis	*Eudocimus albus*
White-breasted nuthatch	*Sitta carolinensis*
White-crowned sparrow	*Zonotrichia leucophrys*
White-eyed vireo	*Vireo griseus*
White-rumped sandpiper	*Calidris fuscicollis*
White-tailed kite	*Elanus leucurus*
White-throated sparrow	*Zonotrichia albicollis*
White-winged crossbill	*Loxia leucoptera*
White-winged scoter	*Melanitta deglandi*
Wild turkey	*Meleagris gallopavo*
Willet	*Tringa semipalmata*
Willow flycatcher	*Empidonax traillii*
Wilson's snipe	*Gallinago delicata*
Wilson's warbler	*Cardellina pusilla*
Winter wren	*Troglodytes hiemalis*
Wood duck	*Aix sponsa*
Wood stork	*Mycteria americana*
Wood thrush	*Hylocichla mustelina*
Worm-eating warbler	*Helmitheros vermivorum*
Yellow rail	*Coturnicops noveboracensis*
Yellow warbler	*Setophaga petechia*
Yellow-bellied flycatcher	*Empidonax flaviventris*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Yellow-billed cuckoo	*Coccyzus americanus*

Table E3.7-3 Terrestrial Species Likely to be Observed in Fairfield, Richland, and Newberry Counties, South Carolina (Sheet 14 of 14)

Common Name	Species Name
Yellow-breasted chat	*Icteria virens*
Yellow-crowned night-heron	*Nyctanassa violacea*
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*
Yellow-rumped warbler	*Setophaga coronata*
Yellow-throated vireo	*Vireo flavifrons*
Yellow-throated warbler	*Setophaga dominica*

(ebird. 2022a; ebird. 2022b; ebird. 2022c; SCDNR. 2022f)

Table E3.7-4 Threatened and Endangered Species Listed for Fairfield, Richland, and Newberry Counties, South Carolina

Common Name	Scientific Name	Federal Status	State Status
Plants			
American chaffseed	*Schwalbea americana*	Endangered	N/A
Canby's dropwort	*Oxypolis canbyi*	Endangered	N/A
Michaux's sumac	*Rhus michauxii*	Endangered	N/A
Rough-leaved loosestrife	*Lysimachia asperulifolia*	Endangered	N/A
Smooth coneflower	*Echinacea laevigata*	Endangered	N/A
Schweinitz's sunflower	*Helianthus schweinitzii*	Endangered	N/A
Mussels			
Carolina heelsplitter	*Lasmigona decorata*	Endangered	N/A
Insects			
Monarch butterfly	*Danaus plexippus*	Candidate	N/A
Fish			
Carolina pygmy sunfish	*Elassoma boehlkei*	N/A	Threatened
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered	Endangered
Amphibians			
Carolina gopher frog	*Lithobates capito*	N/A	Endangered
Pine Barrens treefrog	*Hyla andersonii*	N/A	Threatened
Reptiles			
Southern hognose snake	*Heterodon simus*	N/A	Threatened
Spotted turtle	*Clemmys guttata*	N/A	Threatened
Birds			
Bald eagle	*Haliaeetus leucocephalus*	N/A	Threatened
Wood stork	*Mycteria americana*	Endangered	Endangered
Red-cockaded woodpecker	*Dryobates borealis*	Endangered	Endangered
Mammals			
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	N/A	Endangered
West Indian manatee	*Trichechus manatus*	Threatened	N/A

(USFWS. 2023a; SCDNR. 2022c)

Figure E3.7-1 NWI Wetlands, 6-Mile Radius

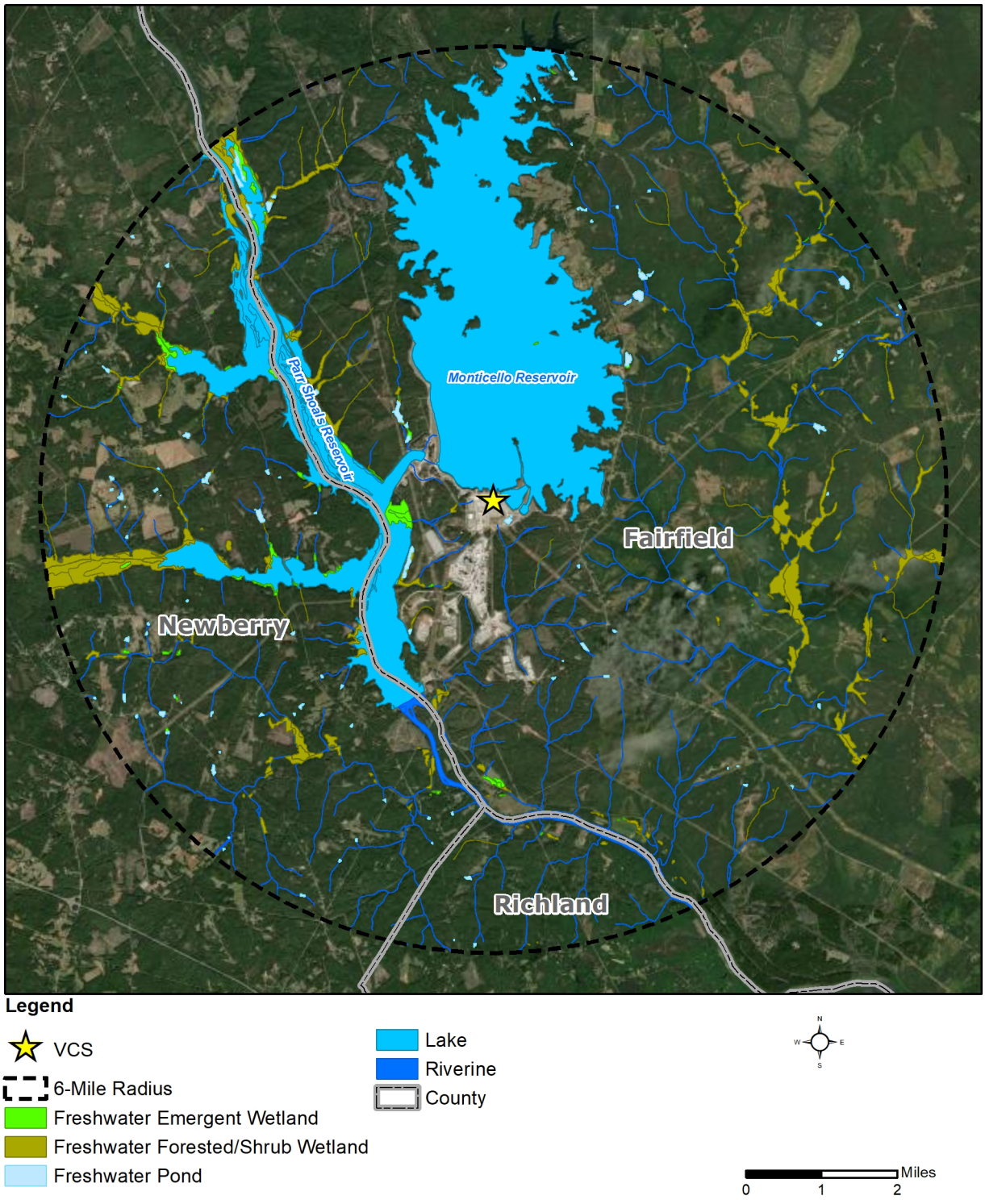


Figure E3.7-2 NWI Wetlands, Onsite Map

E3.8 HISTORIC AND CULTURAL RESOURCES

Cultural resources include prehistoric era and historic era archaeological sites and objects, architectural properties and districts, and traditional cultural properties, which are defined as significant objects or places important to Native American Tribes for maintaining their culture (USDOI. 1998). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act of 1966 (NHPA) [Public Law 89-675].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.
- Afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertaking.

To provide early consultation for the Section 106 process, DE contacted the South Carolina Department of Archives and History for informal consultation concerning the VCSNS SLR and potential effects on cultural resources within the approximately 2,200-acre site and on historic properties within a 6-mile radius of VCSNS. Native American groups recognized as potential stakeholders were also consulted by DE with the opportunity for comment. Correspondence from DE is included in Attachment C.

This ER identifies all known archaeological sites within a 6-mile radius of VCSNS, as well as properties listed on the NRHP within that same radius. For the purpose of the SLR, the aboveground area of potential effects (APE) is defined as the entire VCSNS property and everything within a 6-mile radius of VCSNS. The aboveground APE considers the visual integrity of historical properties in relation to continued VCSNS operation. The archaeological APE is considered bounded by the approximately 2,200-acre VCSNS site, where ground disturbance, though unanticipated during the license renewal period of extended operation, might compromise the physical integrity of archaeological data.

No ground disturbance associated with VCSNS is considered within the scope of the 10 CFR 51 evaluation. As such, the SLR consists of an administrative action relative to historic and cultural resources. Although construction of the existing VCSNS facility and Monticello Reservoir would have impacted any archaeological resources that may have been located within their respective footprints, much of the surrounding area remains largely undisturbed. There have been six previous

cultural resource surveys within portions of the 2,200-acre VCSNS property and extending out from the property (Table E3.8-1).

The literature review of previously recorded cultural sites included the area within a 6-mile radius of VCSNS. The purpose of the literature review was to help develop an understanding of the local context by conducting an inventory of all previously and newly recorded archaeological sites on the 2,200-acre VCSNS property and within a 6-mile radius of VCSNS, regardless of NRHP status.

The results of the literature review showed that there are 201 cultural resources previously recorded within 6 miles of VCSNS. (SCIAA + SCDAH. 2022a; SCIAA + SCDAH. 2022b) Of these 201 cultural resources, 14 resources are NRHP listed, 8 resources have been determined eligible for the NRHP, 6 resources are listed as potentially eligible, 23 resources have not been assessed, 43 resources are listed as probably not eligible, 105 resources are not eligible, and 2 resources were recommended for testing/further work (Tables E3.8-2 and E3.8-3).

E3.8.1 LAND USE HISTORY

The land use history for VCSNS and the surrounding region was developed as part of a Phase 2A literature review and archaeological sensitivity assessment of the VCSNS property and is summarized here. Section E3.8.2 provides a more detailed discussion of historical land use. Previous to construction, the VCSNS property was predominantly forest (Figure E3.8-2). The current land use is discussed in detail in Section E3.2, and the land use categories are summarized in Figure E3.2-1. There are 14 land use/land cover categories within the 2,200-acre VCSNS property discussed in Section E3.2.

Early maps provide information on how the area was used in the past. Colton's 1865 South Carolina Map (Figure E3.8-1) depicts the vicinity of the VCSNS site with townsites listed as Monticello, McMeekins, and Thompson on the east side of the Broad River, with Hope and Pomaria on the west side of the river. Infrastructure in the region includes roads connecting the communities of Monticello, McMeekins, and Thompson in Fairfield County with the surrounding counties of Richardson, Lexington, Newberry, Union, and Chester. The Spartanburg Railroad is depicted paralleling the east side of the Broad River and a spur crosses the river to Hope, Pomaria, Prosperity, and on to Newberry. The USGS 1904 Columbia map (Figure E3.8-2) depicts increasing settlement and infrastructure development of railways, roads, and trails in the region.

The composite USGS Jenkinsville (1969), Salem Crossroads (1969), Rion (1969), Richtex (1971), Chapin (1971), Little Mountain (1971), and Pomaria (1969) quad maps shows the 6-mile region as a mosaic of woodlands surrounding Parr Shoals Reservoir with cleared areas for agricultural lands, power lines, and residential development (Figure E3.8-3). The composite 1969 USGS map shows the 2,200-acre VCSNS site as primarily undeveloped land with a powerline corridor on the west margin of the site, a few jeep trails in the central and northwest portions of the site, and a small

clearing with a couple of roads and five structures on the east margin of the site, and a second clearing to the southwest of the roads and houses (Figure E3.8-3).

Photographs taken prior to, during, and after the construction of the VCSNS facility are useful in showing the environmental context during that time period. As the earlier USGS maps discussed above, at the time of construction the VCSNS facility and reservoir area consisted of undeveloped forest and rangeland, remnants of small communities, and agricultural fields. At the construction site, the trees and brush were removed, and the area was mechanically leveled (Figures E3.8-4, E3.8-5, E3.8-6, and E3.8-7). Construction included excavation for the VCSNS facility components (Figures E3.8-4, E3.8-5, and E3.8-6). Final construction of the VCSNS facility included multiple buildings, structures, and parking lots on a peninsula surrounded primarily by Monticello Reservoir and forest (Figures E3.8-7, E3.8-8, E3.8-9, and E3.8-10).

The VCSNS property and the surrounding region hold evidence of both prehistoric and historic occupation by Native Americans and Euro-Americans. Archaeological records suggest that the VCSNS property and the surrounding area were potentially occupied by Native American populations during the Archaic Period (ca. 8000 BC to 3300 BC), the Woodland Period (ca. 3000 BC to 1000 AD), and the Mississippian Period (ca. 1000 to 1520 AD).

E3.8.2 CULTURAL HISTORY

E3.8.2.1 Paleoindian Period (Prior to 8000 BC)

The Paleoindian Period is the earliest substantiated cultural adaptation in South Carolina (SCE&G. 2022a). Due to lower global temperatures, more water was trapped in glaciers resulting in a larger area of the continental shelf being exposed. Paleoindian peoples tended to live in small bands which traveled seasonally within set territories for food sources that included hunting megafauna, caribou, elk, and deer (SCE&G. 2022a). Many of these bands likely lived along large rivers for access to higher resource areas. These same resource areas commonly have lithic resources suitable for tool manufacture. The material culture is characterized by large, fluted points such as the Clovis and the Middle Paleo Point. Later point types, such as Hardaway Side Notched, Hardaway Blade, and Hardaway-Dalton no longer exhibited fluting, but retained a high level of technical sophistication indicative of Paleoindian tools. Subsistence of Paleoindian peoples focused on large game as well as small game, fishing, and foraging. A more diversified view of the Paleoindian economy is becoming accepted as a result of recent research, in contrast to the previous view emphasizing a heavy reliance on the exploitation of megafauna. Paleoindian sites are primarily located in locations where large streams entered major rivers (Judge. 2017).

E3.8.2.2 Archaic (8000 to 3000 BC)

The Archaic Period is marked by changes in subsistence and settlement patterns likely associated with rising sea levels related to glacial melt. This period is divided into the Early, Middle, and Late Archaic and is characterized by the exploitation of a larger variety of plant and animal resources with an overall greater diversity in material culture. The transition to the Early Archaic Period is inferred to include a less mobile and more localized lifestyle than the preceding Paleoindian Period. Projectile points no longer exemplified the intricate work characteristic of Paleoindian tools. Early Archaic tools such as spear points, knives, drills, scrappers, and gravers were still used, but varied in size and shape and were often fashioned with side or corner notches to allow for hafting. (Judge. 2017)

By the Middle Archaic, the "tool kit" is inferred to have expanded to include atlatls for hunting with notched and stemmed points as well as mortars and pestles for food processing. Stone axes became common for obtaining wood for structures and fire, suggesting a greater level of sedentism with mostly egalitarian social organization. The occurrence of steatite and soapstone bowls and early pottery also suggests longer term occupations and more intense resource exploitation. During this period, the first inland shell middens were constructed, and long-distance trade was established. (SCDAH. 2022)

The Late Archaic had important innovations such as tribal societies, clay pottery vessels, shell rings, and three-quarter grooved axes. (Judge. 2017) The earliest known house in South Carolina is from this period on Hilton Head Island. Shell middens were used as architectural materials to construct 15 large shell ring complexes along the outer coastal plain. (Judge. 2017) Overall, the exploitation strategy during the Archaic Period appears to have been a mostly mobile population conducting hunting and foraging activities around a seasonal movement strategy based on the state's major river systems, exploiting resources from the coast, to the coastal plain, to the Piedmont. (Judge. 2017)

E3.8.2.3 Woodland (3000 BC to 1000 AD)

The Woodland Period is characterized by increasing horticultural expertise, widespread adoption of ceramic technology, and increasing sedentism and social complexity, when compared to the previous Archaic Period (SCDAH. 2022). Early Woodland settlements in the upper coastal plain indicate a shift away from riverine settings, with small, semiautonomous groups living in the uplands at sites containing relatively few artifacts and little artifact diversity (SCE&G. 2022a).

The Middle Woodland is not currently well documented in South Carolina, particularly in non-coastal areas. A large site found in the Savannah River Valley suggests a year-round settlement occupied by a small resident population. This site contains several hundred pits, posts, and human and dog burials. (SCE&G. 2022a) Smaller sites, located in the coastal plains, contained few features and little artifact density, suggesting the presence of hunting/butchering camps. The

diet continued to include aquatic and game resources but began to include more plants. The carbohydrate-rich diet, evident in human bone analysis, suggests an increase in agriculture and less reliance on hunting and foraging. Smaller projectile points, resulting from the conversion from atlatls and darts to the bow and arrow and celts appear. There appeared to be a pattern where small villages were occupied on a year-round basis, with smaller outlying sites representing seasonally occupied special purpose camps. (SCE&G. 2022a)

By the Late Woodland, political stratification was evident within permanent and semi-permanent large villages, some located within palisades, suggesting an increase in intercommunity violence across the larger region. Agriculture appears to have increased in importance, particularly corn and squash. However, foraging and hunting comprised the bulk of the diet. Sites from this time period are rarely discovered in South Carolina, in particular, the South Carolina Piedmont, and it is possible this was a buffer zone for warring groups. (SCE&G. 2022a)

E3.8.2.4 The Mississippian Period (100 to 1520 AD)

This last period before contact with Europeans is characterized by the practice of maize agriculture and stratified societies known as chiefdoms. Settlements included populous villages, and zones of dispersed housing. These groups constructed earthen mounds in some of the villages, usually along the floodplains of major rivers (SCDAH. 2022). The mounds were built in stages with temples and the houses of the chief often erected on the summits of these truncated pyramids. The buildings were burned down, and a new layer of earth added over the top when the chief died before the new chief's home was built on top of the fresh layer. (Judge. 2017) The mound centers were supported by outlying villages, also typically built along major rivers, smaller hamlets, and farmsteads to provide food, tribute, services, and labor to the chief in return for protection and inclusion in the sociopolitical system. (SCE&G. 2022a) Trade networks were extensive, and exchanged resources included marine shell, copper, and exotic lithic materials. These items, in turn, could be fashioned into jewelry or other items of status for the elites of the society. Non-mound sites are also common across South Carolina, and are recognized through the presence of carved, paddle-stamped designs on exterior surfaces of their pottery. The arrival of the Spanish explorers in the early to mid-sixteenth century brought an end to the Mississippian Period and changed the trajectory of Native American culture. (Judge. 2017)

E3.8.2.5 Exploratory Period (1520 to 1670 AD)

The Exploratory Period begins with the arrival of Europeans. At that time, the area was the home of numerous Native American groups. The Spanish made contact in South Carolina in 1526 and they had a mission concept meant to bring the native population under their control. They established La Florida, with Santa Elena as the capital. The Spanish were followed by the French in 1562, who established Charlesfort on present day Parris Island, but it was abandoned shortly thereafter.

These early settlement attempts resulted in a severe reduction of the Native American populations due to the introduction of European and African diseases to which the Native population had no immunity. (SCDAH. 2022)

E3.8.2.6 Historic Period (1670 to Present)

The Historic Period begins with colonization by the British in late 1600s. The English colonial economy excelled on deerskin trade and slave-labor plantations. Early settlement in South Carolina was along the coast in the low country. (SCE&G. 2022a; SCE&G. 2022b) Trading posts, such as Ninety-Six, were established to help facilitate the deerskin trade in the region. Although the European traders had traveled through the Midlands in the early 1700s, settlement did not begin in the Midland region until the mid-1700s. (SCDAH. 2022; SCE&G. 2022a) The first European to arrive in the immediate VCSNS region settled along the Broad, Little and Wateree Rivers between 1740 and 1770. (SCE. 2022a; SCE&G. 2022a; SCE&G. 2022b) Various Tribes from the southeast, including the Cherokee, tried to remove the colonists, and Cherokee raiding of the backcountry settlements was an issue until 1761 with the Treaty of Peace and Friendship (SCE&G. 2022b). The key archaeological features of this period are a severe reduction in Native American materials replaced with industrial mass-produced European-American materials, English trade items, firearms, and glass beads.

During the 1760s, the settlers in the Midlands and upland backcountry refocused their attention on other issues particular to this region, and on a broader scale in the colonies in general. The coastal and lowland area settlers had developed schools, a court system, and churches, while the Midland and uplands lacked the former two elements under the British Colonial government in Charleston. Lawlessness was an issue that resulted in the regional development of Regulators to bring order and justice to the area. The Regulators activities were not always positive, and many found themselves arrested by the colonial government as a result of their actions. The agitation by the Regulators for justice and equality did result in the establishment of the Camden District after the passage of the Circuit Court Act of 1769. (SCE. 2022a, SCE&G. 2022a, SCE&G. 2022b) When the Revolutionary War broke out in the mid-1770s, most of the residents of the region sought to remain neutral, resulting in the compromise of 1775 which essentially allowed the region to be left alone by the provincial government until 1780. (SCE&G. 2022a) Despite the earlier neutrality, the battles moved inland, and the conflict affected the region with battles occurring in modern Fairfield and Newberry Counties in the early 1780s. Due to a fear of the British arising from several war atrocities, many locals joined the patriots and helped defeat the troops and loyalists of the British, driving them from South Carolina during the Revolutionary War. (SCE&G. 2022a, SCE&G. 2022b, SCE. 2022a)

During the period between the Revolutionary War and the Civil War, the backcountry remained initially fairly isolated, and consisted of small farms focused primarily on livestock, grain production

and subsistence farming. The introduction of the cotton gin in 1790 changed the economic basis for many in the region. The short staple variety of cotton was easier to grow and required little capital but yielded 150 to 250 pounds of cotton per acre. The new cotton generated wealth enabled many Newberry and Fairfield residents to become slave holders. During the period between 1800 and 1810 the slave population doubled; in Newberry County it rose from 2,204 to 4,006, while Fairfield County saw an increase from 1,968 to 4,034. (SCE&G. 2022b) During the subsequent antebellum period the high profits from cotton led to an increase in the size of plantations and the overall production of cotton. By 1840 the Fairfield County planters were among the largest cotton producers in the Midlands and contributed to the construction of the Charlotte and South Carolina Railroad through the district. (SCE. 2022a; SCE&G. 2022a) While the planter class may have prospered during the antebellum, overall, the white population of the region was decreasing as residents in the region sought fresh lands and new opportunities further west. (SCE. 2022a) By the 1850s, slaves comprised over 60% of the population in the Fairfield District, and over 60% of the population of Newberry and Richland Districts in 1860. (SCE. 2022a; SCE&G. 2022a)

The secession movement thrived in the cotton production regions and the representatives from the Fairfield, Newberry, and Richland Districts were among the unanimous signatures of the Ordinance of Secession in December 1860. (SCE. 2022a; SCE&G. 2022a) Initially, the area of the VCSNS was not directly impacted by the Civil War, but by 1865 troops under the direct command of General Sherman were marching from Savannah to Columbia, overtaking the city on the morning of February 17, 1865. The march continued north and with both the left wing and the right wing of Sherman's army then setting their sights on Winnsboro. Enroute, the left wing crossed the Broad River at the town of Alston, just south of the VCSNS site on February 19 and 20, 1865, with the calvary proceeding directly through the community of Monticello. Winnsboro fell to the Union on February 21,1865, and was subsequently pillaged and burned. (SCE&G. 2022b)

The post-war Reconstruction was difficult for everyone in the South. Post-war land values had dropped to 25% of their prewar value. The soldiers returning home found the decaying housing and land was left fallow. (SCE&G. 2022b) Agriculture began to recover, although crop production was lowest in the early Reconstruction era. Some farmers initially turned to food crops, while others planted cotton to quickly pay off debts. The lack of slave labor made most of the plantations unprofitable and led to the breakup of the plantation system.

As elsewhere in the United States in the late 19th century tenant farming and sharecropping developed in South Carolina as a means for the landless class to continue farming to support their families. By the 1880s, the overproduction of cotton caused the cotton market to collapse, increasing the debts of the farmer. (SCE&G. 2022a) As cotton prices fell steadily from 1881 to 1886, many tenant, sharecroppers and yeoman farmers found themselves with little money or food. Industry other than agriculture began to recover after the war as well. The Newberry Cotton Mill opened in 1884 as the first fully steam powered textile mill in South Carolina. While the original mill

featured 600 spindles and 200 looms, the mill was expanded in 1895 and again in 1910. (SCE&G. 2022b) Additional mills opened in the region, including the Columbia Mill in Richland County, and the Fairfield Mills, centered in Winnsboro. From 1895 to 1907, manufacturing in the region grew to support 61 such mills. (SCE&G. 2022a; SCE&G. 2022b; SCE. 2022b) The Columbia Mill opened in 1893 was the first fully electric textile mill in the region. SCE&G. 2022a) The textile mills throughout the region continued to develop as the agricultural industry declined in the region due to worn out, depleted soils. The mills increased the demand for electricity regionally and many new innovations in the techniques and technology for harnessing hydroelectric power occurred between 1895 and 1915, leading to the development of a new project of the Broad and Saluda Rivers to provide adequate, standardized electric power for the region. (SCE&G. 2022a; SCE&G. 2022b)

The industrial and manufacturing industries continued their growth and the economy diversified in the early 20th century. Manufacturing, logging of both timber and pulpwood, granite mining, and bottling companies have been some of the major industries of the region. (SCE. 2022a, SCE. 2022b) Infrastructure development has been one of the leading contributors to the regional economy, as it has supplied the transportation needs via roadways and railways, and the electric supply via the construction of hydroelectric power plants on the regional rivers to support the growing manufacturing industries of South Carolina, and the burgeoning needs of the machinations of State Government and the growing population in Columbia. (SCE&G. 2022a, SCE&G. 2022b) The early plans for hydroelectric development on the Broad River at Parr Shoals began with Henry Larkin Parr commissioning a survey of his family's property for the development of canal power at the site of a former milling operation. The results of the survey indicated the possibility of a much more substantial hydroelectric facility. After years of promotional efforts, and changes in project ownership, the Columbia Railway, Gas and Electric Company acquired the rights to the project and began construction of the coffer dams for the project in July 1912, and on May 30, 1914, the dam and hydroelectric plant were commissioned and put into service. (SCE&G. 2022b)

The completion of the Parr facility led to growth in the surrounding region, which again increased the demand for more electricity and the project underwent its first expansion in 1921, with many intervening expansions, resulting in the 1970s construction of the VCSNS nuclear facility and the Fairfield Pumped Storage Facility to meet the growing electrical demands of the region. (SCE&G. 2022b)

E3.8.3 ONSITE CULTURAL RESOURCES

Onsite cultural resources are those located within the 2,200-acre VCSNS property. That property includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE. The South Carolina Institute of Anthropology and Archaeology and South Carolina

Department of Archives and History ArchSite database lists one NRHP-eligible resource, the Fairfield Pumped Storage Facility, within the VCSNS property. (SCIAA + SCDAH. 2022a) There are 10 archaeological sites, 38FA0047, 38FA0328, 38FA0344, 38FA0346, 38FA0347, 38FA0348, 38FA0363, 38FA0364, 38FA0365 and 38FA0366, listed on ArchSite within the VCSNS property. (SCIAA + SCDAH. 2022b) Site 38FA0047 is listed as not assessed. Sites 38FA0328, 38FA0363, and 38FA0364 are listed as not eligible. Sites 38FA0344, 38FA0346, 39FA0347, 38FA0348, and 38FA0365 are listed as probably not eligible. While site 38FA0366 is listed as potentially eligible.

No NRHP-listed cultural resources have been confirmed within the VCSNS property (Figure E3.8-5). No structures within the VCSNS property have been documented through the Historic American Buildings Survey or Historic American Engineering Record programs. As there are no refurbishment activities that are part of this SLR, there is no potential for the undertaking to adversely affect any onsite cultural resources.

E3.8.4 OFFSITE CULTURAL RESOURCES

Offsite cultural resources are those outside the VCSNS property boundary. There are 190 offsite resources within 6 miles of the VCSNS. Lists of known archaeological sites and historic properties within a 6-mile radius of VCSNS are presented in Tables E3.8-2 and E3.8-3. The 12 NRHP-listed properties, one NRHP listed archaeological site, and one NRHP district within 6 miles of VCSNS are presented in Table E3.8-4. The mapped locations of the unrestricted NRHP properties and the NRHP district are depicted in Figure E3.8-3. Due to distance, topography, and vegetation it is unlikely that the VCSNS site is within the viewshed of all but one of the 12 aboveground NRHP listed properties. The Monticello United Methodist Church is located approximately 3.7 miles from VCSNS, near the northeast shoreline of Monticello Reservoir. The location of the church near the shoreline of Monticello Reservoir may provide a partial view of portions of the VCSNS property within the viewshed of the church.

There is no planned offsite disturbance during the SLR period, and as such no offsite impacts to the archaeological resources would be anticipated. As there are no refurbishment activities as a part of the SLR, any visual or noise related impacts to the 14 NRHP properties would be minimal due to distance, topographic variability, and vegetation.

E3.8.5 CULTURAL RESOURCE SURVEYS

A total of six cultural resource surveys within portions of the 2,200-acre VCSNS property are listed on ArchSite. (SCIAA + SCDAH. 2022b) Prior to the construction of VCSNS and the Monticello Reservoir an archaeological survey of the vicinity was conducted by George A. Teague in 1972. Teague identified six sites near the VCSNS site during his survey of approximately 11,800 acres. None of the sites were assessed for NRHP eligibility, "although the report did comment the sites were heavily damaged by factors such as erosion, cultivation and logging." (SCE&G. 2010)

Site 38FA0047 was recorded in 1972 within the VCSNS site boundary. The 1972 survey by Teague is not listed on ArchSite among the six surveys within 6 miles of VCSNS. (SCIAA + SCDAH. 2022b) The other nine onsite archaeological sites, 38FA0328, 38FA0344, 38FA0346, 38FA0347, 38FA0348, 38FA0363, 38FA0364, 38FA0365 and 38FA0366, and structure 0082 Fairfield Pumped Storage were recorded during five of seven cultural resource surveys within portions of the VCSNS site. The 1872 Teague survey and the six ArchSite listed cultural resources investigations are listed in Table E3.8-1.

New South Associates (NSA) completed the Archaeological Survey of Planned Improvements at VCSNS, Fairfield County, South Carolina, in 2006 and 2007, of approximately 445 acres within and adjacent to the 2,200-acre VCSNS property. The survey resulted in the recording of seven sites, six isolated finds, and one cemetery. According to report author Stacey Young, this survey resulted in the recording of only one site, 38FA0328, within the VCSNS property. Site 38FA0328 was recommended not eligible for the NRHP. In the NSA report, "An Addendum to the Survey of the Planned Improvements at V.C. Summer Nuclear Station, Fairfield County, South Carolina" (to the previous 2007 NSA report), author Diana Valk reported the results of a NSA 2007 survey of an additional 1,311 acres within and adjacent to the 2,200-acre VCSNS property. Valk discusses 19 new sites, one previously recorded site, and 24 isolated finds during the 1,311-acre survey. Among those 44 cultural resources, sites 38FA0344, 38FA0346, 38FA0347, and 38FA0348 are located within the 2,200-acre VCSNS property. Valk recommended all four sites as not eligible for the NRHP. NSA conducted additional studies within and adjacent to the property in 2008. Natalie Adams reported the results of the survey of 232 acres, and an additional 5,800 linear feet of road improvements in the "Second Addendum to the Archaeological Survey of Planned Improvement at V.C. Summer Nuclear Station, Fairfield County, South Carolina." Adams reported eight sites and three isolated finds. Among these 11 cultural resources, sites 38FA0363, 38FA0364, 38FA0365, and 38FA0366 were located within the VCSNS property. Adams recommended that sites 38FA0363, 38FA0364, and 38FA0365 were not eligible for the NRHP, and site 38FA0366, an unknown prehistoric lithic scatter, was potentially eligible for the NRHP.

NSA conducted an archaeological survey of approximately 7.7 acres within the 2,200-acre VCSNS property in 2009. Adams reported no sites found in the "Results of Archaeological Survey of Approximately 7.7 Acres in the Vicinity of the Proposed Water Treatment Plant, VC Summer Nuclear Station" report.

A.F. Consultants conducted a survey of within and adjacent to the 2,200-acre VCSNS property in 2012. The project did not result in the recording of any sites (SCIAA + SCDAH. 2022b). S&ME conducted a survey for the Parr Hydroelectric project in 2014 within and adjacent to the VCSNS property. The project resulted in the recording of one cultural resource, structure 0082 the Fairfield Pumped Storage Facility within the VCSNS property. The Fairfield Pumped Storage Facility was determined eligible for the NRHP. (SCIAA + SCDAH. 2022a, SCIAA + SCDAH. 2022b)

E3.8.6 PROCEDURES AND INTEGRATED CULTURAL RESOURCES MANAGEMENT PLANS

DE cultural resources management policies and procedures address protection and/or evaluation of known or inadvertent discovery of potential resources at the VCSNS property. The inadvertent discovery of human remains is handled by a DE corporate procedure that includes the protection of historic and archaeological resources during construction and excavation activities. Administrative procedures define and prescribe protective measures for historic and archaeological resources, outlining appropriate steps to follow, including notifications, as appropriate, should such resources be encountered during pre-work or ground disturbance on the VCSNS property. Cemeteries and artifacts may also be addressed, as needed.

Table E3.8-1 Previous Cultural Resource Surveys within the 2,200-Acre VCSNS Property

Survey Company and Author	Report Date	Description	Findings
South Carolina Institute of Archaeology and Anthropology George A. Teague	1979[a]	An assessment of the Archaeological Resources in the Parr Project Area, South Carolina	Six sites within an 11,800-acre study area
New South Associates Stacey Young	2007	Archaeological Survey of Planned Improvements at V.C. Summer Nuclear Station	Seven sites, six isolated finds (IFs), and one cemetery: All non-eligible except for the Pearson Cemetery which is potentially eligible
New South Associates Diana Valk	2007	An Addendum to the Archaeological Survey of Planned Improvements at V.C. Summer Nuclear Station	19 new sites, 1 previously recorded site, and 24 IFs
New South Associates Natalie Adams	2008	Second Addendum to the Archaeological Survey of Planned Improvements at V.C. Summer Nuclear Station	Two potentially eligible sites, six non-eligible sites, and 3 IFs
New South Associates Natalie Adams	2009	V.C. Summer Nuclear Station, Proposed Water Treatment Plant, Letter Report	No sites
AF Consultant L. M. Drucker	2012	Intensive Archaeological Survey of V.C. Summer-Winnsboro 230-kV Utility Corridor	No sites
S&ME, Nagle and Carpini	2014	Cultural Resources Investigations for the Parr Hydroelectric Project	65 Arch sites 2 ag sites

(SCIAA + SCDAH. 2022b)

a. Report not listed in SCIAA + SCDAH database.

Table E3.8-2 Historic Properties Within the 6-Mile Radius of VCSNS (Sheet 1 of 3)

Site ID#	County	Name	NRHP Status
71000775	Fairfield	Ebenezer Associate Reformed Presbyterian Church/Old Brick Church	Listed 08/19/1971
7100776	Fairfield	Davis Plantation	Listed 10/05/1971
72001208	Fairfield	Little River Baptist Church	Listed 04/13/1972
74001852	Fairfield	Kincaid-Anderson House	Listed 07/30/1974
78002527/ 1191	Newberry	St. John's Lutheran Church	Listed 12/08/1978
79003321/ 1203	Newberry	Pomaria	Listed 04/24/1979
84000572	Fairfield	Dr. John Glenn House	Listed 12/06/1984
84000576	Fairfield	Highpoint	Listed 12/06/1984
84000578	Fairfield	Monticello Methodist Church	Listed 12/06/1984
84000585/ U/39/254/0073	Fairfield	Monticello Store and Post Office	Listed 12/06/1984
84000617	Fairfield	Rockton and Rion Railroad Historic District	Listed 12/06/1984
85000246	Fairfield	Mayfair	Listed 02/06/1985
07001045/ 1193	Newberry	Hope Rosenwald School	Listed 10/03/2007
0058	Fairfield	N/A (7769 State Highway 215 South)	Not assessed
0059	Fairfield	N/A (7835 State Highway 215 South)	Not assessed
0060	Fairfield	N/A (on Shady Lane)	Not assessed
0061	Fairfield	N/A (7599 State Highway 215 South)	Not assessed
0070	Fairfield	White Hall Elementary School	Eligible
0081	Fairfield	Parr Shoals Hydroelectric Facility	Eligible
0082	Fairfield	Fairfield Pump Storage	Eligible
0086	Fairfield	Unnamed House (182 Sleepy Hollow Road)	Not eligible
0087	Fairfield	Unnamed House (143 Sleepy Hollow Road)	Not eligible
0088	Fairfield	Morris Creek Baptist Church	Not eligible
0091	Fairfield	Southern Railway (segment)	Not eligible
1098	Newberry	N/A (Highway 176, east side, ½ mile south of intersection with SC 213)	Not eligible
1190	Newberry	N/A (605 Hope Station Road)	Not eligible
1192	Newberry	N/A (1129 Hope Station Road)	Not eligible
1194	Newberry	N/A (243 Peak Road)	Not eligible
1195	Newberry	N/A (267 Peak Road)	Not eligible

Table E3.8-2 Historic Properties Within the 6-Mile Radius of VCSNS (Sheet 2 of 3)

Site ID#	County	Name	NRHP Status
1196	Newberry	N/A (Peak Road, south side, ¼ mile west of intersection with Broad River Road)	Not eligible
1197	Newberry	N/A (2953 Broad River Road)	Not eligible
1198	Newberry	N/A (4494 Broad River Road)	Not eligible
1199	Newberry	N/A (145 Magnolia Lane)	Not eligible
1200	Newberry	N/A (1766 Broad River Road)	Not eligible
1201	Newberry	N/A (1405 Broad River Road)	Not eligible
1202	Newberry	N/A (Highway 176, east side, ½ mile south of intersection with SC 202)	Not eligible
1204	Newberry	N/A (3922 Highway 176)	Not eligible
1205	Newberry	N/A (295 Confederate Road)	Not eligible
1206	Newberry	N/A (4500 Highway 176)	Not eligible
1207	Newberry	N/A (4958 Highway 176)	Not eligible
1208	Newberry	N/A (2833 Peak Road)	Not eligible
1209	Newberry	N/A (Peak Road, north side, 1 mile east of intersection with Holloway Street)	Not eligible
1210	Newberry	N/A (1733 Peak Road)	Not eligible
1211	Newberry	N/A (1031 Peak Road)	Not eligible
1212	Newberry	N/A (Peak Road, south side, 2 miles east of intersection with Holloway Street)	Not eligible
1213	Newberry	N/A (Peak Road, south side, 1.5 miles east of intersection with Holloway Street)	Not eligible
1246	Newberry	N/A (2033 Hughey Ferry Road)	Not eligible
1247	Newberry	N/A (1771 Hughey Ferry Road)	Not eligible
1248	Newberry	N/A (Hughey Ferry Road, south side, 1.5 miles east of intersection with New Hope Road)	Not eligible
1249	Newberry	N/A (Hughey Ferry Road, northeast corner of intersection with Leitzsey Road	Not eligible
1250	Newberry	N/A (1870 Leitzsey Road)	Not eligible
1251	Newberry	N/A (1245 Leitzsey Road)	Not eligible
1252	Newberry	N/A (Hughey Road, south side, 1 mile east of intersection with Hope Road	Not eligible
1253	Newberry	N/A (Hughey Ferry Road, south side, 1 mile east of intersection with Hope Road)	Not eligible

Table E3.8-2 Historic Properties Within the 6-Mile Radius of VCSNS (Sheet 3 of 3)

Site ID#	County	Name	NRHP Status
1254	Newberry	N/A (400 Bundrick Road)	Not eligible
1285	Newberry	New Hope United Methodist Church	Not eligible
1287	Newberry	N/A (4239 New Hope Road)	Not eligible
1288	Newberry	N/A (5527 New Hope Road)	Not eligible
1290	Newberry	N/A (8708 Broad River Road)	Not eligible
1291	Newberry	N/A (Broad River Road, west side, just south of intersection with New Hope Road)	Not eligible
1292	Newberry	N/A (Broad River Road, east side, across from intersection with New Hope Road)	Not eligible
1293	Newberry	N/A (7443 Broad River Road)	Eligible
1294	Newberry	N/A (Broad River Road, west side, ½ mile south of intersection with New Hope Road)	Not eligible
1295	Newberry	N/A (8269 Broad River Road)	Not eligible
1296	Newberry	N/A (8157 Broad River Road)	Not eligible
4907	Richland	House, unidentified (1213 R. Stoudemayer Road)	Not eligible
4908	Richland	House, unidentified (East side of R. Stoudemayer Road, 1.1 mile northwest of intersection with Broad River Road)	Not eligible
4909	Richland	House, unidentified (1216 R. Stoudemayer Road)	Not eligible
4910	Richland	Stuck House	Not eligible
4911	Richland	House, unidentified (1324 Mike Stuck Road)	Not eligible
U/39/254/0074	Fairfield	N/A (4067 Highway 215 South)	Not eligible
U/39/254/0076	Fairfield	N/A (Frees Creek Drive)	Not eligible
U/71/407/1932	Newberry	New Hope Store	Eligible

(SCIAA + SCDAH. 2022a; SCIAA + SCDAH. 2022b)

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 1 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0029	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown Archaic component	Not assessed
38FA0030	Fairfield	Jenkinsville	Prehistoric site with Early, Middle Archaic, and unknown prehistoric components	Not assessed
38FA0033	Fairfield	Jenkinsville	Prehistoric site with Early, Middle, and Late Archaic, and unknown prehistoric components	Determination date 11/19/2003 No determination listed (Not assessed)
38FA0037	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0038	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38A0038	Fairfield	Jenkinsville	Prehistoric site with Early, Middle, and Late Archaic components	Not assessed
38FA0040	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
74001854 38FA0041	Fairfield	Jenkinsville	McMeekin Rock shelter with unknown Archaic, Woodland, unknown prehistoric, and 18th century components	Listed 08/23/1974
38FA0042	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0043	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
38FA0044	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0045	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Not assessed
38FA0046	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
38FA0047	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0049	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0051	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0053	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Late Archaic, and unknown prehistoric components	Not assessed
7100776 38FA0056	Fairfield	Jenkinsville	19th century Davis Plantation	Listed 05/06/1971

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 2 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
71000775 38FA0057	Fairfield	Jenkinsville	18th century Ebenezer Associate Reformed Presbyterian Church	Listed 08/19/1971
72001208 38FA0058	Fairfield	Jenkinsville	19th century Little River Baptist Church	Listed 04/13/1972
38FA0121	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0122	Fairfield	Jenkinsville	Disturbed scatter of unknown Archaic prehistoric lithic material in a spoils pile	Recommendation listed by recorder was "none" (Not assessed)
38FA0124	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0125	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0126	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0164	Fairfield	Jenkinsville	Prehistoric lithic scatter of six flakes, a Late Woodland point, and a whiteware sherd	Probably not eligible
38FA0175	Fairfield	Jenkinsville	20th century site with no additional information	Not eligible
38FA0298	Fairfield	Salem Crossroads	Two Late Archaic steatite bowl fragments	Further work recommended
38FA0319	Fairfield	Richtex	Surface scatter of 19th and 20th century glass, whiteware and stoneware (N=4)	Probably not eligible
38FA0320	Fairfield	Richtex	Surface scatter of 19th and 20th century glass and whiteware (N=10)	Probably not eligible
38FA0321	Fairfield	Richtex	Surface scatter of 19th and 20th century glass, blue transferware, and whiteware (N=13)	Probably not eligible
38FA0322	Fairfield	Jenkinsville	Multicomponent site with Middle and Late Archaic, unknown prehistoric, 19th and 20th century components (N=392)	Probably not eligible
38FA0323	Fairfield	Jenkinsville	Scatter of unknown historic era debris (N=12)	Not eligible
38FA0324	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric and unknown historic era materials (N=20)	Not eligible
38FA0325	Fairfield	Jenkinsville	18th Century debris scatter	Not eligible
38FA0326	Fairfield	Jenkinsville	Site with an unknown historic era component	Not eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 3 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0327	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric and unknown historic era components	Not eligible
38FA0328	Fairfield	Jenkinsville	Site with an unknown historic era component	Not eligible
38FA0329	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0330	Fairfield	Jenkinsville	19th century debris/ 19th century cemetery	Debris-probably not eligible/ cemetery potentially eligible
38FA0331	Fairfield	Jenkinsville	Multicomponent site with Late Archaic, unknown prehistoric, and 19th and 20th century components	Probably not eligible
38FA0332	Fairfield	Jenkinsville	19th and 20th century debris scatter	Probably not eligible
38FA0333	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Probably not eligible
38FA0334	Fairfield	Jenkinsville	Multicomponent site with Late Archaic, Middle Woodland, unknown prehistoric, and 20th century components	Probably not eligible
38FA0335	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Probably not eligible
38FA0336	Fairfield	Jenkinsville	Multicomponent site with Middle, Late, and unknown Archaic, unknown prehistoric, 19th century, and 1933 Pearson CCC camp components	Probably not eligible
38FA0337	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Woodland components	Probably not eligible
38FA0338	Fairfield	Jenkinsville	Multicomponent site with Middle and Late Woodland, unknown prehistoric, and 17th to 18th century artifacts	Probably not eligible
38FA0339	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38FA0340	Fairfield	Jenkinsville	Prehistoric lithic scatter with Paleo, Early, Middle, and Late Archaic, and unknown prehistoric components	Probably not eligible
38FA0341	Fairfield	Jenkinsville	Scatter of 19th and 20th century glass, stoneware, whiteware, porcelain, milk glass, metal, and stones (N=32)	Probably not eligible
38FA0342	Fairfield	Jenkinsville	Multicomponent site with Paleo, Early Archaic, unknown prehistoric, and a 20-century stoneware fragment	Probably not eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 4 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0343	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Late Archaic, and unknown prehistoric components (N=3)	Probably not eligible
38FA0344	Fairfield	Jenkinsville	Prehistoric artifact scatter with Early Woodland pottery sherd, and unknown prehistoric lithic components (N=36)	Probably not eligible
38FA0345	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Middle Archaic, and unknown prehistoric artifacts	Probably not eligible
38FA0346	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Probably not eligible
38FA0347	Fairfield	Jenkinsville	19th and 20th century debris scatter	Probably not eligible
38FA0348	Fairfield	Jenkinsville	Site with unknown historic era artifacts	Probably not eligible
38FA0349	Fairfield	Jenkinsville	20th century debris scatter	Probably not eligible
38FA0359	Fairfield	Jenkinsville	20th century debris scatter	Not eligible
38FA0360	Fairfield	Jenkinsville	Prehistoric small camp site with post molds, lithics and a pottery sherd from the Middle and Late Woodland Period (Tested)	Potentially eligible, recommended for excavation
38FA0361	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Middle Archaic artifacts	Not eligible
38FA0362	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic artifacts	Not eligible
38FA0363	Fairfield	Jenkinsville	19th and 20th century debris scatter	Not eligible
38FA0364	Fairfield	Jenkinsville	20th century debris scatter	Not eligible
38FA0365	Fairfield	Jenkinsville	Prehistoric lithic scatter with and Middle Archaic artifacts	Probably not eligible
38FA0366	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation (N=14)	Potentially eligible
38FA0373	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early Archaic and Mississippian artifacts (N=37)	Not eligible
38FA0454	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic artifacts (N=16)	Probably not eligible
38FA0456	Fairfield	Salem Crossroads	Scatter of 18th to 20th century debris (N=9)	Probably not eligible
38FA0457	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric lithic scatter and 18th to 20th century historic area debris scatter (N=21)	Probably not eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 5 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0458	Fairfield	Jenkinsville	A light 19th to 20th century debris scatter (N=2)	Probably not eligible
38FA0459	Fairfield	Jenkinsville	Isolated find of a prehistoric artifact of unknown temporal affiliation and an unknown historic era artifact (N=1?)	Probably not eligible
38FA0463	Fairfield	Jenkinsville	A 19th to 20th century artifact (N=1)	Probably not eligible
38FA0464	Fairfield	Jenkinsville	Multicomponent prehistoric lithic scatter and 19th to 20th century debris scatter (N=95)	Probably not eligible
38FA0547	Richland	Chapin	Prehistoric lithic scatter with Middle and Late Archaic material and ceramic scatter with a Mississippian component	Eligible
38FA0560	Fairfield	Jenkinsville	Light scatter of glass and whiteware of unknown age (N=2)	Not eligible
38FA0561	Fairfield	Jenkinsville	Multicomponent site consisting of a prehistoric flake, and a scatter of 20th century glass, whiteware, a wire nail, a brick fragment, and three mortar fragments (N=9)	Not eligible
38FA0562	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation (N=20)	Not eligible
38FA0563	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation (N=8)	Not eligible
38FA0564	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, and an 20th century isolate artifact (N=11)	Not eligible
38FA0565	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, and a 20th century isolate artifact (N=8)	Not eligible
38FA0566	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, a standing 20th century brick chimney and a scatter glass, blue transferware, and a nail (N=9)	Not eligible
38FA0567	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation (N=3)	Not eligible
38FA0571	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter on an outcrop of quartzite, with a Middle Archaic point, and a scatter of whiteware and glass of unknown historic era temporal affiliation (N=119)	Potentially eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 6 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0576	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and a scatter of glass and metal fragments of unknown historic era temporal affiliation (N=17)	Not eligible
38FA0577	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and two cut nails of unknown historic era affiliation (N=5)	Not eligible
38FA0578	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter granite, bricks and modern materials from a house depicted on the 1969 topo	Not eligible
38FA0579	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter of stone and bricks (N=8)	Not eligible
38FA0580	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter five glass fragments from a mid-20th century house depicted on the 1969 topo (N=5?)	Not eligible
38FA0581	Fairfield	Salem Crossroads	A scatter of rough-cut stone and brick fragments of unknown historic affiliation	Not eligible
38FA0582	Fairfield	Jenkinsville	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a fragment of blown glass of unknown historic affiliation (N=22)	Not eligible
38FA0583	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric flake of unknown temporal affiliation, and a scatter of brick, stone, glass, earthenware, pearlware, and metal of unknown historic affiliation (N=36)	Not eligible
38FA0584	Fairfield	Jenkinsville	A scatter of stone, brick, glass, whiteware, creamware, stoneware, and two cut nails (N=10)	Not eligible
38FA0585	Fairfield	Salem Crossroads	A multicomponent site consisting of a prehistoric flake of unknown temporal affiliation and a 20th century scatter of glass, creamware, stoneware, a cut nail, and a button (N=39)	Not eligible
38FA0586	Fairfield	Jenkinsville	A scatter of stones, bricks glass, porcelain, a wire nail, a cut spike, earthenware, and metal fragments of unknown historic affiliation (N=29)	Not eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 7 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0587	Fairfield	Jenkinsville	A scatter of glass, an animal bone, and eight wire nails of unknown historic affiliation (N=12)	Not eligible
38FA0588	Fairfield	Jenkinsville	A scatter of brick, stone, a porcelain fragment, and a glass fragment of unknown historic affiliation	Not eligible
38FA0589	Fairfield	Jenkinsville	A scatter of brick, stone, a whiteware and glass fragments of unknown historic affiliation (N=5)	Not eligible
38FA0590	Fairfield	Jenkinsville	A scatter of brick, stone, and a whiteware fragments of unknown historic affiliation	Not eligible
38FA0591	Fairfield	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and a 19th to 20th century scatter of pearlware and earthenware (N=16)	Not eligible
38FA0616	Fairfield	Chapin	A prehistoric site discovered in four backhoe trenches, materials identified as flakes and tools with unknown Archaic and unknown Woodland Period material (N=87)	Eligible
38FA0617	Fairfield	Chapin	A prehistoric site discovered in nine backhoe trenches, materials identified as flakes, debitage, hammerstones with unknown prehistoric period affiliations, a Late Archaic C14 date was obtained from charcoal buried in one trench (N=39)	Recommended for testing (Not Assessed)
38NE0006	Newberry	Jenkinsville	An Early Archaic to Woodland site originally reported in the 1930s, with many points, stone steatite bowl and net sinkers, and discoidal hand mills.	Probably not eligible
38NE0007	Newberry	Jenkinsville	A Middle Archaic and unknown prehistoric site	Probably not eligible
38NE0008	Newberry	Jenkinsville	An Early to Late Archaic, Early to Late Woodland, and Mississippian prehistoric site	Eligible
38NE0009	Newberry	Jenkinsville	A prehistoric lithic scatter with Late Archaic and unknown prehistoric affiliation	Not eligible
38NE0010	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter with Middle and Late Archaic, Early and Middle Woodland, and Mississippian cultural material	Not eligible
38NE0011	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle and Late Archaic, and unknown prehistoric components	Probably not eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 8 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38NE0012	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0013	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0014	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0030	Newberry	Chapin	A prehistoric lithic scatter with Middle and Late Archaic components	Probably not eligible
38NE0042	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter of unknown affiliation and two 19th to 20th century whiteware and creamware fragments (N=9)	Probably not eligible
38NE0644	Newberry	Chapin	A scatter of prehistoric lithics and ceramics of probable Early to Middle Woodland affiliation (N=10)	Probably not eligible
38NE0646	Newberry	Jenkinsville	An 19th to 20th century roadbed	Probably not eligible
38NE1062	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter of unknown prehistoric affiliation (N=10)	Not eligible
38NE1063	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Probably not eligible
38NE1064	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation (N=12)	Not eligible
38NE1065	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter of unknown prehistoric affiliation (N=12)	Not eligible
38NE1066	Newberry	Jenkinsville	A prehistoric lithic scatter of five debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1067	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation (N=24)	Not eligible
38NE1068	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter, and 19th to 20th century cemetery with 20 graves and a whiteware fragment	Prehistoric is probably not eligible/Cemetery is potentially eligible
38NE1069	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1070	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible

Table E3.8-3 Archaeological Sites within the 6-Mile Radius of VCSNS (Sheet 9 of 9)

Site ID#	County	Quadrangle	Type	NRHP Status
38NE1072	Newberry	Pomaria	A Middle Woodland ceramic and lithic scatter (N=11)	Not eligible
38NE1073	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1074	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation and a whiteware fragment (N=18)	Not eligible
38NE1075	Newberry	Pomaria	A prehistoric lithic scatter of unknown affiliation (N=6)	Not eligible
38NE1076	Newberry	Pomaria	A prehistoric lithic scatter of unknown affiliation (N=5)	Not eligible
38NE1077	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric late Archaic lithic scatter, and a historic component with unknown temporal affiliation (N=95)	Potentially eligible

(SCIAA + SCDAH. 2022b)

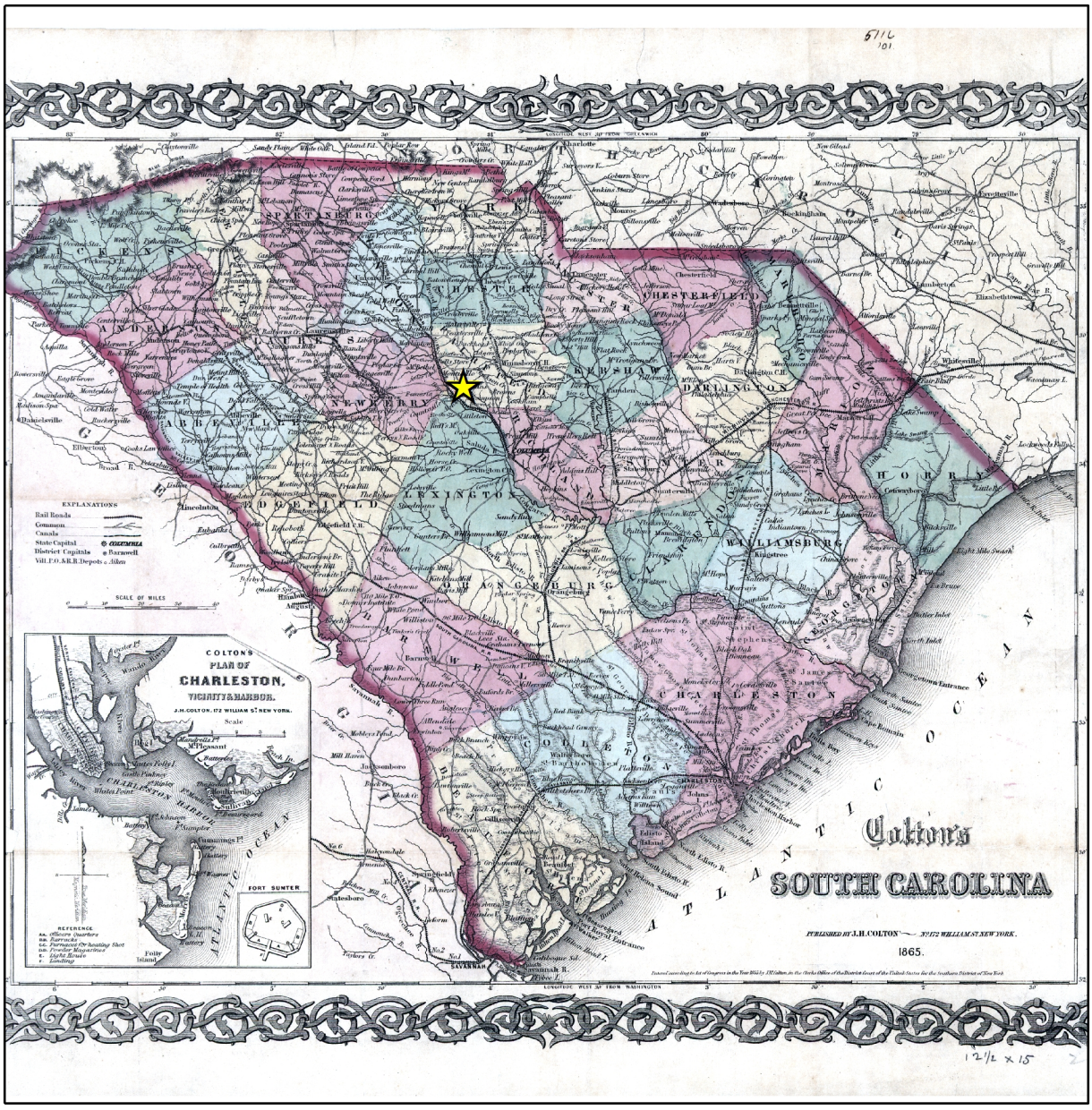
Table E3.8-4 NRHP Properties within 6 Miles of VCSNS

Resource Name NRHP Listing/SC Listing	County	NRHP Listed	Distance from VCSNS[(a)]
Ebenezer Associate Reformed Presbyterian Church/Old Brick Church 71000775/38FA0057	Fairfield	08/19/1971	3.4 miles
Davis Plantation 7100776/38FA0056	Fairfield	10/05/1971	5.4 miles
Little River Baptist Church 72001208/38FA0058	Fairfield	04/13/1972	2.4 miles
Kincaid-Anderson House 74001852	Fairfield	07/30/1974	4.4 miles
St. John's Lutheran Church 78002527/1191	Newberry	12/08/1978	4.5 miles
Pomaria 79003321/1203	Newberry	04/24/1979	5.1 miles
Dr. John Glenn House 84000572	Fairfield	12/06/1984	5.0 miles
Highpoint 84000576	Fairfield	12/06/1984	5.2 miles
Monticello Methodist Church 84000578	Fairfield	12/06/1984	3.7 miles
Monticello Store and Post Office 84000585/ U/39/254/0073	Fairfield	12/06/1984	3.9 miles
Rockton and Rion Railroad Historic District 84000617	Fairfield	12/06/1984	As close as 4.8 miles
Mayfair 85000246	Fairfield	02/06/1985	2.8 miles
Hope Rosenwald School 07001045/1193	Newberry	10/03/2007	3.5 miles
McMeekin rock shelter with unknown Archaic, Woodland, unknown prehistoric, and 18th century components 74001854/38FA0041	Fairfield	08/23/1974	Address restricted

(SCIAA + SCDAH. 2022a; SCIAA + SCDAH. 2022b)

a. Distances are approximate and based on the VCSNS Unit 1 center point and NRHP location data.

Figure E3.8-1 Colton's 1865 South Carolina Map



Legend

★ VCS

Figure E3.8-2 VCSNS Property, 1904

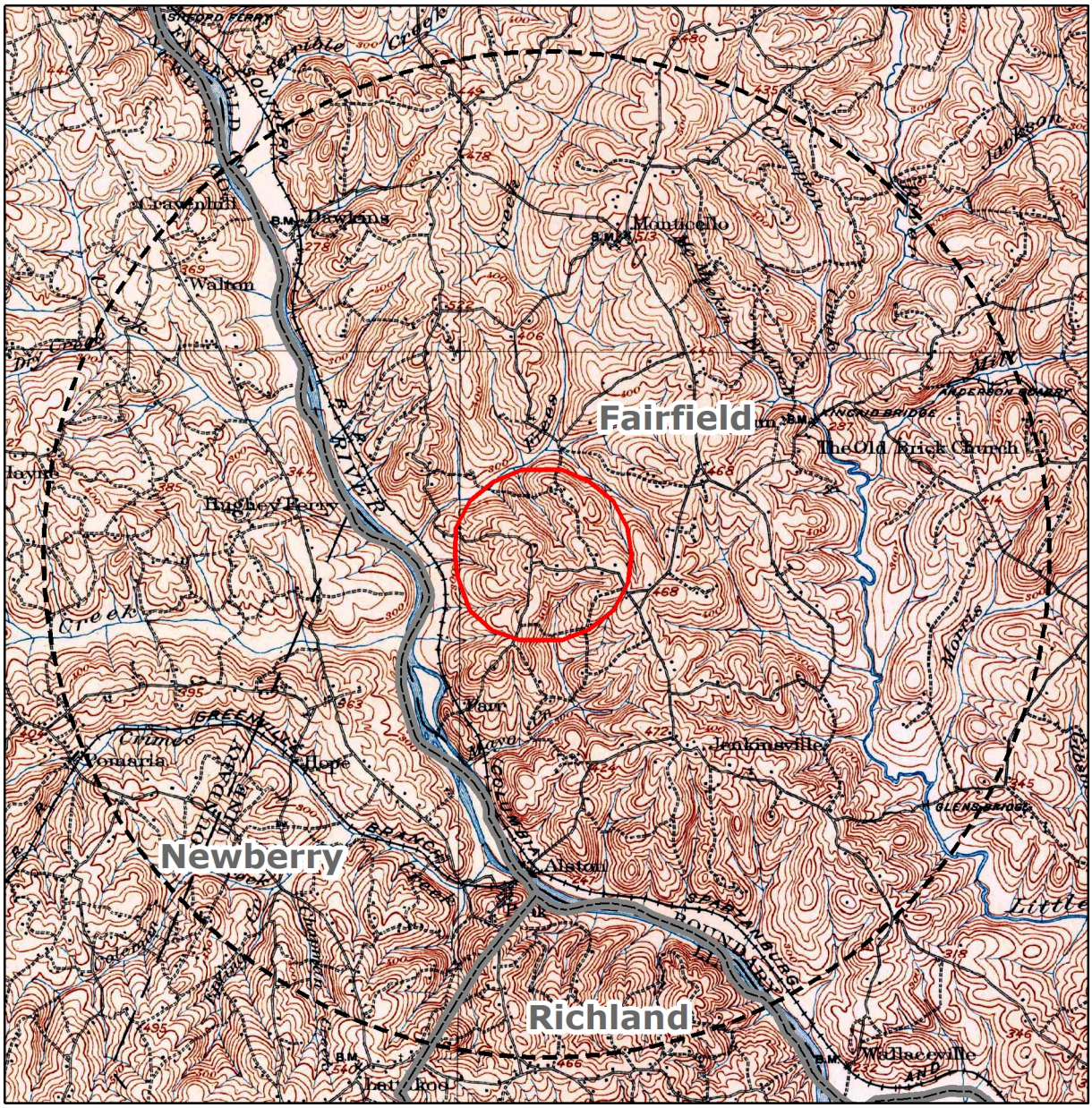


Figure E3.8-3 NRHP-Listed Resources and Cemeteries within 6 Miles of VCSNS

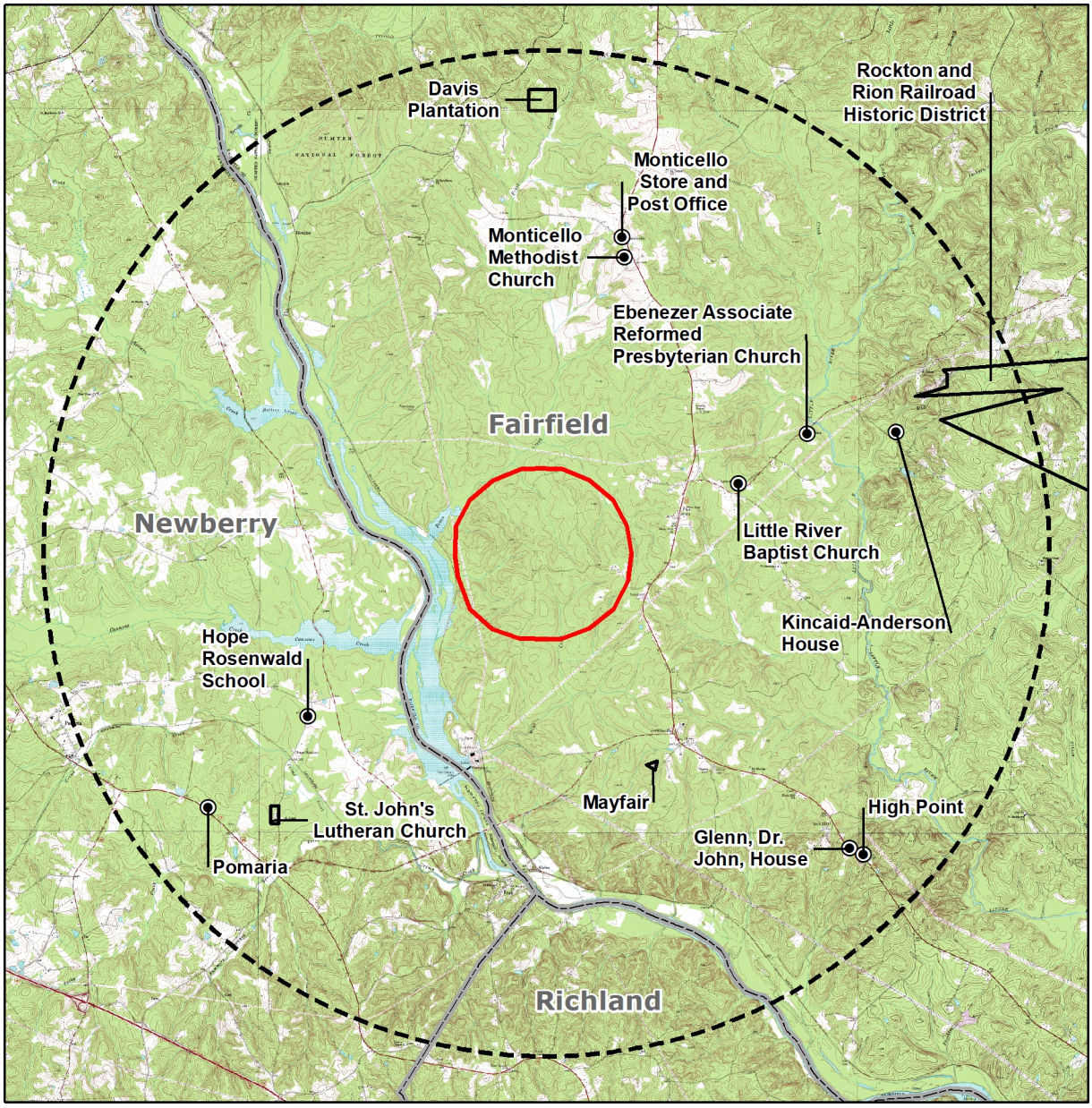


Figure E3.8-4 Construction Photograph of the VCSNS Site Service Pond After Tree Removal, Mechanical Leveling, and Initial Excavation, Facing Northeast 07/20/1973

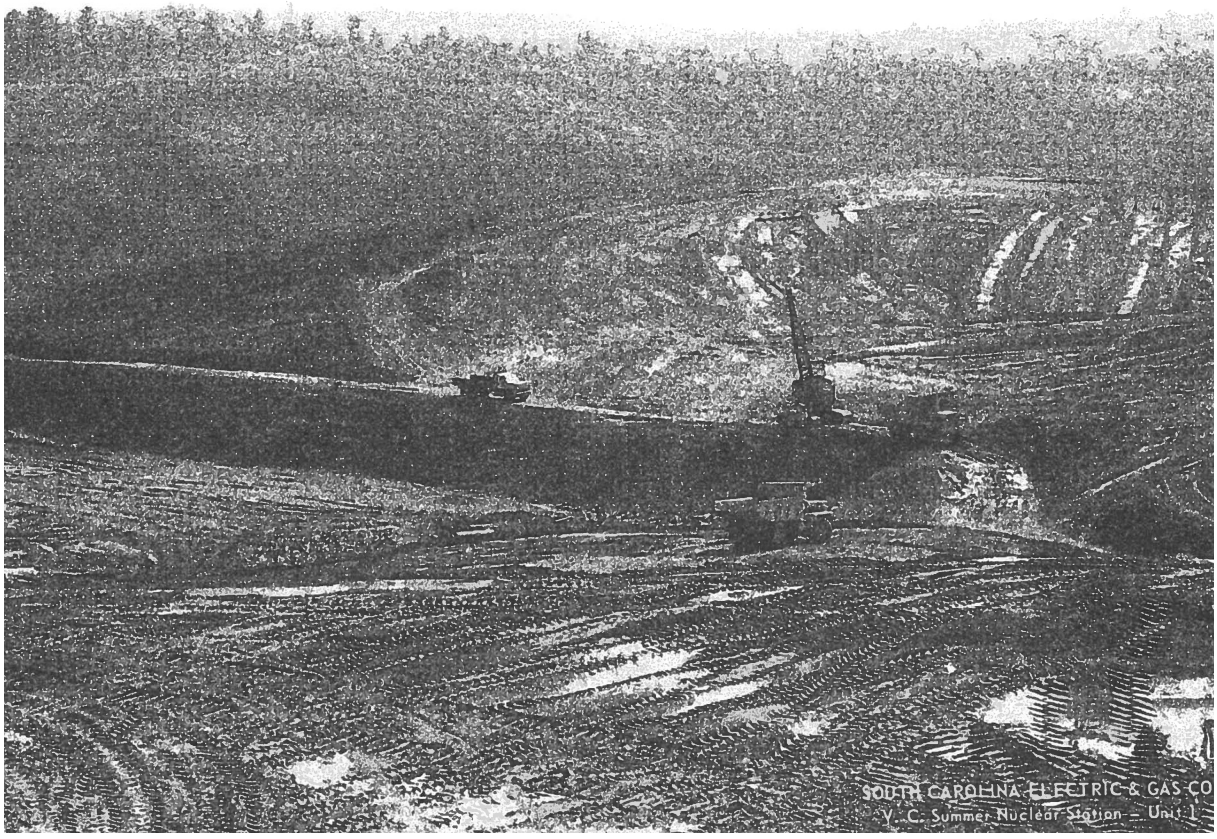


Figure E3.8-5 Construction Photograph of VCSNS, Showing Areas Excavated for Nuclear Building Structures, Facing North 08/28/1973

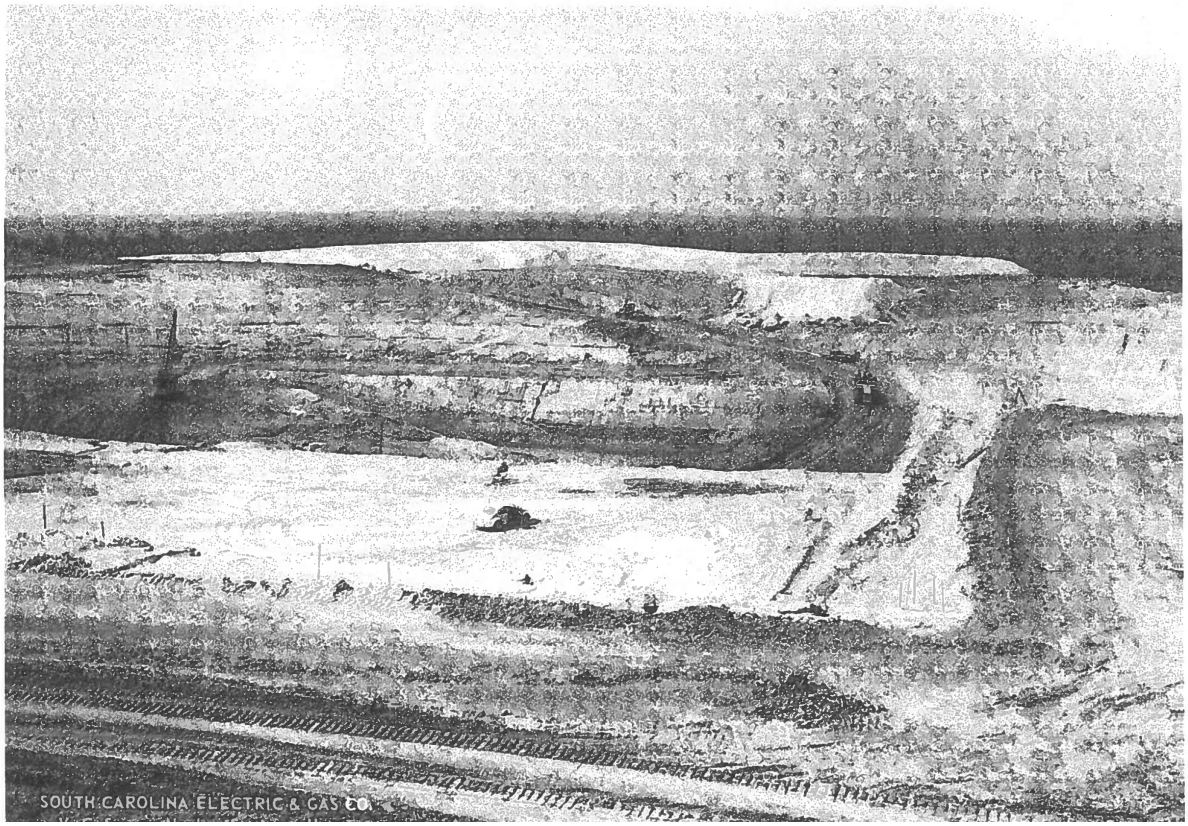


Figure E3.8-6 General Overview Construction Photograph of VCSNS Site During Construction, Showing Excavation and Disturbance, February 1974

Figure E3.8-7 General Overview Construction Photograph of VCSNS Site and Unit 1 During Construction, Showing Excavation and Disturbance, Facing Southeast 06/21/1977

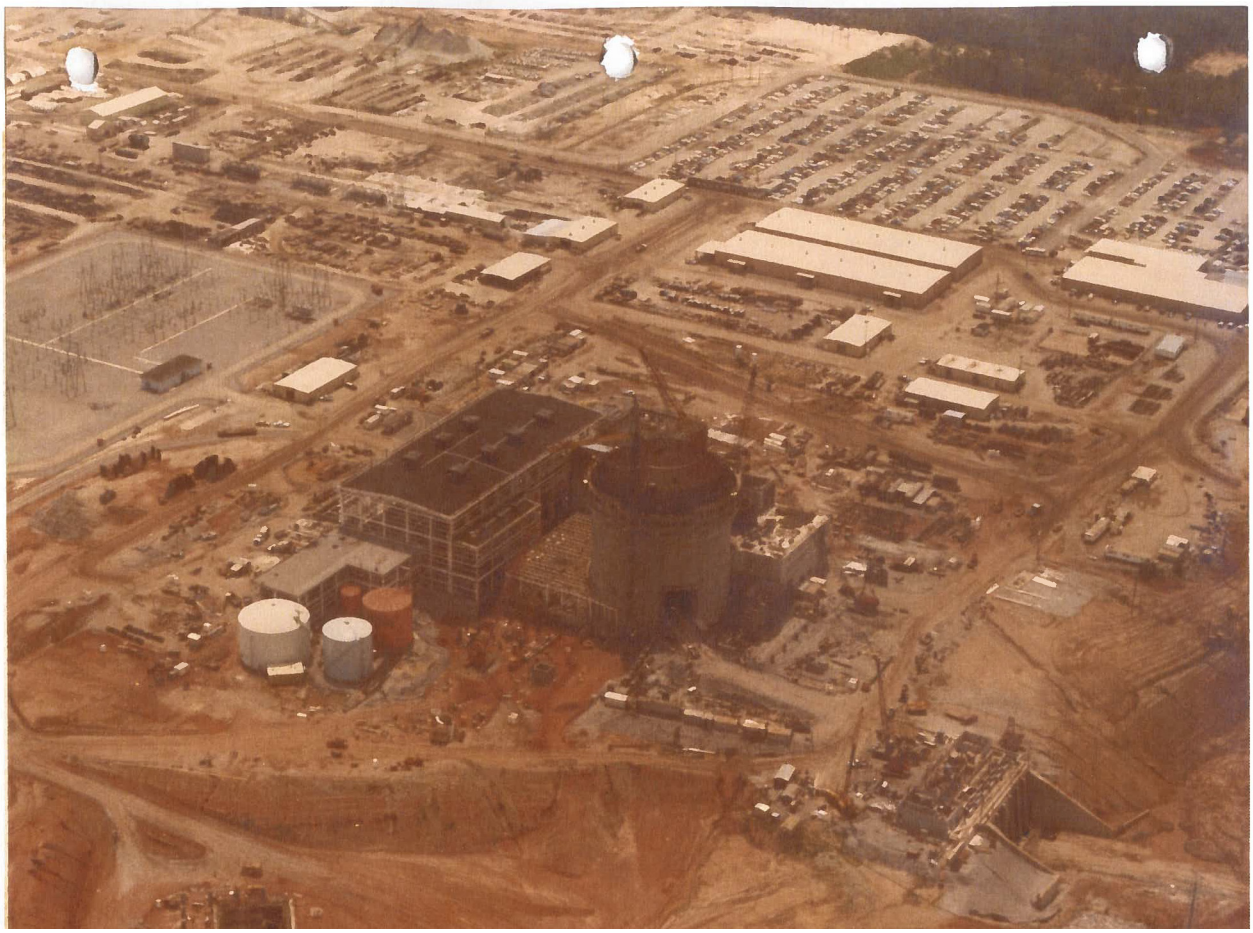


Figure E3.8-8 Late Construction Photograph of VCSNS Showing the Pumped Storage Facility in the Foreground, and the Unit 1 and Associated Facilities in the Background, Facing Southeast, 1977

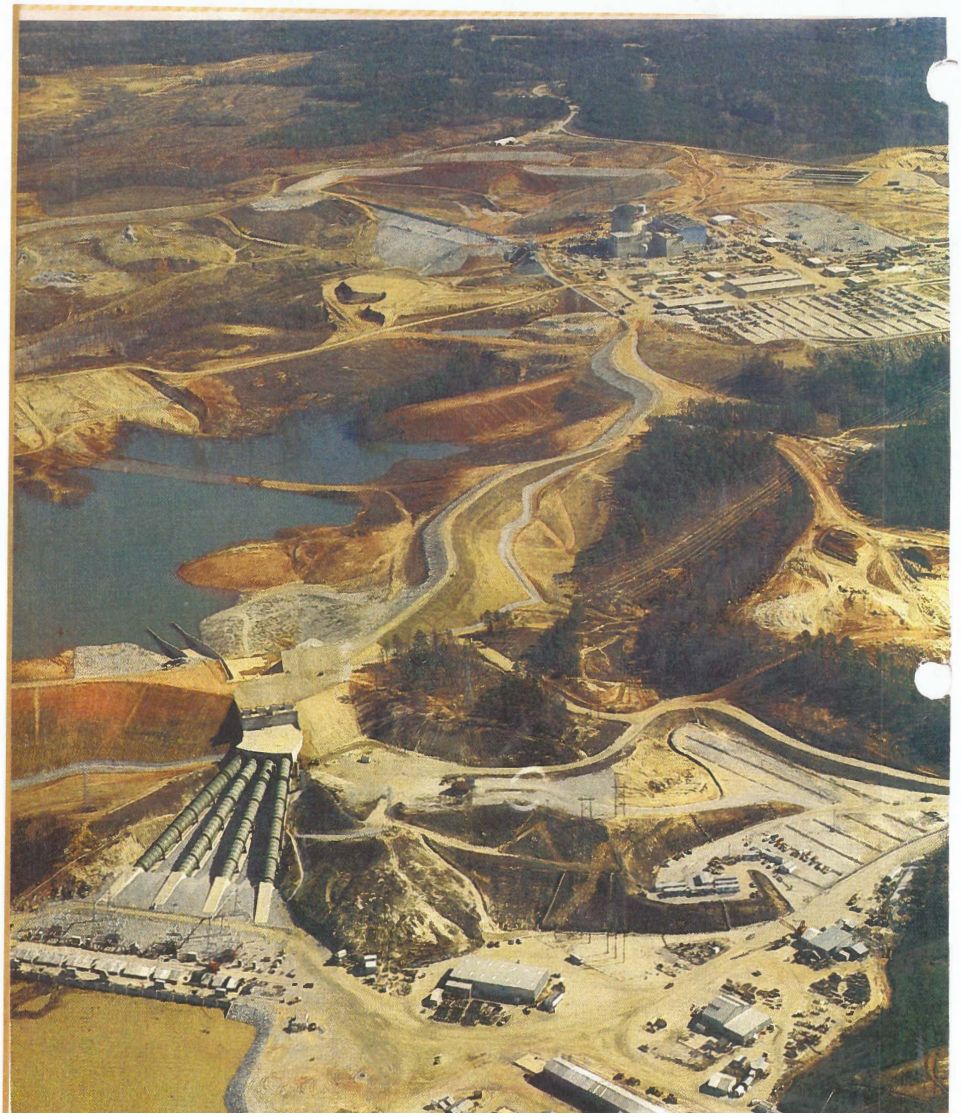


Figure E3.8-9 Recent Aerial Photograph of VCSNS Site Showing Structures, Buildings, Monticello Reservoir, Dam and Pumped Storage Facility, Facing West

Figure E3.8-10 Recent Aerial Photograph of VCSNS Site Showing Structures, Buildings, Monticello Reservoir, Dam and Pumped Storage Facility, Facing East

E3.9 SOCIOECONOMICS

Socioeconomic descriptions are focused on Fairfield, Lexington, Newberry, and Richland Counties because approximately 92% of the VCSNS workforce reside within these four counties. The remaining workforce is dispersed throughout the region (see Table E2.5-1).

VCSNS refueling and maintenance outages are on an 18-month cycle and last approximately 33 to 40 days. As presented in Section E2.5, during an outage there are typically an additional 850 contract employees on site. As seen in Figure E3.1-4, within the 50-mile radius of VCSNS there are several nearby South Carolina communities within the region, including Newberry, Winnsboro, Chapin, and Columbia, with numerous motel, campground, and food service conveniences available for contract workers who provide temporary support during site outages. Transportation corridors such as I-26 and local highways provide commuter access to VCSNS.

E3.9.1 EMPLOYMENT AND INCOME

The four South Carolina counties most influenced by VCSNS operations are Fairfield, Lexington, Newberry, and Richland. Additionally, DE pays taxes on VCSNS to Fairfield County. As presented in Section E3.11.1, the population for Lexington and Richland Counties is expected to increase through 2062 (the SLR operating term). Newberry County's population is projected to increase until 2034. Fairfield County's population is projected to decline beginning in 2022. Low-income populations and poverty thresholds for the counties are described in Section E3.11.2.

The estimated employed population in Fairfield County in 2021 was 8,496 persons. The leading reported occupational sector was government and government enterprises, with approximately 15.9%, or 1,348 persons employed. This was followed by the manufacturing sector with 10.0%, or 851 persons employed; and healthcare and social assistance, with 9.6%, or 812 persons employed. (BEA. 2023) According to Central South Carolina Economic Alliance, the largest employers in Fairfield County are VCSNS, Fairfield County School District, and Healthcare US Co. Ltd. - MLilly (CSCA. 2020). The annual payroll in Fairfield County was approximately $1 billion in 2021, and the average wage per job was $61,327. In 2021, per capita personal income was $48,631 (BEA. 2023). The annual average unemployment rate in Fairfield County declined steadily from 12.8% in 2012 to 4.4% in 2019. During the COVID-19 pandemic, the annual average unemployment rate rose to 7.8% in 2020, then declined to a preliminary 5.0% in 2022. (BLS. 2022)

In 2021, the estimated employed population in Lexington County was 169,085 persons. The leading reported occupational sector was government and government enterprises, with approximately 13.0%, or 21,981 persons employed. This was followed by the retail trade sector with 12.8%, or 21,662 persons employed; and healthcare and social assistance, with 8.0%, or 13,549 persons employed. (BEA. 2023) Lexington County's largest employers are Lexington Medical Center, Lexington County School District 1, and DE (CSCA. 2020). The annual payroll in

Lexington County was approximately $16.6 billion in 2021, and the average wage per job was $51,790. In 2021, per capita personal income was $55,304. (BEA. 2023) The annual average unemployment rate in Lexington County declined steadily from 6.8% in 2012 to 2.3% in 2019. During the COVID-19 pandemic the annual average unemployment rate rose to 4.2% in 2020 and then declined to a preliminary 2.6% in 2022. (BLS. 2022)

In 2021, the estimated employed population in Newberry County was 20,140 persons. The leading reported occupational sector was manufacturing with approximately 24.8%, or 5,004 persons employed. This was followed by the government and government enterprises sector, with 12.2%, or 2,465 persons employed; and administrative and support and waste management and remediation services, with 11.4%, or 2,295 persons employed. (BEA. 2023) Newberry County's largest employers are Samsung, Kraft-Heinz, and the Newberry County School District (CSCA. 2020). The annual payroll in Newberry County was approximately $1.8 billion in 2021, and the average wage per job was $44,217. In 2021, per capita personal income was $46,917. (BEA. 2023) The annual average unemployment rate in Newberry County declined steadily from 8.6% in 2012 to 2.6% in 2019. During the COVID-19 pandemic, the annual average unemployment rate rose to 4.6% in 2020 and then declined to a preliminary 2.7% in 2022. (BLS. 2022)

The estimated employed population in Richland County in 2021 was 297,680 persons. The leading reported occupational sector was government and government enterprises, with approximately 21.2%, or 63,107 persons employed. This was followed by the healthcare and social assistance sector with 10.3%, or 30,676 persons employed; and administrative and support and waste management and remediation services, with 8.8%, or 26,177 persons employed. (BEA. 2023) The State of South Carolina, Prisma Health Midlands, and Blue Cross Blue Shield of SC are Richland County's three largest employers (CSCA. 2020). Richland County's annual wages and salaries were approximately $22.1 billion in 2021, and the average wage per job was $57,510. In 2021, per capita personal income was $52,980 (BEA. 2023). From 2012 to 2019, the annual average unemployment rate declined steadily in Richland County from 8.0% to 2.7%. During the COVID-19 pandemic, the average annual unemployment rate rose to 5.7% in 2020 then declined to a preliminary 3.3% in 2022 (BLS. 2022).

E3.9.2 HOUSING

Between 2010 and 2021, Fairfield County, where VCSNS is located, saw a decrease in population of approximately 13.6%, while Newberry County experienced 1.3% growth during the same time period. The nearby counties of Lexington and Richland saw an increase in population of approximately 14.4% and 8.8%, respectively (see Table E3.11-2). A list of county population growth trends anticipated for the period of extended operation is provided in Table E3.11-3. (USCB. 2022b)

As presented in Table E3.9-1, the percentage of available vacant housing remained consistent in both Lexington and Richland Counties between 2010 and 2021 and would indicate that there is

sufficient housing availability to keep up with reported population increases. Fairfield County's population decreased by 13.6% between 2010 and 2021, but vacant housing units decreased by 0.8%. This would suggest that adequate housing was available for the reported population. While Newberry County experienced minimal population growth between 2010 and 2021 there is still sufficient vacant housing remaining to fulfill the needs of the population. (USCB. 2022d)

Median housing values in all four counties have increased from 2010 reported values, as presented in Table E3.9-1. Between 2010 and 2021, the median housing value rose by 20.2% in Fairfield County, 24.9% in Lexington County, 16.6% in Newberry County, and 19.7% in Richland County. Richland County's median house values are the highest at $175,100, and Fairfield County's median house values are the lowest at $110,000. (USCB. 2022d)

Along with median housing values, median monthly rents also increased in the four counties between 2010 and 2021. Newberry County saw the steepest increase at 42.5%, followed by Fairfield County's increase of 36.9%. Richland County experienced an increase of 34.3%, and Lexington saw the smallest median monthly rent increase at 29.3%. Richland County has the highest median monthly rents at $1,042, with Fairfield County's the lowest at $745. (USCB. 2022d)

E3.9.3 WATER SUPPLY AND WASTEWATER

The SCDHEC provides annual county water usage reporting. In 2020, Fairfield County used between 1–100 million gallons of groundwater and between 1–1,850 million gallons of surface water for public water supply. In Lexington County, between 101–850 million gallons of groundwater and 4,081–9,350 million gallons of surface water were used in 2020 for public water supply. Between 101–850 million gallons of groundwater and 9,351–21,560 million gallons of surface water were used for public water supply in Richland County in 2020. Newberry County used between 1–1,850 million gallons of surface water in 2020 for public water supply, but no groundwater. (SCDHEC. 2021a)

Fairfield County, where VCSNS is located, is in the Piedmont physiographic province of the state, where the primary source of water is from reservoirs, lakes, and major river systems. This surface water provides 90% of the county's water needs. The county also has access to quality groundwater, providing the remaining 10%. The county's two largest surface bodies of water, Monticello Reservoir and Lake Wateree, provide water for power generation for VCSNS and the Duke Power Wateree Hydroelectric Station, respectively. A third water source, a reservoir in the Jackson Mill Creek Watershed, provides water to the town of Winnsboro and its larger service area. This reservoir provides water for public supply, commerce, and industry in Fairfield County. (FC. 2021)

The Fairfield County 2020 Comprehensive Plan outlines the role that the county's lakes and rivers play in fulfilling the area's water needs and stresses the importance of conservation, planning, and regulation to maintaining the water supply. Conservation plans include reliance on federal and local

legislation to keep floodplain areas clear of development to allow stormwater to drain naturally. (FC. 2021)

There are six public water systems in Fairfield County that rely on surface water or groundwater resources: The town of Winnsboro, the town of Ridgeway, Jenkinsville Water Company, Midcounty Water Districts 1 and 2, and the Mitford Water District. Additionally, the Elgin Lugoff Water Authority provides water to about 150 customers around Lake Wateree, close to the Kershaw County line. There are also 30 miscellaneous private wells in the county serving isolated uses, including mobile home parks, boat ramps, rest stops, camp sites, and a health care center. The six public water districts appear to have ample reserves within their systems to meet current needs and future growth, with the area's largest supplier, the town of Winnsboro, operating at 60% of permitted capacity. (FC. 2021)

Sanitary sewer service is largely limited to incorporated areas of Fairfield County: the towns of Winnsboro and Ridgeway, as well as areas of the upper part of the county, extending from the town of Great Falls in neighboring Chester County (FC. 2021). The need for increased wastewater capacity has been high on Fairfield County's priority list, with about 30,000 gallons of wastewater capacity remaining (VBSCN. 2022). The Fairfield Joint Water and Sewer System Authority was formed in 2019 between Fairfield County and the town of Winnsboro, with the goal of building and financing a wastewater treatment plant in the area. As of 2019, the anticipated location of the proposed plant is the southern part of the county with the specific site and funding still undetermined. (FJWSS. 2021) In the state of South Carolina, individual home sewage treatment systems must be approved through the local Environmental Affairs Office, per the SCDHEC and SC code (SCDHEC. 2019c).

Lexington County residents receive water and sanitary sewer services through a combination of public and private entities, as the county of Lexington does not provide or control these services. In addition to the nine public utility agencies, there are four private companies. These entities operate independently but share infrastructure in some cases. Generally, residents of the municipalities or in the Lexington County Joint Water and Sewer area have access to public sewer connections, while residents and business located in the county jurisdiction may or may not have access to public or private utility connections. Where connections do not yet exist, residents rely on permitted and regulated in-ground septic systems and wells. (GWULC. 2022)

The Lexington County Joint Municipal Water and Sewer Commission (LCJMWSC) provides water and sewer services to a substantial portion of Lexington County, with 10 cities and towns plus the county itself currently forming the commission. Utilizing its own resources and the systems resources available from members, the Commission's goal is to meet water and wastewater service needs in certain unincorporated areas of Lexington County. The City of West Columbia supplies the LCJMWSC with its water, which is sourced from Lake Murray. LCJMWSC utilizes the Old Cherokee

Road water treatment plant, which has the ability to produce 22 MGD, of which the commission has acquired approximately 11 MGD of the total capacity. (LCMJWSC. 2022)

The Newberry County Water and Sewer Authority is a special purpose district of South Carolina that serves approximately 4,000 drinking water customers and 500 sewer customers. Over 1.2 million gallons of drinking water are provided to the authority's customers daily, which is sourced from a combination of the authority's Lake Murray Water Treatment Plant and purchases from the city of Newberry. The city of Newberry's water is sourced from the city's treatment plant located on the Saluda River. (NCWSA. 2022)

Richland County is served by seven public and private utility providers. The county has identified two goals with regards to future water and sewer service. The first goal is county coordination with the City of Columbia and other utility districts to ensure an adequate quantity and quality of potable water is available to support land use and development patterns. The second goal is to implement a strategy for providing sanitary sewer service in the county that manages growth, consolidates sewer service providers, and reduces the number of individuals on private septic systems. (RCSC. 2015)

Richland County is currently undergoing a $24.2 million water and sewer expansion project in the lower part of the county. The expanded system will link public water and sewer services to residences, small businesses, schools, and churches, as well as to McEntire Joint National Guard Base, with the goal of improving water quality and easing environmental concerns in Lower Richland. The county expects the project to result in the build-out of an infrastructure system that will provide access to needed water and sewer services that are part of a comprehensive utilities system. The County plans to further expand Lower Richland's infrastructure in subsequent years. (RCSC. 2021)

Section E3.6.3.1 describes the domestic water supply system of VCSNS, which is obtained directly from Monticello Reservoir for potable use and other non-cooling related uses and treated onsite. Sanitary waste is treated at an onsite sanitary wastewater treatment facility, as described in Section E3.6.1.2.3.

E3.9.4 COMMUNITY SERVICES AND EDUCATION

Fairfield County, where VCSNS is located, has one public school district. Based on the 2020–2021 school year, there were eight total schools in the district and 2,414 students. For the 2019–2020 school year, there were two private schools in the county, with 231 students. Within 50 miles of VCSNS in Jenkinsville, South Carolina, there are 13 public and private 4-year educational institutions, and 8 public and private 2-year institutions. Midlands Technical College is the only institution of higher education with a campus in Fairfield County. (NCES. 2022)

Lexington County has six public school districts. There were 58 total public schools in the county and 41,295 students for the 2020–2021 school year. For the 2019–2020 school year, there were 11 private schools in the county serving 943 students. (NCES. 2022)

For the 2020–2021 school year, Newberry County had one public school district with 14 schools serving 5,760 students. There was one private school in Newberry County in the 2019–2020 school year, serving 208 students. (NCES. 2022)

There were seven public school districts in Richland County, with 170 total public schools and 106,576 students for the 2020–2021 school year. There were 24 private schools in Richland County, with 4,978 students, for the 2019–2020 school year. (NCES. 2022)

For Fairfield County emergency services, primary law enforcement is provided through the sheriff's office and the town of Winnsboro's Police Department (PD) (USACOPS. 2022). For firefighting services, Fairfield County residents are served by a combination of career firefighters and volunteers. There are 6 fire departments and 13 stations in Fairfield County, manned by 20 active career firefighters and 79 volunteer firefighters, with 10 firefighters paid per call. (USFA. 2022)

Primary law enforcement in Lexington County is provided through the Lexington County Sheriff's Office and 11 community police departments (USACOPS. 2022). Lexington County's residents are served by a combination of career and volunteer firefighters, with 10 departments, 36 stations, and 435 active career firefighters. Additionally, there are 68 volunteer firefighters and 84 firefighters paid per call serving Lexington County. (USFA. 2022)

For Newberry County Emergency Services, primary law enforcement is provided thorough the county Sheriff's office and the police departments of the towns of Newberry and Whitmire (USACOPS. 2022). Thirteen stations within eight departments provide firefighting services in Newberry County, served by mostly volunteer and some career firefighters. There are 19 career and 207 volunteer firefighters in Newberry County, and no firefighters paid per call. (USFA. 2022)

Richland County primary law enforcement services are provided by the county sheriff's office, Columbia PD, and Forest Acres PD (USACOPS. 2022). There are 35 firefighting stations across 4 departments in Richland County itself, with 622 active career firefighters and 125 volunteer firefighters, providing firefighting services in Richland County. No firefighters in Richland are paid per call. (USFA. 2022)

Within 25 miles of VCSNS, there are five hospitals with a total of 1,416 inpatient beds. The closest medical facility to VCSNS is Prisma Health Baptist – Parkridge with 78 beds, and the hospital with the greatest number of inpatient beds is Prisma Health – Richland, with 645 beds. Nearby, Newberry County Memorial Hospital has a reported 54 inpatient beds available. There are no hospitals in Fairfield County. (HHS. 2022)

E3.9.5 LOCAL GOVERNMENT REVENUES

DE pays annual property taxes to Fairfield County on behalf of VCSNS. In fiscal year (FY) 2021, DE paid $20,426,464 to Fairfield County. The state of South Carolina assesses utilities property tax on all real and personal properties of companies that fall under the classification of "utilities," based on fair market value (SCDOR. 2022). Local taxing authorities, such as the county, city, school district, water and sanitation services, etc., decide the needed income required to provide services. (FC. 2020)

Fairfield County's total property tax revenues were approximately $26.9 million for the fiscal year ending June 30, 2020, representing a 5.6% decrease from the total property tax revenue of approximately $28.5 million in FY 2019. During FY 2020, the latest year for which Fairfield County's annual audit report is available, property tax revenues decreased by approximately $1.6 million, primarily due to activities at VCSNS, including declining assessments and the movement of the construction infrastructure from the canceled Units 2 and 3, resulting in an $830,000 decrease in taxes collected on state business personal property from 2019 to 2020. According to the Fairfield County 2020 audit, DE's payments represented approximately 45% of the total property tax revenues for the county in 2020, and 63% of the total revenue for Fairfield County School District. Revenue from property and sales taxes, the primary sources of revenue for Fairfield County's General Fund, contributed $28.8 million, or approximately 74%, of the county's total revenue of $39.1 million in FY 2020. Sources for the remaining 26% of revenue include charges for services, operating grants and contributions, capital grants and contributions, accommodations taxes, investment income, intergovernmental revenue, and other taxes. (FC. 2020; FCSD. 2022)

County expenses for FY 2020 included general governmental activities, health and welfare, and public safety, among other functions and programs, for a total of $44,100,000 for FY 2020. This was an overall 13.8% increase from the $38,749,000 in expenses for FY 2019. The increase in governmental expenses is primarily due to a $1.6 million increase in other post-employment benefits (OPEB) expenses, as well as grant matches for economic development incentives and expenses related to the COVID-19 pandemic that will be reimbursed by the CARES Act in FY 2021. (FC. 2020)

See Table E3.9-2 for DE's total nuclear taxes, as well as annual property tax payments to Fairfield County, for the years 2017–2021. Annual payments from DE to Fairfield County on behalf of VCSNS have been consistent over the last 5 years, remaining roughly between $20 million and $21.6 million. Additionally, DE paid $27,088,570 in total nuclear taxes and $12,652,074 in property taxes to Fairfield County in 2022, but the total property tax revenue for all of Fairfield County is not yet available.

Two significant, one-time payments from DE to Fairfield County on behalf of VCSNS are notable. First, in 2017, Fairfield County filed a complaint and temporary injunction against DE for actions

related to termination of a prior agreement for fees in lieu of taxes (FILOT) for VCSNS's canceled Units 2 and 3. A settlement between DE and Fairfield County was reached in July of 2021, wherein DE agreed to pay Fairfield County $99 million. That same month, DE satisfied payment in the form of 1.4 million shares of DE common stock.

Second, in 2019, DE paid $1,309,879 to Fairfield County, a property tax amount assessed by the Fairfield County Assessor on equipment onsite that had been previously planned for use on the now-canceled Units 2 and 3. Subsequently, DE signed a forbearance giving up rights to the property. Therefore, no future tax obligation for this land or equipment exists.

DE provides annual funding for South Carolina Emergency Management Division (SCEMD) and SCDHEC per an approved utility grant agreement. In FY 2022, this amount was $387,555. In addition, DE provides funding to counties within the 10-mile Emergency Planning Zone per letters of agreement between DE and the counties. For FY 2022, these amounts are as follows: $90,688 to Newberry County, $22,088 to Richland County, $22,088 to Lexington County, and $4,500 to Fairfield County Fire Service. In addition, DE provides $7,500 to Prisma Health-Midlands in the event that a VCSNS employee becomes contaminated and needs treatment.

DE focuses its charitable work in the environmental education area. The DE Charitable Foundation awarded more than $350,000 to 21 environmentally focused South Carolina non-profits as part of the foundation's Environmental Education and Stewardship Grants Program. The program awarded $1.5 million in grants to 115 community organizations across 10 states. These grants support projects that preserve, enhance, or increase access to the natural world, and were available to non-profit 501(c)(3) organizations and K-12 schools in communities served by DE. Additionally, DE supports Champions of the Environment, a statewide competitive grant program that awards grants of up to $2,500 to K-12 students and teachers to implement environmental action and awareness projects.

Other environmental education programs supported by DE include Solar for Students and Project Plant It! Solar for Students provides students the chance to learn firsthand about harnessing solar energy from a solar array. Participating public schools and educational organizations receive a 1.2-kilowatt solar system that converts sunlight into electric power, as well as educational materials and training for educators. The National Energy Education Development Project (NEED) administers the program by providing technical support, coordinating the installation of solar panels, and preparing educational materials and training.

Since 2007, DE has supported Project Plant It!, a partnership between DE and the Arbor Day Foundation. The program has distributed more than 600,000 free tree seedlings to participants and has taught thousands of students and community members about the importance of trees to the ecosystem. Project Plant It! also distributed wildflower seed packets in 2021 for their 15th anniversary, as part of their new bee and pollinator education program.

DE also supports Keep the Midlands Beautiful through Adopt-a-Waterway and litter prevention and education programs throughout the Midlands. In fall 2021, employees themselves participate in the Good Neighbors Fund as well as maintenance, stewardship, and accessibility improvement activities of local trails in Harbison State Forest.

E3.9.6 TRANSPORTATION

As discussed in Section E3.1, the primary road network in the area is shown in Figure E3.1-3 and Figure E3.1-4. South Carolina Highway 215 (SC-215) runs north-south along the eastern shore of Monticello Reservoir, running south to Columbia, South Carolina, and north to Spartanburg, South Carolina, and providing plant access from the east. Travelers coming from the west would take South Carolina Highway SC-213 (SC-213), which runs southwest-northeast to the south of the plant and intersects with SC-215 southeast of the plant. State Highway SC-176 (SC-176) traverses the region northwest to southeast, roughly parallel to I-26, both providing commuter access to the plant from the west. Access to the plant is provided via Bradham Blvd. Access and egress to the site by road is limited by the topographic features such as the Broad River to the west and the Monticello Reservoir to the north. SC-215/213 is a paved, two-lane road with no dedicated turn lane at the intersection with Bradham Blvd. Turning west towards the plant from SC-215/213, travelers briefly traverse Bradham Blvd., also paved with two lanes, before it becomes Lake Access Rd., which provides direct access to the plant itself.

The U.S. Transportation Research Board (TRB) developed a commonly used indicator called level of service (LOS) to measure how well a road accommodates traffic flow. LOS is a qualitative assessment of traffic flow and how much delay the average vehicle might encounter during peak hours. LOS categories are listed and defined Table E3.9-4.

The South Carolina Department of Transportation (SCDOT) average annual daily traffic (AADT) volumes for state roads in the 6-mile vicinity that link to VCSNS are listed in Table E3.9-3. Over the years, the traffic volume counts reveal some fluctuation on roads leading to Bradham Blvd. At SCDOT Station No. 140, on SC-213 between SC-215 and Broad River Rd., the most recent 2021 AADT count was 6,000. Travelers commuting from the south are likely to travel north on SC 215, where the most recent traffic count at Station No. 145 was 4,300 in 2021. Travelers commuting from the north are also likely to use SC 215, where the most recent traffic count at Station No. 141 was 1,150. (SCDOT. 2022)

To provide an evaluation of LOS for SC-213 and SC-215, the known AADT traffic volumes were compared to the estimated capacity of a two-lane highway, as presented in the TRB highway capacity manual. The manual notes that the capacity of a two-lane highway under base conditions is 1,700 passenger cars per hour (pc/h) in one direction, with a limit of 3,200 pc/h for the total of the two directions. Based on the SCDOT AADT recorded volumes, the SC-213 traffic count at station 140 south of the plant would have a reported flow rate of approximately 125 pc/h/ln. The SC-215

traffic station 141 northeast of the plant would have a reported flow rate of approximately 24 pc/h per lane, and SC-215 at station 145 southeast of the plant would have a flow rate of approximately 90 pc/h per lane. Because the base condition capacities for a two-lane highway are not exceeded by the current average traffic conditions, there should be ample traffic capacity on SC-213 and SC-215 in the vicinity of VCSNS. All three of these areas should fall within the LOS "A" to "C" range of conditions. (SCDOT. 2022) Additionally, during Unit 1 outages, VCSNS staggers construction staff start and end times to avoid contract workers and lessen traffic issues.

All roads in Fairfield County have been designed to provide not less than a "C" LOS, and roads that exceed this LOS are generally scheduled for improvements by the state of South Carolina. Fairfield County has described recent traffic volumes within the county itself as "relatively low" and road capacity as "adequate" (FC. 2021). These descriptions, combined with the 2021 AADT counts and corresponding LOS determinations, suggest that no future impediments to plant commuters are expected.

The 2022 Fairfield County Comprehensive Plan outlines a general movement from sole reliance on the automobile towards a more balanced combination of travel modes (bicycle, public transit, automobile, etc.), and a bicycle corridor along the entirety of SC 213/215 within Fairfield County has been proposed but is not yet in development. Small mass transit projects are also planned for 2022 but are not likely to have an impact on VCSNS commuters. There are no other known ongoing or planned projects affecting the area surrounding the plant entrance in the near future. (FC. 2021) (SCDOT. 2021)

E3.9.7 RECREATIONAL FACILITIES

See Figure E3.1-5 for locations of area attractions that can be found within the vicinity of VCSNS. National parks in the region include Congaree National Park and Francis Marion-Sumter National Forest. A small portion of the Sumter National Forest Enoree District falls within the vicinity of VCSNS, just northwest of the Monticello Reservoir. An estimated 1,443,000 people visited Sumter in 2018, the latest year for which visitor data were available (USDANRM. 2018).

Seven state parks within 50 miles of VCSNS offer a total of 463 campsites able to accommodate RVs: Chester State Park, Lake Greenwood State Park, Andrew Jackson State Park, Croft State Park, Dreher Island State Park, Sesquicentennial State Park, and Lake Wateree State Park (SCSP. 2022). Additionally, the Enoree Ranger District of Sumter National Forest offers 13 RV campsites (USDAFS. 2022). Carolina Adventure World, a private park on 2,600 acres of land that lies within the 50-mile radius of VCSNS, also features 24 RV campsites and several cabins (CAW. 2022).

The VCSNS vicinity also features one privately-owned local park and a trail maintained by a non-profit foundation. Lake Monticello Park is privately owned by DE and is located within the VCSNS vicinity. It offers public picnic facilities and swimming. DE Lake Management is responsible

for land use and shoreline management around Monticello Reservoir (DE. 2022d). Not featured in Figure E3.1-5 but locally relevant is the Palmetto Trail, a multi-purpose recreational trail leading from the mountains of South Carolina to the Atlantic coast. It passes through the vicinity of VCSNS, notably the Palmetto Trail Peak to Prosperity Passage near Pomeria. Portions of the trail are completed and maintained while other segments are unfinished. No trail use visitation information was available from the Palmetto Conservation Foundation. (SCGO. 2022; PCF. 2022)

There is no formal visitor center located at VCSNS. Restrictions in place due to the COVID-19 pandemic prevented VCSNS from hosting any high school or public stakeholder group tours within the last 2 years. The last high school group tour occurred in 2019.

Table E3.9-1 Housing Statistics, 2010–2020

Name	2010	2020	2010–2021 Change (%)
Fairfield County			
Total Housing Units	11,521	10,948	-5.0
Occupied Units	9,121	8,758	-4.0
Vacant Units	2,400	2,190	-8.8
Vacancy Rate (%)	20.8	20.0	-0.8
Median House Value ($)	91,500	110,000	20.2
Median Rent ($/month)	544	745	36.9
Lexington County			
Total Housing Units	110,110	126,768	15.1
Occupied Units	100,793	115,880	15.0
Vacant Units	9,317	10,888	16.9
Vacancy Rate (%)	8.5	8.6	0.1
Median House Value ($)	136,800	170,900	24.9
Median Rent ($/month)	745	963	29.3
Newberry County			
Total Housing Units	17,790	18,208	2.3
Occupied Units	14,266	15,137	6.1
Vacant Units	3,524	3,071	-12.9
Vacancy Rate (%)	19.8	16.9	-2.9
Median House Value ($)	102,300	119,300	16.6
Median Rent ($/month)	595	848	42.5
Richland County			
Total Housing Units	157,564	180,370	14.5
Occupied Units	141,564	160,231	13.2
Vacant Units	16,000	20,139	25.9
Vacancy Rate (%)	10.2	11.2	1.0
Median House Value ($)	146,300	175,100	19.7
Median Rent ($/month)	776	1,042	34.3

(USCB. 2022e)

Table E3.9-2 Annual VCSNS Property Tax Payments, FY 2017–2021

Year	Total Nuclear Taxes (USD)	FY Total County Property Tax Revenues (USD)	VCSNS (USD)[a]	VCSNS% of Total County Property Tax	VCSNS of Total FY School District Revenue
2018	21,626,520.52	26,628,308	10,925,000	41	30
2019	20,787,354.02	28,475,796	12,330,000	43	63
2020	20,169,134.94	26,897,144	12,019,136	45	53
2021	20,426,464.07	27,088,507	12,652,074	47	63
2022	21,269,526.96	NA	NA	NA	NA

NA = not available

a. DE years: (FY 2019–2021), SCANA Corp years: (FY 2017 and 2018)

NOTE: Fairfield County Financial Statements FY 2017–2020 Analysis

Table E3.9-3 Total Average Annual Daily Traffic Counts on SC 213

Route	Location	2011	2016	2021
SC 213	South of plant (Station 140)	3,200	5,200	6,000
SC 215	Northeast of plant (Station 141)	950	1,650	1,150
SC 215	Southeast of plant (Station 145)	1,750	3,500	4,300

(SCDOT. 2022)

Table E3.9-4 Level of Service Definitions

Level of Service	Conditions
A	Free flow of the traffic stream; users are mostly unaffected by the presence of other vehicles.
B	Free flow of the traffic stream, although the presence of other vehicles becomes noticeable. Drivers have slightly less freedom to maneuver.
C	The influence of the traffic density on operations becomes marked and queues may be expected to form. The ability to maneuver with the traffic stream is clearly affected by other vehicles.
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	Operations at or near capacity, an unstable level. The densities vary, depending on the free-flow speed. Vehicles are operating with the minimum spacing (or gaps) for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F.
F	Forced or breakdown of flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity. Queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

E3.10 HUMAN HEALTH

E3.10.1 MICROBIOLOGICAL HAZARDS

In the GEIS, the NRC considered health impacts from thermophilic microorganisms posed to both the public and plant workers because ideal conditions for thermophilic microorganisms can result from nuclear facility operations and discharges. Microorganisms of particular concern include several types of bacteria (*Legionella* species, *Salmonella* species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*. The public can be exposed to the thermophilic microorganisms *Salmonella*, *Shigella*, *P. aeruginosa*, and *N. fowleri* during swimming, boating, or other recreational uses of freshwater. If a nuclear plant's thermal effluent enhances the growth of thermophilic microorganisms in waters open for recreational use, recreational users could experience an elevated risk of exposure when using waters near the plant's discharge. (NRC. 2013a; NRC. 2020b)

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. *Legionella* optimally grow in stagnant surface waters with biofilms or slimes that range in temperature from 95°F to 113°F, although the bacteria can persist in waters from 68°F to 122°F. The bacteria are only pathogenic to humans when aerosolized and inhaled into the lungs. As such, human infection is often associated with complex water systems housed within buildings or structures, such as cooling towers. (NRC. 2020b)

N. fowleri is ubiquitous in nature and thrives in water bodies at temperatures ranging from 95°F to 106°F or higher and is rarely found in water cooler than 95°F. Infection rarely occurs in water temperatures of 95°F or less (NRC. 2013a, Section 3.9.3). Infections occur when *N. fowleri* penetrates the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrates to the brain tissues (CDC. 2021). There have been eight cases of primary amebic meningoencephalitis, the infection caused by *N. fowleri*, in South Carolina from 1962–2020 (CDC. 2021).

The other human pathogens mentioned above have infection routes of contact with infected persons or contaminated water, food, soil, or other contaminated material. The exposure route of concern would be contact with contaminated water containing a population of microorganisms sufficient for human infection. The pathogens can grow at a range of temperatures, but as human pathogens, have an optimal growth temperature around the human body temperature. The most current data on the Centers for Disease Control and Prevention for waterborne illness outbreaks in untreated recreational water are from 2013–2014. The 2013–2014 data list five waterborne illness cases in South Carolina resulting in no hospitalizations, all of which were from *Cryptosporidium* sp. exposure (CDC. 2019).

As discussed in Section E2.2, VCSNS uses a once-through cooling water system that withdraws water from the Monticello Reservoir into its condensers. After the water cools the condensers, the heated water is transferred to a discharge bay and then flows back into the Monticello Reservoir via a 1,000-foot-long discharge canal. The NPDES permit (included in Appendix B) includes effluent limitations and monitoring requirements.

Monticello Reservoir is open to the public for boating and fishing. The Nuclear Regulatory Commission requires a one-mile radius exclusion zone surrounding VCSNS. Admittance to this area is restricted. This area, encompassing approximately 7.2 miles of shoreline on the south end of Monticello Reservoir, is designated by warning signs on the landward side and by buoys on the lakeward side (SCE&G. 2018c). Monticello Park (also known as Hwy 215 Recreation Site) is located on the shoreline northeast of the VCSNS discharge. The Park provides boat launching, courtesy docks, and picnic facilities for public use. Swimming is allowed. In conjunction with Fairfield County Recreation Commission, there is a multiple use recreational area also at the park. A Recreational Lake with a swimming beach is on the north end of Monticello Reservoir. (DE. 2022d, SCE&G. 2018d, SCIWAY. 2019)

Exposure to *Legionella spp.* from power plant operations is a potential problem for a subset of the workforce. Plant personnel most likely to come into contact with *Legionella* aerosols would be those who dislodge biofilms, where *Legionella* are often concentrated, such as during the cleaning of condenser tubes and cooling towers (NRC. 2013a, Section 3.9.3.3). VCSNS uses a once-through cooling water system for its condenser circulating cooling but has a mechanical draft cooling tower for the Turbine Building closed-cycle cooling water system (SCE&G. 2002, Section 3.1.1). Condenser maintenance involves waterbox entry during outages which is covered by the plant's confined space program that addresses monitoring of the atmosphere prior to entry and use of respiratory protection as appropriate.

DE has a comprehensive health and safety program with procedures that implement industrial hygiene practices to minimize the potential for plant worker exposure.

E3.10.2 ELECTRIC SHOCK HAZARDS

The electric field created by high-voltage lines can extend from the energized conductors on the lines to other conducting objects, such as the ground, vegetation, buildings, vehicles, and persons if appropriate clearances are not maintained, posing a shock hazard for the public and workers. To minimize the shock that could be experienced by someone touching an object that is capacitively charged, the clearance between the power lines and the object must limit the induced current to a low enough electrical charge. The NESC contains the basic provisions considered necessary for the safety of workers and the public.

The in-scope transmission lines at VCSNS are depicted on Figure E2.2-1. The in-scope transmission lines include three onsite lines and a line originating offsite to provide power during

outages. The three onsite lines span the short distance between the Unit 1 Turbine Building and the adjacent switchyard. This span is within the fenced Protected Area and the fenced switchyard and access to this span is restricted and controlled by DE.

The three onsite in-scope lines are within areas that NESC defines as an electrical supply station (Part 1 of the NESC titled "Safety Rules for the Installation and Maintenance of Electric Supply Stations and Equipment) and are accessible only to qualified persons. The NESC 5mA threshold for induced shock is not applicable for areas within the electrical station accessible to qualified persons. DE has electrical safety and switchyard/transformer yard activities procedures to govern work on and within these electrical equipment areas.

The line that originates offsite brings power to Unit 1 from the offsite Parr Generating Complex. This line, the Parr 115-kV line, is located within a transmission corridor that transverses land owned and controlled by DE. This land includes the Parr Generating Complex, the VCSNS Units 2/3 abandoned construction site, and the VCSNS site. The only roads it crosses are internal site roads of both the abandoned construction site and Unit 1 site and the Unit 1 access road. The Units 2 and 3 construction site entrances are fenced and posted as restricted entry. The Unit 1 plant site access road is posted as plant property and is under control of DE. The Parr 115-kV line, however, does cross a rail line near the Parr Generating Complex and the VCSNS rail spur as it nears Unit 1.

The in-scope Parr 115-kV transmission line was surveyed in 2011 by an independent engineering firm for compliance with NESC and was found by a South Carolina-registered professional engineer to be compliance with the code in effect at the time, the 2007 NESC. A portion of the line near Parr Generating Complex and a portion near VCSNS Unit 1 underwent changes and were re-surveyed in 2015 by an independent engineering firm for compliance with the NESC in effect at the time, the 2012 NESC. The NESC in Section 1.013.B of the code titled "Application, Existing Installations" does not require existing installations that currently comply with prior editions of the code be modified to comply with a current edition of the code, unless required by the administrative authority, which in this case would be DE, or when a structure is replaced.

The Parr 115-kV line is confined to DE owned and controlled property so DE would be aware of any portable or permanent installations or terrain recontouring that could alter clearances. DE has an active transmission line management program that inspects and maintains the land beneath the lines. DE surveillance and maintenance procedures provide assurance that design ground clearances would not change. These procedures include routine helicopter inspection two times a year and ground inspection once every 8 years. These routine aerial patrols of all corridors include checks for encroachments, broken conductors, broken or leaning structures, and signs of trees burning, any of which would be evidence of clearance problems. The ground inspections include examination for clearance at questionable locations and surveillance for dead or diseased trees which might fall on the transmission line. Problems noted during any inspection are brought to the attention of the appropriate organizations for corrective action.

Work on VCSNS is governed by a comprehensive industrial safety program with programmatic and tiered specific activity procedures. The industrial safety program complies with applicable requirements of the OSHA Standard for Electrical Power Generation, Transmission, and Distribution (29 CFR 1910.269). The program addresses electrical safety, clearance, and safety tagging, use of ladders and portable equipment, etc.

E3.10.3 RADIOLOGICAL HAZARDS

Radiation liquid effluents from VCSNS are released into the Monticello Reservoir at the discharge canal and into Parr Reservoir at the Fairfield Pumped Storage Facility Penstocks. Radioactive gaseous effluents are released at the Main Plant Vent and Reactor Building Purge Exhaust. (DE. 2022c) VCSNS's ARERRs contain a detailed presentation of the releases. There have been no abnormal gaseous or liquid releases from 2017–2021 (SCE&G. 2018a; SCE&G. 2019a; DE. 2020a; DE. 2021b; DE. 2022b).

As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," DE designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at VCSNS. Based on continuing work with industry peer groups as well as Nuclear Energy Institute and American Nuclear Insurers, there are no substantive changes being developed to nuclear power plant radiation protection programs, currently or during the proposed SLR term. DE follows regulatory guidance and maintains awareness of pending changes to them and other pertinent documents and would implement changes as needed.

NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants must meet radiation dose-based limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and the as low as reasonably achievable (ALARA) criteria in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." Through these release limits, the NRC places regulatory limits on the radiation dose that members of the public can receive from a nuclear power plant's radioactive effluent. DE uses its ODCM, which contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents. These methods ensure that radioactive material discharges from VCSNS meet NRC and EPA regulatory dose standards. The ODCM is updated as needed and updated manuals are submitted to NRC with the plant's ARERR (DE. 2020a).

The dose calculations for 2020 and 2021 as reported in VCSNS's ARERR are presented in the table below (DE. 2021b; DE. 2022b).

Population	Dose Parameter	2020 Annual Dose	2021 Annual Dose	Regulatory Limit
Maximum exposed individual in unrestricted area - gaseous emissions excluding Carbon-14	Gamma	1.00E-03 mrad	4.97E-04 mrad	10 mrad
	Beta	4.85E-04 mrad	2.68E-04 mrad	20 mrad
	Organ dose	1.10E-03 mrem	7.43E-04 mrem	15 mrem
Maximum exposed individual - Carbon-14	Total Body	1.61E-01 mrem	1.46E-01 mrem	15 mrem (RG 1.109)
	Maximum organ	8.08E-01 mrem (bone)	7.32E-01 mrem (bone)	15 mrem (RG 1.109)
Members of the public within the site boundary - gaseous emissions and direct radiation as measured by thermoluminescent dosimeters	Gamma	3.26E-03 mrad	1.62E-03 mrad	10 mrad
	Beta	1.58E-03 mrad	8.73E-04 mrad	20 mrad
Fairfield Hydro Station workers	Gamma	4.73E-05 mrad	2.35E-05 mrad	10 mrad
	Beta	2.29E-05 mrad	1.27E-05 mrad	20 mrad
New Nuclear Site workers	Gamma	4.07E-04 mrad	2.02E-04 mrad	10 mrad
	Beta	1.97E-04 mrad	1.09E-04 mrad	20 mrad
Maximum exposed individual in unrestricted area - liquid releases	Total body	6.25E-03 mrem	7.89E-03 mrem	3 mrem
	GI-LLI	6.32E-03 mrem	7.91 E-3 mrem	10 rmrem

mrad = millirad

mrem = millirem

Occupational exposure at nuclear power plants is monitored by the NRC. The 3-year (2018–2020) average occupational dose per individual total effective dose equivalent (TEDE) was 0.062 roentgen equivalent man (rem) per worker for VCSNS and the average for PWRs was 0.072 person-rem. The annual TEDE limit is 5 rems [10 CFR 20.1201(a)(1)]. VCSNS had a 3-year (2018–2020) TEDE collective dose per reactor of approximately 28.268 person-rem and the average for PWRs was 30.352. (NRC. 2022a, Table 4.6)

VCSNS's REMP provides additional assurance that there are no significant dose or radiological environmental impacts due to plant operations. The REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, drinking water, surface water, groundwater, milk, vegetation, fish, shellfish (*Corbicula*), and sediment. Radionuclides observed in the environment in 2021 from VCSNS releases were within the range of concentrations observed in the past. Radiation dose calculated from the sample results is less than that observed with normal fluctuation in natural background. VCSNS operations have no significant radiological impact on the health and safety of the public or environment. (DE. 2022c)

Within the REMP, VCSNS monitors groundwater as a drinking water pathway. Sample sites are within the exclusion zone with a control sample site 2.6 miles south, southeast of VCSNS. None of the 2020 groundwater samples were above the lower limit of detection (DE. 2021a). During 2021, no other radionuclides were detected in groundwater samples other than tritium. Tritium was detected within the site boundary at Site 123 (NPDES Well GW-16 0.34 miles SSE), in four quarterly samples at concentrations of 2.25E+3 picoCuries per liter (pCi/L), 2.63E+3 pCi/L, 2.02E+3 pCi/L, and 1.99E+3 pCi/L. GW-16 is a shallow supplemental monitoring site used to monitor for chemical contaminants around the industrial and sanitary waste treatment system. Groundwater is not used for drinking water onsite, however, if this groundwater represented a credible drinking water exposure pathway, maximum dose projection assuming consumption of 730 liters per year would result in a dose that does not exceed 0.25 millirem (mrem). These levels are substantially less than the 2.00E+4 pCi/L drinking water standard. (DE. 2022b)

E3.11 ENVIRONMENTAL JUSTICE

E3.11.1 REGIONAL POPULATION

The GEIS presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC. 1996b, Section C.1.4). Sparseness measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles.
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles.
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles.

(NRC. 1996b, Section C.1.4)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows:

Demographic Categories Based on Proximity

		Category
Not close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles.
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles.
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.
Close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles.

(NRC. 1996b, Section C.1.4)

The GEIS then uses the following matrix to rank the population in the vicinity of the plant as low, medium, or high:

GEIS Sparseness and Proximity Matrix

		Proximity			
		1	**2**	**3**	**4**
Sparseness	**1**	1.1	1.2	1.3	1.4
	2	2.1	2.2	2.3	2.4
	3	3.1	3.2	3.3	**3.4**
	4	4.1	4.2	**4.3**	**4.4**

Low Population Area | **Medium Population Area** | **High Population Area**

(NRC. 1996b, Figure C.1)

The 2010 census population and TIGER/Line data from the USCB were used to determine demographic characteristics in the vicinity of the site (USCB. 2021). The data were processed at the state, county, and census block levels using ESRI ArcGIS software (USCB. 2022b; USCB. 2022e). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers); nursing homes; mental (psychiatric) hospitals; hospitals or wards for the chronically ill; and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes; college dormitories; military quarters; soup kitchens; shelters for abused women (shelters against domestic violence or family crisis centers); and shelters for children who are runaways, neglected, or without conventional housing. (USCB. 2022f)

The 2020 census data indicate that approximately 177,057 people live within a 20-mile radius of the VCSNS site, which equates to a population density of 141 persons per square mile (USCB. 2022e). Based on the GEIS sparseness index, the site is classified as Category 4 with greater than or equal to 120 persons per square mile within 20 miles.

The 2020 census data indicate that approximately 1,245,777 people live within a 50-mile radius of the site, which equates to a population density of 159 persons per square mile (USCB. 2022e). One city within a 50-mile radius, Columbia, South Carolina, has a population greater than 100,000 residents (Table E3.11-1). Based on the GEIS proximity index, the site is classified as Category 3, one or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.

As illustrated in the GEIS sparseness and proximity matrix, the combination of "sparseness" Category 4 and "proximity" Category 3 results in the conclusion that the VCSNS site is located in a "high" population area.

The area within a 50-mile radius of the VCSNS site totally or partially includes 22 counties within the states of North Carolina and South Carolina (Table E3.11-2). According to the 2020 census, the permanent population (not including transient populations) of the entire 22 counties was approximately 2,474,584 (Table E3.11-2). By 2062, the end of the proposed VCSNS operating term, the permanent population (not including transient populations) of the entire 22 counties is projected to be approximately 4,074,342. Based on 2020–2062 population projections, an annual growth rate of approximately 1.19% is anticipated for the permanent population in the 22 counties wholly or partially within a 50-mile radius (NCOSBM. 2022; SCRFAO. 2022; USCB. 2022b).

As shown in Table E3.11-2, the total population (including transient populations) of the 22 counties, which are totally or partially included within a 50-mile radius, is projected to be approximately 4,321,585 in 2062. The total population (including transient populations) within the 50-mile radius is

projected to be 2,045,510 in 2062. (AHLA. 2019; NCOSBM. 2022; SCPRT. 2020; SCRFAO. 2022; USCB. 2022e; USCB. 2022b; VNC. 2022).

The latest permanent population projections for North Carolina were obtained from the North Carolina Office of State Budget and Management (NCOSBM. 2022). The latest permanent population projections for South Carolina were obtained from the South Carolina Revenue and Fiscal Affairs Office (SCRFAO. 2022). County-level permanent population values for the counties within a 50-mile radius are shown in Table E3.11-2.

Transient data for the State of North Carolina were obtained from the "Visit North Carolina" website (VNC. 2022). Transient data for the State of South Carolina were obtained from the South Carolina Department of Parks, Recreation and Tourism (SCPRT. 2020). The average length of stay for international visitors was not available for either North Carolina or South Carolina. In those situations, information from the American Hotel and Lodging Association was used (AHLA. 2019).

VCSNS is located in Fairfield County. As shown in Table E3.11-2, the population of Fairfield County, South Carolina, as reported in the 2020 census was 20,948. Based on South Carolina's population projection data, Fairfield County's projected permanent population for 2062 is expected to be 21,988. (SCRFAO. 2022) Estimated projected populations and average annual growth rate for Fairfield County is shown in Table E3.11-3.

Cities, towns, villages, and some Census Designated Places (CDPs) with centers falling within a 50-mile radius of VCSNS are listed in Table E3.11-1 As seen in Figure E3.1-3, within the 6-mile vicinity of the plant, the town nearest to VCSNS is Jenkinsville, South Carolina, in Fairfield County (approximately 3 miles southeast). Its 2020 population was reported at 40 persons. Located approximately 4 miles south of VCSNS is the town of Peak, South Carolina, in Newberry County (2020 population of 51). Pomaria, South Carolina, in Newberry County (2020 population of 127), is located approximately 6 miles west-southwest. (USCB. 2022g)

As seen in Table E3.11-1, the largest community in Fairfield County is the city of Winnsboro (2020 population of 3,215), located approximately 14 miles east-northeast of VCSNS. The largest city in Newberry County is Newberry (2020 population of 1,390), located approximately 22 miles northwest of VCSNS. Columbia, South Carolina (2020 population of 136,632), located 26 miles southeast, is the only community within a 50-mile radius of VCSNS that has a population greater than 100,000. Rock Hill, South Carolina, located 46 miles north-northeast, is the only other city within a 50-mile radius that has a population greater than 25,000 as of 2020 (Table E3.11-1).

E3.11.2 MINORITY AND LOW-INCOME POPULATIONS

E3.11.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the environmental "impact area." LIC-203 Revision 3 (NRC. 2020c) defines a geographic area for comparison as a 50-mile radius (also referred to as "the region" in this discussion) centered on the nuclear plant. An alternative approach is also addressed that uses an individual state that encompasses the 50-mile radius individually for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for VCSNS.

LIC-203 guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in 5-year averages. The 2020 low-income and minority census population data and TIGER/Line data for North Carolina and South Carolina were obtained from the USCB website and processed using ArcGIS software (USCB. 2022g). Census population data were used to identify the minority and low-income populations within a 50-mile radius of VCSNS. Environmental justice evaluations for minority and low-income populations are based on the use of USCB block groups for minority and low-income populations.

E3.11.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian/other Pacific Islander, some other race, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC. 2020c). The guidance indicates that a minority population is considered present if either of the following two conditions exists:

1. The minority population in the census block group exceeds 50%; or
2. The minority population percentage is more than 20% greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for each state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20% was added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50%, or minority population is more than 20% greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for

North Carolina, South Carolina, and a 50-mile radius, and the corresponding criteria, are shown in Table E3.11-4.

A minority category of aggregate of all races is created when the populations of all the 2020 USCB minority categories are summed. As shown in Table E3.11-4, the 2020 aggregate of all races category, when compared to the total population, indicates 41.8% of the population in a 50-mile radius (region) are minorities. The aggregate of all races population percentages for North Carolina and South Carolina are 37.8% and 36.6%, respectively. Because 61.8%, 57.8%, and 56.6% exceeds the 50% noted for Condition 1, defined above, the lower criterion (50%) would be used for the threshold. Using the alternate approach defined above, where a 50-mile radius is used as the geographic area, any census block group with a combined aggregate of all races population equal to or greater than 50% would be considered a minority population. Similarly, each state was evaluated and a series of criteria for each race and low-income category were defined. When the two states are used as the geographic area, any census block group with an aggregate of all races population exceeding 50% in North Carolina or South Carolina would be considered a minority population.

Because Hispanic is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. However, because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the aggregate and Hispanic category.

The number of census block groups contributing to the minority population count was evaluated using the criteria shown in Table E3.11-4 and summarized in Table E3.11-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures E3.11-1, E3.11-2, E3.11-3, E3.11-4, E3.11-5, E3.11-6, E3.11-7, E3.11-8, E3.11-9, E3.11-10, E3.11-11, E3.11-12, E3.11-13, E3.11-14, E3.11-15, and E3.11-16) depict the location of minority population census block groups flagged accordingly for each race or aggregate category. Because no block group met the criteria for the "Native Hawaiian/Other Pacific Islander" race category, no figures illustrating that race category were produced.

The percentage of census block groups exceeding the aggregate of all races minority population criterion was 34.5% when a 50-mile radius (region) was used and 34.5% when the individual state was used as the geographic area (Table E3.11-5). For the aggregate and Hispanic category, 35.6% of the census block groups contained a minority population for both region and state geographic areas (Table E3.11-5). The minority population values of the block groups were significantly reduced when races were analyzed individually.

VCSNS is located within a block group with an identified minority population: Block Group 450399601002. This census block group contained a total of 981 people, with 739 Black or African American, 3 American Indian or Alaska Native, 4 Some Other Race, 25 Two or More Races,

771 Aggregate of all Races, 19 Hispanic or Latino, and 773 Aggregate and Hispanic individuals. Using either the individual state criteria or the regional criteria, the block group contains a Black or African American population, an Aggregate of All Minority Races population, and an Aggregate and Hispanic population. (USCB. 2022b; USCB. 2022g)

There are a total of four block groups within a 6-mile radius that meet the criteria for a minority population. There are 327 identified minority population block groups located in, partially within, or adjacent to cities, municipalities, or USCB-defined urban areas. This leaves 14 block groups that do not fall within or are not immediately adjacent to cities, municipalities, or USCB-defined urban areas (USCB. 2020; USCB. 2021).

As presented in Section E3.1.3, there are no federal or state recognized Native American Indian Tribes with reservations or identified lands located within the VCSNS 50-mile region, although the Beaver Creek State Designated Tribal Statistical Area lies just outside the region to the south.

E3.11.2.3 Low-Income Populations

NRC guidance defines "low-income" using USCB statistical poverty thresholds for individuals or families (NRC. 2020c). As addressed above with minority populations, two alternative geographic areas (North Carolina and South Carolina individually and the region) were used as the geographic areas for comparison in this analysis. The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1. The low-income population in the census block group exceeds 50%; or
2. The percentage of households below the poverty level in a block group is significantly greater (typically at least 20%) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., individual state and region's combined average).

To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for the state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for the state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in Condition 2, above, 20% was added to the low-income values for individuals and families and each geographic area. None of the low-income criteria for the geographic areas described in the first condition exceeded 50%.

As shown in Table E3.11-6, when the 2021 census data category "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 15.2% of the population in the region has an individual income below poverty level. In

the states of North Carolina and South Carolina, the percentages of individuals with an income below poverty level are 13.7% and 14.4%, respectively.

As shown in Table E3.11-6, North Carolina has an estimated 535,711 families and South Carolina has an estimated 284,008 families living below poverty level. When the 2021 census data family category "income in the past 12 months below poverty level" is compared to "total family count," 15.4% of the families within the region have an income below poverty level. In the states of North Carolina and South Carolina, the percentages of the family population with an income below poverty level are 13.3% and 14.4%, respectively.

When the region is used as the geographic area, any census block group within a 50-mile radius with populations of low-income individuals equal to or greater than 35.2% of the total block group population would be considered a "low-income population." Using this criterion, 93 of the 911 census block groups (10.2%) were identified as low-income populations within a 50-mile radius of the VCSNS site, as shown in Figure E3.11-17. (USCB. 2022g)

When South Carolina is used as the geographic area, any census block group within the region with a low-income population equal to or greater than 34.5% of the total block group, the population would be considered a "low-income population" (individual) (Table E3.11-6). Using the appropriate criteria for the individual state (North Carolina and South Carolina), 93 of the total 911 census block groups (10.2%) have low-income individual population percentages that meet or exceed the threshold criteria noted in Figure E3.11-7. These census block groups are illustrated in Figure E3.11-18.

Similarly, these criteria are found using both geographies and family census counts (Table E3.11-7). Using the family individual state and regional criteria, 95 and 94 block groups were identified as having low-income families in each criterion (Table E3.11-7). These census block groups are illustrated in Figures E3.11-19 and E3.11-20. (USCB. 2022g; USCB. 2022b) The closest low-income block group that meets the guidance criteria for individuals or families is approximately 9.4 miles southeast of the VCSNS center point (Block Group 450790102001). There are no block groups within a 6-mile radius that meet the criteria for low-income populations. (USCB. 2022g)

E3.11.3 SUBSISTENCE POPULATIONS AND MIGRANT WORKERS

E3.11.3.1 Subsistence Populations

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence use include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level are aggregated and not usually structured to identify such uses on or near the site. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population who are most likely to know of such activity. This may include county officials, community leaders, and landowners in the vicinity who would have knowledge of subsistence activity.

The area surrounding VCSNS is largely rural, forested, and agricultural, with no known subsistence-based activity. As reported in the 2004 NUREG-1437 Supplement 15, the NRC found no unusual resource dependencies or practices, such as subsistence agriculture through which the minority and low-income populations could experience disproportionately high and adverse impacts (NRC. 2004b).

A literature review was conducted for more recent publicly available subsistence information. No publicly available studies were identified. DE staff, who live and work in the VCSNS region, were interviewed and no knowledge of subsistence activities were identified. Furthermore, VCSNS uses a REMP program that has not identified any impacts that would affect human health.

E3.11.3.2 Migrant Workers

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day." In 2017, Fairfield County reported 41 out of 228 total farms employed farm labor. Lexington County reported 162 out of 1,137 total farms employed farm labor. Newberry County reported 93 out of 607 total farms employed farm labor. Richland County reported 67 out of 440 total farms employed farm labor. The 2017 Census of Agriculture reported that none of the Fairfield County farms employed migrant farm workers. In Lexington County, 6 farms reported employing migrant workers. None of the farms in Newberry County reported employing migrant workers. In Richland County, 4 farms reported employing migrant workers. For Fairfield County, an estimated total of 98 farm laborers were hired. The number of workers estimated to work fewer than 150 days per year was withheld to avoid disclosing data for individual farms. For Lexington County, an estimated total of 1,057 farm laborers were hired, of which 528 were estimated to work fewer than 150 days per year. For Newberry County, an estimated total of 360 farm laborers were hired, of which 184 were estimated to work fewer than 150 days per year. For Richland County, an estimated total of 400 farm laborers were hired, of which 187 were estimated to work fewer than 150 days per year. (USDA. 2021b)

Table E3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of VCSNS (Sheet 1 of 3)

City/Town/CDP	County	2010 Census Population[a]	2020 Census Population[a]	Distance to VCSNS (miles)[b][c]	Direction[b][c]
South Carolina					
Arcadia Lakes	Richland	861	865	26	SE
Batesburg-Leesville	Lexington	5,362	5,270	30	SSW
Blythewood	Chester	2,034	4,772	20	NNE
Camden	Union	6,838	7,788	36	NW
Carlisle	Union	436	321	22	NNW
Cayce	Lexington	12,528	13,781	27	SSE
Central Pacolet	Spartanburg	216	209	49	NNW
Chapin	Lexington	1,445	1,809	9	SSW
Chester	Chester	5,607	5,269	29	NNE
Clinton	Laurens	8,490	7,633	34	WNW
Columbia	Richland	129,272	136,632	26	SE
Cross Hill	Laurens	507	404	38	W
Dentsville	Richland	14,062	14,431	26	SE
Eastover	Richland	813	614	46	SE
Edgefield	Edgefield	4,750	2,322	50	SW
Elgin	Lancaster	1,311	1,634	43	NE
Forest Acres	Richland	10,361	10,617	27	SE
Fort Lawn	Chester	895	962	37	NE
Fort Mill	York	10,811	24,521	53	NNE
Gaston	Lexington	1,645	1,608	35	SSE
Gilbert	Lexington	565	571	26	S
Gray Court	Laurens	795	763	50	WNW
Great Falls	Chester	1,979	1,951	30	NE
Greenwood	Greenwood	23,222	22,545	49	W
Heath Springs	Lancaster	790	742	42	ENE
Hickory Grove	York	440	449	48	N
Irmo	Lexington	11,097	11,569	16	SSE
Jenkinsville	Fairfield	46	40	3	SE
Johnston	Edgefield	2,362	1,997	43	SW
Jonesville	Union	911	852	43	NNW
Kershaw	Lancaster	1,803	1,693	45	ENE
Lancaster	Lancaster	8,526	8,460	43	NE

Table E3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of VCSNS (Sheet 2 of 3)

City/Town/CDP	County	2010 Census Population[a]	2020 Census Population[a]	Distance to VCSNS (miles)[b][c]	Direction[b][c]
Laurens	Laurens	9,139	9,335	42	WNW
Lexington	Lexington	17,870	23,568	22	SSE
Little Mountain	Newberry	291	249	9	SW
Lockhart	Union	488	384	35	NNW
Lowrys	Chester	200	184	35	N
McConnells	York	255	280	40	N
Monetta	Saluda	236	205	35	SSW
Newberry	Newberry	10,277	10,691	17	W
Ninety Six	Greenwood	1,998	2,076	41	WSW
North	Orangeburg	754	696	49	SSE
Oak Grove	Calhoun	10,291	12,899	41	SSE
Pacolet	Spartanburg	2,235	2,274	49	NNW
Peak	Newberry	64	51	4	S
Pelion	Lexington	674	631	37	S
Perry	Aiken	233	194	46	S
Pine Ridge	Lexington	2,064	2,167	29	SSE
Pomaria	Newberry	179	127	6	WSW
Prosperity	Newberry	1,180	1,178	14	WSW
Red Bank	Lexington	9,617	10,924	26	S
Richburg	Chester	275	280	33	NNE
Ridge Spring	Saluda	737	579	37	SSW
Ridgeway	Fairfield	319	266	20	E
Rock Hill	York	66,154	74,372	46	NNE
Salley	Aiken	398	329	50	S
Saluda	Saluda	3,565	3,122	33	SW
Seven Oaks	Lexington	15,144	14,652	18	SSE
Sharon	York	494	462	45	N
Silverstreet	Newberry	162	164	24	WSW
South Congaree	Lexington	2,306	2,377	29	SSE
Springdale	Lexington	2,636	2,744	26	SSE
St. Andrews	Lexington	20,493	20,675	17	SSE
Summit	Lexington	402	423	26	SSW
Swansea	Lexington	827	722	41	SSE
Trenton	Edgefield	196	200	49	SW

Table E3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of VCSNS (Sheet 3 of 3)

City/Town/CDP	County	2010 Census Population[a]	2020 Census Population[a]	Distance to VCSNS (miles)[b][c]	Direction[b][c]
Union	Union	8,393	8,174	34	NNW
Van Wyck	Lancaster	N/A	848	45	NE
Wagener	Aiken	797	631	45	S
Ward	Saluda	91	119	39	SW
Waterloo	Laurens	166	149	43	W
West Columbia	Lexington	14,988	17,416	25	SSE
Whitmire	Newberry	1,441	1,390	22	NW
Winnsboro	Fairfield	3,550	3,215	14	ENE
Woodford	Orangeburg	185	161	45	SSE
Woodruff	Spartanburg	4,090	4,212	51	NW
York	York	7,736	8,503	48	N

a. (USCB. 2022a)

b. (USDOT. 2022a; USCB. 2021)

c. Distances reported were measured from the VCSNS center point to the city center.

Table E3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of VCSNS

State, County and Independent City	2010 Population[a]	2020 Population[a]	2062 Projected Permanent Population[a][b]	2062 Projected Total Population[a][b][c]
South Carolina (21 Counties)	**2,062,273**	**2,236,317**	**3,570,909**	**3,804,089**
Aiken	160,099	168,808	212,504	226,380
Calhoun	15,175	14,199	14,343	15,279
Cherokee	55,342	56,216	58,434	62,250
Chester	33,140	32,294	32,294	34,403
Edgefield	26,985	25,657	28,388	30,242
Fairfield	23,956	20,948	21,988	23,424
Greenwood	69,661	69,351	76,599	81,601
Kershaw	61,697	65,403	93,546	99,655
Lancaster	76,652	96,016	294,287	313,504
Laurens	66,537	67,539	68,381	72,847
Lee	19,220	16,531	16,531	17,610
Lexington	262,391	293,991	476,752	507,884
McCormick	10,233	9,526	9,526	10,148
Newberry	37,508	37,719	39,290	41,855
Orangeburg	92,501	84,223	84,598	90,122
Richland	384,504	416,147	517,849	551,664
Saluda	19,875	18,862	20,611	21,957
Spartanburg	284,307	327,997	607,515	647,186
Sumter	107,456	105,556	105,944	112,862
Union	28,961	27,244	27,244	29,023
York	226,073	282,090	764,285	814,193
North Carolina (1 County)	**201,292**	**238,267**	**503,434**	**517,496**
Union	201,292	238,267	503,434	517,496

a. (USCB. 2022b)

b. (NCOSBM. 2022; SCRFAO. 2022)

c. (SCPRT. 2020; VNC. 2022)

Table E3.11-3 County Population Growth, 2020–2062

South Carolina		2020	2030	2040	2050	2060	2062
Fairfield County	Population	20,948	21,988	21,988	21,988	21,988	21,988
	Average Annual Growth%	N/A	0.49	0.00	0.00	0.00	0.00
Lexington County	Population	293,991	345,617	386,444	427,493	468,542	476,752
	Average Annual Growth%	N/A	1.63	1.12	1.01	0.92	0.87
Newberry County	Population	37,719	39,260	39,290	39,290	39,290	39,290
	Average Annual Growth%	N/A	0.40	0.01	0.00	0.00	0.00
Richland County	Population	416,147	444,778	467,106	490,171	513,236	517,849
	Average Annual Growth%	N/A	0.67	0.49	0.48	0.46	0.45

Note: Projected population values are based on the population projection growth trend for the years reported by the South Carolina Revenue and Fiscal Affairs Office (USCB. 2022b; SCRFAO. 2022).

According to SCRFAO projection information, Fairfield County's population is expected to decline after 2021. To provide conservative estimates the population value for 2021 was extended through 2062.

According to SCRFAO projection information, Newberry County's population is expected to decline after 2034. To provide conservative estimates the population value for 2034 was extended through 2062.

Table E3.11-4 Minority Population Criteria

Geographic Area	South Carolina[a]			North Carolina[a]			50-Mile Radius (Region)[b]		
Total Population	**5,118,425**			**10,439,388**			**1,335,418**		
Census Categories	**State Population by Census Category[a]**	**%[c]**	**Criteria**	**State Population by Census Category[a]**	**%[c]**	**Criteria**	**Regional Population by Census Category[b]**	**%[c]**	**Criteria**
Black or African American	1,280,531	25.0	45.0	2,140,217	20.5	40.5	411,120	30.8	50.0
American Indian or Alaska Native	24,303	0.5	20.5	130,032	1.2	21.2	6,625	0.5	20.5
Asian	90,466	1.8	21.8	343,051	3.3	23.3	22,923	1.7	21.7
Native Hawaiian/Other Pacific Islander	3,431	0.1	20.1	8,518	0.1	20.1	936	0.1	20.1
Some Other Race	177,876	3.5	23.5	617,390	5.9	25.9	41,737	3.1	23.1
Two or More Races	298,376	5.8	25.8	711,721	6.8	26.8	75,444	5.6	25.6
Aggregate of All Races	1,874,983	36.6	50.0	3,950,929	37.8	50.0	558,785	41.8	50.0
Hispanic or Latino	352,838	6.9	26.9	1,118,596	10.7	30.7	84,759	6.3	26.3
Aggregate and Hispanic[d]	1,939,873	37.9	50.0	4,127,240	39.5	50.0	573,758	43.0	50.0

a. (USCB. 2022b)

b. (USCB. 2022g)

c.% values were calculated by dividing each Census Categories' population by the state or region total population values.

d. Includes everyone except persons who identified themselves as White, Not Hispanic, or Latino (NRC. 2020c).

Table E3.11-5 Minority Census Block Group Counts, 50-Mile Radius of VCSNS

Total Number of Block Groups with Population within 50-mile Radius	Individual State Method		50-Mile Radius (Region)	
	Census Block Groups		Census Block Groups	
	911		911	
Census Categories	**Number of Block Groups with Identified Minority Category**	**% of Block Groups within 50 miles**	**Number of Block Groups with Identified Minority Category**	**% of Block Groups within 50 miles**
Black or African American	252	27.7	216	23.7
American Indian or Alaska Native	1	0.1	1	0.1
Asian	1	0.1	1	0.1
Native Hawaiian/Other Pacific Islander	0	0	0	0
Some Other Race	3	0.3	4	0.4
Two or More Races	1	0.1	1	0.1
Aggregate of All Races	314	34.5	314	34.5
Hispanic or Latino	18	2	21	2.3
Aggregate and Hispanic	324	35.6	324	35.6

(USCB. 2022g; USCB. 2021)

Table E3.11-6 Low-Income Population Criteria

Geographic Area	South Carolina[a]			North Carolina[a]			50-Mile Radius (Region)[b]		
(Income) Total Population	**4,950,181**			**10,098,330**			**1,291,007**		
(Income) Total Families	**1,961,481**			**4,031,592**			**514,999**		
Census Category	**State Population by Census Category**	**%[c]**	**Criteria**	**State Population by Census Category**	**%[c]**	**Criteria**	**State Population by Census Category**	**%[c]**	**Criteria**
Low Income: Number of Persons Below Poverty Level (Individuals)	726,470	14.7	34.7	1,411,939	14.0	34.0	198,896	15.4	35.4
Low Income: Number of Families Below Poverty Level (Households)	284,769	14.5	34.5	540,970	13.4	33.4	79,201	15.4	35.4

a. (USCB. 2022b)

b. (USCB. 2022g)

c. Percent values were calculated by dividing each census category's population by the state and regional total population values.

Table E3.11-7 Low-Income Census Block Group Counts, 50-Mile Radius of VCSNS

Total Number of Block Groups with Population within 50-mile Radius	Individual State Method		50-Mile Radius (Region)	
	Census Block Groups		Census Block Groups	
	911		911	
Census Categories	Number of Block Groups with Identified Minority and Low-Income Category	% of Block Groups within 50 miles	Number of Block Groups with Identified Minority and Low-Income Category	% of Block Groups within 50 miles
Low Income Individuals	93	10.2	96	10.5
Low Income Families (Households)	83	9.1	86	9.4

(USCB. 2022g; USCB. 2021)

Figure E3.11-1 Aggregate of All Races Populations (Regional)

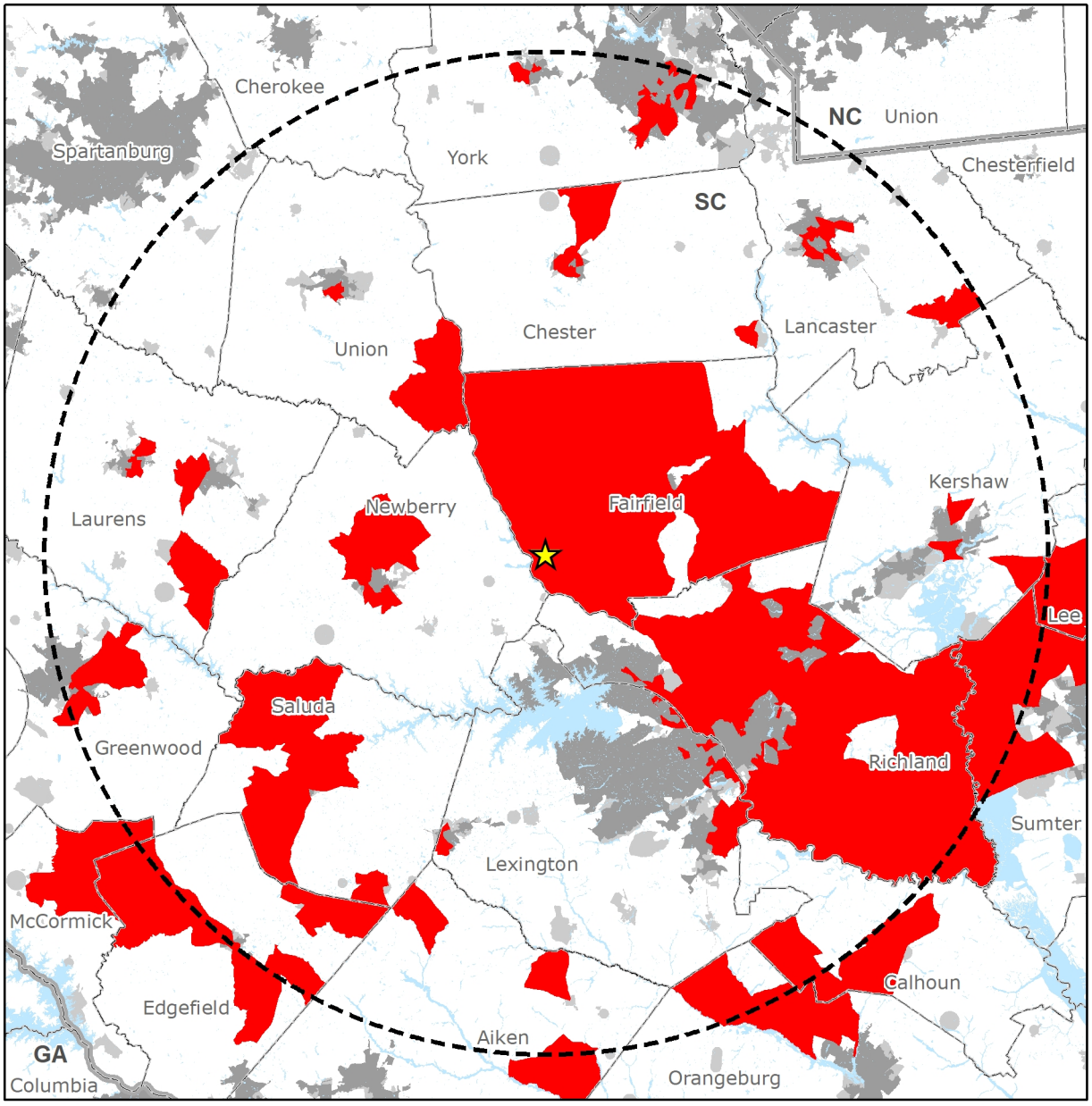


Figure E3.11-2 Aggregate of All Races Populations (Individual State)

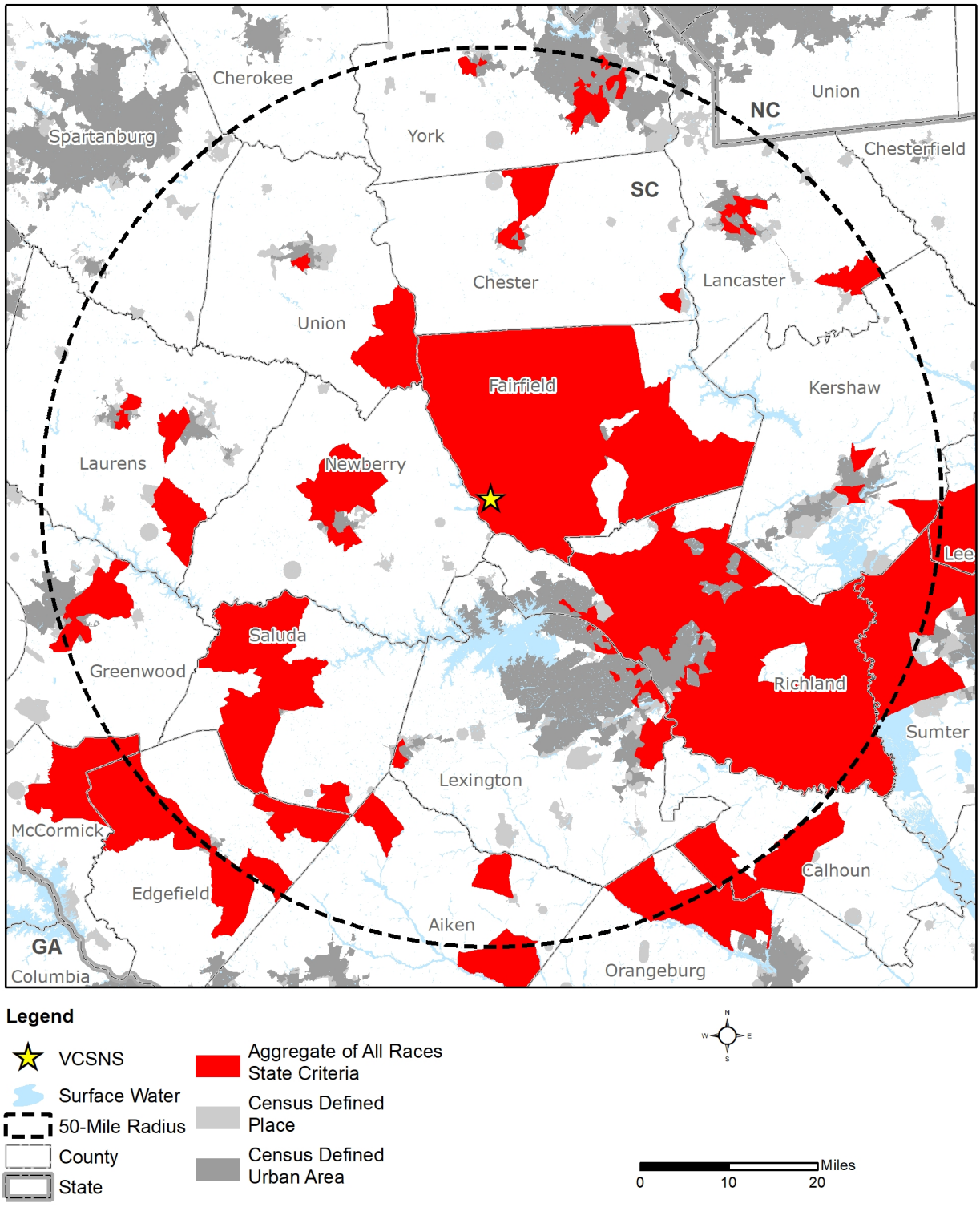


Figure E3.11-3 Aggregate and Hispanic Populations (Regional)

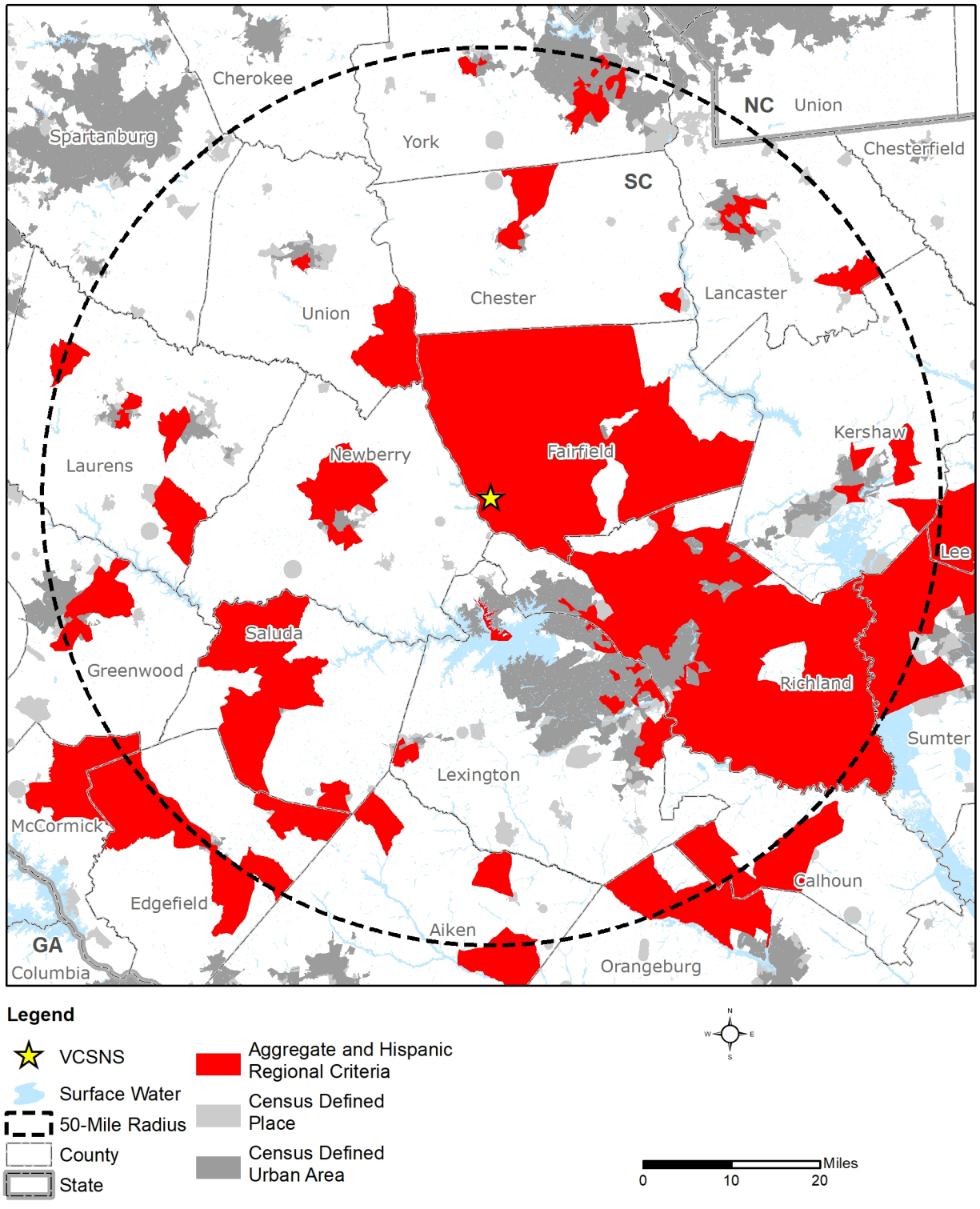


Figure E3.11-4 Aggregate and Hispanic Populations (Individual State)

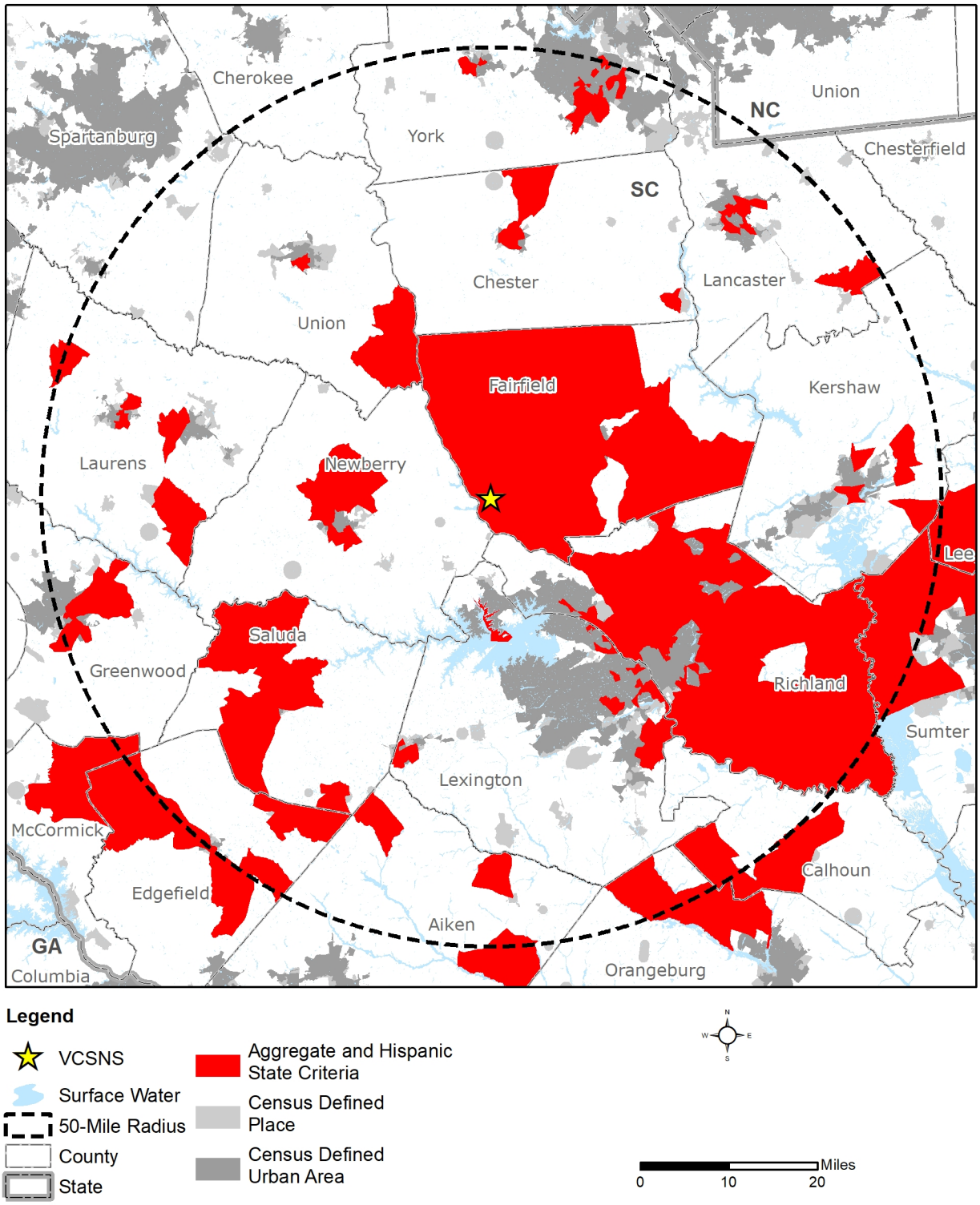


Figure E3.11-5 Black or African American Populations (Regional)

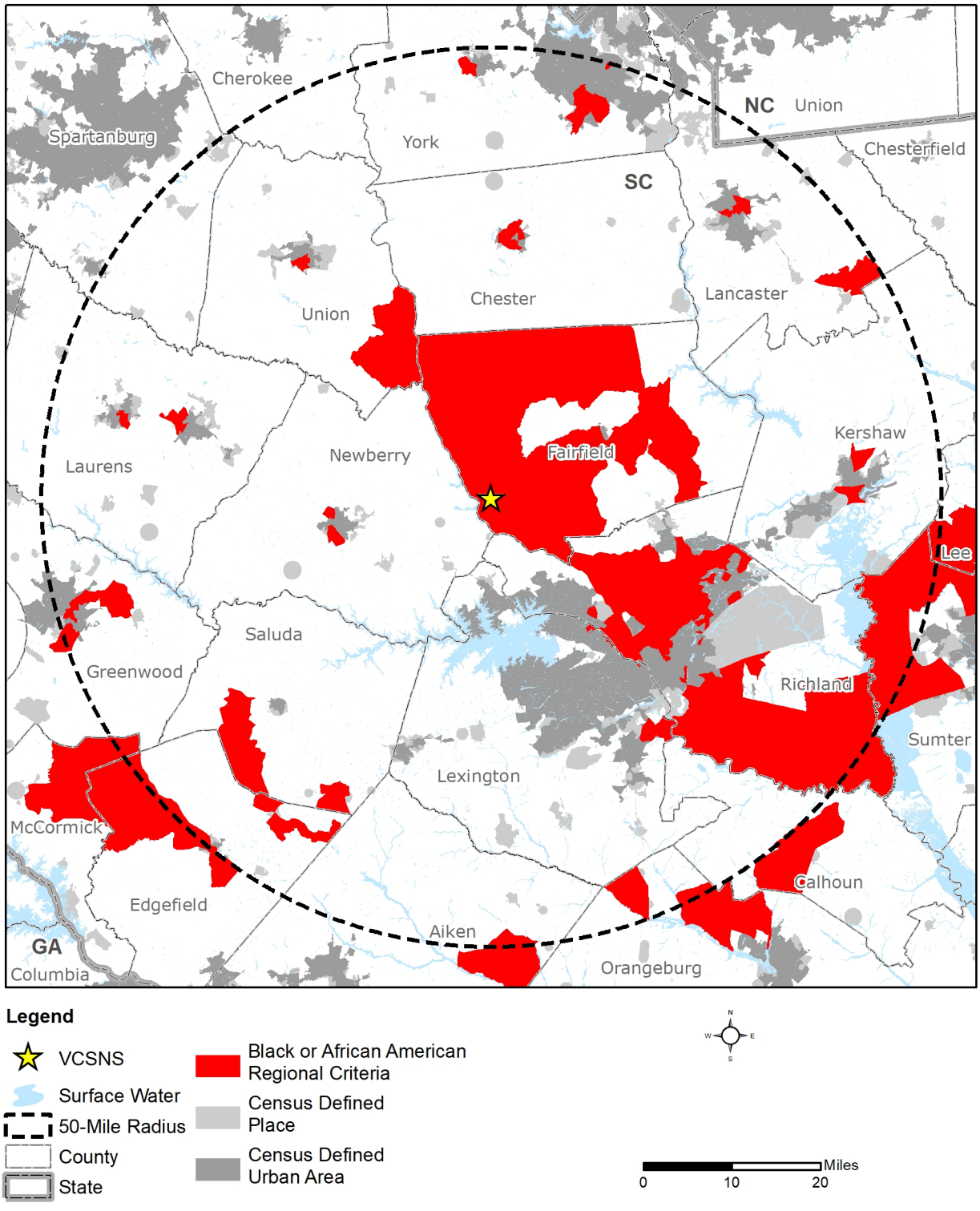


Figure E3.11-6 Black or African American Populations (Individual State)

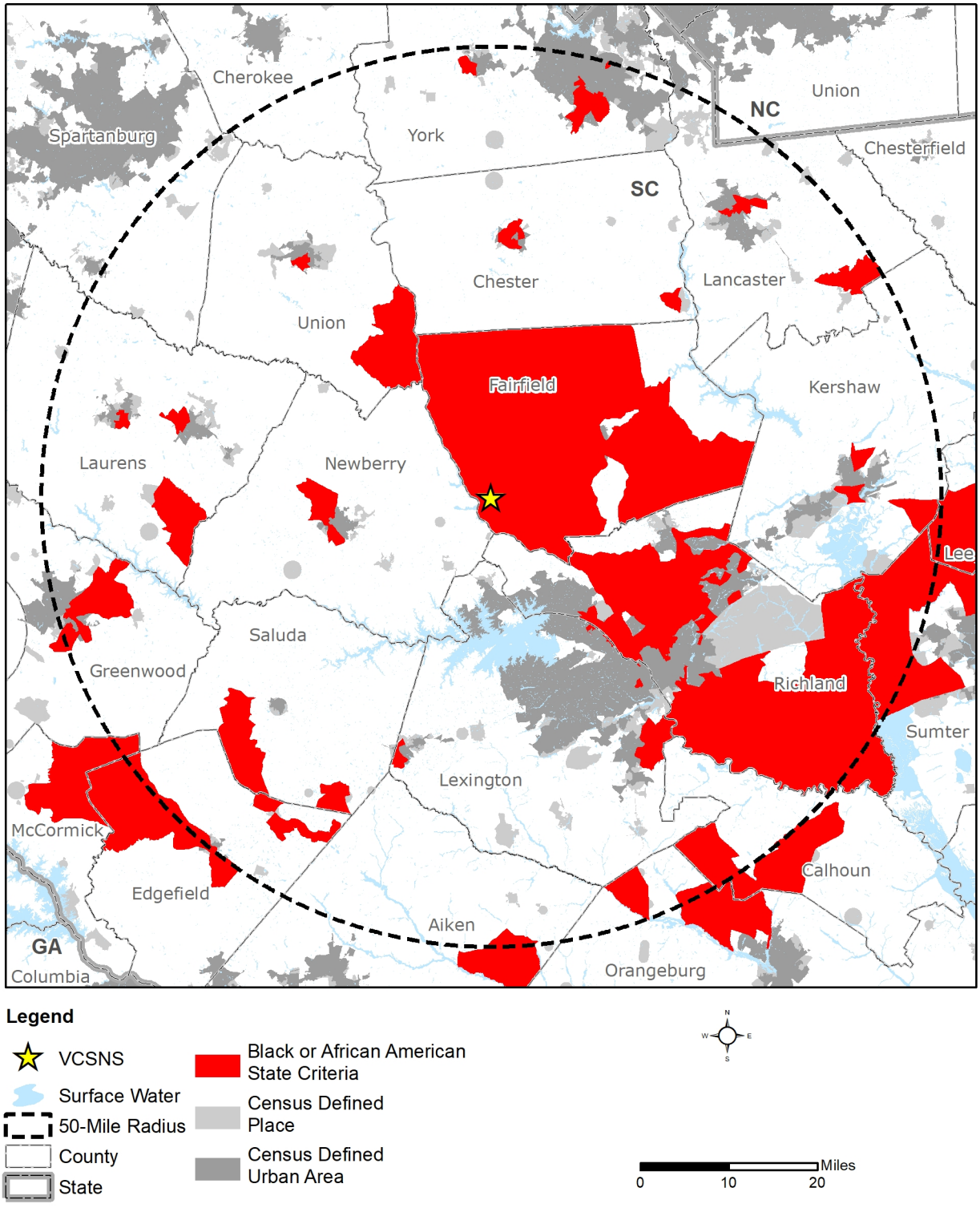


Figure E3.11-7 Asian Populations (Regional)

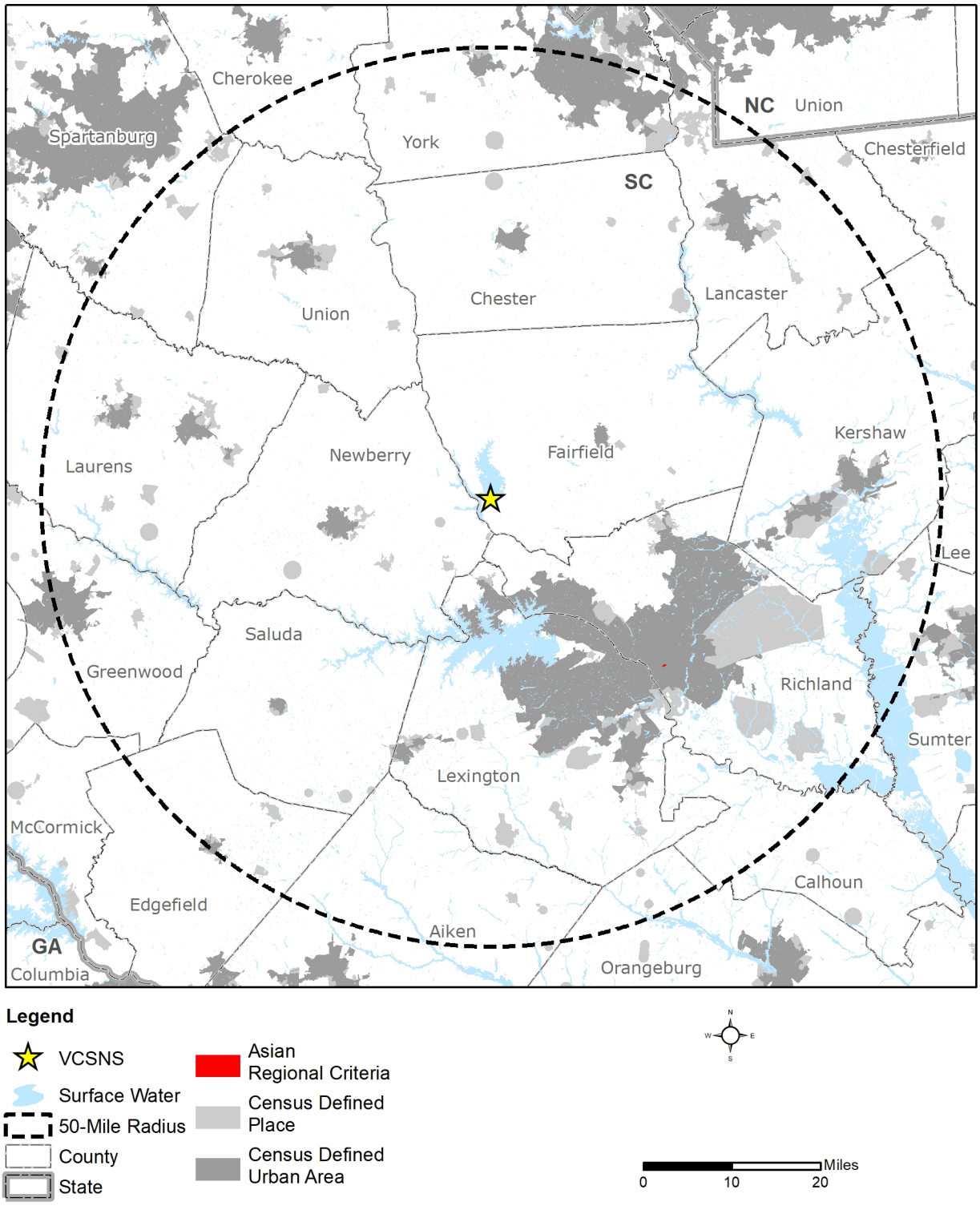


Figure E3.11-8 Asian Populations (Individual State)

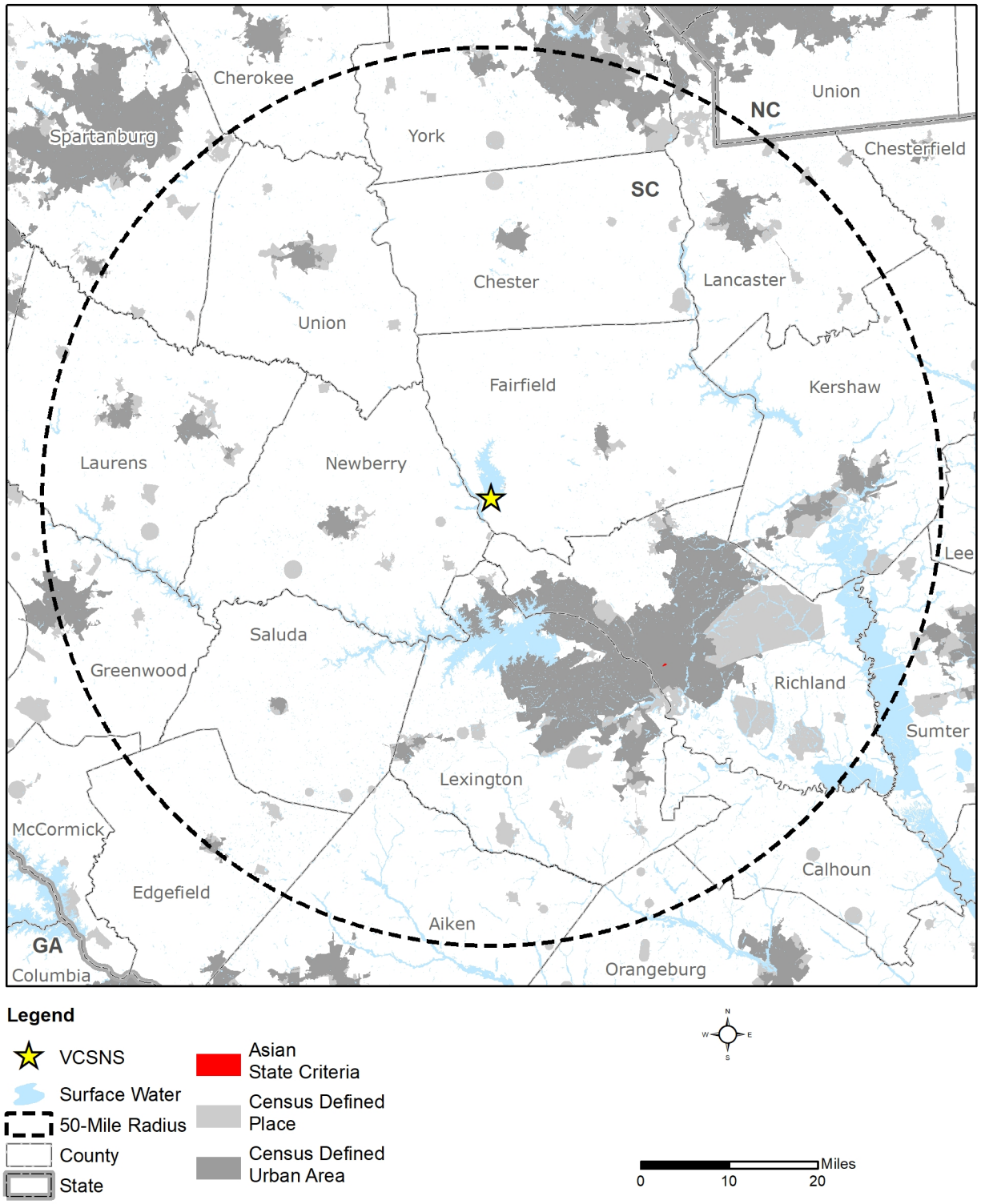


Figure E3.11-9 American Indian or Alaska Native Populations (Regional)

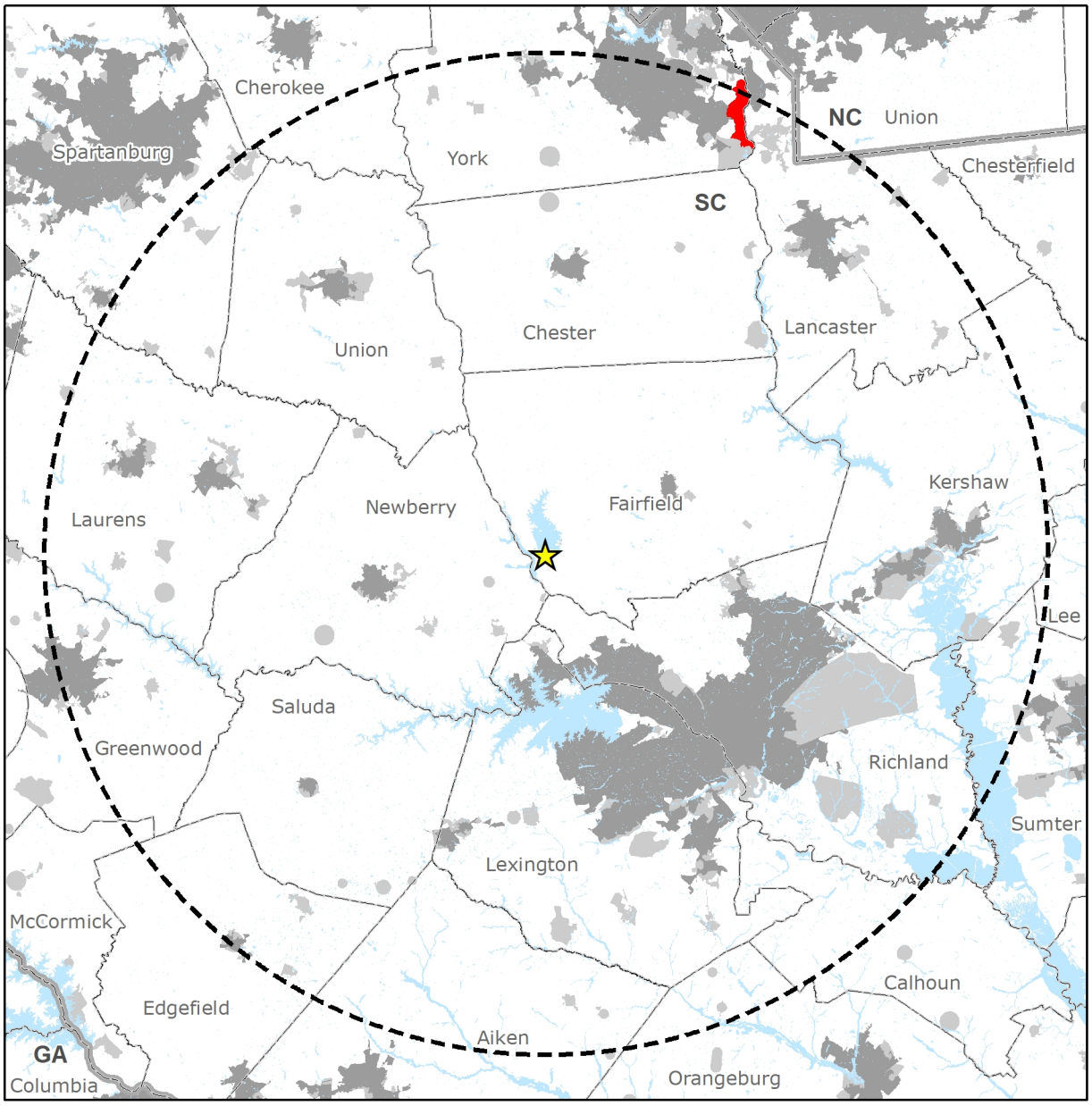


Figure E3.11-10 American Indian or Alaska Native Populations (Individual State)

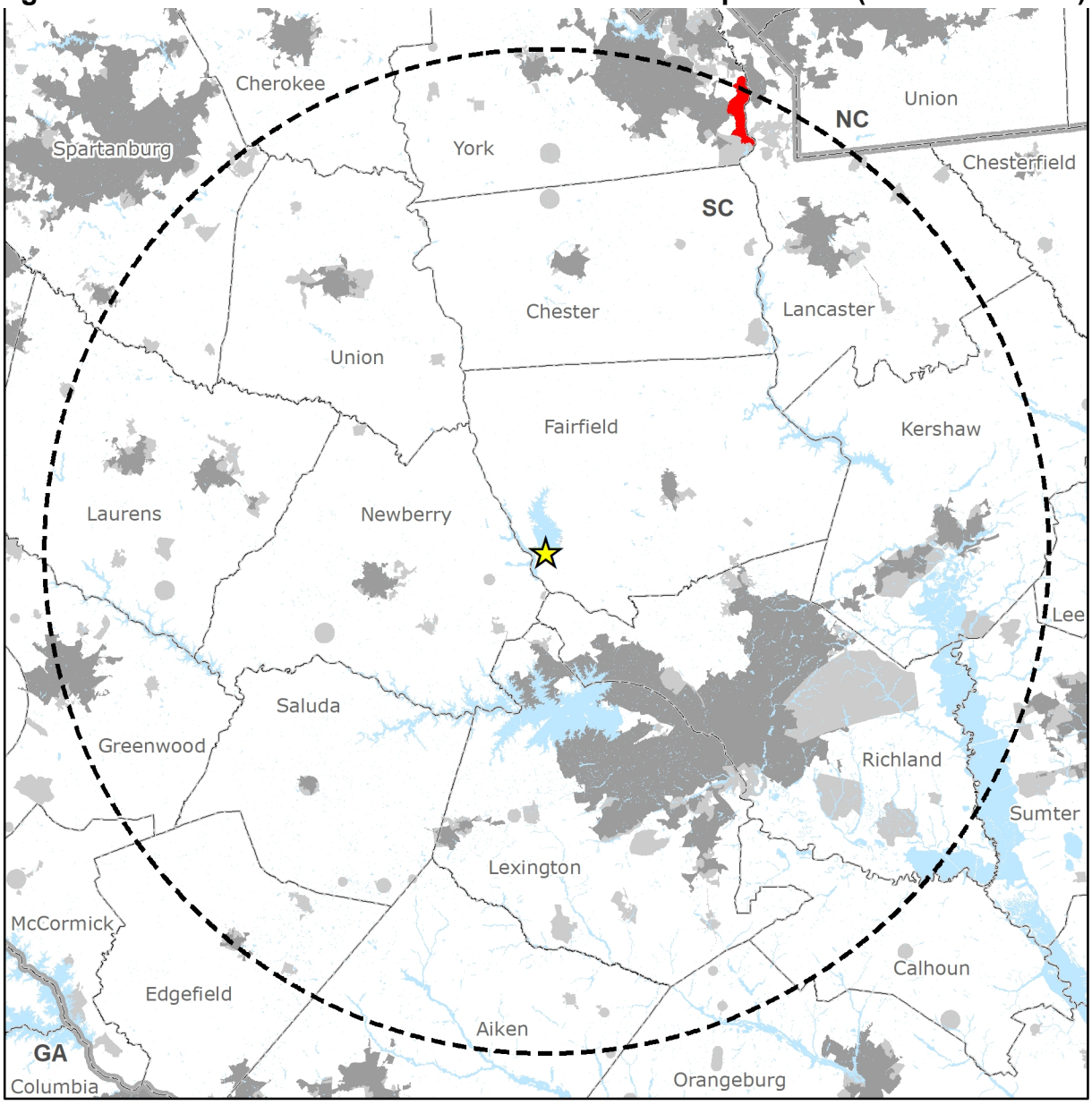


Figure E3.11-11 Some Other Race Populations (Regional)

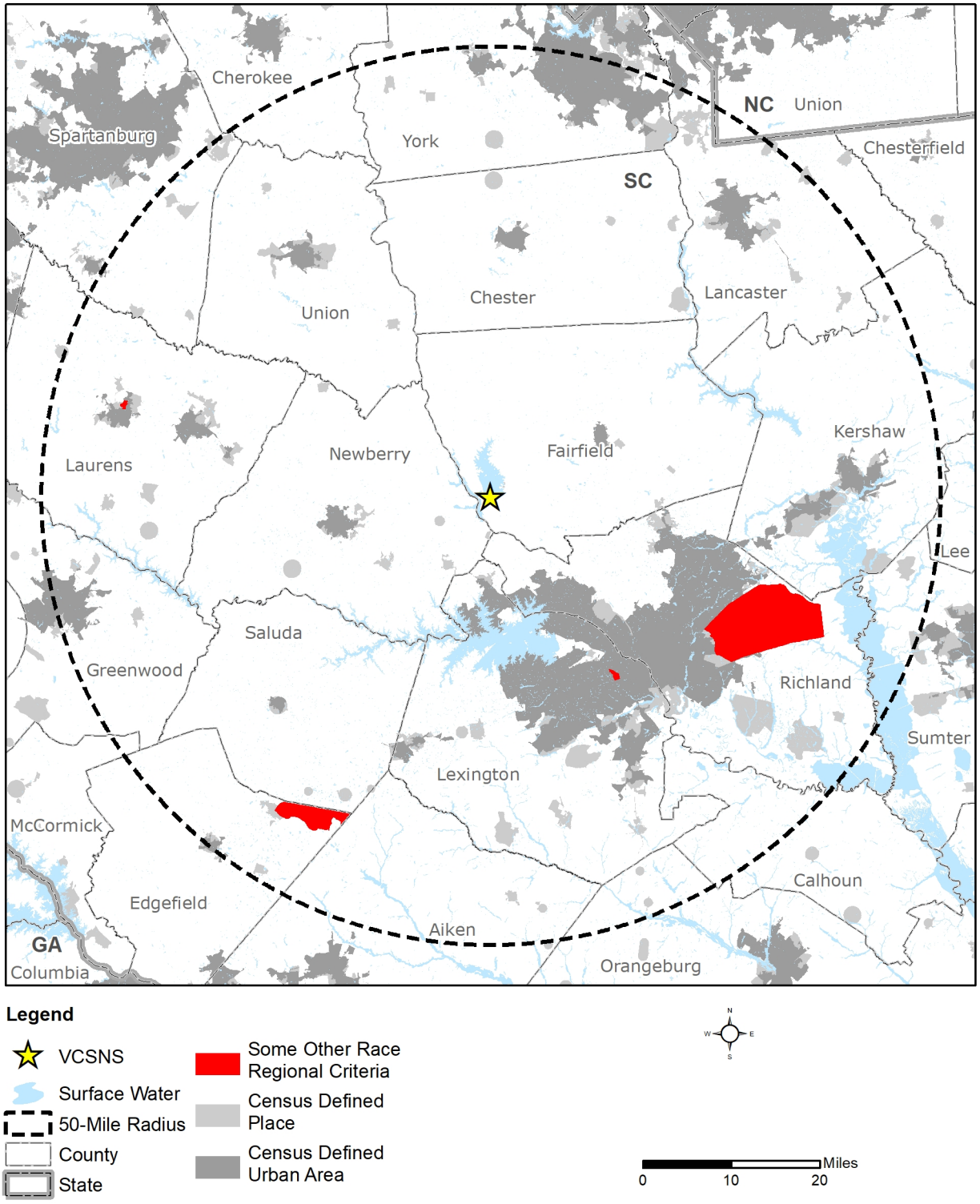


Figure E3.11-12 Some Other Race Populations (Individual State)

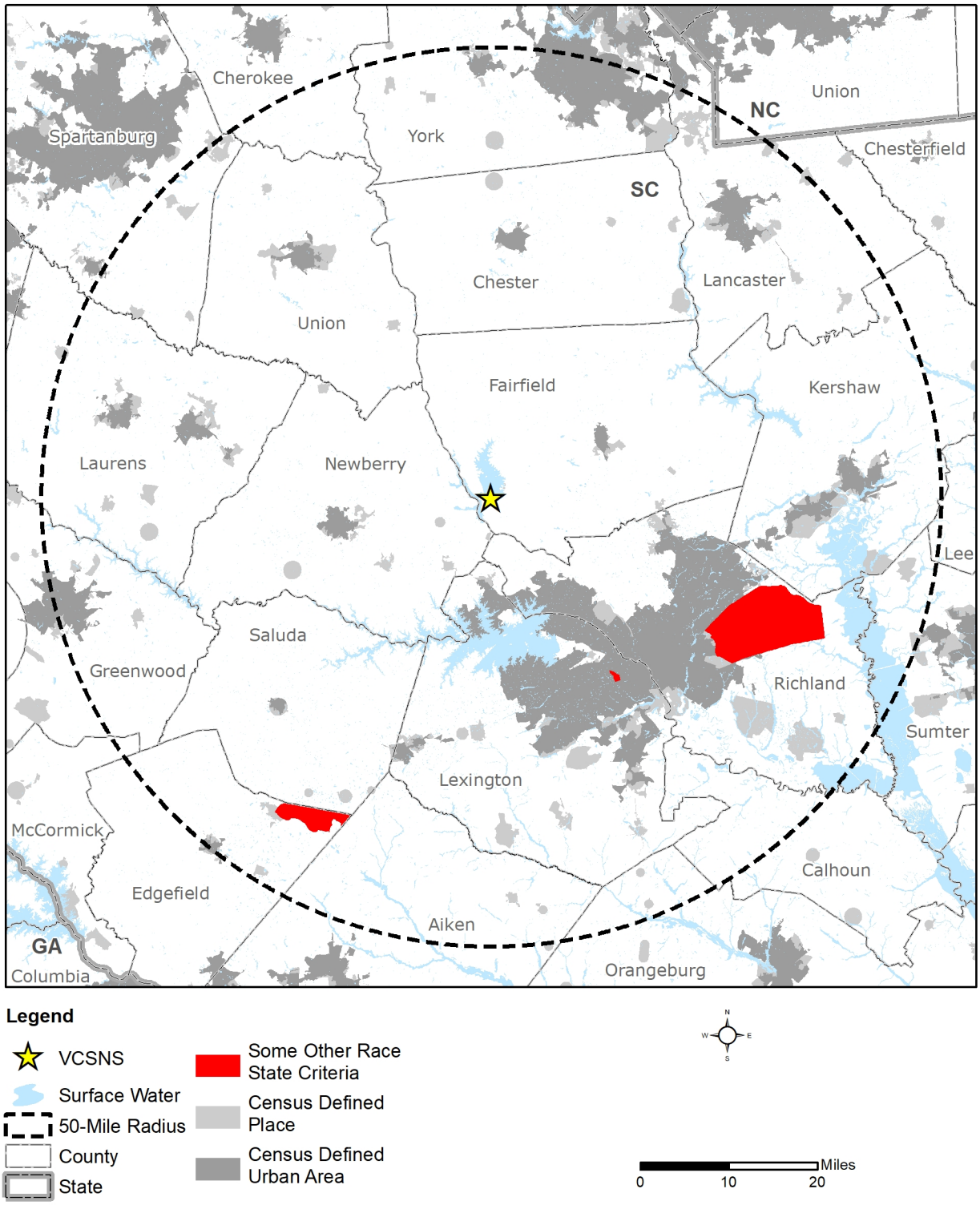


Figure E3.11-13 Two or More Races Populations (Regional)

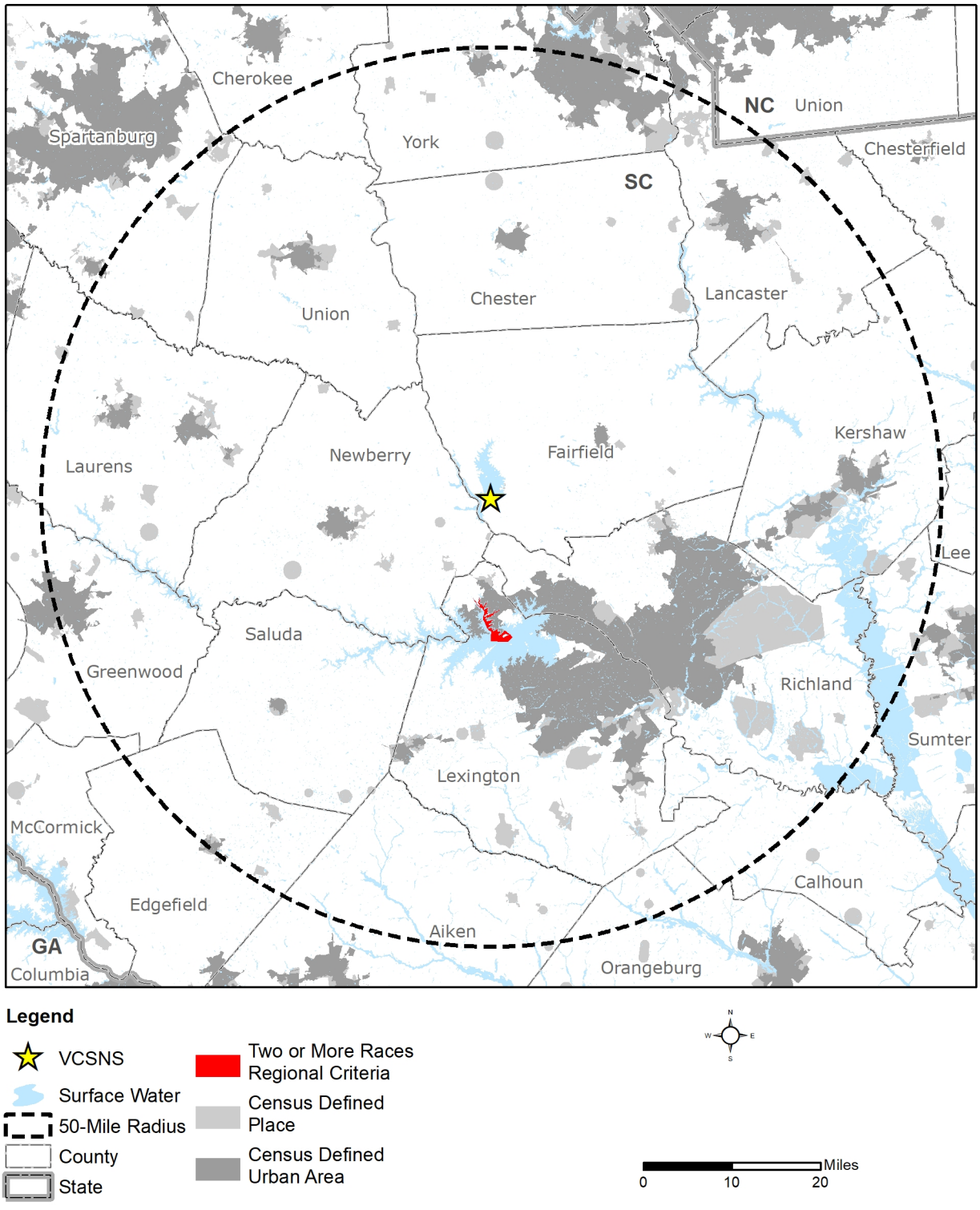


Figure E3.11-14 Two or More Races Populations (Individual State)

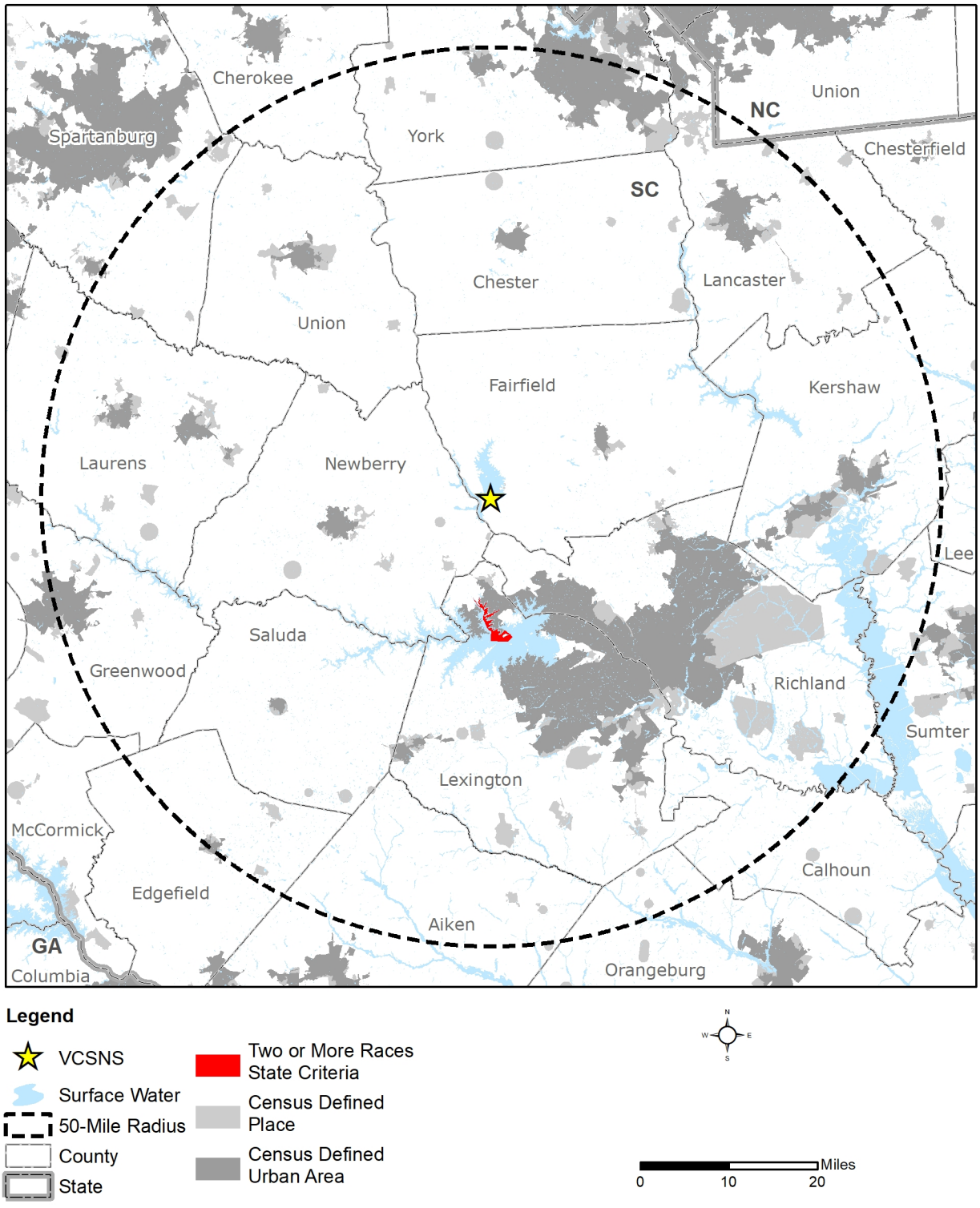


Figure E3.11-15 Hispanic or Latino Populations (Regional)

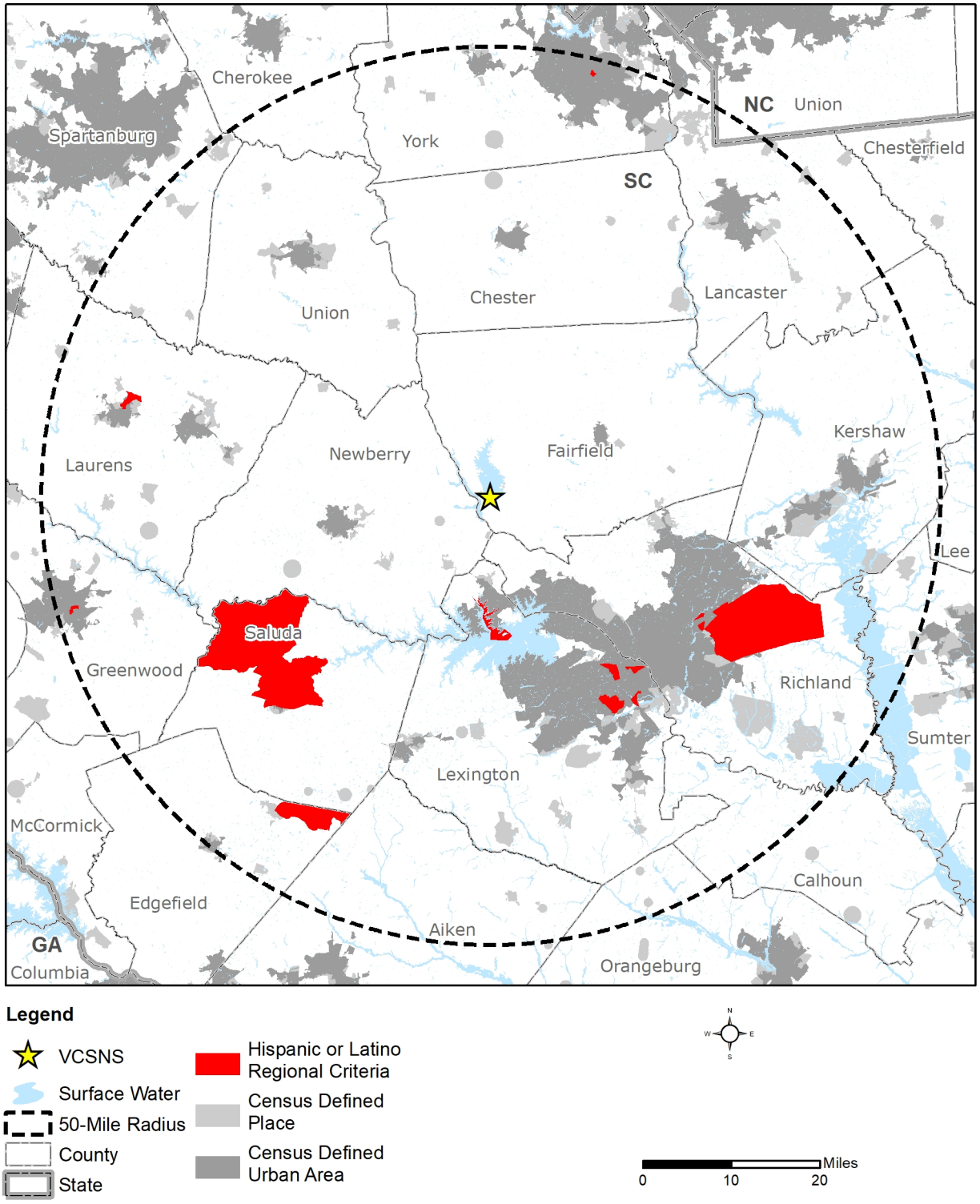


Figure E3.11-16 Hispanic or Latino Populations (Individual State)

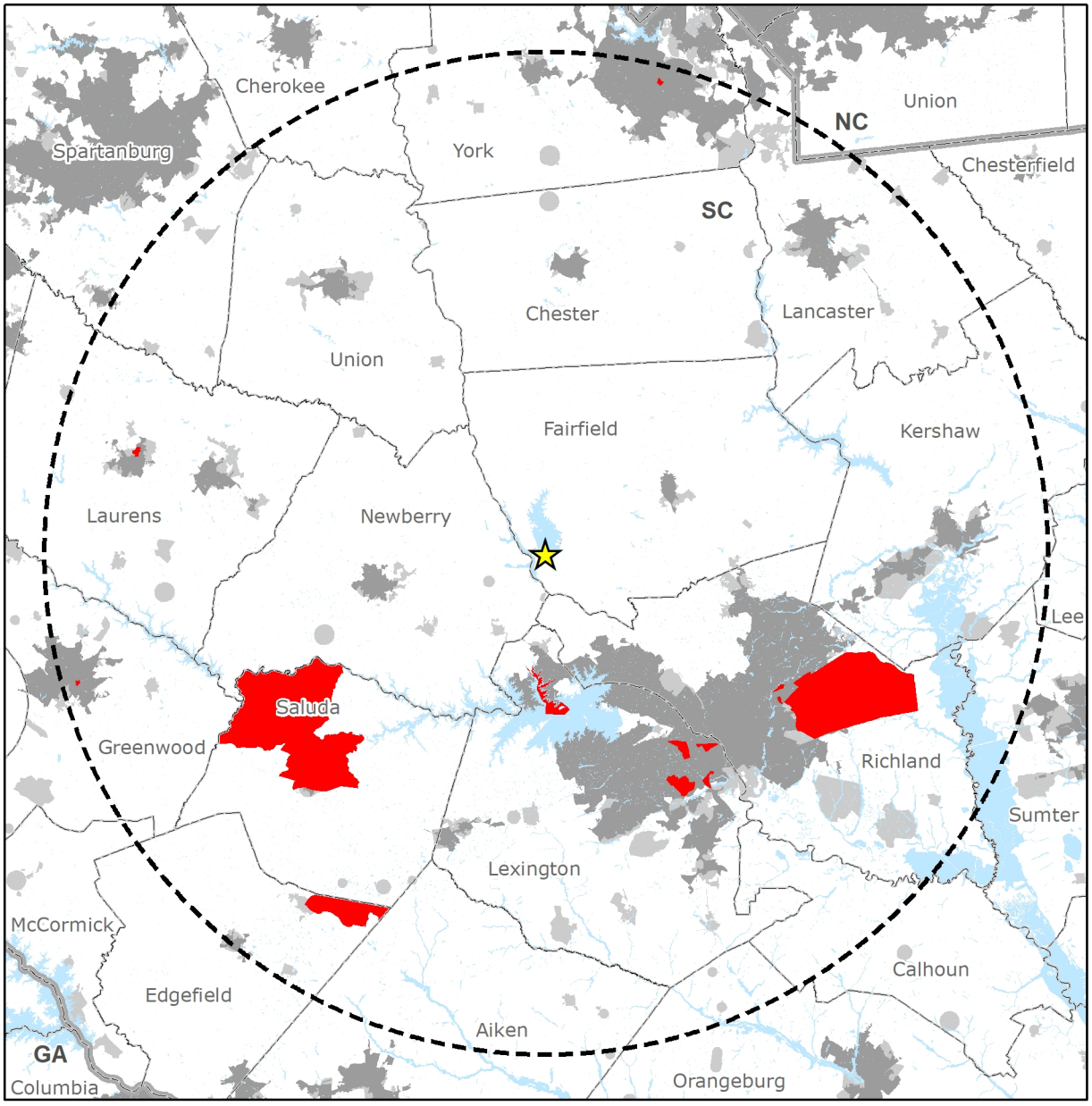


Figure E3.11-17 Low Income Individuals (Regional)

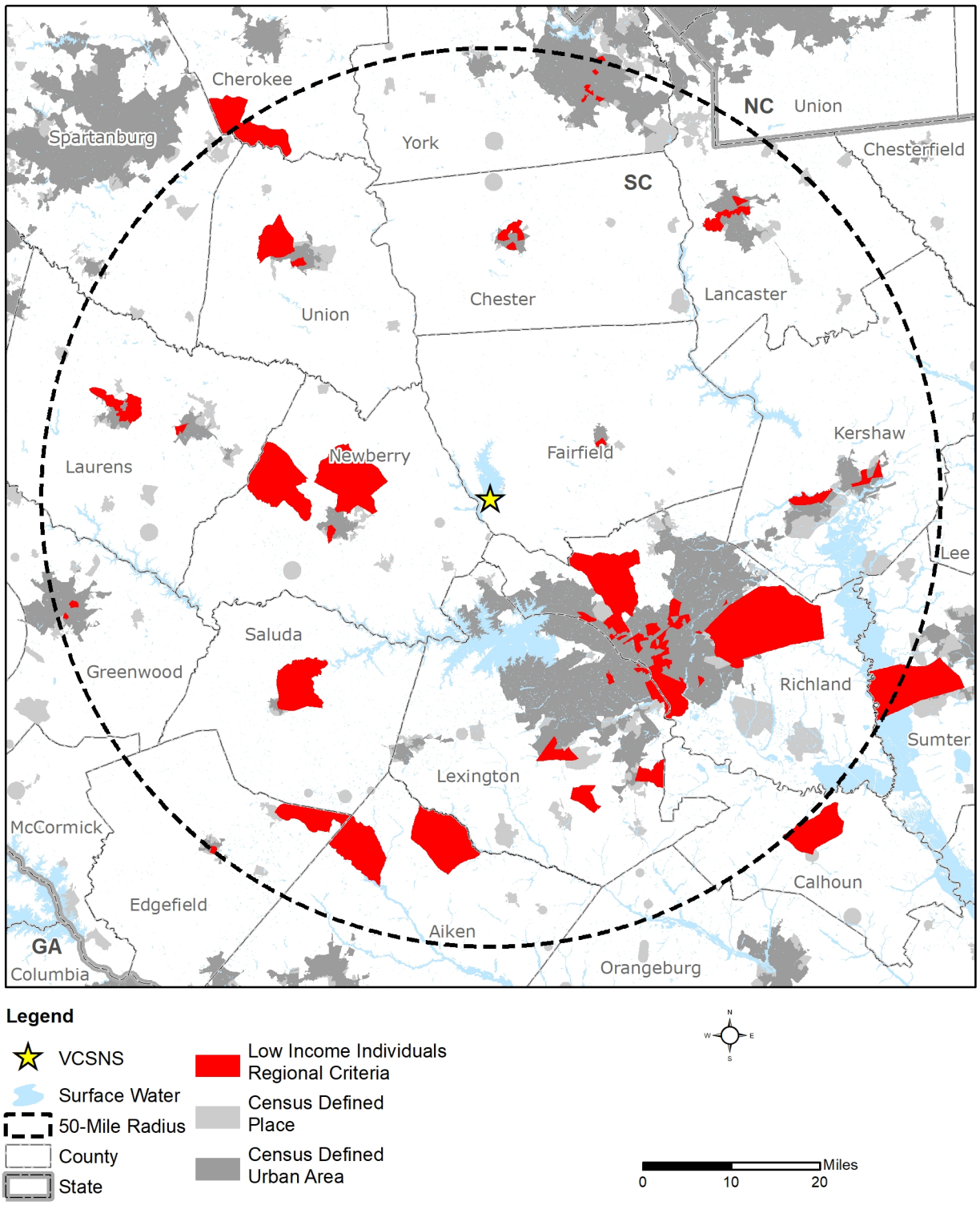


Figure E3.11-18 Low Income Individuals (Individual State)

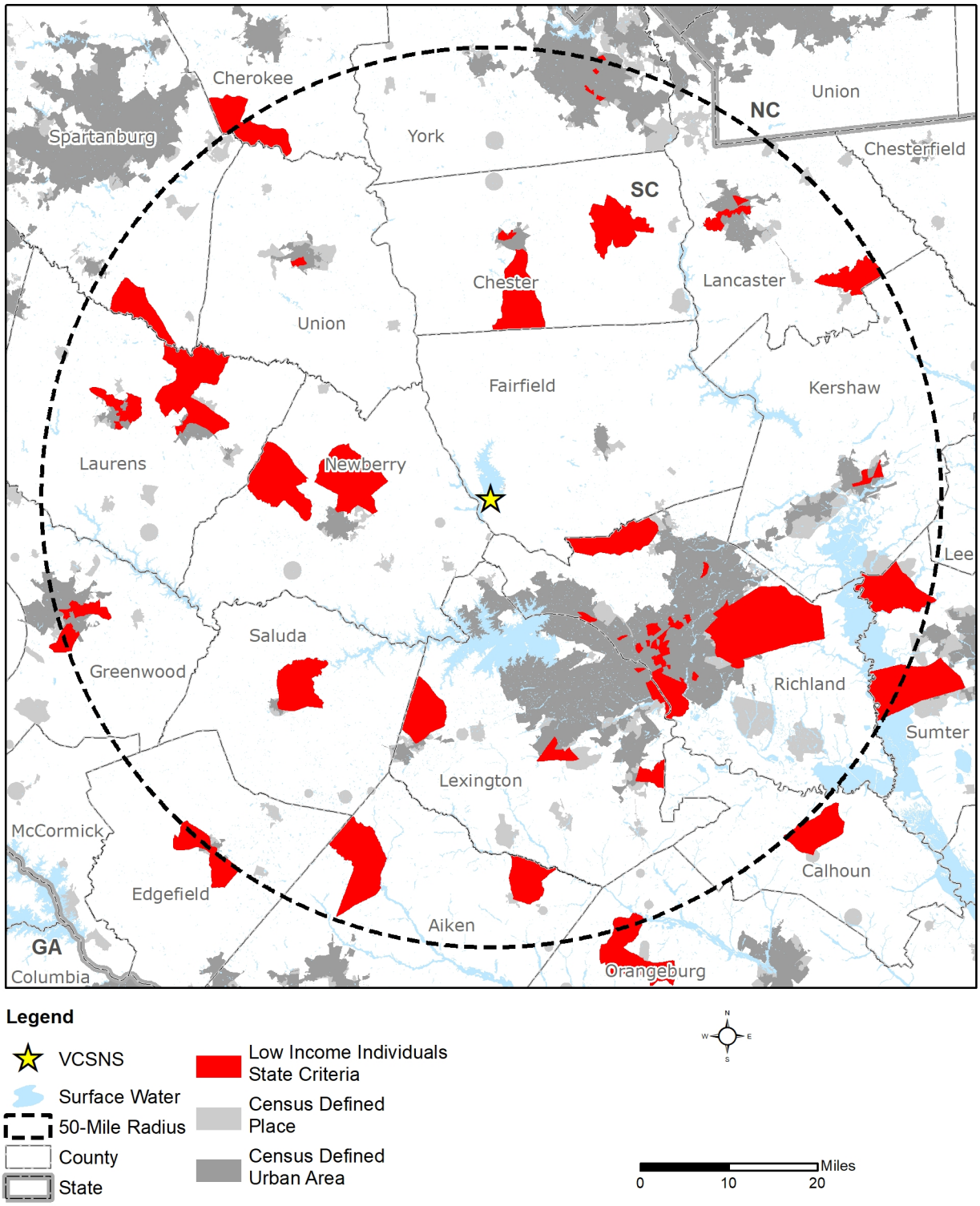


Figure E3.11-19 Low Income Households (Regional)

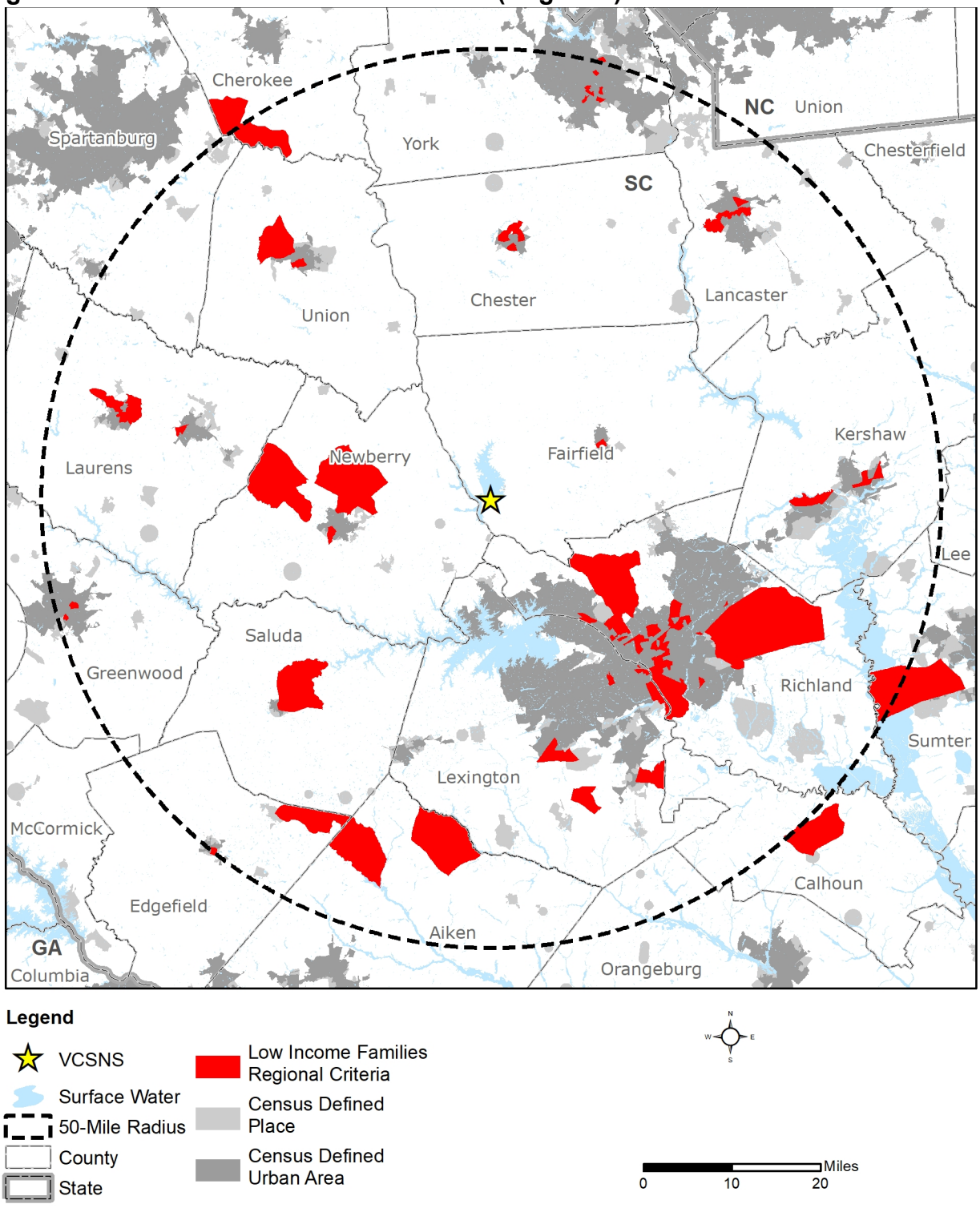
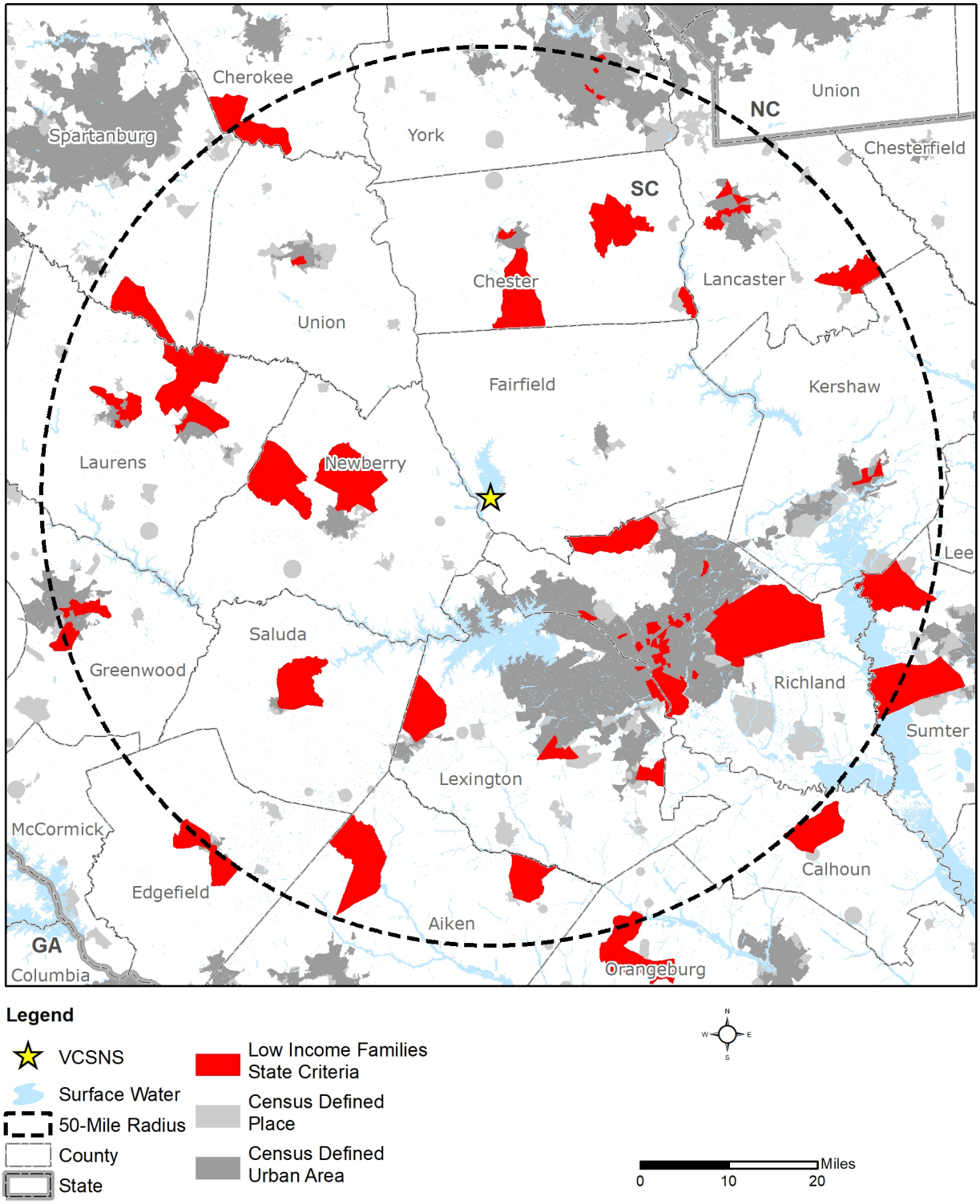


Figure E3.11-20 Low Income Households (Individual State)



E3.12 WASTE MANAGEMENT

In addressing the plant's radioactive and nonradioactive waste management systems and programs, NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information being requested in this section can be incorporated by reference into Section E2.2 of the ER (NRC. 2013b, Section 3.11). Therefore, consistent with NRC Regulatory Guide 4.2, DE is providing the information below to address VCSNS's radioactive and nonradioactive waste management systems and program.

E3.12.1 RADIOACTIVE WASTE MANAGEMENT

Section E2.2.6 includes a discussion of VCSNS's liquid, gaseous, and solid radwaste systems. The section provides a description of the systems, management of LLMW, radwaste storage, spent fuel storage, and permitted facilities currently utilized for offsite processing and disposal of radioactive wastes.

E3.12.2 NONRADIOACTIVE WASTE MANAGEMENT

Section E2.2.7 includes a discussion of VCSNS's RCRA nonradioactive waste management program, types of wastes generated, waste minimization program, and permitted facilities currently utilized for disposition of wastes.

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E4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The ER must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term.

> *The environmental report must include an analysis that considers. . . the environmental effects of the proposed action. . . and alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]*
>
> *The environmental report shall. . . discuss. . . the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance. [10 CFR 51.45(b)(1)]*
>
> *The information submitted. . . should not be confined to information supporting the proposed action but should also include adverse information. [10 CFR 51.45(e)]*

In the 2013 GEIS, the NRC identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal. The NRC also codified conclusions for those issues in 10 CFR 51, Subpart A, Appendix B, Table B-1.

In CLI-22-2 and CLI-22-3, the Commission held that those 2013 GEIS analyses and codified conclusions were applicable to initial license renewals, but that additional site- and SLR-specific analyses are needed to support environmental reviews in SLR proceedings. For issues that are applicable to VCSNS, the discussion below evaluates the generic analysis from the 2013 GEIS, considers whether that analysis presents new information relevant to VCSNS SLR, and provides a further site-specific analysis for VCSNS SLR. Together, those analyses satisfy the requirements of 10 CFR 51.53(c)(2) and 51.45.

Table E4.0-1 lists the 78 and indicates if the issue is applicable to VCSNS and identifies which ER section addresses the issue. With the exception of issues associated with threatened and endangered species/EFH, historic and cultural resources, environmental justice, and electromagnetic fields (EMFs), DE has identified the significance of the impacts as SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3 as follows:

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

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource. For issues where probability is a key consideration (i.e., accident consequences), probability was a factor in determining significance.

Consistent with NRC guidance, DE identified the significance of the impacts for remaining issues as follows:

- For threatened and endangered species (ESA), the significance of the effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, (1) would have no effect on federally listed species; (2) are not likely to adversely affect federally listed species; (3) are likely to adversely affect federally listed species; or (4) are likely to jeopardize a federally listed species or adversely modify designated critical habitat. For EFH (Magnuson Stevens Fishery Conservation and Management Act), the significance of effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, would have: (1) no adverse impact; (2) minimal adverse impact; or (3) substantial adverse impact to the essential habitat of federally managed fish populations. (NRC. 2013b)
- For historic and cultural resources (NHPA), the significance of the effects from license renewal can be characterized based on a determination that: (1) no historic properties are present (no effect); (2) historic properties are present but would not be adversely affected (no adverse effect); or (3) historic properties are adversely affected (adverse effect). (NRC. 2013a)
- For environmental justice, impacts would be based on disproportionately high and adverse human health and environmental effects on minority and low-income populations. (NRC. 2013a)
- For chronic effects of EMFs, Footnote 6 to 10 CFR Part 51, Subpart A, Appendix B, Table B-1 states that an applicant is not required to provide information on this issue and therefore, DE did not conduct a site-specific analysis of this issue.

In accordance with NEPA practice, DE considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are SMALL receive less mitigation consideration than impacts that are LARGE).

E4.0.1 FORMAT OF ISSUES REVIEWED

Chapter E4.0 follows Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC. 2013b) regarding content for the license renewal issues identified in 10 CFR 51, Subpart A, Appendix B, Table B-1. The format for addressing issues is described below.

- *Issue:* Title of the issue.
- *Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1:* The findings for the issue from 10 CFR 51, Subpart A, Appendix B, Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants.
- *Requirement:* Statement of Applicable Requirement.
- *Background:* A background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.
- *Site-specific Analysis:* An analysis of the environmental impact, taking into account information current site-specific information and, as appropriate, provided in the GEIS and 10 CFR 51, Subpart A, Appendix B. If an issue is not applicable, the analysis lists the explanation. The analysis section also provides a summary conclusion of the environmental impacts and identifies, as applicable, either ongoing or additional planned mitigation measures to reduce adverse impacts.

Table E4.0-1 Environmental Resource Issues Evaluated for VCSNS (Sheet 1 of 5)

Resource Issue	Applicability	ER Section
Land Use		
Onsite Land Use	Applicable	E4.1.1
Offsite Land Use	Applicable	E4.1.2
Offsite Land Use in Transmission Line Right-of-Ways (ROWs)	Applicable	E4.1.3
Visual Resources		
Aesthetic Impacts	Applicable	E4.1.4
Air Quality		
Air Quality Impacts (All Plants)	Applicable	E4.2.1
Air Quality Effects of Transmission Lines	Applicable	E4.2.2
Noise		
Noise	Applicable	E4.3
Geologic Environment		
Geology and Soils	Applicable	E4.4
Surface Water Resources		
Surface Water Use and Quality (Non-Cooling System Impacts)	Applicable	E4.5.1
Altered Current Patterns at Intake and Discharge Structures	Applicable	E4.5.2
Altered Salinity Gradients	Not Applicable	E4.5.3
Altered Thermal Stratification of Lakes	Applicable	E4.5.4
Scouring Caused by Discharged Cooling Water	Applicable	E4.5.5
Discharge of Metals in Cooling System Effluent	Applicable	E4.5.6
Discharge of Biocides, Sanitary Wastes, and Minor Chemical Spills	Applicable	E4.5.7
Surface Water Use Conflicts (Plants with Once-Through Cooling Systems)	Applicable	E4.5.8
Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	Applicable	E4.5.9

Table E4.0-1 Environmental Resource Issues Evaluated for VCSNS (Sheet 2 of 5)

Resource Issue	Applicability	ER Section
Effects of Dredging on Surface Water Quality	Not Applicable	E4.5.10
Temperature Effects on Sediment Transport Capacity	Applicable	E4.5.11
Groundwater Resources		
Groundwater Contamination and Use (Non-Cooling System Impacts)	Applicable	E4.5.12
Groundwater Use Conflicts (Plants that Withdraw Less than 100 gpm)	Applicable	E4.5.13
Groundwater Use Conflicts (Plants that Withdraw More than 100 gpm)	Not Applicable	E4.5.14
Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)	Applicable	E4.5.15
Groundwater Quality Degradation Resulting from Water Withdrawals	Applicable	E4.5.16
Groundwater Quality Degradation (Plants with Cooling Ponds in Salt Marshes)	Not Applicable	E4.5.17
Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)	Applicable	E4.5.18
Radionuclides Released to Groundwater	Applicable	E4.5.19
Terrestrial Resources		
Effects on Terrestrial Resources (Non-Cooling System Impacts)	Applicable	E4.6.1
Exposure of Terrestrial Organisms to Radionuclides	Applicable	E4.6.2
Cooling System Impacts on Terrestrial Resources (Plants with Once-Through Cooling Systems or Cooling Ponds)	Applicable	E4.6.3
Cooling Tower Impacts on Vegetation (Plants with Cooling Towers)	Applicable	E4.6.4
Bird Collisions with Plant Structures and Transmission Lines	Applicable	E4.6.5
Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	Applicable	E4.6.6
Transmission Line Right-of-Way Management Impacts on Terrestrial Resources	Applicable	E4.6.7
Electromagnetic Fields on Flora and Fauna (Plants, Agricultural Crops, Honeybees, Wildlife, Livestock)	Applicable	E4.6.8

Table E4.0-1 Environmental Resource Issues Evaluated for VCSNS (Sheet 3 of 5)

Resource Issue	Applicability	ER Section
Aquatic Resources		
Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	Applicable	E4.6.9
Impingement and Entrainment of Aquatic Organisms (Plants with Cooling Towers)	Not Applicable	E4.6.10
Entrainment of Phytoplankton and Zooplankton (All Plants)	Applicable	E4.6.11
Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	Applicable	E4.6.12
Thermal Impacts on Aquatic Organisms (Plants with Cooling Towers)	Not Applicable	E4.6.13
Infrequently Reported Thermal Impacts (All Plants)	Applicable	E4.6.14
Effects of Cooling Water Discharge on Dissolved Oxygen, Gas Supersaturation, and Eutrophication	Applicable	E4.6.15
Effects of Nonradiological Contaminants on Aquatic Organisms	Applicable	E4.6.16
Exposure of Aquatic Organisms to Radionuclides	Applicable	E4.6.17
Effects of Dredging on Aquatic Organisms	Not Applicable	E4.6.18
Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	Applicable	E4.6.19
Effects on Aquatic Resources (Non-Cooling System Impacts)	Applicable	E4.6.20
Impacts of Transmission Line Right-of-Way Management on Aquatic Resources	Applicable	E4.6.21
Losses from Predation, Parasitism, and Disease Among Organisms Exposed to Sub-Lethal Stresses	Applicable	E4.6.22
Special Status Species and Habitats		
Threatened, Endangered, and Protected Species, and Essential Fish Habitat	Applicable	E4.6.23
Historic and Cultural Resources		
Historic and Cultural Resources	Applicable	E4.7

Table E4.0-1 Environmental Resource Issues Evaluated for VCSNS (Sheet 4 of 5)

Resource Issue	Applicability	ER Section
Socioeconomics		
Employment and Income, Recreation and Tourism	Applicable	E4.8.1
Tax Revenues	Applicable	E4.8.2
Community Services and Education	Applicable	E4.8.3
Population and Housing	Applicable	E4.8.4
Transportation	Applicable	E4.8.5
Human Health		
Radiation Exposures to the Public	Applicable	E4.9.1
Radiation Exposures to Plant Workers	Applicable	E4.9.2
Human Health Impact from Chemicals	Applicable	E4.9.3
Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River)	Applicable	E4.9.4
Microbiological Hazards to Plant Workers	Applicable	E4.9.5
Chronic Effects of Electromagnetic Fields[(a)]	Not Applicable	NA
Physical Occupational Hazards	Applicable	E4.9.6
Electric Shock Hazards	Applicable	E4.9.7
Postulated Accidents		
Design-Basis Accidents	Applicable	E4.15.1
Severe Accident Consequences[(b)]	Applicable	E4.15.2
Severe Accident Mitigation Alternatives	Applicable	E4.15.3
Environmental Justice		
Minority and Low-Income Populations	Applicable	E4.10.1
Waste Management		
Low-Level Waste Storage and Disposal	Applicable	E4.11.1
Onsite Storage of Spent Nuclear Fuel	Applicable	E4.11.2
Offsite Radiological Impacts of Spent Nuclear Fuel and High-Level Waste Disposal	Applicable	E4.11.3

Table E4.0-1 Environmental Resource Issues Evaluated for VCSNS (Sheet 5 of 5)

Resource Issue	Applicability	ER Section
Mixed-Waste Storage and Disposal	Applicable	E4.11.4
Nonradioactive Waste Storage and Disposal	Applicable	E4.11.5
Cumulative Impacts		
Cumulative Impacts	Applicable	E4.12
Uranium Fuel Cycle		
Offsite Radiological Impacts—Individual Impacts from Other than the Disposal of Spent Fuel and High-Level Waste	Applicable	E4.13.1
Offsite Radiological Impacts—Collective Impacts from Other than the Disposal of Spent Fuel and High-Level Waste	Applicable	E4.13.2
Nonradiological Impacts of the Uranium Fuel Cycle	Applicable	E4.13.3
Transportation	Applicable	E4.13.4
Termination of Nuclear Power Plant Operations and Decommissioning		
Termination of Plant Operations and Decommissioning	Applicable	E4.14

a. Footnote 6 to 10 CFR Part 51, Subpart A, Appendix B, Table B-1 states that an applicant is not required to provide information on this issue and therefore, this issue is considered not applicable to VCSNS and not addressed in an ER section.

b. The 2013 GEIS presents this issue in combination with the Severe Accident Mitigation Alternatives as described in GEIS Table 2.1-1 (NRC. 2013a). It is listed as a separate issue here for clarity.

E4.1 LAND USE AND VISUAL RESOURCES

E4.1.1 ONSITE LAND USE

E4.1.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes in onsite land use from continued operations and refurbishment associated with license renewal would be a small fraction of the nuclear power plant site and would involve only land that is controlled by the licensee.

E4.1.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.1.1.3 Background [GEIS Section 4.2.1.1]

Operational activities at a nuclear power plant during the license renewal term would be similar to those occurring during the current license term. Generally, onsite land use conditions would remain unchanged. However, additional spent nuclear fuel and LLRW generated during the license renewal term could require the construction of new or expansion of existing onsite storage facilities. Should additional storage facilities be required, this action would be addressed in separate license reviews conducted by the NRC. Refurbishment activities, such as steam generator and vessel head replacement, have not permanently changed onsite land use conditions.

E4.1.1.4 Site-Specific Analysis

Onsite land use information is presented in Section E3.2.1 of this ER. No license renewal-related refurbishment activities have been identified, as presented in Section E2.3. As discussed in Section E3.1.4, there is a cumulative 5-year project that includes the selling of components, equipment, and materials, as well as salvaging scrap equipment and materials associated with the canceled Units 2 and 3 project. This project does not change existing onsite land uses, and no license renewal-related construction activities have been identified. Continued operation during the proposed SLR term is not expected to change and no refurbishment activities are anticipated, and therefore no changes to onsite land uses are projected.

DE finds that impacts to onsite land uses for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.1.2 OFFSITE LAND USE

E4.1.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Offsite land use would not be affected by continued operations and refurbishment associated with license renewal.

E4.1.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.1.2.3 Background [GEIS Section 4.2.1.1]

The impacts of continued plant operations during the license renewal term and refurbishment on offsite land use were evaluated separately in the 1996 GEIS. It was predicted that impacts associated with refurbishment and changes in population and tax revenue on offsite land use could range from SMALL to MODERATE. License Renewal reviews, however, have shown no power plant-related population changes or significant tax revenue changes due to license renewal. Non-outage employment levels at nuclear power plants have remained relatively unchanged or have decreased. With no increase in the number of workers, there has been no increase in housing, infrastructure, or demand for services beyond what has already occurred. Operational activities during the license renewal term would be similar to those occurring during the current license term and would not affect offsite land use beyond what has already been affected.

For plants that have the potential to impact a coastal zone or coastal watershed, as defined by each state participating in the national Coastal Zone Management Program (CZMP), applicants for license renewal must submit to the affected state a certification that the proposed license renewal is consistent with the state CZMP. Applicants must coordinate with the state agency that manages the state CZMP to obtain a determination that the proposed nuclear plant license renewal would be consistent with the state program.

E4.1.2.4 Site-Specific Analysis

Offsite land use information is discussed in Section E3.2.2 of this ER. As presented in Section E2.5. there are no plans to add workers to support plant operations during the proposed SLR operating term, nor are any significant changes to tax payments anticipated (see Section E4.8.2). As presented in Section E2.3, no license renewal-related refurbishment or construction activities have been identified. Therefore, no changes in offsite land use during the proposed SLR operating term are anticipated.

As presented in Section E9.5.10, VCSNS is not located in or near a coastal zone under the national CZMP and does not have the potential to impact a coastal zone or coastal watershed.

DE finds that impacts to offsite land uses for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.1.3 OFFSITE LAND USE IN TRANSMISSION RIGHT-OF-WAYS

E4.1.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Use of transmission-line ROWs from continued operations and refurbishment associated with license renewal would continue with no change in land use restrictions.

E4.1.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.1.3.3 Background [GEIS Section 4.2.1.1]

In most cases, transmission lines originating at power plant substations are no longer owned or managed by the nuclear power plant licensees. Accordingly, only those transmission lines that connect the plant to the switchyard where electricity is fed into the regional power distribution system (encompassing those lines that connect the plant to the first substation of the regional electric power grid), and power lines that feed the plant from the grid during outages are considered within the scope of license renewal reviews. Operational activities in offsite transmission line ROWs, within the scope of review, during the license renewal term, would be similar to those occurring during the current license term and would not affect offsite land use in transmission line ROWs beyond what has already been affected.

Certain land use activity within the ROW is usually restricted. Land cover is generally managed through a variety of maintenance procedures so that vegetation growth and building construction do not interfere with the power line operation and access. Land use within ROWs is limited to activities that do not endanger power line operation: these include recreation, off-road vehicle use, grazing, agricultural cultivation, irrigation, roads, environmental conservation, and wildlife areas. The impact of transmission lines on offsite land use during the license renewal term was considered SMALL for all plants.

E4.1.3.4 Site-Specific Analysis

As discussed in Section E2.2.5, the in-scope transmission lines include those lines that connect the Turbine Building to the switchyard within the site boundary/EAB, and the Parr ESF 115-kV line which extends beyond the site boundary/EAB offsite to the Parr Substation. The 2.6-mile 115-kV transmission line is primarily an aboveground, overhead line, with an approximate 600-foot segment traveling through an underground duct to avoid crossing over 230-kV lines near the Parr Substation. DE owns and maintains ROWs associated with the transmission line and has procedures in place that govern the line-clearing specifications and herbicide management. Changes to current land uses and management procedures within the ROWs are not anticipated. Ongoing use of power line ROWs would continue with no change in restrictions during the SLR term. DE finds that impacts to offsite land uses within transmission ROWs for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.1.4 AESTHETIC IMPACTS

E4.1.4.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL. No important changes to the visual appearance of plant structures or transmission lines are expected from continued operations and refurbishment associated with license renewal.

E4.1.4.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.1.4.3 Background [GEIS Section 4.2.1.2]

A case study performed for the 1996 GEIS found a limited number of situations where nuclear power plants had a negative effect on visual resources. Negative perceptions were based on aesthetic considerations (for instance, the plant is out of character or scale with the community or the viewshed), physical environmental concerns, safety and perceived risk issues, an anti-plant attitude, or an anti-nuclear orientation. It is believed that these negative perceptions would persist regardless of mitigation measures.

In addition, the visual appearance of transmission lines is not expected to change during the license renewal term. After the Containment Building and cooling towers, transmission line towers are probably the most frequently observed structure associated with nuclear power plants. Transmission lines from nuclear power plants are generally indistinguishable from those from other power plants. Because electrical transmission lines are common throughout the United States, they

are generally perceived with less prejudice than the nuclear power plant itself. Also, the visual impact of transmission lines tends to wear off when viewed repeatedly.

E4.1.4.4 Site-Specific Analysis

The visual appearance of the plant and in-scope transmission lines is presented in Section E3.2.3 of this ER. As presented in Section E3.2.3, VCSNS is located on the southern shores of the Monticello Reservoir in a rural area surrounded by forest. Predominant visual features at VCSNS are the Reactor Containment Building and Auxiliary Buildings, Turbine Building, Diesel Generator Building, and transmission corridors. Generally, views of the plant are limited to the Monticello Reservoir, portions of SC-215/213, and along the eastern shore of the reservoir and therefore have minimal visual impact to the surrounding area. VCSNS also conducted a review of current and planned on-site construction activities that could result in a noticeable change in the appearance characteristics of the site when viewed from offsite. Though several projects were identified as part of ongoing operations, including a warehouse renovation, a planned expansion of the Combined Maintenance Shop for blasting and painting, the addition of permanent buildings at the new Security Training Facility, the removal of the Head Assembly Building, and the disassembly of the heavy lifting device at the Units 2 and 3 site (scheduled to be completed by April 2023), the surrounding forest and general topography of the area provides visual screening that obscures the visibility of these projects. There is scheduled timber harvesting in the vicinity of VCSNS, but this activity is not anticipated to increase the visibility of the site. DE finds that impacts to aesthetics for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.2 AIR QUALITY

E4.2.1 AIR QUALITY IMPACTS (ALL PLANTS)

E4.2.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Air quality impacts from continued operations and refurbishment associated with license renewal are expected to be SMALL at all plants. Emissions resulting from refurbishment activities at locations in or near air quality nonattainment or maintenance areas would be short-lived and would cease after these refurbishment activities are completed. Operating experience has shown that the scale of refurbishment activities has not resulted in exceedance of the *de minimis* thresholds for criteria pollutants, and BMPs, including fugitive dust controls and the imposition of permit conditions in state and local air emissions permits, would ensure conformance with applicable state or tribal implementation plans.

Emissions from emergency diesel generators and fire pumps, and routine operations of boilers used for space heating, would not be a concern, even for plants located in or adjacent to

nonattainment areas. Impacts from cooling tower particulate emissions, even under the worst-case situations, have been SMALL.

E4.2.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.2.1.3 Background [GEIS Section 4.3.1.1]

Impacts on air quality during normal plant operations can result from operations of fossil fuel-fired equipment needed for various plant functions. Each licensed plant typically employs emergency diesel generators for use as a backup power source. Emergency diesel generators and fire pumps typically require state or local operating permits. These diesel generators are typically tested once a month with several test burns of various durations (e.g., one to several hours). In addition to these maintenance tests, longer-running endurance tests are also typically conducted at each plant. Each generator is typically tested for 24 hours on a staggered test schedule (e.g., once every refueling outage).

In addition to the emergency diesel generators, fossil fuel (i.e., diesel-, oil-, or natural gas-fired) boilers are used primarily for evaporator heating, plant space heating, and/or feedwater purification. These units typically operate at a variable load on a continuous basis throughout the year unless end use is restricted to one application, such as space heating. The utility boilers at commercial plants are relatively small when compared with most industrial boilers and are typically regulated through state-level operating permits.

As presented in Section 3.3 of the GEIS, cooling tower drift can increase downwind particulate matter (PM) concentrations, impair visibility, ice roadways, cause drift deposition, and damage vegetation and painted surfaces. Thus, although there is the potential for some air quality impacts to occur as a result of equipment and cooling tower operations, even in the worst-case situation (Hope Creek), the impacts have been SMALL, and licensees would be required to operate within state permit requirements.

In the 1996 GEIS, the NRC concluded that the impacts from plant refurbishment associated with license renewal on air quality could range from SMALL to LARGE, although these impacts were expected to be SMALL for most plants. However, findings from license renewal supplemental environmental impact statements (SEISs) published since the 1996 GEIS have shown that refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and months of time, as well as the degree of land disturbance that was conservatively estimated in the 1996 GEIS. Presumed air pollutant emissions, including levels of fugitive dust, have therefore not been realized.

E4.2.1.4 Site-Specific Analysis

Air quality information is presented in Section E3.3.3 of this ER. As discussed in Section E3.3.3.1, the 62-mile area surrounding the plant is in attainment with the NAAQS for all criteria air pollutants. As presented in Section E3.3.3.2, no future upgrade or replacement activities (e.g., diesel generators, diesel pumps) that would increase or decrease air emissions over the SLR operating term were identified as necessary for plant operations. As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. DE's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel pumps) that would affect VCSNS's air emissions program.

BMPs, including fugitive dust controls and compliance with current and future air emissions regulatory requirements, applicable emissions control measures, and reporting requirements will ensure continued SMALL impact on ambient air quality.

During the proposed SLR term, appropriate air emission laws would regulate and mitigate any potential VCSNS activities that could increase air pollutants. Furthermore, no temporary impacts associated with refurbishment activities are expected.

DE finds that impacts to air quality for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.2.2 AIR QUALITY EFFECTS OF TRANSMISSION LINES

E4.2.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

E4.2.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.2.2.3 Background [GEIS Section 4.3.1.1]

Small amounts of ozone and substantially smaller amounts of oxides of nitrogen are produced by transmission lines during corona, a phenomenon that occurs when air ionizes near isolated irregularities on the conductor surface such as abrasions, dust particles, raindrops, and insects. Several studies have quantified the amount of ozone generated and concluded that the amount produced by even the largest lines in operation (765 kV) is insignificant.

Ozone concentrations generated by transmission lines are therefore too low to cause any significant effects. The minute amounts of oxides of nitrogen produced are similarly insignificant. A finding of SMALL significance for transmission lines within this scope of review is supported by the evidence that production of ozone and oxides of nitrogen is insignificant and does not measurably contribute to ambient levels of those gases.

E4.2.2.4 Site-Specific Analysis

Research considered by the NRC is supported by evidence that the production of ozone and oxides of nitrogen by even the largest lines in operation (765 kV) is insignificant and does not measurably contribute to ambient levels of those gases. As discussed in Section E2.2.5, the in-scope transmission lines at VCSNS are 230 kV and 115 kV. Therefore, the production of ozone and oxides of nitrogen from in-scope transmission lines at VCSNS would be *de minimis*.

DE finds that impacts to air quality effects for the proposed SLR term are SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.3 NOISE

E4.3.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

SMALL. Noise levels would remain below regulatory guidelines for offsite receptors during continued operations and refurbishment associated with license renewal.

E4.3.2 REQUIREMENT [CLI-22-2 AND CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.3.3 BACKGROUND [GEIS SECTION 4.3.1.2]

Major sources of noise at operating nuclear power plants are cooling towers, turbines, transformers, large pumps, and cooling water system motors. Nuclear plant operations have not changed appreciably with time, and no change in noise levels or noise-related impacts is expected during the license renewal term. Since no change is expected in the amount of noise generated during the license renewal term, the only issue of concern is the number of people now living close to the nuclear power plant who are exposed to operational noise.

Given the industrial nature of the power plant and the number of years of plant operation, noise from a nuclear plant is generally nothing more than a continuous minor nuisance. However, noise levels may sometimes exceed the 55 dBA level that the EPA uses as a threshold level to protect

against excess noise during outdoor activities. However, according to the EPA, this threshold does "not constitute a standard, specification, or regulation," but was intended to provide a basis for state and local governments establishing noise standards. Nevertheless, noise levels at the site boundary are expected to remain well below regulatory standards for offsite residents.

Noise would also be generated by construction-related activities and equipment used during refurbishment. However, this noise would occur for relatively short periods of time (several weeks) and is not expected to be distinguishable from other operational noises at the site boundary nor create an adverse impact on nearby residents.

E4.3.4 SITE-SPECIFIC ANALYSIS

Industrial background noise at VCSNS is generally from operation of pumps, turbines, generators, switchyard equipment, transformers, cooling tower, and loudspeakers.

As discussed in Section E3.4, the loudest sound producing areas of VCSNS are the Auxiliary Building and the Diesel Generator Building when the engines are running. Noise sampling indicated peak noise levels of 100.5 dBA and 109.1 dBA generated from the Auxiliary Building and the Diesel Generator Building respectively. It is unlikely that noise from the plant would affect offsite residences as the nearest residence is 1.04 miles in the east-southeast direction.

Section E3.4 describes the land surrounding VCSNS as primarily rural with forest and small farms composing the dominant land use. Land uses are not anticipated to change during the SLR term, and it is unlikely that noise levels from VCSNS would affect offsite sensitive receptors (e.g., residences, schools, churches, etc.). Additionally, no noise complaints have been received from offsite residences as it relates to VCSNS's operation and outage activities from 2017–2021, and to date, no noise complaints have been received in 2022.

People living in the vicinity of VCNS would not experience any changes in noise levels during the proposed SLR term beyond what is currently experienced. Therefore, the impact of continued operations during the proposed SLR term would not exceed the noise impacts predicted by the NRC. VCSNS has not received any noise complaints from the public, no refurbishment activities are anticipated, and no anticipated changes in noise levels associated with continued operations are expected.

DE finds that noise impacts for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.4 GEOLOGY AND SOILS

E4.4.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

SMALL. The effect of geologic and soil conditions on plant operations and the impact of continued operations and refurbishment activities on geology and soils would be SMALL for all nuclear power plants and would not change appreciably during the proposed license renewal term.

E4.4.2 REQUIREMENT [CLI-22-2 AND CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.4.3 BACKGROUND [GEIS SECTION 4.4.1]

The impact of continued operations and refurbishment associated with LRs on geologic and soil resources would consist of soil disturbance, including sediment and/or any associated bedrock, for projects, such as replacing or adding buildings, roads, parking lots, and belowground and aboveground utility structures. Implementing BMPs would reduce soil erosion and subsequent impacts on surface water quality. These practices include, but are not limited to, minimizing the amount of disturbed land; stockpiling topsoil before ground disturbance; mulching and seeding disturbed areas; covering loose materials with geotextiles; using silt fences to reduce sediment loading to surface water; using check dams to minimize the erosive power of drainages; and installing proper culvert outlets to direct flows in streams or drainages.

Detailed geotechnical analyses would be required to address the stability of excavations, foundation footings, and slope cuts for building construction, road creation, or other refurbishment-related construction projects. Depending on the plant location and design, riverbank or coastline protection might need to be upgraded, especially at water intake or discharge structures if natural flows, such as storm surges, cause an increase in erosion. In addition, FPPA requires federal agencies to consider agency actions affecting the preservation of farmland, including prime and other important farmland soils, as described in Section 3.4 of the GEIS.

E4.4.4 SITE-SPECIFIC ANALYSIS

Construction and maintenance activities undertaken during the SLR period that would involve ground disturbance would be required to follow the VCSNS excavation permit procedure and could also trigger an environmental review to determine any impacts .

Soils could also be impacted by infiltration of pollutants in stormwater and spills of oil and hazardous materials. VCSNS maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater

and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. VCSNS has a spill prevention control and countermeasures (SPCC) plan and hazardous waste contingency plan, hazardous waste management plan, and a chemical control procedure.

Previous findings by the NRC determined continued operation of a nuclear plant in a license renewal term to have a SMALL impact to geology and soils. Controls are in place for VCSNS projects that involve ground disturbance, stormwater controls in place to reduce the potential for stormwater runoff to contaminate soils, and procedures in place to minimize the potential for spills.

Only routine infrastructure, renovation, and maintenance projects would be expected during VCSNS's continued operation. Compliance with current and future NPDES regulatory requirements and permit conditions, implementation of a SWPPP, implementation of BMPs, and adhering to internal procedures would ensure that geology and soil impacts from continued plant operations over the SLR term would be SMALL.

DE finds that impacts to geology and soils for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5 WATER RESOURCES

E4.5.1 SURFACE WATER USE AND QUALITY (NON-COOLING SYSTEM IMPACTS)

E4.5.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Impacts are expected to be SMALL if BMPs are employed to control soil erosion and spills. Surface water use associated with continued operations and refurbishment associated with license renewal would not increase significantly or would be reduced if refurbishment occurs during a plant outage.

E4.5.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.1.3 Background [GEIS Section 4.5.1.1]

Surface Water Use

The NRC considered water use during refurbishment activities for concrete production, dust control, washing stations, facility and equipment cleaning, and soil compaction and excavation backfilling. Surface water consumption for non-cooling water-related operational activities is limited to such

uses as facility and equipment cleaning. The use of public domestic water would reduce the direct consumptive use impacts on surface water resources. The impacts due to the volume of water consumed from a surface water source would be insignificant when compared with that used and consumed by a plant's cooling system. No surface use conflicts would be expected.

Surface Water Quality

The NRC considered the potential impacts of land disturbing activities, industrial wastewater, stormwater, residual chlorine due to domestic water runoff, and inadvertent spills resulting from nuclear plants' operations on surface water quality in its GEIS for license renewal. The NRC considered the mitigation measures of (NPDES) permits, SWPPPs, BMPs, and pollution control structures such as detention and infiltration basins. The NRC concluded that nuclear power plants' operation under NPDES permits and the implementation of BMPs would mitigate surface water quality impacts from non-cooling systems to be SMALL.

E4.5.1.4 Site-Specific Analysis

Surface Water Use

Surface water used at VCSNS is withdrawn from the Monticello Reservoir and governed by water appropriation limits in Surface Water Withdrawal Permit No. 20PN001. VCSNS may withdraw a maximum of 26,243.86 MGM of water from the Monticello Reservoir from two intakes: the Circulating Water Intake Structure, and the OWS. The estimated amount of water to be discharged totals 24,955.55 MGM via NPDES Outfalls 001 and 014 to the Monticello Reservoir, and 0.16 MGM to the Broad River via NPDES Outfall 003. While the Monticello Reservoir withdrawals are primarily used for condenser cooling, a small portion of the withdrawal is used for the SWS, potable water, Turbine Building cooling tower makeup water, and fire protection. (Sections E3.6.3.1 and E2.2.3.8)

Surface Water Quality

Non-cooling water discharges at VCSNS are discharged via the six NPDES-permitted internal outfalls (004, 005, 06A, 06B, 007, and 008) to the Monticello Reservoir and the Broad River (Section E3.6.1.2.1). These permitted outfalls have limits for constituents of concern, such as oil and grease, total suspended solids, and other monitoring requirements (Section E3.6.1.2.1). The NPDES permit for VCSNS requires the site to comply with these and other measures to protect surface water and groundwater from non-cooling water. Future NPDES permits would be at least as stringent in their requirements.

Surface water could also be impacted by infiltration of pollutants in stormwater and spills of oil and hazardous materials. As discussed in Section E3.6.1.2.2, stormwater discharges associated with VCSNS industrial activities are regulated and controlled through the NPDES permit. DE also maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will

be used to prevent or reduce the pollutants in stormwater discharges. VCSNS documents all stormwater management issues in an annual report, as well as corrective measures taken throughout the reporting period. As presented in Section E9.5.3.5, VCSNS maintains a SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the plant to minimize the frequency and severity of oil spills. In addition, VCSNS has a hazardous substance spill contingency plan and a chemical control program.

VCSNS has not proposed any refurbishment activities related to SLR (Section E2.3). As discussed in Section E4.1.4.4, as part of ongoing operations, VCSNS is undertaking projects at the new Security Training facility, a planned expansion of the Combined Maintenance Shop, and removal of the Head Assembly Building. Land disturbance for the period of extended operation at VCSNS would be related to routine infrastructure maintenance as needed to support VCSNS operations. VCSNS' excavation procedure addresses construction and maintenance activities undertaken during the SLR period involving ground disturbance. Such projects are required to follow the VCSNS excavation permit procedure and could also trigger an environmental review to determine any impacts . VCSNS would obtain required stormwater permits for construction, demolition, and maintenance activities, and VCSNS would comply with the stormwater management and BMP requirements. The SCDHEC generic permit for stormwater discharge from large and small construction activities permit, SCR100000, is a general permit for construction activities that would require preparation of a construction SWPPP that identifies BMPs that would be implemented to minimize erosion and sediment resulting from stormwater runoff. (SCDHEC. 2021b)

The NRC's previous findings determined continued operation of a nuclear plant in a license renewal term to have a SMALL impact to surface water use and quality due to non-cooling water systems. The information DE reviewed indicated that VCSNS has permits in place to govern discharges and programs and procedures in place to minimize the potential for spills. VCSNS will ensure a SMALL impact on surface water quality from non-cooling systems during the proposed SLR operating term by implementing the SWPPP, BMPs, and SPCC plan, and by complying with current and future NPDES and stormwater regulatory requirements and permit conditions.

DE finds that impacts to surface water use and quality for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.2 ALTERED CURRENT PATTERNS AT INTAKE AND DISCHARGE STRUCTURES

E4.5.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Altered current patterns would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been SMALL at operating nuclear power plants.

E4.5.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.2.3 Background [GEIS Section 4.5.1.1]

The large flow rates associated with cooling system water use have the potential to alter current patterns. The degree of influence depends on the design and location of the intake and discharge structures and the characteristics of the surface water body. The size of large rivers, lakes, or reservoirs precludes significant current alterations, except in the vicinity of the structures. The effect on currents near the intake and discharge locations is expected to be localized, and any problems would have been mitigated during the early operational period of a plant. Impacts from altered current patterns at intake and discharge structures during the license renewal term were considered to be SMALL for all plants.

E4.5.2.4 Site-Specific Analysis

There are no modifications associated with the proposed action that would alter the existing current pattern; therefore, existing current patterns are expected to continue during the proposed SLR operating term.

Previous NRC's findings determined continued operation of a nuclear plant in a license renewal term would have a small impact to current patterns. Impacts to surface water use and quality during the proposed SLR term are limited based on the size of the Monticello and Parr Reservoirs (Section E3.6.1) and that there are no modifications planned that would alter the existing current pattern.

DE finds that impacts to altered current patterns at intake and discharge for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.3 ALTERED SALINITY GRADIENTS

E4.5.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Effects on salinity gradients would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been small at operating nuclear power plants.

E4.5.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.3.3 Background [GEIS Section 4.5.1.1]

This issue relates to plants located on estuaries and addresses changes in salinity caused by cooling system water withdrawals and discharges. Impacts of altered salinity gradients would be SMALL for all nuclear plants.

E4.5.3.4 Site-Specific Analysis

VCSNS does not discharge to an estuary. Therefore, this issue is not applicable and further analysis is not required.

E4.5.4 ALTERED THERMAL STRATIFICATION OF LAKES

E4.5.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Effects on thermal stratification would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been small at operating nuclear power plants.

E4.5.4.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.4.3 Background [GEIS Section 4.5.1.1]

Because cooling systems typically withdraw from the deeper, cooler portion of the water column of lakes or reservoirs and discharge to the surface, they have the ability to alter the thermal stratification of the surface water. This is not considered an issue for rivers or oceans because of mixing caused by natural turbulence. Impacts of altered thermal stratification of lakes would be SMALL for all nuclear plants.

E4.5.4.4 Site-Specific Analysis

The VCSNS NPDES-permitted temperature monitoring and reporting requirements were established at Outfall 001, as described in Section E3.6.1.2.6, with a daily maximum temperature of 113°F to be measured "in pipe" prior to discharge. To comply with SCDHEC water quality standards for temperature in lakes, DE conducts studies supporting the thermal effluent limitations.

As discussed in Section E3.6.4.1, thermal vertical profiles are measured at four sites in the Monticello Reservoir, including the Unit 1 intake. In the spring through mid-summer, temperatures at depths of 15 meters (about 49.2 feet) are up to 6.7°C (12.06°F) cooler than at the surface. During other times of the year, little variation with depth is observed. Therefore, thermal stratification has not been observed in the Monticello Reservoir.

DE finds that impacts of thermal stratification in the Monticello Reservoir for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.5 SCOURING CAUSED BY DISCHARGED COOLING WATER

E4.5.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Scouring effects would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been SMALL at operating nuclear power plants.

E4.5.5.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.5.3 Background [GEIS Section 4.5.1.1]

The high flow rate of water from a cooling system discharge structure has the potential to scour sediments and redeposit them elsewhere. While scouring is possible during reactor startup, operational periods would typically have negligible scouring. Scouring is expected to occur only in the vicinity of the discharge structure where flow rates are high. Scouring has been observed at only three nuclear power plants and the effects were localized and minor. The NRC reviewed the impacts of scouring caused by discharged cooling water and found the impacts during the license renewal term would be SMALL for all plants.

E4.5.5.4 Site-Specific Analysis

Circulating water moves through a 12-foot-diameter pipe from the plant to a semi-enclosed discharge bay located east of the SWP, separated by a dam. From the discharge bay, the heated

effluent moves through a 1,000-foot-long discharge canal to the Monticello Reservoir. The discharge canal directs the discharge flow to the northeast. A 2,600-foot-long jetty extending from the north side of the SWP prevents recirculation of the heated water. (SCE&G. 2002)

There are no plant operations or modifications planned for the proposed SLR operating term that would alter discharge patterns and flow rates (Section E2.2).

Previous findings by the NRC determined continued operation of a nuclear plant in a license renewal term to have a small impact due to scouring caused by cooling water discharge. Scouring impacts would be limited during the proposed SLR term based on the presence of the discharge bay, length of the discharge canal, which prevents scouring, and that there are no modifications planned that would alter the existing current pattern.

DE finds that impacts from scouring caused by discharge cooling water for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.6 DISCHARGE OF METALS IN COOLING SYSTEM EFFLUENT

E4.5.6.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Discharges of metals have not been found to be a problem at operating nuclear power plants with cooling tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. Discharges are monitored and controlled as part of the NPDES permit process.

E4.5.6.2 Requirement [CLI-22-2 and CLI-2-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.6.3 Background [GEIS Section 4.5.1.1]

Heavy metals such as copper, zinc, and chromium can be leached from condenser tubing and other components of the heat exchange system by circulating cooling water. These metals are normally addressed in NPDES permits because high concentrations of them can be toxic to aquatic organisms. During normal operations, concentrations are normally below laboratory detection levels. However, plants occasionally undergo planned outages for refueling with stagnant water remaining in the heat exchange system. Impacts from the discharge of metals in cooling system effluent during the license renewal term would be SMALL for all plants.

E4.5.6.4 Site-Specific Analysis

Condenser tubes are stainless steel at VCSNS and would not contribute leached metals to the cooling water discharge (DE. 2023a).

DE finds that impacts from discharge of metals in cooling system effluent for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.7 DISCHARGE OF BIOCIDES, SANITARY WASTES, AND MINOR CHEMICAL SPILLS

E4.5.7.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The effects of these discharges are regulated by federal and state environmental agencies. Discharges are monitored and controlled as part of the NPDES permit process. These impacts have been SMALL at operating nuclear power plants.

E4.5.7.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.7.3 Background [GEIS Section 4.5.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the discharge of biocides, sanitary wastes, and minor chemical spills. The use of biocides is common and is required to control biofouling and nuisance organisms in plant cooling systems. However, the types of chemicals, their amounts or concentrations, and the frequency of their use may vary. Ultimately, any biocides used in the cooling system are discharged to surface water bodies. The discharge of treated sanitary waste also occurs at plants. Discharge may occur via onsite wastewater treatment facilities, via an onsite septic field, or through a connection to a municipal sewage system. Minor chemical spills collected in floor drains are associated with industry in general and are a possibility at all plants. Each of these factors represents a potential impact on surface water quality. The NRC considered the potential impacts of these factors resulting from nuclear plant operations of surface water quality in its GEIS for license renewal. The NRC concluded that nuclear power plant operation under NPDES permits would mitigate impacts from biocides, sanitary wastes, and minor chemical spills to SMALL significance.

E4.5.7.4 Site-Specific Analysis

The plant's NPDES permit governs water treatment chemicals and biocides use (Section E3.6.1). The NPDES permit requires bromide monitoring and reporting at the external Outfall 001 for condenser cooling water and low volume waste discharged through the discharge canal. Biocide and scale control chemicals are used in accordance with all use and discharge requirements, including provisions of the NPDES permit issued to the VCSNS site, as well as provisions established in plant-specific requests approved by SCDHEC under the NPDES permit. Compliance with NPDES permit limits for discharge of these biocides and associated residuals is ensured through controlled application protocols and monitoring. The SCDHEC has reviewed and approved these chemical additives. New chemical additives or changes in dosages of chemical additives must be approved by the SCDHEC in accordance with the permit. (Section E3.6.1.2.1)

As presented in Section E3.6.1.2.3, site sanitary wastewater is treated at an onsite sanitary wastewater treatment facility prior to discharge through NPDES Outfall 005. Sanitary wastewater effluent is combined with effluents from Outfalls 06A, 06B, and 008, which are discharged to the Monticello Reservoir through NPDES Outfall 014.

Surface water could also be impacted by infiltration of pollutants in stormwater and spills of oil and hazardous materials. As mentioned previously in Section E4.5.6, VCSNS has a SWPPP, a SPCC plan, and a hazardous substance spill contingency plan. There were no reportable spills associated with VCSNS during the period 2017–2021.

VCSNS has a hazardous waste contingency plan, which includes emergency response procedures for the nonradiological hazards of plant operations guided by compliance with state, district, and local environmental permits and requirements. The comprehensive regulatory controls and permits in place and VCSNS's compliance with them, guided by their internal procedures, would mitigate impacts to surface waters from VCSNS's continued operations during the proposed SLR term.

Previous NRC findings determined continued operation of a nuclear plant in a license renewal term to have a small impact to surface water use and quality because NPDES permits would mitigate impacts from biocides, sanitary wastes, and minor chemical spills to SMALL significance. VCSNS operates the cooling system under NPDES Permit No. SC0030856. The permit indicates that biocides are to be used in accordance with registration requirements of the Federal Insecticides, Fungicide, and Rodenticide Act. Discharges are monitored and constituents are controlled in compliance with the permit. DE will continue to comply with current and future NPDES regulatory requirements and permit conditions.

DE finds that impacts from discharge of biocides, sanitary wastes, and minor chemical spills for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.8 SURFACE WATER USE CONFLICTS (PLANTS WITH ONCE-THROUGH COOLING SYSTEMS)

E4.5.8.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

E4.5.8.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.8.3 Background [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Once-through and closed-cycle cooling systems have different water consumption rates. Once-through cooling systems return most of their withdrawn water to the same surface water body, with evaporative losses of less than 3%. Consumptive use by plants with once-through cooling systems during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment by the NRC. The NRC considered that future water availability could be impacted by climate change and drought. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased. This situation would then necessitate decisions by local, state, and regional water planning officials. The NRC concluded that the impact on water use conflicts from the continued operation and refurbishment activities would be SMALL for plants that utilize once-through cooling.

E4.5.8.4 Site-Specific Analysis

VCSNS operates primarily with a once-through cooling system. The Turbine Building closed-cycle cooling water system uses a wet surface industrial cooling tower for the heat sink (DE. 2023a). Cooling tower use results in high water consumption. The Turbine Building cooling tower is a wet surface industrial type. It rejects heat to the atmosphere by heat transfer to spray water passing over the outside of the tubes and then to the atmosphere by evaporation of the spray water in the air stream produced by the cooling tower fans. As described in Section E3.6.1, makeup water is provided from the clarifier raw water pumps in the Circulating Water Pump House, and blowdown goes to the circulating water discharge canal. Surface water withdrawals are regulated in Permit No. 20PN001, and discharges are permitted under NPDES Permit SC0030856. Section E4.5.1.4

analyzes the surface water use conflict issue considering VCSNS use of the once-through cooling and cooling tower use in compliance with its NPDES and surface water withdrawal permits. The analysis considered compliance with these permits, concluding that surface water use is a small impact. Compliance with current and future NPDES regulatory requirements and surface water withdrawal permits will ensure the impact on water use conflicts from the continued operation remains a SMALL impact.

DE finds that continued operation with a once-through cooling system for the proposed SLR term would not create surface water use conflicts; therefore, impacts for this issue would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.9 SURFACE WATER USE CONFLICTS (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A RIVER)

E4.5.9.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts could be of small or moderate significance, depending on makeup water requirements, water availability, and competing water demands.

E4.5.9.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

E4.5.9.3 Background [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Closed-cycle cooling is not completely closed, because the system discharges blowdown water to a surface water body and withdraws water for makeup of both the consumptive water loss due to evaporation and drift (for cooling towers) and blowdown discharge. For plants using cooling towers, the makeup water needed to replenish the consumptive loss of water to evaporation can be significant and is reported at 60% or more of the condenser flow rate. Cooling ponds will also require makeup water as a result of naturally occurring evaporation, evaporation of the warm effluent, and possible seepage to groundwater.

Consumptive use by plants with cooling ponds or cooling towers using makeup water from a river during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment by

the NRC. In the 1996 GEIS, application of this issue applied only to rivers with low flow to define the difference between plants located on "small" versus "large" rivers. However, any river, regardless of size, can experience low flow conditions of varying severity during periods of drought and changing conditions in the affected watershed such as upstream diversions and use of river water. The NRC subsequently determined that use of the term "low flow" in categorizing river flow is of little value considering that all rivers can experience low flow conditions.

Population growth around nuclear power plants has increased demand on municipal water systems, including systems that rely on surface water. Municipal intakes located downstream from a nuclear power plant could experience water shortages, especially in times of drought. Similarly, water demands upstream from a plant could impact the water availability at the plant's intake.

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands.

E4.5.9.4 Site-Specific Analysis

The NRC defines a "cooling pond" as a manmade impoundment that does not impede the flow of a navigable system and that is used primarily to remove waste heat from condenser water. Therefore, the Monticello Reservoir is considered a cooling pond. As discussed in Section E3.6.1, Monticello Reservoir was formed by the Frees Creek dams to serve as the upper pool for the Fairfield Pumped Storage Facility and the source of makeup cooling water for VCSNS. Water levels in the Monticello Reservoir can vary as much as 4.5 feet from use by VCSNS and the Fairfield Pumped Storage Facility, and water levels in the Parr Reservoir can vary as much as 10 feet by use from the Fairfield Pumped Storage Facility.

During normal plant operation, evaporation from Monticello Reservoir has been estimated to be 33 cfs, with an additional 22 cfs from condenser water. The total evaporation rate of 55 cfs corresponds to an average daily evaporation loss of 109 acre-feet. Annually, evaporative losses from Monticello Reservoir are offset by precipitation, and there is no evidence of significant seepage from the reservoir to groundwater. There is also evaporative loss from the Turbine Building cooling tower. Although an evaporative loss rate is not available for this cooling tower; makeup water to this cooling tower is governed by the existing surface water withdrawal permit, and evaporative loss is expected to be small. Downstream of VCSNS, surface water is withdrawn by a number of municipalities and industries, the largest of which is the City of Columbia. (Sections E3.6.3.1 and E3.6.1) Relicensing of Parr Hydro was contingent upon FERC-mandated minimum instream flows, which would mitigate impacts downstream of the Parr Dam in the Broad River (SCE&G. 2002).

DE finds that continued operation with a cooling tower for the proposed SLR term would not create surface water use conflicts; therefore, impacts for this issue would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.10 EFFECTS OF DREDGING ON SURFACE WATER QUALITY

E4.5.10.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Dredging to remove accumulated sediments in the vicinity of intake and discharge structures and to maintain barge shipping has not been found to be a problem for surface water quality. Dredging is performed under permit from the U.S. Army Corps of Engineers (USACE) and possibly from other state or local agencies.

E4.5.10.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.10.3 Background [GEIS Section 4.5.1.1]

Dredging activities and the discharge of dredged and/or fill material have the potential to impact surface water quality. Nuclear power plants conduct maintenance dredging to remove accumulated sediments in the vicinity of water intakes, canals, and discharge structures, and to maintain barge shipping lanes. The issue does not concern maintenance dredging of onsite cooling ponds and onsite disposal of dredged material (e.g., mud). In the 2013 license renewal GEIS, the NRC reviewed the potential impacts to surface water quality from dredging operations to support nuclear power plant operations and found the issue to have SMALL impacts to all plants. In general, the NRC found maintenance dredging affects localized areas for a brief period of time. The NRC also recognized that dredging operations are performed under permits issued by the USACE and possibly state or local agencies.

E4.5.10.4 Site-Specific Analysis

VCSNS does not conduct maintenance dredging for the intake and discharge. No dredging is anticipated during the SLR term (Section E3.6.1.2.4). Therefore, this issue is not applicable and further analysis is not required.

E4.5.11 TEMPERATURE EFFECTS ON SEDIMENT TRANSPORT CAPACITY

E4.5.11.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem.

E4.5.11.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.11.3 Background [GEIS Section 4.5.1.1]

The GEIS discusses this issue by stating: "Increased temperature and the resulting decreased viscosity have been hypothesized to change the sediment transport capacity of water, leading to potential sedimentation problems, altered turbidity of rivers, and changes in riverbed configuration." The NRC's review indicated that there is no evidence that temperature effects on sediment transport capacity have caused adverse environmental effects at any existing nuclear power plant and acknowledged that regulatory agencies have expressed no concerns regarding the impacts of temperature on sediment transport capacity. Furthermore, because of the small area near a nuclear power plant affected by increased water temperature, it is not expected that plant operations would have a significant impact. Effects are considered to be of SMALL significance for all plants. No change in the operation of the cooling system is expected during the license renewal term so no change in effects on sediment transport capacity is anticipated.

E4.5.11.4 Site-Specific Analysis

As discussed in Section E4.5.5.4, most of the discharge from VCSNS is through a discharge bay leading to a 1,000-foot discharge canal into the Monticello Reservoir through Outfall 001 with a small amount discharged to the Fairfield Pumped Storage Facility penstocks through Outfall 003. Discharges are governed by VCSNS's NPDES permit, which established temperature discharge limits (Table E3.6-1). Thermal studies conducted in 2012 to support NPDES permit temperature limits for the NPDES permit identifies the extent of the 90°F thermal plume during summer months and a 5°F difference plume during winter months. Per South Carolina Regulation 61-68 – Water Classifications and Standards: Section E.12.c, the weekly average water temperatures shall not be increased by more than 5°F above natural conditions and shall not exceed 90°F as a result of the discharge of heated liquids…." The model results indicated that the hot effluent spreads and cools as it mixes with the ambient water downstream of the discharge canal. In addition, the raised 2,600-foot jetty shields the thermal plume from the western side of the Monticello Reservoir. The

presence of the jetty would minimize the potential for the heated water to influence the physical properties of the receiving waters and as "hypothesized to change the sediment transport capacity of water, leading to potential sedimentation problems."

There are no plant operations or modifications planned for the proposed SLR operating term that would alter discharge patterns (Section E2.2).

DE finds that temperature effects on sediment transport capacity for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.12 GROUNDWATER CONTAMINATION AND USE (NON-COOLING SYSTEM IMPACTS)

E4.5.12.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Extensive dewatering is not anticipated from continued operations and refurbishment associated with license renewal. Industrial practices involving the use of solvents, hydrocarbons, heavy metals, or other chemicals, and/or the use of wastewater ponds or lagoons have the potential to contaminate site groundwater, soil, and subsoil. Contamination is subject to state or EPA-regulated cleanup and monitoring programs. The application of BMPs for handling any materials produced or used during these activities would reduce impacts.

E4.5.12.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.12.3 Background [GEIS Section 4.5.1.2]

Among common groundwater uses are extraction or draining of groundwater for dewatering purposes and groundwater extraction for contaminant plume control. Contamination of groundwater and soil can result from leaks or spills of solvents, diesel fuel, gasoline, and other industrial chemicals; heavy metals deposited to soils from industrial activities; leaching of contaminants from wastewater ponds or lagoons; and other sources. The NRC considered the issue in light of the programs and procedures commonly implemented at nuclear plants, including proper chemical and waste storage and handling; secondary containment and leak detection; use of BMPs and SPCC plans; compliance with federal and state regulations and permits; and groundwater monitoring programs. The NRC concluded that implementation of such programs and procedures would serve to mitigate any effects to groundwater use or quality to those of a SMALL impact.

E4.5.12.4 Site-Specific Analysis

As presented in Section E3.6.3.2, groundwater is not used to supply any of the water required for VCSNS plant operations. Nonsafety-related dewatering activities occur at the site near VCSNS structures experiencing water intrusion issues. There are no recovery wells for nonradioactive contaminants in use at VCSNS.

As discussed in Section E3.6.2.4, DE has implemented a GWPP in accordance with the EPRI Guideline for Implementing a Groundwater Protection Program at Nuclear Power Plants. As part of this program, the GWPP includes 21 wells installed prior to 2022 (11 water table wells and 10 dewatering wells). No gamma or difficult-to-detect radionuclides, other than naturally occurring radionuclides, were identified in well samples between 2017 and 2021 (Section E3.6.4.2).

As discussed in Section E3.6.4.2, groundwater monitoring is required in the ABFOST area, which is located near the SWP. The ABFOST consists of one 500,000-gallon AST containing No. 2 fuel oil located within a secondary containment basin. FPP has consistently been measured in groundwater well GW-3 and the extent of the dissolved-phase plume is confined to the GW-3 and GW-4 area. Benzene and naphthalene have been detected above their MCLs in groundwater samples collected from upgradient monitoring well GW-4. None of the constituents have been detected in downgradient well GW-2 above their respective MCLs. A trend analysis of VOCs detected in GW-4 from 2014 through 2021 indicates that total VOC concentrations are decreasing in this well. Groundwater gradient was measured southward, away from the Monticello Reservoir (Section E3.6.4.2.2).

Section E3.6.4.2.2 presents the nonradioactive releases for years 2017–2021. There have been three inadvertent nonradioactive releases; none were reported to impact groundwater beneath the site. There are no ongoing remediation activities for these releases.

Non-contact cooling water and low volume waste are monitored and discharged to the Monticello Reservoir via NPDES Outfalls 001 and 014, and low volume waste and non-chemical metal cleaning waste is discharged to the Broad River/Parr Reservoir via NPDES Outfall 003, in accordance with the VCSNS wastewater NPDES Permit No. SC0030856. Chemical additives approved by the SCDHEC are used to control pH, scale, and corrosion in the circulating water system, and to control biofouling of plant equipment. The current NPDES wastewater permit authorizes discharges from nine outfalls: three external (Outfalls 001, 003, and 014) and six internal (Outfalls 004, 005, 06A, 06B, 007, and 008). (Section E3.6.1.2.1)

As discussed in Section E4.4.4, VCSNS has controls in place for projects that involve ground disturbance, stormwater controls in place to reduce the potential for stormwater runoff to contaminate soils and groundwater, a SWPPP with BMPs to prevent the introduction of pollutants to the stormwater and collection in the stormwater basins, and procedures in place to minimize the potential for spills.

Previous NRC findings have determined continued operation of a nuclear plant in a license renewal term to have a small impact to groundwater use and quality due to non-cooling water systems based on programs and procedures commonly implemented at nuclear plants, such as chemical storage and SPCC plans. The information reviewed indicated that DE has programs and procedures in place to minimize the potential for groundwater contamination and would maintain/secure required permits for basins and spoils areas. Compliance with current NPDES permits, stormwater regulatory requirements, and implementation of the SWPPP, BMPs, and the SPCC plan will ensure insignificant (i.e., SMALL) impacts on groundwater use and quality from non-cooling systems during the proposed SLR operating term. In addition, as described in Section E4.5.19.4, water from plant uses would continue to be processed and monitored in compliance with licensing and permitting to protect groundwater resources from radioactive exposure pathways.

DE finds that non-cooling system impacts to groundwater resources from groundwater contamination and use for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.13 GROUNDWATER USE CONFLICTS (PLANTS THAT WITHDRAW LESS THAN 100 GPM)

E4.5.13.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Plants that withdraw less than 100 gpm are not expected to cause any groundwater use conflicts.

E4.5.13.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.13.3 Background [GEIS Section 4.5.1.2]

Water wells are used by nuclear power plants for their potable water system, landscape watering, and at some plants, groundwater is the source for the makeup and SWSs. The pumping of groundwater creates a cone of depression in the potentiometric surface around the pumping well. The amount the water table or potentiometric surface declines and the overall extent of the cone depend on the pumping rate, characteristics of the aquifer (e.g., its permeability), whether the aquifer is confined or unconfined, and certain boundary conditions (including the nearby presence of a hydrologically connected surface water body). Generally, plants with a peak withdrawal rate of

less than 100 gpm do not have a significant cone of depression. Their potential for causing conflict with other groundwater users would depend largely on the proximity of the other wells.

E4.5.13.4 Site-Specific Analysis

As mentioned in Section E3.6.3.2, groundwater is not used to supply any of the water required for VCSNS plant operations. The potentiometric surface at VCSNS is largely controlled by the dewatering system. The dewatering system consisted of two dewatering wells in operation in 2003. Fourteen additional dewatering wells began operation in 2008. Three of the dewatering wells were installed in bedrock. The remaining dewatering wells were screened in fill materials, saprolite, and partially weathered rock. The dewatering wells maintain a relatively constant water level programmed in the controller. Groundwater flows toward the dewatering wells in all directions in the vicinity of the dewatering wells. (Section E3.6.2.3) The dewatering wells remove groundwater to prevent infiltration into power block structures. The removed groundwater is transferred to the plant's stormwater drainage system and then discharged to the Monticello Reservoir. These dewatering activities are ongoing on a year-round basis and not seasonal or periodic. An estimate or measurement of groundwater removed by these dewatering activities is not available; however, the NPDES permit in force prior to the dewatering well installations was revised to address this additional effluent of approximately 70,000 gpd (steady state; approximately 48.6 gpm). (DE. 2023a)

The overburden soils release water slowly to the lower, more pervious saprolitic and jointed rock zones. As a result of this storage effect, yields of wells and flows of springs remain rather constant, and are sustained during periods of deficient moisture. Review of the available information does not indicate that well dewatering is a problem in the site area, and ground water fluctuations are, therefore, considered to be minor. (DE. 2023a) Cones of depression usually do not extend past the property boundary, reducing the possibility of a groundwater use conflict (NRC. 2013a).

Previous NRC findings determined the impact on groundwater use conflicts from continued operations during the license renewal term for all nuclear plants that withdraw less than 100 gpm would be SMALL. DE does not anticipate that groundwater withdrawal increases above the reported quantities would be required during the proposed SLR operating term.

DE finds that impacts to groundwater use conflicts from groundwater withdrawals for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.14 GROUNDWATER USE CONFLICTS (PLANTS THAT WITHDRAW MORE THAN 100 GPM)

E4.5.14.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Plants that withdraw more than 100 gpm could cause groundwater use conflicts with nearby groundwater users.

E4.5.14.2 Requirement [10 CFR 51.53(c)(3)(ii)(C)]

If the applicant's plant pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater must be provided.

E4.5.14.3 Background [GEIS Section 4.5.1.2]

A nuclear plant may have several wells with combined pumping in excess of 100 gpm (378 liters per minute). Overall site pumping rates of this magnitude have the potential to create conflicts with other local groundwater users if the cone of depression extends to the offsite well(s). Large offsite pumping rates for municipal, industrial, or agricultural purposes may, in turn, lower the water level at power plant wells. For any user, allocation is normally determined through a state-issued permit.

Groundwater use conflicts have not been observed at any nuclear power plants, and no significant change in water well systems is expected over the license renewal term. If a conflict did occur, it might be possible to resolve it if the power plant relocated its well or wellfield to a different part of the property. The siting of new wells would be determined through a hydrogeologic assessment.

E4.5.14.4 Site-Specific Analysis

As discussed in Section E4.5.13, VCSNS withdraws less than 100 gpm and it is not anticipated that groundwater withdrawal would increase to more than 100 gpm during the proposed SLR operating term; therefore, this issue is not applicable and further analysis is not required.

E4.5.15 GROUNDWATER USE CONFLICTS (PLANTS WITH CLOSED-CYCLE COOLING SYSTEMS THAT WITHDRAW MAKEUP WATER FROM A RIVER)

E4.5.15.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands.

E4.5.15.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

E4.5.15.3 Background [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would occur naturally, although withdrawals for makeup water would increase the effect.

E4.5.15.4 Site-Specific Analysis

As defined in Section E4.5.9.4, VCSNS operates as a once-through cooling plant that withdraws from and discharges to a cooling pond, Monticello Reservoir.

The "natural body of water" (the Broad River/Parr Reservoir) is not relied on for heat dissipation but is used as a source of makeup water to replace that lost to evaporation from the cooling pond (Monticello Reservoir) and as a receiving stream for discharges from the cooling pond. (NRC. 2004a)

As defined above, VCSNS operates as a once-through cooling plant that withdraws from and discharges to a cooling pond, Monticello Reservoir. Monticello Reservoir was built to supply cooling water to VCSNS and to provide an upper reservoir for the Fairfield Pumped Storage Facility located on Parr Reservoir. (NRC. 2004b)

The issue of groundwater use conflicts applies to VCSNS because it withdraws from and discharges to a cooling pond, Monticello Reservoir, which receives its makeup water from Parr Reservoir on the Broad River. (NRC. 2004b)

Monticello Reservoir water lost to evaporation is replaced with water from Parr Reservoir as part of the normal operation of the Fairfield Pumped Storage Facility. Water is cycled between the reservoirs daily. (NRC. 2004b) Average ambient evaporation from the Monticello Reservoir was estimated to be about 65 acre-feet/day (33 cfs) with an additional 44 acre-feet/day (22 cfs) latent evaporation from condenser water. The total evaporation rate of 55 cfs corresponds to an average

daily evaporation loss of 109 acre-feet. On a mean annual basis, most of the evaporation loss from the Monticello Reservoir is offset by precipitation. (SCE&G. 2010)

Water used for cooling at the facility is not removed from a stream with natural flow, but from Monticello Reservoir, an impounded section of the Broad River. The flow is regulated to maintain a minimum downstream release of 150 cfs. The site is located within the Piedmont Physiographic Province of South Carolina. Rivers in the South Carolina Piedmont typically are high-energy, shallow, rocky-bottomed streams that tend not to develop extensive alluvial flood plains. The Broad River is typical of the area. With the construction of Parr Reservoir, the upstream river flood plain was inundated. The surrounding area is characterized by a surficial water table aquifer in saprolitic soils and shallow fractures in rocks. With the construction of Parr Reservoir, the water in the surficial aquifer adjacent to the reservoir rose. Water flow within saprolitic soil is typically very slow due to the relatively impermeable natural soils, and the flow direction follows the surface topography within drainage basins toward discharge points along the stream valleys. These soils release water slowly back to reservoir during extreme low-level periods. The fact that Broad River water is pumped (via Fairfield Pumped Storage Facility) to Monticello Reservoir has had no significant impact on the alluvial aquifer in the vicinity of the site during periods of low natural stream flow. The water in Parr Reservoir itself and the surrounding surficial aquifer distributes any loss in reservoir water level in such a way as to be considered insignificant to the alluvial aquifer. (NRC. 2004b)

In 2004, the NRC reviewed the available information including the discharge history of the Broad River, maintenance of minimum flow conditions on the Broad River, the physiographic and hydrogeologic setting, and the demands placed on the Broad River during low-flow conditions to compensate for evaporative losses. Based on this evaluation, the NRC determined any impacts from VCSNS on the Broad River flow conditions or associated, sparsely distributed alluvial groundwater that would affect instream and riparian communities in Parr Reservoir or the Broad River over the license renewal term would be SMALL. (NRC. 2004b) As stated in Section E4.5.13.4, groundwater withdrawal volumes during the proposed SLR term are not expected to change. Compliance with current groundwater use regulatory requirements and permit conditions would ensure that groundwater use conflicts would not occur due to groundwater withdrawals.

DE finds that impacts to groundwater use conflicts from water withdrawals for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.16 GROUNDWATER QUALITY DEGRADATION RESULTING FROM WATER WITHDRAWALS

E4.5.16.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Groundwater withdrawals at operating nuclear power plants would not contribute significantly to groundwater quality degradation.

E4.5.16.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.16.3 Background [GEIS Section 4.5.1.2]

In the 2013 license renewal GEIS, the NRC reviewed groundwater drawdown due to water withdrawals, which can draw water into the aquifer. If the water is of lower quality, this poses the possibility of groundwater degradation. Further, wells in a coastal setting (e.g., ocean shore or estuary) have the potential to cause saltwater intrusion into the aquifer. The degree of saltwater intrusion depends on the cumulative pumping rates of wells, their screen depths, and hydrogeologic conditions.

The NRC recognized that nuclear power plants are not the large-volume groundwater users that would be a leading driver for saltwater intrusion in the plant's locale. The NRC concluded that groundwater withdrawals by nuclear power plants would have a SMALL impact on groundwater quality.

E4.5.16.4 Site-Specific Analysis

Hydrogeology local to VCSNS is discussed in Section E3.6.2.1 with groundwater uses described in Section E3.6.3.2. Groundwater in the VCSNS region occurs in jointed and fractured crystalline bedrock and in the lower zones of the residual soil overburden. Recharge to these formations is principally by infiltration of precipitation falling on the upland areas. The aquifer at VCSNS exists under water table conditions in the saprolite and fractured bedrock (Section E3.6.3.2). Groundwater in the vicinity of VCSNS is highly mineralized because of prolonged contact with, and solution of, rock minerals, and, as a result, is generally higher than local surface waters in hardness, dissolved solids, and conductivity. (Section E3.6.4.2)

There is no onsite use of groundwater as drinking water. The only nearby public water supply is the Jenkinsville Water Company. Three of its five wells are within approximately 2 miles of the VCSNS site boundary, but more than 2 miles from the center point. (Section E3.6.3.2)

As stated in Section E4.5.13.4, groundwater withdrawal volumes during the proposed SLR term are not expected to change. Compliance with current groundwater use regulatory requirements and permit conditions would ensure that groundwater quality would not be degraded due to groundwater withdrawals.

DE finds that impacts from groundwater quality degradation resulting from water withdrawals for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.5.17 GROUNDWATER QUALITY DEGRADATION (PLANTS WITH COOLING PONDS IN SALT MARSHES)

E4.5.17.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Sites with closed-cycle cooling ponds could degrade groundwater quality. However, groundwater in salt marshes is naturally brackish and, thus, not potable. Consequently, the human use of such groundwater is limited to industrial purposes.

E4.5.17.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.5.17.3 Background [GEIS Section 4.5.1.2]

Nuclear plants that use cooling ponds as part of their cooling water system discharge effluent to the pond. The effluent's concentration of contaminants and other solids increases relative to that of the makeup water as it passes through the cooling system. These changes include increased total dissolved solids (or TDS), since they concentrate as a result of evaporation, increased heavy metals (because cooling water contacts the cooling system components), and increased chemical additives to prevent biofouling. Because all the ponds are unlined, the water discharged to them can interact with the shallow groundwater system and may create a groundwater mound. In this case, groundwater below the pond can flow radially outward, and this groundwater would have some of the characteristics of the cooling system effluent.

In salt marsh locations, the groundwater is naturally brackish (i.e., with a TDS concentration of about 1,000 to more than 10,000 mg/L) and, thus, is already limited in its uses. As such, this issue concerns only the potential for changing the groundwater use category of the underlying shallow and brackish groundwater due to the introduction of cooling water contaminants. Impacts of groundwater quality degradation for nuclear plants using cooling ponds in salt marshes would be SMALL.

E4.5.17.4 Site-Specific Analysis

VCSNS is not located in a salt marsh. Salt marshes are coastal wetlands that are flooded and drained by salt water brought in by the tides (NOS. 2022). Therefore, this issue is not applicable and further analysis is not required.

E4.5.18 GROUNDWATER QUALITY DEGRADATION (PLANTS WITH COOLING PONDS AT INLAND SITES)

E4.5.18.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Inland sites with closed-cycle cooling ponds could degrade groundwater quality. The significance of the impact would depend on cooling pond water quality, site hydrogeologic conditions (including the interaction of surface water and groundwater), and the location, depth, and pump rate of water wells.

E4.5.18.2 Requirement [10 CFR 51.53(c)(3)(ii)(D)]

If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.

E4.5.18.3 Background [GEIS Section 4.5.1.2]

Some nuclear power plants that rely on unlined cooling ponds are located at inland sites surrounded by farmland or forest or undeveloped open land. Degraded groundwater has the potential to flow radially from the ponds and reach offsite groundwater wells. The degree to which this occurs depends on the water quality of the cooling pond; site hydrogeologic conditions (including the interaction of surface water and groundwater); and the location, depth, and pump rate of water wells. Mitigation of significant problems stemming from this issue could include lining existing ponds, constructing new lined ponds, or installing subsurface flow barrier walls. Groundwater monitoring networks would be necessary to detect and evaluate groundwater quality degradation. The degradation of groundwater quality associated with cooling ponds has not been reported for any inland nuclear plant sites.

E4.5.18.4 Site-Specific Analysis

As defined in Section E4.5.9.4, VCSNS operates as a once-through cooling plant that withdraws from and discharges to a cooling pond, Monticello Reservoir.

The issue of groundwater degradation applies to VCSNS because the plant uses a cooling pond. VCSNS employs a once-through cooling system, but withdraws from and discharges to a cooling pond, Monticello Reservoir. Monticello Reservoir provides once through cooling water to VCSNS and acts as the upper reservoir for the Fairfield Pumped Storage Facility. Parr Reservoir, created by

the damming of the Broad River, serves as the lower reservoir for the Fairfield Pumped Storage Facility. Makeup water for Monticello Reservoir is supplied from Parr Reservoir. As part of Fairfield Pumped Storage Facility operations, water is released from Monticello Reservoir through Fairfield Pumped Storage Facility and discharged to Parr Reservoir during the day. Water is then pumped at night from Parr Reservoir to Monticello Reservoir to maintain the level of the upper reservoir. Over time, the water quality of Monticello Reservoir due to the constant cycling and mixing of water is basically that of the Broad River. (NRC. 2004b)

Water quality monitoring data indicate that Monticello Reservoir waters are relatively low in concentrations of common ions, low in hardness, and low in dissolved solids/conductivity. Groundwater in the vicinity of the site is highly mineralized, due to prolonged contact with, and solution of, rock minerals, and as a result is generally higher than local surface waters in hardness, dissolved solids, and conductivity. (NRC. 2004b) As discussed in Section E3.6.4.1, there is no indication that evaporative losses associated with operation of VCSNS have increased concentrations of common ions, minerals, or solids in Monticello Reservoir water.

As described in Section E3.6.3.2, groundwater is not used for VCSNS plant operations and drinking water is provided by surface water from the Monticello Reservoir. Groundwater in the vicinity of VCSNS is highly mineralized because of prolonged contact with, and solution of, rock minerals, and, as a result, is generally higher than local surface waters in hardness, dissolved solids, and conductivity. (SCE&G. 2010, Section 2.3.3.1.5) Aquifer hydraulic properties are discussed in Section E3.6.2.2. The shallow groundwater is described as relatively impermeable saprolite overlying the fractured bedrock aquifer with no evidence of significant seepage from the Monticello Reservoir.

As discussed in Section E3.6.4.1, Monticello Reservoir has not been impaired by VCSNS operations and, with the exception of pH, is not listed in the SCDHEC's 2018 and draft 3022 303(d) list of impaired waters. Section E4.5.1.4, discusses non-cooling system impacts to the reservoir from plant operations. Sections E4.5.2.4, E4.5.4.4, and E4.5.5.4 discuss impacts to surface water quality due to cooling system operations. The analysis presented concludes VCSNS would ensure a SMALL impact on surface water quality from non-cooling systems and cooling systems during the proposed SLR operating term by plant design (stainless steel condenser tubes), implementing the SWPPP, BMPs, and SPCC plan, and by complying with current and future NPDES and stormwater regulatory requirements and permit conditions.

As noted in Section E3.6.4.1, surface water pH values at the sites near VCSNS Unit 1 intake and discharge are consistently around 7.5, ranging from 6.8 to 8.0. Groundwater pH values measured for the NPDES permit are consistently more acidic, ranging from 4.70 to 5.87 in 2020. Therefore, based on no impairment to Monticello Reservoir from plant operations, and higher quality surface water when compared to groundwater, there is no indication that groundwater quality in the area

has been affected by this cooling pond. Therefore, there appears to have been little or no negative impact on groundwater quality as a result of the operation of VCSNS.

In 2004, the NRC reviewed the available information including the physiographic and hydrogeologic setting and the water quality of Monticello Reservoir and the regional groundwater. Based on this evaluation, overall groundwater quality is likely to be improved by the presence of Monticello Reservoir and any negative impacts from VCSNS on the groundwater in the vicinity of the plant over the license renewal term would be SMALL. (NRC. 2004b) As discussed above, lack of plant impact to surface water quality and comparison of water quality data between Monticello Reservoir and site groundwater continues to show no negative impacts on local groundwater from Monticello Reservoir.

DE finds that impacts from groundwater quality degradation resulting from cooling pond operations for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed, SMALL.

E4.5.19 RADIONUCLIDES RELEASED TO GROUNDWATER

E4.5.19.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. Groundwater protection programs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics.

E4.5.19.2 Requirement [10 CFR 51.53(c)(3)(iv)]

An applicant shall assess the impact of any documented inadvertent releases of radionuclides into groundwater. The applicant shall include in its assessment a description of any groundwater protection program used for the surveillance of piping and components containing radioactive liquids for which a pathway to groundwater may exist. The assessment must also include a description of any past inadvertent releases and the projected impact to the environment (e.g., aquifers, rivers, lakes, ponds, ocean) during the license renewal term.

E4.5.19.3 Background [GEIS Section 4.5.1.2]

The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites which involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons learned review of these incidents. On September 1, 2006, the task force issued its report: Liquid Radioactive Release Lessons Learned Task Force Report.

The most significant conclusion dealt with the potential health impacts on the public from inadvertent releases. Although there were numerous events during which radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety were adversely impacted.

On the basis of the information and experience with these leaks, the NRC concludes that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel in identifying and stopping the leak in a timely fashion.

E4.5.19.4 Site-Specific Analysis

A description of the VCSNS GWPP is presented in Section E3.6.2.4. Table E3.6-3 presents well construction details for the VCSNS groundwater monitoring wells, while Figure E3.6-6 shows the location of the wells. Table E3.6-7 presents information on five registered water supply wells located within a 2-mile radius from the VCSNS boundary, while Figure E3.6-8 shows the location of these offsite wells.

As described in Section E3.6.3.2, groundwater is not used for VCSNS plant operations and drinking water is provided by surface water from the Monticello Reservoir.

As presented in Section E3.6.4.2.1, tritium detections for groundwater samples collected in 2017 through 2021 ranged from 1,010 pCi/L in 2018 to 2,800 pCi/L in 2020 in well GW-16, far below the drinking water limit of 20,000 pCi/L. Therefore, no further mitigation is required.

DE finds that impacts from radionuclides to groundwater for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6 ECOLOGICAL RESOURCES

E4.6.1 EFFECTS ON TERRESTRIAL RESOURCES (NON-COOLING SYSTEM IMPACTS)

E4.6.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Applications of BMPs would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

E4.6.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats.

E4.6.1.3 Background [GEIS Section 4.6.1.1]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear power plant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time. Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the site (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state or maintain current trends of change.

Terrestrial habitats and wildlife could be affected by ground disturbance from refurbishment related construction activities. Land disturbed during the construction of new ISFSIs would range from about 2.5 to 10 acres. Other activities may include new parking areas for plant employees, access roads, buildings, and facilities. Temporary project support areas for equipment storage, worker parking, and material laydown areas could also result in the disturbance of habitat and wildlife.

Successful application of environmental review procedures, employed by the licensees at many of the operating nuclear plant sites, would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected, to control

fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce wildlife disturbance in adjacent habitats, could greatly reduce the impacts of continued operations and refurbishment activities.

E4.6.1.4 Site-Specific Analysis

E4.6.1.4.1 Refurbishment Activities

As discussed in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

E4.6.1.4.2 Operational Activities

Terrestrial resources are described in Section E3.7.2. No license renewal-related construction activities or changes in operational practices have been identified that would involve disturbing habitats. DE would continue to conduct ongoing plant operational and maintenance activities during the license renewal period. However, these activities are expected to have minimal impacts on terrestrial resources because activities are anticipated to occur within previously disturbed habitats. As discussed in Section E9.6, DE has administrative controls in place at VCSNS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site are currently subject to such as stormwater management, spill prevention, and herbicide usage further serve to minimize impacts to terrestrial resources.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the subsequent renewal period.

DE finds that effects on terrestrial ecosystems for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed, SMALL.

E4.6.2 EXPOSURE OF TERRESTRIAL ORGANISMS TO RADIONUCLIDES

E4.6.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Doses to terrestrial organisms from continued operations and refurbishment associated with license renewal are expected to be well below exposure guidelines developed to protect these organisms.

E4.6.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.2.3 Background [GEIS Section 4.6.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the potential for radionuclides from normal operations to impact terrestrial organisms and concluded that impacts on terrestrial biota would be SMALL. In its review, the NRC considered the various pathways that radionuclides may be released from nuclear power plants into the environment. Releases into terrestrial environments often result from deposition of small amounts of radioactive particulates released from power plant vents during normal operations. These releases typically include krypton, xenon, and argon (which do not contain radioactive particles), tritium, isotopes of iodine, and cesium, and they may also include strontium, cobalt, and chromium. Radionuclides may also be released into the aquatic environment from the liquid effluent discharge line. Radionuclides that enter shallow groundwater from cooling ponds can be taken up by terrestrial plant species, including both upland species and wetland species, where wetlands receive groundwater discharge. Terrestrial biota may be exposed to ionizing radiation from radionuclides through direct contact with water or other media, inhalation, or ingestion of food, water, or soil.

As part of the 2013 GEIS analysis, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on terrestrial biota from continued operations. The NRC selected 15 representative plants to calculate estimated dose rates for terrestrial biota from nuclear plants. The maximum estimated dose rate calculated for any of the nuclear power plants was 0.0354 rad per day (rad/d) (3.54 x 10-4 Gray per day [Gy/d]) (riparian animal at the Browns Ferry plant), which is below the guideline value of 0.1 rad/d (0.001 Gy/d) for a riparian animal receptor. On the basis of these calculations and a review of the available literature, the NRC concluded that the impact of routine radionuclide releases from past and current operations and refurbishment activities on terrestrial biota would be SMALL for all nuclear plants and would not be expected to appreciably change during the proposed SLR term.

E4.6.2.4 Site-Specific Analysis

Radiation liquid effluents from VCSNS are released into the Monticello Reservoir at the discharge canal and into the Parr Reservoir at the Fairfield Pumped Storage Facility penstocks (DE. 2022c). Radioactive gaseous effluents are released at the Main Plant Vent and Reactor Building Purge Exhaust (DE. 2022c). VCSNS's ARERRs contain a detailed presentation of the releases. There have been no abnormal gaseous or liquid releases from 2017–2021 (SCE&G. 2018c; SCE&G. 2019b; DE. 2020b; DE. 2021a; DE. 2022c).

As discussed in Section E3.10.3, VCSNS's REMP provides additional assurance that there are no significant dose or radiological environmental impacts due to plant operations. The REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, drinking water, surface water, groundwater, milk, vegetation, fish, shellfish (*Corbicula*), and sediment. Radionuclides observed in the environment in 2021 from VCSNS releases were within the range of concentrations observed in the past. Radiation dose calculated from the sample results is less than that observed with normal fluctuation in natural background. (DE. 2022c)

The concentration of radioactive materials in soils and sediments increases in the environment at a rate that depends on the rate of release and the rate of removal. Removal can take place through radioactive decay or through chemical, biological, or physical processes. For a given rate of release, the concentrations of longer-lived radionuclides and, consequently, the dose rates attributable to them would continue to increase if license renewal was granted. Previous NRC analysis regarding the accumulation of long-lived radionuclides from an additional 20 years of operation in an initial license renewal concluded that the increase would result in a negligible dose for humans (less than 0.1 person-rem) (NRC. 2013a). This same logic can be applied to terrestrial wildlife and plants. VCSNS's REMP's results discussed above indicate that radioactivity is not accumulating. Continued operation during the first 20-year renewal term and a second 20-year renewal term is expected to likewise show that there is not an accumulation of radioactivity.

Continued compliance with NRC radiological effluent limits and implementation of the REMP would ensure that terrestrial organisms' exposure to radionuclides is well within guidelines and adverse trends are detected in order to implement corrective actions.

DE finds that exposure of terrestrial organisms to radionuclides for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.3 COOLING SYSTEM IMPACTS ON TERRESTRIAL RESOURCES (PLANTS WITH ONCE-THROUGH COOLING SYSTEMS OR COOLING PONDS)

E4.6.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. No adverse effects to terrestrial plants or animals have been reported as a result of increased water temperatures, fogging, humidity, or reduced habitat quality. Due to the low concentrations of contaminants in cooling system effluents, uptake, and accumulation of contaminants in the tissues of wildlife exposed to the contaminated water or aquatic food sources are not expected to be significant issues.

E4.6.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.3.3 Background [GEIS Section 4.6.1.1]

This issue considers potential impacts to terrestrial resources from contaminants and physical alterations of the environment resulting from the operation of the cooling system. Physical alterations include increased water temperatures; humidity and fogging; contaminants in surface water or groundwater; and disturbance of wetlands from maintenance dredging of onsite cooling ponds, disposal of dredged material from such dredging, and erosion of shoreline wetlands. Other potential impacts to terrestrial resources considered in this issue include impingement of waterfowl at the cooling water intakes, potential for groundwater quality degradation by contaminants present in cooling ponds and cooling canals, and reduced water availability due to surface water or groundwater withdrawals.

The 2013 GEIS stated no adverse effects on terrestrial plants or animals have been reported as a result of increased water temperatures, fogging, humidity, or reduced habitat quality. Because of the low concentrations of contaminants within the liquid effluents associated with the cooling systems, the uptake and accumulation of contaminants in the tissues of wildlife exposed to the contaminated water or aquatic food sources are not expected to be a significant issue, and the impacts are expected to be SMALL for all plants. Potential mitigation measures would include regular monitoring of the cooling systems for water quality and measures to exclude wildlife from contaminated ponds. On the basis of these considerations, the NRC concluded that the impact of continued operation of the cooling systems on terrestrial resources would be SMALL for all nuclear plants.

E4.6.3.4 Site-Specific Analysis

The NRC identified certain activities or conditions for impacts to terrestrial resources as a consequence of operation of a plant's cooling water system. The cooling water system is described in Section E2.2.3. DE plans to continue to operate the cooling water as currently configured through the proposed SLR period. These are identified below along with VCSNS-specific information.

- Physical alterations include increased water temperatures, humidity, and fogging.
  - o VCSNS's NPDES permit establishes conditions for operation of the cooling water system based on ambient water temperature of the Monticello Reservoir and discharge temperature limits. These permit conditions limit the discharge temperature. While there

have been five reported NOVs issued to VCSNS between 2017 and 2022, none were with respect to discharge temperature limits.

- Reduced water availability due to surface water use.
  - The cooling water source is Monticello Reservoir, which receives its makeup water from Parr Reservoir on the Broad River. Monticello Reservoir water loss to evaporation is replaced with water from Parr Reservoir as part of the normal operation of the Fairfield Pumped Storage Facility. Water is cycled between the reservoirs daily. (NRC. 2004b, Section 4.5.1) The VCSNS surface water withdrawal permit (Permit No. 20PN001) establishes limits on surface water withdrawals. During the proposed SLR operating term, VCSNS is anticipated to consume water from Monticello Reservoir at current rates; therefore, there would be no increase in consumptive water use.
- Contaminants in surface water.
  - Discharges are governed by VCSNS's NPDES permit. There have been no notices of violations related to the NPDES permit with respect to contaminants in surface water in the past five years (2018–2022).
- Reduced water availability due to groundwater withdrawals.
  - Not applicable to VCSNS because the cooling water source is Monticello Reservoir, not groundwater.
- Contaminants in groundwater; potential for groundwater quality degradation by contaminants present in cooling ponds and cooling canals.
  - Monticello Reservoir serves as the cooling pond for the cooling system and discharges are governed by the NPDES permit.
- Disturbance of wetlands from maintenance dredging of onsite cooling ponds, disposal of dredged material from such dredging.
  - VCSNS does not conduct maintenance dredging for the Monticello Reservoir, the intake area, or the discharge canal (Section E3.6.1.2.4). No dredging is anticipated during the SLR term.
- Erosion of shoreline wetlands.
  - Figure E3.7-2 shows the National Wetlands Inventory mapped wetlands within the VCSNS site. There are no wetlands along the bank where the discharge is located.
- Impingement of waterfowl at the cooling water intakes.
  - None of the recorded bird deaths/injuries occurring between 2013 and 2022 was a result of impingement at the intake.

In summary, adequate regulatory controls are in place to ensure that terrestrial resources are protected during the proposed VCSNS SLR operating term.

DE finds that cooling system impacts to terrestrial resources for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.4 COOLING TOWER IMPACTS ON VEGETATION (PLANTS WITH COOLING TOWERS)

E4.6.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have the potential to affect adjacent vegetation, but these impacts have been small at operating nuclear power plants and are not expected to change over the license renewal term.

E4.6.4.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.4.3 Background [GEIS Section 4.6.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the effects of cooling tower operation on surrounding vegetation. Terrestrial habitats in the vicinity of nuclear power plant cooling towers have been exposed to deposition of cooling tower drift particulates (including salt), deposition of water droplets on vegetation from drift, structural damage from freezing vapor plumes, and increased humidity. Generally, deposition rates from these cooling towers have been below those that are known to result in measurable adverse impacts on plants, and no deposition effects on agricultural crops or plant communities have been observed at most of the nuclear power plants. Exceptions have been observed at some nuclear plants; however, the impacts have been addressed by changes to cooling tower operations. Impacts from icing have been rare, minor, and localized near nuclear power plant cooling towers and have been corrected by changes in tower operation at the plants where they occurred. NRC concluded that the impact of continued operation of cooling towers on plant communities would be SMALL for all nuclear plants.

E4.6.4.4 Site-Specific Analysis

As discussed in Section E2.2.3, VCSNS does not utilize cooling towers for condenser cooling. However, the Turbine Building closed-cycle cooling water system utilizes a mechanical draft cooling tower (MDCT) just for cooling certain loads within the Turbine Building. The cooling tower is located

within the developed area of VCSNS and any impacts from water droplets and drift would be localized to the immediate area away from terrestrial resources.

DE finds that cooling towers would have a SMALL impact on vegetation for the proposed SLR term. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.5 BIRD COLLISIONS WITH PLANT STRUCTURES AND TRANSMISSION LINES

E4.6.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Bird collisions with cooling towers and other plant structures and transmission lines occur at rates that are unlikely to affect local or migratory populations and the rates are not expected to change.

E4.6.5.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.5.3 Background [GEIS Section 4.6.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the impact on avian mortality from birds colliding with cooling towers and transmission lines by reviewing the primary literature for avian collision mortality associated with all types of manmade objects, as well as the results of monitoring studies conducted at six nuclear plants. The NRC found that collision mortality associated with nuclear plant structures and transmission lines represents only a fraction of the total annual bird collision mortality from all manmade sources. In addition, there are no reports of relatively high collision mortality occurring at the transmission lines associated with nuclear power plants in the United States.

E4.6.5.4 Site-Specific Analysis

As discussed in Section E2.2.5.1, in-scope transmission lines at VCSNS are those from the Turbine Building to the 230-kV switchyard and a 115-kV public line that extends 2.6 miles to the Parr Generating Complex.

As discussed in Section E2.2.5.3, DE promotes protection of migratory, and threatened and endangered birds through a corporate avian protection plan. DE also incorporates guidelines from industry standards to create more avian-safe distribution poles and lines throughout its electric distribution system. In addition, the transmission lines are considered for high visibility to avoid bird

collisions and the towers are considered to deter nesting. DE keeps records of all bird-related mortalities/injuries at the VCSNS site. A total of 16 bird mortalities were reported at the site from 2018–2022. Of these, two were confirmed collision deaths. Between 2018–2022, there have been no recorded bird collisions associated with in-scope transmission lines.

VCSNS has not proposed any refurbishment activities or construction of new facilities related to SLR. Therefore, bird collisions with plant structures and transmission lines are not expected to affect local or migratory bird populations during the proposed SLR term.

Given the low occurrence in bird mortality (10 on site over a 5-year period) at VCSNS, DE's avian protection plan, and VCSNS's adherence to regulatory and permit requirements for protected species including migratory birds, the continued operation of the VCSNS plant during the SLR term would have a SMALL impact due to bird collisions with plant structures and transmission lines.

DE finds that bird collisions with plant structures and transmission lines impacts for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.6 WATER USE CONFLICTS WITH TERRESTRIAL RESOURCES (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A RIVER)

E4.6.6.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance

E4.6.6.2 Requirement [10 CFR 51.53(c)(3)(iv)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action of water availability and competing water demands, the flow of the river, and related impacts on riparian (terrestrial) ecological communities must be provided.

E4.6.6.3 Background [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time.

E4.6.6.4 Site-Specific Analysis

Monticello Reservoir is considered a cooling pond. Monticello Reservoir was built to supply cooling water to the plant and to provide an upper reservoir for the Fairfield Pumped Storage Facility located on Parr Reservoir. (NRC. 2004b, Section 2.1.3) Monticello Reservoir water lost to evaporation is replaced with water from Parr Reservoir as part of the normal operation of the Fairfield Pumped Storage Facility. Water is cycled between the reservoirs daily. (NRC. 2004b, Section 4.5.1) During the proposed SLR operating term, VCSNS is anticipated to consume water from Monticello Reservoir at current rates; therefore, there would be no increase in consumptive water use. Water levels in the Monticello Reservoir can vary as much as 4.5 feet from use by VCSNS and the Fairfield Pumped Storage Facility, and water levels in the Parr Reservoir can vary as much as 10 feet by use from the Parr Hydro plant.

The Parr Project inclusive of Monticello and Parr Reservoirs was relicensed by the FERC in 2020 (FERC. 2020). The relicensure process included various flow studies and consideration of impacts on terrestrial and aquatic resources. The FERC established flow conditions protective of the terrestrial and aquatic resources.

Compliance with the FERC license conditions current and future NPDES regulatory requirements and surface water withdrawal permits would ensure that water use conflicts from the continued operation continues to be limited to a SMALL impact.

DE finds that water use conflicts with terrestrial resources during the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.7 TRANSMISSION LINE RIGHT-OF-WAY MANAGEMENT IMPACTS ON TERRESTRIAL RESOURCES

E4.6.7.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Continued right-of-way (ROW) management during the license renewal term is expected to keep terrestrial communities in their current condition. Application of BMPs would reduce the potential for impacts.

E4.6.7.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.7.3 Background [GEIS Section 4.6.1.1]

NRC reviewed the impacts of transmission line ROW management on terrestrial resources and found that although the initial habitat destruction associated with ROW clearing can have numerous consequences on wildlife populations, the proper management of transmission line ROW areas does not have significant adverse impacts on current wildlife populations and that ROW management can provide valuable wildlife habitats. The NRC noted that continued ROW management during the license renewal term will not lower habitat quality or cause significant changes in wildlife populations in the surrounding habitat. Therefore, the NRC concluded that the impact of continued transmission line ROW management on terrestrial resources is SMALL for all nuclear plants.

E4.6.7.4 Site-Specific Analysis

In-scope transmission lines at VCSNS are depicted on Figure E2.2-2 and discussed in Section E2.2.5. The in-scope transmission lines between the Turbine Building and the switchyard are within the VCSNS EAB. The Parr ESF 115-kV transmission line extends outside of the VCSNS EAB and crosses vegetated areas.

DE has procedures regarding maintenance of vegetation under the in-scope transmission lines at the VCSNS site (Section E2.2.5.2). These include procedures for line clearing specifications, trimming of trees, and cutting of brush as well as removal of danger trees. DE also maintains procedures for the application of herbicides and pesticides to control vegetation under in-scope transmission lines. Control methods are based on environmental impact and anticipated effectiveness, along with site characteristics, security, economics, current land use, and other factors.

The in-scope transmission lines do not cross areas designated as critical habitat for federally listed species nor do they cross any state or federal parks, wildlife refuges, or wildlife management areas. Due to the high levels of disturbance and human presence, wildlife use of areas along the in-scope transmission lines is likely to remain minimal.

Because of the highly mobile nature of most wildlife species, any potential displacement from corridor management would be temporary. High levels of disturbance can increase presence of invasive species. To date, no invasive terrestrial species have been found in the vicinity of transmission line ROWs.

DE has administrative policies and implements BMPs for preventing erosion from soil disruption related to maintenance and management. The NPDES permit requires VCSNS to implement BMPs to protect surface water and groundwater from runoff of pollutants and loose soil in industrial areas.

Management of the in-scope transmission lines is not likely to affect terrestrial resources. Implementation of BMPs combined with limited resources within the ROW, would mitigate impacts to terrestrial resources from VCSNS's continued operations during the proposed SLR term.

DE finds that impacts to terrestrial resources from transmission line ROW management for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.8 ELECTROMAGNETIC FIELDS ON FLORA AND FAUNA (PLANTS, AGRICULTURAL CROPS, HONEYBEES, WILDLIFE, LIVESTOCK)

E4.6.8.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. No significant impacts of electromagnetic fields (EMFs) on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

E4.6.8.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.8.3 Background [GEIS Section 4.6.1.1]

In the 2013 license renewal GEIS, the NRC reviewed the impacts of EMFs on flora and fauna and concluded that no significant impacts of EMFs emitted on terrestrial biota have been identified. Although foliage very close to lines can be damaged, the overall productivity and reproduction of native and agricultural plants appear unaffected. Also, no evidence suggests significant impacts on individual animals or wildlife populations that are chronically exposed to EMFs under transmission lines or in the towers. Livestock behavior and production also appear unaffected by line operation. Therefore, the potential impact of EMFs on terrestrial biota is expected to be of SMALL significance for all plants.

E4.6.8.4 Site-Specific Analysis

The in-scope transmission lines are depicted on Figure E2.2-2 and discussed in Section E2.2.5.1. In-scope transmission lines are those from the Turbine Building to the 230-kV switchyard and a 115-kV line. Two 230-kV in-scope transmission lines span the distance between the generating units and the switchyard, crossing only industrial areas and are approximately 384 and 391 feet in length. These in-scope lines do not cross agricultural fields, pastures, or wildlife habitat. The 115-kV ESF transmission line extends from Parr Generating Complex to VCSNS, traversing approximately 2.6 miles within a managed ROW and crosses terrestrial habitat.

As described in Section E2.2.5.1, the highest voltage of the in-scope transmission lines at the VCSNS site is 230 kV. DE has not proposed any refurbishment activities or construction of new facilities related to SLR. The NRC's 2013 literature search on the issue indicated that the EMFs produced by operating transmission lines up to 1,100 kV have not been reported to have any biologically or economically significant impact on plants, wildlife, agricultural crops, or livestock. (NRC. 2013a, Section 4.6.1.1)

Given that in-scope transmission lines are of a voltage not reported to have any biologically significant impact on plants, wildlife, agricultural crops, or livestock, the EMFs emitted by the VCSNS in-scope transmission lines would have no impact on flora and fauna.

DE finds that impacts to flora and fauna from electromagnetic fields for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.9 IMPINGEMENT AND ENTRAINMENT OF AQUATIC ORGANISMS (PLANTS WITH ONCE-THROUGH COOLING SYSTEMS OR COOLING PONDS)

E4.6.9.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, OR LARGE. The impacts of impingement and entrainment are small at many plants but may be moderate or even large at a few plants with once-through and cooling pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site.

E4.6.9.2 Requirement [10 CFR 51.53(c)(3)(iv)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current CWA 316(b) determinations or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from impingement and entrainment.

E4.6.9.3 Background [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. At some nuclear power plants, other vertebrate species may also be impinged on the traveling screens or on intake netting placed within intake canals.

Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs

and larvae), larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 inches at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening techniques, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

E4.6.9.4 Site-Specific Analysis

As stated in Section E3.7.7.1, in accordance with the statutory guidelines set forth in the NPDES permit issued to DE for VCSNS in 2022, and to maintain compliance under Section 316(b) of the CWA, periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that VCSNS is utilizing the BTA to reduce entrainment and impingement. Further, with the recently reissued NPDES permit, the SCDHEC determined that the existing system is a closed-cycle cooling system as defined by the 2014 316(b) rule and, therefore, automatically meets one of the criteria for impingement BTA.

Entrainment monitoring took place at VCSNS during three time periods: 1984–1985, 2008–2009, and 2016–2017. An impingement study was conducted in 2005–2006. The 2008–2009 and 2016–2017 entrainment studies and the 2005–2006 impingement study results are detailed in Section E3.7.7 and are discussed below.

During the year-long (bi-weekly) impingement sampling program from July 2005–June 2006, a total of thirteen fish taxa (12 species and one hybrid), crayfish, and freshwater grass shrimp were collected at VCSNS. The objective of the 2005–2006 impingement study was to: (1) characterize existing impingement at the VCSNS Circulating Water Intake Structure, and (2) develop a preliminary estimate of annual impingement mortality occurring at the site, representative of the once-through cooling system in the absence of any structural or operational controls specifically intended to reduce impingement mortality. Fish species included shad (two species), catfish and bullheads (five species), white perch, bass, and sunfish (three species), and yellow perch. Threadfin shad numerically dominated the impingement samples (288 fish collected), comprising 50.2% of the total number of fish. Other abundant species in impingement samples were blue catfish (12.2%; 70 fish), channel catfish (11.8%; 68 fish), white perch (9.4%; 54 fish), and yellow perch (6.1%; 35 fish). White perch dominated impingement biomass, comprising 36.6% of the catch. No rare, threatened, or endangered species were impinged during the study.

Using direct replacement costs published by the American Fisheries Society, the value of all fish and shellfish impinged annually at VCSNS totals approximately $2,336. Threadfin shad, the

numerically dominant species impinged represents a total replacement value of $505. Recreationally important species represent a total replacement value of $1,786.

The total annual entrainment from September to August based on the 2008–2009 entrainment sampling program was estimated to be 15.3 million larvae and eggs under typical water withdrawal rate and 24.9 million under maximum water withdrawal rate annually at VCSNS. Entrainment estimates were highest for threadfin shad larvae, which made up 71% of all larvae potentially entrained, under typical (10.9 million larvae) and maximum (17.6 million larvae) water withdrawal rate scenarios. White perch entrainment estimates ranked second under typical (1.9 million larvae) and maximum (3.1 million larvae) water withdrawal rates. White perch larvae made up 13% of the total entrainment estimate. Clupeids were the third most abundant species potentially entrained under typical (1.8 million) and maximum water withdrawal rates (2.9 million). Clupeids were 12% of the total entrainment estimate. Threadfin shad and gizzard shad together made up approximately 73% of all the larvae collected in Monticello Reservoir and the same percentage of the entrainment estimate. White perch were the next most abundant larvae, accounting for 13% of both the larvae collected and the entrainment estimate.

Dames and Moore (1985) conducted an ichthyoplankton study in Monticello Reservoir in 1983–1984 as part of the original 316(b) demonstration for VCSNS. In their study, gizzard shad (94%) were the dominant larval species and white bass ranked second in abundance (5%). These densities are higher than those observed in the 2008–2009 study and threadfin shad, the dominant species in this study, was not observed in the 1984–1985 study. Based on this current study, an estimated 15.3 million fish larvae would be entrained annually under typical operating conditions.

A second entrainment sampling program was conducted in Monticello Reservoir between March 2016–August 2016 to provide estimates of ichthyoplankton entrainment for VCSNS Unit 1 Circulating Water Intake Structure. A total of 1,311 organisms comprising seven fish families were collected here. The total estimated number of ichthyoplankton entrained by VCSNS during 2016 was 78.1 million ichthyoplankton during the night and 27.3 million ichthyoplankton during the day. The estimated annual entrainment abundance from 1 March through 31 August 2016 was 105.4 million. The ichthyoplankton community in 2016 was composed of seven families and these were identical to the families collected in the 2008–2009 ichthyoplankton study above. Similar to past studies at Monticello Reservoir, members of the Clupeidae, or the herring and shad family, dominated the 2016 ichthyoplankton collections and entrainment estimate, and larval clupeids comprised 86.0% of all ichthyoplankton estimated to be entrained. Centrarchids were the second most entrained fish family in 2016. The sunfish, bass, and crappie members of this family typical spawn near shore during spring (crappie and bass) and summer (sunfish). Based on their preference for limnetic habitats as juveniles, Bluegill and Black Crappie are the species most likely to be entrained at the VCSNS circulating water intake structure.

The stability and consistency of the clupeid forage fish community over recent years is demonstrated by these same species making up 85% of all entrainable larvae collected and in the 2008–2009 study at VCSNS Units 2 and 3. It appears that once VCSNS became an operational baseload generating plant and its warm effluents were a consistent winter feature, the stability and consistency of the clupeid fish community was realized. Ichthyoplankton sampling in Monticello Reservoir by the SCDNR in 1987, 1988, 1989, and 1997 has consistently demonstrated threadfin shad to dominate the age zero clupeid prey base. High fecundity, multiple spawns per year, and good overwinter survival in thermally enriched waters have generally allowed threadfin shad to dominate clupeid forage fish communities. This domination has been documented at Monticello Reservoir for approximately the last three decades in studies. Indeed, threadfin and gizzard shad make up the limnetic forage fish community in many southeastern U.S. reservoirs. Impingement data are in agreement with the high abundance of threadfin shad in Monticello Reservoir. The 2005–2006 circulating water intake structure impingement study at VCSNS found 50.2% of all impinged fish to be small threadfin shad.

The ichthyoplankton community of Monticello Reservoir is dominated by one family of fish, the Clupeidae. The highly fecund Threadfin Shad is the sole species in that family that is being consistently entrained. Given their preference for warm water temperatures, their high reproductive capacity, short life span, and ability to quickly recolonize the reservoir, it is anticipated that a large winter kill event of this species would be undetectable one year later. However, a winter kill of Threadfin Shad is unlikely as the baseload operation of VCSNS would assure the generation of warm thermal effluents during even the severest of winters. The study notes that the operation of VCSNS assures the stability of the Threadfin Shad population, and all the Monticello Reservoir fish predators that feed upon it.

The VCSNS facility has operated under a NPDES permit and has been withdrawing once-through, non-contact cooling water without any identified problems. The VCSNS facility also meets the BTA standard for impingement mortality and entrainment by employing a closed-cycle recirculating cooling system per 40 CFR 125.94(c)(1) and 40 CFR 125.92(c)(2), respectively. VCSNS will ensure that it continues to utilize the BTA to minimize entrainment and impingement to the fullest extent practicable to maintain compliance with the current NPDES permit.

The impingement and entrainment studies demonstrate that the fish community in Monticello Reservoir has remained stable over the course of the operation of the VCSNS site. Based on these previous studies and compliance with NPDES permit conditions, adherence to the 316(b) rule, NPDES BTA requirements, and permit requirements for ongoing studies to identify any potential concerns, these actions will minimize the already existing SMALL impacts.

DE finds that impingement and entrainment of aquatic organisms impacts for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.10 IMPINGEMENT AND ENTRAINMENT OF AQUATIC ORGANISMS (PLANTS WITH COOLING TOWERS)

E4.6.10.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Impingement and entrainment rates are lower at plants that use closed-cycle cooling with cooling towers because the rates and volumes of water withdrawal needed for makeup are minimized.

E4.6.10.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.10.3 Background [GEIS Section 4.6.1.2]

In the 2013 license renewal GEIS, the NRC reviewed the impacts of impingement and entrainment at plants with cooling towers. Removal of any substantial volume of water from a natural body of water by a cooling system will likely also remove or kill some of the aquatic organisms that live there through impingement or entrainment. The potential for impingement and entrainment of aquatic organisms is influenced by a variety of factors with the volume of water withdrawn relative to the size of the water source appears to be the best predictor of the number of organisms that would be impinged or entrained within a given aquatic system. Because the volume of water withdrawn by a power plant is minimized when a closed-cycle cooling system is employed, the impacts to aquatic organisms from impingement and entrainment would be smaller than the impacts from impingement and entrainment that would occur if that plant employed a once-through cooling system instead. In considering the impingement and entrainment effects of closed-cycle cooling systems on aquatic ecology, the NRC evaluated the same issues that were evaluated for plants with once-through cooling systems or cooling ponds. On the basis of these considerations, the NRC concludes that the impingement and entrainment of aquatic organisms at plants with cooling towers operating as a closed-cycle cooling system over the license renewal term would be SMALL.

E4.6.10.4 Site-Specific Analysis

As discussed in Section E2.2.3, VCSNS does not utilize cooling towers for condenser cooling. Therefore, this issue is not applicable and further analysis is not required.

E4.6.11 ENTRAINMENT OF PHYTOPLANKTON AND ZOOPLANKTON (ALL PLANTS)

E4.6.11.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

E4.6.11.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.11.3 Background [GEIS Section 4.6.1.2]

In the 2013 license renewal GEIS, the NRC reviewed the entrainment of phytoplankton and zooplankton and found that due to no change in operation of the cooling system during the license renewal term, no change in effects on entrainment of phytoplankton and zooplankton was anticipated. Therefore, the NRC determined that entrainment of phytoplankton and zooplankton is expected to have a SMALL impact on populations of these organisms in source waterbodies for all plants.

E4.6.11.4 Site-Specific Analysis

Phytoplankton and zooplankton play a vital role in the well-being of the lake, serving as importance food sources. Zooplankton play further role in the aquatic food web as they act to regulate productivity by working as secondary producers. They are the primary food source of small fish that occur in aquatic systems, thereby feeding a majority of the food web. Several species of fish, including those found in Monticello Reservoir are dependent on plankton.

To maintain compliance under Section 316(b) of the CWA, periodic monitoring of entrainment and impingement of fish and aquatic species is conducted to verify that VCSNS is utilizing the BTA to reduce entrainment and impingement. As discussed under Section E4.6.9, the fish and aquatic community in Monticello Reservoir has remained stable over the course of the operation of the VCSNS site. Given this stability at Monticello Reservoir, it is reasonable that the primary food sources of several of these species, i.e., the phytoplankton and zooplankton communities have remained stable to date.

VCSNS's continued operation in compliance with its NPDES permits is not expected to adversely affect the aquatic community during the proposed SLR operating term. Further, there are no plant operations or modifications planned for the proposed SLR operating term that would alter the

cooling water system, and no plans for SLR-related refurbishment activities have been identified. Therefore, based on the previous impingement and entrainment studies, ecological monitoring, and compliance with current and future NPDES permit conditions, impacts from entrainment of phytoplankton and zooplankton during the proposed operating term would be SMALL.

DE finds that entrainment of phytoplankton and zooplankton impacts for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.12 THERMAL IMPACTS ON AQUATIC ORGANISMS (PLANTS WITH ONCE-THROUGH COOLING SYSTEMS OR COOLING PONDS)

E4.6.12.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Most of the effects associated with thermal discharges are localized and not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area.

E4.6.12.2 Requirement [10 CFR 51.53(c)(3)(iv)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of a 316(a) variance in accordance with 40 CFR Part 125, or equivalent state permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from thermal changes.

E4.6.12.3 Background [GEIS Section 4.5.1.2]

Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, NRC classified heat shock as an issue that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

E4.6.12.4 Site-Specific Analysis

A thermal mixing zone evaluation was conducted in 2012 as part of a NPDES renewal application to support a decision maintaining the current temperature limits for VCSNS. An addendum was conducted in 2014 after SCDHEC requested additional models. A three-dimensional CFD model was used due to the complexity of the basin and channel dynamics at VCSNS. To maintain 113°F as a daily maximum discharge limit year-round, additional modeling runs were done using the highest and lowest ambient temperatures from 10 years of temperature data for the Monticello Reservoir. In all cases calculated, the thermal plumes due to the cooling water discharge remain entirely or predominantly to the east of the island that separates the VCSNS Circulating Water Intake Structure and discharge. The thermal plumes did not approach the Fairfield Pumped Storage Facility intake, the VCSNS Unit 1 Circulating Water Intake Structure, or the northern reach of Monticello Reservoir. (SCE&G. 2018b) The model results indicated that the hot effluent spreads and cools as it mixes with the ambient water downstream of the discharge canal. In addition, the raised 2,600-foot jetty shields the thermal plume from the western side of the Monticello Reservoir. The presence of the jetty would minimize the potential for heated water to influence the physical properties of the receiving waters and as a result, have a SMALL impact on the thriving aquatic community that presently exists in the area. During reissuance of the 2022 NPDES permit for VCSNS, SCDHEC determined based on the modeling studies that the thermal mixing zone continues to be minimized. Consequently, the thermal limits on Outfall 001 remained the same as in the previous permit.

DE conducts monthly water quality monitoring to assess the condition of Monticello Reservoir. Water quality data collected in 2019 and 2020 reveal that Monticello Reservoir exhibits mixed thermal conditions at the southern end of the reservoir apart from the thermal plume from VCSNS. There is no evidence of the thermal plume in the area near the VCSNS circulating water intake, nor at the uplake sampling location. Temperature data reveal a thermally stratified environment at the uplake sampling location during warm weather months. Water quality monitoring data across various points in Monticello Reservoir sites suggest that water quality in the reservoir is sufficient for supporting aquatic life.

The thermal mixing zone study shows that the thermal plume at VCSNS is localized, and the elevated jetty shields the plume on the western size, thereby minimizing the ability of the plume to influence the physical properties of the receiving water around it. Further water quality monitoring across various sites shows that across the reservoir, temperatures (along with other water parameters) are sufficient to support aquatic life.

DE finds that the effects of thermal impacts on aquatic organisms for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.13 THERMAL IMPACTS ON AQUATIC ORGANISMS (PLANTS WITH COOLING TOWERS)

E4.6.13.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Thermal effects associated with plants that use cooling towers are expected to be small because of the reduced amount of heated discharge.

E4.6.13.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.13.3 Background [GEIS Section 4.5.1.2]

In the 2013 license renewal GEIS, the NRC the NRC considered the impacts of thermal discharges on aquatic organisms during the license renewal term. NRC concludes that the direct impact of thermal discharges on aquatic organisms at nuclear plants with cooling towers over the license renewal term would be SMALL. This finding was based, in part, on the presence of smaller thermal plumes at plants with closed-cycle cooling towers than would occur if a once-through cooling system was used at those plants.

E4.6.13.4 Site-Specific Analysis

As discussed in Section E2.2.3, VCSNS does not utilize cooling towers for condenser cooling. Therefore, this issue is not applicable and further analysis is not required.

E4.6.14 INFREQUENTLY REPORTED THERMAL IMPACTS (ALL PLANTS)

E4.6.14.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Continued operations during the license renewal term are expected to have SMALL thermal impacts with respect to the following:

Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem.

Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem.

Thermal discharge may have localized effects but is not expected to affect the larger geographical distribution of aquatic organisms.

Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem.

Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem.

E4.6.14.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.14.3 Background [GEIS Section 4.5.1.2]

In the 2013 license renewal GEIS, the NRC reviewed infrequently reported thermal impacts for all nuclear plants. Potential effects common to the operation of nuclear power plant cooling systems considered by NRC in the license renewal GEIS as infrequently reported thermal impacts are listed below, along with a description of the effect. The mitigation measures identified for the thermal effect are also included in the description and/or the standard used by NRC to classify the impacts of the effect as being of SMALL significance. The NRC's review revealed only SMALL levels of impact in the aquatic resources due to the infrequently reported thermal impacts and expects the same at all plants.

Cold shock. Cold shock can occur when organisms acclimated to the elevated temperatures of a thermal plume are abruptly exposed to temperature decreases when thermal effluent stops. Such events are most likely to occur during winter. Cold shock events have only rarely occurred at nuclear plants. Gradual shutdown of plant operations generally precludes cold shock events.

Creation of thermal plume migration barriers. The potential exists for thermal plumes to create a barrier to migrating fish if the mixing zone covers an extensive cross-sectional area of a river and exceeds the fish avoidance temperature. A demonstration of the size of the cross section being small enough to allow passage could indicate a SMALL impact.

Changes in the distribution of aquatic organisms. Impacts of thermal discharges on the geographic distribution of aquatic organisms are considered to be of SMALL significance if populations in the overall region are not reduced.

Accelerated development of aquatic insect maturation. Heated effluents could accelerate the development of immature stages of aquatic insects in freshwater systems, resulting in premature emergence. If adults emerge before the normal seasonal cycle, they may be unable to feed or reproduce. The NRC did not describe any occurrences of this effect at nuclear power plants and

acknowledged that the literature search indicated it had not been observed in field investigations. The NRC also included the stimulation of population growth of macroinvertebrates from heated effluents under this effect.

Stimulation of the growth of aquatic nuisance species. An aquatic nuisance species is a non-indigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters. Thermal discharges can allow nuisance species, such as the Asiatic clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*), to become established or proliferate. The effects of stimulating the growth of nuisance organisms are considered to be of SMALL significance to aquatic resources if these organisms are restricted to the condenser cooling system (e.g., Asiatic clam; zebra mussel) or do not proliferate beyond the immediate vicinity of the plant.

E4.6.14.4 Site-Specific Analysis

The activities or conditions NRC identified above in the background discussion for this issue as a consequence of operation of a plant's cooling water system thermal discharge are listed below along with applicable VCSNS information.

Cold shock. Discharges are governed by the VCSNS NPDES permit which establishes discharge temperature limits. As part of a larger post-316(a) demonstration environmental monitoring effort that includes fish population studies, DE has continued to monitor Monticello Reservoir water temperatures, using fixed temperature recorders at various stations. Water quality reports from 2014–2019 support the 316(a) demonstration for VCSNS that the operation of the power plant has not resulted in significant harm to the biological community and continues to support aquatic life in Monticello Reservoir. The 2019 annual monitoring report states that the temperature data recorded in Monticello Reservoir was within the historical minimum and maximum temperatures and the lake stratifies and mixes seasonally as expected, and that the fisheries are diverse, being represented by multiple species and in numbers that are in balance.

Creation of thermal plume migration barriers. Thermal discharges have been discussed in detail under Section E4.5.11. The thermal discharge associated with VCSNS has been demonstrated to be localized due to the presence of an elevated jetty that acts to buffer the influence of the thermal plume on receiving waters. The thermal plume is compatible with the Monticello Reservoir and the fish community in the reservoir is dominated by species that most likely take advantage of warm water conditions in the reservoir. As part of the 316(a) demonstration environmental monitoring effort, DE has continued to monitor Monticello Reservoir water temperatures; these data indicate no significant changes in the water quality of the cooling water discharge or any major long-term decreases in overall fish species diversity (2005–2017) in the vicinity of the VCSNS site.

Changes in the distribution of aquatic organisms. As discussed in Section E4.6.9, the two entrainment studies and one impingement study conducted at Monticello Reservoir over a 17-year period (2005–2017) demonstrate a stable aquatic community at the site, with a relatively unchanged fish species composition.

Accelerated development of aquatic insect maturation. In the license renewal GEIS, the NRC did not describe any occurrences of this effect at nuclear power plants and acknowledged that the literature search indicated it had not been observed in field investigations. The NRC also included the stimulation of population growth of macroinvertebrates from heated effluents under this effect. There has been no record or observations of this phenomenon occurring in the Monticello Reservoir. The macroinvertebrates found in Monticello Reservoir are common species widely distributed in the region.

Stimulation of the growth of aquatic nuisance species. Section E3.7.5 discusses the invasive aquatic species found in the VCSNS vicinity. Several invasive aquatic plant and animal species have been recorded in Fairfield, Newberry, and Richland counties. Many of these are known to have wide distributions that are not dependent on warmed waters. These include alligatorweed, Brazilian waterweed, brittleleaf naiad, Eurasian watermilfoil, European water chestnut, hydrilla, water primrose, Asian clam, Japanese mystery snail, common carp, blue catfish, and flathead catfish. It is possible that Monticello Reservoir harbors some of these species and that their potential occurrence in the vicinity of the site is likely more attributable to their aggressive expansion and other factors than due to the operation of the site specifically.

There are no plant operations or modifications planned for the proposed SLR operating term that would alter discharge structures or thermal discharges.

DE finds that infrequently reported thermal impacts for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.15 EFFECTS OF COOLING WATER DISCHARGE ON DISSOLVED OXYGEN, GAS SUPERSATURATION, AND EUTROPHICATION

E4.6.15.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been mitigated. Low dissolved oxygen was a concern at one nuclear power plant with a once-through cooling system but has been mitigated. Eutrophication (nutrient loading) and resulting effects on chemical and biological oxygen demands have not been found to be a problem at operating nuclear power plants.

E4.6.15.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.15.3 Background [GEIS Section 4.5.1.2]

In the 2013 license renewal GEIS, the NRC reviewed the potential effects on aquatic biota from low dissolved oxygen levels, gas supersaturation (gas bubble disease), and eutrophication for nuclear power plant cooling water discharges. The addition of a heat load to an aquatic ecosystem via the discharge of cooling water has the potential to stress aquatic biota by simultaneously increasing metabolic rates and the need for oxygen and by reducing dissolved oxygen concentrations to sub-optimal levels. The potential for effects on biota from a reduction in the dissolved oxygen concentration is greater in ecosystems where dissolved oxygen levels are already approaching sub-optimal levels as a result of other factors that affect the environment. Thus, organisms in ecosystems where (1) the biological demand for dissolved oxygen is elevated as a result of increased levels of detritus or nutrients (e.g., eutrophication from runoff containing fertilizers or manure or from the release of dead, entrained organisms in the discharge of once-through cooling systems); or (2) low flow levels and high ambient temperatures already exist (e.g., as a result of drought conditions or hot weather) may be more susceptible to negative effects if dissolved oxygen levels are reduced further. For this reason, the EPA and states often regulate dissolved oxygen to ensure that minimum levels will be maintained.

In addition to the effects of cooling systems on dissolved oxygen described above, the NRC reviewed the potential for impacts to aquatic organisms from gas bubble disease. The rapid heating of water in the condenser cooling system also decreases the solubility and saturation point for other dissolved gases. Thus, as the water passing through the cooling system is heated, the water becomes supersaturated with gases. Although the levels of dissolved gases will return to normal values as the water cools and mixes with ambient waters, tissues of aquatic organisms that remain in the supersaturated effluent for extended periods can become equilibrated to the increased partial pressures of gases within the effluent. If these organisms are subsequently exposed to water with lower partial pressures (which occurs when the water cools or when the organisms move to water in other locations or at other depths), dissolved gas (especially nitrogen) within the tissues may come out of solution and form embolisms (bubbles) within the affected tissues, most noticeably the eyes and fins. The resulting condition is known as gas bubble disease.

In the 2013 GEIS, the NRC concluded that there would be no change in effects of low dissolved oxygen concentrations or gas supersaturation on aquatic biota during the license renewal term in the absence of changes to operation of the cooling system or the ambient conditions. Overall, the

NRC concluded that impacts of plant operation on low dissolved oxygen concentrations and gas supersaturation attributable to cooling water discharges would be SMALL for all plants.

E4.6.15.4 Site-Specific Analysis

VCSNS operates under conditions of an NPDES permit which establishes conditions for operation of the cooling water system. As part of the 316(a) demonstration environmental monitoring effort, DE has continued to monitor Monticello Reservoir water temperatures, using fixed temperature recorders at various stations. Data collected between 2014–2019 do not indicate significant changes in the water quality of the cooling water discharge or any major long-term decreases in overall fish species diversity (2005–2017) in the vicinity of the VCSNS site. DE also collected water quality data (temperature, pH, specific conductance, and dissolved oxygen) quarterly at three locations within Monticello Reservoir in 2019 and 2020. Dissolved oxygen levels remained relatively high in Monticello Reservoir throughout the year except in deep water during the summer and autumn months. Near neutral pH conditions were typical throughout Monticello Reservoir, except for photosynthesis-induced pH elevation near the surface during the spring and summer months. Conductivity values were generally low and were consistent with historical Monticello Reservoir values.

As discussed in Section E2.2, VCSNS has not proposed any refurbishment activities or construction of new facilities related to SLR; therefore, no changes to operation of the cooling system or ambient conditions that could lead to changes in dissolved oxygen, supersaturation, and eutrophication in Monticello Reservoir in the vicinity of the VCSNS site are anticipated.

DE finds that effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.16 EFFECTS OF NONRADIOLOGICAL CONTAMINANTS ON AQUATIC ORGANISMS

E4.6.16.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. BMPs and discharge limitations of NPDES permits are expected to minimize the potential for impacts to aquatic resources during continued operations and refurbishment associated with license renewal. Accumulation of metal contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal.

E4.6.16.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.16.3 Background [GEIS Section 4.6.1.2]

The potential for nonradiological contaminants to accumulate in sediments or aquatic biota was identified as a Category 1 issue in the 1996 GEIS. This was originally raised as an issue of concern at a few power plants that used copper alloy condenser tubes, but this concern has been successfully mitigated by replacing copper alloy tubes with those made from other metals (e.g., titanium). An operating nuclear power plant can contribute other contaminants by concentrating existing constituents from the water body (e.g., in blowdown at closed-cycle plants) or by the addition of chemicals to cooling water during plant operations (e.g., biocides). Concentrations of heavy metals and other contaminants in the discharges of nuclear power plants are normally quickly diluted or flushed from the area by the large volumes of the receiving water. The discharge of metals and other toxic contaminants may also be subject to controls implemented by state or federal agencies through the NPDES permit process. Impacts of contaminant discharges are considered to be of SMALL significance if water quality criteria (e.g., NPDES permits) are not violated and if aquatic organisms in the vicinity of the plant are not bioaccumulating the contaminants.

E4.6.16.4 Site-Specific Analysis

Chemical additives are used to control pH, scale, and corrosion in the circulating water system, and to control biofouling of plant equipment. The NPDES wastewater permit authorizes discharges from 11 outfalls. Non-contact cooling water and low volume waste are monitored and discharged to the Monticello Reservoir via NPDES Outfalls 001 and 014, and low volume waste and non-chemical metal cleaning waste is discharged to the Broad River/Parr Reservoir via NPDES Outfall 003, in accordance with the VCSNS wastewater NPDES Permit No. SC0030856. The effluent from the cooling and SWSs are subject to the NPDES permit. The current NPDES permit for the OWS authorizes effluent limitations to the Monticello Reservoir.

A review of records from 2018–2021 for spill notification and environmental compliance at VCSNS showed one leak: the reactor was manually tripped due to a main transformer fault that released mineral oil on November 16, 2021. The oil was mixed with a large amount of water from the transformer's suppression system, which surpassed the capacity of VCSNS's oil/water separator. The oil/water separator sump level transferred the mixture to internal NPDES Outfall 06B, which drains to Outfall 014, and an oil sheen was observed at Outfall 014. Less than 50 gallons of mineral

oil was estimated to have entered the Monticello Reservoir. The oil was contained with booms and cleaned up. The EPA National Response Center and SCDHEC were notified.

While there have been five NOVs received between 2017 and 2021, none of these were attributable to discharge of contaminants into Monticello Reservoir.

Sections E4.5.6 and E4.5.7 address discharge of metals in the cooling system effluent and discharge of biocides in the cooling system effluent, respectively. Based on the use of stainless steel for the condenser tubes, impacts from the discharge of metals in cooling system effluent during the proposed SLR term would be SMALL.

The plant's NPDES permit governs water treatment chemicals and biocides use (Section E3.6.1). Biocide and scale control chemicals are used in accordance with all use and discharge requirements, including provisions of the NPDES permit issued to the VCSNS site, as well as provisions established in plant-specific requests approved by SCDHEC under the NPDES permit. Compliance with NPDES permit limits for discharge of these biocides and associated residuals is ensured through controlled application protocols and monitoring, and based on this continued compliance, impacts to surface water from these constituents in the cooling water discharge would be SMALL.

There are no plant operations or modifications planned for the proposed SLR operating term that would alter discharge patterns. Compliance with regulatory, permit, and license requirements would ensure that scouring impacts would be SMALL.

E4.6.17 EXPOSURE OF AQUATIC ORGANISMS TO RADIONUCLIDES

E4.6.17.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Doses to aquatic organisms are expected to be well below exposure guidelines developed to protect these aquatic organisms.

E4.6.17.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.17.3 Background [GEIS Section 4.6.1.2]

Pathways for aquatic biota exposure considered by the NRC in 2013 included that aquatic biota can be exposed externally to ionizing radiation from radionuclides in water, sediment, and other biota, and aquatic biota can be exposed internally via ingested food and water and, in certain situations, absorption through the skin and respiratory organs. No evidence of significant differences in sensitivity to radionuclides between marine and freshwater organisms has been reported. Some

radionuclides tend to follow pathways similar to their nutrient analogs and can therefore be transferred rapidly through the food chain. These include (1) radionuclides such as strontium-90, barium-140, radon-226, and calcium-46 that behave like calcium and are therefore accumulated in bony tissues; (2) radionuclides such as iodine-129 and iodine-131 that act like stable iodine and accumulate in thyroid tissue; (3) radionuclides such as potassium-40, cesium-137, and rubidium-86 that follow the general movement of potassium and can be distributed throughout the body; and (4) radionuclides such as tritium, which resembles stable hydrogen, that is distributed throughout the body of an organism.

In the 2013 GEIS, the NRC conducted a review of all operating nuclear power plants to evaluate the potential impacts of radionuclides on aquatic biota from continued operations. The NRC selected 15 representative plants to calculate estimated dose rates for aquatic biota. The total estimated dose rates for aquatic biota for these plants were all less than 0.2 rad/d (0.002 Gy/d), considerably less than the U.S. Department of Energy's (DOE) guideline value of 1 rad/d (0.01 Gy/d). On the basis of the reviewed literature and the dose rates estimated for aquatic biota from site-specific data, the NRC concluded that the impact of radionuclides on aquatic biota from past operations would be SMALL for all plants, and it would not be expected to change appreciably during the renewal period.

E4.6.17.4 Site-Specific Analysis

VCSNS operates in accordance with its license. Releases are maintained in compliance with 10 CFR Part 20 limits and reported in ARERRs submitted to the NRC. In addition, VCSNS conducts sampling in accordance with its REMP. The VCSNS REMP is designed to provide representative measurements of radiation and of radioactive materials through various media exposure pathways. The REMP includes annual water and aquatic exposure pathway samplings including precipitation, surface, river and well water, silt and shoreline sediments, and fish.

Radiation liquid effluents from VCSNS are released into the Monticello Reservoir at the discharge canal and into Parr Reservoir at the Fairfield Pumped Storage Facility Penstocks (DE. 2022c). Radioactive gaseous effluents are released at the Main Plant Vent and Reactor Building Purge Exhaust (DE. 2022c). VCSNS's annual REMP contain a detailed presentation of the releases. There have been no abnormal gaseous or liquid releases 2017–2021 (SCE&G. 2018c; SCE&G. 2019b; DE. 2020b; DE. 2021a; DE. 2022c).

As presented in Section E3.10.3, VCSNS's REMP provides additional assurance that there are no significant dose or radiological environmental impacts due to plant operations. The REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, drinking water, surface water, groundwater, milk, vegetation, fish, shellfish (Corbicula), and sediment. Radionuclides observed in the environment in 2021 from VCSNS releases were within the range of concentrations

observed in the past. Radiation dose calculated from the sample results is less than that observed with normal fluctuation in natural background. VCSNS operations have no significant radiological impact on the health and safety of the public or environment. (DE. 2022c)

Within the REMP, VCSNS monitors groundwater. None of the 2020 groundwater samples were above the lower limit of detection (DE. 2021a). During 2021 no other radionuclides were detected in groundwater samples other than tritium. Tritium was detected within the site boundary at monitoring well GW-16 as discussed in Section E3.6.4.2.1 However, this groundwater contamination does not represent an exposure pathway for aquatic organism due to distance to surface water interface and tritium is a short-lived radionuclide.

As discussed in the GEIS, the concentration of radioactive materials in soils and sediments increases in the environment at a rate that depends on the rate of release and the rate of removal. Removal can take place through radioactive decay or through chemical, biological, or physical processes. For a given rate of release, the concentrations of longer-lived radionuclides and, consequently, the dose rates attributable to them would continue to increase if license renewal was granted. NRC's GEIS analysis regarding the accumulation of long-lived radionuclides from an additional 20 years of operation in an initial license renewal concluded that the increase would result in a negligible dose for humans (less than 0.1 person-rem). (NRC. 2013a) This same logic can be applied to aquatic resources. VCSNS's REMP's results discussed above indicate that radioactivity is not accumulating. Continued operation during the first 20-year renewal term and a second 20-year renewal term is expected to likewise show that there is not an accumulation of radioactivity.

Continued compliance with NRC radiological effluent limits and implementation of the REMP would ensure that aquatic organisms' exposure to radionuclides is well within guidelines and adverse trends are detected to implement corrective actions.

DE finds that exposure of aquatic organisms to radionuclides for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.18 EFFECTS OF DREDGING ON AQUATIC ORGANISMS

E4.6.18.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Dredging at nuclear power plants is expected to occur infrequently, would be of relatively short duration, and would affect relatively small areas. Dredging is performed under permit from the USACE and possibly from other state or local agencies.

E4.6.18.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.18.3 Background [GEIS Section 4.6.1.2]

Dredging is an activity that is performed at some power plants to remove accumulated sediments from intake and discharge areas (or, more rarely, to maintain barge slips) and may have localized impacts on aquatic biota. The impacts of dredging were not evaluated in the 1996 GEIS. NRC reviewed potential impacts to aquatic organisms from dredging operations to support nuclear power plant operations and anticipated that maintenance dredging would occur infrequently, would be of relatively short duration, would affect relatively small areas, and would be primarily undertaken in areas containing soft sediments that would be recolonized fairly rapidly by benthic organisms in surrounding areas. NRC also considered that the levels of chemical and radionuclide contamination of sediments in the areas near power plant intakes and discharges that would need to be dredged are likely to be relatively low. The NRC considered compliance with USACE, and applicable state permits sufficient to mitigate any impacts to a SMALL significance.

E4.6.18.4 Site-Specific Analysis

VCSNS does not conduct maintenance dredging for the intake and discharge. No dredging is anticipated during the SLR term. Therefore, this issue is not applicable and further analysis is not required.

E4.6.19 WATER USE CONFLICTS WITH AQUATIC RESOURCES (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A RIVER)

E4.6.19.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations.

E4.6.19.2 Requirement [10 CFR 51.53(c)(3)(iv)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on stream (aquatic)…ecological communities must be provided.

E4.6.19.3 Background [GEIS Section 4.6.1.2]

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or a combination of such factors. Water use conflicts with biological resources in stream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

E4.6.19.4 Site-Specific Analysis

Monticello Reservoir is considered a cooling pond. Monticello Reservoir was built to supply cooling water to the plant and to provide an upper reservoir for the Fairfield Pumped Storage Facility located on Parr Reservoir. (NRC. 2004b; Section 2.1.3) Monticello Reservoir water lost to evaporation is replaced with water from Parr Reservoir as part of the normal operation of the Fairfield Pumped Storage Facility. Water is cycled between the reservoirs daily. (NRC. 2004b, Section 4.5.1) During the proposed SLR operating term, VCSNS is anticipated to consume water from Monticello Reservoir at current rates; therefore, there would be no increase in consumptive water use. Water levels in the Monticello Reservoir can vary as much as 4.5 feet from use by VCSNS and the Fairfield Pumped Storage Facility, and water levels in the Parr Reservoir can vary as much as 10 feet by use from the Parr Hydro plant.

The Parr Project inclusive of Monticello and Parr Reservoirs was relicensed by the FERC in 2020 (FERC. 2020). The relicensure process included various flow studies and consideration of impacts on terrestrial and aquatic resources. The FERC established flow conditions protective of the terrestrial and aquatic resources.

Compliance with the FERC license conditions, current and future NPDES regulatory requirements, and surface water withdrawal permits would ensure that water use conflicts from the continued operation continues to be limited to a SMALL impact.

DE finds that water use conflicts with aquatic resources for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.20 EFFECTS ON AQUATIC RESOURCES (NON-COOLING SYSTEM IMPACTS)

E4.6.20.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Licensee application of appropriate mitigation measures is expected to result in no more than small changes to aquatic communities from their current condition.

E4.6.20.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.20.3 Background [GEIS Section 4.6.1.2]

Impacts on aquatic resources from continued operations and refurbishment activities could occur at all operating nuclear power plants during the license renewal term as a result of (1) direct disturbance (e.g., ground disturbance, draining ponds, blocking or redirecting streams, and placing riprap along shorelines) of aquatic habitats within project areas; (2) sedimentation of nearby aquatic habitats as a consequence of soil erosion; (3) changes in water quantity or water quality (e.g., grading that affects surface runoff patterns or depletions or discharges of water into aquatic habitats); or (4) releases of chemical contaminants into nearby aquatic systems. In the 2013 license renewal GEIS, the NRC reviewed these activities and their effects under this issue as listed above, with the understanding that permits from various federal, state, and local governmental authorities are typically required for ground-disturbing activities and with proper application of environmental reviews, permitting processes, and BMPs, impacts on sensitive aquatic habitats would likely be avoided. With this understanding, the NRC concluded that the impact of continued operations and refurbishment activities on aquatic resources would be SMALL.

E4.6.20.4 Site-Specific Analysis

VCSNS has procedures and plans in place to address concerns about the potential for impacts to onsite and nearby aquatic habitats as a consequence of site disturbance, soil erosion, changes in water quality, or releases of chemical contaminants as detailed below. VCSNS has administrative procedures that establish the policies and general requirements for ongoing operations, maintenance, and construction activities to be conducted in accordance with the VCSNS environmental protection plan, and applicable federal, state, and local regulations and permit conditions.

VCSNS has not proposed any refurbishment activities or construction of new facilities related to SLR. Land disturbance for continued operations at VCSNS would be related to routine

infrastructure maintenance and renovation activities to maintain and upgrade or replace infrastructure and structures as needed to support VCSNS operations. As discussed in Section E4.4.4, DE has established specific procedures and guidance to address ground disturbance from any activity to ensure compliance with regulations and permit requirements for erosion and sediment control and stormwater.

Further, VCSNS does not conduct routine dredging Monticello reservoirs that would result in the release of sediments to aquatic resources. Should any dredging needs arise for plant operations, DE would obtain the necessary federal and state permits.

As presented in Section E4.4.4, VCSNS maintains and implements a SWPPP that identifies potential sources of pollution (such as erosion) that would reasonably be expected to affect the quality of stormwater and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. Construction and maintenance activities undertaken during the SLR period that would involve ground disturbance would be required to have a separate SWPPP, in accordance with a NPDES stormwater permit from construction activities. In addition, VCSNS has an SPCC and a chemical control procedure and waste management procedure.

Compliance with regulatory requirements and permit conditions, implementation of a SWPPP, and implementation of BMPs, will ensure that the potential for impacts to nearby aquatic habitats as a consequence of soil erosion, changes in water quality, or releases of chemical contaminants during the SLR term will be SMALL.

DE finds that effects on aquatic resources for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.21 IMPACTS OF TRANSMISSION LINE RIGHT-OF-WAY MANAGEMENT ON AQUATIC RESOURCES

E4.6.21.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL. Licensee application of BMPs to ROW maintenance is expected to result in no more than SMALL impacts to aquatic resources.

E4.6.21.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.21.3 Background [GEIS Section 4.6.1.2]

This is a new issue added by the 2013 GEIS. Continued operations and refurbishment activities will require management and maintenance of in-scope transmission lines and associated in-scope transmission line ROWs. Continued operations and refurbishment activities could result in negative impacts on aquatic resources within the ROW or from runoff associated with in-scope transmission line management and maintenance. In the 2013 license renewal GEIS, the NRC reviewed the impacts of transmission line ROW management on aquatic species and found that changes in aquatic species diversity, abundance, or health from transmission line ROW maintenance are likely to be SMALL. The continued use of proper management practices with respect to soil erosion and application of herbicides is expected. In addition, license renewal for a specific plant would affect only the portion of the transmission line that connects the power plant to the first substation, so the amount of aquatic habitat crossed is likely to be SMALL.

E4.6.21.4 Site-Specific Analysis

In-scope transmission lines at VCSNS are depicted on Figure E2.2-2 and discussed in Section E2.2.5. The in-scope transmission lines between the Turbine Building and the switchyard do not cross vegetated areas. The Parr ESF 115-kV transmission line extends outside of the VCSNS site boundary and crosses vegetated areas. The in-scope transmission lines do not cross any water resources.

DE has procedures regarding maintenance of vegetation under the in-scope transmission lines at the VCSNS site, as well as procedures for the application of herbicides and pesticides to control vegetation under in-scope transmission lines (Section E2.2.5.2) . Further, DE has administrative policies and implements BMPs for preventing erosion from soil disruption related to maintenance and management. The NPDES permit requires VCSNS to implement BMPs to protect surface water and groundwater from runoff of pollutants and loose soil in industrial areas.

Implementation of BMPs and adherence to vegetation management protocols will ensure minimal impact on aquatic resources from ROW management and maintenance.

DE finds that impacts of transmission line ROW management on aquatic resources for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.22 LOSSES FROM PREDATION, PARASITISM, AND DISEASE AMONG ORGANISMS EXPOSED TO SUBLETHAL STRESSES

E4.6.22.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

SMALL. These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

E4.6.22.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.6.22.3 Background [GEIS Section 4.6.1.2]

During the license renewal term, cooling system intake and discharge would continue to affect aquatic resources. Sub-lethal stresses can come from impingement, entrainment, thermal discharge, low dissolved oxygen levels, gas supersaturation in tissues, and exposure to radionuclides and nonradiological contaminants. Impacts such as increased susceptibility to predation, parasitism, and disease can increase for species exposed to sub-lethal stresses. The effects of low dissolved oxygen levels are not expected to be felt by aquatic species beyond the thermal mixing zone. It is anticipated that heavy metal concentrations and radionuclide releases related to normal plant operations would not result in negative effects on aquatic biota. Impacts on the susceptibility of aquatic organisms to predation, parasitism, and disease due to sub-lethal stresses are considered to be of SMALL significance if changes are localized and populations of aquatic organisms in the receiving water body are not reduced. Indirect power plant-induced mortality has not been shown to cause reductions in the overall populations of aquatic organisms near any existing nuclear power plants. The level of impact due to sub-lethal stresses has been SMALL at plants reviewed by the NRC in the 2013 GEIS and is expected to be SMALL for all nuclear plants.

E4.6.22.4 Site-Specific Analysis

The stresses of impingement, entrainment, thermal discharge, low dissolved oxygen levels, gas supersaturation in tissues, and exposure to radionuclides and nonradiological contaminants are discussed under previous sections and summarized below:

- Surface water use and quality (non-cooling system impacts), Section E4.5.1.4: Compliance with current and future NPDES and stormwater regulatory requirements and permit conditions, and implementation of SWPPP, BMPs, and the SPCC plan will ensure an insignificant impact on surface water quality from non-cooling systems during the proposed SLR operating term.
- Altered current patterns at intake and discharge structures, Section E4.5.2: There are no modifications associated with the proposed action that would alter the existing current pattern; therefore, existing current patterns are expected to continue during the proposed SLR operating term. Given this, impacts to surface water use and quality are SMALL.
- Discharge of metals in cooling system effluent, Section E4.5.6: Condenser tubes are stainless steel at VCSNS (DE. 2023a, Section 10.4.1.1) and would not contribute leached

metals to the cooling water discharge. As such, impacts from the discharge of metals in cooling system effluent during the proposed SLR term are SMALL.

- Discharge of biocides, sanitary wastes, and minor chemical spills, Section E4.5.7.4: Plant wastewater, sanitary wastewater, and stormwater discharges are governed by the VCSNS's NPDES permit. Compliance (which is ensured through controlled application and monitoring) with NPDES regulatory requirements and permit conditions will ensure the impacts of biocides and minor chemical spills to be SMALL.
- Temperature effects on sediment transport capacity, Section E4.5.11: Most of the discharge from VCSNS is through a discharge bay leading to a discharge canal into the Monticello Reservoir. Discharges are governed by VCSNS's NPDES permit, which established temperature discharge limits. The presence of the jetty would minimize the potential for the heated water to influence the physical properties of the receiving waters and as "hypothesized to change the sediment transport capacity of water, leading to potential sedimentation problems." Water quality monitoring of Monticello Reservoir has not indicated long-term warming trends. There are no plant operations or modifications planned for the proposed SLR operating term that would alter discharge structures or thermal discharges. As such, impacts to surface water resources including temperature effects on sediment transport capacity are SMALL.
- Entrainment of phytoplankton and zooplankton, Section E4.6.12: DE complies with the current NPDES permit, implementing any BTA requirements determined necessary to minimize impacts of impingement and entrainment. Previous entrainment and impingement studies indicate that the operation of VCSNS is not having a negative impact on the aquatic communities of Monticello or Parr reservoirs. With continued compliance with the NPDES permit, impacts from impingement and entrainment of aquatic organisms, including phytoplankton and zooplankton during the proposed SLR operating term would be SMALL.
- Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication, Section E4.6.15: Discharges are governed by the VCSNS NPDES permit which establishes conditions for operation of the cooling water system based on ambient water temperature of Monticello Reservoir and discharge temperature limits. Annual monitoring conducted do not indicate significant changes in the water quality of the cooling water discharge or any major long-term decreases in overall fish abundance and species diversity in Monticello Reservoir. Given that VCSNS operates under conditions of a NPDES permit and that no site modifications are planned, the effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication will be SMALL.
- Effects of nonradiological contaminants on aquatic organisms, Section E4.6.16: The current NPDES permit for the OWS authorizes effluent limitations to the Monticello Reservoir. A review of records from 2017–2022 for spill notification and environmental compliance at

VCSNS showed one leak: the reactor was manually tripped due to a main transformer fault that released mineral oil on November 16, 2021. The oil was contained with booms and cleaned up. None of the NOVs received between 2017 and 2022 were attributable to discharge of contaminants into Monticello Reservoir. Since no alterations are planned for the proposed SLR term and discharges would continue to be in compliance with the NPDES permit, effects of nonradiological contaminants on aquatic organisms will be SMALL.

- Exposure of aquatic organisms to radionuclides, Section E4.6.17: VCSNS operates in compliance with NRC regulations. Based on the results of the 2021 monitoring, DE concluded that the operation of VCSNS created no adverse environmental effects, similar to previous years. Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that aquatic organisms' exposure to radionuclides is well within guidelines and adverse trends are detected to implement corrective actions.
- Effects on aquatic resources (non-cooling system impacts), Section E4.6.20: Compliance with regulatory requirements and permit conditions, implementation of a SWPPP, implementation of BMPs, and adherence to VCSNS's environmental protection plan will ensure minimal impacts to nearby aquatic habitats as a consequence of soil erosion, changes in water quality, or releases of chemical contaminants.

Consideration of the above issues would indicate sub-lethal stresses are not significantly impacting the aquatic resources in the vicinity of VCSNS.

DE finds that losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.6.23 THREATENED, ENDANGERED, AND PROTECTED SPECIES, AND ESSENTIAL FISH HABITAT

E4.6.23.1 Findings from 10 CFR Part 51, Subpart A, Appendix B, Table B-1

The magnitude of impacts on threatened, endangered, and protected species, critical habitat, and EFH would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

E4.6.23.2 Requirement [10 CFR 51.53(c)(3)(iv)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened and endangered species in accordance with federal laws protecting wildlife, including but not limited to, the ESA, and EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

E4.6.23.3 Background [GEIS Section 4.6.1.3]

There are several federal acts that provide protection to certain species and habitats that are treated here under a single issue. The issue includes impacts to biological resources such as threatened and endangered species and their critical habitat under the ESA, EFH as protected under the Magnuson-Stevens Fishery Conservation and Management Act and impacts to mammalian species protected under the Marine Mammal Protection Act.

Factors that could potentially result in impacts on listed terrestrial species include habitat disturbance, cooling tower drift, operation and maintenance of cooling systems, transmission line ROW maintenance, collisions with cooling towers and transmission lines, and exposure to radionuclides. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present.

Potential impacts of continued operations and refurbishment activities on state or federally listed threatened and endangered species, protected marine mammals, and EFH could occur during the license renewal term. Factors that could potentially result in impacts to these species and habitats include impacts of refurbishment, other ground-disturbing activities, release of contaminants, effects of cooling water discharge on dissolved oxygen, gas supersaturation, eutrophication, thermal discharges, entrainment, impingement, reduction in water levels due to the cooling system operations, dredging, radionuclides, and transmission line ROW maintenance.

E4.6.23.4 Site-Specific Analysis

E4.6.23.4.1 Refurbishment Activities

As discussed in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to threatened, endangered, and protected species, designated critical habitat or EFH, and no further analysis is required.

E4.6.23.4.2 Operational Activities

Federally Listed Threatened and Endangered Species

As discussed in Section E3.7.8.1, a total of eight species in Fairfield, Newberry, and Richland Counties are federally protected under the ESA: West Indian manatee, red-cockaded woodpecker, Carolina heelsplitter, American chaffseed, Canby's dropwort, Michaux's sumac, rough-leaved loosestrife, and smooth coneflower. In addition, the monarch butterfly is federally listed as a candidate species.

The current known range for the red-cockaded woodpecker does not overlap with the VCSNS site (USFWS. 2022m). However, there have observations of the species within 6 miles of the VCSNS site within the last 5–10 years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022c). Red-cockaded woodpeckers prefer mature pine forests with a hardwood understory. Forested areas within the VCSNS site have been managed for timber in the past and therefore are unlikely to present suitable high-quality habitat for this species (SCE&G. 2002). Actions requiring removal of trees may be conducted under the USFWS 4(d) rule which sets guidelines for incidental take, and consultation with federal wildlife agencies to ensure that no impacts to this species occur from any future activities. All plant operations are located in disturbed areas and tree clearing is not anticipated; however, DE would consult with USFWS to ensure compliance with the ESA. Based on habitat unsuitability at the VCSNS site and compliance with all regulatory requirements associated with federally listed species, the continued operation of the site for the proposed SLR operating term will have NO EFFECT on the red-cockaded woodpecker.

Manatees prefer habitats that include areas near the shore featuring underwater vegetation like seagrass and eelgrass. Given their restricted range and habitat requirements for the West Indian Manatee, this species is unlikely to occur in the vicinity of the VCSNS site as the site does not provide suitable habitat. The current known range for the West Indian Manatee does not overlap with the VCSNS site (USFWS. 2022b) and there have been no records of this species occurring in the vicinity of the VCSNS site. As such, continued operation of the VCSNS site for the proposed operating term will have NO EFFECT on the West Indian manatee.

There are no records of the Carolina heelsplitter as occurring on the VCSNS site and the current known range does not overlap with the VCSNS site (USFWS. 2022c). Further, a freshwater mussel survey of the Monticello Reservoir conducted in 2015 did not find Carolina heelsplitter (TOE. 2016). Thus, the continued operation of the VCSNS site for the proposed operating term will have NO EFFECT on the Carolina heelsplitter.

Primary threats to the five federally listed plant species (American chaffseed, Canby's dropwort, Michaux's sumac, rough-leaved loosestrife, and smooth coneflower) includes habitat destruction. Continued operations of VCSNS do not involve clearing activities or modifications to existing terrestrial or aquatic vegetation. Furthermore, the current known ranges of these species do not

overlap with the VCSNS site (USFWS. 2022d; USFWS. 2022e; USFWS. 2022n; USFWS. 2022f; USFWS. 2022g) and as such no impacts from the continued operation of VCSNS is anticipated. Thus, the continued operation of the VCSNS site for the proposed operating term will have NO EFFECT to these state-listed invertebrate species.

Suitable habitat for the monarch butterfly is likely present in undeveloped portions of the VCSNS site that are not maintained by mowing as well as in the vicinity of the site. Existing regulatory programs that the site is subject to including management of herbicide applications ensure that habitats and wildlife are protected. Thus, the continued operation of the VCSNS site for the proposed operating term MAY AFFECT BUT IS NOT LIKELY TO ADVERSELY AFFECT the monarch butterfly.

State-Listed Threatened and Endangered Species

As discussed in E3.7.8.2, a total of 10 species that are threatened or endangered are listed by the SCDNR as potentially occurring in Richland, Fairfield, and Newberry Counties (SCDNR. 2022c). The red-cockaded woodpecker is discussed under federally listed species above.

While only the bald eagle has been recorded within the premises of the VCSNS site, several others have been recorded to occur within 6 miles of the VCSNS site based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022c), including the spotted turtle, Carolina pygmy sunfish, southern hog-nosed snake, pine barren treefrog, Carolina gopher frog, Rafinesque's big-eared bat, and the shortnose sturgeon.

Wood storks occur in a variety of wetland and the VCSNS site and the surrounding areas within six miles, including Monticello Reservoir, potentially present suitable habitat for the species. The species has been recorded to occur within 6 miles of the VCSNS site within the last 10 to 20 years based on the review of the SCDNR Tracked Species Distributions 14 map (SCDNR. 2022c). However, no changes or alternations to the operational activities of VCSNS is proposed that would significantly alter aquatic habitat suitable for the species. Although juvenile wood storks are not particularly adept at flying, the likelihood of avian collision with tall structures is expected to be minimal. Collisions with in-scope transmissions lines are not anticipated. DE keeps records of all bird-related mortalities/injuries at the VCSNS site. A total of 16 bird mortalities were reported at the site from 2018–2022. Of these, two were confirmed collision deaths. There have been no recorded bird collisions associated with in-scope transmission lines between 2018–2022. Compliance with all regulatory requirements associated with listed species will continue to be an administrative control practiced by DE for the life of the facility; thus, the continued operation of the VCSNS site for the proposed operating term is unlikely to impact the wood stork.

The spotted turtle is a small, semi-aquatic species that inhabits a variety of wetlands including small ponds, streams, swamps, flooded forest floors and another shallow bodies of water. This species

has been recorded to occur within 6 miles of the VCSNS site, but given the requirement for shallow bodies of water, the developed VCSNS site in unlikely to present suitable habitat.

The Carolina pygmy sunfish is a small secretive fish that inhabits slow-moving acidic waters of ponds, ditches, and streams. Although this species has been recorded to occur within 6 miles of VCSNS within the last 5 to 10 years, this species is generally associated with abundant aquatic vegetation and shallow water. Given that Monticello Reservoir is a relatively deep reservoir, this species is unlikely to be found in the immediate vicinity of VCSNS.

The pine barrens treefrog is found in the northern portion of South Carolina's Coastal Plain in the Sandhills Fall-line Ecoregion, and typically occurs in herb shrub bogs, pocosins and related communities. It has also been recorded with 6 miles of the VCSNS site within the last 20 to 40 years. Currently, several pine barrens treefrog colonies exist along powerline and gas line ROWs, where mechanical vegetation control (e.g., mowing) keeps the vegetation low, maintaining the open habitat required by the species. However, this species has not been recorded within the VCSNS site itself in the last 20 years. Hence the VCSNS site may not present suitable habitat for this species.

The primary habitat of the Carolina gopher frog is native xeric upland habitats, comprised mainly of longleaf pine and sandy substrates. As a result of fire suppression, habitat loss and degradation, many species including the gopher frog associated with longleaf pine forests have declined. While this species has been recorded within 6 miles of the VCSNS site within the last 20 to 40 years, given the habitat requirement of upland longleaf pine habitat, the VCSNS site does not provide suitable habitat for this species, and has not been recorded here.

Similar to gopher frogs, southern hognose snakes are typically associated with the more xeric longleaf communities and can be found in the same habitat types that support gopher tortoise populations. The southern hognose snake has been documented from 15 counties in South Carolina. The primary threat confronting this species is habitat loss by conversion for agriculture and/or loblolly pine plantations in South Carolina. The loss, or degradation of longleaf pine habitat results in the loss of key components. Further, the introduction of fire ants throughout the southeastern United States has also been implicated as a potential reason for the apparent decline of the southern hognose snake (Bennett and Buhlmann. 2015b). While this species has been recorded within 6 miles of the VCSNS site within the last five years, given the absence of suitable habitat such as longleaf pine forests on the VCSNS site, this species is unlikely to be found here.

In South Carolina, Rafinesque's big-eared bat are permanent residents of the coastal plain and hibernate rather than move south during winter months. They characteristically roost in dilapidated buildings or tree cavities near water. Rafinesque's big-eared bat is very sensitive to human activities and will abandon a roost if disturbed. They also require large cavity trees for roosting. Given that VCSNS is an industrial site with constant human activity, and the likely absence of large cavity

trees, this site does not present suitable habitat, and although this species has been recorded within a 6-mile radius in the last five years, there have been no records of it occurring within the VCSNS site.

In South Carolina, there appear to be populations of shortnose sturgeon in the Savannah River, one or more of the rivers flowing into St. Helena Sound (Ashepoo, Combahee, and Edisto Rivers), the Cooper River, the Santee River, and one or more Winyah Bay rivers (Pee Dee, Waccamaw, and Black). There may also be a landlocked ("damlocked") population in the Santee-Cooper Lake System (Lakes Marion and Moultrie and tributary rivers), although not much is known about these landlocked populations. The SCDNR completed a comprehensive aquatic resources inventory of the Broad River between 2000 and 2002. This included evaluation of the condition of 312 km of riparian habitat along the Broad River and sampling for fish. Shortnose sturgeon were not recorded in the survey, and there are no records of the species within the VCSNS site. There is a known population of shortnose sturgeon in the Santee-Cooper system that ascends the Santee River to spawn in the Congaree River. SCDNR has telemetry data on these fish. SCDNR telemetry data indicate that no tagged fish have traversed the fishway at Columbia Diversion Dam into the reach of the Broad River that comes within 6 miles of VCSNS. Moreover, the aquatic resources on the VCSNS site do not provide suitable habitat for the shortnose sturgeon. However, the species has been recorded to occur within 6 miles of the VCSNS site within the last five years based on the review of the SCDNR Tracked Species Distributions map (SCDNR. 2022c).

Due to the lack of habitat onsite as well as adherence to administrative controls and existing programs such as stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment, operation of the site will not affect offsite habitat for the above species if present. Thus, the continued operation of the VCSNS site for the proposed operating term will have no impact to a SMALL impact on state-listed species.

Bald Eagles

As stated in Section E3.7.8.2.1, bald eagles are known to nest at the VCSNS site. Activities on the VCSNS site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. VCSNS maintains a migratory bird SPUT authorized by the USFWS, which authorizes utilities to collect, transport, and temporarily possess migratory birds found dead on utility property, structures, and ROWs for avian mortality monitoring or disposal purposes. DE submits annual reports of all activities conducted under the SPUT to the USFWS. Compliance with all regulatory requirements associated with this species will continue to be an administrative control practiced by DE for the licensed life of the VCSNS facility. Adherence to these controls, as well as compliance with applicable laws and regulations, should prevent potentially negative impacts to bald eagles.

Thus, the continued operation of the VCSNS site for the proposed SLR operating term will have a SMALL impact on bald eagles.

Migratory Birds

As stated in Section E3.7.8.4, 14 birds of conservation concern have the potential to occur in Fairfield, Newberry and Richland counties, South Carolina (USFWS. 2023a). Suitable habitat is potentially present on the VCSNS site and in the immediate vicinity for all of the species listed above. Henslow's sparrow, lesser yellowlegs, and rusty blackbird occur as migrants through Fairfield, Newberry and Richland counties and may utilize stop-over habitat available onsite or in the vicinity. These species are known to breed elsewhere. The other 11 migratory bird species are known to breed in Fairfield, Newberry, and Richland counties (USFWS. 2023a). Bald eagles are known to nest at the VCSNS site. One osprey nest was observed on the Met Tower in 2021.

VCSNS maintains a migratory bird SPUT authorized by the USFWS, which authorizes utilities to collect, transport, and temporarily possess migratory birds found dead on utility property, structures, and ROWs for avian mortality monitoring or disposal purposes. The permit also authorizes relocating active or inactive migratory bird nests (except threatened/endangered species and eagles). The permit has an expiration date of December 31, 2023. DE submits annual reports of all activities conducted under the SPUT to the USFWS. When necessary, a SCDNR biologist is consulted for appropriate handling of nest removal. Thus, the continued operation of the VCSNS site for the proposed operating term will have a SMALL impact on birds protected under the MBTA.

Essential Fish Habitat

As stated in Section E3.7.8.4, no EFH is located within the vicinity of VCSNS, nor were any EFH areas protected from fishing. As HAPCs are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of VCSNS (NOAA. 2022b). Thus, the continued operation of the VCSNS site for the proposed operating term would have no impact on EFH.

DE finds that impacts to threatened, endangered and protected species and EHF for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.7 HISTORIC AND CULTURAL RESOURCES

The following sections address the historic and cultural issues applicable to VCSNS, providing background on issues and analyses regarding the proposed SLR operating term.

E4.7.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

Continued operations associated with license renewal are expected to have no SLR-related impacts as no refurbishment or construction activities have been identified. The NHPA requires the

federal agency to consult with the state historic preservation officer (SHPO) and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

E4.7.2 REQUIREMENT [10 CFR 51.53(C)(3)(II)(K)]

All applicants shall identify any potentially affected historic or archaeological properties and assess whether any of these properties will be affected by future plant operations and any planned refurbishment activities in accordance with the NHPA.

E4.7.3 BACKGROUND [GEIS SECTION 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The SLR APE is the area that may be impacted by ground-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or building), landscaping, agricultural, or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of danger trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines has not changed significantly over time; therefore, additional viewshed impacts to historic and cultural resources are not anticipated.

E4.7.4 SITE-SPECIFIC ANALYSIS

E4.7.4.1 Refurbishment Activities

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no SLR-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

E4.7.4.2 Operational Activities

As presented in Section E3.8.5, there have been seven cultural resources survey investigations conducted within the VCSNS property. There are 10 archaeological sites and one structure on the 2,200-acre VCSNS property. One cultural resource on the property has been determined eligible for the NRHP. As presented in Section E3.8, no SLR-related ground-disturbing activities have been

identified. Therefore, no adverse effects are anticipated during the proposed SLR operating term for any sites within the VCSNS property.

The area within a 6-mile radius of the site, is archaeologically sensitive (Table E3.8-3). However, adverse impacts would only occur to such sites as a result of soil-intrusive activities. Because DE has no plans to conduct such soil-intrusive activities at any location outside of the VCSNS property boundary under the SLR, no adverse effects to these archaeological sites would occur.

There are 12 aboveground NRHP-listed properties and one NRHP district within 6 miles of VCSNS (Table E3.8-4). The closest property, 72001208, the Little River Baptist Church, is over 2.4 miles from VCSNS. Due to distance, topography and vegetation, the visual and noise impacts to the 72001208 property will be minimal. The remaining 11 NRHP properties are all over 3.4 miles from the VCSNS site. Therefore, any visual or noise related impacts to these 13 NRHP properties would be minimal due to distance, topographic variability, and vegetation.

As presented above, no license renewal-related refurbishment or construction activities have been identified. No offsite NRHP-listed historic properties would be adversely impacted as a result of continued operations of VCSNS, and there are no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of this SLR. In addition, administrative procedural controls are in place for protection of cultural resources ahead of any future ground-disturbing activities at the plant.

E4.8 SOCIOECONOMICS

The following sections address socioeconomic issues applicable to VCSNS, providing an evaluation of potential impacts of the proposed subsequent license renewal action.

E4.8.1 EMPLOYMENT AND INCOME, RECREATION, AND TOURISM

E4.8.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Although most nuclear plants have large numbers of employees with higher-than-average wages and salaries, employment, income, recreation, and tourism, impacts from continued operations and refurbishment associated with license renewal are expected to be small.

E4.8.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.8.1.3 Background [GEIS Section 4.8.1.1]

Employees receive income from the nuclear power plant in the form of wages, salaries, and benefits. Employees and their families, in turn, spend this income on goods and services within the community, thereby creating additional opportunities for employment and income. In addition, people and businesses in the community receive income for the goods and services sold to the power plant. Payments for these goods and services create additional employment and income opportunities in the community. The measure of a community's ability to support the operational demands of a power plant depends on the ability of the community to respond to the changing socioeconomic conditions.

Some communities experience seasonal transient population growth due to local tourism and recreational activities. Income from tourism and recreational activities creates employment and income opportunities in the communities around nuclear power plants.

Nevertheless, the effects of nuclear power plant operations on employment, income, recreation, and tourism are ongoing and have become well-established during the current license term for all nuclear power plants. The impacts from power plant operations during the license renewal term on employment and income in the region around each nuclear power plant are not expected to change from what is currently being experienced. In addition, tourism, and recreational activities in the vicinity of nuclear plants are not expected to change as a result of the license renewal.

E4.8.1.4 Site-Specific Analysis

Information related to employment and income is presented in Section E3.9.1 and information related to recreation and tourism is presented in Section E3.9.7, of this ER. As discussed in Section E2.5, there are plans to add permanent employees as needed to maintain licensed operator positions, but no plans to add permanent staff to support SMITTR activities. Furthermore, there are no refurbishment activities planned that would require additional workers or create a visual impact. As previously discussed in Section E3.2.3, views of VCSNS are available from the Monticello Reservoir, portions of SC 215, and lands along the eastern shore of the reservoir; however, the surrounding forest and general topography of the area provide visual screening and limit the visibility of the entire facility to adjacent communities. As a result, the site does not visually impact areas in the vicinity that have a high degree of visitor use.

Because no changes to the site's visual profile associated with plant structures or transmission lines are anticipated, no refurbishment is planned, and because the only anticipated changes to the VCSNS workforce are as-needed permanent employees, the people living in the VCSNS region are not likely to experience any changes to socioeconomic and aesthetic conditions during the proposed SLR term.

DE finds that impacts to employment and income for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.8.2 TAX REVENUES

E4.8.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Nuclear plants provide tax revenue to local jurisdictions in the form of property tax payments, payments in lieu of tax (PILOT), or tax payments on energy production. The amount of tax revenue paid during the license renewal term due to continued operations and refurbishment associated with license renewal is not expected to change.

E4.8.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.8.2.3 Background [GEIS Section 4.8.1.2]

Nuclear power plants and the workers who operate them are an important source of revenue for many local governments and public school systems. Tax revenues from nuclear power plants mostly come from property tax payments or other forms of payments such as PILOT payments, although taxes on energy production have also been collected from several nuclear power plants. County and municipal governments and public school districts receive tax revenue either directly or indirectly through state tax and revenue-sharing programs.

Counties and municipal governments in the vicinity of a nuclear power plant also receive tax revenue from sales tax and fees from the power plant and its employees. Changes in the number of workers and the amount of taxes paid to county, municipal governments, and public schools can affect socioeconomic conditions in the counties and communities around the nuclear power plant.

A review of LRAs received by the NRC since the 1996 GEIS has shown that SLR-related refurbishment activities, such as steam generator and vessel head replacement, have not had a noticeable effect on the assessed value of nuclear plants; thus, changes in tax revenues are not anticipated from future SLR-related refurbishment activities.

The primary impact of license renewal would be the continuation or change in the amount of taxes paid by nuclear power plant owners to local governments and public school systems. The impact of nuclear plant operations on tax revenues in local communities and the impact that the expenditure of tax revenues has on the region are not expected to change appreciably from the amount of taxes

paid during the current license term. Tax payments during the license renewal term would be similar to those currently being paid by each nuclear plant.

E4.8.2.4 Site-Specific Analysis

Information related to annual property tax payments made on behalf of VCSNS and apportionment to local taxing jurisdictions is presented in Section E3.9.5 of this ER. As discussed in Section E2.3, no subsequent license renewal-related refurbishment activities have been identified for VCSNS. DE plans to continue to operate VCSNS as currently designed and no associated changes to plant employment, other than hiring workers as needed, are anticipated. Furthermore, no associated changes to VCSNS taxable property value are anticipated. Therefore, DE's annual property tax payments are expected to remain constant through the period of extended operation with no notable future increases or decreases.

Because there are no significant anticipated changes to the operational workforce, no refurbishment is planned, and tax payments are expected to remain constant, the people living in the VCSNS region are not likely to experience any changes in socioeconomic conditions due to the plant during the proposed SLR term.

DE finds that impacts to tax revenue for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.8.3 COMMUNITY SERVICES AND EDUCATION

E4.8.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes resulting from continued operations and refurbishment activities associated with license renewal to local community and educational services would be small. With little or no change in employment at the licensee's plant, value of the power plant, payments on energy production, or PILOT payments expected during the license renewal term, community and educational services would not be affected by continued power plant production.

E4.8.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.8.3.3 Background [GEIS Section 4.8.1.3]

Any changes in the number of workers at a nuclear plant will affect the demand for public services from local communities. Environmental reviews conducted by the NRC since the 1996 GEIS have

shown, however, that the number of workers at relicensed nuclear plants has not changed significantly because of license renewal, so demand-related impacts on community services, including public utilities, are no longer anticipated from future license renewals.

In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and the months of time that were conservatively analyzed in the 1996 GEIS, so significant impacts on community services are no longer anticipated. Because of the relatively short duration of refurbishment-related activities, workers are not expected to bring families and school-aged children with them; therefore, impacts from refurbishment on educational services are no longer anticipated.

Taxes paid by nuclear power plant owners support a range of community services, including public water safety, fire protection, health, and judicial, social, and education services. In some communities, tax revenues from power plants can have a noticeable impact on the quality of services available to local residents. Although many of the community services paid for by tax revenues from power plants are used by plant workers and their families, the impact of nuclear plant operations on the availability and quality of community services and education is SMALL and is not expected to change due to license renewal.

E4.8.3.4 Site-Specific Analysis

See Section E3.9.4 of this ER for a discussion of community services and education. As described in Section E2.5, there are no plans to add workers other than as needed to support VCSNS operations during the SLR term. Furthermore, there are no refurbishment activities planned that would require additional workers or change the taxable value of VCSNS. The DE annual property tax payments made on behalf of VCSNS are expected to remain constant throughout the proposed SLR term.

Because no significant changes to employment are expected from continued operations, tax payments are anticipated to remain consistent throughout the SLR term, and no refurbishment activities are planned, the people living in the VCSNS region are not likely to experience any changes in socioeconomic conditions due to the plant during the proposed SLR term beyond the current conditions.

DE finds that impacts to community services and education for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.8.4 POPULATION AND HOUSING

E4.8.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to regional population and housing availability and value would be small. With little or no change in employment at the licensee's plant expected during the license renewal term, population and housing availability and values would not be affected by continued power plant operations.

E4.8.4.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable issues is required to be included in SLRA ERs.

E4.8.4.3 Background [GEIS Section 4.8.1.4]

Socioeconomic impact analyses of resources (e.g., housing) affected by changes in regional population are based on employment trends at nuclear power plants. Population growth from increased employment and spending at a nuclear power plant is important because it is one of the main drivers of socioeconomic impacts. As previously discussed, however, employment levels at nuclear power plants are expected to remain relatively constant with little or no population growth or increased demand for permanent housing during the license renewal term. The operational effects on population and housing values and availability in the vicinity of nuclear power plants are not expected to change from what is currently being experienced, ad no demand-related impacts are expected during the license renewal term.

The increased number of workers at nuclear power plants during regularly scheduled plant refueling and maintenance outages does create a short-term increase in the demand for temporary (rental) housing units in the region around each plant. However, because of the short duration and repeated nature of these scheduled outages and the general availability of rental housing units (including portable trailers) in the vicinity of nuclear power plants, employment-related housing impacts have had little or no long-term impact on the price and availability of rental housing. Refurbishment impacts would be similar to what is experienced during routine plant refueling and maintenance outages.

E4.8.4.4 Site-Specific Analysis

Information related to population and housing is presented in Section E3.9.2 of this ER. As described in Section E2.5, there are no plans to add workers other than as needed to support VCSNS plant operations during the SLR term. Furthermore, no VCSNS refurbishment activities have been identified that would lead to a need for a larger workforce at the plant.

Because no changes to employment are expected from the continued operations, and no refurbishment activities are identified that would require additional workers, the people living in the VCSNS region are not likely to experience any changes in socioeconomic conditions due to the plant during the proposed SLR term.

DE finds that impacts to population and housing for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.8.5 TRANSPORTATION

E4.8.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to traffic volumes would be SMALL.

E4.8.5.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.8.5.3 Background [GEIS Section 4.8.1.5]

Transportation impacts depend on the size of the workforce, the capacity of the local road network, traffic patterns, and the availability of alternate commuting routes to and from the plant. Because most sites have only a single access road, there is often congestion on these roads during shift changes.

Transportation impacts are ongoing and have become well established during the current licensing term for all nuclear power plants. As previously discussed, it is unlikely that the number of permanent operations workers would increase at a power plant during the license renewal term. In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the numbers of workers, and the months of time conservatively estimated in the 1996 GEIS. Consequently, employment at nuclear power plants during the license renewal term is expected to remain unchanged.

E4.8.5.4 Site-Specific Analysis

As presented in Section E3.9.6 of this ER, the road capacity in the immediate vicinity of VCSNS has an acceptable LOS and should continue to adequately support plant staffing levels during the period of extended operation. As discussed in Section E2.5, there are no plans to add workers to support plant operations at VCSNS during the proposed SLR term. Furthermore, there are no

identified refurbishment activities that would require additional VCSNS staff (see Section E2.3). Therefore, no changes are anticipated for the commuting workforce of VCSNS.

Because no changes to employment are expected from continued operations of VCSNS and no potential refurbishment activities have been proposed that would require a larger workforce, the people living in the VCSNS region are not likely to experience any changes in socioeconomic conditions due to the plant during the VCSNS SLR term beyond the current conditions.

DE finds that impacts to transportation for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.9 HUMAN HEALTH

E4.9.1 RADIATION EXPOSURES TO THE PUBLIC

E4.9.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Radiation doses to the public from continued operations and refurbishment associated with license renewal are expected to continue at current levels and would be well below regulatory limits.

E4.9.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.9.1.3 Background [GEIS Section 4.9.1.1.3]

Radiological exposures from nuclear power plants include offsite doses to members of the public. This impact is common to all commercial U.S. reactors. NRC regulations in 10 CFR Part 20 identify maximum allowable concentrations of radionuclides that can be released from a licensed facility to control radiation exposures of the public. In addition, pursuant to 10 CFR 50.36a, nuclear power reactors have special license conditions requiring minimization of radiological impacts associated with plant operations to ALARA levels. Nuclear power plant releases to the environment must also comply with EPA standards in 40 CFR Part 190. These standards specify limits on the annual dose equivalent from normal operations of uranium fuel-cycle facilities.

In the 2013 license renewal GEIS, the NRC reviewed radiation exposures to the public and states that experience with the design, construction, and operation of nuclear power reactors indicate that compliance with the design objectives of Appendix I to 10 CFR Part 50 will keep average annual releases of radioactive material in effluents at small percentages of the limits specified in 10 CFR

Part 20 and 40 CFR Part 190. No aspect of future operation has been identified that would substantially alter this situation.

E4.9.1.4 Site-Specific Analysis

The proposed action is to continue to operate as currently designed; no refurbishment activities are proposed, so radioactive effluents would be similar to those under current operations.

As discussed in ER Section E3.10.3, VCSNS operates in compliance with NRC effluents standards and reports effluents annually to NRC as required. The dose estimated for 2020 and 2021 are presented in Section E3.10.3 and show that the dose attributable to VCSNS operations are a fraction of the regulatory limits. The annual estimated dose for 2017–2021 to the hypothetical Maximum Exposed Individual (MEI) was a fraction of the regulatory limit with all annual estimated doses being less than 0.4% of the regulatory standard set for the dose parameter (DE. 2020a; DE. 2021b; DE. 2022b; SCE&G. 2018a; SCE&G. 2019a). Because there is no reason to expect effluents to increase in the period of extended operation, annual doses to the public from continued operation are expected to be well within regulatory limits.

The highest annual MEI dose (total body) in the years 2017–2021 was from 2017 operations and was calculated to be 0.33% of the limit (SCE&G. 2018a). Using the 2017 result, 20 years of operation would cumulatively expose this MEI to less than 7% of the annual regulatory limit. A single MEI (i.e., the same person) is unlikely to be in a position for exposure throughout the entirety of a plant's operating years (60 years). Thus, while the exposure year over year would result in a cumulative dose, this cumulative dose would be the sum of annual doses that are a small fraction of the regulatory limit. Again, using the 2017 result, 20 years of operation with this low dose would not approach the permitted exposure for a single year; thus, a 50% increase in cumulative dose remains a low dose.

Radionuclides observed in the environment from REMP sampling in 2021 were within the range of concentrations observed in the past. Radiation dose calculated from the sample results is less than that observed with normal fluctuation in natural background. Results indicated that VCSNS operations have no significant radiological impact on the health and safety of the public or environment. (DE. 2022c)

The concentration of radioactive materials in soils and sediments increases in the environment at a rate that depends on the rate of release and the rate of removal. Removal can take place through radioactive decay or through chemical, biological, or physical processes. For a given rate of release, the concentrations of longer-lived radionuclides and, consequently, the dose rates attributable to them would continue to increase if license renewal was granted. The accumulation of long-lived radionuclides from an additional 20 years of operation would result in a negligible dose (less than 0.1 person-rem) (NRC. 2013b). VCSNS's REMP results discussed above indicate that radioactivity is not accumulating, thus supporting that public dose would be negligible from

continuing operation. VCSNS continues to release radioactive effluents at a fraction of regulatory limits and now after 40 years of operation, REMP results continue to show no adverse trends in levels of radiation and radioactive materials. Continued operation during the first 20-year renewal term and a second 20-year renewal term is expected to likewise show that there is not an accumulation of radioactivity. Furthermore, detecting any adverse trends in REMP results would allow for corrective actions to be implemented and ensuring that public dose whether from short- or long-lived radionuclides remains within regulatory limits.

Continued compliance with NRC radiological effluent limits and implementation of the REMP will ensure that public exposure to radionuclides attributable to VCSNS is well within guidelines and adverse trends are detected to implement corrective actions.

DE finds that radiation doses to the public attributable to VCSNS's operations for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.9.2 RADIATION EXPOSURES TO THE PLANT WORKERS

E4.9.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Occupational doses from continued operations and refurbishment associated with license renewal are expected to be within the range of doses experienced during the current license term and would continue to be well below regulatory limits.

E4.9.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.9.2.3 Background [GEIS Section 4.9.1.1.1]

Radiological exposures from nuclear power plants include onsite doses to the workforce. This impact is common to all commercial U.S. reactors. Nuclear power reactors are required to comply with 10 CFR Part 20, Subpart C, "Occupational Dose Limits for Adults."

In the 2013 license renewal GEIS, the NRC reviewed radiation exposures to plant workers. Occupational dose information collected and reviewed by the NRC in the 2013 license renewal GEIS provides evidence that doses to nearly all radiation workers are far below the worker dose limit established by 10 CFR Part 20 and that the continuing efforts to maintain doses at ALARA levels have been successful. As plants age, there may be slight increases in radioactive inventories, which would result in slight increases in occupational radiation doses. However, it is expected that occupational doses from refurbishment activities associated with license renewal and

occupational doses for continued operations during the license renewal term would be similar to the doses during the current operations.

E4.9.2.4 Site-Specific Analysis

The most recent occupational radiation exposure report (NUREG-0713) presents dose data for NRC licensees through 2019. The average collective dose per reactor at PWRs have trended downward since 2005 (the data year that NRC reviewed in the GEIS) when the average dose per reactor was 79 person-rem with the exception of a slight increase in 2006 to 87 person-rem (NRC. 2022a, Table 4.2 and Figure 4.1). The data set covers 1994–2020 and this longer time frame also shows an overall downward trend for average collective dose per reactor. The middle 50% of collective dose per PWR reactors also trended downward since 2005 as well as since 1994 (NRC. 2022a, Figure 4.4b). The dose performance trend presented for VCSNS shows that since 2005, VCSNS's collective dose per reactor was similar to or well under the PWR average collective dose per reactor with the exception of 2014 (NRC. 2022a, Appendix D). In 2014, VCSNS conducted a steam generator outage and an additional unscheduled outage and also conducted reactor vessel head inspections and repairs.

NRC's previous assessment presented that in 2005 the individual worker dose at PWRs in 2005 were all below 2 rem, less than half of the 5 rem regulatory limit [10CFR 20.1201(a)(1)] (NRC. 2013b). This is also the case for 2020 with the highest dose range experienced for PWR workers being 1.0 to 2.0 rem and involving 43 workers (NRC. 2022a, Appendix B). Of the 1,269 workers monitored at VCSNS in 2020, 468 had a measurable dose and 8 workers had a dose greater than 0.25 rem recorded at VCSNS (NRC. 2022c, Appendix B). The 3-year (2018–2020) average annual occupational dose (TEDE) per worker at VCSNS was 0.062 rem (NRC. 2022a, Table 4.6). The average for pressure water reactor workers for the same time frame is 0.072 rem. The annual TEDE limit is five rems [10 CFR 20.1201(a)(1)]. VCSNS had a 3-year (2018–2020) TEDE collective dose per reactor of approximately 28.268 person-rem and the average for PWRs was 30.352. (NRC. 2022a, Table 4.6) Continued practice of ALARA principles will ensure VCSNS worker's exposure from continued operations remains within regulatory limits and ALARA.

The cumulative dose to a worker would increase with each year worked. However, an individual worker is not likely to be employed at a plant for all 60 years of a reactor's license term plus initial renewal term. That same logic applies even more so to an SLR term; an individual worker is highly unlikely to be employed for 80 years. Therefore, a second license renewal term would not have a cumulative dose impact beyond that considered by NRC's previous assessment to be SMALL.

As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," DE designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at VCSNS. Based on continuing work with industry peer groups as well as Nuclear Energy Institute

and American Nuclear Insurers, there are no substantive changes being developed to nuclear power plant radiation protection programs, currently or during the proposed SLR term.

Occupational doses from continued operations are expected to be within the range of doses experienced during the current licensing term and would continue to be well below regulatory limits.

DE finds that impacts from radiation exposure to plant workers for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.9.3 HUMAN HEALTH IMPACT FROM CHEMICALS

E4.9.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Chemical hazards to plant workers resulting from continued operations and refurbishment associated with license renewal are expected to be minimized by the licensee implementing good industrial hygiene practices as required by permits and federal and state regulations. Chemical releases to the environment and the potential for impacts to the public are expected to be minimized by adherence to discharge limitations of NPDES and other permits.

E4.9.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.9.3.3 Background [GEIS Section 4.9.1.1.2]

Human health impacts from chemicals and physical occupational hazards other than noise are new issues added by the 2013 GEIS. Chemical effects could result from discharge of chlorine or other biocides, small-volume discharges of sanitary and other liquid wastes, heavy metals leached from cooling system piping and condenser tubing in plant wastewater effluents, the use and disposal of chemicals and chemical spills, and use and disposal of hazardous chemicals. These chemical effects could pose human health hazards to the public and workers. In the 2013 license renewal GEIS, the NRC reviewed the potential for human health impacts from the chemical effects and these activities. Federal and state environmental agencies regulate the use, storage, and discharge of chemicals, biocides, and sanitary wastes. These environmental agencies also regulate how facilities like a nuclear power plant manage minor chemical spills. The NRC requires nuclear power plants to operate in compliance with all permits, thereby minimizing adverse impacts to the environment and on workers and the public. It is anticipated that all plants will continue to operate in compliance with all applicable permits, and no additional mitigation measures would be warranted

for the license renewal term. Based on these considerations, the NRC considered the health impact from chemicals to workers and the public to be SMALL for all nuclear plants.

E4.9.3.4 Site-Specific Analysis

Plant workers may encounter hazardous chemicals when the chemistries of the primary and secondary coolant systems are being adjusted, biocides are being applied to address the fouling of cooling system components, equipment containing hazardous oils or other chemicals is being repaired or replaced, solvents are being used for cleaning, or other equipment is being repaired. As discussed in Chapter E9.0, VCSNS operates in compliance with its various wastewater permits and in compliance with waste and chemical management regulations. VCSNS has a chemical control program to oversee the proper use and storage of chemicals onsite and ensure that Safety Data Sheets are available.

Work on the VCSNS site is governed by a comprehensive industrial safety program. The effectiveness of the occupational safety program is indicated by the number of injuries and illnesses experienced by the plant's workers. The VCSNS Occupational Safety and Health Administration (OSHA) form 300A submittals, which report the number of recordable injuries and illnesses experienced by VCSNS workers in a given year, were reviewed for 2017 through 2021. The number of recordable injuries were 11, 7, 0, 2, and 0 for years 2017 to 2021, respectively. Only one of the injuries involved time away from work. VCSNS's average recordable injury and illness incident rate per 100 equivalent full-time workers was 0.6 for 2017–2021. The nuclear electric power generation industry's rate for 2020 was 0.3 and the electrical power generation industry as a whole was 1.1 (BLS. 2021).

The risk of human health impacts from chemicals could increase over time with the accumulation of chemical substances that do not easily biodegrade such as heavy metals and polychlorinated biphenyl (PCBs). With the Monticello Reservoir capturing the plant's wastewater and stormwater, it would be a location to see accumulation (e.g., bioaccumulation) of long-lived chemical substances if that was going to occur onsite. There are no fish consumption advisories for Monticello Reservoir (SCDHEC. 2022b). Thus, with regard to VCSNS operations, there are no indications of an increasing risk to human health from chemicals. Given VCSNS's application of worker safety practices and environmental conditions not indicating adverse impacts, the impacts for this issue with respect to an SLR term for VCSNS are SMALL.

Chemical hazards to plant workers resulting from continued operations associated with license renewal are expected to be minimized by good industrial hygiene practices as required by permits and compliance with federal and state regulations. Chemical releases to the environment and the potential for impacts to the public are expected to be minimized by adherence to discharge limitations of NPDES and other permits and regulatory requirements.

DE finds that impacts to human health from chemicals for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.9.4 MICROBIOLOGICAL HAZARDS TO THE PUBLIC (PLANTS WITH COOLING PONDS OR CANALS, OR COOLING TOWERS THAT DISCHARGE TO A RIVER)

E4.9.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics.

E4.9.4.2 Requirement [10 CFR 51.53(c)(3)(G)]

If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river, an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided.

E4.9.4.3 Background [GEIS Section 4.9.1.1.3]

N. fowleri, which is the pathogenic strain of the free-living amoebae *Naegleria* spp., appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms.

Changes in microbial populations and in the public use of water bodies might occur after the operating license is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affected water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water.

E4.9.4.4 Site-Specific Analysis

Section E3.10.1 describes the thermophilic microorganisms of particular concern at nuclear power plants. Also, Section E3.10.1 mentions that there have been eight reported cases of primary amebic meningoencephalitis in South Carolina from 1962–2020 and no waterborne disease cases for untreated recreational waters in South Carolina attributed to any of the microorganisms of

particular concern in the most recent Centers for Disease Control and Prevention report (CDC. 2019; CDC. 2021).

The temperature of the wastewater effluent as it enters the discharge canal during the summer months is limited by the NPDES permit to a daily maximum of 113°F (Attachment A). The long-term average temperature for the warmer months (March–October) for VCSNS's discharge is 104°F.

The effluent enters the discharge canal about 10 feet below the water surface and then flows through the 1,000-foot discharge canal before entering the Monticello Reservoir. The effluent is diluted by the discharge canal's volume and then further diluted by the large volume of the Monticello Reservoir before reaching public areas.

The NRC requires a one-mile radius exclusion zone surrounding VCSNS. Admittance to this area is restricted. This area, encompassing approximately 7.2 miles of shoreline on the south end of Monticello Reservoir, is designated by warning signs on the landward side and by buoys on the lakeward side (SCE&G. 2018d). Monticello Park is located on the shoreline northeast of the VCSNS discharge beyond the exclusion zone (see Figures E3.1-1 and E3.1-6). Monticello Reservoir has a sub-impoundment on the north end called the Recreational Lake which has a swimming beach. (SCE&G. 2018e)

Public exposure to aerosolized *Legionella* from nuclear plant operations is not a concern because such exposure would be confined to a small area of the site near the MDCT. The cooling tower is within the plant's fenced and security-patrolled protected area.

Given that the thermal discharge is diluted into the Monticello Reservoir waters and the public is restricted from a large area of the southern end of Monticello Reservoir, the public would not be exposed to thermally enhanced waters. Furthermore, while swimming is not restricted, the Monticello Reservoir's swimming beach that draws the greatest number of swimmers is at the north end of the waterbody. Therefore, the microbiological hazard to the public from VCSNS's thermal discharge during the proposed SLR term would be SMALL.

Regulatory Guide 4.2 for license renewal applicants (NRC. 2013b) directs the applicant to consult with the state public health department—in this case, the SCDHEC, regarding concerns about the potential for waterborne disease outbreaks associated with license renewal. Correspondence is included in Attachment E. SCDHEC's response states that the agency does not take exception with DE's conclusion that continued operation of VCSNS would not be expected to adversely affect public health due to exposure to thermophilic pathogens in the Monticello Reservoir.

DE finds that microbiological hazards to the public for the proposed SLR term would pose a SMALL human health impact. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.9.5 MICROBIOLOGICAL HAZARDS TO PLANT WORKERS

E4.9.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures as required by permits and federal and state regulations.

E4.9.5.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.9.5.3 Background [GEIS Section 4.9.1.1.3]

Some microorganisms associated with nuclear power plant cooling towers and thermal discharges can have deleterious impacts on the health of plant workers and the public. Certain microorganisms can benefit from thermal effluents. The potential for adverse health effects from microorganisms on nuclear power plant workers is an issue for plants that use cooling towers. In the 2013 license renewal GEIS, the NRC reviewed microbiological hazards to plant workers. The GEIS discussion of microbiological hazards focuses on the thermophilic microorganisms *Legionella* spp. (which can be a hazard during such activities as cleaning condenser tubes and cooling towers) and the pathogenic amoeba, *Naegieria fowleri* (which can be a hazard in cooling water discharges and also can pose a public health hazard, as addressed under a separate site-specific environmental issue). No change in existing microbiological hazards is expected over the license renewal term. It is considered unlikely that any plants that have not already experienced occupational microbiological hazards would do so during the license renewal term or that hazards would increase over that period. It is anticipated that all plants will continue to employ proven industrial hygiene principles so that adverse occupational health effects associated with microorganisms will be of SMALL significance at all sites.

E4.9.5.4 Site-Specific Analysis

DE has a comprehensive health and safety program with procedures that implement industrial hygiene practices to minimize the potential for plant worker exposure.

Exposure to *Legionella* spp. from power plant operations is a potential problem for a subset of the workforce. Plant personnel most likely to come into contact with *Legionella* aerosols would be those who dislodge biofilms, where *Legionella* are often concentrated, such as during the cleaning of condenser tubes and cooling towers (NRC. 2013b, Section 3.9.3.3). VCSNS uses a once-through cooling water system for its condenser cooling water. The plant has a MDCT for other process

water cooling. Condenser maintenance involves waterbox entry during outages which is covered by the plant's confined space program that addresses monitoring of the atmosphere prior to entry and use of respiratory protection as appropriate.

VCSNS has a sanitary wastewater treatment and has licensed staff to operate the plant. The sanitary wastewater treatment system consists of two dosing tanks, an aeration basin with six aerators, two sand filters, two chlorination basins, and two dechlorination basins. The system's discharge is NPDES internal outfall 005 which has *Escherichia coli* limits (Attachment A). Outfall 005 combines with additional plant wastewater and discharges through Outfall 014 to the VCSNS discharge canal about a foot below the water surface.

Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices and VCSNS has a comprehensive occupational safety program to minimize worker exposures as required by permits and federal and state regulations. Thus, DE finds that microbiological hazards to plant workers during the proposed SLR term would be SMALL.

DE is not proposing changes in the cooling water system or sanitary wastewater treatment and disposal. Further, should the need for changes in these systems arise, they would be carried out under state wastewater permits. The human health impact from the microbiological organisms mentioned above are from acute exposure rather than chronic exposure.

DE finds that impacts from microbiological hazards to plant workers for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.9.6 PHYSICAL OCCUPATIONAL HAZARDS

E4.9.6.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Occupational safety and health hazards are generic to all types of electrical generating stations, including nuclear power plants, and are of SMALL significance if the workers adhere to safety standards and use protective equipment as required by federal and state regulations.

E4.9.6.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.9.6.3 Background [GEIS Section 4.9.1.1.5]

This issue addresses the potential for workers at a nuclear plant to have human health impacts from physical occupational hazards (e.g., slips and trips, falls from height, and those related to transportation, temperature, humidity, electricity, noise, and vibration). The NRC evaluated the

issue of occupational hazards by comparing the rate of fatal injuries and nonfatal occupational injuries and illnesses in the utility sector with the rate in all industries combined. The utility sector rates were lower than those of many other sectors. It is expected that over the license renewal term, workers would continue to adhere to safety standards and use protective equipment, so adverse occupational impacts would be of SMALL significance at all sites.

E4.9.6.4 Site-Specific Analysis

Plant conditions which result in an occupational risk, but do not affect the safety of licensed radioactive materials, are under the statutory authority of OSHA. VCSNS adheres to OSHA standard 29 CFR Part 1910 Subpart R, Special Industries, as it relates to Electric Power Generation, Transmission and Distribution (29 CFR Part 1910.269).

Work on the VCSNS site is governed by a comprehensive industrial safety program. The program addresses electrical safety, use of ladders and portable equipment, etc. As discussed in Section E4.9.3.4, VCSNS's number of recordable injuries reported to OSHA were 11, 7, 0, 2, and 0 for years 2017 to 2021 only one of which involved time away from work.

The human health impact from most physical hazards would be due to singular events (e.g., fall) which do not accumulate. The exception would be physical hazards that have a chronic exposure component such as sound level exposure. OSHA regulations address such precautions and continued compliance with OSHA regulations for exposure and use of personal protective equipment. Given (1) VCSNS has a comprehensive occupational safety program designed to address OSHA safety standards and use of protective equipment, (2) has a low incidence of OSHA-recordable work-related injuries and illnesses, and (3) VCSNS workers' adherence to safety standards and use of protective equipment, physical occupational hazards during the proposed SLR term would be SMALL.

DE finds that impacts from physical occupational hazards for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, analyzed here, SMALL.

E4.9.7 ELECTRIC SHOCK HAZARDS

E4.9.7.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Electrical shock potential is of small significance for transmission lines that are operated in adherence with the NESC. Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential.

E4.9.7.2 Requirement [10 CFR 51.53(c)(3)(iv)]

If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided.

E4.9.7.3 Background [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 milliamperes (mA). With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received operating licenses with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines, within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically.

E4.9.7.4 Site-Specific Analysis

As discussed in Section E3.10.2, the three in-scope transmission lines between the Turbine Building and the Unit 1 switchyard are within the owner-controlled area of VCSNS and does not present an electric shock risk to the public. Work on and near these lines is governed by plant procedures and VCSNS's comprehensive health and safety program.

As discussed in Section E3.10.2, the in-scope transmission line originating at Parr Generating Complex, Parr 115-kV line, is in compliance with NESC and is subject to periodic inspections and maintenance to ensure that compliance with NESC is maintained.

DE finds that impacts to human health from electric shock hazards for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.10 ENVIRONMENTAL JUSTICE

E4.10.1 MINORITY AND LOW-INCOME POPULATIONS

E4.10.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

Impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See NRC Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (69 FR 52040, August 24, 2004).

E4.10.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(N)]

Applicants shall provide information on the general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant that could be affected by the renewal of the plant's operating license, including any planned refurbishment activities, and ongoing and future plant operations.

E4.10.1.3 Background [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from operating a nuclear power plant.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels

of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites in order to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

E4.10.1.4 Site-Specific Analysis

E4.10.1.4.1 Refurbishment Activities

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

E4.10.1.4.2 Operational Activities

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. DE's analyses of the issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of VCSNS during the proposed SLR operating term would either be SMALL or non-adverse. Therefore, high or adverse impacts to the general human population would not occur.

As described in Section E3.10, DE maintains a REMP. With this program, DE monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding VCSNS. The results of the program indicate VCSNS has created no adverse environmental effects or health hazards. Therefore, no environmental pathways have been adversely impacted and are not anticipated to be impacted during the VCSNS proposed SLR operating term.

Section E3.11.2 identifies the locations of minority and low-income populations as defined by NRR Office Instruction LIC-203 (NRC. 2020c). Section E3.11.3 describes the search for subsistence-like populations near VCSNS, of which none were found. The figures accompanying Section E3.11.2 show the locations of minority and low-income populations within a 50-mile radius of VCSNS. None of those locations, when considered in the context of impact pathways, or cumulative impact pathways, described in this chapter, are expected to be disproportionately impacted.

Therefore, no disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations, are anticipated as a result of the proposed SLR.

E4.11 WASTE MANAGEMENT

E4.11.1 LOW-LEVEL WASTE STORAGE AND DISPOSAL

E4.11.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment would remain small during the license renewal term.

E4.11.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.11.1.3 Background [GEIS Section 4.11.1.1]

The NRC believes that the comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts on the environment will remain SMALL during the term of a renewed license. The maximum additional onsite land that may be required for low-level waste (LLW) storage during the term of a renewed license and associated impacts would be SMALL. Nonradiological impacts on air and water would be negligible. The radiological and nonradiological environmental impacts of long-term disposal of LLW from any individual plant at licensed sites are SMALL. In addition, the NRC concludes that there is reasonable assurance that sufficient LLW disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

E4.11.1.4 Site-Specific Analysis

VCSNS would continue to manage and store LLRW onsite in accordance with NRC regulations and dispose of LLRW in NRC-licensed treatment and disposal facilities during the proposed SLR operating term. VCSNS does not have planned modifications to plant processes that would increase LLRW generation and does not anticipate an increase in LLW from normal operations. Prior to shipping LLRW offsite for processing or disposal, VCSNS would continue to manage and store LLRW onsite in accordance with NRC regulations. VCSNS reports on its LLRW shipping to disposal and treatment facilities in the ARERR (DE. 2022b). VCSNS ships LLRW to NRC-licensed treatment and disposal facilities and would continue to do so during the proposed SLR term. Discussed above in Section E4.9.1, VCSNS estimated public dose was controlled within radiation protection standards and REMP sampling and analysis do not indicate an adverse trend in radioactivity attributable to VCSNS operations.

The radiological impacts from disposal of waste generated during a SLR term has the potential to increase as long-lived radionuclides accumulate at disposal facilities. However, the disposal facilities would be licensed, which means the facility would have a design including design capacity and conditions of operation to minimize environmental impacts.

Given that there are comprehensive regulatory controls in place and VCSNS complies with these regulations and given that DE uses licensed treatment and disposal facilities, impacts from the storage and disposal of LLRW would remain SMALL during the proposed SLR term.

DE finds that impacts from LLRW waste storage and disposal for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.11.2 ONSITE STORAGE OF SPENT NUCLEAR FUEL

E4.11.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

Fuel from an additional 20 years of operation can be safely accommodated onsite during the license renewal term with small environmental impacts through dry or pool storage at all plants.

For the period after the licensed life for reactor operations, the impacts of onsite storage of spent nuclear fuel during the continued storage period are discussed in NUREG-2157 and as stated in §51.23(b), shall be deemed incorporated into this issue.

E4.11.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.11.2.3 Background [GEIS Section 4.11.1.2]

As discussed in Section 3.11.1.2 (GEIS), spent nuclear fuel is currently stored at reactor sites either in spent fuel pools or in ISFSIs. The storage of spent fuel in spent fuel pools was considered for each plant in the safety and environmental reviews at the construction permit and operating license stage. This onsite storage of spent fuel and high-level waste is expected to continue into the foreseeable future.

Interim storage needs vary among plants, with older units likely to lose pool storage capacity sooner than newer ones. Given the uncertainties regarding the final disposition of spent fuel and high-level waste, it is expected that expanded spent fuel storage capacity will be needed at all nuclear power plants.

E4.11.2.4 Site-Specific Analysis

For onsite storage of spent fuel during the license renewal term, Table B-1 was amended after the 2013 GEIS by the Continued Storage Rule (79 FR 56238) to codify the Commission's determination that the impacts would be SMALL. This rulemaking postdates the license renewal GEIS rulemaking in 2013, and the Commission's codified impact determination was not overturned by the NRC's CLI-22-02 Order. The Continued Storage Rulemaking explicitly considered subsequent license renewals, stating in Footnote 3 at 79 FR 56245, "The Commission's regulations provide that renewed operating licenses may be subsequently renewed…The GEIS [Continued Storage of Spent Nuclear Fuel GEIS] assumes two renewals in evaluating potential environmental impacts." Pursuant to the Commission's generic analysis and codified conclusion, the impacts of onsite storage of spent fuel during the SLR term at VCSNS are SMALL.

As presented in Section E2.2.6.4, VCSNS stores its SNF onsite in the Unit 1 spent fuel pool and in dry storage in the onsite ISFSI in compliance with the plant's license.

Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are SMALL.

E4.11.3 OFFSITE RADIOLOGICAL IMPACTS OF SPENT NUCLEAR FUEL AND HIGH-LEVEL WASTE DISPOSAL

E4.11.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

For the high-level waste and spent-fuel disposal component of the fuel cycle, the EPA established a dose limit of 0.15 millisievert (mSv) (15 millirem) per year for the first 10,000 years and 1.0 mSv (100 millirem) per year between 10,000 years and 1 million years for offsite releases of radionuclides at the proposed repository at Yucca Mountain, Nevada.

The Commission concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, this issue is considered Category 1.

E4.11.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable Category 1 environmental issues is required to be included in SLRA ERs.

E4.11.3.3 Background [GEIS Section 4.11.1.3]

As a result of the *New York v. NRC* decision and pending the issuance of a generic EIS and revised Waste Confidence Decision and Rule, the NRC has revised the Category 1 issue, "Offsite radiological impacts of spent nuclear fuel and high-level waste disposal." This issue pertained to the long-term disposal of spent nuclear fuel and high-level waste, including possible disposal in a deep geologic repository. Although the Waste Confidence Decision and Rule did not assess the impacts associated with disposal of spent nuclear fuel and high-level waste in a repository, it did reflect the Commission's confidence, at the time, in the technical feasibility of a repository and when that repository could have been expected to become available. Without the analysis in the Waste Confidence Decision, the NRC cannot assess how long the spent fuel will need to be stored onsite. Therefore, the NRC reclassifies this GEIS issue from a Category 1 issue with no assigned impact level to an uncategorized issue with an impact level of uncertain. Moreover, the ultimate disposal of spent nuclear fuel in a potential future geologic repository is a separate and independent licensing action that is outside the regulatory scope of license renewal.

E4.11.3.4 Site-Specific Analysis

The final continued storage of nuclear spent fuel rulemaking [79 FR 56238] postdates the license renewal GEIS rulemaking in 2013, and the Commission's codified impact determination was not overturned by the NRC's CLI-22-02 Order. The Continued Storage Rulemaking explicitly considered SLRs, stating in Footnote 3 at 79 FR 56238, pg. 56245: "The Commission's regulations provide that renewed OLs may be subsequently renewed. The GEIS [Continued Storage of Spent Nuclear Fuel GEIS] assumes two renewals in evaluating potential environmental impacts." Thus, pursuant to the Commission's codified conclusion, the offsite radiological impacts of SNF and high-level waste disposal for one SLR term at VCSNS are analyzed in the Continued Storage GEIS with no impact level assigned.

E4.11.4 MIXED-WASTE STORAGE AND DISPOSAL

E4.11.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal would not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small.

E4.11.4.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.11.4.3 Background [GEIS Section 4.11.1.4]

Mixed waste is regulated both by the EPA or the authorized state agency under RCRA and by the NRC or the agreement state agency under the AEA; Public Law 83-703. The waste is either treated onsite or sent offsite for treatment followed by disposal at a permitted landfill. The comprehensive regulatory controls and the facilities and procedures that are in place at nuclear power plants ensure that the mixed waste is properly handled and stored and that doses to and exposure to toxic materials by the public and the environment are negligible at all plants. License renewal will not increase the small but continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts from the long-term disposal of mixed waste at any individual plant at licensed sites are considered SMALL for all sites.

E4.11.4.4 Site-Specific Analysis

VCSNS's systems for managing radioactive and hazardous waste are presented in Sections E2.2.6 and E2.2.7. VCSNS is a LQG for hazardous waste. VCSNS routinely generates mixed waste, primarily used oil. VCSNS received a conditional exemption per R.61-79.266, Section 266 Subpart N for onsite storage of mixed waste from SCDHEC in 2005. VCSNS has procedures for shipping mixed waste in accordance with federal and state regulations.

As discussed in ER Section E3.10.3, radionuclides observed in the environment in 2021 from VCSNS releases were within the range of concentrations observed in the past. Radiation dose calculated from the sample results is less than that observed with normal fluctuation in natural background. VCSNS operations have no significant radiological impact on the health and safety of the public or environment. (DE. 2022c)

Based on review of its compliance history for the previous five years (2017–2021), VCSNS has not received any NOVs for hazardous waste management.

The radiological and nonradiological impacts from disposal of mixed waste generated during a SLR term has the potential to increase as long-lived radionuclides and toxic metals accumulate at disposal facilities. However, the disposal facilities would be permitted and licensed, which means the facility would have a design and conditions of operation to minimize environmental impacts.

VCSNS's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of mixed waste during the proposed SLR term.

DE finds that impacts from mixed-waste storage and disposal for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.11.5 NONRADIOACTIVE WASTE STORAGE AND DISPOSAL

E4.11.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. No changes to systems that generate nonradioactive waste are anticipated during the license renewal term. Facilities and procedures are in place to ensure continued proper handling, storage, and disposal, as well as negligible exposure to toxic materials for the public and the environment at all plants.

E4.11.5.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.11.5.3 Background [GEIS Section 4.11.1.5]

The management of hazardous wastes generated at all of these facilities, both onsite and offsite, is strictly regulated by the EPA or the responsible state agencies per the requirements of RCRA. As does any industrial facility, nuclear power plants and the rest of the uranium fuel cycle facilities also generate nonradioactive nonhazardous waste. These wastes are managed by following good housekeeping practices and are generally disposed of in local landfills permitted under RCRA Subtitle D regulations.

In the 1996 GEIS, the impacts associated with managing nonradioactive wastes at uranium fuel cycle facilities, including nuclear power plants, were found to be SMALL. It was indicated that no changes to nonradioactive waste generation would be anticipated for license renewal, and that systems and procedures are in place to ensure continued proper handling and disposal of the wastes at all plants.

E4.11.5.4 Site-Specific Analysis

VCSNS's systems for managing radioactive and hazardous waste are presented in Sections E2.2.6 and E2.2.7. VCSNS is an LQG for hazardous waste. VCSNS manages its nonradioactive waste streams including hazardous, universal, and solid wastes according to VCSNS procedures. VCSNS has a chemical control procedure. DE addresses waste minimization through its corporate policy, waste management programs, site-specific procedures, practices or guidelines, job hazard analyses and pre-job briefs, training of employees and contract workers, and through regulatory

compliance and corrective actions. The corporate policy established an Environmental Management System that includes as one of its practices to "Ensure the proper handling and disposal of wastes, and minimize waste creation, discharges and emissions while pursuing opportunities to prevent pollution, reduce carbon emissions and recycle and reuse waste materials."

Based on review of its compliance history for the previous five years (2017–2021), VCSNS has not received any NOVs for hazardous waste management.

VCSNS would continue to store and dispose of or recycle hazardous and nonhazardous wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed SLR operating term.

Impacts from disposal of hazardous waste generated during a SLR term has the potential to increase as long-lived toxic metals (those that do not easily biodegrade) accumulate at disposal facilities. However, the disposal facilities would be permitted, which means the facility would have a design and conditions of operation to minimize environmental impacts.

VCSNS's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of nonradioactive waste during the proposed SLR term.

DE finds that impacts from nonradioactive waste storage and disposal for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.12 CUMULATIVE IMPACTS

E4.12.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

Cumulative impacts of continued operations and refurbishment associated with license renewal must be considered on a plant-specific basis. Impacts would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource.

E4.12.2 REQUIREMENT [10 CFR 51.53(C)(3)(II)(O)]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect.

E4.12.3 BACKGROUND [GEIS SECTION 4.13]

Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative

impacts analysis takes into account all actions, however minor since impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region to cumulative impacts are regulated and monitored through a permitting process (e.g., NPDES) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

E4.12.4 SITE-SPECIFIC ANALYSIS

Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of VCSNS during the proposed SLR operating term with past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such actions.

DE considered potential cumulative impacts during the license renewal period in its environmental analysis associated with the resources discussed in the following sections. For the purpose of this analysis, past actions are those related to the resources at the time of plant licensing and construction, present actions are those related to the resources at the time of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of plant operation, which would include the 20-year subsequent license renewal term. These criteria are in line with Regulatory Guide 4.2, Supplement 1, Rev. 1 (NRC. 2013b), The geographic area over which past, present, and future actions would occur is dependent on the type of action considered and is described below for each impact area.

The impacts of the proposed action are combined with other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor, but collectively significant, actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

As discussed in Section E3.10.3, no subsequent license renewal-related refurbishment activities have been identified. As indicated in Section E3.1.4, no major changes to VCSNS Unit 1 operations or plans for future expansion of plant infrastructure during the SLR term, are anticipated. The effects of past actions are already reflected in the description of the affected environment in Chapter E3.0. VCSNS has determined that the current onsite ISFSI pad has enough space for

canister storage to operate through an 80-year period of operation, and therefore no expansion is required or planned. Therefore, planning the expansion of the VCSNS ISFSI for the proposed SLR operating term is not reasonably foreseeable. Further, ISFSI expansion plans would depend on the status of the DOE's future performance of its obligation to accept SNF or the availability of other interim storage options. If future planning includes the expansion of VCSNS ISFSI storage capabilities on site during the SLR period of extended operation, there is more than sufficient room to expand the ISFSI in the previously disturbed area adjacent to the existing pad. This would cause no significant environmental impact.

Section E3.1.4 describes other projects in the vicinity of VCSNS. The largest project is the Units 2 and 3 salvage and closeout projects. Decommissioning work on the former firing range adjacent to the Broad River has been completed.

The NRC completed a cumulative impacts assessment of VCSNS operations during the initial license renewal term. In summary, the NRC concluded that for each impact area, the potential cumulative impacts resulting from VCSNS operations during the license renewal period would be SMALL and mitigation is not warranted (NRC. 2004b, Section 4.8).

E4.12.4.1 Land Use and Visual Resources

The land use impact of VCSNS is characterized as SMALL in Section E4.1. As described in Section E3.1.4, there are currently no planned projects for the VCSNS site; therefore, nothing is expected to require a change in land use. As described in Section E3.1.1 and illustrated in Figure E3.1-3, the VCSNS vicinity falls within rural portions of Fairfield, Newberry, and Richland Counties. Most of the Monticello Reservoir falls inside the vicinity. As discussed in Section E3.2.1, VCSNS is zoned as an Industrial District (I-1) according to the Fairfield County Zoning Map and the Land Management Ordinance.

Based on the projects listed in Section E3.1.4, there are no land use changes anticipated in the vicinity of VCSNS. Therefore, the cumulative land use impact of VCSNS and other reasonably foreseeable projects in the region would be SMALL.

As stated in Section E3.2.3, the surrounding area is sparsely populated with forestry representing the most extensive land use within the vicinity providing some screening of predominate visual features of the site, these features are visible in some areas. However, the continued use of existing structures associated with VCSNS would not alter their visual impact. The visual characteristics of other reasonably foreseeable projects in the region are surface projects that will not contribute to cumulative visual impacts. Because the visual impacts due to VCSNS are SMALL and are not expected to change or to contribute to other projects, the cumulative visual impacts are expected to be SMALL.

E4.12.4.2 Air Quality and Noise

E4.12.4.2.1 Air Quality

Section E3.3.3 discusses regional air quality and VCSNS air emission sources. All of the counties within 62 miles of the site are in attainment. Four counties in the 62 miles surrounding the site in the Metropolitan Charlotte Intrastate AQCR designated as maintenance areas for 8-hour Ozone (2008). Mecklenburg County, South Carolina, is also designated as a maintenance area for CO (1971). Also as presented in Section E3.3.3, there is no mandatory Class I federal areas within 100 miles of VCSNS.

VCSNS air pollutant emissions are minimal and stem from intermittent use, maintenance and testing of stationary diesel generators and fire pumps and an auxiliary boiler during outages. The planned projects listed in Section E3.1.4 could result in localized temporary air emissions from construction and demolition equipment. Implementing fugitive dust BMPs and maintaining portable equipment in proper working order would minimize air emissions. Compliance with the existing air permit and any future permit would minimize impacts to air quality.

Section E3.2.2 describes the area surrounding VCSNS as rural and undeveloped. The state of South Carolina provides local governments with the authority to implement and enforce zoning regulations. The future land use changes for the area surrounding VCSNS are anticipated to change due to growth in population and development however, the growth is expected to be slow and at a low rate. Therefore, land uses adjacent to the site are expected to remain the same and are not expected to have air emission sources. The area will continue to experience air emissions from vehicles on the adjacent roadways and boating on the Monticello Reservoir. Any air emissions from future projects would be subject to state air permitting and regulations. The cumulative air quality impact would be SMALL.

E4.12.4.2.2 Climate Change

Climate change can impact air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels have been found to be particularly sensitive to climate change influences. Sunshine, high temperatures and air stagnation are favorable meteorological conditions leading to higher levels of ozone. Although surface temperatures are expected to increase, ozone levels will not necessarily increase because ozone formation is also dependent on the relative amount of precursors available. The combination of higher temperatures, stagnant air masses, sunlight, and emissions of precursors may make it difficult to meet ozone NAAQS. States, however, must continue to comply with the CAA and ensure air quality standards are met. (NRC. 2015)

Given that climate change trends in air temperature and precipitation are increasing but continued operation would contribute only small emissions of GHG from minor air emission sources, the

cumulative impact on climate change from present and future actions would be SMALL. Moreover, continued operation of VCSNS avoids millions of tons of carbon dioxide (CO_2) from alternative fossil-fuel generation (Section E7.2.3.1.3), positively impacting the climate change factor of CO_2 concentrations.

E4.12.4.2.3 Noise

The surrounding land use discussed above in Section E4.12.1 is rural and no development is reasonably foreseeable. Noise impacts would be limited to these rural areas (Figure E3.1-3). Therefore, cumulative noise impacts from continued plant operations over the license renewal term would be SMALL and the expected noise impacts from the projects listed in Section E3.1.4 would be SMALL and limited in duration, cumulative noise impacts would be SMALL.

E4.12.4.3 Geology and Soils

Cumulative impacts to geology and soils could result from ground-disturbing activities and stormwater runoff. As noted in Section E2.3, DE has no plans to conduct license-renewal-related refurbishment or replacement activities. Section E3.1.4 discusses future projects in the vicinity.

Although no changes in land use that would affect geology and soils are reasonably foreseeable, any onsite ground-disturbing activities during the proposed SLR operating term would be governed by a stormwater construction permit and/or the SWPPP. Ground disturbances at VCSNS would be limited to the current site area, subject to construction and stormwater permitting and applicable BMPs; therefore, the cumulative impact on geology and soils would be SMALL.

E4.12.4.4 Water Resources

E4.12.4.4.1 Surface Water

Cumulative impacts on surface water resources relate to issues concerning water use and quality (NRC. 2013a). Any modifications to surface water withdrawal would be regulated by a SDHEC Surface Water Withdrawal Permit. Surface water conflicts would be considered by SDHEC prior to issuance of the permit. As described in Section E3.1.4, there are no plant operations or modifications planned for the proposed SLR operating term including any modifications that would alter current patterns at the intake and discharge systems. Therefore, the cumulative impact to surface water use conflicts would be SMALL.

Details of surface water discharges and associated permits are discussed in Section E3.6.1.2.1. Sections E9.3, E9.4, and E3.6.1.2.5 list NOVs and/or permit exceedances and the efforts made to resolve them. As presented in Chapter E9.0, VCSNS complies with its discharge limits and conditions. As discussed in Section E9.5.3, VCSNS holds a 401 Water Quality Certification Waiver. As discussed in Section E3.6.4.1, there are impaired waters identified near VCSNS. VCSNS is in

compliance with its permits (Section E3.6.1.2.1) and does not contribute to these impairments. Therefore, the cumulative impact to surface water quality would be SMALL.

Given VCSNS compliance with its surface water withdrawal and discharge permits and regulations, VCSNS would have a SMALL contribution to any surface water quality cumulative impact.

E4.12.4.4.2 Groundwater

Cumulative impacts on groundwater resources relate to issues concerning water use and quality. Impacts typically result from the water demands associated with urban, industrial, and commercial, and agricultural development. (NRC. 2013a)

As discussed in Section E3.6.3.1, all of the water used by VCSNS is withdrawn from Monticello Reservoir. As stated in Section E3.6.3.2, drinking water at VCSNS is provided by surface water from the Monticello Reservoir. With the exception of monitoring wells and dewatering wells, no groundwater is withdrawn from the site as part of plant operations.

It is not anticipated that groundwater withdrawal for operations will be required during the SLR operating term. As presented previously, land development in the VCSNS vicinity is not anticipated. VCSNS will continue to maintain and implement its site-specific spill prevention plans to prevent spills that would contaminate soils, groundwater, and surface water during the proposed SLR operating term. Therefore, the cumulative impact to groundwater resources would be SMALL.

E4.12.4.4.3 Climate Change

Climate change can affect the availability of water resources due to climatic changes such as changes in temperature and precipitation patterns. The availability of water is expected to reduce due to warmer temperatures and increased evaporation. Warmer water and higher air temperatures can reduce the efficiency of thermal power plant cooling technologies. In addition, discharge-permit conditions may limit operations for some power plants as water temperatures rise. According to the EPA, as average temperatures increase, evaporation and average rainfall is likely to decrease in some places while increasing in other places. The increased evaporation and changes in decreased rainfall are both likely to impact the average flow of rivers and streams. The temperatures of South Carolina have increased by 0.5 to one degree Fahrenheit in the last century. (NRC. 2013a; EPA. 2022f)

An increase in ambient temperature of one degree Fahrenheit in a century would not affect water temperatures through the SLR period. As such, no changes in the Monticello Reservoir water temperatures are reasonably foreseeable. As presented in Section E3.6.1, the theoretical maximum consumptive losses at VCSNS are a small percentage of permitted withdrawals. VCSNS operations do not require groundwater withdrawals. Because VCSNS complies with its permitted withdrawal limits, its contribution to the cumulative impacts on water availability would be SMALL.

Given that the continued operation would have a small impact on water resources and its continued operation would avoid millions of tons of CO_2 from alternative fossil-fuel generation, the continued operation of VCSNS could be viewed as a net beneficial contribution to climate change impacts.

E4.12.4.5 Ecological Resources

E4.12.4.5.1 Terrestrial

The impacts on terrestrial species during the proposed subsequent license renewal period are described as SMALL in Sections E4.6.1.4, E4.6.2.4, E4.6.3.4, E4.6.4.4, E4.6.5.4, E4.6.6.4, E4.6.7.4, and E4.6.8.4. The continued operation of VCSNS is governed by regulations, procedures and plans designed to minimized adverse impacts on terrestrial species. As discussed in Section E9.6, DE has administrative controls in place at VCSNS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. Successful application of the regulations, procedures, plans, and administrative controls would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce disturbance of wildlife in adjacent habitats could greatly reduce the impacts of continued operations (NRC. 2013a). Regulatory programs that the site is currently subject to such as stormwater management, spill prevention, dredging, and herbicide usage further serve to minimize impacts to terrestrial resources. With continued application of these programs and procedures, the land-based impacts would largely be confined to VCSNS property and would have minimal opportunity to contribute to cumulative impacts.

As discussed in Sections E3.7.8.1, E3.7.8.2, and E4.6.23.4 habitat for federally and state-listed terrestrial species does occur on the VCSNS site. However, adherence to regulatory and permit requirements to avoid take of protected species and DE administrative controls such as those regarding response to avian collisions with transmission lines minimize or avoid impact to these species. Impacts to threatened, endangered, and protected species are discussed in Section E4.6.23.4. DE is not aware of any adverse impacts regarding threatened, endangered, and protected species attributable to the site. Maintenance activities necessary to support license renewal likely would be limited to previously disturbed areas onsite of the VCSNS site. As such, there is no contribution to cumulative impacts on protected species from VCSNS. Overall, the cumulative impacts to terrestrial ecological resources is anticipated to be SMALL.

E4.12.4.5.2 Aquatic

The impacts on aquatic ecological communities during the proposed subsequent license renewal period are described as SMALL in Sections E4.6.9.4, E4.6.10.4, E4.6.11.4, E4.6.12.4, E4.6.13.4, E4.6.14.4, E4.6.15.4, E4.6.16.4, E4.6.17.4, E4.6.18.4, E4.6.19.4, E4.6.20.4, E4.6.21.4, and

E4.6.22.4. Ongoing studies ensure that VCSNS continues to use the BTA to minimize entrainment and impingement and comply with the NPDES permit. As stated in Section E3.7.8.5, no EFH is located within the vicinity of VCSNS, nor were any EFH areas protected from fishing. As HAPCs are derived from EFH, there were also no HAPCs located within the 6-mile vicinity of VCSNS. Thus, the continued operation of the VCSNS site for the proposed operating term will have no impact on EFH.

Because VCSNS commissions ongoing studies, uses the BTA and complies with the NPDES permit, it is not expected to contribute to cumulative aquatic ecological impacts in the region.

E4.12.4.6 Climate Change

Global climate change could cause shifts in species' ranges and migratory corridors for terrestrial resources, as well as changes in ecological processes (NRC. 2013a). According to the EPA, climate change is not expected to substantially change forest cover in South Carolina that would cause changes in habitat (EPA. 2022f).

As discussed in Section E9.6, DE has administrative controls in place at VCSNS to ensure that operational changes or construction activities are reviewed and impacts on environmentally sensitive areas are minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. As discussed in Section E3.7.2.6, adherence to regulatory and permit requirements to avoid take of protected species and DE administrative controls such as those regarding response to avian collisions with transmission lines will minimize or avoid impact to terrestrial species. Therefore, cumulative impacts of climate change and VCSNS activities on terrestrial species would be SMALL.

The potential effects of climate change, whether from natural cycles or related manmade activities, could result in a variety of changes that would affect inland and coastal aquatic resources (NRC. 2013a). According to the EPA, as average temperatures increase evaporation, average rainfall is likely to decrease in some places and increase in others. The increased evaporation and changes in rainfall are likely to impact the average flow of rivers and streams (EPA. 2022f). However, the impact to the Monticello Reservoir is not reasonably predictable for the SLR term. As presented in Section E4.12.4, VCSNS is in compliance with its NPDES permits. Any changes in conditions in the Monticello Reservoir are expected to be addressed in subsequent reviews of the NPDES permit. As such, impacts to aquatic species, in the Monticello Reservoir, are not expected to contribute to cumulative aquatic ecological impacts for the region. Therefore, the continued operation of VCSNS would be a small contributor to climate change effects that impact vulnerable aquatic species due to rising temperature. Therefore, cumulative impacts to aquatic ecological communities from VCSNS, and climate change are anticipated to be SMALL during the SLR period.

E4.12.4.7 Historic and Cultural Resources

As presented in Section E2.3, there are no refurbishment activities or other construction activities currently planned to support SLR operations. Therefore, the SLR consists of an administrative action relative to historic and cultural resources. Although construction of the existing VCSNS facility itself would have impacted any archaeological resources that may have been located within its footprint, much of the surrounding area remains largely undisturbed. As stated in Section E4.7.4.2, DE has administrative procedural controls in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. Section E4.7.4.2 also states that there will be no adverse effects on historic and cultural resources as a result of continued operations of VCSNS during the SLR term. Therefore, no cumulative adverse effects are anticipated to cultural resources on the site during the proposed SLR operating term or due to reasonably foreseeable future projects.

E4.12.4.8 Socioeconomics

As discussed in Section E2.5, the proposed SLR does not include plans to add permanent workers, so the SMALL adverse impacts that are the result of workers' impact on community services, education, and infrastructure including transportation would not change. Tax payments from the operating plant (Section E3.9.5) are anticipated to continue without significant change through the SLR period. The economic contributions of the plant's workers would remain the same. Thus, significant beneficial socioeconomic impacts would also continue during the proposed SLR operating term. Therefore, the cumulative impact contribution of the plant on socioeconomic impacts will be SMALL beneficial.

E4.12.4.9 Human Health

E4.12.4.9.1 Microbiological Hazards

Nonradiological human health impacts occur with temperatures optimal to grow thermophilic organisms such as those listed in Section E3.10.1. As mentioned in Sections E3.10.1 and E4.9.4.4 these temperatures occur in the discharge canal about 10 feet below the water surface where it flows 1,000 feet before entering the Monticello Reservoir. However, public access to the discharge canal in the southern portion of the Monticello reservoir is restricted. Section E4.9.1.4 concluded stating that public risk is SMALL. There are no other thermal discharges near VCSNS. Therefore, the VCSNS's thermal discharge would not contribute to any other thermal discharges since there would be no overlap. Therefore, the cumulative nonradiological health impact is SMALL.

E4.12.4.9.2 Electric Shock Hazards

Compliance with NESC and VCSNS procedures minimize occupational risk from electrical shock hazards (Section E4.9.7.4). As described in Section E2.2.5.5, VCSNS maintains safety-specific policies for all work conducted at electrical transmission locations. Therefore, cumulative impacts to human health from nonradiological hazards are not expected. The cumulative impacts on human health are expected to be SMALL.

E4.12.4.9.3 Radiological Hazards

Radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impacts of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR 20 and 40 CFR 190. For this analysis, the region of influence is the surrounding 50-mile region.

As presented in Section E3.10.3, VCSNS prepares ARERRs. The report for 2021 indicate that doses to members of the public comply with NRC and EPA radiation protection standards and have no significant radiological impact on the health and safety of the public or environment. The three-year (2017–2019) average annual occupational dose TEDE was 0.059 rem. The annual TEDE limit is five rems [10 CFR 20.1201(a)(1)]. No other nuclear power facilities were presented in Section E3.1.1 as being within 50 miles of the site.

The Columbia Fuel Fabrication Facility is located approximately 36 miles southeast of the plant (NRC. 2022b). The facility complies with all of its emission goals, meeting its regulatory obligations for both public exposure and occupations dose (NRC. 2019a).

The cumulative impact of VCSNS's VCSNS operation and any other radiation sources would be expected to be SMALL because all routine releases and occupational exposure would be subject to federal regulations. Therefore, operating VCSNS for an additional 20-year period would not cause an increase in annual radioactive effluent releases.

E4.12.4.10 Waste Management

As presented in Section E2.2.6, the comprehensive regulatory controls in place for management of radiological waste and DE's compliance with these regulations and use of only licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed SLR operating term. The NRC oversees the licensing of radiological waste treatment and disposal facilities. There are four facilities providing LLRW disposal services in the United States (NRC. 2022c).

As presented in Section E3.10.3, VCSNS's annual reports indicate that radiological doses to members of the public were negligible and in accordance with NRC and EPA radiation protection standards. There are no other operating nuclear power plants or radiological waste treatment and

disposal facilities within the 50-mile region of VCSNS. As mentioned in E4.12.4.9.3, the Columbia Fuel Fabrication Facility is located approximately 36 miles southeast of the plant (NRC. 2022b).

As presented in Sections E2.2.6 and E2.2.7, DE has programs in place to manage VCSNS's hazardous and nonhazardous waste streams. Continuation of existing systems and procedures to ensure proper storage and disposal during the proposed SLR operating term would allow the impacts to be SMALL. The other facilities within the 50-mile region of VCSNS are also required to comply with appropriate EPA and state requirements for the management of radioactive and nonradioactive wastes. Thus, the cumulative waste management impact would be SMALL.

E4.13 IMPACTS COMMON TO ALL ALTERNATIVES: URANIUM FUEL CYCLE

E4.13.1 OFFSITE RADIOLOGICAL IMPACTS—INDIVIDUAL IMPACTS FROM OTHER THAN THE DISPOSAL OF SPENT FUEL AND HIGH-LEVEL WASTE

E4.13.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The impacts to the public from radiological exposures have been considered by the NRC in Table S-3 of this part. Based on information in the GEIS, impacts to individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, would remain at or below the NRC's regulatory limits.

E4.13.1.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.13.1.3 Background [GEIS Section 4.12.1.1]

The primary indicators of impact are the concentrations of radionuclides in the effluents from the fuel cycle facilities and the radiological doses received by a MEI on the site boundary or at some location away from the site boundary. The basis for establishing the significance of individual effects is the comparison of the releases in the effluents and the MEI doses with the permissible levels in applicable regulations. The analyses performed by the NRC in the preparation of Table S-3 and found in the 1996 GEIS indicate that as long as the facilities operate under a valid license issued by either the NRC or an agreement state, the individual effects will meet the applicable regulations. Based on these considerations, the NRC has concluded that the impacts on individuals from radioactive gaseous and liquid releases during the license renewal term would

remain at or below the NRC's regulatory limits. Accordingly, the NRC concludes that offsite radiological impacts of the uranium fuel cycle (individual effects from sources other than the disposal of spent fuel and high-level waste) are SMALL.

E4.13.1.4 Site-Specific Analysis

As stated above, impacts to individuals from radioactive gaseous and liquid releases would remain at or below regulatory limits as long as facilities operate under a valid license issued by either the NRC or an agreement state. VCSNS's nuclear fuel is supplied by vendors with the appropriate licenses and radioactive waste services are contracted with facilities having the appropriate licenses and permits. DE finds that impacts from VCSNS's contribution to offsite radiological impacts would be SMALL.

NRC previously found that the generic issues related to the uranium fuel cycle would not be affected by continued operations associated with license renewal (NRC. 2013a). This determination would apply to a second license renewal term as well provided VCSNS continues to utilize facilities with the appropriate licenses and permits.

DE finds that individual offsite radiological impacts from other than the disposal of spent fuel and high-level waste for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.13.2 OFFSITE RADIOLOGICAL IMPACTS—COLLECTIVE IMPACTS FROM OTHER THAN THE DISPOSAL OF SPENT FUEL AND HIGH-LEVEL WASTE

E4.13.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

There are no regulatory limits applicable to collective doses to the general public from fuel-cycle facilities. The practice of estimating health effects on the basis of collective doses may not be meaningful. All fuel-cycle facilities are designed and operated to meet the applicable regulatory limits and standards. The NRC concludes that the collective impacts are acceptable.

The NRC concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, and that the option of extended operation under 10 CFR Part 54 should be eliminated.

E4.13.2.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.13.2.3 Background [GEIS Section 4.12.1.1]

There are no regulatory limits applicable to collective doses to the general public from fuel cycle facilities. All regulatory limits are based on individual doses. All fuel cycle facilities are designed and operated to meet the applicable regulatory limits.

As discussed in the 1996 GEIS, despite the lack of definitive data, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. The NRC concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, and that the option of extended operation under 10 CFR Part 54 should be eliminated.

E4.13.2.4 Site-Specific Analysis

All fuel cycle facilities are designed to meet the applicable regulatory limits and standards. As long as facilities operate under a valid license issued by either the NRC or an agreement state, regulatory requirements would be meet. VCSNS's nuclear fuel is supplied by vendors with the appropriate licenses and radioactive waste services are contracted with facilities having the appropriate licenses and permits. Thus, DE finds that impacts from VCSNS's contribution to offsite radiological impacts would be SMALL.

NRC previously found that the generic issues related to the uranium fuel cycle would not be affected by continued operations associated with license renewal (NRC. 2013a). This determination would apply to a second license renewal term as well provided VCSNS continues to utilize facilities with the appropriate licenses and permits.

DE finds that collective offsite radiological impacts from other than the disposal of spent fuel and high-level waste for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.13.3 NONRADIOLOGICAL IMPACTS OF THE URANIUM FUEL CYCLE

E4.13.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an OL for any plant would be SMALL.

E4.13.3.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.13.3.3 Background [GEIS Section 4.12.1.1]

Data on the nonradiological impacts of the fuel cycle are provided in Table S-3. These data cover land use, water use, fossil fuel use, and chemical effluents. The significance of the environmental impacts associated with these data was evaluated in the 1996 GEIS on the basis of several relative comparisons. It was noted that the impacts associated with uses of all of the above resources would be SMALL. Any impacts associated with nonradiological liquid releases from the fuel cycle facilities would also be SMALL. As a result, the aggregate nonradiological impact of the uranium fuel cycle resulting from the renewal of an OL for a plant would be SMALL.

E4.13.3.4 Site-Specific Analysis

Nonradiological environmental impacts would remain at or below regulatory or permit limits as long as facilities operate in accordance with their federal, state, and local environmental permits. VCSNS's nuclear fuel is supplied by vendors with the appropriate licenses and permits and radioactive waste services are contracted with facilities having the appropriate licenses and permits. DE finds that impacts from VCSNS's contribution to offsite nonradiological impacts would be SMALL.

NRC previously found that the generic issues related to the uranium fuel cycle would not be affected by continued operations associated with license renewal (NRC. 2013b). This determination would apply to a second license renewal term as well provided VCSNS continues to utilize facilities with the appropriate licenses and permits.

DE finds that nonradiological impacts for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.13.4 TRANSPORTATION

E4.13.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The impacts of transporting materials to and from uranium-fuel-cycle facilities on workers, the public, and the environment are expected to be SMALL.

E4.13.4.2 Requirement [CLI-22-2 and CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.13.4.3 Background [GEIS Section 4.12.1.1]

The impacts associated with transporting fresh fuel to one 1,000 MWe model light-water reactor and with transporting spent fuel and radioactive waste (LLW and mixed waste) from that light water reactor are provided in Table S-4 in 10 CFR 51.52. Similar to Table S-3, and as indicated in 10 CFR 51.52, every ER prepared for the construction permit stage of a commercial nuclear power plant must contain a statement concerning the transport of fuel and radioactive waste to and from the reactor. A similar statement is also required in LRAs. Table S-4 forms the basis of such a statement.

In 1999, the NRC issued an addendum to the 1996 GEIS in which the agency evaluated the applicability of Table S-4 to future license renewal proceedings, given that the spent fuel is likely to be shipped to a single repository (as opposed to several destinations, as originally assumed in the preparation of Table S-4) and given that shipments of spent fuel are likely to involve more highly enriched fresh fuel (more than 4% as assumed in Table S-4) and higher burnup spent fuel (higher than 33,000 MWd/MTU as assumed in Table S-4). In the addendum, the NRC evaluated the impacts of transporting the spent fuel from reactor sites to the candidate repository at Yucca Mountain and the impacts of shipping more highly enriched fresh fuel and higher burnup spent fuel. On the basis of the evaluations, the NRC concluded that the values given in Table S-4 would still be bounding, as long as the (1) enrichment of the fresh fuel was 5% or less, (2) burnup of the spent fuel was 62,000 MWd/MTU or less, and (3) higher burnup spent fuel (higher than 33,000 MWd/MTU) was cooled for at least five years before being shipped offsite.

E4.13.4.4 Site-Specific Analysis

As stated above, NRC confirmed that the impacts of this issue to be SMALL and bounded by the values given in Table S-4 in 10 CFR 51.52 provided the following three conditions established in NRC's transportation addendum to the 1996 GEIS (i.e., NUREG-1437, Volume 1, Addendum 1) were met:

(1) enrichment of fresh fuel was 5.0% or less;

(2) burnup of the spent fuel was 62,000 MWd/MTU or less; and

(3) higher burnup spent fuel (higher than 33,000 MWd/MTU) was cooled for at least five years before being shipped offsite.

The NRC did not revisit the radiological impact analysis of transporting SNF away from reactor storage locations in the 2014 GEIS for Continued Storage of Spent Nuclear Fuel and again stated that the radiological impact analysis can be found in Table S-4 in 10 CFR 51.52 (NRC. 2014a).

The fuel used at VCSNS is enriched to a maximum of 5%, and the fuel peak rod burnup limit is 62,000 MWd/MTU and these parameters would be adhered to during the proposed SLR term. Spent fuel is stored onsite in the spent fuel pool prior to transfer to onsite dry storage at the ISFSI.

VCSNS's nuclear fuel is supplied by vendors with the appropriate licenses and transported to the site in accordance with NRC and DOT requirements.

Spent Fuel Dry Cask Storage operations are conducted under a general license in accordance with Subpart K of 10 CFR Part 72. The onsite ISFSI has a capacity for 98 vertical spent fuel storage casks. VCSNS uses the Holtec HI-STORM Flood and Wind (FW) vertical cask storage overpack, the Holtec MPC-37 multi-purpose canister, and the HI-TRAC Variable Weight transfer cask as described in the HI-STORM FW Multi-purpose Canister Storage System FSAR and approved by NRC in HI-STORM FW Certificate of Compliance No. 1032 (DE. 2023a, Section 9.1.5). The ISFSI is designed to store the spent fuel generation for 80 years of operation.

As presented in Sections E4.11.1.4 and E4.11.4.4, DE has a comprehensive program of managing its radioactive and mixed wastes at VCSNS that implements the regulatory requirements for management, storage, inspections, packaging, and shipping.

VCSNS would comply with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes and SNF. Given that VCSNS meets the three criteria from NUREG-1437, Volume 1, Addendum 1, and radioactive waste shipping procedures to implement regulatory requirement, DE finds that impacts from VCSNS's contribution to offsite radiological impacts from transportation of fuel and radiological waste would be SMALL.

The impacts (e.g., direct radiation) of a transportation event would be discrete from other transportation events and accumulation of dose by the public, other than persons in the cab of a truck transporting the material on subsequent trips, would be unlikely. The packaging of radioactive materials in accordance with NRC and DOT regulations would minimize exposure. Further, the transportation events are unlikely to be staffed by the same person throughout or beyond a 20-year time period.

DE finds that impacts to transportation for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL

E4.14 TERMINATION OF NUCLEAR POWER PLANT OPERATIONS AND DECOMMISSIONING

E4.14.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

SMALL. License renewal is expected to have a negligible effect on the impacts of terminating operations and decommissioning on all resources.

E4.14.2 REQUIREMENT [CLI-22-2 AND CLI-22-3]

Based on the February 24, 2022, NRC Memoranda and Orders, the GEIS did not address subsequent license renewal. As a result, a site-specific evaluation of applicable environmental issues is required to be included in SLRA ERs.

E4.14.3 BACKGROUND [GEIS SECTIONS 4.12.2 AND 4.12.2.1]

The impacts of decommissioning nuclear plants were evaluated by the NRC in NUREG-0586, Generic Environmental Impact Statement for Decommissioning Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors.

This section describes and discusses the environmental consequences of terminating nuclear power plant operations and decommissioning, but the only impacts attributable to the proposed action (license renewal) are the effects of an additional 20 years of operations on the impacts of decommissioning. The majority of the impacts associated with plant operations would cease with reactor shutdown; however, some impacts would remain unchanged, while others would continue at reduced or altered levels. Some new impacts might also result directly from terminating nuclear power plant operations.

Terminating nuclear power plant operations would result in the cessation of actions necessary to maintain the reactor, as well as a significant reduction in the workforce. NRC presumes that terminating nuclear power plant operations would not immediately lead to the dismantlement of the reactor or other infrastructure, much of which would still be in use to support other units onsite that continued to operate. Even for sites with just one unit, some facilities would remain in operation to ensure that the site was maintained in safe shutdown condition.

E4.14.4 SITE-SPECIFIC ANALYSIS

Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. The operations aspects that affect termination of plant operation and decommissioning impacts include waste volumes, changes in worker numbers, and changes in tax revenues.

Application of ALARA principles during the operating years of the proposed SLR operating term would minimize increases in radioactivity in the structures and equipment to be decommissioned. Spent fuel removed from the spent fuel pool at VCSNS will be stored in an NRC-licensed ISFSI located on the VCSNS site until transfer to a licensed facility. The ISFSI used to accommodate the increased spent fuel volume would require decommissioning. Its decommissioning would be a separate licensing action if the ISFSI is not empty prior to plant decommissioning.

Additional workers that would incrementally increase socioeconomic impacts of termination of plant operations are not anticipated for the proposed SLR operating period (Section E2.5).

As stated above in Section E4.8.2.4, DE expects its tax payments and its beneficial impact on the local taxing entities to continue during the SLR term. The tax revenue socioeconomic impact of termination of operations would not be appreciably affected by the additional years of operation under a SLR.

DE would plan and conduct decommissioning activities in accordance with NRC-reviewed methods and evaluate anticipated environmental impacts to ensure that they are bound by previously issued environmental assessments.

Given DE's radiation protection and radioactive waste management programs and no appreciable changes in socioeconomic aspects of plant operation, DE finds that continued operations during a subsequent license renewal term would be a SMALL impact on terminating operations and decommissioning on all resources.

NRC previously determined that only the decommissioning portion of this issue would be impacted by license renewal and that the impact would be SMALL. This determination would apply to a second license renewal term as well. ALARA principles would continue to minimize increases in radioactivity in the structures and equipment to be decommissioned in a second renewal term as in a first. As presented in Section E4.13.4.4, the ISFSI at VCSNS would accommodate the volume of spent fuel generated during a SLR term so no additional structure would be added for eventual decommissioning. The use of licensed storage casks minimizes direct radiation, minimizing increases in radioactivity in the ISFSI pad. Finally, as discussed above, tax payments would continue during the SLR providing the relatively same beneficial impact as during the current license term.

DE finds that impacts from termination of nuclear power plant operations and decommissioning for the proposed SLR term would be SMALL. Based on the discussion provided above, the impacts for this issue with respect to an SLR term for VCSNS are, as analyzed here, SMALL.

E4.15 POSTULATED ACCIDENTS

E4.15.1 DESIGN-BASIS ACCIDENTS

The following generic issue related to postulated accidents was reviewed for new and significant information that could make previous findings by the NRC inapplicable to VCSNS: Issue 65—Design-basis accidents.

E4.15.1.1 Generic Analysis

Design-basis accidents (DBAs) are those that both the licensee and the NRC staff evaluate to ensure the plant meets acceptable design and performance criteria, and that the plant can withstand normal and abnormal transients and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public.

Section 5.3 of the 1996 GEIS discusses the impacts of potential accidents, their consequences, and addresses the general characteristics of DBAs, including characteristics of fission products, meteorological considerations, possible exposure pathways, potential adverse health effects, avoiding adverse health effects, accident experience and observed impacts, and emergency preparedness. In the 2013 license renewal GEIS, the NRC reexamined the information from the 1996 GEIS regarding DBAs and concluded that this information is still valid. The NRC found that the environmental impacts of DBAs are of SMALL significance for all nuclear plants. This conclusion was reached because the plants were designed to successfully withstand these accidents, and a licensee is required to maintain the plant within acceptable design and performance criteria, including during any license renewal term. It is also stated that the environmental impacts during a license renewal term should not differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Impacts from design-basis accidents would not be affected by changes in plant environment because such impacts (1) are based on calculated radioactive releases that are not expected to change; (2) are not affected by plant environment because they are evaluated for the hypothetical maximally exposed individual; and (3) have been previously determined acceptable (NRC. 1996a; NRC. 2013a).

E4.15.1.2 Site-Specific Analysis

In 2002, SCE&G submitted an application for license renewal, which was approved in 2004. The original 40-year license for VCSNS was thereby renewed for an additional 20 years. As part of the initial license renewal process, to receive NRC approval to operate a nuclear power facility, an applicant must submit a safety analysis report (SAR) as part of its application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features provided to prevent and mitigate accidents.

The NRC staff reviewed the application to determine whether the plant design met the NRC's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

A number of these postulated accidents are not expected to occur during the life of VCSNS but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in 10 CFR Part 50 and 10 CFR Part 100.

The environmental impacts of DBAs were evaluated during the initial license process, and the ability of the plant to withstand these accidents was demonstrated to be acceptable before issuance of the operating license. The results of these evaluations are found in license documentation such as the staff's safety evaluation report, the final environmental impact statement, and the VCSNS FSAR. VCSNS is required to maintain the acceptable design and performance criteria throughout the life of the plant including any extended-life operation. The consequences for these events are evaluated for the hypothetical MEI; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of VCSNS, including the license renewal period. Accordingly, the design of VCSNS relative to DBAs during the extended period is considered to remain acceptable and the environmental impacts of those accidents were not examined further in the GEIS (NRC. 2004b).

When the 2013 GEIS was issued, the NRC's review of updated external hazards information for all operating power reactors (as ordered by the Commission following the Fukushima Dai-Ichi accident) remained ongoing. On June 9, 2020, the NRC completed its review of such information as to VCSNS and concluded that no further regulatory actions were needed to ensure adequate protection or compliance with regulatory requirements, re-confirming the acceptability of VCSNS's design basis (NRC. 2020d).

The environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Due to the requirements for VCSNS to maintain its licensing basis (the adequacy of which the NRC recently re-confirmed) and implement aging management programs during the license renewal term, the environmental impacts during a subsequent license renewal term are not expected to differ significantly from those calculated for the DBA assessments conducted as part of the initial plant licensing process. Collectively, the Generic Analysis for initial license renewals and the Site-Specific Analysis for VCSNS SLR demonstrates that impacts due to DBAs are SMALL, consistent with the GEIS findings, and confirms that the NRC's generic assessment for this issue is valid for VCSNS.

As to this issue, the 2013 GEIS analysis of the incremental effects of a 20-year renewal does not materially differ between an initial 20-year renewal period and a second 20-year renewal period. DE finds that impacts of design-basis accidents for the proposed subsequent period of extended operation are SMALL.

E4.15.2 EVALUATION OF NEW INFORMATION CONCERNING SEVERE ACCIDENT CONSEQUENCES

E4.15.2.1 Generic Background

Severe accidents are postulated accidents that are more severe than DBAs because severe accidents can result in substantial damage to the reactor core, with or without serious offsite consequences. Severe accidents can entail multiple failures of equipment or functions. The evaluation of severe accident consequences below follows the model approach in NEI 17-04 (Revision 1) for determination of whether or not there is new and significant information regarding the severe accident mitigation alternatives (SAMA) analyses (NEI. 2019b). The NRC staff has reviewed the NEI 17-04 Revision 1 document and endorsed its interim use in (NRC. 2019b). For the VCSNS SLR, the consideration of new and significant changes since the time of the initial license renewal is consistent with the Generic Environmental Impact Statement (GEIS), Supplement 49 (NRC. 2014b). Section 5.3.9 of GEIS Supplement 49 states the following:

> *New information is significant if it provides a seriously different picture of the impacts of the federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring.*

The implication of this statement is that "significance" is not solely related to whether a SAMA is cost beneficial but depends also on a SAMA's potential to significantly reduce risk to the public (NEI. 2019b).

The following issue (requirement) related to severe accidents has been defined by the NRC in 10 CFR 51.53(c)(3)(ii)(L):

> *If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.*

The NRC finding regarding severe accidents is stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, as follows:

> *The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.*

In accordance with 10 CFR 51.53(c)(3)(ii)(L) and Table B-1 of Appendix B to Subpart A of 10 CFR Part 51, DE is not required to perform another SAMA analysis for VCSNS for the SLR application. However, DE is required to provide for VCSNS in the SLR application any new and significant information regarding the environmental impacts of license renewal of which it is aware, including new and significant information that could affect the environmental impacts related to postulated severe accidents or that could affect the results of a previous SAMA analysis. Accordingly, DE reviewed this issue for new and significant information that would cause the following generic conclusions in the GEIS (NRC. 2013a) concerning this issue to be inapplicable to VCSNS.

1. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants.
2. License renewal ERs for plants for which SAMAs have been previously considered need not consider SAMAs.

The assessment process for new and significant information related to the first conclusion included: (1) interviews with subject matter experts on the validity of the conclusions 2013 GEIS as they relate to VCSNS; and (2) review of documents related to predicted impacts of severe accidents at VCSNS. Consideration was given to developments in plant operation and accident analysis that could have changed the assumptions made concerning severe accident consequences after SAMAs were previously evaluated by the NRC for VCSNS during initial license renewal (NRC. 2004b). Developments in the following areas included:

- New internal events information,
- External events,
- New source term information,
- Power uprates,
- Higher fuel burnup,
- Low power and shutdown events
- Spent fuel pool accidents
- BEIR VII Coefficient
- Uncertainties
- Other considerations, including population increase and risk-beneficial plant changes implemented in response to recommendations from the Fukushima Dai-ichi Near-Term Task Force.

E4.15.2.2 Site-Specific Analysis

As part of the site-specific analysis, DE considered relevant new information concerning severe accident consequences since initial license renewal. The review for new and significant information was informed by the current VCSNS probabilistic risk assessment (PRA). Over the course of plant operation, changes are made to the plant design, operation, and maintenance practices. Periodic updates to the VCSNS PRA have ensured that the PRA includes the relevant changes and continues to reflect the current plant design and operation. PRA updates also include updates to the initiating event and equipment performance data using the most current industry and plant specific sources. The PRA models have been updated to reflect improvements in state-of-the-art analysis of severe accidents. Therefore, the PRA provides valuable insights into the risk significance of the plant changes over time.

Each of the above areas of severe accident consequence is evaluated in more detail in the following discussion.

E4.15.2.2.1 New Internal Events Information

Since the first VCSNS license renewal and SAMA evaluation, there have been many improvements to the plant's risk profile. The VCSNS model used to evaluate the SAMA in the original license renewal had an internal events accident frequencies (CDF) of approximately 5.59E-05/year. The VCSNS internal events PRA model used to determine the significance of new information in the license renewal analysis has a CDF of approximately 2.72E-06/year. This change represents approximately 95% reduction or about a factor of 20.6 reduction in CDF. The improvement in CDF makes any proposed new SAMA or previously evaluated SAMA less likely to be cost-beneficial.

The updated internal events model has been utilized in the quantitative PRA calculation for the new and significant evaluation that demonstrated the absence of any significant SAMAs. Considering the plant improvements to reduce internal events risk (as discussed in the "Other Considerations" subsection below) and the conservative dose values used in the 1996 GEIS (as discussed in the "Uncertainties" subsection below), the VCSNS offsite consequences of severe accidents initiated by internal events during the subsequent licensing period would not exceed the impacts predicted in the 1996 GEIS. Therefore, DE concludes that no new and significant information exists for VCSNS concerning offsite consequences from severe accidents initiated by internal events.

E4.15.2.2.2 External Events

In the 1996 GEIS (NRC. 1996b), it was concluded that an applicant for license renewal only needed to analyze the environmental impacts from either internal or external events, since it was found that the risk from external events (such as earthquakes) were adequately addressed through consideration of severe accidents initiated by internal events (such as loss of cooling water).

In the VCSNS initial license renewal (NRC. 2004b), external events were assessed conservatively by multiplying the estimated internal events maximum attainable benefit by a factor of 2.

In the 2013 license renewal GEIS (NRC. 2013a), the scope expanded the evaluation of the 1996 GEIS and used more recent technical information that included both internally and externally initiated event CDFs. The NRC reviewed CDFs for external events reported in NUREG-1150 (NRC. 1990) and NUREG/CR-5305 (NRC. 1992), finding them to be generally one or more orders of magnitude lower than the CDFs that formed the basis of the 1996 GEIS. The primary focus of the assessment was on seismic and fire events, which the NRC had determined would contribute most to plant risk from external events. Based on a comparison of the risks from internal events to risks from seismic and fire events, the 2013 GEIS concluded that it would be reasonable to assume that contributions to plant risk from fire events and seismic events are each comparable to the contribution from internal events, although a preliminary assessment from Generic Issue 199 indicated that, on average, updated seismic CDFs remained slightly (approximately 30%) less than the internal events CDF.

The VCSNS fire PRA model has been developed since the time of the initial license renewal and is considered new information. The VCSNS fire CDF is 5.07E-5. Conservatisms in this NUREG/CR-6850 (NRC. 2005a) based model that will be reduced with future updates include updated heat release rates and newer information on hot short modeling. Other conservatisms, such as limited detailed fire modeling and assumed system failures for untraced cables, will remain as the standard practice. The VCSNS seismic PRA model has been developed since the time of the initial license renewal and is considered new information. The VCSNS seismic CDF is 3.52E-5.

The individual external events are comparable or less than the internal events mean value CDF of 5.9E-5 per reactor year for PWRs that the 2013 GEIS used to estimate the probability weighted, offsite consequences for airborne, surface water and groundwater pathways, as well as the resulting economic impacts for such pathways. VCSNS specific analysis on both fire and seismic external event risk information confirms the 2013 GEIS conclusion that these external events contributions are comparable and bounded by the 1996 GEIS values of 8.4E-5 per year for internal events in all PWRs. Also, changes have been implemented at the site in response to Fukushima Dai-ichi Near Term Task Force recommendations and other plant-specific programs that are "risk-beneficial" but not all are credited in VCSNS PRA models. If these were fully credited in the PRAs, the CDF would be somewhat lower.

VCSNS has demonstrated that transportation and nearby facility accidents are not considered to be significant vulnerabilities at the plant (DE. 2021c). VCSNS high winds hazard information from the IPEEE, concluding that the impact on VCSNS from high winds leads to the conclusions that there are no significant events of concern, is appropriate for VCSNS (DE. 2022e). Since the IPEEE, VCSNS has augmented its ability to respond to high wind events that are beyond the design basis as a part of industry response to Fukushima events. Therefore, it can be concluded that high winds

do not contribute any insights to new and significant information. VCSNS external flooding hazards have been reevaluated in response to the NRC's March 12, 2021, 10 CDF 50.44(f) request for information. The external flooding hazard information in the IPEEE has been superseded by the more recent external flooding hazard evaluation (DE. 2022e). The results indicate that the Mitigating Strategies Flood Hazard Information assessment of the flood hazard re-evaluation report probable maximum flood from the adjacent Monticello Reservoir and flooding from local intense precipitation are not bounded by the current licensing basis. However, the FLEX design basis flood parameters for both the local intense precipitation and probable maximum flood were set equivalent to, and therefore bound, the Mitigating Strategies Flood Hazard Information (SCE&G. 2016). NRC staff concluded that VCSNS has demonstrated that effective flood protection exists for the unbounded flooding mechanisms during a beyond-design basis external flooding event at VCSNS, based on appropriate implementation of the regulatory commitments (DE. 2022e). Therefore, it can be determined that the contribution for transportation, pipeline, nearby facility accidents, high winds, and external flooding, do not contribute any insights to new and significant information.

In conclusion, there is approximately a factor of 1.8 decrease in newer internal and external event information from those calculated in the previous LRA, and seismic and fire risk was determined to be within the values calculated in the 1996 GEIS and bounded by the VCSNS initial license renewal (NRC. 2004a). DE concludes that no new and significant information exists for VCSNS concerning offsite consequences of severe accidents caused by external events.

E4.15.2.2.3 New Source Term Information

Based on a comparison of NRC studies from NUREG-0773 (NRC. 1982) and NUREG/CR-6295 (NRC. 1997a), the 2013 GEIS (NRC. 2013a) concluded that the 1997 source term information indicated that the timing from dominant severe accident sequences are comparable to the analysis forming the basis of the 1996 GEIS. In most cases, the release frequencies and release fractions estimated in the 1997 study were an order of magnitude lower than previously estimated. Thus, the environmental impacts used as the basis for the 1996 GEIS (i.e., the frequency-weighted consequences) were higher than impacts that would be estimated using the 1997 source term information. Therefore, the updated estimates of offsite consequences remained within the bounds of the 1996 GEIS evaluation (NRC. 1996b).

Additionally, Surry Nuclear Power Station was evaluated in NUREG/CR-7110 (NRC. 2013d) in the state-of-art-reactor consequence analysis (SOARCA), published in 2013. This analysis updated the NRC's severe accident studies of the Surry Nuclear Power Station (e.g., NUREG-1150 (NRC. 1990), incorporating state-of-the-art analyses to evaluate offsite risk. The conclusions of the SOARCA analysis were that:

> *"… the calculated risks of public health consequences from severe accidents modeled in SOARCA are very small."* and

"The unmitigated versions of the scenarios analyzed in SOARCA have lower risk of early fatalities than calculated in the 1982 Siting Study SST1 case. SOARCA's analyses show essentially zero risk of early fatalities."

The SOARCA was not a complete analysis of all scenarios in the PRA, but it supports the conclusion that the offsite effects from a severe accident would be small. While VCSNS is not a design identical to Surry Nuclear Power Station, both are PWRs with Westinghouse 3-loop designs, and the general conclusions of lower offsite consequences from the SOARCA apply to VCSNS as well.

For the new and significant evaluation, SAMAs were grouped if similar, and all were evaluated for the impact they would have on the VCSNS CDF and release category frequencies if they were implemented. If any of the SAMAs were found to reduce CDF or release category frequency by at least 50%, the SAMA was retained for a full Level 3 evaluation of the reduction in maximum benefit (MB). No SAMAs were found to provide such a reduction.

DE reviewed and determined that the previously evaluated source terms used in the initial license renewal SAMA analysis to assess offsite radiological consequences of severe accidents are bounded by the conclusions of the 1996 GEIS and are considered appropriate for VCSNS SLR.

E4.15.2.2.4 Power Uprates

Large early release frequency (LERF) represents the frequency of event sequences that could result in early fatalities. The 2013 GEIS (NRC. 2013a) considered the effects on plant risk of power uprates and concluded that the impact of a power uprate on early fatalities can be gauged by considering the impact of the uprate on the LERF metric. Accordingly, the 2013 GEIS considered LERF calculated by each licensee who at that time had been granted a power uprate of greater than 10%. It was found that the increase in LERF ranged from a minimal impact to an increase of 30% (with a mean of 10.5%), which was characterized as small to moderate change. Taken in combination with the other information presented in the 2013 GEIS, the NRC concluded that effects of such increases on risk and environmental impacts of severe accidents would be bounded by the 1996 GEIS, which used the 95% upper confidence bound (UCB) values as the basis for estimating offsite consequences (NRC. 1996b).

The NRC approved a 4.5% power uprate for VCSNS in 1996 (NRC. 1996c), which was prior to the initial license renewal. No additional power uprate changes have occurred at VCSNS since initial license renewal. DE concludes that no new and significant information exists for VCSNS concerning offsite consequences due to power uprates.

E4.15.2.2.5 Higher Fuel Burnup

As provided in NUREG/CR-6703 (NRC. 2001a), the NRC has concluded that there are no significant adverse environmental impacts associated with extending peak rod fuel burnup. Peak rod fuel burnup from 42 to 75 GWd/MT for PWRs results in a moderate increase (~38%) in population dose in the event of a severe accident. Peak fuel burnup from 42 to 75 GWd/MT for PWRs would have effects on risk and environmental impacts of severe accidents that are bounded by the 1996 GEIS (NRC. 1996a).

Average peak rod fuel burnup limit for VCSNS during the terms of the subsequent license is not expected to exceed 62 GWd/MT. Because VCSNS peak fuel burnup will be within the range considered by the NRC in NUREG/CR-6703 for PWRs, DE concludes that no new and significant information exists for VCSNS concerning the effect of peak fuel burnup on risk and environmental impacts of severe accidents.

E4.15.2.2.6 Consideration of Low Power and Shutdown Events

NUREG/CR-1150 (NRC. 1990), which assesses five nuclear plants including Surry Nuclear Power Station, assesses accidents at low power and shutdown conditions. VCSNS and Surry are not identically designed plants, but they are both Westinghouse 3-loop PWRs. Based on the similarities between VCSNS and Surry, the general conclusions of plant configurations in low-power and shutdown conditions evaluated in NUREG/CR-1150 apply to VCSNS as well.

As discussed in SECY 97-168, existing regulatory controls for shutdown operations have evolved through a series of industry actions which have been successful in achieving an acceptable level of safety of low power and shutdown operation (NRC. 1997b). Therefore, the offsite consequences of severe accidents, considering low power and shutdown events, would not exceed the impacts predicted in the 1996 GEIS. DE concludes that no new and significant information exists for VCSNS concerning lower power and shutdown events.

E4.15.2.2.7 Consideration of Spent Fuel Pool Accidents

Consistent with NUREG-1738 (NRC. 2001b), the impacts of accidents in SFPs at VCSNS is comparable to or lower than those from reactor accidents and are bounded by the 1996 GEIS (NRC. 1996b). There are no spent fuel configurations that would distinguish VCSNS from the evaluated plants such that the assumptions in the 1996 GEIS would not apply.

The 2013 GEIS (NRC. 2013a) indicates that analyses performed and mitigative measures employed since 2001 have further lowered the risk of accidents involving SFPs. As a result of post-Fukushima Near-Term Task Force 2.1 recommendations, implementation of diverse and flexible coping strategies (FLEX), provides additional resources to maintain spent fuel pool (SFP)

water inventory and risk reduction (NRC. 2017). Therefore, DE concludes that there is no new and significant information related to SFP accidents at VCSNS.

E4.15.2.2.8 Use of Biological Effects of Ionizing Radiation VII Risk Coefficients

The risk coefficients from biological effects of ionizing radiation (BEIR) VII are applicable to the health effects from radiation exposures and cancers associated with them. As stated in SECY-05-0202, "the major conclusion is that current scientific evidence in consistent with the hypothesis that there is a linear, no-threshold dose response relationship between exposure to ionizing radiation and the development of cancer in humans. This conclusion is consistent with the system of radiological protection that the NRC uses to develop its regulations. Therefore, the NRC's regulations continue to be adequately protective of public health and safety and the environment." (NRC. 2005b). The NRC has concluded the impacts from BEIR VII would be small and that conclusions of the 1996 GEIS remain valid.

Because the VCSNS SAMA analysis does not find any SAMAs that reduced the risk metrics by at least 50%, no offsite doses are computed as part of a full Level 3 evaluation. Therefore, the BEIR VII risk coefficients have no impact on the VCSNS SAMA Stage 1 analysis, and there is no information. Further, the plant internal events risk has improved through significant modifications since the initial license renewal, some of which are listed in the "Other Considerations" subsection below. Therefore, the impact from consideration of the BEIR VII report would be insignificant.

E4.15.2.2.9 Uncertainties

The 1996 GEIS (NRC. 1996b) used 95th percentile UCB estimates whenever available for its estimates of the environmental impacts of severe accidents, which applies conservatism to cover uncertainties. The 2013 GEIS states that "a comparison of population dose from newer assessments illustrates a reduction in impact by a factor of 5 to 100 when compared to older assessments, and an additional factor of 2 to 4 due to the conservatism built into the 1996 GEIS values." The 1996 GEIS used a VCSNS specific predicted UCB total dose value of 1381 person-rem/reactor-year (NRC. 1996b, Table 5.9). This can be compared to the VCSNS initial license renewal specific dose calculation of approximately 1 person-rem/reactor year (NRC. 2004b, Table 5-4). For VCSNS, this factor of population dose reduction from newer information is on the order of a factor of 1381, which confirms the 2013 GEIS conclusion. Considering additional plant improvements since the initial license renewal, this dose reduction factor remains valid for the subsequent licensing term.

E4.15.2.2.10 Other Considerations

The 1996 GEIS concluded that meteorological patterns, (i.e., wind directions and frequencies) tend to remain constant over time (NRC. 1996b). Therefore, changes in the exposure index would result

from changes in the population estimates or distributions. The 2013 GEIS adjusted the exposure index and found an increase in impacts ranging from 5 to 30% from year 2000 to each plant's mid-year license renewal period (NRC. 2013a). Given the range of uncertainties in this type of analysis, this was considered as not significant. According to NEI 17-04, Rev. 1, Section 2.1, population growth is considered new information, but not necessarily significant for the Stage 1 analysis. Detailed population information including population projection information is presented in Section E3.11.1, "Regional Population" of the SLR ER. For the 50-mile radius from the plant, the 2020 permanent population was 1,245,777, and the projected 2062 permanent and transient population is 2,045,510. Using an exponential scale, that is a 1.01% growth per year or a 26.6% growth from the beginning to the end of the 60 to 80 years renewal period of interest. This is within the 30% population increase that the 2013 GEIS has determined not to be significant. Therefore, the effect of population growth is expected to be bounded by the assessment in the 1996 GEIS (NRC. 1996b).

Since the performance of the previous VCSNS SAMA analysis, several changes have been implemented at the site that are "risk-beneficial." The VCSNS model used to evaluate the SAMAs in the original license renewal had an internal events CDF of approximately 5.59E-05/year. The VCSNS internal events PRA model used to determine the significance of new information in the license renewal analysis has a CDF of approximately 2.72E-06/year (95% reduction in CDF). DE has a process by which design and procedure changes to the plant are evaluated and the PRA model revised to ensure the model reflects the as-built, as-operated plant. The following list summarizes the major changes for VCSNS since 2000, with risk-beneficial attributes:

- Alternate AC
- ECCS Automatic Sump Recirculation
- SW RBCU valve changes to Air Operated
- Instrument Air: Second Dryer added, New Power Supply
- Alternate Seal Injection
- Pressurizer PORV Accumulator Upsize
- Auto Start Capability added to Diesel Air Compressor
- Low Leakage RCP Seals (Flowserve N9000)
- Automatic Recirculation Control Valves on MD EFW Pumps

The results of the design changes as well as modeling improvements resulted in the lower CDF and LERF values noted. Additional detail of changes in CDF and LERF since 2000 is presented in Appendix A.

There are no known unimplemented PRA modeling changes that may significantly impact the results or conclusions of the VCSNS SAMA evaluation.

E4.15.2.3 Conclusions for Severe Accident Consequences

DE finds that, collectively, the site-specific analysis demonstrates that the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents would remain SMALL for the VCSNS subsequent license renewal period.

E4.15.3 EVALUATION OF NEW INFORMATION CONCERNING SEVERE ACCIDENT MITIGATION ALTERNATIVES

E4.15.3.1 Generic Background

The NEI 17-04 Revision 1 methodology (NEI. 2019b) describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis. In Stage 1, the SLR applicant uses PRA risk insights and risk model quantifications to estimate the percentage reduction in the MB associated with (1) all unimplemented final plant-specific SAMAs for the analyzed plant and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and that are applicable to the analyzed plant. Consistent with the NRC's rulings that new and significant information is that which "presents 'a seriously different picture' of the environmental impacts compared to the previously issued final environmental impact statement," (NRC. 2014b), the first stage examines whether these potentially cost-beneficial SAMA might reduce severe accident risk substantially. If it can be demonstrated that none of these SAMAs being evaluated can reduce the MB by 50% or more, then the applicant may document the conclusion that there is no "new and significant" information relevant to the previous SAMA analysis. If one or more of those SAMAs are shown to reduce the MB by 50%t or more, then the applicant must complete Stage 2 by developing updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the MB by 50% or more, then the applicant must complete Stage 3 by performing a cost-benefit analysis for the "potentially significant" SAMAs identified in Stage 2. Applicants able to demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 evaluations. The application of the NEI 17-04 methodology is described as follows.

E4.15.3.1.1 Definitions of New and Significant Information

"New" information pertains to data used in a SAMA analysis that have changed or become available since the time the preceding SAMA analysis was performed.

There are some inputs to the SAMA analysis that are expected to change, or to potentially change, for all plants. These inputs include the following:

- Updated Level 3 model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
  - Population, as projected within a 50-mile radius of the plant
  - Value of farm and non-farm wealth
  - Core inventory (e.g., due to power uprate)
  - Evacuation timing and speed
  - Level 3 methodology updates
- NUREG/BR-0058 (NRC. 2004c) cost-benefit methodology updates.

In addition, other changes that could be considered "new information" are dependent on plant activities or site-specific changes. These types of changes include the following:

- The identification of a new hazard.
- Updated plant risk model (e.g., a fire PRA that replaces the individual plant examination of external events [IPEEE] analysis).
  - Impacts of plant changes that are included in the plant risk models will be reflected in the model results and do not need to be assessed separately.
- Non-modeled modifications/changes to the plant.
  - Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps), unless they impact a specific input to SAMA (e.g., a new low-pressure turbine in the power conversion system that results in a greater net electrical output).

For risk model updates performed to reflect the latest PRA model state of the practice, it is noted that the actual physical plant risk may not have changed; however, because the best-estimate assessment or understanding of the risk has changed, it is considered new information.

E4.15.3.2 Site-Specific Analysis

E4.15.3.2.1 Background

The evaluations of the VCSNS SLR SAMAs are consistent with the NEI 17-04 Revision 1 methodology (NEI. 2019b), which describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis.

As part of the VCSNS initial license renewal process, a detailed evaluation of potential SAMAs was performed. Of the potential SAMAs identified in the initial license renewal, a detailed cost-benefit

analysis was performed on the 12 SAMAs that could not be otherwise screened (NRC. 2004b). The cost-benefit analysis included development of a Level 3 approach PRA for VCSNS, which was used to calculate conditional offsite doses and property damage for each of the PRA release categories. By calculating the reduction in CDF and release category frequencies for each potential SAMA, the present value dollar benefit of each was determined, using the guidance of NUREG/BR-0184 (NRC. 1997c). The benefit was then compared to a cost estimate for each to complete the cost-benefit comparison. The conclusion of the analysis was that none of the proposed SAMAs were cost beneficial and implemented at VCSNS, and no SAMAs remain for further evaluation. The current VCSNS PRA models (internal events plus flooding, fire, and seismic PRA models) were used to determine the level of significance of new information. Consistent with the NEI methodology, these PRA models reflected the most up-to-date understanding of plant risk at the time of analysis (NEI. 2019b).

Consistent with the NEI 17-04 methodology (NEI. 2019b), the VCSNS PRA model is used to determine the level of significance of new information. As noted above, the criterion established for a SAMA being "potentially significant" is if the MB calculated for VCSNS would be reduced by a factor of two or more if the SAMA were implemented. If it can be shown that a particular SAMA would not reduce the CDF or any of the significant Level 2 release category group frequencies in the models of record by more than a factor of two, then that particular SAMA could not reduce the MB by more than a factor of two. Therefore, that SAMA would not be considered potentially significant and would not be evaluated further in assessing the significance of new information. This criterion was applied to the SAMA screening evaluation presented in Section E4.15.3.1.

As seen in the subsequent sections all SAMAs for VCSNS were screened using the Stage 1 qualitative or quantitative screening criteria from NEI 17-04. Therefore, the "Stage 2" from NEI 17-04 (update of the Level 3 PRA for detailed benefit calculations) is not required, and all SAMAs were found to not meet the criteria for "new and significant information" in Stage 1. The existence of a SAMA that would reduce MB by 50% or more and also be potentially cost-beneficial, would indicate the existence of "new and significant" information relevant to the previous SAMA analysis.

E4.15.3.2.2 Analysis of SAMAs for New and Significant Information

Stage 1 Assessment – Overview

The list of candidate SAMAs for the VCSNS SLR was developed from plant-specific and industry sources. For the plant-specific portion, the initial VCSNS license renewal SAMA evaluation was examined to identify all SAMAs that could not be qualitatively screened, and that were found not to be cost effective. Evaluating these items is appropriate for determining if there is any new and significant information for VCSNS and the PRA since the time of the initial license renewal in regard to the potential plant improvements.

For evaluation of the industry sources, the GEIS (NRC. 1996b) supplements were examined for SAMAs found to be potentially cost effective at plants similar to VCSNS. SAMAs found to be cost effective at similar plants (pressurized water reactors) were considered for their significance at VCSNS.

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to VCSNS or are already implemented at VCSNS (including plant modifications since the initial license renewal). The final plant specific VCSNS SAMAs from the initial license renewal are those that were potentially cost beneficial and did not exceed the MB.

The remaining SAMAs were then grouped based on similarities in mitigation equipment or risk-reduction benefits, and all were evaluated for the impact they would have on the VCSNS CDF and release category frequencies (i.e., Intact, SERF, LERF, and Late) if implemented. If any of the SAMAs reduced the total CDF, Intact, SERF, LERF, or Late frequencies by at least 50%, then the SAMA would be retained for a full Level 3 PRA evaluation of the reduction in MB. As described in the following sections, all SAMAs were screened without the need to perform a Level 3 update.

The current VCSNS PRA models (internal events plus flooding) were used in the quantitative evaluation of MB to determine the level of significance of new information. External hazard frequencies are calculated by applying a multiplier of 2 to the internal events benefits. Multiplying internal event frequency by a factor of 2 is consistent with the implementation of the external hazard multiplier approach in NEI 05-01 (NEI. 2005) and the initial license renewal (NRC. 2004b). This approach is sufficient to evaluate the SAMAs for new and significant information, given the bounding approach to the quantitative analyses and to the conservatism in the NEI approach.

Stage 1 Assessment – Identification and Qualitative Screening

A total of 330 industry SAMAs were collected from the 1996 GEIS supplements for each PWR site, of which all but 57 were qualitatively screened using the criteria discussed in Section E4.15.3.1. In addition, 18 VCSNS-specific SAMAs were collected for evaluation in the SLR, of which all but 5 were screened. A total of 62 SAMAs were not qualitatively screened and were grouped into 19 SAMA cases for quantitative screening evaluation.

Stage 1 Assessment – Quantitative Screening

This section presents the quantitative screening of the VCSNS SAMAs. The current VCSNS PRA models (internal events plus flooding, fire, and seismic PRA models) were used in the quantitative evaluation of MB to determine the level of significance of new information. External hazard frequencies are calculated by applying a multiplier of 2 to the internal events benefits. Multiplying internal event frequency by a factor of 2 is consistent with the implementation of the external hazard multiplier approach in NEI 05-01 (NEI. 2005) and the initial license renewal (NRC. 2004b). The NEI 17-04 methodology considers a SAMA to be potentially significant if it reduces the MB by at least 50%. The Stage 1 quantitative screening process evaluates this using the criteria of total CDF

and no release category frequency being reduced by at least 50%. Because the MB is the sum total of the contribution of each release category, if no release category decreases by at least 50%, then the total MB reduction cannot exceed 50%.

Therefore, the release category groups are examined for percentage reduction. If neither the total CDF, nor any release category (Intact, SERF, LERF, and Late) frequency is reduced by >50%, then the MB is also not reduced by >50%. SAMAs screened in this manner are not considered "potentially significant" and are conclusively screened as part of the Stage 1 assessment.

Table E4.15-1 presents the 19 SAMA evaluations, a description of the assessment, and the quantitative screening results from the bounding SAMA evaluations. As seen in Table E4.15-1, none of the bounding quantitative screening evaluations result in a reduction of total CDF, Intact, total SERF, total LERF, or total Late frequency greater than 50%. The evaluations were selected conservatively to provide assurance that they are bounding.

In one SAMA evaluation case (EFWP), the external hazards estimate is overly conservative as the total level 2 result exceeds the 50% threshold using the conservative estimate for external events contribution. A refined quantification was performed to lower the overall conservatism and obtain a more realistic estimate of risk reduction. For the seismic contribution, the additional EFW pump would have similar seismic capabilities and dependencies as the other EFW pumps and would be expected to be considered correlated to the existing pumps. Given correlation, the risk reduction would be negligible for seismic contributions that are approximately 50% of the external event contribution.

A refinement was made to lower the overall conservatism and obtain a more realistic estimate of risk reduction. The internal fire and seismic models were quantified for the change in CDF. This is representative of the change in Level 2 results. After refinement, the aggregate benefit for all hazards for this SAMA is below the 50% threshold for CDF, as identified in Table E4.15-1.

E4.15.3.3 Conclusions: Analysis of SAMAs for New and Significant Information

Appropriate qualitative screening criteria were applied to the industry SAMAs identified for consideration. For the remaining industry SAMAs and for the VCSNS-specific SAMAs to be evaluated, a series of bounding quantitative analyses were performed. These analyses demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the VCSNS MB by 50% or greater.

Therefore, it is concluded that there is no new and significant information that would alter the conclusions of the original SAMA analysis for VCSNS.

Table E4.15-1 Summary of Aggregate SAMA Maximum Benefits (Sheet 1 of 2)

Case Name	Assessment	Total L2 (Intact, LERF, LRF)		
		Base	Freq	Δ%
ALT_CS	Quantitatively evaluate alternate containment spray to scrub radionuclides in containment.	2.75E-06	3.16E-09	0.11%
ALT_INVERTER	Quantitatively evaluate benefit of a standby unit for a failed inverter.	2.75E-06	4.01E-08	1.46%
ALT_RH	Quantitatively evaluate an alternate water source for the residual heat removal (RH) system.	2.75E-06	3.21E-07	11.65%
ATWS	Quantitatively evaluate increased reliability of reactor trip in anticipated transient without scram (ATWS).	2.75E-06	1.43E-07	5.19%
BUSXTIE	Quantitatively evaluate backup powered 7.2-kV emergency bus with crosstie ability.	2.75E-06	3.60E-07	13.08%
CCW	Quantitatively evaluate an alternate cooling source for charging pumps.	2.75E-06	2.53E-07	9.17%
CCW_MOV	Quantitatively evaluate maintaining RH discharge motor operated valves (MOVs) open.	2.75E-06	1.93E-08	0.70%
CCW_RHX	Quantitatively evaluate automating component cooling water (CCW) flow to the RH heat exchangers.	2.75E-06	9.22E-08	3.35%
CIV	Quantitatively evaluate improvements to containment isolation system.	2.75E-06	2.29E-08	0.83%
DC-CHG	Quantitatively evaluate improved direct current (DC) power source capability.	2.75E-06	6.48E-7	23.52%
ECCS-COOL	Quantitatively evaluate risk improvement for removing emergency core cooling system (ECCS) cooling dependency on CCW.	2.75E-06	3.26E-07	11.84%
EFWP[(a)]	Quantitatively evaluate the benefit of additional permanent independently installed emergency feedwater (EF) pump for improved station blackout (SBO) response.	9.38E-05	2.00E-05	21.32%
HPI	Quantitatively evaluate improved or alternate high-pressure injection (HPI) injection source.	2.75E-06	2.76E-07	10.01%

Table E4.15-1 Summary of Aggregate SAMA Maximum Benefits (Sheet 2 of 2)

Case Name	Assessment	Total L2 (Intact, LERF, LRF)		
		Base	Freq	Δ%
IND_SGTR	Quantitatively evaluate removing requirement to clear the water loop seals after core damage to allow better circulation and reducing likelihood of induced stem generator tube rupture (SGTR).	2.75E-06	3.64E-08	-1.32%
PORV_OPEN	Quantitatively evaluate elimination of stuck open reactor coolant system (RCS) power-operated relief valves (PORVs) or safety relief valves (SRVs) following trip.	2.75E-06	4.96E-08	1.80%
RCP_SEALS	Quantitatively evaluate automatic reactor coolant pump (RCP) trip on loss of CCW.	2.75E-06	2.03E-07	7.36%
RWST	Quantitatively evaluate backup water source for re-filling the RWST.	2.75E-06	1.13E-06	47.66%
SGTR	Quantitatively evaluate improved steam generator capability thereby eliminating potential for SGTRs.	2.75E-06	7.94E-07	28.83%
SSB	Quantitatively evaluate elimination of secondary line break inside containment.	2.75E-06	1.11E-07	4.02%

a. SAMA EFWP calculated with a refined method which included IE/IF CDF, Fire CDF, and Seismic CDF, as discussed in Section E4.15.3.2.1.

E5.0 NEW AND SIGNIFICANT INFORMATION

Per the NRC's 2022 CLI-22-3 Memorandum and Order, site-specific assessments were performed for environmental issues applicable to VCSNS, rather than new and significant information reviews (NRC. 2022d). The site-specific assessments for the applicable environmental issues are included in Chapter E4.0.

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E6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

E6.1 LICENSE RENEWAL IMPACTS

Chapter E4.0 references NRC findings for each of the 70 environmental issues that apply to VCSNS, all of which have SMALL environmental impacts. Table E6.1-1 identifies the environmental impacts that subsequent renewal of the VCSNS OL would have on resources associated with the environmental issues.

DE has reviewed the environmental impacts of renewing the VCSNS OL and concluded that further mitigation measures beyond those presented in Section E6.2 and listed in Table E6.1-1 of this ER to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for DE's conclusion.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 1 of 16)

Resource Issue	ER Section	Environmental Impact
Land Use		
Onsite Land Use	E4.1.1	SMALL impact. Operation of VCSNS is not expected to change and no refurbishment activities are anticipated. Therefore, no changes to land uses are projected. The impacts from onsite land uses would remain SMALL during the SLR term.
Offsite Land Use	E4.1.2	SMALL impact. VCSNS has no plans to add workers, no significant changes to tax payments, and no refurbishment activities have been identified. Therefore, no changes in offsite land use are anticipated. The impacts from offsite land use would remain SMALL during the SLR term.
Offsite Land Use in Transmission Line Right-of-Ways (ROWs)	E4.1.3	SMALL impact. Ongoing use of power line ROWs at VCSNS are not expected to change. Therefore, no changes to current land uses and management procedures within the ROWs are anticipated. The impact from offsite land uses within transmission ROWs would remain SMALL during the SLR term.
Visual Resources		
Aesthetic Impacts	E4.1.4	SMALL impact. VCSNS has not identified any refurbishment activities that would change the aesthetics of the VCSNS facility. Therefore, aesthetic impacts would remain SMALL during the SLR term.
Air Quality		
Air Quality Impacts (All Plants)	E4.2.1	SMALL impact. VCSNS has not identified refurbishment activities, future upgrades, or replacement activities that would increase or decrease air emissions. Appropriate permit conditions would regulate and mitigate any potential VCSNS activities that could increase air pollutants. Therefore, air quality impacts would remain SMALL during the SLR term.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 2 of 16)

Resource Issue	ER Section	Environmental Impact
Air Quality Effects of Transmission Lines	E4.2.2	SMALL impact. VCSNS's in-scope transmission lines range from 115 kV to 230 kV and there are no anticipated changes to the system. The amount of ozone generated from the in-scope transmission lines is anticipated to be minimal. Therefore, air quality effects of transmission lines would remain SMALL during the SLR term.
Noise		
Noise Impacts	E4.3	SMALL impact. People living in the vicinity of VCSNS will not experience any changes in noise levels beyond what is currently experienced. Therefore, the impact of continued reactor operations would remain SMALL during the SLR term.
Geologic Environment		
Geology and Soils	E4.4	SMALL impact. VCSNS's compliance with current and future NPDES regulatory requirements and permit conditions, implementation of a SWPPP, implementations of BMPs, and adhering to internal procedures will ensure that geology and soil impacts will remain SMALL during the SLR term.
Surface Water Resources		
Surface Water Use and Quality (Non-Cooling System Impacts)	E4.5.1	SMALL impact. VCSNS has permits in place to govern discharges and programs and procedures in place to minimize the potential for spills. Future compliance with permits, programs, and procedures will ensure the impacts on surface water use and quality are SMALL.
Altered Current Patterns at Intake and Discharge Structures	E4.5.2	SMALL impact. VCSNS has no modifications that would alter the existing current pattern. Therefore, impacts to altered current patterns at the intake and discharge structures would be SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 3 of 16)

Resource Issue	ER Section	Environmental Impact
Altered Thermal Stratification of Lakes	E4.5.4	SMALL impact. To comply with SCDHEC water quality standards for temperature in lakes, DE conducts studies supporting the thermal effluent limitations. Therefore, the impacts to thermal stratification in the vicinity of the intake and discharge structures during the SLR term would be SMALL.
Scouring Caused by Discharged Cooling Water	E4.5.5	SMALL impact. VCSNS has no plant operations or modifications planned that would alter discharge patterns and flow rates. Therefore, VCSNS's impact due to scouring caused by cooling water discharge is SMALL.
Discharge of Metals in Cooling System Effluent	E4.5.6	SMALL impact. Condenser tubes are stainless steel at VCSNS and would not contribute leached metals to the cooling water discharge. Discharges at VCSNS are monitored and controlled as part of the NPDES permit process and the impact is SMALL.
Discharge of Biocides, Sanitary Wastes, and Minor Chemical Spills	E4.5.7	SMALL impact. The comprehensive regulatory controls and permits in place and VCSNS's compliance with them, guided by internal procedures, would mitigate impacts to surface waters from continued operation. Impacts of biocides and minor chemical spills will continue to be limited to a SMALL impact.
Surface Water Use Conflicts (Plants with Once-Through Cooling Systems)	E4.5.8	SMALL impact. VCSNS utilizes a once-through cooling system and a cooling tower. VCSNS is in compliance with both the Surface Water Appropriations Permit and the NPDES permit. Future compliance with these water use permits and regulations will ensure a SMALL impact on surface water use.
Surface Water Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	E4.5.9	SMALL impact. Makeup water to VCSNS's cooling tower is governed by an existing surface water withdrawal permit and evaporative loss is expected to be small. Continued operation with a cooling tower for the SLR term would not create surface water use conflicts. Therefore, impacts for this issue will remain SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 4 of 16)

Resource Issue	ER Section	Environmental Impact
Temperature Effects on Sediment Transport Capacity	E4.5.11	SMALL impact. Discharges are governed by VCSNS's NPDES permit. There are no plant operations or modifications planned that would alter discharge patterns. Impacts from increased water temperature on sediment transport capacity would remain SMALL.
Groundwater Resources		
Groundwater Contamination and Use (Non-Cooling System Impacts)	E4.5.12	SMALL impact. VCSNS has programs and procedures in place to minimize the potential for groundwater contamination. Compliance with current and future water withdrawal permits, NPDES permits, stormwater regulatory requirements, and implementation of the SWPPP, BMPs, and the SPCC plan will ensure impacts on groundwater use and quality from non-cooling systems would remain SMALL.
Groundwater Use Conflicts (Plants that Withdraw Less than 100 gpm)	E4.5.13	SMALL impact. VCSNS does not anticipate groundwater withdrawals greater than 100 gpm. Therefore, the impact on groundwater use conflicts from continued operations would be SMALL.
Groundwater Use Conflicts (Plants with Closed-Cycle Cooling Systems that Withdraw Makeup Water from a River)	E4.5.15	SMALL impact. VCSNS withdraws from and discharges to a cooling pond, Monticello Reservoir, which receives its makeup water from Parr Reservoir on the Broad River. Impacts from VCSNS on the Broad River flow conditions or associated, sparsely distributed alluvial groundwater that would affect instream and riparian communities in Parr Reservoir or the Broad River over the license renewal term would be SMALL.
Groundwater Quality Degradation Resulting from Water Withdrawals	E4.5.16	SMALL impact. VCSNS does not anticipate an increase in groundwater withdrawals beyond what is currently reported. Therefore, the impacts from groundwater quality degradation resulting from water withdrawals would be SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 5 of 16)

Resource Issue	ER Section	Environmental Impact
Groundwater Quality Degradation (Plants with Cooling Ponds at Inland Sites)	E4.5.18	SMALL impact. VCSNS employs a once-through cooling system, withdrawing from, and discharging to a cooling pond, Monticello Reservoir. Overall groundwater quality is likely to be improved by the presence of the Monticello Reservoir and any negative impacts from VCSNS on the groundwater in the vicinity of the plant over the license renewal term would be SMALL.
Radionuclides Released to Groundwater	E4.5.19	SMALL impact. Water for plant uses continues to be processed and monitored in compliance with licensing and permitting. Impacts from radionuclides to groundwater do not warrant additional mitigation measures beyond compliance with the existing groundwater protection program.
Terrestrial Resources		
Effects on Terrestrial Resources (Non-Cooling System Impacts)	E4.6.1	SMALL impact. No refurbishment or other license renewal-related construction activities have been identified; adequate management programs and regulatory controls are in place to protect onsite important plant and animal habitats.
Exposure of Terrestrial Organisms to Radionuclides	E4.6.2	SMALL impact. VCSNS operates in compliance with NRC effluents standards and reports effluents annually as required. Continued compliance with NRC radiological effluents limits and implementation of the REMP will ensure that terrestrial organisms' exposure to radionuclides remains SMALL.
Cooling System Impacts on Terrestrial Resources (Plants with Once-Through Cooling Systems or Cooling Ponds)	E4.6.3	SMALL impact. VCSNS utilizes regulatory controls to ensure that terrestrial resources are protected. Therefore, the cooling system at VCSNS would continue to have a SMALL impact on terrestrial resources.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 6 of 16)

Resource Issue	ER Section	Environmental Impact
Cooling Tower Impacts on Vegetation (Plants with Cooling Towers)	E4.6.4	SMALL impact. VCSNS operates an MDCT for cooling certain loads within the Turbine Building. The cooling tower is within the developed area of VCSNS and away from terrestrial resources. Therefore, the cooling towers would continue to have a SMALL impact on vegetation for the SLR term.
Bird Collisions with Plant Structures and Transmission Lines	E4.6.5	SMALL impact. VCSNS's avian protection plan establishes measures to avoid and minimize risk of avian collision with transmission lines. Given the low occurrence in bird mortality and VCSNS's adherence to regulatory and permit requirements, the impacts due to bird collisions with plant structures and transmission lines would remain SMALL.
Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	E4.6.6	SMALL impact. VCSNS employs a once-through cooling system, withdrawing from, and discharging to a cooling pond, Monticello Reservoir, which receives its makeup water from Parr Reservoir on the Broad River. Compliance with the FERC license conditions, current and future NPDES regulatory requirements, and surface water withdrawal permits ensures that water use conflicts from the continued operation is limited to a SMALL impact.
Transmission Line Right-of-Way Management Impacts on Terrestrial Resources	E4.6.7	SMALL impact. VCSNS's in-scope transmission corridor is developed and industrialized, with limited ecological features. Implementation of BMPs will ensure the impact on terrestrial resources from ROW management and maintenance would continue to be SMALL.
Electromagnetic Fields on Flora and Fauna (Plants, Agricultural Crops, Honeybees, Wildlife, Livestock)	E4.6.8	SMALL impact. VCSNS in-scope transmission lines are confined to industrial areas and are of a voltage not reported to have any biologically significant impacts and the EMFs emitted by the in-scope transmission lines would have no impact on flora and fauna. Therefore, impacts from electromagnetic fields on flora and fauna during the SLR term would be SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 7 of 16)

Resource Issue	ER Section	Environmental Impact
Aquatic Resources		
Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	E4.6.9	SMALL impact. Based on impingement and entrainment studies, compliance with current and future NPDES permit conditions, and the implementation of best available technology requirement to minimize impacts of impingement and entrainment, the impacts would be SMALL during the proposed SLR operating term.
Entrainment of Phytoplankton and Zooplankton (All Plants)	E4.6.11	SMALL impact. VCSNS conducts monitoring as required under 316(b) of the CWA. Based on impingement and entrainment studies, ecological monitoring, and compliance with current and future NPDES permit conditions, impacts from entrainment of phytoplankton and zooplankton would be SMALL.
Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)	E4.6.12	SMALL impact. The thermal discharge associated with VCSNS outflow is localized, thereby minimizing the ability of the plume to influence physical properties of the receiving water. Because there are no planned operational changes, impacts would be SMALL during the proposed SLR operating term.
Infrequently Reported Thermal Impacts (All Plants)	E4.6.14	SMALL impact. Discharges at VCSNS are governed by an NPDES permit which establishes discharge limits. The thermal discharge associated with VCSNS is localized due to the presence of an elevated jetty that acts to buffer the influence of thermal plume on receiving waters. There are no plant operations or modifications planned for the proposed SLR term that would alter discharge structures or thermal discharges. Therefore, infrequently reported thermal impacts would remain SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 8 of 16)

Resource Issue	ER Section	Environmental Impact
Effects of Cooling Water Discharge on Dissolved Oxygen, Gas Supersaturation, and Eutrophication	E4.6.15	SMALL impact. VCSNS operates under conditions of its NPDES permit that requires environmental monitoring studies which include water quality assessments. Data collected do not indicate significant change in water quality or decrease in the Monticello Reservoir at VCSNS. Therefore, the effects of dissolved oxygen, supersaturation, and eutrophication would remain SMALL.
Effects of Nonradiological Contaminants on Aquatic Organisms	E4.6.16	SMALL impact. VCSNS's NPDES permit governs water treatment chemicals and biocide use. Since no plant modifications are planned and discharges will continue to be in compliance with the NPDES permit, the impact on the aquatic community from nonradiological contaminants will remain SMALL.
Exposure of Aquatic Organisms to Radionuclides	E4.6.17	SMALL impact. VCSNS's continued compliance with NRC radiological effluent limits and implementation of the REMP ensures that aquatic organisms' exposure to radionuclides are well within guidelines and the impact will remain SMALL.
Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)	E4.6.19	SMALL impact. VCSNS employs a once-through cooling system, withdrawing from, and discharging to a cooling pond, Monticello Reservoir, which receives its makeup water from Parr Reservoir on the Broad River. Compliance with the FERC license conditions, current and future NPDES regulatory requirements, and surface water withdrawal permits will ensure that water use conflicts from the continued operation continues to be limited to a SMALL impact.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 9 of 16)

Resource Issue	ER Section	Environmental Impact
Effects on Aquatic Resources (Non-Cooling System Impacts)	E4.6.20	SMALL impact. VCSNS has administrative procedures that establish the policies and general requirements for ongoing operations, maintenance, and construction activities to be conducted in accordance with the VCSNS environmental protection plan, and applicable federal, state, and local regulations and permit conditions. Continued implementation of a SWPPP and BMPs will ensure that the potential for impacts to nearby aquatic habitats as a consequence of soil erosion, changes in water quality, or releases of chemical contaminants during the SLR term will be SMALL.
Impacts of Transmission Line Right-of-Way Management on Aquatic Resources	E4.6.21	SMALL impact. VCSNS has administrative policies and implements BMPs for preventing erosion from soil disruption related to maintenance and management. The NPDES permit requires VCSNS to implement BMPS to protect surface water and groundwater from runoff of pollutants and loose soil in industrial areas. Implementation of BMPS and adherence to vegetation management protocols will ensure that impact on aquatic resources from ROW management would be SMALL.
Losses from Predation, Parasitism, and Disease Among Organisms Exposed to Sub-Lethal Stresses	E4.6.22	SMALL impact. Sub-lethal stresses are not significantly impacting the aquatic resources in the vicinity of VCSNS. Therefore, losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses during the SLR term would be SMALL.
Special Status Species and Habitats		
Threatened, Endangered, and Protected Species, and Essential Fish Habitat	E4.6.23	SMALL impact. No refurbishment or other license renewal-related construction activities have been identified. The continued operation of the site would have no adverse effects to any federally or state-listed species. EFH was not identified near VCSNS. Therefore, continued operation MAY AFFECT BUT IS NOT LIEKLY TO ADVERSELY AFFECT threatened, endangered, and protected species, critical habitat, or EFH in the vicinity of VCSNS.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 10 of 16)

Resource Issue	ER Section	Environmental Impact
Historic and Cultural Resources		
Historic and Cultural Resources	E4.7	No impact. While cultural resources are present at the VCSNS site, no adverse effects have been identified. No refurbishment or other license-renewal related construction activities have been identified; administrative procedure ensures protection of these types of resources in the event of excavation activities.
Socioeconomics		
Employment and Income, Recreation and Tourism	E4.8.1	SMALL impact. VCSNS has no plans to change the site's visual profile, no refurbishment is planned, and the only anticipated changes to the workforce are as-needed permanent employees. Therefore, the impacts to employment and income for the SLR term would be SMALL.
Tax Revenues	E4.8.2	SMALL impact. VCSNS has no plans to change the operational workforce, no refurbishment is planned, and tax payments are expected to remain constant. Therefore, potential impacts related to tax revenue during the SLR term are SMALL.
Community Services and Education	E4.8.3	SMALL impact. VCSNS has no anticipated changes to employment from continued operations, tax payments are anticipated to remain consistent, and no refurbishment activities are planned. Therefore, potential impacts related to community services and education during the SLR term are SMALL.
Population and Housing	E4.8.4	SMALL impact. VCSNS has no anticipated changes to employment from continued operations and no refurbishment activities are planned. Therefore, potential impacts to population and housing during the SLR term are SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 11 of 16)

Resource Issue	ER Section	Environmental Impact
Transportation	E4.8.5	SMALL impact. VCSNS has no anticipated changes to employment from continued operations and no potential refurbishment activities have been proposed that would require a larger workforce. Therefore, potential impacts to transportation during the SLR term are SMALL.
Human Health		
Radiation Exposures to the Public	E4.9.1	SMALL impact. Continued compliance with NRC radiological effluent limits and implementation of the REMP ensures that public exposure to radionuclides attributable to VCSNS is well within guidelines and adverse trends are detected to implement corrective actions. Therefore, impacts from radiation exposures to the public attributable to VCSNS operations would remain SMALL during the SLR term.
Radiation Exposures to Plant Workers	E4.9.2	SMALL impact. Occupational doses from continued operations are expected to be within the range of doses during the current licensing term and would continue to be well below regulatory limits. Therefore, impacts from radiation exposure to plant workers would remain SMALL during the SLR term.
Human Health Impact from Chemicals	E4.9.3	SMALL impact. Chemical hazards to plant workers at VCSNS are expected to be minimized by good hygiene practices as required by permits and compliance with federal and state regulations. Chemical releases to the environment and the potential for impacts to the public are expected to be minimized by adherence to discharge limitations of the NPDES and other permits and regulatory requirements. Therefore, impacts to human health from chemicals during the SLR term would be SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 12 of 16)

Resource Issue	ER Section	Environmental Impact
Microbiological Hazards to the Public (Plants with Cooling Ponds or Canals, or Cooling Towers that Discharge to a River)	E4.9.4	SMALL impact. The discharge area's location away from public access, along with VCSNS controls, also mitigates public exposure. Therefore, impacts to the public from microbiological hazards would remain SMALL during the SLR term.
Microbiological Hazards to Plant Workers	E4.9.5	SMALL impact. Occupational health impacts are controlled by continued application of accepted industrial hygiene practices and VCSNS has a comprehensive safety program to minimize worker exposures as required by permits and federal and state regulations. Therefore, microbiological hazards to plant workers during the SLR term are SMALL.
Physical Occupational Hazards	E4.9.6	SMALL impact. Continued compliance with OSHA regulations for exposure and use of personal protective equipment reduces the risk from chronic exposure. Therefore, physical occupational hazards during the SLR term would be SMALL.
Electric Shock Hazards	E4.9.7	SMALL impact. VCSNS in-scope transmission lines are in compliance with NESC clearance guidelines. Work on and near the transmission lines is governed by plant procedures. Given these conditions, the human health impact from electric shock hazards during the proposed SLR operating term would be SMALL.
Postulated Accidents		
Design-Basis Accidents	E4.15.1	SMALL impact. Since VCSNS maintains its licensing basis and implements aging management programs during the license renewal term, the environmental impacts during the SLR term are not expected to differ significantly from those calculated for DBA assessments conducted as part of the initial plant licensing process. Therefore, the impacts due to DBAs are SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 13 of 16)

Resource Issue	ER Section	Environmental Impact
Severe Accident Consequences	E4.15.2	SMALL impact. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents is SMALL. Therefore, the impact of severe accidents remains SMALL for the SLR term.
Severe Accident Mitigation Alternatives	E4.15.3	The quantitative analyses performed demonstrate that none of the SAMAs considered for quantitative evaluation would reduce the VCSNS MB by 50% or greater. Therefore, there is no new and significant information that would alter the conclusions of the original SAMA analysis for VCSNS.
Environmental Justice		
Minority and Low-Income Populations	E4.10.1	No impact. No disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations are anticipated.
Waste Management		
Low-Level Waste Storage and Disposal	E4.11.1	SMALL impact. VCSNS manages and stores LLRW onsite in accordance with NRC regulations and disposes of LLRW in NRC-licensed treatment and disposal facilities. Therefore, impacts from the storage and disposal of LLRW during the SLR term would remain SMALL.
Onsite Storage of Spent Nuclear Fuel	E4.11.2	SMALL impact. VCSNS currently stores SNF in its spent fuel pool and dry storage in an NRC-licensed ISFSI. Therefore, the impacts of onsite storage of spent fuel during the SLR term at VCSNS are SMALL.
Offsite Radiological Impacts of Spent Nuclear Fuel and High-Level Waste Disposal	E4.11.3	No impact. The offsite radiological impacts of SNF and high-level waste disposal for one SLR term at VCSNS are analyzed in the Continued Storage GEIS with no impact level assigned.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 14 of 16)

Resource Issue	ER Section	Environmental Impact
Mixed-Waste Storage and Disposal	E4.11.4	SMALL impact. VCSNS has procedures for shipping mixed waste to be in accordance with federal and state regulations. VCSNS's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of mixed waste during the SLR term.
Nonradioactive Waste Storage and Disposal	E4.11.5	SMALL impact. VCSNS stores and disposes of recyclable, hazardous, and nonhazardous wastes in accordance with EPA and state regulations and disposes of the wastes in appropriately permitted treatment and disposal facilities. VCSNS's compliance with comprehensive regulatory controls and use of NRC-licensed and EPA-permitted treatment and disposal facilities will ensure the continued SMALL impact from the handling, storage, and disposal of nonradioactive waste during the SLR term.
Cumulative Impacts		
Cumulative Impacts	E4.12	SMALL adverse to SMALL beneficial impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, surface water, groundwater, terrestrial and aquatic and ecological resources, human health, climate change, and waste management. SMALL adverse to SMALL beneficial for socioeconomics. No impact for historic and cultural resources.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 15 of 16)

Resource Issue	ER Section	Environmental Impact
Uranium Fuel Cycle		
Offsite Radiological Impacts–Individual Impacts from Other Than the Disposal of Spent Fuel and High-Level Waste	E4.13.1	SMALL impact. VCSNS has a comprehensive program of managing its radioactive wastes that implements regulatory requirements for management, storage, inspections, packaging, and shipping. VCSNS complies with applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes. Therefore, offsite radiological impacts from radioactive waste management during the SLR term are SMALL.
Offsite Radiological Impacts–Collective Impacts from Other than the Disposal of Spent Fuel and High-Level Waste	E4.13.2	SMALL impact. VCSNS complies with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes. Therefore, offsite radiological impacts from radioactive waste management during the SLR term are SMALL.
Nonradiological Impacts of the Uranium Fuel Cycle	E4.13.3	SMALL impact. VCSNS's continued fuel demand would not alter nonradiological impacts upstream in the fuel cycle. Therefore, the nonradiological impacts of the uranium fuel cycle resulting from the SLR term are SMALL.
Transportation	E4.13.4	SMALL impact. VCSNS has a comprehensive program of managing its radioactive and mixed wastes that implements the regulatory requirements for management, storage, inspections, packaging, and shipping. VCSNS complies with the applicable NRC, DOT, DOE, and state regulatory controls for packaging and transportation of radioactive wastes and SNF. Therefore, radiological impacts from transportation of radioactive materials and waste during the SLR term are SMALL.

Table E6.1-1 Environmental Impacts Related to Subsequent License Renewal at VCSNS (Sheet 16 of 16)

Resource Issue	ER Section	Environmental Impact
Termination of Nuclear Power Plant Operations and Decommissioning		
Termination of Plant Operations and Decommissioning	E4.14	SMALL impact. Radiation exposures from continued operations and stored spent fuel to both workers and the public are expected to remain at current levels, which are below regulatory limits. Therefore, continued operation during the SLR term would be a SMALL impact on terminating operations and decommissioning on all resources.

E6.2 MITIGATION

E6.2.1 REQUIREMENTS [10 CFR 51.45(C)]

The environmental report must include an analysis that considers and balances…alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

E6.2.2 DE RESPONSE

NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the applicant should identify any ongoing mitigation and address the potential need for additional mitigation. Applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC. 2013b)

As discussed in Section E6.1, impacts associated with the proposed VCSNS SLR do not require the implementation of additional mitigation measures. The permits and programs presented in Chapter E9.0 (i.e., NPDES permit; stormwater program; air permit; SPCC plan; hazardous waste management program; cultural resource procedures; and environmental review programs) that currently mitigate the operational environmental impacts of VCSNS are adequate. Therefore, additional mitigation measures are not sufficiently beneficial as to be warranted.

E6.3 UNAVOIDABLE ADVERSE IMPACTS

E6.3.1 REQUIREMENT [10 CFR 51.45(B)(2)]

The environmental report shall . . . discuss . . . any adverse environmental effects which cannot be avoided should the proposal be implemented . . . . [10 CFR 51.45(b)(2)]

E6.3.2 DE RESPONSE

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the facility is in existence at the license renewal stage and has already operated for years. As a result, adverse impacts associated with the initial construction have been avoided, mitigated, or already occurred.

As discussed in Chapter E4.0 DE does not anticipate the continued operations of VCSNS to adversely affect the environment. DE also does not anticipate any SLR-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. Therefore, the environmental impacts to be evaluated for SLR are those associated with continued operation during the renewal term.

DE identified the following site-specific unavoidable adverse impacts associated with VCSNS license renewal:

- The majority of the land use at VCSNS would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of VCSNS). Uranium mining associated with the nuclear fuel cycle also has offsite land use implications.
- As discussed in Section E3.6.1.2.1, normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to the Monticello Reservoir at or below SCDHEC approved concentrations. Compliance with the NPDES permit would ensure that impacts remain SMALL.
- As discussed in Section E3.6.3.1, plant operation of VCSNS results in consumptive water use of the Monticello Reservoir. VCSNS uses a once-through cooling system that withdraws from and discharges to the Monticello Reservoir with minimal waste.
- Operation of VCSNS results in the generation of SNF and waste material, including LLRW, hazardous waste, and nonhazardous waste. Specific plant design features in conjunction with a waste minimization program, employee safety training programs and work procedures, and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.
- Operation of VCSNS results in a very small increase in radioactivity in the air and water emissions. The incremental radiation dose to the local population resulting from VCSNS operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to the public from VCSNS's gaseous releases would be well within the allowable limits of 10 CFR 20 and 10 CFR 50, Appendix I. Operation of VCSNS also creates a very low probability of accidental radiation exposure to inhabitants of the area.

E6.4 IRREVERSIBLE OR IRRETRIEVABLE RESOURCE COMMITMENTS

E6.4.1 REQUIREMENT [10 CFR 51.45(B)(5)]

The environmental report shall . . . discuss . . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. [10 CFR 51.45(b)(5)]

E6.4.2 DE RESPONSE

The term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their

former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

The continued operation of VCSNS for the proposed SLR operating term would result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of SNF, LLRW generated as a result of plant operations, and sanitary waste generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of VCSNS that cannot be recovered or recycled, or that are consumed or reduced to unrecoverable forms.

Other than the above, no SLR-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

If VCSNS ceases operations on or before the expiration of the current OLs, the likely power generation alternatives would require a commitment of resources for construction of the replacement plant as well as for fuel to run the plant.

E6.5 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

E6.5.1 REQUIREMENT [10 CFR 51.45(B)(4)]

The environmental report shall . . . discuss . . . the 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)]

E6.5.2 DE RESPONSE

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since VCSNS began operations. The final environmental statement (FES) for VCSNS evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of VCSNS. The proposed SLR operating term will not alter the short-term uses of the environment from the uses previously evaluated in the VCSNS FES. The proposed SLR operating term will postpone the availability of the site resources (land, air, water) for other uses. Denial of the application to renew the VCSNS OLs would lead to the shutdown of the

plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the site area occupied by VCSNS into a park or an industrial facility after decommissioning are quite different. Extending VCSNS operations would not alter, but postpone, the potential long-term uses of the site that are currently possible.

In summary, no SLR-related refurbishment activities have been identified that would alter the evaluation of the VCSNS FES for the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity of these resources.

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E7.0 ALTERNATIVES TO THE PROPOSED ACTION

The environmental report shall . . . discuss . . . alternatives to the proposed action . . . . [10 CFR 51.45(b)(3)]

The applicant shall discuss in this report the environmental impacts of alternatives and any other matters . . . . The report is not required to include discussion of need for power or economic costs and 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)]

A reasonable alternative must be commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's operating license . . . . The amount of replacement power generated must equal the base-load capacity previously supplied by the nuclear plant and reliably operate at or near the nuclear plant's demonstrated capacity factor. (NRC. 2013a, Section 2.3)

E7.1 NO-ACTION ALTERNATIVE

As described in Section E2.1, the proposed action is to renew the OL for VCSNS for an additional 20-year period. The only other alternative under consideration is the no-action alternative, which would be the decision *not* to renew the VCSNS OL. If the VCSNS OL is not renewed, the 966 MWe (net) of baseload power would not be available to meet DE's power generation needs during the proposed SLR operating term from 2042–2062. Because DE is a regulated utility that must meet its customers' long-term power needs, and VCSNS constitutes a significant block of long-term baseload capacity for South Carolina, it is reasonable to assume that a decision not to renew the VCSNS licenses would necessitate the replacement of this capacity. Therefore, the no-action alternative will identify replacement power sources for the loss of VCSNS generation as a reasonably foreseeable consequence of no action.

In accordance with 10 CFR 51.53(b)(3), this ER will discuss a no-action alternative to the proposed license renewal and a range of alternatives for replacement baseload power sources. A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactor's renewed OL or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's renewed OL (NRC. 2013a). The replacement power alternative generation must also provide adequate baseload power capacity that was previously supplied by the nuclear plant, and the alternative must reliably operate at or near the demonstrated capacity factor of VCSNS.

The replacement power sources being considered under the no-action alternative are presented in Section E7.2.1. Section E7.2.2 will identify the no-action alternative power sources evaluated that were not considered reasonable power sources for the replacement of the VCSNS generation.

E7.1.1 DECOMMISSIONING IMPACTS

The NRC's definition of decommissioning as stated in 10 CFR 20.1003 is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits the following:

- Release of the property for unrestricted use and termination of the license; or
- Release of the property under restricted conditions and termination of the license.

The NRC-evaluated decommissioning options include the following:

- Immediate dismantling soon after the facility closes;
- Safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination; and
- Permanent entombment on the site in structurally sound material such as concrete that is maintained and monitored.

Decommissioning must be completed within a 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, DE would continue operating VCSNS until the existing OL expires. Upon expiration of the OL, DE would initiate decommissioning procedures in accordance with NRC requirements. The NRC evaluated decommissioning environmental impacts in 2002 in the Decommissioning GEIS, NUREG-0586, Supplement 1 (NRC. 2002). NRC used the 2002 analysis to inform the license renewal GEIS analysis of decommissioning. DE considers the Decommissioning GEIS description of decommissioning impacts as representing the actions it would perform for the VCSNS decommissioning. Therefore, DE relies on the NRC's conclusions regarding the environmental impacts of decommissioning VCSNS.

Decommissioning and its associated impacts are not considered evaluation criteria used to proceed with the proposed action or select the no-action alternative. VCSNS will be decommissioned eventually, regardless of the NRC decision on license renewal, and license renewal will postpone decommissioning for another 20 years.

The primary criteria used to evaluate the proposed action and the no-action alternative are the power options available for replacement of VCSNS generation. DE concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal as identified in the Decommissioning GEIS. Decommissioning

impacts are expected to be SMALL, inclusive of any necessary mitigation and could overlap with operation of a VCSNS replacement.

E7.2 ENERGY ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS

In accordance with 10 CFR 51.53(c)(2), DE considered a range of alternatives to replace generation if the renewed VCSNS OL is not renewed. DE considered each of the replacement alternatives identified in the NRC GEIS for license renewal (NRC. 2013a, Section 2.3). These alternatives were evaluated based on their ability to provide reliable baseload power and to be operational prior to the expiration of the current OL. Alternatives unable to replace VCSNS baseload power were considered unreasonable. The following subsections will identify the replacement power sources considered as reasonable (Section E7.2.1), and power sources considered as unreasonable (Section E7.2.2).

E7.2.1 ENERGY ALTERNATIVES CONSIDERED AS REASONABLE

A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactor's OL or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactor's OL. The replacement power alternative generation must also provide baseload capacity previously supplied by the nuclear plant. The alternatives analysis identified the following power sources as meeting the NRC criteria for reasonableness in the replacement of VCSNS generation during the proposed SLR operating term. These energy alternatives considered reasonable are further discussed in Section E7.2.3.

- Natural Gas Alternative –
  - Natural gas combustion turbine located at the abandoned Units 2 and 3 site
- New Nuclear Alternative –
  - Small modular reactor (SMR) located at the abandoned Units 2 and 3 site
- Combination Alternative 1 –
  - Natural gas combustion turbine located at the abandoned Units 2 and 3 site
  - Solar panels with lithium-ion battery storage located at the abandoned Units 2 and 3 site
  - Three solar facilities with lithium-ion battery storage located offsite
- Combination Alternative 2 –
  - SMR located at the abandoned Units 2 and 3 site
  - Solar panels with lithium-ion battery storage located at the abandoned Units 2 and 3 site

E7.2.2 ENERGY ALTERNATIVES NOT CONSIDERED REASONABLE

The full range of energy alternatives as described in the GEIS includes power sources that will require development of new generation and power alternatives that will not require new generation, such as purchased power (NRC. 2013a, Section 2.3). DE considered all the alternatives described in the GEIS for replacement of the VCSNS generation. This section will address the energy alternatives that were not considered reasonable for additional evaluation.

E7.2.2.1 Purchased Power

Replacing all of the energy generation and capacity provided by VCSNS with purchased power would introduce greater uncertainties in energy reliability that are not within DE's control. Further, purchased power would be subject to competing power demand to secure firm power contracts adding to energy reliability concerns. The closure of coal-fired plants across the United States also changes the availability of baseload generation availability, further introducing uncertainty for purchasing a firm energy supply.

Potential environmental impacts associated with purchased power could be substantial and exceed the impacts associated with the continued operation of VCSNS. The potential environmental impacts associated with purchased power would include those associated with the source of the generation and the transmission of the power into the regional grid. Fossil generation results in air emissions, water use and quality issues, and land use impacts associated with the plant footprint. Renewable energy generation can have a large development footprint that can convert natural habitats to an industrial site. The conversion of forest and even agricultural lands to an industrial site can result in impacts to habitat that may adversely impact wildlife and plant species. Additional transmission capacity may be required to distribute electricity from renewable or fossil generation, and this may result in impacts to communities and lands within and adjacent to the corridor. These impacts could include loss of sensitive habitat, visual and view shed impairment, and degradation of wetlands and stream crossings.

Given the uncertainties associated with purchasing baseload power at the scale of VCSNS's generation capacity on a long-term basis and the environmental impacts for developing new generation and transmission capacity, as well the operational impacts of fossil-fuel generation, purchased power was not considered a reasonable discrete alternative.

E7.2.2.2 Other Dominion Energy Plant Reactivation or Extended Service Life

By law, South Carolina electric utilities must prepare an IRP every 3 years and update that IRP during each intervening year. DE has previously submitted and had approved, a Modified 2020 IRP and 2021 Update to the 2020 IRP. DE filed its 2023 IRP with the Public Service Commission of South Carolina (SCPSC) on January 31, 2023. The SCPSC will approve, modify, or deny the IRP within 300 days. In the 2023 IRP, DE evaluated fourteen build plans resulting in five Core Build

Plans which use the three most likely Market Scenarios to model fifteen core cases that attempt to achieve CO_2 emissions reductions of 70–85% by 2050. The resulting scenarios include the planned retirement of two coal-only generating stations in South Carolina and the transition of an additional coal-only generating station to natural gas. Specifically, the Wateree station is anticipated to be retired in 2028, the Williams station in 2030 and Cope would be converted to natural gas only in 2031. The Williams and Wateree stations would be replaced with a combined-cycle natural gas plant and large-frame natural gas combustion turbines, respectively, concurrently with an estimated 5,025 MW of solar generation and 1,500 MW of battery storage between 2026 and 2049. (DE. 2021d; DE. 2023b)

Since 2000, DE and its predecessor, SCE&G, have retired or repowered eight coal generation units and reduced carbon emission by 45% compared to 2005 levels (DE. 2023b) By 2019, the coal-fired retirements and repowering had also reduced SO_2 emissions by 99%, nitrous oxide emissions by 84% and mercury emissions by 85% compared to 2005 levels (DE. 2021e). In 2020, DE announced a significant expansion of its GHG emissions reduction goals, establishing a new companywide commitment to achieve net zero CO_2 and methane emissions by 2050 (DE. 2021e).

Reactivating or continuing to operate coal-fired plants would result in much higher criteria air pollutant emissions than the operation of a nuclear power plant. This resource planning path would also not be in line with the preferred resource plan selected during Public Service Commission of South Carolina's resource planning requirements. Therefore, plant reactivation and extended service life is not considered a reasonable alternative because of the environmental impacts with continued use of fossil fuel-fired generation sources.

E7.2.2.3 Conservation and Energy Efficiency Measures (Demand-Side Management)

Demand-side management (DSM) includes demand response that shifts electricity from a peak-use period to times of lower demand, and energy efficiency or conservation programs that reduce the amount of electricity required for existing activities and processes. A DSM alternative would be required to reduce the baseload demand by 966 Mwe to be considered a reasonable alternative. Reliance on DSM as a reasonable alternative to VCSNS is uncertain because it relies on voluntary participation rather than mandatory energy efficiency from compliance with codes and standards (e.g., building codes and appliance energy use ratings) and realized savings of energy of need to replace VCSNS's large capacity.

DE considered three levels of DSM in a Rapid Assessment analysis as directed by the SCPSC (DE. 2021d). The results of the 2023 DSM potential study are included as inputs to the 2023 IRP modeling representing Low, Medium and High Case DSM scenarios (DE. 2023b). Given that DE has considered the highest level of implementation and integrated it into its resource planning, reliance of further reductions for resource planning would introduce additional uncertainty. Further,

reliance on DSM to replace VCSNS's generation capacity would be unreasonable. Therefore, DSM is not considered a reasonable alternative.

E7.2.2.4 Wind

South Carolina does not have substantial onshore wind energy resources (EIA. 2021a). Further, wind was not included in DE's South Carolina IRP due to cost and local weather conditions, making the wind resource not economical in comparison with solar. The following discussion presents the metrics of deployment of wind based on national, rather than state-specific, data.

The land needs for wind generation include land parcel(s) that can host a wind farm where turbines are spaced for operation and linked with other turbines and with power converters and connections with transmission infrastructure. Within the wind farm acreage, land would be permanently disturbed for wind turbine bases and power infrastructure as well as temporary construction areas such as laydown and worker support areas. The DOE developed three land use metrics for these acreage considerations: 85 acres per MW for wind farm boundaries, 2.47 acres per MW for construction footprint, and 0.74 acres per MW for permanent structures (DOE. 2015). To replace 966 Mwe from VCSNS with wind power would require about 2,333 Mwe based on the average U.S. wind generation capacity of 41.4% (DOE. 2021a). Based on the DOE metrics, the acreage requirements are about 200,000-acres for wind farms, 5,800 acres for construction footprint, and 1,700 acres for permanent structures. The wind farm acreage would require many installations to bring together enough available land parcels. Each of these installations has the potential to significantly impact land use, even with spaced wind turbines allowing for compatible uses such as crop cultivation.

Wind typically cycles over a 24-hour period, is not dispatchable, and low-capacity factors can be experienced for several days at a time due to variable wind patterns. Therefore, wind generation by itself is not capable of providing baseload power. For a wind farm to replace a baseload energy source, capacity significantly exceeding the VCSNS generation, coupled with large amounts of energy storage, would have to be included for the facility. Installation of batteries to provide firm power, compensating for wind's intermittent nature, would further increase acreage requirements.

Other impacts from wind generation include impacts to terrestrial ecology from land disturbance and avian mortality from operations. Fully replacing VCSNS's generating capacity with a discrete wind alternative based on the U.S. average for wind farm generating capacity would require multiple utility-scale wind farms, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. Depending on the location of the wind facilities, the land use disturbances could result in moderate to large impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, discrete wind would not be a superior alternative to continued operation of VCSNS.

While South Carolina does not have substantial onshore wind energy resources, it does have offshore wind potential. A 2016 study from the National Renewable Energy Laboratory (NREL) ranked South Carolina sixth among states for offshore wind potential (NREL. 2016). DE is early in its offshore wind experience and is operating a two-test turbine pilot wind project off the coast of Virginia. DE is also developing plans to begin construction on the Coastal Virginia Offshore Wind (a maturation of the pilot project) in 2024. The project would be located 27 miles offshore with 176 wind turbines 2.6 gigawatts (nameplate). The turbines would be approximately 800 feet tall. The project also includes three offshore substations, undersea cabling to bring the power to shore, and new onshore transmission infrastructure. (DE. 2022f)

In 2021, the Bureau of Ocean Energy Management (BOEM) awarded two wind leases offshore of Wilmington, North Carolina, adjacent to the South Carolina border. Additionally, the BOEM has identified areas off the South Carolina coast to undergo detailed mapping and environmental baseline studies, which is a lengthy process. At this time no specific lease sites have been identified and no timetable for leasing has been announced. (DE. 2023b)

For an offshore wind project off the coast of South Carolina, siting would require careful consideration to bathymetry, shipping lanes, fishing rights, wildlife migration patterns, and other environmental concerns. Wind installations also pose aesthetic impact concerns, and the larger turbines require greater offshore distances to minimize aesthetic impacts. DE would have to lease the project site through BOEM, conduct environmental reviews, and secure various permits for offshore and onshore infrastructure, which is another lengthy process. For DE resource planning purposes, wind resources off the shore of South Carolina could be considered beginning in late 2040. (DE. 2023b)

There is currently only one other operating offshore wind project, Block Island Wind Farm, which is a 30 MW project that began operation in 2016. This project, located off the coast of Rhode Island, required permits from BOEM, USACE, USFWS, National Marine Fisheries Service, the U.S. Coast Guard, the EPA, and three state agencies. Impacts associated with the construction and operation of an offshore wind facility would be focused on marine ecology, avian species, economic impacts to commercial fishing and recreational boating, and potential impacts to coastal wetlands and bays from transmission line development. Most of the impacts associated with offshore wind will occur during the construction phase and would continue into operation with potential impacts to marine and avian species. (RICRMC. 2022)

Projects totaling 800 MW have been approved in the United States and projects totaling an additional 10,000 MW have initiated the permitting process according to the DOE (DOE. 2021b). None of these projects are off the coast of South Carolina.

Nonetheless, even if wind were considered to be reasonable, the impacts discussed above show that the impacts from wind (with or without energy storage) would be higher than the impacts for

renewal of the VCSNS OL, summarized in Table E8.0-1, and therefore, a discrete wind alternative (with or without energy storage) would not be superior to continued operation of VCSNS.

E7.2.2.5 Solar

Combination Alternatives 1 and 2 include a solar component. However, fully replacing VCSNS's generating capacity with a discrete solar alternative would require several more utility-scale solar installations, effectively multiplying the potential environmental impacts, particularly the land use and terrestrial ecology impacts. Solar generation is intermittent by nature, and the generation can fluctuate from hour to hour. Furthermore, it is not dispatchable, and low-capacity factors can be experienced for several days at a time due to cloud cover. This type of generation volatility on a large scale can create distribution and/or transmission instability. For solar power to be viable as a discrete source of replacement energy that is reliably available for the regional grid at all hours of the day, a capacity significantly exceeding the VCSNS generation, coupled with large amounts of battery storage, would be needed.

Due to the amount of solar generating capacity needed to replace the VCSNS baseload generation and the lower efficiencies in producing electricity from solar power versus nuclear power, the land acreage required for a discrete solar alternative is larger than other alternatives being considered in this ER. On average, utility-scale solar photovoltaic (PV) power plants in the United States operated at about 25% of their electricity generating capacity, based on an average of annual values from 2014–2017 (EIA. 2019). United States solar capacity factors for 2018–2021 ranged from 24.2 to 25.1 (EIA. 2022a). Using a capacity factor of 25%, replacing the 966 MW VCSNS would require about 3,900 MW of solar production. Based on five South Carolina solar projects from the last few years presented in Table E7.2-1, an average of 8.9 acres per MW is used to estimate acreage requirements. Using an 8.9 acres per MW land use factor, 34,300 acres would be required to replace VCSNS with solar. Furthermore, installation of batteries to provide firm power, compensating for solar's intermittent nature, could further increase acreage requirements. To acquire this much acreage through purchase or lease would require many installations, each with the potential to significantly impact environmental resources.

Between 2026 and 2050 DE plans to introduce an additional 5,025 MW of solar energy. This additional solar generation is aimed to replace the generation of two coal-fired plants, which will be decommissioned, as well as meet projected demand. DE determined that the load growth forecast predicts an increase in demand of between 0.5% to 0.9%. Utility scale solar facilities use relatively large areas of land, both for siting of the physical panels as well as construction of new transmission interconnection. The impacts of land use conversion for each site would be dependent on the site's location. DE would seek to avoid sensitive resources and prime farmland. However, the siting of the solar installations to meet demand from VCSNS in addition to the coal plant retirements and increased demand could require siting in second or third tier candidate sites. Such

sites could be farther from the electrical grid requiring longer connection corridors, in closer proximity to sensitive resources, encompass prime farmland, or desirable for residential or commercial development, which would increase the environmental impact of an individual site. Depending on the location of the solar facilities, the acreage needed and land disturbances could result in moderate to large impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, discrete solar would not be a superior alternative to continued operation of VCSNS.

Table E7.2-1 South Carolina Solar

Project	MW	Acres	Acres/MW
Bowman	101	651	6.45
Centerfield	98	590	6.02
Beulah	101	650	6.44
Solvay	71.4	900	12.61
Lambert II	100	1,290	12.90
Average	—	—	8.9

(Lambert II. 2022; LCC. 2022; PGR. 2022; PIT. 2017; SPWO. 2021; SSC. 2022).

A solar alternative using distributed solar involving solar panels installed on residential and commercial buildings would avoid the land use impacts. Such a distributed system would rely on the participation of the property owners and would have the same uncertainties as discussed in Section E7.2.2.3 for DSM. Reliance on distributed rooftop solar as a reasonable alternative to VCSNS is uncertain because it relies on voluntary participation and would have to comply compliance with codes and standards (e.g., building codes and property covenants) and realized reduced consumption at those properties as well as extra energy being fed back to the regional grid. The NREL developed estimates for the potential generating capacity of solar PV panels that could be installed on residential and commercial properties in each state. The NREL's estimate for South Carolina is 18,973,118 megawatt hours (MWh) (NREL. 2021). To fully replace VCSNS generation with distributed solar on rooftops requires approximately 45% of the available rooftop space for the entire state of South Carolina. Moreover, NREL cautions that its estimation could be overestimating the available rooftop space and states:

> "The technical generation potential of residential and commercial rooftop PV provides an upper bound of feasible development potential for planning purposes. Technical generation potential does not consider economic or market feasibility. The technical generation potential of residential and commercial rooftop PV is estimated by combining modeled suitable rooftop area with solar resource availability and quality and system performance data . . . Technical potential does not account for existing systems." (NREL. 2021)

Thus, if the available space was overestimated, distributed solar could require well over 45% of all the South Carolina rooftop space available. Given the uncertainties in implementation of distributed solar, distributed solar is not a reasonable replacement alternative for VCSNS.

E7.2.2.6 Combination of Wind and Solar

As stated above in Section E7.2.2.5, the Combination Alternative includes a solar component along with a natural gas-fired or nuclear plant. This section presents an alternative of multiple wind facilities and multiple solar facilities, both with battery storage, to cumulatively provide full replacement for the VCSNS generation. DE considered a range of scenarios to understand the land use impact of such a combination alternative, including combinations of 70% of replacement being provided by wind, 30% by solar, 50% from each, and 30% from wind and 70% from solar. For simplicity, it is assumed that battery storage at each site could be accommodated within the acreage footprint of the wind or solar facility. The capacity factors of 41.4% and 25.0% for wind and solar facilities, respectively, were used. Table E7.2-2 below presents the disturbed acreage for the three scenarios. The disturbed acreage accounts for the permanent and construction support facilities for wind using the land use factor of 2.47 acres per MW presented in Section E7.2.2.4, and the 8.9 acres per solar MW presented in Section E7.2.2.5.

Table E7.2-2 Disturbed Acreage for Combination of Wind and Solar

Scenario	MW Wind/Number of 300 MW Facilities	MW Solar/Number of 100 MW Facilities	Disturbed Acreage (Facilities Only)
70% wind 30% solar	1,630/6	1,160/12	14,300
50% wind 50% solar	1,170/4	1,930/24	20,000
30% wind 70% solar	700/3	2,700/27	25,800

Additional land is needed for transmission connections associated with the new wind and solar facilities. Each facility would need a transmission connection, and the connection could require miles of new transmission corridor for the connection to the regional grid. Each mile of a new 150-foot-wide ROW transmission corridor would require more than 18 acres. Therefore, the actual disturbed acreage would be greater than what is represented in Table E7.2-2.

As it was for the discrete wind and solar alternatives, depending on the location of the facilities and transmission corridors, the land use disturbances could result in moderate to large impacts on wildlife habitats, vegetation, land use, and aesthetics. Therefore, a combination of wind and solar would not be a superior alternative to continued operation of VCSNS. Beyond the potential land use and disturbance-related impacts associated with the necessary acreage, the site selection and acquisition, permitting, and construction of each facility is anticipated to take several years to complete.

The impacts and uncertainties discussed above show that the impacts from a combination wind and solar alternative would be higher than the impacts for renewal of the VCSNS OL and, therefore, would not be a reasonable replacement alternative for VCSNS.

E7.2.2.7 Hydropower

The DOE's Oak Ridge National Laboratory assessed the ability of existing non-powered dams across the country to generate electricity. The two non-powered dams in South Carolina provide less than 10 MW of power generation capacity (ORNL. 2012).

Construction of a new dam and hydropower facility would require significant siting considerations, such as the area that would be inundated to provide water storage for generation, as well as the overall environmental impacts associated with the development of the facility. The environmental impacts could be moderate to large for land use, water resources, socioeconomics, ecology, and cultural resources for a single location, and replacement of the VCSNS generation would require several locations to be developed.

The lack of potential for large hydroelectric power facilities at existing dams in South Carolina and the environmental constraints associated with the development of a new hydropower facility make hydropower an unreasonable alternative to replace the VCSNS generation.

E7.2.2.8 Geothermal

The NREL graded the geothermal resources of the United States. Nearly all of South Carolina is graded as the lowest potentials (lowest two out of five potential categories) for geothermal energy (NREL. 2018). Therefore, geothermal energy is not considered a reasonable power source for the replacement for VCSNS.

E7.2.2.9 Biomass

Biomass includes wood products and waste, municipal waste, manure, certain crops and crop waste, and other types of waste residues used to create electricity. Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources. Biomass, from wood and wood waste, landfill gas, and other feedstocks, accounted for about 2% of South Carolina's total net electricity generation in 2020. With about 13 million acres of forest that cover nearly two-thirds of the state, forestry is a leading industry in South Carolina, and there are nine utility-scale power plants in the state that burn wood and wood waste for generating electricity. South Carolina has 10 landfill gas-fueled generating facilities. There are two projects utilizing manure and fuel as well. South Carolina also has biomass resources in the form of agricultural residues from corn, wheat, and soybean crops. (EIA. 2021a)

Biomass plants tend to be much smaller than nuclear or fossil fuel plants. To replace the VCSNS baseload generation, it would take the construction of many biomass plants located near reliable fuel sources that continuously produce enough biomass to fuel the plants. Average size biomass plants are generally 50 MWe, with the largest ones being 120-140 MWe (Biomass. 2022). Replacing the generating capacity of VCSNS using only biomass would require the construction of eight or more large facilities.

Biomass plants require storage facilities for the fuel products and for waste ash/residue for the wood, crop, and agriculture waste types. Wood waste plants require a large land area for storage and processing, and, like coal generation, they produce ash that must be disposed of in a manner that does not pollute waterways and air. Therefore, environmental impacts associated with construction of a wood waste plant could be moderate to large, with the impact intensity level being dependent on the siting and proximity to a source of wood waste.

Utilizing municipal solid waste for electricity is also dependent on being close to large population centers that generate large amounts of waste. Air emissions are also an issue with biomass plants, and construction of a plant would require installation of maximum achievable control technology to comply with the CAA. The combustion of the fuel also results in air emissions that must be controlled to meet air quality regulations.

Producing baseload generation from biomass sources is limited because of the need to site facilities near substantial fuel sources and impacts to land from constructing and operating the facility. In addition, without the construction of multiple smaller facilities, biomass plants are unable to produce the large baseloads of electricity that nuclear and fossil fuel plants generate. The construction and operation of biomass plants of the size necessary to act as an alternative to VCSNS would result in environmental impacts to land use, water quality, ecological resources, and air quality and would not be a superior alternative to continued operation of VCSNS. Therefore, biomass is not considered a reasonable alternative to VCSNS's baseload generation.

E7.2.2.10 Fuel Cells

Current fuel cell installations for large-scale stationary power are significantly smaller scale than what is needed as a reasonable replacement of VCSNS's generating capacity, with much of the systems installed for individual customers. Larger applications generally provide from hundreds of kilowatts to tens of MWs of power (DOE. 2017; Duke. 2019). As of January 2020, the United States had 550 MW of stationary fuel cell generation capacity (FCHEA. 2020). Fuel cells as a utility-scale generation alternative are not presently competitive with other alternatives. Additionally, developments in fuel cell technology are too uncertain at this time to consider this a viable alternative. Therefore, fuel cells are not considered a reasonable alternative to VCSNS's baseload generation.

E7.2.2.11 Ocean Wave and Current Energy

The FERC has licensing authority over hydrokinetic energy projects deployed in the United States. Currently, there is only one licensed inland project that generates 70kW (FERC. 2020).

Given hydrokinetic technology is in the early stages of commercial application and projects have low generation capacities, ocean wave and current energy is not considered a reasonable alternative for replacement of VCSNS in the necessary time frame for power supply.

E7.2.2.12 Petroleum-Fired

Petroleum-fired generation emits large amounts of CO_2 and hazardous air pollutants (HAPs), making it undesirable for utilities looking to reduce air pollutants and comply with regulations. Based on the greater environmental impacts and cleaner energy source policies and regulations, oil-fired generation is not a reasonable alternative.

E7.2.2.13 Coal-Fired

Coal-fired plants are being retired throughout the United States to reduce carbon emissions and address concerns with ash storage and disposal. DE is similarly retiring its Williams and Wateree coal-fired plants in 2028. The NRC recently considered a supercritical pulverized coal facility as an alternative to renewing the River Bend Station Unit 1 OL but found license renewal as the preferred alternative. The supercritical pulverized coal facility alternative had operating impacts greater than license renewal in addition to the environmental impacts inherent with new construction projects. (NRC. 2018) Based on the greater potential for environmental impacts, coal-fired generation is not considered a reasonable alternative.

E7.2.3 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

E7.2.3.1 Natural Gas-Fired Generation

A natural gas-fired combined-cycle (NGCC) plant would consist of multiple combustion turbines, a heat recovery steam generator, and a steam turbine generator. Based on a capacity factor of 87% (EIA. 2022b), the NGCC plant would have a design capacity of 1,110 MWe (gross) of generation to replace the current 966 MWe provided by VCSNS. The NGCC plant would have a closed-cycle cooling system using new MDCTs.

E7.2.3.1.1 Land Use

The construction site for the abandoned VCSNS Units 2 and 3 project, portions of which are located on the VCSNS site (see Figure E3.1-1), has available land for siting a replacement NGCC plant. Approximately 48 acres would be needed based on a National Energy Technology Laboratory (NETL) factor of m2/MWh (NETL. 2010). This site would also allow existing transmission

infrastructure and corridors to be used. A natural gas transmission pipeline supplies DE's combustion turbines at Parr Generating Complex located on DE property surrounding the VCSNS site (USDOT. 2022b). The proximity of this existing pipeline would result in a minimal extension to supply the NGCC alternative plant and could potentially not require extension of current ROWs. Further, given the existing natural gas supply in the United States, it is assumed that natural gas supply is adequate without the need for additional well development. The site was developed for power energy, so the placement of the NGCC plant there would not result in land use conversion. Minimal land use conversion for the pipeline extension, if needed, would have an overall SMALL land use impact.

E7.2.3.1.2 Visual Resources

Use of an existing power plant site would allow the additional structures to blend in with the existing ones during construction as well as operation. The tallest structures would be the exhaust stack(s), and some portion of these structures would likely be visible offsite for 1 mile or more. The exhaust stack(s) would be lighted as required by Federal Aviation Administration (FAA) requirements. In general, there would also be more lighting visible across the night landscape, particularly from the waterside due to minimal tree screening from the addition of the NGCC plant. The additions to the viewshed would be similar in type and magnitude to the existing power plant and abandoned construction site, so the impact to visual resources would be SMALL.

E7.2.3.1.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities. This would be managed in accordance with regulatory requirements and BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities. With implementation of mitigation measures and properly serviced equipment impacts would be SMALL.

The operational NGCC plant would be equipped with air pollution controls to ensure compliance with air quality regulations. Emission estimates for the NGCC plant based on EPA AP-42 emission factors are shown in Table E7.2-3. The emission factors are applied to the fuel consumption. Fuel consumption is based on the plant's efficiency which can be represented by the heat rate. The U.S. Energy Information Administration (EIA) tracks heat rates across the U.S. electricity

generators and reports the average heat rate annually. However, the heat rates of NGCC plants installed since 2015 show heat rate improvements (declining heat rates) over plants installed before 2000 (i.e., 6,654 versus 8,840 Btu/kWh) (EIA. 2020). The heat rate value of 6,654 Btu/kWh was used for the NGCC plant alternative to capture the greater efficiency of newer gas turbines rather than the most recently reported annual average heat rate for all U.S. NGCC plants.

The NGCC plant would qualify as a new major source of criteria pollutants and would be subject to the CAA prevention of significant deterioration air quality review. Therefore, the plant would have to comply with the new source performance standard for NGCC plants set forth in 40 CFR Part 60 Subpart KKKK and 40 CFR Part 60 Subpart TTTT. The plant would also qualify as a major source because of its potential to emit more than 100 tons per year of criteria pollutants. The plant would be required to obtain a Title V operating permit.

The NGCC plant would be subject to the national emission standards for HAPs for stationary combustion turbines if the plant was a major source of HAPs, having the potential to emit 10 tons per year or more of any single HAP or 25 tons per year or more of any combination of HAPs [40 CFR 63.6085(b)]. A new NGCC plant would also have to comply with Title IV of CAA [42 USC 7651] reduction requirements for SO_2 and NO_x, which are the main precursors of acid rain and the major causes of reduced visibility.

Cooling towers would have air emissions and atmospheric effects from drift and plumes. Cooling tower drift consists of the liquid droplets entrained in the exhaust air stream. A plume forms when the saturated water vapor that leaves the top of the tower encounters cooler air and very small water droplets condense out of the air. Drift that leaves the top of the NGCC's MDCTs would reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled and would be in accordance with any applicable limits and restrictions for use of water treatment chemicals and discharge limits.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. This has the effect of introducing fine particulate matter into the atmosphere. Particulate matter emissions (e.g., PM_{10} and $PM_{2.5}$) are regulated air emissions. The dissolved solids from both drift and plumes could also be deposited on the surrounding land. However, impacts on vegetation due to the deposition would be expected to be localized and primarily onsite. Atmospheric effects of plumes could include icing, fogging, and shadowing. The NGCC's cooling tower(s), which would have much less water flow than an operating nuclear unit, and the water chemistry would be controlled. Further, the MCDTs would be located away from offsite roadways, so fogging and icing would not present an offsite visibility hazard for vehicles. The impacts from plumes and drift are expected to be SMALL.

The impacts to local air quality during construction would be similar to any large-scale building project and would be conducted in compliance with applicable regulations and permits. Air quality

impacts of construction would be SMALL. A new NGCC plant would be a major source of criteria pollutants and GHGs. Compliance with existing air quality regulations would ensure air quality impacts are minimized. Therefore, the operations-related impacts on air quality under the NGCC plant alternative would be MODERATE.

E7.2.3.1.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. The size of the Units 2 and 3 construction site would allow considerable sound level attenuation to offsite receptors. The sound level from most construction activities would be expected to be 75 dBA during daytime hours as set by Fairfield County for continuous noise levels in non-residential areas (FC. 2016). For construction operations to occur during nighttime hours a permit is required which would allow sound levels up to 70 dBA.

Noise impacts associated with plant operations would include noise from transformers, turbines, pumps, compressors, exhaust stack, combustion inlet filter house, condenser fans, the cooling towers, high-pressure steam piping, and loudspeakers. The VCSNS Units 2 and 3 construction site is within a DE power generation area hosting the VCSNS, Fairfield Pumped Storage Facility, and Parr Generation Complex, which is a setting where the noise level of an operational industrial site is acceptable. Construction and operations-related noise impacts would be SMALL.

E7.2.3.1.5 Geology and Soils

Construction-related impacts to geology would be minimal, as excavation would be shallow enough to not be expected to damage geologic formations. In addition, materials such as stone and gravel used in the construction would be sourced from local quarries and other local or regional sources. Therefore, construction-related impacts to geology would be SMALL.

The site was previously cleared for the VCSNS Units 2 and 3 construction, so minimal land-clearing activities would be needed. The ground disturbance would exceed one acre, and DE would obtain a stormwater construction permit from SCDHEC. This is a general permit for construction activities that require an erosion control and stormwater management plan and installation of BMPs to minimize erosion and sediment loss resulting from precipitation. Overall, with the installation and implementation of BMPs, construction-related impacts to soils would be SMALL.

Operations-related impacts on geology and soils from the NGCC plant would be minimized by adherence to an industrial stormwater permit governing the power plant site. A SWPPP would be prepared, identifying proper BMPs to minimize sediment releases. Soil impacts related to the

operation of the plant would be SMALL. No geological impacts are expected during the operation of the plant.

E7.2.3.1.6 Hydrology (Surface Water and Groundwater)

Surface Water

The construction-related impacts to surface water include those related to construction of the NGCC plant that would alter surface drainage features. The impacts from drainage alterations would be minimized by the implementation of BMPs identified in the stormwater permit and erosion control and stormwater management plan. Adherence to stormwater controls would minimize sediment release and provide protection to nearby waterbodies from accidental releases of oils or other chemicals being used.

The intake and discharge sites for VCSNS Units 2 and 3 and any existing, abandoned structures would be used if practical. If not, new, or modified structures would be constructed in or along the shoreline under a CWA Section 404 permit from the U.S. Army Corps of Engineers (USACE) and applicable state agencies.

Through compliance with permit conditions and implementation of BMPs, surface water impacts from NGCC plant construction would be SMALL.

Water needs for construction of NGCC plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water. In addition, construction could require minimal dewatering of excavations. DE assumes water used for construction would be obtained through VCSNS existing water treatment plant utilizing water from Monticello Reservoir. Surface water use impacts from construction would be SMALL.

Operations-related water use would be primarily for cooling water makeup. Closed-cycle cooling would result in water consumption due to evaporation and drift. The NGCC plant would have water withdrawals of approximately 4.66 MGD and consume approximately 3.54 MGD based on the water use factors developed by the National Energy Technology Laboratory of 175 gallons per MW hours for withdrawals and 133 gallons per MW hours for consumption (NETL. 2011, Appendix D). As presented in Table E3.6-4a, VCSNS's average annual surface water withdrawal rate from 2017–2021 was 662.21 MGD.

A new NPDES permit would be required for the NGCC plant discharge. Adherence to the NPDES permit would minimize impacts to water quality. The NGCC plant operations would require water for drinking, sanitary purposes, and likely for some processes. The supply would be from the VCSNS existing water treatment plant.

Surface water use and quality impacts from the NGCC plant would be SMALL.

Groundwater quality impacts would be mitigated through use of BMPs and stormwater systems on the industrial site. In addition, waste management and spill mitigation would minimize the spread of contaminants through the soil into the groundwater. Therefore, construction and operations-related impacts on groundwater quality would be SMALL.

Groundwater

Groundwater quality impacts would be mitigated through use of BMPs and stormwater systems on the industrial site. In addition, waste management and spill mitigation would minimize the spread of contaminants through the soil into the groundwater. Therefore, construction and operations-related impacts on groundwater quality would be SMALL.

E7.2.3.1.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

Terrestrial ecology impacts resulting from the construction of the NGCC plant would primarily result from movement of construction equipment and materials, noise, and emissions of construction activities. The construction site is cleared and provides poor wildlife habitat, but the construction would displace the wildlife that have re-occupied the construction site, and these would disperse to nearby habitats.

Based on implementation of construction BMPs for erosion and dust control, noise abatement, proper equipment maintenance, and adherence to applicable permit conditions, the overall impact of construction-related activities on terrestrial ecological resources would be SMALL.

Operational impacts on terrestrial resources would be similar to those occurring with the operation of VCSNS. Overall, the operation of the NGCC plant would result in SMALL impacts to terrestrial resources

Aquatic

Impacts on aquatic resources during construction would be minimal through implementation of BMPs, which would minimize impacts from surface water discharges and shoreline construction needed to construct intake and discharge structures. If construction for the intake and discharge structures require dredging, a CWA Section 404 permit from the USACE and applicable state agencies would be obtained. Permit conditions would address measures to reduce impacts to water quality and aquatic resources.

Implementation of the SWPPP and BMPs in the construction stormwater permit would also minimize potential spills and releases associated with the construction of the plant. Therefore, construction-related impacts on aquatic ecological resources would be SMALL.

During operations, the NGCC plant would require less cooling water intake than VCSNS. The NGCC plant would also require an NPDES permit. Operations-related impacts on aquatic ecological resources would be SMALL.

Special Status Species

Section E3.7.8 discusses the federal and state species occurring in Fairfield, Newberry, and Richland Counties. The federally listed species include the northern long-eared bat, red-cockaded woodpecker, wood stork, Carolina heelsplitter, four listed plants whose range does not overlap with the VCSNS site, and the federally endangered plant, Michaux's sumac, which is dependent upon some form of disturbance. None of these species were known to occur at the VCSNS Units 2 and 3 construction site when the nuclear units were assessed for environmental impacts in 2011; however, the Carolina heelsplitter was acknowledged to potentially reside in onsite creeks and streams in the vicinity of VCSNS (NRC. 2011). As mentioned in Section E3.7.8, the Carolina heelsplitter was not found during a survey conducted in 2015 in the Monticello Reservoir.

The NGCC plant would not require a federal permit except for construction in or along a waterway or in wetlands, so the federal action for review of the potential for impacts to protected species would be limited. However, S.C. Code Ann. § 58-33-10 et. seq, the Utility Facility Siting and Environmental Protection Act, does require a Certificate of Environmental Compatibility and Public Convenience and Necessity issued by the SCPSC prior to development of major generation facilities (i.e., greater than 75 MWs). The certificate application requires a summary of any studies of the environmental impact of the facility. The certification process requires SCDHEC, SCDNR, and the South Carolina Department of Parks, Recreation, and Tourism be parties to the certification proceeding. Thus, the SCPSC would have the opportunity to consider impacts to special status species in their review of whether to grant the project a certification or not.

Construction at the VCSNS Units 2 and 3 site would require no or minimal tree removal. However, if tree removal is needed, the USFWS guidance regarding nesting and roosting trees that support the northern long-eared bat and the bald eagle (USFWS. 2019a; USFWS. 2019b), both of which potentially occur at the VCSNS site, would be followed.

For construction in or along waterways, such as the construction of intake and discharge structures or for dredging, a CWA Section 404 permit would be required. The application would require information on protected aquatic species (e.g., the Carolina heelsplitter) and the potential for impacts from the project. The permit conditions would require measures to minimize impacts to protected species. Use of a closed-cycle cooling and compliance with a state issued NPDES permit would minimize impacts to aquatic species from impingement and entrainment and impacts to water quality during operations.

Construction and operation of a NGCC plant at the VCSNS site MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

As discussed in Section E3.7.8, the vicinity of the VCSNS site has suitable habitat for various state-listed species including the bald eagle, spotted turtle, southern hog-nosed snake, Pine Barrens treefrog, Carolina gopher frog, Rafinesque's Big-eared Bat. The CWA 404 permit process would review the potential for impact to state-listed species and include permit conditions as needed. The certificate of need process would also provide the opportunity to consider impacts to state-listed species. Overall, the construction and operation of a NGCC plant at the VCSNS site would have a SMALL to MODERATE impact on special status species.

E7.2.3.1.8 Historic and Cultural Resources

Previous cultural resource identification efforts for the VCSNS Units 2 and 3 project resulting in the identification of a total of 39 archaeological sites within the APE, most of which have been recommended as ineligible for listing in the National Register. Four archaeological sites have either been recommended as National Register eligible, 38FA0330 General Pearson's gravesite located in the Pearson Family Cemetery, see Figure E3.1-1 and 38FA0360; potentially eligible, 38FA0366; or recommended for preservation, despite not being considered potentially eligible for inclusion in the National Register, 38FA0349. These same resources were identified as requiring protective measures during construction of VCSNS Units 2 and 3. Protective measures identified for these resources for construction of VCSNS Units 2 and 3, included fencing at the Pearson Family Cemetery, temporary fencing at Site 38FA360, and delineation of all four sites as sensitive areas on management maps and VCSNS Units 2 and 3 plant layout and design drawings. Based on the avoidance and protective measures put in place, as well as concurrence from SHPO on impacts, NRC determined that the construction of VCSNS Units 2 and 3 would have a moderate impact on cultural resources. (NRC. 2011, Figure 3-4 and Section 4.6.1)

For development of the NGCC plant, DE would avoid and/or protect cultural sites as agreed to for the VCSNS Units 2 and 3 development. The construction footprint for the NGCC would be much smaller than the VCSNS Units 2 and 3 construction footprint, so the extent of the APE would be smaller. However, the natural gas pipeline extension would extend the APE linearly. However, the extension could join the existing pipeline at Parr Generating Complex crossing the VCSNS Units 2 and 3 construction site, avoiding offsite property that was not reviewed during VCSNS Units 2 and 3 project planning.

During operations, air emissions could contribute to corrosive atmospheric conditions and reduced visibility. The plant would have to comply with Title IV of CAA [42 USC 7651] reduction requirements for SO_x and NO_x, which are the main precursors of acid rain and the major causes of reduced visibility. The NRHP eligible General Pearson Cemetery's headstones and masonry could experience increased deterioration from acid rain.

Given the location of the NRHP-eligible site on the VCSNS Units 2 and 3 construction site and the potential for impacts to extend throughout the operational period, the NGCC plant poses an

adverse effect to the General Pearson Cemetery; however, absent atmospheric modeling, the project's effects are indeterminable. Other archaeological resources would be avoided or protected during both the NGCC plant construction and operations, and construction of a natural gas pipeline. Conservatively, given the NRHP eligible historical site, the construction- and operation-related impacts to cultural resources would be POTENTIAL ADVERSE EFFECT.

E7.2.3.1.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The socioeconomic impacts of the NGCC plant would be similar to other large industrial construction projects and have short- and long-term economic stimulus to Fairfield County and the surrounding region due to worker wages and tax payments. Construction impacts would also have adverse socioeconomic impacts from increased use and demand for community services and infrastructure from the construction workforce and activities. The adverse impacts would be mitigated through tax revenues.

The project timeline of planning, procurement, and construction duration would be 2–3 years. The peak construction workforce would be about 1,200 and would likely be primarily from the surrounding area rather than relocation (NRC. 2019c). Construction would have beneficial economic impacts in the area by creating direct and indirect jobs and incomes, increasing purchases of goods and services, and generating tax revenues. The workforce would also result in additional pressure on local temporary housing, community services, and infrastructure. Given the peak workforce size and duration of the project, both the beneficial and adverse socioeconomic impacts due to construction would likely be SMALL for Fairfield County.

The operations workforce for a NGCC plant would be 150 workers (NRC. 2019c), much smaller than the Unit 1 workforce. The adverse socioeconomic impacts from use of infrastructure and demand for community services from this smaller workforce would be SMALL. Worker wages and taxes paid by the workers and DE would have beneficial socioeconomic impacts. DE would pay property taxes for the operating NGCC plant, and the payments would likely be similar in relative scale as those currently paid for Unit 1. Current tax payments represent more than 40% of the Fairfield County property tax collections and more than half of the local school district revenue (see Table E3.9-2). Therefore, property taxes paid for an operating NGCC plant and worker wages and employee taxes, albeit for a smaller workforce than the Unit 1 workforce, would result in a LARGE beneficial socioeconomic impact. However, the loss of the larger operational workforce of Unit 1 and the temporary (outage) personnel economic stimulus would adversely affect various aspects of the local economy including employment, taxes, and housing, offsite land use, economic structure, and public services.

Transportation

The temporary construction workforce at its peak would likely be noticeable and could cause congestion on roadways in the proximity of the construction site. To reduce congestion, work shifts for construction and operations could be implemented temporarily. The much smaller operations workforce would not have these congestion impacts. The socioeconomic impacts of the NGCC alternative would be SMALL to MODERATE for construction and SMALL for operations.

E7.2.3.1.10 Human Health

Impacts on human health from construction of an NGCC plant would be similar to those associated with a large industrial facility construction project. Worker safety would be addressed by following the OSHA worker protection standards. The radiological human health impact on construction and operations workers due to working in proximity to operating and then decommissioning VCSNS would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. Operation of an NGCC plant would also have similar impacts to the existing power plant and would be in compliance with OSHA standards.

Human health impacts from the operation of the NGCC plant would primarily be from air pollutant emissions. The NGCC plant would emit criteria air pollutants (Table E7.2-3). Some pollutants, such as NO_x, contribute to ozone formation, which can create health problems. These criteria pollutants are regulated, and technology will be installed in the plant to limit the criteria air pollutant releases.

Overall, with application of pollutant controls and compliance with air quality standards and compliance with OSHA worker safety standards, operations-related impacts to human health under the NGCC alternative would be SMALL to MODERATE.

E7.2.3.1.11 Environmental Justice

Potential impacts from construction of an NGCC plant would primarily be associated with socioeconomic effects. These impacts would consist of the short-term beneficial impacts from an increase in worker expenditures at local businesses and short-term adverse impacts from rental housing shortages and traffic congestion during the construction phase of the project. Environmental effects, such as fugitive dust and noise, and adverse socioeconomic impacts would be minor and temporary and would not be expected to result in disproportionately high and adverse effects to low income and minority communities.

The activities associated with the operating NGCC plant would be similar to those at VCSNS with the exception of air emissions. As presented in Section E7.2.3.1.3, air quality impacts from an NGCC plant would be MODERATE. Section E3.11.2 presents the minority and low-income population in the region surrounding the VCSNS site. There are a total of four block groups within a 6-mile radius that meet the criteria for a minority population. The closest low-income block group

that meets the guidance criteria for individuals or families is located approximately 1.3 miles southeast of the VCSNS center point. Minority and low-income populations living in close proximity to the NGCC plant could be affected by emissions associated with plant operations. However, because emissions are expected to remain within regulatory standards, impacts from emissions are not expected to be disproportionately high and adverse. Overall, no disproportionately high and adverse effects to low income and minority communities would be expected from operations.

E7.2.3.1.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the NGCC plant would be handled according to state regulations and disposed of at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

Operation of the NGCC plant would result in waste from spent catalytic reduction catalysts used to control nitrous oxide emissions. This waste stream is considered hazardous and would be disposed of at a facility that handles hazardous materials. Other waste generated at the site would be characterized as hazardous or nonhazardous. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. DE would implement recycling and waste minimization programs that would reduce waste volumes. The nonradiological waste impacts from operations would be SMALL, given DE's compliance with regulations, use of permitted facilities, and implementation of effective practices for waste minimization.

E7.2.3.2 New Nuclear Generation

This alternative is an SMR plant based on the NuScale design. The NuScale design is up to 12 units under a single control room. The 12-unit plant of the NuScale design would yield 884 MWe net (NuScale. 2021a). To replace the 966 MW of VCSNS, two multi-unit configurations would be needed. The SMR plant would be sited within the VCSNS Units 2 and 3 site. Like the VCSNS Units 2 and 3 project, the SMR plants would have a closed-cycle cooling system using MDCTs with makeup water from Monticello Reservoir. DE assumes no additional transmission corridors would be needed to support the SMR plant.

E7.2.3.2.1 Land Use

Facility site acreage requirements include land for the reactor core and all balance of plant infrastructure (e.g., cooling towers and switchyard), setbacks, buffer/site safety areas, and access. The land requirement for the 12-unit SMR plant of the NuScale design is 30 acres (NuScale. 2021a). A State of Washington siting study for SMRs of various technologies used a model 600-MWe plant and conservatively set 130 acres as its initial threshold for assessing sites within the state, acknowledging that construction needs could also require additional temporary

acreage (Golder. 2016). Given that 130 acres is four times the acreage needed for a NuScale plant, a 130-acre site is assumed to be sufficient to support construction of a VCSNS replacement plant. The construction site for the abandoned Units 2 and 3 project, portions of which are located on the VCSNS site (see Figure E3.1-1), has available land for siting a replacement SMR plant. The site was developed for power energy, so the placement of the SMR plant there would not result in land use conversion. No land use impact is expected.

E7.2.3.2.2 Visual Resources

Containment structures for SMR units are not as tall as conventional nuclear containment structures. The NuScale design's containment structure is 76 feet in height (NuScale. 2019). The MDCTs would have a low profile compared to natural draft parabolic cooling towers and would not be expected to extend the distance at which the plant would be visible. The visual resources impact for the reactors and MDCTs would be similar to that of the existing generating units and abandoned construction site and SMALL for both construction and operation.

E7.2.3.2.3 Air Quality

Temporary and minor effects on local ambient air quality could occur as a result of construction activities. Fugitive dust and fine particulate matter would be generated during earthmoving activities, material-handling activities, by wind erosion, and other activities, and managed in accordance with regulatory requirements. BMPs (e.g., paving or stabilizing disturbed areas, water suppression, reduced material handling) would minimize such emissions. Vehicles used to haul debris, equipment, and supplies, as well as equipment used for earthmoving, would create pollutants. All equipment would be serviced regularly, and all industrial activities would be conducted in accordance with federal, state, and local emission requirements. Emissions from construction activities would be temporary and intermittent for the duration of construction activities.

Air quality impacts from operations would include intermittent releases from the periodic testing and occasional use of stand-by equipment and use of other minor sources of air emissions. GHGs emissions associated with nuclear power are within the same order of magnitude as renewable energy sources (NRC. 2013a, Section 4.12.3). The SMR alternative would have greatly reduced GHG emissions compared to emissions from a fossil fuel-fired plant.

As discussed in Section E7.2.3.1.3, the MDCTs would have air emission and atmospheric effects from drift and plumes. These emissions would be similar to those of the NGCC plant.

The impacts on local air quality during construction would be similar to any large-scale building project and would be conducted in compliance with applicable regulations and permits. Air quality impacts of construction would be SMALL. Compliance with existing air quality regulations would ensure air quality impacts are minimized during operations for the minor air emissions from an

operating nuclear plant. Therefore, the operations-related impacts on air quality under the SMR plant alternative would be SMALL.

E7.2.3.2.4 Noise

Sources of noise during construction would include clearing, earthmoving, foundation preparation, pile driving (if needed), concrete mixing and pouring, steel erection, and various stages of facility equipment fabrication, assembly, and installation. Additionally, a substantial number of diesel- and gasoline-powered vehicles and other equipment would be used. The size of the VCSNS site would allow considerable sound level attenuation to offsite receptors. The sound level from most construction activities would be expected to be below the 60 to 65 dBA range of acceptable day-night average sound levels set by the U.S. Department of Housing and Urban Development at the site border. Construction activities resulting in offsite sound levels above this range would be temporary.

Noise sources associated with the operation and infrastructure would include pumps, cooling towers, transformers, switchyard equipment, and loudspeakers. The operating SMR facility would have noise sources and levels not unlike those of the existing operating units and would attenuate over the distance to the site border. Many of these noise sources are confined indoors or would be infrequent. Noise from a cooling tower is generally from motors, fan, and cascading water. Given sound attenuation, noise impacts to sensitive receptors are not expected. Therefore, construction and operations-related noise impacts would be SMALL.

E7.2.3.2.5 Geology and Soils

Construction of the SMR at the VCSNS Units 2 and 3 site would have less extensive excavation than those of Units 2 and 3 and are not expected to damage geologic formations. In addition, materials such as stone and gravel used in the construction would be sourced from local quarries and other local or regional sources. Therefore, construction-related impacts to geology would be SMALL.

Construction-related impacts to soil would occur during land clearing, filling, and the construction of the plant. The exposure of soils during clearing and grubbing will increase the risk of erosion from precipitation and high wind events. Soils excavated and removed during clearing and construction would be stockpiled onsite for use as backfill after construction is completed. Because the ground disturbance would exceed one acre, DE would obtain a stormwater construction permit from SCDHEC. Overall, with the installation and implementation of BMPs, construction-related impacts to soils would be SMALL.

Operations-related impacts on geology and soils from the SMR plant would be minimized by adherence to the industrial stormwater permit governing the power plant site. Operations-related impacts would be SMALL.

E7.2.3.2.6 Hydrology (Surface Water and Groundwater)

Surface Water

The construction-related impacts to surface water include those related to construction of the SMR plant that would alter surface drainage features. The VCSNS Units 2 and 3 construction site has undergone extensive clearing and surface drainage alterations. The impacts from any further drainage alterations would be minimized by the implementation of BMPs identified in the project's stormwater permit and erosion control and stormwater management plan. Adherence to the stormwater controls would minimize sediment release and provide protection to nearby waterbodies from accidental releases of oils or other chemicals being used.

The intake and discharge sites for VCSNS Units 2 and 3 and any existing, abandoned structures would be used if practical. If not, new or modified structures would be constructed in or along the shoreline under a CWA Section 404 permit from the USACE and applicable state agencies.

Through compliance with permit conditions and implementation of BMPs, surface water impacts from SMR plant construction would be SMALL.

Water needs for construction of an SMR plant would be similar to typical uses of water for large industrial projects. These uses include dust abatement, concrete mixing, and potable water. In addition, construction could require dewatering of excavations. DE assumes water used for construction would be obtained through municipal supply. Groundwater and surface water use impacts from construction would be SMALL.

Operations-related water use would be primarily for cooling water makeup. Closed-cycle cooling would result in water consumption due to evaporation and drift. The NuScale design when operated with wet cooling is estimated to consume 740 gallons per MWh which falls within the water consumption of convention nuclear power plants and other large-scale thermoelectric plants (NuScale. 2021b). A 12-module plant annual water consumption for operations would be approximately 5.7 billion gallons. The SMR alternative to replacement 966 MWs from VCSNS would be approximately 10% larger and scaling up would annually consume approximately 6.3 billion gallons. For comparison, based on NETL water consumption factors for nuclear plants with once-through cooling of 127 gals/MWh (NETL. 2011), VCSNS would consume approximately 1.1 billion gallons annually. While there is a substantial difference in the SMR versus VCSNS consumption, the SMR plant consumption of 6.3 billion gallons annually is less than the 62 cfs (15 billion gallons) during normal operations considered by NRC for the proposed VCSNS Units 2 and 3 (NRC. 2011). NRC estimated that a higher maximum consumption rate of 69 cfs would use 1 to 1.6% of historical average flow in the Broad River (NRC. 2011).

A new NPDES permit would be required for the SMR plant discharge. Adherence to the NPDES permit would minimize impacts to water quality.

The SMR plant operations would require water for drinking, sanitary purposes, and likely for some processes. The supply would be from the VCSNS existing water treatment plant.

Surface water use and quality impacts would be SMALL.

Groundwater

Groundwater quality impacts would be mitigated through use of BMPs and stormwater systems on the industrial site. In addition, waste management and spill mitigation would minimize the spread of contaminants through the soil into the groundwater. Therefore, operations-related impacts on groundwater use and quality would be SMALL.

E7.2.3.2.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The acreage needed for the SMR would be more than a NGCC plant but would be located within the same previously cleared and disturbed VCSNS Units 2 and 3 construction site. As such, the construction site provides poor wildlife habitat. Terrestrial ecology impacts resulting from the construction of the SMR plant would be similar to that of the discrete NGCC alternative discussed in Section E7.2.3.1.7 and primarily result from any needed additional land clearing, noise, and emissions of construction activities.

Operational impacts on terrestrial resources would be similar to those occurring with the operation of VCSNS. Overall, the operation of the SMR plant would result in SMALL impacts to terrestrial resources.

Aquatic

Impacts on aquatic resources during construction would be minimal through implementation of BMPs, which would minimize impacts from surface water discharges and shoreline construction needed to construct intake and discharge structures. If construction for the intake and discharge structures require dredging, a CWA Section 404 permit from the U.S. Army Corps of Engineers and applicable state agencies would be obtained. Permit conditions would address measures to reduce impacts to water quality and aquatic resources.

Implementation of the SWPPP and BMPs in the construction stormwater permit would also minimize potential spills and releases associated with the construction of the plant. Therefore, construction-related impacts on aquatic ecological resources would be SMALL.

During operations, the SMR plant with closed-cycle cooling would require less cooling water intake than VCSNS but would consume more. Based on NuScale plant water consumption, the SMR plant would consume approximately 6.3 billion gallons annually. For comparison, based on NETL water consumption factors for nuclear plants with once-through cooling of 127 gals/MWh (NETL. 2011), VCSNS would consume approximately 1.1 billion gallons annually. A closed-cycle SMR plant would

have smaller impingement and entrainment impacts compared to the once-through VCSNS. As presented in Section E7.2.3.2.6, the water consumption of the SMR would be well under that NRC previously considered to be a small impact on the available water resources. Therefore, regardless of the higher water demand of the SMR plant as compared to VCSNS, neither quantity of water consumption would cause undue stress on the water resource and the aquatic community that it supports. The SMR plant would also require an NPDES permit. Operations-related impacts on aquatic ecological resources would be SMALL.

Special Status Species

Impacts to special status species resulting from the construction of the SMR plant would be similar to that of the discrete NGCC alternative discussed in Section E7.2.3.1.7. In addition to the potential to mitigate any impacts to special status species through the SCDNR's participation in the certificate of need process, an SMR would require a federal license from NRC which requires an ESA Section 7 review for the project. Construction and operation of an SMR plant at the VCSNS Units 2 and 3 site MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

E7.2.3.2.8 Historic and Cultural Resources

As discussed in Section E7.2.3.1.8, cultural sites have been identified on the VCSNS Units 2 and 3 site and protective measures were put in place for the that project. For development of the SMR plant, DE would avoid and/or protect cultural sites as agreed to for the VCSNS Units 2 and 3 development. The construction footprint for the SMR plant would be much smaller than the VCSNS Units 2 and 3 construction footprint, so avoidance of cultural sites is even more practical. Also, the extent of the APE would be smaller. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites. Construction and operation of the SMR alternative is expected to have NO ADVERSE EFFECT on cultural sites.

E7.2.3.2.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The socioeconomic impacts of the SMR plant would be similar to other large industrial construction projects and have short- and long-term economic stimulus to Fairfield County and the surrounding region due to worker wages and tax payments. Construction would have beneficial economic impacts in the area by creating direct and indirect jobs and incomes, increasing purchases of goods and services, and generating tax revenues. The workforce would also result in additional pressure on local temporary housing, community services, and infrastructure. The adverse impacts would be mitigated through tax revenues.

The NRC reviewed the socioeconomic impacts of construction of VCSNS Units 2 and 3 and concluded that the impacts would be small, with the exception of transportation impacts to people living and working along the roadway network in the Jenkinsville community, who would experience moderate impacts (NRC. 2011, Section 4.4.5). The peak onsite workforce considered by the NRC was 3,600 workers for a construction schedule that staggered the building of the two reactors to allow the peak workforce from Unit 2 to transfer to Unit 3 (NRC. 2011, Section 4.4). The peak onsite construction workforce for an SMR plant would be smaller because the reactor units are modular units and not constructed onsite as is a conventional nuclear reactor. Thus, the NRC's assessment for VCSNS Units 2 and 3 would bound that of the SMR plant.

The operations workforce would be similar to Unit 1, so Fairfield County and the surrounding area continue to benefit from worker wages and taxes paid by the workers. The adverse socioeconomic impacts from use of infrastructure and demand for community services from workforce would be SMALL. DE would pay property taxes for the operating SMR plant, and the payments would likely be similar in relative scale as those currently paid for Unit 1. Current tax payments represent more than 40% of the Fairfield County property tax collections and more than half of the local school district revenue (see Table E3.9-2). Primarily due to the tax payments rather than the smaller workforce, beneficial socioeconomic impacts would be LARGE.

Transportation

As mentioned above, the NRC assessment of transportation impacts from construction of VCSNS Units 2 and 3 concluded that people living and working along the roadway network in the Jenkinsville community would experience moderate impacts (NRC. 2011, Section 4.4.5). The operations workforce for the SMR plant would result in traffic congestion impacts similar to that of the current Unit 1 workforce. The socioeconomic impacts of the SMR alternative would be MODERATE for construction and SMALL for operations.

E7.2.3.2.10 Human Health

Impacts on human health from construction of an SMR plant would be similar to those associated with a large industrial facility construction project. Worker safety would be addressed by following the OSHA worker protection standards. The radiological human health impact on construction and operations workers due to working in proximity to operating and then decommissioning VCSNS would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. Operation of the SMR plant would also have similar impacts to the existing power plant and would be in compliance with the NRC radiological limits and OSHA standards. Operations-related impacts to human health under the SMR alternative would be SMALL.

E7.2.3.2.11 Environmental Justice

Potential impacts from construction of an SMR plant would primarily be associated with socioeconomic effects. These impacts would consist of the beneficial impacts from an increase in worker expenditures at local businesses and adverse impacts from rental housing shortages and traffic congestion during the construction phase of the project. Environmental effects such as fugitive dust and noise and adverse socioeconomic impacts would be minor and temporary and would not be expected to result in disproportionately high and adverse effects to low income and minority communities.

The activities associated with the operating plant would be similar to those at VCSNS. Section E3.11.2 presents the minority and low-income population in the region surrounding the VCSNS site. The SMR plant sited at the VCSNS Units 2 and 3 site is in close proximity to minority and low-income populations. However, the minor environmental effects from operations are not expected to result in significant impacts. The adverse socioeconomic impacts from use of and demand for community services would also not be significant. Therefore, no disproportionately high and adverse effects to the minority or low-income populations are expected.

E7.2.3.2.12 Waste Management

Solid, liquid, and gaseous waste generated during the construction of the SMR plant would be handled according to state regulations and disposed of at permitted offsite treatment or disposal facilities. Therefore, construction-related waste impacts would be SMALL.

The operation of the SMR plant would result in nonhazardous, hazardous, SNF and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. DE would implement recycling and waste minimization programs that would reduce waste volumes. The nonradiological waste impacts from operations would be SMALL, given DE's compliance with regulations, use of permitted facilities, and implementation of effective practices for waste minimization. Radioactive waste would be managed onsite, transported, and disposed of in licensed facilities in accordance with NRC, DOT, and state regulations. SNF would be managed onsite in accordance with NRC regulations. Therefore, environmental impacts for the SMR alternative associated with radioactive waste would be SMALL.

E7.2.3.3 Combination Alternative 1

Combination Alternative 1 relies on renewables for about one-third of the generation, with the remaining generation coming from natural gas. Renewables in current use by utilities (wind, solar, hydropower, biomass) require vast amounts of land for generation or fuel sources (Section E7.2.2). Replacing the full 966 MWs provided by VCSNS with just renewables would require acreages far beyond that of a natural gas alternative (discussed in Section E7.2.2.1). Including natural gas

generation in the combination minimizes land use conversion because (1) the plant can be located at the VCSNS Units 2 and 3 site, (2) existing natural gas pipeline abuts the VCSNS Units 2 and 3 site, so no land conversion for pipelines would be required, and (3) the abundant natural gas supply in the United States eliminates the need for more acreage to be converted for new natural gas wells. Using the VCSNS Units 2 and 3 site for natural gas-fired generation continues to provide tax revenue and employment for Fairfield County. Further, natural gas is a cleaner burning fuel than biomass fuels and would operate under strict emission regulations. This balanced combination alternative includes an NGCC plant and a solar installation at the VCSNS Units 2 and 3 site and offsite solar installations, as follows:

- 700 MW (gross) NGCC plant at VCSNS Units 2 and 3 site,
- 60-MW solar installation with battery storage at VCSNS Units 2 and 3 site, and
- Three 100-MW solar installations with battery storage located offsite in South Carolina.

To provide approximately one-third of the replacement generation, the size of the NGCC plant component would be 700 MWe (gross) based on an EIA capacity factor of 0.87 (EIA. 2022b). Solar generation has a much lower capacity factor to account for nighttime hours and daytime hours with varying solar irradiation. Each installed solar MW would yield approximately 2,190 MWh of generation annually using a 25% capacity factor. The co-located solar installation and the three offsite installations would be supported with lithium-ion battery storage to provide firm generation. The offsite solar installations are assumed to require new transmission lines and corridors to connect to the regional grid.

E7.2.3.3.1 Land Use

The NGCC component of the combination alternative is 63% the size of the NGCC discrete alternative. The combination alternative NGCC plant would be sited within the same construction footprint as the discrete NGCC alternative, requiring less overall acreage. Therefore, the land use impacts for the NGCC plant component would bound that of the NGCC alternative described in Section E7.2.3.1.1 and would be SMALL for construction and operation.

As discussed in Section E7.2.2.5, solar facilities require large areas of land to generate electricity, using 8.9 acres per MW. The existing VCSNS Units 2 and 3 site provides acreage for a solar installation in largely cleared areas. A 60-MW solar installation would require 533 acres. The 100-MW offsite installation would require 888 acres for each solar installation, a total of approximately 3,200 acres. The offsite solar acreage would require land use conversion for electricity generation.

DE assumes 25 miles of new 345-kV transmission lines in a new 150-foot-wide ROW transmission corridor would need to be developed to support each offsite solar installation, an acreage

requirement of 455 acres each or approximately 1,360 acres total for the three offsite solar installations. The new transmission corridors would require land conversion.

Given that DE would screen the sites and selected sites would be compatible with existing county-level or planning region land use plans, the impact of individual sites would not be expected to have a significant impact. However, the total acreage needed to support the offsite installations and the acreage required for transmission would impact many landowners, including adjacent residences. Overall, the project would have a MODERATE impact.

E7.2.3.3.2 Visual Resources

Visual impacts from the NGCC plant component would be essentially the same as those described for the discrete NGCC alternative in Section E7.2.3.1.2.

The solar installations would require large land areas. The solar panels could be visible to the public from offsite locations, depending on buffer areas or screening. The solar installations would be sited to comply with land zoning and any required buffers or screening. Site selection would avoid impacting scenic areas such as U.S. Congress-designated areas for protection of unique natural, cultural, and recreational values (e.g., national scenic and historic trails, national historic landmarks, scenic areas, recreation areas, preserves, and monuments). Avoiding impacts on the most scenic viewsheds would reduce the most significant visual impacts, allowing the impact to be noticeable but not destabilizing.

The visible impact of the transmission lines for the solar installations would not appear any different than existing transmission lines. Site selection would avoid scenic views and impacts on cultural resources. Overall, the visual impacts from the construction and operation of Combination Alternative 1 would range from SMALL to MODERATE.

E7.2.3.3.3 Air Quality

The impacts on air quality due to construction and operation of the NGCC plant would be similar to those associated with the discrete NGCC plant alternative discussed in Section E7.2.3 and would be SMALL for construction related impacts and MODERATE for operational impacts. The estimated criteria air pollutant and CO_2 emissions are presented in Table E7.2-3.

Construction activities associated with the solar installations would generate fugitive dust. Mitigation would be implemented via wetting of cleared areas and dirt roads to minimize the fugitive dust. Construction equipment and vehicles would also emit exhaust emissions. These emissions would be temporary and mitigation such as curtailing idling of vehicles would be implemented to minimize short-term air quality impacts. Construction emissions associated with the solar components of the combination alternative would be SMALL. The solar installations would not release air emissions during operation.

Overall, the air quality impacts from the construction of Combination Alternative 1 would be SMALL and operations would be MODERATE for the NGCC component.

E7.2.3.3.4 Noise

The construction and operation of the NGCC plant component would have noise impacts similar to those described in the discrete NGCC plant alternative presented in Section E7.2.3.1.4 and would be SMALL.

Construction of each solar installation would likewise have noise impacts similar to those described in the discrete NGCC plant alternative presented in Section E7.2.3.1.4 with a shorter duration. However, given the acreage of the solar installations and the potential need for land clearing, noise impacts would likely be noticeable for the duration of construction of each facility. No noise impacts would occur from operation of a solar installation.

Overall, construction-related noise impacts associated with the combination alternative is dependent on the sites selected for the offsite solar installations and their proximity to residents and other sensitive receptors and would range from SMALL to MODERATE. Operations-related noise impacts would be SMALL.

E7.2.3.3.5 Geology and Soils

The impact on geology and soils due to construction and operation of the NGCC component would be similar to those associated with the discrete NGCC plant alternative discussed in Section E7.2.3.1.5 and would be SMALL. The onsite solar installation would require another approximately 523 acres. The acreage would require some additional clearing and tree removal.

Construction impacts to geology and soils resulting from the construction of the solar installations and supporting transmission lines would primarily be impacts to soils from clearing and grubbing. These temporary soil impacts would be minimized by implementation of BMPs. Geological impacts would be minor, as any gravel or stone used in the construction of roads and infrastructure would be sourced from local businesses that sell materials sourced from local quarries. During operations, the solar installations would be required to have a NPDES construction stormwater permit and comply with SCDHEC regulations to control stormwater runoff.

Overall, the geology and soil impacts from the construction and operation of Combination Alternative 1 would be SMALL.

E7.2.3.3.6 Hydrology (Surface Water and Groundwater)

The impact on surface water and groundwater use and quality due to constructing and operating the NGCC plant component would be similar to that associated with the discrete NGCC plant alternative discussed in Section E7.2.3.1.6 and would be SMALL for construction and for operation.

Construction of the solar installations and their supporting transmission lines would require water for dust suppression, equipment washing, and sanitary systems. The solar installation would not have process water needs for operation, but water would be needed for periodically washing the solar panels. The water usage demand for the onsite solar installation would be met by VCSNS's water treatment plant supply available at the site. Water demand for the offsite solar installations would be trucked in portable water or onsite or nearby surface or groundwater resources. DE would utilize the most practical supply and comply with any required water withdrawal permits and applicable regulations. Water quality impacts could result from erosion and runoff associated with the construction of the solar installations. These temporary soil impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Groundwater would be protected through the implementation of stormwater controls and spill prevention measures. Once in operation, DE would operate the installations in compliance with stormwater regulations. The use and water quality impacts for both surface water and groundwater resources associated with the construction and operation of the solar installations would be SMALL.

Overall, the impacts to surface water resources from the construction and operation of the combination alternative would be SMALL. Overall, the impacts to groundwater resources for Combination Alternative 1 would be SMALL.

E7.2.3.3.7 Ecological Resources (Terrestrial and Aquatic)

Terrestrial

The impact on terrestrial resources due to construction and operation of the NGCC plant component would be similar to those associated with the discrete NGCC plant alternative discussed in Section E7.2.3.1.7 and would be SMALL for construction and operations.

Terrestrial ecology impacts from the construction of solar installations and new transmission corridors would result from clearing land, much of which is likely to be providing terrestrial habitat. The onsite solar installation would require approximately 523 acres. Much of the available acreage at the VCSNS Units 2 and 3 construction site is already cleared, but some additional clearing and tree removal would be needed. Each of the three offsite solar installations would require approximately 888 acres. To avoid take during tree removal, the USFWS guidance regarding nesting and roosting trees supporting the northern long-eared bat and the bald eagle would be followed (USFWS. 2019a; USFWS. 2019b).

As presented in Section E7.2.3.1.7, generation facilities greater than 75 MW require a Certificate of Environmental Compatibility and Public Convenience and Necessity from the SCPSC, and the SCDNR is a party to the certification proceeding. SCDNR's participation would suggest that project approval would necessitate avoidance of wetlands and other high-quality terrestrial habitats such

as critical habitat for threatened and endangered species. No operational impacts to terrestrial ecological resources would occur from the solar component of the combination alternative.

Overall, the ecological impacts to terrestrial species from construction and operation of this alternative would be MODERATE, primarily due to the acreage disturbed and permanent terrestrial habitat removal.

Aquatic

The NGCC component would use the same cooling water intake and discharge configuration as the discrete NGCC alternative. The combination alternative NGCC plant would be approximately 63% the size of the discrete alternative and therefore use less cooling water. The impact on aquatic resources due to constructing and operating the NGCC plant component would be similar to those associated with the discrete NGCC plant alternative presented in Section E7.2.3.1.7.

Impacts to aquatic resources would result from the construction of the solar components of the combination alternative due to the implementation of BMPs to control erosion and runoff. Operations-related impacts which are associated with solar components would also be minimized by stormwater runoff BMPs.

Therefore, the ecological impacts to aquatic species from the construction and operation of the combination alternative would be SMALL.

Special Status Species

The NGCC plant component would be constructed within the same area as the discrete NGCC alternative. Terrestrial ecology impacts from the construction of a solar installation at the VCSNS Units 2 and 3 site would result from additional land clearing and tree removal. Much of this land was disturbed for the VCSNS Units 2 and 3 construction and continues to have some limited equipment maintenance and removal activities. The site also has VCSNS's firing range. For these reasons, the VCSNS Units 2 and 3 construction site does not offer high-quality terrestrial habitat. Section E3.7.8 discusses the federal and state species occurring in Fairfield, Newberry, and Richland Counties. The federally listed species include the northern long-eared bat, red-cockaded woodpecker, wood stork, Carolina heelsplitter, four listed plants whose range does not overlap with the VCSNS site, and the federally endangered plant, Michaux's sumac, which is dependent upon some form of disturbance. None of these species were known to occur at the VCSNS Units 2 and 3 construction site when the nuclear units were assessed for environmental impacts in 2011; however, the Carolina heelsplitter was acknowledged to possibly reside in onsite creeks and streams in the vicinity of VCSNS (NRC. 2011). As mentioned in Section E3.7.8, the Carolina heelsplitter was not found during a survey conducted in 2015 in the Monticello Reservoir. Construction and operation of an NGCC plant and solar installation at the VCSNS site MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

The three 100-MW offsite solar installations would require a Certificate of Environmental Compatibility and Public Convenience and Necessity from the SCPSC. As mentioned above, the SCDNR is a party to the certification proceeding. SCDNR's participation would suggest that project approval would necessitate avoidance of impacts to federal and state threatened and endangered species and any critical habitat. Given avoidance, minimization, and mitigation measures, and compliance with applicable permits, each solar installation MAY AFFECT, but is NOT LIKELY TO ADVERSELY AFFECT federally listed species.

Overall, the given the acreage needed for the solar installations but with the required certificate from the SCPSC needed, construction of Combination Alternative 1 would have a SMALL to MODERATE impact and operation would have a SMALL to MODERATE impact on special status species.

E7.2.3.3.8 Historic and Cultural Resources

The impact on historic and cultural resources due to construction and operation of an NGCC plant at the VCSNS Units 2 and 3 site would be similar to those associated with the discrete NGCC plant alternative presented in Section E7.2.3.1.8. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites. However, without identifying the footprint of the NGCC plant and the solar installation within the VCSNS Units 2 and 3 site, construction activities could have adverse impacts on the NRHP eligible historical site, General Pearson's gravesite located in the Person Family Cemetery (Figure E3.1-1), and the archaeological sites located on the VCSNS Units 2 and 3 site. The air emissions from the operating NGCC plant could also contribute to adverse effects on the cemetery's headstones from acid rain. Therefore, absent identifying footprints within the larger VCSNS Units 2 and 3 construction site and associated atmospheric modeling and vibration studies, the project's effects are conservatively considered to have POTENTIAL ADVERSE EFFECT.

Development of offsite solar installations and supporting transmission lines could impact cultural resources, depending on the siting location. The offsite solar installations would not require a federal license, prompting a cultural site review and the Certificate of Need process does not include SHPO as a participant. Therefore, impacts to historic and cultural resources could range from NO EFFECT to ADVERSE EFFECT, depending on the site.

E7.2.3.3.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The socioeconomic impacts of the NGCC plant and solar installation at the VCSNS Units 2 and 3 site would be similar to other large industrial construction projects and have short- and long-term economic stimulus to Fairfield County and the surrounding region due to worker wages and tax payments. Construction impacts would also have adverse socioeconomic impacts from increased

use and demand for community services and infrastructure from the construction workforce and activities. The adverse impacts would be mitigated through tax revenues. The construction and operation of the NGCC and solar components of combination alternative located at the VCSNS Units 2 and 3 site would be similar to those associated with the discrete NGCC plant alternative presented in Section E7.2.3.1.9.

The construction and operation of the offsite solar installations and supporting transmission lines of the combination alternative would create fewer construction jobs than the NGCC plant (a few hundred for less than 1 year). Any boost to the local economies would be short in duration, and socioeconomic impacts related to the construction would be SMALL.

The number of workers required to maintain each solar installation would be very small, and it would not have a noticeable impact on the local economy. If DE leased the property for the solar installations, lease payments would be made to the property owners. The solar installations could be taxed at a higher rate than agricultural land, providing a tax benefit. The beneficial impact would be dependent on the tax base of the county, but the impact would likely be small. Therefore, the operations-related socioeconomic impacts from the offsite solar components of combination alternative would be SMALL.

Overall, the beneficial socioeconomic impacts from the construction would be SMALL for all counties and operation of Combination Alternative 1 would be LARGE for Fairfield and SMALL for all other counties. The adverse socioeconomic impacts from construction and operation of the combination alternative would be SMALL for all counties.

Transportation

Transportation impacts during the construction and operation of the NGCC plant and solar components located at the VCSNS Units 2 and 3 site would be similar to those associated with the discrete NGCC plant alternative discussed in Section E7.2.2.3.

The construction workforce and equipment transported to the individual solar sites would be less than that for the NGCC plant. Traffic impacts associated with the operation of each solar facility would not be quantifiable. Once the facility is in operation, very few employees would be required for facility operations. Therefore, transportation impacts for construction and operation under the solar components would be SMALL.

Overall, the transportation impacts associated with construction of the combination alternative would be SMALL for the offsite solar components and range from SMALL to MODERATE for the components located at VCSNS Units 2 and 3 site. The impacts during operation would be expected to be SMALL for all the components of Combination Alternative 1.

E7.2.3.3.10 Human Health

Impacts on human health from construction and operation of the NGCC component would be similar to those associated with the discrete NGCC plant alternative presented in Section E7.2.3.1.10 and would be SMALL for construction and SMALL to MODERATE for operations. The radiological human health impact on construction and operations workers located at the Units 2 and 3 site due to working in proximity to operating and then decommissioning VCSNS would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.

During construction of the solar installations, worker safety would be addressed by following the OSHA worker protection standards. Therefore, construction-related impacts on human health from the solar components of the combination alternative would be SMALL.

Therefore, the human health impacts associated with the construction of Combination Alternative 1 would be SMALL and range from SMALL to MODERATE for operations.

E7.2.3.3.11 Environmental Justice

Potential impacts on minority and low-income populations from construction and operation of the NGCC and solar components at the Units 2 and 3 site would be similar to those associated with the discrete NGCC plant alternative discussed in Section E7.2.3.1.12.

Some minor environmental effects from construction of the offsite solar installations would result from fugitive dust during construction, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income populations under the combination alternative would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the projects. The temporary increase in traffic on roads would likely result in some small impacts to traffic that could affect local minority and low-income populations.

The construction and operation of the offsite solar components of the combination alternative would be unlikely to have disproportionately high and adverse human health and environmental effects on minority and low-income populations due to the temporary nature of construction impacts. The NGCC plant sited at the VCSNS Units 2 and 3 site is in close proximity to minority and low-income populations would have air emissions that could have air quality and health impacts. However, because emissions are expected to remain within regulatory standards, impacts from emissions are not expected to be high and adverse. Overall, the combination alternative is not expected to have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

E7.2.3.3.12 Waste Management

Impacts on waste management from construction of the NGCC and solar components located at the VCSNS Units 2 and 3 site would be similar to those associated with the discrete NGCC plant alternative presented in Section E7.2.3.1.12. The waste management impacts of operating the NGCC plant would be similar to those associated with the discrete NGCC plant alternative presented in Section E7.2.3.1.12.

The construction of the offsite solar installations would create land clearing waste disposed of onsite or shipped to an offsite construction debris landfill. The construction of the solar installations would create sanitary and industrial waste in smaller quantities than the NGCC plant. This waste would be recycled, disposed of onsite, or shipped to an offsite waste disposal facility.

The operation of each solar installation would be expected to generate very minimal waste from daily operations. The battery storage system at the solar installation would have to be replaced after several years of operation; however, many of the components are recyclable, minimizing the waste generation. Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL. 2020). There would be significant waste generation upon decommissioning. As a good environmental steward, DE would implement waste management practices to recycle or dispose of all waste generated at the solar installations at an offsite waste disposal facility. Therefore, waste management impacts from daily operations of the solar installations would be SMALL.

Overall, the waste management impacts from the construction and operation of Combination Alternative 1 would be SMALL.

E7.2.3.4 Combination Alternative 2

Combination Alternative 2 would allow the generating units to be confined to the Units 2 and 3 abandoned site. The alternative relies on one 12-unit SMR with MDCTs and a larger onsite solar installation than Combination Alternative 1. Locating the SMR and solar installation on the VCSNS Units 2 and 3 abandoned site would minimize land use conversion and maintain a workforce comparable to the existing Unit 1 workforce in the Fairfield, Newberry, and Richland County area. This combination alternative includes:

- One 12-unit SMR (884 MW net) at VCSNS Units 2 and 3 site, and
- 82-MW solar installation with battery storage at VCSNS Units 2 and 3 site.

E7.2.3.4.1 Land Use

The SMR component would be sited within the same footprint as the nuclear alternative, requiring less acreage. An 82-MW solar installation would require 713 acres. This larger acreage for an onsite solar installation than Combination Alternative 1 would require clearing more treed areas on

the VCSNS Units 2 and 3 site. Using the existing site that was converted for generation land use previously means that likely no additional land use conversion would be needed. Therefore, the land use impacts for the Combination Alternative 2 would be SMALL for construction and operation.

E7.2.3.4.2 Visual Resources

The SMR component would blend in with the existing industrial appearance. The solar panels could be visible to the public from offsite locations and the Monticello Reservoir, depending on buffer areas or screening. The visual impacts from the construction and operation of the combination alternative would be SMALL.

E7.2.3.4.3 Air Quality

The impacts on air quality due to construction of Combination Alternative 2 would be similar to those associated with Combination Alternative 1 discussed in Section E7.2.3.3. The SMR would have air quality impacts similar to the nuclear alternative. The solar installations would not release air emissions during operation. Overall, the air quality impacts from the construction and operation of Combination Alternative 2 would be SMALL.

E7.2.3.4.4 Noise

The construction of the SMR and solar installation at the VCSNS Units 2 and 3 site would be similar to other large construction sites and not unlike that experienced for the construction of VCSNS Units 2 and 3 before the project was abandoned. Due to the distance of sensitive receptors and the temporary and intermittent nature of construction, noise impacts during construction would be SMALL. During operations, the noise impact would be similar to that of Unit 1 and would also be SMALL.

E7.2.3.4.5 Geology and Soils

The impact on geology and soils due to construction and operation of Combination Alternative 2 would be similar to that of the onsite components of Combination 1 and would be SMALL. The greater acreage needed for onsite solar installation would require more tree removal and clearing; however, soil erosion would be minimized by implementation of BMPs.

E7.2.3.4.6 Hydrology (Surface Water and Groundwater)

The impact on surface water and groundwater use and quality due to constructing and operating the SMR plant component would be similar to that associated with the nuclear alternative discussed in Section E7.2.3.2.6 and would be SMALL for construction and operation.

Like construction of the SMR component, the solar installation would require water for dust suppression, equipment washing, and sanitary systems. The solar installation would not have

process water needs for operation, but water would be needed for periodically washing the solar panels. The water usage demand for the onsite solar installation would be met by VCSNS's water treatment plant supply available at the site. Water quality impacts could result from erosion and runoff associated with the construction of the solar installations. These temporary soil impacts would be minimized by implementation of BMPs and compliance with the construction stormwater permit and applicable regulations. Groundwater would be protected through the implementation of stormwater controls and spill prevention measures.

Once in operation, DE would operate the installations in compliance with stormwater regulations. The use and water quality impacts for both surface water and groundwater resources associated with the construction and operation of Combination Alternative 2 would be SMALL.

E7.2.3.4.7 Ecological Resources (Terrestrial and Aquatic)

The impact on terrestrial resources, aquatic resources, and special species due to construction and operation of Combination Alternative 2 would be similar to that of the onsite components of Combination Alternative 1. Overall, construction and operation of Combination Alternative 2 would have a SMALL impact on ecological resources. Construction and operation of an SMR plant and solar installation at the VCSNS site MAY AFFECT but is NOT LIKELY to ADVERSELY AFFECT federally listed species.

E7.2.3.4.8 Historic and Cultural Resources

The impact on historic and cultural resources due to construction and operation of an SMR plant and solar installation at the VCSNS Units 2 and 3 site would be similar to those associated with the nuclear alternative presented in Section E7.2.3.2.8 and the onsite solar installation of Combination Alternative 1. As discussed in Section E7.2.3.1.8, cultural sites have been identified on the VCSNS Units 2 and 3 site and protective measures were put in place for the that project. For development of Combination Alternative 2, DE would avoid and/or protect cultural sites as agreed to for the Units 2 and 3 development. The construction footprint for the Combination Alternative 2 would be similar, but the solar panels could encroach more on the General Pearson cemetery. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites. Construction and operation of the SMR alternative is expected to have NO ADVERSE EFFECT on cultural sites.

E7.2.3.4.9 Socioeconomics

Socioeconomic Issues Other than Transportation

The socioeconomic impacts of the SMR plant and solar installation at the VCSNS Units 2 and 3 site would be similar to other large industrial construction projects and have short- and long-term economic stimulus to Fairfield County and the surrounding region due to worker wages and tax

payments. Construction impacts would also have adverse socioeconomic impacts from increased use and demand for community services and infrastructure from the construction workforce and activities. The adverse impacts would be mitigated through tax revenues. The construction and operation of the SMR and solar components of combination alternative located at the VCSNS Units 2 and 3 site would be similar to those associated with the nuclear plant alternative presented in Section E7.2.3.2.9. Overall, the beneficial socioeconomic impacts from the construction and operation of the combination alternative would be LARGE for Fairfield and SMALL for other surrounding counties. The adverse socioeconomic impacts from construction and operation of the combination alternative would be SMALL for all counties.

Transportation

Transportation impacts during the construction and operation of the SMR plant and solar components of combination alternative located at the VCSNS Units 2 and 3 site would be similar to those associated with the nuclear alternative discussed in Section E7.2.2.3.

E7.2.3.4.10 Human Health

During construction of the SMR and solar installation, worker safety would be addressed by following the OSHA worker protection standards. The radiological human health impact on construction workers located at the VCSNS Units 2 and 3 site due to working in proximity to operating VCSNS would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. Therefore, construction-related impacts on human health of Combination Alternative 2 would be SMALL.

Operational impacts of the SMR component would be similar to those associated with the nuclear alternative presented in Section E7.2.3.2.10 and would be SMALL. Operation of the solar installation would not have air or water emissions and would have no to small impacts to the health of its few workers and the public. Overall, the human health impacts associated with the construction and operation of Combination Alternative 2 would be SMALL.

E7.2.3.4.11 Environmental Justice

Potential impacts on minority and low-income populations from construction and operation of the SMR and solar installation at the VCSNS Units 2 and 3 site would be similar to those associated with the nuclear plant alternative discussed in Section E7.2.3.1.12. Combination Alternative 2 is not expected to have disproportionately high and adverse human health and environmental effects on minority and low-income populations.

E7.2.3.4.12 Waste Management

Impacts on waste management from construction of the SMR and solar installation located at the VCSNS Units 2 and 3 site would be similar to those associated with the nuclear alternative

presented in Section E7.2.3.1.12. However, construction of the onsite solar installation would create more land-clearing waste than the nuclear alternative that would be disposed of onsite or shipped to an offsite construction debris landfill. The operation of the solar installation is expected to generate very minimal waste from daily operations. The battery storage system at the solar installation would have to be replaced after several years of operation; however, many of the components are recyclable, minimizing the waste generation. Solar developers are currently assuming lifespans for solar panels to be 30 years or more (LBNL. 2020). There would be significant waste generation upon decommissioning. As a good environmental steward, DE would implement waste management practices to recycle or dispose of all waste generated at the solar installations at an offsite waste disposal facility. Therefore, waste management impacts from daily operations of the solar installations would be SMALL.

Overall, the waste management impacts from the construction and operation of Combination Alternative 2 would be SMALL.

Table E7.2-3 Air Emissions Estimated for NGCC and Combination Alternatives

Emission	NGCC Alternative (Estimated Tons/Year)[b]	Combination Alternative NGCC Plant (Estimated Tons/Year)[b]
Sulfur dioxide	110	69
Nitrogen oxides[a]	421	264
Carbon monoxide	971	609
Particulate matter 10 microns	214	134
Nitrous oxide	97	61
Volatile organic compounds	68	43
Carbon dioxide	3,559,651	2,233,073

a. Assumes a 90% reduction in emissions due to operation of air pollution control equipment (selective catalytic reduction).

b. Estimates based on EPA AP-42 emission factors. See formulas below.

Formulas and Sources

Annual gas consumption (ft^3)	Plant size in MWe x heat rate x 1,000 x (1/ heat content) x hours in a year						
Heat rate = 6,554 Btu/kWh (EIA. 2020) Heat content of natural gas 2020 = 1,033 Btu/ft^3 (EIA. 2021b)							
Annual MMBtu = (annual gas consumption x fuel heating average value)/1,000,000							
Emission factor for processed natural gas (lbs/MMBtu)	CO_2	NO_X	CO	PM	SO_2	VOC	N_2O
	110	0.13	0.03	0.0066	0.0034	0.0021	0.003
Annual emissions (tons) = (emission factor) x (annual MMBtu)/2000							
Air emission factors (EPA. 2000, Tables 3.1-1 and 3.1-2a)							

MMBtu = million British thermal units

E7.3 ALTERNATIVES FOR REDUCING ADVERSE IMPACTS

E7.3.1 ALTERNATIVES CONSIDERED

A review of the environmental impacts in Chapter E4.0 identified no significant adverse effects that would require consideration of additional alternatives. Therefore, DE concludes that the impacts associated with renewal of the VCSNS OL would not require consideration of alternatives for reducing adverse impacts as specified in NRC Regulatory Guide 4.2, Revision 1 (NRC. 2013b,Section 7.2). This determination assumes the existing mitigation measures discussed in Section E6.2 adequately minimize and avoid environmental impacts associated with operating VCSNS.

E7.3.2 ENVIRONMENTAL IMPACTS OF ALTERNATIVES FOR REDUCING ADVERSE IMPACTS

No additional alternatives were considered by DE to reduce impacts because, as determined in Chapter E4.0, the continued operation of VCSNS does not result in significant adverse effects to the environment.

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E8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF SUBSEQUENT LICENSE RENEWAL WITH THE ALTERNATIVES

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)]

The proposed action is renewal of the VCSNS OL, which would preserve the option to continue to operate VCSNS to provide reliable baseload power throughout the proposed 20-year SLR operating term. Chapter E4.0 provides analyses of the environmental impacts for the proposed action. The proposed action is compared to the no-action alternative, which includes both the termination of operations and decommissioning of VCSNS and reasonably foreseeable replacement of its baseload generating capacity. The termination of operations and decommissioning impacts are presented in the GEIS (NRC. 2013a, Section 14.2.2), and decommissioning impacts are analyzed in the GEIS on decommissioning, NUREG-0586, Supplement 1 (NRC. 2002). The energy alternatives component of the no-action alternative is described, and its impacts analyzed in Chapter E7.0.

Table E8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable for comparison purposes. Tables E8.0-2 and E8.0-3 provide a more detailed comparison. The environmental impacts compared in Tables E8.0-1, E8.0-2, and E8.0-3 are Category 1 and 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in an alternatives analysis.

In conclusion, there is no reasonable alternative that is environmentally preferable to the continued operation of VCSNS. All alternatives capable of meeting the needs currently served by VCSNS entail impacts greater than or equal to the proposed action of VCSNS SLR. The continued operation of VCSNS would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of VCSNS will have a significant positive economic impact on Fairfield County through tax revenues paid by DE for VCSNS. Continued employment of plant workers will continue to provide economic benefits to the surrounding communities.

Table E8.0-1 Environmental Impacts Comparison Summary (Sheet 1 of 3)

Impact Area[a]	Proposed Action	No Action				
		Termination of Operations and Decommissioning[b]	Natural Gas	New Nuclear (SMR)	Combination Alternative 1 (Natural Gas and Solar)	Combination Alternative 2 (SMR and Solar)
Land Use	SMALL	SMALL	SMALL	NONE	MODERATE	SMALL
Visual Resources	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL
Air Quality	SMALL	SMALL	SMALL (construction) MODERATE (operations)	SMALL	SMALL (construction) MODERATE (operations)	SMALL
Noise	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	SMALL
Geology and Soils	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Surface Water	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Terrestrial	SMALL	SMALL	SMALL	SMALL	MODERATE	SMALL
Aquatic	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Special Status Species	NO EFFECT to MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	Site-specific	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT	MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT

Table E8.0-1 Environmental Impacts Comparison Summary (Sheet 2 of 3)

Impact Area[a]	Proposed Action	No Action				
		Termination of Operations and Decommissioning[b]	Natural Gas	New Nuclear (SMR)	Combination Alternative 1 (Natural Gas and Solar)	Combination Alternative 2 (SMR and Solar)
Historic and Cultural	NO ADVERSE EFFECT	NO ADVERSE EFFECT	POTENTIAL ADVERSE EFFECT	NO ADVERSE EFFECT	POTENTIAL ADVERSE EFFECT for VCSNS Units 2 and 3 site located components; NO EFFECT to ADVERSE EFFECT for offsite solar	NO ADVERSE EFFECT
Socioeconomics	SMALL	MODERATE to LARGE (termination) SMALL (decommissioning)	Construction: SMALL for adverse and beneficial impacts Operations: SMALL for adverse and LARGE to Fairfield County for beneficial	Construction: SMALL for adverse and beneficial impacts Operations: SMALL for adverse and LARGE to Fairfield County for beneficial	Construction: SMALL for adverse and beneficial impacts Operations: SMALL for adverse and LARGE to Fairfield County for beneficial	Construction: SMALL for adverse and beneficial impacts Operations: SMALL for adverse and LARGE to Fairfield County for beneficial
Transportation	SMALL	SMALL	SMALL to MODERATE (construction) SMALL (operations)	MODERATE (construction) SMALL (operations)	SMALL to MODERATE for construction and SMALL for operations of VCSNS Units 2 and 3 site located components; SMALL for offsite solar	MODERATE (construction) SMALL (operations)

Table E8.0-1 Environmental Impacts Comparison Summary (Sheet 3 of 3)

Impact Area[a]	Proposed Action	No Action				
		Termination of Operations and Decommissioning[b]	Natural Gas	New Nuclear (SMR)	Combination Alternative 1 (Natural Gas and Solar)	Combination Alternative 2 (SMR and Solar)
Human Health	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL (construction) SMALL to MODERATE (operations)	SMALL
Environmental Justice	No disproportionately high and adverse effects	Site-specific	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects	No disproportionately high and adverse effects
Waste Management	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

a. As defined in 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3:

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, important attributes of the resource.

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

b. Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of termination and decommissioning regarding a license renewal assessment. Entries in this column are from NRC's generic determination in NUREG-0586 Supplement 1 (NRC. 2002), the decommissioning GEIS.

Table E8.0-2 Alternatives Features Comparison Summary

	Natural Gas	Nuclear (SMR)	Combination Alternative 1 (Natural Gas and Solar)	Combination Alternative 2 (SMR and Solar)
Summary of Alternative	Multiple combustion turbines, a heat recovery steam generator, and a steam turbine generator; design capacity of 1,110 MWe (gross) (Section E7.2.3.1)	SMR plant with two clusters of SMR units each with own control room, generation capacity comparable to VCSNS generation (Section E7.2.3.2)	700 MW (gross) NGCC plant, 60 MW solar with battery storage at abandoned Units 2 and 3 site; three 100-MW solar installations with battery storage offsite in South Carolina (Section E7.2.3.3)	SMR plant with one 12-unit cluster and 82-MW solar installation with battery storage (Section E7.2.3.4)
Location	Abandoned VCSNS Units 2 and 3 project site (Section E7.2.3.1.1)	Abandoned VCSNS Units 2 and 3 project site (Section E7.2.3.3.1)	NGCC plant and one solar installation: Abandoned VCSNS Units 2 and 3 project site Offsite solar: Three compatible sites in South Carolina (Section E7.2.3.2)	Abandoned VCSNS Units 2 and 3 project site (Section E7.2.3.4)
Cooling System	Closed-cycle cooling with MDCTs (Section E7.2.3.1)	Closed-cycle cooling with MDCTs (Section E7.2.3.2)	NGCC plant: Closed-cycle cooling with MDCTs (Section E7.2.3.3) Solar: No cooling system required	SMR plant: Closed-cycle cooling with MDCTs Solar: No cooling system required (Section E7.2.3.4)
Land Requirements	48 acres (Section E7.2.3.1)	30+ to 130 acres for plant (Section E7.2.3.2.1)	Abandoned VCSNS Units 2 and 3 project site: Less than 48 acres for NGCC plant, 533 acres for solar installation Offsite solar: 3 sites of 888 acres each and each with 455 acres for transmission (Section E7.2.3.3.1)	Abandoned VCSNS Units 2 and 3 project site: 30+ to 130 acres for plant, 713 acres for solar installation (Section E7.2.3.4)
Workforce	1,200 workers for construction and 150 workers for operations (Section E7.2.3.1.9)	Less than conventional nuclear plant for construction, 3,600 workers, similar for operations (Section E7.2.3.2.9)	NGCC and solar: 1,200 workers for construction and 150 workers for operations Offsite solar: Construction workforce few hundred for less than one year; operational workforce very small without a noticeable impact on the local economy (Section E7.2.3.3.9)	Less than 3,600 workers for construction of a conventional nuclear plant for both SMR and solar construction similar to a conventional nuclear plant for operations for both SMR and solar operations (Section E7.2.3.4.9)

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 1 of 18)

Land Use	
Proposed Action	**SMALL** for onsite and offsite land use issues. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No changes in onsite land use or changes in significant offsite land use attributable to VCSNS operations are expected. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Temporary onsite land use changes during decommissioning are anticipated to be comparable but would not require additional land. (NRC. 2002)
Natural Gas	**SMALL:** Use of the VCSNS Units 2 and 3 abandoned project site for the plant and pipeline would not require land to be converted to energy infrastructure.
Nuclear (SMR)	**SMALL:** Use of the VCSNS Units 2 and 3 abandoned project site for the plant would not require land to be converted to energy infrastructure.
Combination 1 (Natural Gas and Solar)	**MODERATE:** Use of the VCSNS Units 2 and 3 abandoned project site for the plant and pipeline and one solar installation would not require land to be converted to energy infrastructure. Three offsite solar installations would convert land use of 888 acres each to energy infrastructure. Transmission corridors would also require land conversion to energy infrastructure.
Combination 2 (SMR and Solar)	**SMALL:** Use of the VCSNS Units 2 and 3 abandoned project site for the SMR plant and solar installation would not require land to be converted to energy infrastructure.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 2 of 18)

Visual Resources	
Proposed Action	**SMALL** for visual resources impacts. See Chapter E4.0 for analysis.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No additional structures were proposed to continue operation for another 20 years. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Terminating nuclear power plant operations would not change the visual appearance of the nuclear power plant until demolition of structures. Decommissioning activities would be localized. (NRC. 2002)
Natural Gas	**SMALL:** The appearance would blend with the existing VCSNS structures.
Nuclear (SMR)	**SMALL:** The appearance would blend with the existing VCSNS structures.
Combination 1 (Natural Gas and Solar)	**SMALL to MODERATE:** The appearance of the NGCC plant would blend with the existing VCSNS structures. The solar panels could be visible to the public from offsite locations, depending on buffer areas or screening. Site selection would avoid scenic views and impacts to the offsite solar sites. The solar installations would be sited to comply with land zoning and any required buffers or screening.
Combination 2 (SMR and Solar)	**SMALL:** The appearance of the SMR plant would blend with the existing VCSNS structures. The solar panels could be visible to the public from offsite locations, depending on buffer areas or screening.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 3 of 18)

Air Quality	
Proposed Action	**SMALL** for air quality impact and air quality effects of transmission lines issues. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. There are no additional emission sources expected to be added to VCSNS. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** After termination of operations, air emissions from the nuclear power plant would continue, but at greatly reduced levels. The most likely impact of decommissioning on air quality is degradation by fugitive dust. Use of BMPs, such as seeding and wetting, can be used to minimize fugitive dust. (NRC. 2002)
Natural Gas	**SMALL (construction) MODERATE (operations):** Construction impacts would be temporary. Emissions being maintained within state regulatory limits and fugitive dust would be minimized with BMPs. The NGCC plant's emissions would be within permit limits. The MDCTs would have air emissions and atmospheric effects from drift and plumes. The plant would be operated in compliance with its air permit.
Nuclear (SMR)	**SMALL:** Construction impacts would be temporary; operational impacts would be minor, and emissions being maintained within regulatory limits. The MDCTs would have air emissions and atmospheric effects from drift and plumes. The plant would be operated in compliance with its air permit.
Combination 1 (Natural Gas and Solar)	**SMALL (construction) MODERATE (operations):** Construction impacts would be temporary. Emissions being maintained within state regulatory limits and fugitive dust would be minimized with BMPs. Emissions from the NGCC plant and the MDCTs would be within permit limits. The solar installations would not release any air emissions during operation.
Combination 2 (SMR and Solar)	**SMALL:** Construction impacts would be temporary; operational impacts would be minor, and emissions being maintained within regulatory limits. The MDCTs would have air emissions and atmospheric effects from drift and plumes. The plant would be operated in compliance with its air permit. The solar installation would not release any air emissions during operation.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 4 of 18)

Noise	
Proposed Action	**SMALL** for noise issue. See Chapter E4.0 for analysis.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No additional impacts related to noise are expected. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** During decommissioning, noise would generally be far enough away from sensitive receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable offsite. Noise abatement procedures could also be used during decommissioning in order to reduce noise. (NRC. 2002)
Natural Gas	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction. Noise levels during operation would be similar to the existing generation units in the area.
Nuclear (SMR)	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction. Noise levels during operation would be similar to the existing generation units in the area.
Combination 1 (Natural Gas and Solar)	**SMALL to MODERATE (construction):** Noise impacts from construction activities would be intermittent and last only through the duration of construction and the size of the VCSNS and Units 2 and 3 project site would allow attenuation, minimizing sound levels offsite. Noise impacts from land clearing and construction at offsite solar sites would range from SMALL to MODERATE dependent on proximity to sensitive receptors. **SMALL (operations):** Noise levels during operation of the NGCC plant would be similar to the existing generation units in the area. No noise impacts would occur from operation of the solar installations.
Combination 2 (SMR and Solar)	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction. Noise levels during operation would be similar to the existing generation units in the area.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 5 of 18)

Geology and Soils	
Proposed Action	**SMALL** geology and soil issue. See Chapter E4.0 for analysis.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. With no construction planned during the proposed SLR term, there would be no additional impacts to geology and soils. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Termination of nuclear plant operations is not expected to impact geology and soils. Erosion problems could be mitigated by using BMPs during decommissioning. Site geologic resources would not be affected by decommissioning. (NRC. 2002)
Natural Gas	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Nuclear (SMR)	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Combination 1 (Natural Gas and Solar)	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
Combination 2 (SMR and Solar)	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 6 of 18)

Surface Water	
Proposed Action	**SMALL** for all surface water issues other than altered salinity gradients and altered thermal stratification of lakes which are not applicable. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant surface water impacts are anticipated during the SLR term. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** After termination of operations, water use and discharges from the nuclear power plant would continue, but at greatly reduced levels. The NRC concluded that the impacts on water use and water quality from decommissioning would be SMALL for all plants. (NRC. 2002)
Natural Gas	**SMALL:** Potable and process water needs would be met by the existing VCSNS water treatment facility. Cooling makeup water would be sourced from Monticello Reservoir in compliance with withdrawal permits. Water quality impacts could result from erosion and runoff associated with construction. These temporary impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations and the NGCC plant would be operated in compliance with its NPDES permit.
Nuclear (SMR)	**SMALL:** Potable and process water needs would be met by the existing VCSNS water treatment facility. Cooling makeup water would be sourced from Monticello Reservoir in compliance with withdrawal permits. Water quality impacts could result from erosion and runoff associated with construction. These temporary impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations.
Combination 1 (Natural Gas and Solar)	**SMALL:** Potable and process water needs would be met by the existing VCSNS water treatment facility. Cooling makeup water would be sourced from Monticello Reservoir in compliance with withdrawal permits. Water quality impacts could result from erosion and runoff associated with construction. These temporary impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations and the NGCC plant would be operated in compliance with its NPDES permit. For offsite solar, water needs would be met in compliance with any required water withdrawal permits and applicable regulations. Water quality impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 7 of 18)

Surface Water	
Combination 2 (SMR and Solar)	**SMALL:** Potable and process water needs would be met by the existing VCSNS water treatment facility. Cooling makeup water would be sourced from Monticello Reservoir in compliance with withdrawal permits. Water quality impacts could result from erosion and runoff associated with construction. These temporary impacts would be minimized by implementation of BMPs and compliance with stormwater permits and applicable regulations. Once in operation, the installations would be operated in compliance with stormwater regulations and the SMR plant would be operated in compliance with its SMR permit.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 8 of 18)

Groundwater	
Proposed Action	**SMALL** for all groundwater issues with the exception of groundwater quality degradation for plants with cooling ponds in salt marshes which is not applicable to VCSNS. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant groundwater impacts are anticipated. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** Decommissioning activities include some that may affect groundwater quality through the infiltration of water used for various purposes (e.g., cooling of cutting equipment, decontamination spray, and dust suppression). BMPs are expected to be employed as appropriate to collect and manage these waters. Groundwater chemistry may change as rainwater infiltrates through rubble. The increased pH could promote the subsurface transport of radionuclides and metals. However, this effect is expected to occur only over a short distance as a function of the buffering capacity of soil. Offsite transport of groundwater contaminants is not expected. (NRC. 2002)
Natural Gas	**SMALL:** Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
Nuclear (SMR)	**SMALL:** Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.
Combination 1 (Natural Gas and Solar)	**SMALL:** Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation. For offsite solar installations, water needs for construction and operation would be met in compliance with any required water withdrawal permits and applicable regulations. Compliance with stormwater permits and BMPs would address the potential for infiltration of pollutants in runoff and spill response.
Combination 2 (SMR and Solar)	**SMALL:** Compliance with permit conditions, adherence to stormwater regulations, and applying SWPPP mitigation and BMPs would minimize impacts during construction and operation.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 9 of 18)

Terrestrial	
Proposed Action	**SMALL** for all terrestrial ecology issues. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant impacts to terrestrial resources are expected. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect terrestrial biota, but at a reduced level of impact. Areas disturbed or used to support decommissioning are within the operational areas of the site and are also within the Protected Area. Decommissioning activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. (NRC. 2002)
Natural Gas	**SMALL:** Use of the abandoned Units 2 and 3 project site minimizes further disturbance of terrestrial habitat.
Nuclear (SMR)	**SMALL:** Use of the abandoned Units 2 and 3 project site minimizes further disturbance of terrestrial habitat.
Combination 1 (Natural Gas and Solar)	**MODERATE:** Use of the abandoned Units 2 and 3 project site minimizes further disturbance of terrestrial habitat. The offsite solar installation would require approximately 888 acres for the installation and 455 acres for a new transmission line at each of three sites. Site selection could avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species.
Combination 2 (SMR and Solar)	**SMALL:** Use of the abandoned Units 2 and 3 project site minimizes further disturbance of terrestrial habitat.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 10 of 18)

Aquatic	
Proposed Action	**SMALL** for all aquatic ecology issues. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant impacts to aquatic resources are expected. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The NRC concluded that for facilities at which the decommissioning activities would be limited to existing operational areas, the potential impacts on aquatic resources would be SMALL. (NRC. 2002)
Natural Gas	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction and operation. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
Nuclear (SMR)	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
Combination 1 (Natural Gas and Solar)	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction and operation. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.
Combination 2 (SMR and Solar)	**SMALL:** Adherence to permits and implementation of BMPs would minimize impacts on aquatic ecosystems during construction and operation. Use of closed-cycle cooling system would minimize impingement and entrainment of aquatic organisms.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 11 of 18)

Special Status Species	
Proposed Action	**NO EFFECT to MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** Suitable habitat for federal and state-protected species is present on the VCSNS site or in the immediate vicinity. No SLR-related refurbishment or other SLR-related construction activities have been identified. Administrative controls are in place at VCSNS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. Decommissioning would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time of decommissioning regarding the presence of special status species or their habitats' presence (NRC. 2002). Thus, VCSNS cannot forecast a level of impact for this resource area.
Natural Gas	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The abandoned Units 2 and 3 project site does not offer high-quality terrestrial habitat. However, suitable habitat for federal and state-protected species is present on the VCSNS site or in the immediate vicinity.
Nuclear (SMR)	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The abandoned Units 2 and 3 project site does not offer high-quality terrestrial habitat. However, suitable habitat for federal and state-protected species is present on the VCSNS site or in the immediate vicinity.
Combination 1 (Natural Gas and Solar)	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The abandoned Units 2 and 3 project site does not offer high-quality terrestrial habitat. However, suitable habitat for federal and state-protected species is present on the VCSNS site or in the immediate vicinity. Site selection for offsite solar installations could avoid wetlands and other high-quality terrestrial habitats such as critical habitat for threatened and endangered species.
Combination 2 (SMR and Solar)	**MAY AFFECT, NOT LIKELY to ADVERSELY AFFECT:** The abandoned Units 2 and 3 project site does not offer high-quality terrestrial habitat. However, suitable habitat for federal and state-protected species is present on the VCSNS site or in the immediate vicinity.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 12 of 18)

Historic and Cultural Resources	
Proposed Action	**NO ADVERSE EFFECT:** No license renewal-related refurbishment or construction activities identified. VCSNS has no plans to conduct such soil intrusive activities at any location outside of the VCSNS site boundary under an SLR. Due to topography, vegetation, and distance, no potential adverse effects to any NRHP-listed properties are expected as a result of the continued operation of VCSNS, including viewshed, aesthetic, and noise impacts.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant impacts to historic and cultural resources are expected. See Section E4.14 for assessment. **SMALL** from NRC generic decommissioning analysis**:** The NRC conducted an analysis of the potential effects of decommissioning on historic and archaeological (cultural) resources and found that the potential onsite impacts at sites where the disturbance of lands would not go beyond the operational areas would be SMALL. (NRC. 2002)
Natural Gas	**ADVERSE EFFECT (NGCC operations):** Cultural resources have been recorded within the Units 2 and 3 project site. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites. The air emissions from the operating NGCC plant could also contribute to adverse effects on the NRHP eligible historical site, the General Pearson cemetery's headstones, from acid rain.
Nuclear (SMR)	**NO ADVERSE EFFECT:** Cultural resources have been recorded within the Units 2 and 3 project site. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites.
Combination 1 (Natural Gas and Solar)	**ADVERSE EFFECT (NGCC operations):** Cultural resources have been recorded within the Units 2 and 3 project site. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites. The air emissions from the operating NGCC plant could also contribute to adverse effects on the NRHP eligible historical site, the General Pearson cemetery's headstones from acid rain. **NO EFFECT to ADVERSE EFFECT (offsite solar):** Development of offsite solar installations and supporting transmission lines could impact cultural resources, depending on the siting location. The offsite solar installations would not require a federal license, prompting a cultural site review and the Certificate of Need process does not include SHPO as a participant.
Combination 2 (SMR and Solar)	**No ADVERSE EFFECT:** Cultural resources have been recorded within the Units 2 and 3 project site. Implementation of avoidance and protective measures would minimize impacts to the identified archaeological and historic sites.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 13 of 18)

Socioeconomics	
Proposed Action	**SMALL** for all socioeconomic issues. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process (NRC. 2002, Section 4.3.12). Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. The proposed action does not include additional workers. See Section E4.14 for assessment. **MODERATE to LARGE** from NRC generic decommissioning analysis**:** Terminating nuclear plant operations would have a noticeable adverse impact on socioeconomic conditions in the region around the nuclear power plant. There would be immediate socioeconomic impacts from the loss of jobs. The impacts from the loss or reduction of tax revenue due to the termination of plant operations on community and public education services could range from SMALL to LARGE. (NRC. 2002) The tax payments attributable to VCSNS provide a significant beneficial economic impact to Fairfield County. Therefore, the loss of jobs would affect a small percentage of the population in the surrounding 3-county area, but the tax revenue loss would have a noticeable and potentially destabilizing impact on Fairfield County. **SMALL** from NRC generic decommissioning analysis: Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services. The impacts of decommissioning on socioeconomics are neither detectable nor destabilizing; therefore, the impacts on socioeconomics are SMALL. (NRC. 2002, Section 4.3.12.3 and 4.3.12.4)
Natural Gas	**SMALL adverse (construction and operations):** Demand for community services and use of infrastructure during construction and operations would be mitigated by tax payments. **SMALL (construction), LARGE (operations) beneficial:** Construction workers would stimulate the local economy by spending and tax payments would have a small impact. Tax payments for the operating plant to Fairfield County would represent a large percentage of total property and school tax revenue. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 14 of 18)

Socioeconomics	
Nuclear (SMR)	**SMALL adverse (construction and operations):** Demand for community services and use of infrastructure during construction and operations would be mitigated by tax payments. **SMALL (construction), LARGE (operations) beneficial:** Construction workers would stimulate the local economy by spending and tax payments would have a small impact. Tax payments for the operating plant to Fairfield County would represent a large percentage of total property and school tax revenue. **MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.
Combination 1 (Natural Gas and Solar)	**SMALL adverse (construction and operations):** Demand for community services and use of infrastructure during construction and operations would be mitigated by tax payments. **SMALL (construction), LARGE (operations) beneficial:** Construction workers would stimulate the local economy by spending and tax payments would have a small impact. Tax payments for the operating plant to Fairfield County would represent a large percentage of total property and school tax revenue. The solar installations would be operated with few staff. Local communities would benefit from property tax or lease payments. **SMALL to MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.
Combination 2 (SMR and Solar)	**SMALL adverse (construction and operations):** Demand for community services and use of infrastructure during construction and operations would be mitigated by tax payments. **SMALL (construction), LARGE (operations) beneficial:** Construction workers would stimulate the local economy by spending and tax payments would have a small impact. Tax payments for the operating plant to Fairfield County would represent a large percentage of total property and school tax revenue. **MODERATE (construction traffic); SMALL (operations traffic):** Construction commuting would increase traffic and congestion on the local roadways. Transportation impacts would decrease after construction.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 15 of 18)

Human Health	
Proposed Action	**SMALL** for all human health issues. See Chapter E4.0 for analyses
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant human health impacts are expected, and human health impacts are not expected to significantly increase with an SLR term. See Sections E4.9 and E4.14. **SMALL** from NRC generic decommissioning analysis**:** The human health impacts from physical, chemical, and microbiological hazards would be SMALL for all plants. (NRC. 2002)
Natural Gas	**SMALL to MODERATE:** Compliance with OSHA worker protection rules would control impacts on workers from construction activities and operations. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NGCC plant would emit criteria air pollutants within permit limits.
Nuclear (SMR)	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.
Combination 1 (Natural Gas and Solar)	**SMALL (construction); SMALL to MODERATE (operations):** Compliance with OSHA worker protection rules would control impacts on workers from construction activities and operations. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. The NGCC plant would emit criteria air pollutants that could have health impacts, but emissions would be within permit limits.
Combination 2 (SMR and Solar)	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction and operation. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 16 of 18)

Environmental Justice	
Proposed Action	**No disproportionately high and adverse impacts to minority and low-income populations:** Based on known pathways, there are no expected disproportionately high and adverse impacts on minority or low-income populations from the proposed action (Section E4.10.1.4.2).
Termination of Operations and Decommissioning	Termination of power plant operations and the resulting loss of jobs, income, and tax revenue could have a disproportionate effect on minority and low-income populations (NRC. 2013a, Section 4.12.2). Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. Decommissioning would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time (NRC. 2002). Thus, VCSNS cannot determine the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by minority or low-income populations.
Natural Gas	**No disproportionately high and adverse impacts to minority and low-income populations:** Impacts during construction of new installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income populations would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations.
Nuclear (SMR)	**No disproportionately high and adverse impacts to minority and low-income populations:** Impacts during construction of new installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income populations would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 17 of 18)

Environmental Justice	
Combination 1 (Natural Gas and Solar)	**No disproportionately high and adverse impacts to minority and low-income populations:** Impacts during construction of new installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income populations would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations. Impacts during construction of offsite solar installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income populations would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations.
Combination 2 (SMR and Solar)	**No disproportionately high and adverse impacts to minority and low-income populations:** Impacts during construction of new installations would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. Some minor environmental impacts would result from the construction from fugitive dust, but this impact would be temporary and short in duration. Socioeconomic impacts on minority and low-income population would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the installations.

Table E8.0-3 Environmental Impacts Comparison Detail (Sheet 18 of 18)

Waste Management	
Proposed Action	**SMALL** for all waste management issues. See Chapter E4.0 for analyses.
Termination of Operations and Decommissioning	Only the incremental increases in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. No significant waste management issues are expected. See Section E4.14 for the assessment. **SMALL** from NRC generic decommissioning analysis**:** After termination of nuclear plant operations, there would be a period before the beginning of decommissioning when the reactor would be placed in a cold shutdown condition and maintained. The quantities of waste generated would be smaller than the quantities generated during either operations or decommissioning. The impacts associated with the management of LLRW, hazardous waste, mixed waste, and nonradioactive and nonhazardous waste during operations and decommissioning would be SMALL. (NRC. 2002)
Natural Gas	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
Nuclear (SMR)	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
Combination 1 (Natural Gas and Solar)	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous and hazardous wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
Combination 2 (SMR and Solar)	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.

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E9.0 STATUS OF COMPLIANCE

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)]

E9.1 VCSNS AUTHORIZATIONS

Table E9.1-1 provides a summary of the authorizations held by VCSNS for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, through the proposed SLR operating term given their respective renewal schedules. Table E9.1-2 lists additional environmental authorizations and consultations related to the renewal of VCSNS Unit 1 OL.

Table E9.1-1 Environmental Authorizations for Current VCSNS Operations (Sheet 1 of 2)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
NRC	Atomic Energy Act, 10 CFR Part 50	VCSNS license to operate Unit 1	NPF-12	August 6, 2042	Operation of VCSNS Unit 1
NRC	NRC Regulations 10 CFR Part 72	General license for storage of fuel at power reactor sites	General Permit	N/A	Storage of power reactor spent fuel and other associated radioactive materials in an ISFSI.
USDOT 49	U.S.C. 5108 [49 CFR Part 107, Subpart G]	Registration	Reg. No. 062521550130D	June 30, 2022 (renewed annually)	Hazardous material shipment
EPA	40 CFR 262	Hazardous Waste Generator Registration	SCD069311579	Does not expire, most current registration dated August 20, 2020	Generation of Hazardous Waste
FERC	Federal Power Act, 18 CFR 5.1	Operation and maintenance of the Parr Hydroelectric Project	1894-211	November 1, 2070	Operation and Maintenance of Parr Hydroelectric Project (includes Monticello and Parr Reservoirs)
USFWS	MBTA 50 CFR Part 13; 50 CFR 21.27	Migratory Bird Special Utility Permit	MB040209-2	March 31, 2024	Authorized to collect, transport, and temporarily possess carcasses and partial remains of migratory birds, and partial remains of migratory birds and emergency relocation of nests of migratory birds other than eagles or threatened or endangered species
SCDNR	S. C. Code 50-11-1180	Scientific Collecting Permit	F-23-025	December 31, 2023	To conduct wildlife investigations for scientific purposes

Table E9.1-1 Environmental Authorizations for Current VCSNS Operations (Sheet 2 of 2)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
SCDHEC	S.C. Code Sections 48-1-10, Regulation 61-9	Water Treatment Plant Dischargers	SCG646000	Expires July 31, 2027	Discharge effluent to Monticello Reservoir from Offsite Water Treatment Facility
SCDHEC	SC R 61-9.610	Stormwater Discharge Permit (NPDES)	General Permit No. SCR000000	General Permit expires June 30, 2027	Discharge stormwater to Monticello and Parr Reservoirs and Broad River (Outfalls 001, 014, 003)
SCDHEC	S.C. Code Sections 49-4-10 and S.C. Reg. 61-119	Surface Water Withdrawal Permit	20PN001	March 9, 2044	Withdrawal of Surface Water from Monticello Reservoir
SCDHEC	SC Radioactive Waste Transportation and Disposal Act (Act No. 429)	Permit to transport radioactive waste	0163-39-22-X	December 31, 2023	Radioactive waste transportation in SC
SCDHEC	SC Code 48-1-10, SC Reg. 61-9	NPDES Permit	SC0030856	August 31, 2027	Plant wastewater and cooling water discharges
SCDHEC	Safe Drinking Water Act	SC Code 44-55, SC R. 61-58	27383-WS	Final approval to place into operation granted June 6, 2019 (no expiration date)	Operate public, nontransient, noncommunity water system
SCDHEC	40 CFR 280; SC R. 61-92	Registration Certificate	03157	July 31, 2022 (renewed annually)	Operation of Underground Storage Tanks
Tennessee Department of Environment and Conservation	TDEC Rule 0400-20-10-.32	License to Ship Radioactive Material	T-SC001-L23	December 31, 2023	Shipment of radioactive material to a licensed disposal/ processing facility in Tennessee

Table E9.1-2 Environmental Authorizations and Consultations for VCSNS License Renewal

Agency	Authority	Requirement	Remarks
NRC	Atomic Energy Act [42 USC 2011 *et seq*.]	License renewal	Applicant for federal license must submit an ER in support of an LRA.
USFWS	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, regarding federally protected species.
SCDNR	Endangered Species Act Section 7 [16 USC 1536]	Consultation	State-level agency for protected species to assist in identifying adverse impacts to protected species resulting from continued operation of the facility.
SCDAH	National Historic Preservation Act, Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Catawba Indian Nation	National Historic Preservation Act, Section 110	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Cherokee Indian Nation	National Historic Preservation Act, Section 110	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Eastern Band of Cherokees	National Historic Preservation Act, Section 110	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Muscogee (Creek) Nation	National Historic Preservation Act, Section 110	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.

E9.2 STATUS OF COMPLIANCE

VCSNS has established control measures in place to ensure compliance with the authorizations listed in Table E9.1-1, including monitoring, reporting, and operating within specified limits. VCSNS environmental compliance coordinators are responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with the environmental programs submitted to appropriate agencies, as specified in the permits and/or governing regulations.

E9.3 NOTICES OF VIOLATIONS

A records review for 2018–2021 indicates the following violations and warnings were issued to VCSNS.

On September 3, 2019, the SCDHEC issued a warning letter to the VCSNS OWS regarding their DMR, notifying them that a concentration was missing, and the reported monitoring period was incorrect. The sample result was provided in the original DMR. VCSNS submitted a corrected DMR, listing the data in the format requested by the data reviewer and with a corrected monitoring period, on September 11, 2019.

On May 24, 2021, SCDHEC conducted a routine UST compliance inspection at VCSNS, which resulted in a notice of alleged violation for failure to complete the 3-year spill bucket containment test and failure to conduct a 3-year overfill inspection. SCDHEC listed required corrective actions, which included performing a tightness test on the specified spill containment, performing the 3-year overfill inspection, and sending results to SCDHEC within 30 days. The spill bucket test was resolved on October 29, 2021, and the Overfill Protection Testing was completed and, therefore, resolved on February 11, 2022. VCSNS received confirmation from SCDHEC on February 16, 2022, that the site was back in compliance.

On May 25, 2021, the SCDHEC issued a warning letter to VCSNS regarding the December 2020 DMR, notifying them of a failure to comply with the effluent limits of the NPDES permit for total suspended solids and manganese and opening DE to further enforcement action. VCSNS provided the following explanations for two compliance failures: The VCSNS DMR for the fourth quarter of 2020 explains that the total suspended solids exceedance is due to the use of aerators installed at the settling basins to help maintain pH. The VCSNS DMR for December 2020 explains that a manganese sample was not obtained for analysis. SCDHEC did not require further action because explanations of the cited violations were submitted.

On November 18, 2021, SCDHEC issued a NOV to VCSNS, notifying them that the OWS, Permit No. SCG646072, was in violation of the South Carolina State Environmental Laboratory Certification Program. Sampling and analysis for TRC was not conducted by a South Carolina

certified laboratory, as required by Regulation 61-81E, placing VCSNS in violation of the Pollution Control Act and Water Pollution Control Permits and subject to further enforcement action. VCSNS explained that the laboratory servicing the Wastewater Treatment Facility mistakenly believed that it was certified for TRC. Since June 2018, VCSNS chemistry personnel continued to participate in and successfully pass an annual water pollution proficiency test conducted by Environmental Resources Associates. Daily quality control requirements, equipment maintenance, and method requirements were followed during this time. VCSNS applied for recertification and used a certified vendor laboratory for TRC analysis. The SCDHEC issued Consent Order 22-024-W on April 21, 2022, for this failure, and closed the consent order on May 5, 2022, stating that the consent order requirements were satisfied in a letter dated May 12, 2022. SCDHEC also approved the laboratory certification application for TRC analysis in a letter dated September 16, 2022.

The VCSNS DMR for December 2021 reported a pH exceedance. A pH of 8.8 SU obtained for Outfall 014, versus a permit limit of 6.0 to 8.5 SU (November–March). In the DMR, VCSNS noted that chemistry personnel suspected the initial and backup samples were contaminated. A new sample was taken 1 hour later with a new telescoping sample cup. The pH of the new sample was within permit limits. VCSNS cannot invalidate the original 8.8 SU value due to the analytical methodology; therefore, VCSNS reported this value as an exceedance of the daily maximum limit of 8.5 SU. However, the compliance sample result of 8.36 pH is being reported as the monthly minimum value, because pH values cannot be averaged. SCDHEC did not issue an NOV for the pH limit exceedance because this was the first occurrence for that parameter within a 12-month period.

SCDHEC issued VCSNS NOV AI-0005261 on April 6, 2022, regarding NPDES permit SCG646072. At Outfall 08A, the TRC daily maximum and monthly averages were exceeded as reported in the January 2022 DMR. DE responded to SCDHEC in a letter dated April 20, 2022, stating that the exceedance was likely due to interference from the presence of oxidized manganese. VCSNS took the following measures to ensure permit compliance: running aerators days before discharging the basins to lower potential residual chlorine, adding dichlorination tablets to the continuous chlorine monitoring system, and performing TRC analyses on several internal process samples from both basins that contribute to Outfall 08A to ensure that TRC concentrations do not exceed discharge limits.

Pertaining to NPDES Permit No. SCG646072, the monthly average total suspended solids limit of 30 mg/L was exceeded at Outfall 06A in March 2022. VCSNS believed the exceedance to be a result of an algae bloom. No SCDHEC correspondence has been received for this exceedance.

E9.4 REMEDIATION ACTIVITIES

In 2020, DE completed its Firing Range Decommissioning Project at VCSNS after achieving final stabilization on all portions of the site, including the basin. Since DE utilized Enviroblend as the

stabilization agent, the soil did not have to be categorized as a hazardous waste due to Pb. DE subsequently submitted notification of termination of NPDES Coverage Permit No. SCR10Z5CH.

In 2021, VCSNS began an assessment of the blasting area outside of the Combined Maintenance Shop on the VCSNS site to determine if past blasting operations have adversely impacted the soils of the property. Though nonhazardous blasting material is currently used, various blasting materials may have been used in the past. Analysis of the blasting grit samples found an exceedance of residential EPA Regional Screening Levels of aluminum, arsenic, cobalt, iron, Pb, and thallium, though only arsenic exceeded the industrial Regional Screening Levels. Additionally, although outdoor maintenance abrasive blasting is considered an exempt activity per SCDHEC Bureau of Air Quality, the activity itself did not meet DE fleet environmental standards. Therefore, DE chose to remediate the blasting area.

In July of 2022, DE began mitigating the presence of the blasting grit by removing the black granular material where visually observed, in addition to removing 2 inches of soil beneath. The remediation activity was completed in August 2022, and waste material disposed of at a local landfill.

As discussed in Section E3.6.4.2.2, VCSNS continues a monitoring program implemented in 2013 to monitor groundwater contamination from a 1978 fuel oil spill when an underground supply line was punctured during installation of a survey monument. An annual groundwater monitoring plan approved by SCDHEC is in place. Based on reviews of records, there are no other current or ongoing remediation activities taking place at VCSNS.

E9.5 FEDERAL, STATE, AND LOCAL REGULATORY STANDARDS: DISCUSSION OF COMPLIANCE

This section contains information regarding environmental programs identified in the 2013 GEIS that may or may not be applicable to the site, and the current status of compliance with each program.

E9.5.1 ATOMIC ENERGY ACT

As discussed in Section E2.2.6, VCSNS accomplishes its radioactive waste management through the use of three interrelated systems: liquid waste processing system, GWPS, and solid waste disposal system. As a generator of both LLRW and spent fuel, VCSNS is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

E9.5.2 CLEAN AIR ACT

E9.5.2.1 Air Permit

As discussed in Section E3.3.3.2, VCSNS was granted an exception from the requirement to obtain an air permit based on South Carolina Regulation 61-62.1 Section II Part B.2.f.i, ii and h. The regulation exempts emergency power generators with a capacity of less than 150 kW, as well as generators of greater than 150 kW used only for emergencies and operated a total of 500 hours or less per year for testing and maintenance. There are no annual reporting requirements for VCSNS.

E9.5.2.2 Chemical Accident Prevention Provisions [40 CFR 68]

VCSNS is not subject to the risk management plan requirements described in 40 CFR 68, Chemical Accidents Provisions, as the amount of regulated chemicals present (hydrazine and ammonia 30% concentration) onsite does not exceed the threshold quantities specified in 40 CFR 68.130.

E9.5.2.3 Stratospheric Ozone [40 CFR 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Sections 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. VCSNS is in compliance with Sections 608 and 609 of the CAA as amended in 1990 and the implementing of regulations codified in these regulations. The program to manage stationary refrigeration appliances at VCSNS is described in Dominion Energy's corporate procedures and is applicable to employees, vendors, and contractors for the management of refrigerants in compliance with federal regulations.

E9.5.3 CLEAN WATER ACT

E9.5.3.1 Water Quality (401) Certification

Federal CWA Section 401 requires applicants for a federal license to conduct an activity that might result in a discharge into navigable waters provide the licensing agency with either a waiver from the state or a certification from the state that the discharge will comply with applicable CWA requirements [33 USC 1341]. VCSNS holds a 401 Water Quality Certification Waiver. This waiver was granted in August 2022.

E9.5.3.2 NPDES Permit

NPDES permit No. SC0030856, issued by the SCDHEC on August 9, 2022, authorizes discharge to Monticello Reservoir and the Parr Reservoir via Outfalls 001, 014, and 003 (see Table E9.1-1). As discussed in Section E3.6.1.2.1, non-contact cooling water and low volume waste are monitored and discharged to the Monticello Reservoir via NPDES Outfalls 001 and 014, and low volume waste and non-chemical metal cleaning waste is discharged to the Broad River/Parr Reservoir via NPDES Outfall 003. The permit authorizes discharges for nine outfalls (three external and six internal). Outfalls 005 and 006 are not required during the current permit period. This permit will expire August 31, 2027.

NPDES Permit No. SCG646000, issued by the SCDHEC on July 15, 2022, authorizes the discharge from the OWS. As discussed in Section E3.6.1.2.1, plant effluent is discharged to the Monticello Reservoir via NPDES authorized outfalls and requires monitoring of water quality and effluent limits. The outfall is depicted in Figure E3.6-3 and the associated effluent limits are listed in Table E3.6-2. The OWS uses reverse osmosis and is described further in Section E3.6.3.1. The outfall numbers are used to distinguish sampling requirements under S.C. Regulations 61-68 and 61-69 for Water Classifications and Standards and Classified Waters, respectively, but all outfalls discharge to the Monticello Reservoir via Outfall 001. The water treatment plant discharge consists of treated filter backwash water, sedimentation basin wash down water, and decant water.

E9.5.3.3 Industrial Stormwater Discharge

As discussed in Section E3.6.1.2.2, stormwater discharge from industrial facilities is subject to permitting requirements under SC R.61-9, and the SCDHEC has issued an NPDES general permit for stormwater discharges associated with industrial activities, Permit No. SCR000000, which grants authorization to discharge under the South Carolina Stormwater Management Program. VCSNS operates in compliance with the general industrial stormwater permit.

E9.5.3.4 Sanitary Wastewaters

As discussed in Section E3.6.1.2.3, VCSNS is equipped with its own sewage treatment plant. Sanitary wastewater is collected by a drainage system that terminates at an onsite sanitary disposal facility. Treated wastewater is discharged to the Monticello Reservoir via internal NPDES Outfall 005. Sanitary sludges are permitted for disposal at an offsite facility, in accordance with NPDES Permit SC0030856. However, sanitary sludge from Outfall 005 will not be required during the next NPDES permit period once approved by SCDHEC.

Because sanitary wastewaters at VCSNS are collected and treated in a sewage treatment unit prior to disposal, VCSNS is required to employ or contract at least one licensed wastewater treatment operator for the sewage treatment facility. The license must be issued in accordance with South

Carolina Regulation 51-3. VCSNS maintains onsite certified biological wastewater operator licenses; therefore, the site is in compliance with this program.

E9.5.3.5 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the federal Water Pollution Control Act. The regulation has been published in 40 CFR Part 112, and facilities subject to the rule must prepare and implement a SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. VCSNS is subject to this rule and has a written SPCC as part of the site's Oil/Chemical Release Contingency Plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the plant to minimize the frequency and severity of oil spills to meet the requirements of this rule.

E9.5.3.6 Reportable Spills [40 CFR Part 110]

VCSNS is subject to the reporting provisions of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the federal Water Pollution Control Act. Any discharges of oil in such quantities that may be harmful to public health, welfare, or the environment must be reported to the EPA's national response center. Based on a review of site records from 2017 through 2021, two spills were reported to the National Response Center.

The reactor was manually tripped due to a main transformer fault that released mineral oil on November 16, 2021. The oil was mixed with a large amount of water from the transformer's suppression system, which surpassed the capacity of VCSNS's oil/water separator. The oil/water separator sump level transferred the mixture to internal NPDES Outfall 06B, which drains to Outfall 014, and an oil sheen was observed at Outfall 014. Less than 50 gallons of mineral oil was estimated to have entered the Monticello Reservoir. The oil was contained with booms and cleaned up. The EPA National Response Center and SCDHEC were notified.

On June 8, 2020, VCSNS reported a transmission fluid spill to the SCDHEC, resulting in 1 to 2 ounces of transmission fluid being released into the Monticello Reservoir. The spill was a result of a hydraulic hose leak during equipment testing. This spill did not violate any NRC regulations or reporting criteria. The notification was made solely as a 4-hour non-emergency notification for a Notification of Other Government Agency. The event was reportable in accordance with 10 CFR 50.72(b)(2)(xi). There was no impact on the health and safety of the public or plant personnel, and the NRC Resident Inspector was notified.

E9.5.3.7 Facility Response Plan

VCSNS is not subject to the facility response plan risk requirement of 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than 1 million gallons.

E9.5.3.8 Section 404 Permit

Currently, VCSNS does not have any Section 404 permits in place because VCSNS does not have any dredge and fill activities. However, VCSNS would comply with regulatory requirements imposed by the USACE under Section 404 of the CWA as it relates to performing future activities in federal jurisdictional waters when appropriate.

E9.5.4 SAFE DRINKING WATER ACT

VCSNS operates the OWS, which is subject to the SDWA. State governments are approved to implement these rules and drinking water standards for the EPA through waterworks regulations. Title 44, Chapter 55 of the South Carolina Code of Laws outlines the state SDWA regulations for drinking water, and R 61-55 further outlines the state's drinking water regulations. VCSNS received approval to place the OWS into operation on June 6, 2019, and is subject to inspection by the SCDHEC once every 2 years. Onsite wells are not used for drinking water; therefore, there are no additional wells or equipment at VCSNS that are subject to the SDWA.

E9.5.5 ENDANGERED SPECIES ACT

Potential impacts to state and federally listed species were considered in VCSNS's review and analysis in Section E4.6.23, and it was concluded that none would likely be adversely affected as a result of the proposed SLR. Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed or proposed for listing as endangered or threatened. Depending on the action involved, the ESA requires consultation with the USFWS and with the National Marine Fisheries Service if marine or anadromous species could be affected. Although VCSNS has invited comment from the USFWS (Attachment B) during the development of this ER, a more structured consultation process with these agencies may be initiated by the NRC per Section 7 of the ESA.

E9.5.6 MIGRATORY BIRD TREATY ACT

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed, and grants protection to any bird parts, including feathers, eggs, and nests. As listed on Table E9.1-1, VCSNS holds Migratory Bird Special Utility Permit MB040209-2, authorizing them to collect, transport, and temporarily possess carcasses and partial remains of migratory birds, and partial remains of

migratory birds and emergency relocation of nests of migratory birds other than eagles or threatened or endangered species.

E9.5.7 BALD AND GOLDEN EAGLE PROTECTION ACT

The BGEPA prohibits the take, transport, sale, barter, trade, import and export, and possession of bald and golden eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. As discussed in Section E3.7.8.2, bald eagles are known to nest at the VCSNS site. Activities at the VCSNS site are evaluated to ensure compliance under the BGEPA and MBTA.

E9.5.8 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

As discussed in Section E3.7.8.5, no HAPC or EFH areas protected from fishing are located within 6 miles of VCSNS. Therefore, there are no Magnuson Stevens Fishery Conservation and Management Act restrictions applicable to VCSNS operations.

E9.5.9 MARINE MAMMAL PROTECTION ACT

The Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no Marine Mammal Protection Act permitting requirements associated with VCSNS operations.

E9.5.10 COASTAL ZONE MANAGEMENT ACT

The Federal Coastal Zone Management Act [16 USC 1451 et seq.] imposes requirements on an applicant 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.

E9.5.11 WILD AND SCENIC RIVERS ACT

Section 7(a) of the Wild and Scenic Rivers Act requires federal agencies to determine whether the operation of the project under a new license would invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the designated river corridor. No waterbodies at or adjacent to VCSNS have been designated a wild and scenic river (NWSRS. 2022).

E9.5.12 NATIONAL HISTORIC PRESERVATION ACT

Potential impacts on historical properties are discussed in Section E4.7.4.2. As discussed in Section E3.8.6, cultural resources on the VCSNS site are protected by administrative procedures.

The procedures ensure that any unknown historic or cultural resources that may be discovered on the site are identified and protected.

Section 106 of the NHPA requires federal agencies having the authority to license any undertaking, prior to issuing the license, to consider 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 SHPO to substitute state review for council review [35 CFR 800.7]. Although not required of an applicant by federal law or NRC regulation, to provide early consultation for the Section 106 process, DE contacted the South Carolina Department of Archives and History (SCDAH) for informal consultation concerning VCSNS SLR and potential effects on cultural resources within the approximate 2,200-acre site and on historic properties within a 6-mile radius of VCSNS, as discussed in Section E3.8. Native American groups recognized as potential stakeholders were also consulted by DE with the opportunity for comment (Attachment C).

E9.5.13 RESOURCE CONSERVATION AND RECOVERY ACT

E9.5.13.1 Nonradioactive Waste

As a generator of hazardous and nonhazardous wastes, VCSNS is subject to and complies with the RCRA and specific SCDHEC regulations contained in SC R 61-79 and 61-107. VCSNS is classified as a large-quantity generator of hazardous waste. As a generator of hazardous waste, VCSNS also maintains a hazardous waste generator identification number (Table E9.1-1). Based on review of its compliance history for the previous 5 years (2017–2021), VCSNS has not received any NOVs for hazardous waste management.

E9.5.13.2 Reportable Spills [40 CFR Part 262]

VCSNS is subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(C) as it relates to a fire, explosion, or other release of hazardous waste which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached a surface water. Any such event must be reported to the EPA's national response center. A review of site records from 2017–2021 indicated that no spills of hazardous waste occurred.

E9.5.13.3 Mixed Waste

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous wastes are regulated by the EPA under the RCRA of 1976. Management of radioactive waste at VCSNS is discussed in Section E2.2.6. Waste streams managed by VCSNS are in compliance with applicable regulatory standards and have not resulted in any NOVs for the 2017–2021 timeframe. VCSNS will continue to store and dispose of hazardous and nonhazardous

wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed SLR operating term.

E9.5.13.4 Underground Storage Tanks [SC R. 61-92]

VCSNS has one underground storage tank registered with the SCDHEC, Division of Underground Storage Tank Management (Table E9.1-1). The UST has a capacity of 30,000 gallons and contains mixed petroleum.

E9.5.13.5 Aboveground Storage Tanks

South Carolina does not regulate ASTs (SCDHEC. 2022d).

E9.5.13.6 Reportable Spills [SC R. 61-92.280.60]

VCSNS is subject to the reporting provisions of the SC R. 61-92.280.60 for reporting the release of a regulated substance from a UST containing a petroleum product or hazardous substance. Any such events must be reported to the SCDHEC. Spills at VCSNS are presented in Section E9.5.3.6 and none involved release from a UST.

E9.5.14 POLLUTION PREVENTION ACT

In accordance with RCRA Section 3002(b) and 40 CFR 262.27, a small or large quantity generator must certify that there is a waste minimization program in place to reduce the volume and toxicity of waste generated to the degree determined to be economically practical. VCSNS is meeting this requirement as procedural measures are in place to minimize hazardous waste generated to the maximum extent practical.

E9.5.15 FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT

The Federal Insecticide, Fungicide, and Rodenticide Act requires that pesticides distributed or sold in the United States must be registered (licensed) by the EPA. Commercially available EPA-registered pesticides, herbicides, and rodenticides are applied by licensed contractors as needed.

E9.5.16 TOXIC SUBSTANCES CONTROL ACT

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR Part 761] and asbestos [40 CFR Part 763], both of which may be present at VCSNS. VCSNS procedures provide guidance for asbestos removal and PCBs to ensure compliance with state and federal regulations.

E9.5.17 HAZARDOUS MATERIALS TRANSPORTATION ACT

Because VCSNS ships hazardous materials regulated by the DOT offsite, the facility is subject to and complies with applicable requirements of the Hazardous Materials Transportation Act described in Title 49 of the CFR, including the requirement to possess a current hazardous materials certificate of registration (Table E9.1-1).

E9.5.18 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT

E9.5.18.1 Section 312 Reporting [40 CFR 370]

VCSNS is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act that requires annual submittal of an emergency and hazardous chemical inventory report (Tier II) to the local emergency planning commission, the state emergency response committee, and the local fire department. This report typically includes, but is not limited to, chemicals such as amberlite cation and anion resins, diesel fuel, propane, freon, hydrazine, lead in batteries, sodium bisulfite, sulfuric acid batteries, sulfuric acid, CO_2, hydrogen, nitrogen, and other chemicals.

E9.5.19 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

VCSNS is subject to the hazardous substance release and reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the U.S. Coast Guard National Response Center, the SCDHEC, and the South Carolina Emergency Management Division, as appropriate, and subsequent written follow-up within 15 days of the release. Based on a review of records of the 5-year period from 2017 through 2021, there have been no releases at VCSNS that have triggered this notification requirement.

E9.5.20 FARMLAND PROTECTION POLICY ACT

The FPPA applies to federal programs. The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and VCSNS is located on non-federal lands, the FPPA is not applicable.

E9.5.21 FEDERAL AVIATION ACT

Coordination with the FAA is required when it becomes necessary to ensure the highest structures associated with a project do not impair the safety of aviation. Submission of a letter of notification

(with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exists or recommending project changes and/or the installation of warning devices such as lighting.

As presented in Section E3.2.3, the tallest structure at VCSNS is the Reactor Containment Building, which is approximately 166 feet in height. No license renewal-related construction activities have been identified that would create new visual impacts; therefore, no new notifications to the FAA are required.

E9.5.22 OCCUPATIONAL SAFETY AND HEALTH ACT

OSHA governs the occupational safety and health of the construction workers and operations staff. VCSNS and its contractors comply with OSHA's requirements, as these are incorporated in the site's occupational health and safety practices.

E9.5.23 STATE WATER USE REPORTING

As shown in Table E9.1-1, VCSNS holds a permit from the SCDHEC, pursuant to S.C. Code Sections 49-4-10 and S.C. Reg 61-119, to withdraw water for plant use from Monticello Reservoir. The facility provides monthly withdrawal reports. VCSNS is in compliance with the state's register and reporting requirements.

E9.5.24 FAIRFIELD COUNTY ZONING REQUIREMENTS

VCSNS is located in Fairfield County, South Carolina. As discussed in Section E3.2.1, VCSNS is zoned as an Industrial District (I-1) according to the Fairfield County Zoning Map and the Land Management Ordinance.

E9.6 ENVIRONMENTAL REVIEWS

VCSNS has environmental guidance in place to ensure all environmentally sensitive areas at VCSNS, if present, are adequately protected during site operation and project planning. These controls, which encompass nonradiological environmental resource areas such as land use, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, waste management, and pollution prevention, consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified as necessary.
- BMPs, including for stormwater, are implemented to protect wetlands and sensitive ecosystems.
- Appropriate agencies are consulted on matters involving state and federally listed threatened, endangered, and protected species; BMPs are implemented to minimize impacts to these species.

- Appropriate agencies are consulted on matters involving cultural resources and to ensure BMPs are implemented to minimize impacts to this resource.

In summary, administrative controls at VCSNS ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed as necessary.

E9.7 ALTERNATIVES

The discussion of alternatives in the environmental report shall include a discussion of whether alternatives will comply with applicable environmental quality standard and requirements [10 CFR 51.45(d)].

The natural gas, new nuclear, combination of natural gas and solar, and combination of new nuclear and solar alternatives discussed in Chapter E7.0 would be constructed and operated to comply with all applicable environmental quality standards and requirements. While alternative generation would be developed and operated compliant with standards and requirements, additional environmental impacts associated with siting, construction, and operation would be realized. Continued compliant operation of VCSNS would not result in these additional impacts.

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Attachment A: NPDES Permits

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Healthy People. Healthy Communities.

August 9, 2022

Tracey Stewart
Dominion Energy South Carolina, Inc
V.C. Summer Nuclear Station
PO BOX 88, MC 830
JENKINSVILLE, SC 29065

Re: Department Decision
DOMINION ENERGY SOUTH CAROLINA INC/V C SUMMER NUCLEAR STATION
NPDES Permit # SC0030856
Fairfield County

Dear Tracey Stewart:

Enclosed is the National Pollutant Discharge Elimination system (NPDES) Permit for the above referenced facility.

In order that you understand your responsibilities included in the provisions of this permit, particular attention should be given to the following sections:

1. PART II.E: This section contains responsibilities for the proper operation and maintenance of your facility.
2. PART II.L.3: This section describes the specific requirements for the permit to be transferred to another party.
3. PART II.L.4: This section contains your responsibilities for reporting monitoring results. Preprinted Discharge Monitoring Report (DMR) forms will be provided at a later date by DHEC for reporting monitoring results.
4. PART III: This section contains all listings of effluent characteristics, discharge limitations, and groundwater, soil and sludge monitoring.
5. PART V: This section contains all the special requirements relative to your permit. Such items in this section include the certified operator required to operate your wastewater treatment plant, the day of the week on which monitoring shall occur, sludge disposal requirements, and whole effluent toxicity requirements.

Please note the effective date on the permit and see the enclosed South Carolina Board of Health and Environmental Control Guide to Board Review.

If you have any questions about the technical aspects of this permit, please contact Melanie K Townley at 803-898-4223. Information pertaining to adjudicatory matters may be obtained by contacting the Legal Office, SCDHEC, 2600 Bull Street, Columbia, SC 29201, or by calling them at (803) 898-3350.

Sincerely,

Crystal Rippy, Manager
Industrial Wastewater Permitting Section

Enclosures

email w/encl: EPA
Jacob Oblander, Compliance Manager, BOW/WPC Enforcement
Veronica Barringer, Midlands EA Columbia
Melanie K Townley, BOW
Carolyn T Moores, BOW, Groundwater Protection & Agricultural Permitting

National Pollutant Discharge Elimination System Permit

(for Discharge to Surface Waters)

This NPDES Permit Authorizes

Dominion Energy South Carolina, Inc.

Virgil C. Summer Nuclear Station

to discharge from a facility located at

Highway 215
Jenkinsville, SC
Fairfield County

to receiving waters named

Outfall 001 and 014: Monticello Reservoir
Outfall 003: Broad River/Parr Reservoir

in accordance with limitations, monitoring requirements and other conditions set forth herein. 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."

Shawn M. Clarke, P.E., Director
Water Facilities Permitting Division

Issue Date:	August 9, 2022	***Expiration Date[1]:***	August 31, 2027
Effective Date:	September 1, 2022	***Permit No.:***	**SC0030856**

[1] This permit will continue to be in effect beyond the expiration date if a complete timely re-application is received pursuant to Regulation 61-9.122.6 and signed per Regulation 61-9.122.22.

dhec

S.C. Department of Health and Environmental Control

Table of Contents

PART I. Definitions

Any term not defined in this Part has the definition stated in the Pollution Control Act or in "Water Pollution Control Permits", R.61-9 or its normal meaning.

A. The "Act", or CWA, shall refer to the Clean Water Act (Formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended.

B. The "average" or "arithmetic mean" of any set of values is the summation of the individual values divided by the number of individual values.

C. "Basin" (or "Lagoon") means any in-ground or earthen structure designed to receive, treat, store, temporarily retain and/or allow for the infiltration/evaporation of wastewater.

D. "Blowdown" means the minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentration in amounts exceeding limits established by best engineering practices.

E. "Bottom ash" means the ash that drops out of the furnace gas stream in the furnace and in the economizer sections. Economizer ash is included when it is collected with bottom ash (40 CFR 423.11(f)).

F. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

G. "Chemical metal cleaning waste" means any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning (40 CFR 423.11(c)).

H. "Coal pile runoff" means the rainfall runoff from or through any coal storage pile (40 CFR 423.11(m)).

I. A "composite sample" shall be defined as one of the following four types:

1. An influent or effluent portion collected continuously over a specified period of time at a rate proportional to the flow.

2. A combination of not less than 8 influent or effluent grab samples collected at regular (equal) intervals over a specified period of time and composited by increasing the volume of each aliquot in proportion to flow. If continuous flow measurement is not used to composite in proportion to flow, the following method will be used: An instantaneous flow measurement should be taken each time a grab sample is collected. At the end of the sampling period, the instantaneous flow measurements should be summed to obtain a total flow. The instantaneous flow measurement can then be divided by the total flow to determine the percentage of each grab sample to be combined. These combined samples form the composite sample.

3. A combination of not less than 8 influent or effluent grab samples of equal volume but at variable time intervals that are inversely proportional to the volume of the flow. In other words, the time interval between aliquots is reduced as the volume of flow increases.

4. If the effluent flow varies by less than 15 percent, a combination of not less than 8 influent or effluent grab samples of constant (equal) volume collected at regular (equal) time intervals over a specified period of time.

All samples shall be properly preserved in accordance with Part II.J.4. Continuous flow or the sum of instantaneous flows measured and averaged for the specified compositing time period shall be used with composite results to calculate mass.

J. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the average measurement of the pollutant over the day.

K. "Daily maximum" is the highest average value recorded of samples collected on any single day during the calendar month.

L. "Daily minimum" is the lowest average value recorded of samples collected on any single day during the calendar month.

M. The "Department" or "DHEC" shall refer to the South Carolina Department of Health and Environmental Control.

N. "Fly ash" means the ash that is carried out of the furnace by the gas stream and collected by mechanical precipitators, electrostatic precipitators, and/or fabric filters. Economizer ash is included when it is collected with fly ash (40 CFR 423.11(e)).

O. The "geometric mean" of any set of values is the Nth root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

P. A "grab sample" is an individual, discrete or single influent or effluent portion of at least 100 milliliters collected at a time representative of the discharge and over a period not exceeding 15 minutes and retained separately for analysis.

Q. "Groundwater" means the water below the land surface found in fractured rock or various soil strata.

R. "Low volume waste sources" include, but are not limited to: wastewaters from wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, and recirculating house service water systems. Sanitary and air conditioning wastes are not included (40 CFR 423.11(b)).

S. The "maximum or minimum" is the highest or lowest value, respectively, recorded of all samples collected during the calendar month. These terms may also be known as the instantaneous maximum or minimum.

T. "Metal cleaning waste" means any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning (40 CFR 423.11(d)).

U. "Monitoring well" means any well used to sample groundwater for water quality analysis or to measure groundwater levels.

V. The "monthly average", other than for fecal coliform, E. Coli and enterococci, is the arithmetic mean of all samples collected in a calendar month period. The monthly average for fecal coliform, E. Coli and enterococci bacteria is the geometric mean of all samples collected in a calendar month period. The monthly average loading is the arithmetic average of all daily discharges made during the month.

W. "Once through cooling water" means water passed through the main cooling condensers in one or two passes for the purpose of removing waste heat (40 CFR 423.11(g)).

X. The "PCA" shall refer to the Pollution Control Act (Chapter 1, Title 48, Code of Laws of South Carolina).

Y. The "practical quantitation limit" (PQL) is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specific sample weights, volumes, and processing steps have been followed. It is also referred to as the reporting limit.

Z. "Quarter" is defined as the first three calendar months beginning with the month that this permit becomes effective and each group of three calendar months thereafter.

AA. "Quarterly average" is the arithmetic mean of all samples collected in a quarter.

BB. "Recirculated cooling water" means water which is passed through the main condensers for the purpose of removing waste heat, passed through a cooling device for the purpose of removing such heat from the water then passed again, except for blowdown, through the main condenser (40 CFR 423.11(h)).

CC. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

DD. "Sludge" means industrial sludge. Industrial sludge is a solid, semi-solid, or liquid residue generated during the treatment of industrial wastewater in a treatment works. Industrial sludge includes, but is not limited to, industrial septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from industrial sludge. Industrial sludge does not include ash generated during the firing of industrial sludge in an industrial sludge incinerator or grit and screenings generated during preliminary treatment of industrial wastewater in a treatment works. Industrial sludge by definition does not include sludge covered under 40 CFR Part 503 or R.61-9.503.

EE. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

FF. "Wastewater" means industrial wastewater. Industrial wastewater is wastewater generated from a federal facility, commercial or industrial process, including waste and wastewater from humans when generated at an industrial facility.

PART II. Standard Conditions

A. Duty to comply

The permittee must comply with all conditions of the permit. Any permit noncompliance constitutes a violation of the Clean Water Act and the Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. The Department's approval of wastewater facility plans and specifications does not relieve the permittee of responsibility to meet permit limits.

1. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

2. Failure to comply with permit conditions or the provisions of this permit may subject the permittee to civil penalties under S.C. Code Section 48-1-330 or criminal sanctions under S.C. Code Section 48-1-320. Sanctions for violations of the Federal Clean Water Act may be imposed in accordance with the provisions of 40 CFR Part 122.41(a)(2) and (3).

3. A person who violates any provision of this permit, a term, condition or schedule of compliance contained within this NPDES permit, or the State law is subject to the actions defined in the State law.

B. Duty to reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. A permittee with a currently effective permit shall submit a new application 180 days before the existing permit expires, unless permission for a later date has been granted by the Department. The Department shall not grant permission for applications to be submitted later than the expiration date of the existing permit.

C. Need to halt or reduce activity not a defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper operation and maintenance

1. The permittee shall at all times properly operate and maintain in good working order and operate as efficiently as possible all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes effective performance based on design facility removals, adequate funding, adequate operator staffing and training and also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Power Failures. In order to maintain compliance with effluent limitations and prohibitions of this permit, the permittee shall either:

   a. provide an alternative power source sufficient to operate the wastewater control facilities;

   b. or have a plan of operation which will halt, reduce, or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

3. The permittee shall develop and maintain at the facility a complete Operations and Maintenance Manual for the waste treatment facilities. The manual shall be made available for on-site review during normal working hours. The manual shall contain operation and maintenance instructions for all equipment and appurtenances associated with the waste treatment facilities and land application system, if applicable. The manual shall contain a general description of the treatment process(es), the operational procedures to meet the requirements of E.1 above, and the corrective action to be taken should operating difficulties be encountered.

4. The permittee shall provide for the performance of daily treatment facility inspections by a certified operator of the appropriate grade as defined in Part V.E of this permit. The Department may make exceptions to the daily operator requirement in accordance with R.61-9.122.41(e)(3)(ii). The inspections shall include, but should not necessarily be limited to, areas which require visual observation to determine efficient operation and for which immediate corrective measures can be taken using the O & M manual as a guide. All inspections shall be recorded and shall include the date, time, and name of the person making the inspection, corrective measures taken, and routine equipment maintenance, repair, or replacement performed. The permittee shall maintain all records of inspections at the permitted facility as required by the permit, and the records shall be made available for on-site review during normal working hours.

5. A roster of operators associated with the facility's operation and their certification grades shall be maintained onsite and be made available to the Department upon request.

6. Wastewater Sewer Systems

   a. Purpose. This section establishes rules for governing the operation and maintenance of wastewater sewer systems, including gravity or pressure interceptor sewers. It is the purpose of this section to establish standards for the management of sewer systems to prevent and/or minimize system failures that would lead to public health or environmental impacts.

b. Applicability. This section applies to all sewer systems that have been or would be subject to a DHEC construction permit under Regulation 61-67 and whose owner owns or operates the wastewater treatment system to which the sewer discharges.

c. General requirements. The permittee must:

(1) Properly manage, operate, and maintain at all times all parts of its sewer system(s), to include maintaining contractual operation agreements to provide services, if appropriate;

(2) Provide adequate capacity to convey base flows and peak flows for all parts of the sewer system or, if capital improvements are necessary to meet this standard, develop a schedule of short and long term improvements;

(3) Take all reasonable steps to stop and mitigate the impact of releases of wastewater to the environment; and

(4) Notify the Department within 30 days of a proposed change in ownership of a sewer system.

F. Permit actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

G. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege nor does it authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations.

H. Duty to provide information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.

I. Inspection and entry

The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and Pollution Control Act, any substances or parameters at any location.

J. Monitoring and records

1. a. (1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(2) Samples shall be reasonably distributed in time, while maintaining representative sampling.

(3) No analysis, which is otherwise valid, shall be terminated for the purpose of preventing the analysis from showing a permit or water quality violation.

b. Flow Measurements.

(1) Where primary flow meters are required, appropriate flow measurement devices and methods consistent with accepted scientific practices shall be present and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than 10% from the true discharge rates throughout the range of expected discharge volumes. The primary flow device, where required, must be accessible to the use of a continuous flow recorder.

(2) Where permits require an estimate of flow, the permittee shall maintain at the permitted facility a record of the method(s) used in estimating the discharge flow (e.g., pump curves, production charts, water use records) for the outfall(s) designated on limits pages to monitor flow by an estimate.

(3) Records of any necessary calibrations must be kept.

2. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by R.61-9.503 or R.61-9.504), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

3. Records of monitoring information shall include:

   a. The date, exact place, and time of sampling or measurements;

   b. The individual(s) who performed the sampling or measurements;

   c. The date(s) analyses were performed;

   d. The individual(s) who performed the analyses;

   e. The analytical techniques or methods used; and

   f. The results of such analyses.

4. a. Analyses for required monitoring must be conducted according to test procedures approved under 40 CFR Part 136, equivalent test procedures approved by the Department or other test procedures that have been specified in the permit.

   In the case of sludge use or disposal, analysis for required monitoring must be conducted according to test procedures approved under 40 CFR Part 136, test procedures specified in R.61-9.503 or R.61-9.504, equivalent test procedures approved by the Department or other test procedures that have been specified in the permit.

   b. Unless addressed elsewhere in this permit, the permittee shall use a sufficiently sensitive analytical method that achieves a value below the derived permit limit stated in Part III. For the purposes of reporting analytical data on the Discharge Monitoring Report (DMR):

      (1) Analytical results below the PQL conducted using a method in accordance with Part II.J.4.a above shall be reported as zero (0). Zero (0) shall also be used to average results which are below the PQL. When zero (0) is reported or used to average results, the permittee shall report, in the "General Report Comments Section" of the DMR, the analytical method used, the PQL achieved, and the number of times results below the PQL were reported as zero (0).

      (2) Analytical results above the PQL conducted using a method in accordance with Part II.J.4.a shall be reported as the value achieved. When averaging results using a value containing a "less than," the average shall be calculated using the value and reported as "less than" the average of all results collected.

      (3)(a) The mass value for a pollutant collected using a grab sample shall be calculated using the 24-hour totalized flow for the day the sample was collected (if available) or the instantaneous flow at the time of the sample and either the concentration value actually achieved or the value as determined from the procedures in (1) or (2) above, as appropriate. Grab samples should be collected at a time representative of the discharge.

      (b) The mass value for a pollutant collected using a composite sample shall be calculated using the 24-hour totalized flow measured for the day the sample was collected and either the

concentration value actually achieved or the value as determined from the procedures in (1) or (2) above, as appropriate.

5. The PCA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000 or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment provided by the Clean Water Act is also by imprisonment of not more than 4 years.

K. Signatory requirement.

1. All applications, reports, or information submitted to the Department shall be signed and certified.

a. Applications. All permit applications shall be signed as follows:

(1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(a) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions f or the corporation, or

(b) The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency or public facility: By either a principal executive officer, mayor, or other duly authorized employee or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(a) The chief executive officer of the agency, or

(b) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator, Region 4, EPA).

b. All reports required by permits, and other information requested by the Department, shall be signed by a person described in Part II.K.1.a of this section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in Part II.K.1.a of this section;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) and,

(3) The written authorization is submitted to the Department.

c. Changes to authorization. If an authorization under Part II.K.1.b of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part II.K.1.b of this section must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

d. Certification. Any person signing a document under Part II.K.1.a or b of this section shall make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

2. The PCA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $25,000 per violation, or by imprisonment for not more than two years per violation, or by both.

L. Reporting requirements

1. Planned changes.

The permittee shall give written notice to DHEC/Bureau of Water/Water Facilities Permitting Division as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in R 61-9.122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Part II.L.8 of this section.

c. The alteration or addition results in a significant change in the permittee's sewage sludge or industrial sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan (included in the NPDES permit directly or by reference);

2. Anticipated noncompliance.

The permittee shall give advance notice to the DHEC/Bureau of Water/Water Pollution Control Division of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers.

This permit is not transferable to any person except after written notice to the DHEC/Bureau of Water/NPDES Administration. The Department may require modification or revocation and reissuance of the permit to change the name of permittee and incorporate such other requirements as may be necessary under the Pollution Control Act and the Clean Water Act.

a. Transfers by modification. Except as provided in paragraph b of this section, a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued (under R.61-9.122.62(e)(2)), or a minor modification made (under R.61-9.122.63(d)), to identify the new permittee and incorporate such other requirements as may be necessary under CWA.

b. Other transfers. As an alternative to transfers under paragraph a of this section, any NPDES permit may be transferred to a new permittee if:

(1) The current permittee notifies the Department at least 30 days in advance of the proposed transfer date in Part II.L.3.b(2) of this section;

(2) The notice includes U.S. EPA NPDES Application Form 1 and a written agreement between the existing and new permittee containing a specific date for transfer of permit responsibility, coverage, and liability between them; and

(3) Permits are non-transferable except with prior consent of the Department. A modification under this section is a minor modification which does not require public notice.

4. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit. Monitoring periods are calculated beginning with the permit effective date unless otherwise stated elsewhere in this permit. If the permit is modified, monitoring periods are calculated beginning with the modification effective date for those items that are part of the modification unless otherwise stated elsewhere in this permit.

a. Monitoring results must be reported online via an electronic Discharge Monitoring Report (DMR) or schedule specified by the Department for reporting results of monitoring of groundwater or sludge use or disposal practices including the following:

(1) Effluent Monitoring: Effluent monitoring results obtained at the required frequency shall be reported on a Discharge Monitoring Report Form. The completed DMR must be submitted via ePermitting no later than 11:59 PM on the 28th day of the month following the end of the monitoring period.

The permittee shall use the electronic DMR system via ePermitting. If the permittee encounters technical difficulties using the electronic DMR system, contact DHEC for technical assistance at epermittinghelp@dhec.sc.gov. Please contact the Compliance Manager for your permit to obtain approval to submit paper DMRs until the technical issue is resolved.

(2) Groundwater Monitoring: Groundwater monitoring results obtained at the required frequency shall be reported on a Groundwater Monitoring Report (GMR). The GMR must be submitted via ePermitting no later than 11:59 PM on the 28th day of the month following the end of the monitoring period.

The permittee shall use the electronic GMR schedule via ePermitting. If the permittee encounters technical difficulties using the electronic GMR schedule, contact DHEC for technical assistance at epermittinghelp@dhec.sc.gov. Please contact gmrsubmissions@dhec.sc.gov to obtain approval to submit paper GMRs until the technical issue is resolved.

(3) Sludge, Biosolids and/or Soil Monitoring: Sludge, biosolids and/or soil monitoring results obtained at the required frequency shall be reported in a laboratory format on a schedule submitted via ePermitting no later than 11:59 PM on the 28th day of the month following the end of the monitoring period

The permittee shall use the electronic reports via ePermitting. If the permittee encounters technical difficulties using the electronic report schedule, contact DHEC for technical assistance at epermittinghelp@dhec.sc.gov. Please contact the Compliance Manager for your permit to obtain approval to submit paper DMRs until the technical issue is resolved.

(4) All other reports and submissions required by this permit shall be submitted via ePermitting no later than 11:59 PM on the 28th day of the month following the end of the monitoring period unless otherwise specified in this permit.

The permittee shall use the electronic reports via ePermitting. If the permittee encounters technical difficulties using the electronic report schedule, contact DHEC for technical assistance at epermittinghelp@dhec.sc.gov. Please contact the Compliance Manager for your permit to obtain approval to submit paper DMRs until the technical issue is resolved.

b. If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in R.61-9.503 or R.61-9.504, or as specified in the permit, all

valid results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Department. The permittee has sole responsibility for scheduling analyses, other than for the sample date specified in Part V, so as to ensure there is sufficient opportunity to complete and report the required number of valid results for each monitoring period.

c. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Department in the permit.

5. Twenty-four hour reporting

a. The permittee/system owner (or applicable representative) (hereafter permittee/system owner) shall report any non-compliance that meets the criteria in Part II.L.5.b. Any information shall be provided orally or electronically to the local DHEC office as soon as possible but no later than 24 hours from the time the permittee/system owner becomes aware of the circumstances. During normal working hours (8:30 AM - 5:00 PM Eastern Standard Time) call the appropriate regional office in the table below.

County	**DHEC Region**	**Phone No.**
Fairfield, Lexington, Newberry, Richland	Midlands Region BEHS Columbia	803-896-0620

* After hour reporting should be made to the 24-hour Emergency Response telephone number 1-888-481-0125.

A follow-up report shall also be provided to DHEC within 5 days of the time the permittee/system owner becomes aware of the circumstances. For sanitary sewer overflows (SSOs), the 'WW Sewer System Overflow or Pump Station Failure Reporting' schedule (in ePermitting) should be used. For all other non-compliance meeting the criteria of II.L.5.b, the 5-Day Reporting' schedule (in ePermitting) should be used. If the permittee encounters technical difficulties using the electronic report schedule in ePermitting, a written submission using DHEC Form 3685 (or submission with equivalent information) should be submitted to the address below. For ePermitting technical assistance, contact DHEC at epermittinghelp@dhec.sc.gov. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

S.C. Department of Health and Environmental Control
Bureau of Water/Water Pollution Control Division
Data and Records Management Section
2600 Bull Street
Columbia, South Carolina 29201

b. The following shall be included as information which must be reported within 24 hours under this paragraph.

(1) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See R.61-9.122.44(g)).

(2) Any upset which exceeds any effluent limitation in the permit.

(3) Violation of a maximum daily discharge limitation for any of the pollutants listed below (See R 61-9.122.44(g)):

Total Copper

(4) Any non-compliance with the conditions of this permit which may endanger human health or the environment.

(5) Any spill or release of untreated wastewater that reaches the surface waters of the State.

[Note: When investigating a potential release due to a problem with a pump station, the investigation should include an evaluation of upstream manholes.]

c. The Department may waive the written report on a case-by-case basis for reports under Part II.L.5.b of this section if the oral report has been received within 24 hours.

6. Other noncompliance.

The permittee shall report all instances of noncompliance not reported under Part II.L.4 and 5 of this section and Part IV at the time monitoring reports are submitted. The reports shall contain the information listed in Part II.L.5 of this section.

7. Other information.

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information to the Water Facilities Permitting Division. This information may result in permit modification, revocation and reissuance, or termination in accordance with Regulation 61-9.

8. Existing manufacturing, commercial, mining, and silvicultural dischargers.

In addition to the reporting requirements under Part II.L.1-7 of this section, all existing manufacturing, commercial, mining, and silvicultural dischargers must notify the DHEC/Bureau of Water/Water Pollution Control Division of the Department as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following “notification levels”:

(1) One hundred micrograms per liter (100 µg/l);

(2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application; or

(4) The level established by the Department in accordance with section R.61-9.122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed in the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 µg/l);

(2) One milligram per liter (1 mg/l) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with R.61-9.122.21(g)(7).

(4) The level established by the Department in accordance with section R.61-9.122.44(f).

M. Bypass

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Part II.M.2 and 3 of this section.

2. Notice.

a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible, at least ten days before the date of the bypass to the DHEC/Bureau of Water/ Water Facilities Permitting Division.

b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part II.L.5 of this section.

3. Prohibition of bypass

a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The permittee submitted notices as required under Part II.M.2 of this section.

b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in Part II.M.3.a of this section.

N. Upset

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Part II.N.2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated; and

   c. The permittee submitted notice of the upset as required in Part II.L.5.b(2) of this section.

   d. The permittee complied with any remedial measures required under Part II.D of this section.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

O. Misrepresentation of Information

1. Any person making application for a NPDES discharge permit or filing any record, report, or other document pursuant to a regulation of the Department, shall certify that all information contained in such document is true. All application facts certified to by the applicant shall be considered valid conditions of the permit issued pursuant to the application.

2. Any person who knowingly makes any false statement, representation, or certification in any application, record, report, or other documents filed with the Department pursuant to the State law, and the rules and regulations pursuant to that law, shall be deemed to have violated a permit condition and shall be subject to the penalties provided for pursuant to 48-1-320 or 48-1-330.

Part III. Limitations and Monitoring Requirements

A. Effluent Limitations and Monitoring Requirements

1. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 001: once through non-contact cooling water and low volume waste regulated at internal outfalls 004 and 007. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	Continuous	Continuous[2]
pH	-	-	Min 6.0 su, Max 8.5 su[3]		1/Month	Grab
Discharge Temperature[4]	-	-	MR[1]°F	113°F	Continuous	Continuous
Intake Temperature[5]	-	-	MR[1]°F	MR[1]°F	Continuous	Continuous

[1]MR: Monitor and Report
[2]See Part II.J.1
[3]See Part I.S
[4]Discharge samples shall be collected in accordance with "a" below.
[5]Intake samples shall be monitored on the inlet side of the main condenser.

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after the combination of all waste streams but prior to mixing with the receiving stream.

b. There shall be no addition of chlorine to the main condenser cooling system or to the other cooling services.

2. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from internal outfall serial number 004: low volume waste. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Calculation[2]
Total Suspended Solids	-	-	30 mg/l	100 mg/l	1/Month	Grab
Oil and Grease	-	-	15 mg/l	20 mg/l	1/Month	Grab

[1]MR: Monitor and Report
[2]004 Flow shall be the sum of the flows from each continuously monitored steam generator blowdown line.

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after the discharge of steam generator blowdown treatment but prior to mixing with other waste streams or the receiving stream.

b. Internal Outfall 004 regularly discharges to final outfall 001 however as alternate pathways this discharge may be routed through final outfall 003 or through internal outfall 06A to final outfall 014.

3. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from internal outfall serial number 007: low volume waste. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Instantaneous[2]
Total Suspended Solids	-	-	30 mg/l	100 mg/l	1/Month	Grab
Oil and Grease	-	-	15 mg/l	20 mg/l	1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after the discharge from the neutralization basin but prior to mixing with other waste streams or the receiving stream.

b. Internal Outfall 007 discharges to final outfall 001.

4. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 003: low volume waste and non-chemical metal cleaning waste. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Estimate[2]
pH	-	-	Min 6.0 su, Max 9.0 su[3]		1/Month	Grab
Total Suspended Solids	-	-	30 mg/l	100 mg/l	1/Month	Grab
Oil and Grease	-	-	15 mg/l	20 mg/l	1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1
[3]See Part I.S

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after final treatment but prior to mixing with the receiving stream.

5. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 014: the combination of internal outfalls 005, 06A, 06B and 008. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	Continuous	Continuous[2]
pH	-	-	Min 6.0 su, Max 8.5 su[3]		1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1
[3]See Part I.S

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after the combination of internal outfalls 005, 06A, 06B and 008 but prior to mixing with the receiving stream.

6. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 005: sanitary wastewater. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Instantaneous[2]
Biochemical Oxygen Demand (BOD_5)	-	-	30 mg/l	45 mg/l	1/Month	24 Hr. Comp.
Total Suspended Solids (TSS)	-	-	30 mg/l	45 mg/l	1/Month	24 Hr. Comp.
E.Coli	-	-	126/100 ml	349/100 ml	1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after discharge from the dechlorination tank but prior to mixing with other waste streams or the receiving stream.

b. Internal Outfall 005 discharges to final outfall 014.

7. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 06A: low volume waste. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Instantaneous[2]
Total Suspended Solids (TSS)	-	-	30 mg/l	100 mg/l	1/Month	Grab
Oil and Grease	-	-	15 mg/l	20 mg/l	1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after discharge from the alum sludge basin but prior to mixing with other waste streams or the receiving stream.

c. Internal Outfall 06A discharges to final outfall 014.

8. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 06B: low volume waste. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Instantaneous[2]
Total Suspended Solids (TSS)	-	-	30 mg/l	98 mg/l	1/Month	Grab
Oil and Grease	-	-	15 mg/l	19 mg/l	1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after discharge from the plant waste surge basin but prior to mixing with other waste streams or the receiving stream.

b. Internal Outfall 06B discharges to final outfall 014.

9. During the period beginning on the effective date of this permit and lasting through the expiration date, the permittee is authorized to discharge from final outfall serial number 008: low volume waste, non-chemical metal cleaning waste and chemical metal cleaning wastes. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Sampling Frequency	Sample Type
Flow	MR[1], MGD	MR[1], MGD	-	-	1/Month	Instantaneous[2]
Total Suspended Solids (TSS)	-	-	30 mg/l	100 mg/l	1/Month	Grab
Oil and Grease	-	-	15 mg/l	20 mg/l	1/Month	Grab
Total Copper[3]	-	-	1.0 mg/l	1.0 mg/l	1/Month	Grab
Iron[3]	-	-	1.0 mg/l	1.0 mg/l	1/Month	Grab

[1]MR: Monitor and Report
[2]See Part II.J.1
[3]Sampling is required only when chemical metal cleaning wastes are discharged. Report "Conditional Monitoring" on the discharge monitoring report form when chemical metal cleaning waste are not discharged during the monitoring period.

a. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): after discharge from the plant startup waste holding basin but prior to mixing with other waste streams or the receiving stream.

b. Internal Outfall 008 discharges to final outfall 014.

B. Whole Effluent Toxicity and Other Biological Limitations and Monitoring Requirements

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from outfall 014: the combination of internal outfalls 005, 06A, 06B and 008. Such discharge shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS	
	Daily Minimum	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Ceriodaphnia dubia Chronic Whole Effluent Toxicity @ CTC= 100%	-	MR[1] %	MR[1] %	Once/5 Years	Grab
Ceriodaphnia dubia LC50 – 48-hour Acute[2]	MR[1]	-	-	Once/5 Years	Calculated
Ceriodaphnia dubia IC25 – 7-day Chronic	MR[1]	-	-	Once/5 Years	Calculated

See Part V.B. for additional toxicity reporting requirements.

[1]MR = Monitor and Report.
[2]The permittee shall report the LC50 at 48-hours from the chronic WET test.

The following notes apply only to valid tests. For invalid tests see Part V.B.

Note 1: The overall % effect is defined as the larger of the % survival effect or the % reproduction effect.

Note 2: If only one test is conducted during a month, the monthly average and daily maximum are each equal to the overall % effect.

Note 3: If more than one test is conducted during a month, the monthly average is the arithmetic mean of the overall % effect values of all tests conducted during the month.

Note 4: The monthly average to be reported on the DMR is the highest monthly average for any month during the monitoring period. There is no averaging of data from tests from one month to another.

Note 5: The daily maximum to be reported on the DMR is the highest of the % survival effect or % reproduction effect of all tests conducted during the monitoring period.

Note 6: The daily minimum to be reported on the DMR is the minimum IC25 and LC50 of all tests conducted during the monitoring period.

Note 7: When a sample is collected in one month and the test is completed in the next month, the overall % effect applies to the month in which the sample was collected.

Note 8: Tests must be separated by at least 7 days (from the time the first sample is collected to start one test until the time the first sample is collected to start a different test). There is no restriction on when a new test may begin following a failed or invalid test.

Note 9: For any split sample:

a. Determine the % survival effect and % reproduction effect values separately for each test.
b. Determine the arithmetic mean of the % survival effects and of the % reproduction effects for all tests.
c. The monthly average and daily maximum shall be the higher of the % effect values from (b) above.
d. For the IC25 and the LC50, the daily minimum is the lowest average value recorded of samples collected on any single day during the calendar month.
e. For the purposes of reporting, split samples are reported as an individual sample regardless of the number of times it is split. All laboratories used shall be identified on the DMR and each test shall be reported individually on the DMR Attachment for Whole Effluent Toxicity Results (in ePermitting).

a. Samples used to demonstrate compliance with the discharge limitations and monitoring requirements specified above shall be taken at or near the final point-of-discharge but prior to mixing with the receiving waters or other waste streams.

C. Groundwater Monitoring Requirements

1. Each of the six (6) groundwater monitoring wells (GW 08A, 9, 12, 13A, 15A and 17) shall be sampled by the permittee as specified below:

Parameter	**Measurement Frequency**	**Sample Method**
Water Table Elevation, MSL	Semi-annually	Tape (to the nearest 0.01')
Ammonia	Semi-annually	Pump or Bailer Method
Field pH	Semi-annually	Pump or Bailer Method
Field Specific Conductance	Semi-annually	Pump or Bailer Method
Total Iron	Semi-annually	Pump or Bailer Method
Total Lead	Semi-annually	Pump or Bailer Method
Nitrate	Semi-annually	Pump or Bailer Method
Sulfate	Semi-annually	Pump or Bailer Method
Total Dissolved Solids	Semi-annually	Pump or Bailer Method
Acrolein	Annually	Pump or Bailer Method
Acrylonitrile	Annually	Pump or Bailer Method
Benzene	Annually	Pump or Bailer Method
Bis (Chloromethyl) Ether	Annually	Pump or Bailer Method
Bromoform	Annually	Pump or Bailer Method
Carbon Tetrachloride	Annually	Pump or Bailer Method
Chlorobenzene	Annually	Pump or Bailer Method
Chlorodibromomethane	Annually	Pump or Bailer Method
Chloroethane	Annually	Pump or Bailer Method
2-Chloroethyl vinyl ether	Annually	Pump or Bailer Method
Chloroform	Annually	Pump or Bailer Method
Dichlorobromomethane	Annually	Pump or Bailer Method
Dichlorodifluoromethane	Annually	Pump or Bailer Method
1,1-Dichloroethane	Annually	Pump or Bailer Method
1,2-Dichloroethane	Annually	Pump or Bailer Method
1,1-Dichloroethene	Annually	Pump or Bailer Method

1,2-Dichloropropane	Annually	Pump or Bailer Method
1,3-Dichloropropylene	Annually	Pump or Bailer Method
Ethylbenzene	Annually	Pump or Bailer Method
Methyl bromide	Annually	Pump or Bailer Method
Methyl chloride	Annually	Pump or Bailer Method
Methylene chloride	Annually	Pump or Bailer Method
1,1,2,2-Tetrachloroethane	Annually	Pump or Bailer Method
Tetrachloroethylene	Annually	Pump or Bailer Method
Toluene	Annually	Pump or Bailer Method
1,2-Trans-dichlorothylene	Annually	Pump or Bailer Method
1,1,1-Trichloroethane	Annually	Pump or Bailer Method
1,1,2-Trichloroethane	Annually	Pump or Bailer Method
Trichloroethylene	Annually	Pump or Bailer Method
Trichlorofluoromethane	Annually	Pump or Bailer Method
Vinyl chloride	Annually	Pump or Bailer Method

2. The permittee shall follow the Groundwater Monitoring Sampling Period and Reporting Deadline in the table below for the coordinating Measurement Frequency indicated in the table (in paragraph a.) above:

Measurement Frequency	**Sampling Period**	**Reporting Deadline**
Quarterly (Samples must be taken at least 60 days apart.)	January 1st – March 31st	April 28th
	April 1st – June 30th	July 28th
	July 1st – September 30th	October 28th
	October 1st – December 31st	January 28th
Semi-Annually	January 1st – March 31st	April 28th
	July 1st – September 30th	October 28th
Annually	October 1st – December 31st	January 28th

c. For new in-ground wastewater treatment units or new land application activities, background groundwater quality data must be submitted prior to final approval to place into operation.

d. Sample collection methods shall be in accordance with the EPA Region 4 Groundwater Sampling Operation Procedure, EPA publication SESDPROC 301-R3, effective March 6, 2013 or most recent version of the EPA Region 4 Groundwater Sampling Operation Procedure. Analytical methods must be EPA-approved, appropriate for the media being analyzed, and must be able to achieve a practical quantitation limit (i.e. reporting limit) below the standard for Class GB groundwater as established in South Carolina Water Classifications and Standards R.61-68 if applicable to the parameter being analyzed.

e. All groundwater monitoring wells must be properly maintained at all times and are to yield a representative sample of the aquifer. If the groundwater elevation drops to a level that prevents the collection of a sample for two consecutive sampling periods, then this well shall be considered as "rendered unusable." In accordance with Regulation 61-71, any monitoring well which is destroyed, rendered unusable, or abandoned, shall be reported to the Department, and shall be properly abandoned, revitalized, or replaced. The permittee shall revitalize or replace the dry well within six months after recording the second dry sampling period.

f. In accordance with R.61-9.505.5(d), "If a deleterious impact to the groundwaters of the State from the permitted use or disposal practices is documented through groundwater monitoring levels exceeding the standards set forth in R.61-68 or a significant adverse trend occurs, then it will be the obligation of the permittee as directed by the Department to conduct an investigation to determine the vertical and horizontal extent of groundwater impact. The Department may require remediation of the groundwater to within acceptable levels for groundwater as set forth in R.61-68."

D. Sludge Monitoring Requirements

Not applicable to this permit.

E. Soil Monitoring Requirements

Not applicable to this permit.

Part IV. Schedule of Compliance

A. Schedule(s)

Not applicable to this permit.

B. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each scheduled date.

Part V. Other Requirements

A. Effluent Requirements

1. There shall be no discharge of floating solids or visible foam in other than trace amounts, nor shall the effluent cause a visible sheen on the receiving waters.

2. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

3. Unless authorized elsewhere in this permit, the permittee must meet the following requirements concerning maintenance chemicals for the following waste streams: once-through noncontact cooling water, cooling tower blowdown or recirculated cooling water and boiler blowdown. Maintenance chemicals shall be defined as any man-induced additives that may be added to the referenced waste streams.

   a. Detectable amounts of any of the one hundred and twenty-six priority pollutants is prohibited in the discharge, if the pollutants are present due to the use of maintenance chemicals.

   b. Slimicides, algicides and biocides are to be used in accordance with registration requirements of the Federal Insecticides, Fungicide and Rodenticide Act.

   c. The use of maintenance chemicals containing bis(tributyltin) oxide is prohibited.

   d. Any maintenance chemicals added must degrade rapidly, either due to hydrolytic decomposition or biodegradation.

   e. Discharges of maintenance chemicals added to waste streams must be limited to concentrations which protect indigenous aquatic populations in the receiving stream.

   f. The permittee must keep the following documentation on-site for each maintenance chemical used. The information shall be made available for on-site review by Department personnel during normal working hours.

      (1) Safety Data Sheets (SDS) including name, general composition, and aquatic toxicity information (i.e., NOEC or LC50) for each chemical used;
      (2) Quantity of each chemical used,
      (3) Frequency and location of use (including outfall to which it flows), and
      (4) Information, samples and/or calculations which demonstrate compliance with items (a) – (e) above.

   g. The permittee shall submit the information in (f) above with each permit renewal application.

   h. The Department may request submittal of the information in (f) above at any time to determine permit compliance and may modify this permit to include additional monitoring and/or limitations as necessary to protect water quality.

B. Whole Effluent Toxicity and Other Biological Requirements

1. Acute Toxicity

Not applicable to this permit.

2. Chronic Toxicity (For the requirements identified in Part III.B):

a. A *Ceriodaphnia dubia* three brood chronic toxicity test shall be conducted at the frequency stated in Part III.B, Effluent Toxicity Limitations and Monitoring Requirements, using the chronic test concentration (CTC) of 100% and the following test concentrations: 0% (control), 50%, 60%, 71%, 84% and 100% effluent. The permittee may add additional test concentrations without prior authorization from the Department provided that the test begins with at least 10 replicates in each concentration and all data is used to determine permit compliance.

b. The test shall be conducted using EPA Method 1002.0 in accordance with "Short-Term Methods for Estimating Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," EPA/821/R-02/013 (October 2002).

c. The permittee shall use the linear interpolation method described in "Short-Term Methods for Estimating Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," EPA/821/R-02/013 (October 2002), Appendix M to estimate the percent effect at the CTC according to the equations in d below.

d. The linear interpolation estimate of percent effect is $\left(1-\frac{M_{CTC}}{M_1}\right)*100$ if the CTC is a tested concentration. Otherwise, it is $\left(1-\frac{M_J-\frac{M_{J+1}-M_J}{C_{J+1}-C_J}*C_J+\frac{M_{J+1}-M_J}{C_{J+1}-C_J}*CTC}{M_1}\right)*100.$

e. A test shall be invalidated if any part of Method 1002.0 is not followed or if the laboratory is not certified at the time the test is conducted.

f. All valid toxicity test results shall be submitted via the DMR Attachment for Whole Effluent Toxicity Results (in ePermitting) in accordance with Part II.L.4. In addition, results from all invalid tests must be included with this DMR Attachment, including lab control data. The permittee has sole responsibility for scheduling toxicity tests so as to ensure there is sufficient opportunity to complete and report the required number of valid test results for each monitoring period.

g. The permittee is responsible for reporting a valid test during each monitoring period. However, the Department acknowledges that invalid tests may occur. All of the following conditions must be satisfied for the permittee to be in compliance with Whole Effluent Toxicity (WET) testing requirements for a particular monitoring period when a valid test was not obtained.

(1) A minimum of three (3) tests have been conducted which were invalid in accordance with Part V.B.1.e above;

(2) The data and results of all invalid tests are to be submitted via the DMR Attachment for Whole Effluent Toxicity Results (in ePermitting);

(3) At least one additional State-certified laboratory was used after two (2) consecutive invalid tests were determined by the first laboratory. The laboratory ID number(s) of the additional lab(s) shall be reported via the DMR Attachment for Whole Effluent Toxicity Results (in ePermitting); and

(4) A valid test was reported during each of the previous three reporting periods.

If these conditions are satisfied, the permittee may enter "*3" in the appropriate boxes on the toxicity DMR and add the statement to the 'General Reports Comments' Section of the DMR that "*3 indicates invalid tests."

h. This permit may be modified based on new information that supports a modification in accordance with Regulation 61-9.122.62 and Regulation 61-68.D.

3. Instream Macroinvertebrate Assessment

Not applicable to this permit.

C. Groundwater Requirements

1. Within 120 days of the effective date of this permit, the permittee shall submit to the Department:

a. Current site map(s) with labeling that illustrate the components of the wastewater treatment plant (such as basins, tanks, piping, sludge treatment, etc.), groundwater monitoring wells, streams and other waterbodies, property boundaries, and any on-site production wells.

b. The ground level elevation and the top of the casing elevation of each groundwater monitoring well measured to within 0.01 feet above mean sea level, unless another measurement accuracy is approved by the Department.

D. Sludge Requirements

1. The permittee shall apply in writing to the DHEC/Bureau of Water requesting written approval for sludge disposal. A letter of acceptance from the facility that will accept the sludge for disposal or reuse shall be included with the request.

2. This permit does not allow for the land application of alum sludge. The permittee must apply for and receive a permit modification prior to the land application of alum sludge.

3. Odor Requirements

a. The permittee shall not cause, allow, or permit emission into the ambient air of any substance or combinations of substances in quantities that an undesirable level of odor is determined to result unless preventative measures of the type set out below are taken to abate or control the emission to the satisfaction of the Department. Should an odor problem come to the attention of the Department through field surveillance or specific complaints, the Department may determine, in accordance with section 48-1-120 of the Pollution Control Act, if the odor is at an undesirable level by considering the character and degree of injury or interference to:

(1) The health or welfare of the people;

(2) Plant, animal, freshwater aquatic, or marine life;

(3) Property; or

(4) Enjoyment of life or use of affected property.

b. Should the Department determine that an undesirable level of odor exists, the Department may require:

(1) The permittee to submit a corrective action plan to address the odor problem,

(2) Remediation of the undesirable level of odor within a reasonable timeframe, and

(3) In an order, specific methods to address the problem.

E. Other Conditions

1. The permittee shall maintain an all weather access road to the wastewater treatment plant and appurtenances at all times.

2. The wastewater treatment plant is assigned a classification of Group II-Biological. This classification corresponds to an operator with a Grade C-Biological wastewater operator's license.

3. The permittee shall monitor all parameters consistent with conditions established by this permit as follows during every calendar month unless otherwise approved by the Department:

Outfall 001: Sample on the first (1st) Thursday of the month
Outfall 003: Sample tank prior to discharge (only one of the two tanks discharges at a time)
Outfall 004: Sample when blowdown is released
Outfall 005: Sample on the first (1st) Wednesday of the month
Outfall 06A: Sample on the first (1st) Monday of the month
Outfall 06B: Sample on the first (1st) Monday of the month
Outfall 007: Sample the first (1st) discharge of each month
Outfall 008: Sample once per discharge occurrence but need not be more than once per month
Outfall 014: Sample on the first (1st) Thursday of each month (except whole effluent toxicity)

If this day falls on a holiday, sampling shall be conducted on the next business day. If no discharge occurs on this day, the permittee shall collect an effluent sample during the monitoring period on a day when there is a discharge. If there is no discharge during the entire monitoring period, report "no discharge" for all parameters. Additional monitoring as necessary to meet the frequency requirements of this permit shall be performed by the permittee.

4. The permittee shall maintain a Best Management Practices (BMP) plan to identify and control the discharge of significant amounts of oils and the hazardous and toxic substances listed in 40 CFR Part 117 and Tables II and III of Appendix D to 40 CFR Part 122. The plan shall include a listing of all potential sources of spills or leaks of these materials, a method for containment, a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters or plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and material handling areas; loading and unloading operations; plant site runoff; and sludge and waste disposal areas. The BMP plan shall be developed in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps. The BMP plan shall be maintained at the plant site and shall be available for inspection by EPA and Department personnel.

5. The permittee shall not store coal, soil nor other similar erodible materials in a manner in which runoff is uncontrolled, nor conduct construction activities in a manner which produces uncontrolled runoff unless such uncontrolled runoff has been specifically approved by SCDHEC. "Uncontrolled" shall mean without sedimentation basin or other controls approved by SCDHEC.

6. The permittee shall notify the affected downstream water treatment plant(s) of any emergency condition, plant upset, bypass or other system failure which has the potential to affect the quality of water withdrawn for drinking water purposes. This notification should be made as soon as possible and in anticipation of such event, if feasible, without taking away from any response time necessary to attempt to alleviate the situation.

7. The discharge of any waste resulting from the combustion of chemical metal cleaning wastes, toxic wastes, or hazardous wastes to any waste stream which ultimately discharges to waters of the State is prohibited.

8. Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act. For the purposes of this condition, "take" is defined in the Endangered Species Act to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

9. The facility meets the best technology available (BTA) standard for impingement mortality by employing a closed-cycle recirculating cooling system per 40 CFR 125.94(c)(1).

10. The Department has determined that the facility meets BTA for entrainment by employing a closed-cycle recirculating cooling system per 40 CFR 125.92(c)(2).

11. At all times, the permittee shall maintain and operate the cooling water intake structure and associated equipment as described in the NPDES permit application.

12. The permittee shall monitor intake flow no less often than daily pursuant to 40 CFR 125.94(c)(1).

13. Pursuant to 40 CFR 125.96(e), the permittee shall conduct weekly visual inspections of the cooling water intake structure or employ remote monitoring devices to ensure that the technology is performing as designed.

14. Pursuant to 40 CFR 125.97(c), an annual certification statement signed by the authorized representative as defined in Reg.61-9.122.22(1) with the following information shall be submitted to the Department, no later than January 31st for the previous year.

    a. Certification that water intake structure technologies have been maintained and operated as set forth in this permit, or a justification to allow a modification of the practices. Also, include a summary of the required visual or remote inspections (see Part V.E.10).

    b. If the information contained in the previous year's annual certification is still pertinent, the permittee may simply state as such in a letter to the Department and the letter, along with any applicable data submission requirements shall constitute the annual certification.

    c. If there are substantial modifications to the operation of any unit that impacts the cooling water withdrawals or operation of the water intake structure, the permittee must provide a summary of those changes in the report.

15. Pursuant to 40 CFR 125.97(c), records of all submissions that are part of the permit reporting requirements including compliance monitoring and supplement data collection must be retained until the subsequent permit is issued.

16. The permittee must submit the information required at 40 CFR 122.21(r) and 40 CFR 125.95(f) in subsequent permit applications. Based on 40 CFR 125.95(c), the permittee may request to reduce the information required in the subsequent application if conditions at the facility and in the water body remain substantially unchanged since the previous application and the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. This request should be submitted to the Department at least two years and six months prior to the expiration of this permit.

FACT SHEET
AND
PERMIT RATIONALE

Dominion Energy South Carolina, Inc.
Virgil C. Summer Nuclear Station
NPDES Permit No. SC0012345

Permitting Engineer: Melanie Townley

August 9, 2022

Facility Rating: ☒ Major ☐ Minor
☐ Issuance (New) ☒ Reissuance ☐ Modification ☐ Minor Modification

Site Address: Highway 215, Jenkinsville, SC 29065
County: Fairfield
Watershed: Basin 05 (Broad River Basin)

Facility Description (include SIC/NAICS code/descriptions): This facility is a single unit nuclear-fueled electric power generating facility.
SIC Code: 4911-Electric Services
NAICS Code: 221113-Nuclear Electric Power Generation

Receiving Waters and Classification by final outfall: 001-Monticello Reservoir (Freshwater); 003-Broad River via Penstocks of Fairfield Hydro; 014- Monticello Reservoir (Freshwater)

Is any discharge to Impaired Waters? Yes (see State 303(d) list for impaired waters)
If Yes, list the monitoring station number(s) and parameter(s) causing impairment: The following stations in the Monticello Reservoir are impaired for pH: B-327, RL-04370, RL-04374, RL-13089 and RL-15009; Station B-236, downstream on the Broad River is impaired for total copper and the following upstream Broad River stations are impaired for total phosphorus: B-236, RL-12049 and RL-16047. Note that Base Station B-345 is between the final outfalls and B-236. Metals are monitored quarterly and it is not impaired for total copper.

Is any discharge to a waterbody or for a parameter listed in an approved TMDL? Yes
If Yes, list the parameter(s) for which the TMDL is written and the waterbody segments impacted: Fecal coliform on Twelve Mile Creek

Does any discharge have the potential to affect a threatened or endangered species? Yes, the Bald Eagle

Outfalls are discussed in Section I of this rationale with a general description of the discharge, treatment system, stream flows and other pertinent information about each outfall.

EPA review of the draft permit is required if any box below is checked (Mark all that apply)
☐ Permits with discharges which may affect the waters of another State (Coordination with the other State is also required) - List State and name of waterbody(ies) that reach affected state: none
☒ Major permits
☒ Permits with any discharge subject to any of the primary industrial categories (see R.61-9.122, Appendix A)
☐ Permits with any discharge of process wastewater with an average flow exceeding 0.5 MGD
☐ Permits which incorporate pollutant trading

☐ Priority permits
☐ Modification(s) to any permit listed above or a mod that changes a permit to put it into one of the above categories (where it previously was not)

List of Attachments to this Rationale:

Attachment 1	Permit Application
Attachment 2	Water Quality Spreadsheets
Attachment 3	Location Maps
Attachment 4	Wasteload Allocation and Source Water

I. PERMIT LIMITATIONS AND MONITORING REQUIREMENTS

Outfalls

Description of outfall, receiving water and wastewater treatment system: An overview of the final outfalls covered in this NPDES permit is as follows. Note, this nuclear generating facility is subject to 40 CFR Part 423.

1. **Final Outfall 001 to Monticello Reservoir**: once-through noncontact cooling water, internal outfall 004 (low volume waste consisting of steam generator blowdown) and internal outfall 007 (low volume waste from the neutralization waste tank). Note that as an alternate pathway, internal outfall 004 may be routed through outfall 003 or internal outfall 06A to final outfall 014.
2. **Final Outfall 003 to Broad River via Penstocks of Fairfield Hydro:** low volume waste (radioactive waste) and non-chemical metal cleaning waste (from nuclear steam generator cleaning).
3. **Final Outfall 014 to Monticello Reservoir**: consists of the following internal outfalls: 005 (sanitary wastewater), 06A (low volume waste from the alum sludge basin), 06B (low volume waste and stormwater from the transformer and fuel oil storage/handling areas all discharging from the plant waste surge/retention basin), 008 (metal cleaning waste and low volume waste from the plant startup waste holding basin, oil collection sump and clarifier blowdown sump).

Operator requirements: Based on the treatment system described below for each outfall (if any) and the Pollution Control Act (PCA), the treatment system is classified as Group II-Biological. The Environmental Certification Board Rules require that a Grade C-Biological operator be assigned to operate this facility. Inspections of the facility will be required on a daily basis per Regulation 61-9.122.41(e).

Information for this outfall is based on NPDES Permit Application: 2C dated 3/18/19

Data from Discharge Monitoring Reports (DMRs) and NPDES permit application (including all subsequent data presented) from 7/16 to 7/21 has been used to evaluate permit limitations.

This outfall is within a state-approved source water protection area (SWPA) for a surface water drinking water intake and has the potential to affect the intake. The affected intake(s) (Intake #S20103) is/are owned by SCE&G VC Summer Nuclear Station. The 7Q10 and AAF to be used for permitting MCL and water/organism criteria are given on the spreadsheet. Additional information on source water protection is provided in sections III.B and G of this rationale.

Previous permit limits are based on the permit modification effective date of 5/21/19.

All waterbody data is provided on the attached Water Quality Spreadsheets. This data includes 7Q10, annual average flow, dilution factors, hardness, TSS and other information as explained in this rationale. Additional information as necessary to explain the values used will be provided below.

FINAL OUTFALL 001: Outfall 001 consists of the combination of once-through noncontact cooling water, internal Outfall 004 (low volume waste - steam generator blowdown) and internal outfall 007 (low volume waste from the ion exchange regeneration, chemical feed equipment drain sump, caustic tank area sump and the "D" battery room sump). Outfall 007 consists of a 100,000-gallon neutralization basin tank where sodium-hydroxide is used to adjust the pH. Note that due to the nature of the discharge (mostly once-through noncontact cooling water) and the fact that it is not feasible to install a composite sampler, grab samples will be allowed.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: Continuous
   Sample Type: Continuous
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: 738.7 MGD
   Long Term Avg Value: 647.65 MGD
3. DMR Data: The highest flow was reported in 9/21 as 738.72 MGD
4. Actual long term average flow (from DMR): 669 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: Continuous
   Sample Type: Continuous

pH

1. Previous Permit Limits: 6.0-8.5 standard units.
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: Min: 6.18 su, Max: 7.27 su
3. DMR Data: The highest and lowest pH was reported as 7.8 standard units in 5/20 and 6.2 standard units in12/18.
4. Water Quality Data: Water quality standards for pH are established in Reg. 61-68.G. For freshwater, this is 6.0-8.5 standard units.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: None
7. PQL: Not applicable
8. Conclusion: pH should be between 6.0 and 8.5 standard units.
   Sampling Frequency: 1/Month
   Sample type: Grab

Temperature

1. Previous Permit Limits:
   Discharge: Monthly Average: MR°F
   Daily Maximum: 113°F
   Intake: Monthly Average: MR°F
   Daily Maximum: MR°F
   Sampling Frequency: Continuous
   Sample Type: Continuous
2. NPDES Application: (No. of analyses: 4 in winter and 8 in summer)
   Summer: Average: 28.32°C
   Maximum: 30.14°C
   Winter: Average: 39.79°C
   Maximum: 44.14°C
3. DMR Data: The highest temperature was reported in 9/21 as 112.55 °F
4. Water Quality Data: Per Reg. 61-68.E.12.a, The water temperature of all Freshwaters which are free flowing shall not be increased more than 5°F (2.8°C) above natural temperature conditions and shall not exceed a maximum of 90°F (32.2°C) as a result of the discharge of heated liquids unless a different temperature standard as provided for in C.12 has been established, a mixing zone as provided in C.10 has been established, or a Section 316(a) determination under the Federal Clean Water Act has been completed.
5. Effluent limitation guidelines: not applicable
6. Other information: The permittee submitted a second addendum to the previous mixing zone support a continued daily maximum discharge temperature limit of 113°F. This request supports previous modeling submitted to show that an instream temperature of 90°F and a temperature increase of less than 5°F can be met at the edge of the mixing zone in the Monticello Reservoir (6800 acres).

   The permittee previously modeled summer months for the 90°F and winter months for the temperature increase of less than 5°F.

   January 2012: The permittee initially modeled summer months for the 90°F and winter months for the temperature increase of less than 5°F. The modeling was completed using a 113°F discharge temperature and a 86.4°F ambient temperature in the summer months (when discharge and ambient temperature are assumed to be highest) and a 98.7°F discharge temperature and a 66.6°F ambient temperature during winter months (when the differential between the discharge and ambient temperature is assumed to be highest). The discharge flow rate was set to 766 MGD (the flow rate through the Unit 1 intake with all three pumps operational). Note that they looked at the following 4 scenarios for both meeting the 90°F and a temperature increase of less than 5°F. The pump-back ambient flow is 41,800 cfs and the ambient generating flow is 50,400 cfs.

      1. Monticello Reservoir at high water slack conditions - no flow through Fairfield Pumped Storage Facility (FPSF)
      2. Monticello Reservoir at low water slack conditions - no flow through FPSF
      3. Monticello Reservoir at low water rising conditions – when FPSF is in pump-back mode
      4. Monticello Reservoir at high water falling conditions - when FSPSF is in generating mode

   February 2014 Addendum: Revised modeling was completed using a 113°F discharge temperature and a

87.9°F ambient temperature in the summer months (highest intake temperature representative of reservoir temperature) and a 113°F discharge temperature and a 46.4°F ambient temperature during winter months (lowest intake temperature representative of reservoir temperature). Note that they looked at the following 4 scenarios below during the winter and scenario 4 below during the summer it was assumed that the small change in ambient temperature in the summer would still result in the worst case being scenario 4. All other inputs remained the same.

1. Monticello Reservoir at high water slack conditions - no flow through Fairfield Pumped Storage Facility (FPSF)
2. Monticello Reservoir at low water slack conditions - no flow through FPSF
3. Monticello Reservoir at low water rising conditions – when FPSF is in pump-back mode
4. Monticello Reservoir at high water falling conditions - when FSPSF is in generating mode

The revised modeling resulted in the largest mixing zone area (scenario 2 in winter) being less than 6% of the Reservoir's surface area. The Department believes the mixing zone has been minimized.

November 2018 Addendum 2: Due to little change in ambient temperature and operating conditions, additional modeling was not completed. Considering data from 2013 through 2018, the highest daily maximum Lake Monticello temperature was 87.2°F, lower than the previous 87.9°F. The updated date range shows a minimum monthly average instream temperature of 44.7 °F. Although this is lower than the previous 46.4°F, the difference between the discharge and instream temperature only increased 2.6%. Also, the previous winter temperature plume was a factor of 3.2 smaller than the summer and therefore even with this small change, the winter plume would remain smaller than the summer plume. The Department believes the mixing zone continues to be minimized.

7. PQL: Not applicable
8. Conclusion: The temperature requirements remain as in the previous permit.
   Discharge: Monthly Average: MR°F
   Daily Maximum: 113°F
   Intake: Monthly Average: MR°F
   Daily Maximum: MR°F
   Sampling Frequency: Continuous
   Sample Type: Continuous

Biochemical Oxygen Demand (BOD_5)

1. Previous permit limits: None
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: <2.00 mg/l (<13806 lb/d)
3. DMR Data: No DMR data
4. Effluent limitations guidelines: Not applicable to this parameter
5. PQL: 2.0 mg/l
6. Other information: None
7. Conclusion: Monitoring/limitations are not necessary at this time as the permittee has again reported less than detect for BOD_5 at the outfall.

Free Available Chlorine & Total Residual Chlorine (Total Residual Oxidants)

1. Previous permit limits: None

2. NPDES Application: (# of analyses: 0)
3. DMR Data: No DMR data
4. Water Quality Data: Not applicable
5. Effluent limitation guidelines:

   Free Available Chlorine

   40 CFR Part 423.12.b(6) for once through cooling water:
   Monthly average: 0.2 mg/l
   Daily maximum: 0.5 mg/l

   40 CFR Part 423.12.b(8): Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the Regional Administrator or State, if the State has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level or chlorination.

   Total Residual Chlorine (Total Residual Oxidants)

   40 CFR Part 423.13(b)(1) for once through cooling water: Instantaneous Maximum: 0.2 mg/l

   40 CFR Part 423.13(b)(2): Total residual chlorine may not be discharged from any single generating unit for more than two (2) hours per day unless the discharger demonstrates to the Department that the discharge for more than two hours is required for macroinvertebrate control.
6. Other information: Per 40 CFR Part 423.11 once through cooling water means water passed through the main cooling condensers in one or two passes for the purpose of removing waste heat.
7. Conclusion: This permit includes a restriction that there shall be no addition of chlorine to the main condenser cooling water or to other cooling services. Also note that the permittee adds Spectrus OX1200 (a form of bromide) to the turbine building closed cycle cooling tower, however this is not the main condenser. No additional limitations are necessary at this time.

Bromide

1. Previous permit limits:
   Monthly average: MR mg/l
   Daily maximum: MR mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: <0.5 mg/l (<3082 lb/d)
   Long Term Avg Value: <0.5 mg/l (<2702 lb/d)
3. DMR Data: The highest DMR data point was reported as 0.11 mg/l in November 2021.
4. Water Quality Data: see spreadsheet
5. Other Information: The permittee has sampled for bromide since the last permit reissuance. All data has been reported as less than detect with the exception of one data point at 0.11 mg/l.
6. Does the discharge cause, have the Reasonable Potential to Cause or Contribute: No
7. Effluent limitations guidelines (ELGs) and professional judgment-based limits: Not applicable to this parameter.
8. PQL: 2.0 mg/l
9. Conclusion: Monitoring and/or limitations are not needed at this time.

Whole Effluent Toxicity (WET)

1. Previous permit requirements: None

2. Mixing Zone and Zone of Initial Dilution (ZID) Information: A mixing zone was not requested by the permittee.
3. Other information: The permit effective 2/1/03 included chronic WET limits with a CTC = 100%. All data during that permit was reported as 0% effect.
4. Conclusion: Monitoring/limitations are not necessary as this discharge is approximately 90% once-through noncontact cooling water. Note also that the previous WET test results mentioned above were all reported as zero percent effect.

Internal Outfall 004: This internal outfall consists of low volume waste (steam generator blowdown) and discharges to final Outfall 001. However, as an alternative, the steam generator blowdown may discharge through internal Outfall 06A (ultimately through 014) or after demineralization through final Outfall 003.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Calculation
2. NPDES Application: (# of analyses: 4)
   Maximum Daily Value: 1300707 MGD
   Long Term Avg Value: 6.15992 MGD
3. DMR Data: The highest flow was reported in 5/20 as 0.247824 MGD.
4. Actual long term average flow (from DMR): 0.085 MGD
5. Conclusion: The permittee shall continue to monitor and report flow for this outfall.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Calculation

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab
2. NPDES Application: (# of analyses: 5)
   Maximum Daily Value: <1.00 mg/l (<109.7 lb/d)
   Long Term Avg Value: <1.00 mg/l (< 51.4lb/d)
3. DMR Data: The highest TSS was reported in 11/21 as 4.6 mg/l.
4. Water Quality Data: NA
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
6. Other information: None
7. PQL: 1000 µg/l
8. Conclusion: The TSS limits remain in accordance with 40 CFR Part 423.12.

Monthly average: 30 mg/l
Daily Maximum: 100 mg/l
Sampling frequency: 1/Month
Sample Type: Grab

Oil and grease

1. Previous Permit Limits:
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (No. of analyses: 5)
   Maximum Daily Value: <5.00 mg/l (<545.37 lb/d)
   Long Term Avg Value: < 5.00 mg/l (< 257.02 lb/d)
3. DMR Data: All DMR data was reported as 0 mg/l.
4. Water Quality Data: Narrative water quality criteria for oil and grease is covered by Reg.61-68.E.5.
5. Effluent limitation guidelines: 40 CFR Part 423.12 for low volume waste:
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
6. Other information: None
7. PQL: 5 mg/l
8. Conclusion: The oil and grease limits remain in accordance with 40 CFR Part 423.12.
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

pH

1. Previous Permit Limits: None
2. NPDES Application: (# of analyses: 1): 8.91 standard units
3. DMR Data: No DMR data
4. Water Quality Data: Water quality limits are addressed at the final 001 outfall.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: This discharge consists of blowdown (defined as low volume waste per 40 CFR Part 423). In accordance with the USEPA Memorandum dated March 21, 1986, the pH limitation in 40 CFR Part 423.12 for low volume waste which commingles with once through cooling water may be met after combination with the once through cooling water. Note that the regular discharge path is through Outfall 001 (low volume waste combined with once through cooling water), however when discharged through 003 or 014, the pH limits on the final are at least as stringent as or more stringent than the effluent guidelines.
7. PQL: Not applicable
8. Conclusion: pH is not limited at this internal outfall, as limitations have been set at the final outfalls.

Internal Outfall 007: This internal outfall consists of low volume waste from the neutralization waste tank. Treatment consists of 100,000-gallon neutralization basin tank where sodium-hydroxide is used to adjust the pH before the effluent is discharged to Outfall 001.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous
2. NPDES Application: (# of analyses: 40)
   Maximum Daily Value: 0.218100 MGD
   Long Term Avg Value: 0.105900 MGD
3. DMR Data: The highest flow was reported in 6/17 as 0.325 MGD
4. Actual long term average flow (from DMR and/or application): 0.089 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: 21.2 mg/l (38.58 lb/d)
   Long Term Avg Value: 7.87 mg/l (6.95 lb/d)
3. DMR Data: The highest TSS was reported in 8/16 as 89 mg/l
4. Water Quality Data: NA
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
6. Other information: None
7. PQL: 1000 µg/l
8. Conclusion: The TSS limits remain in accordance with 40 CFR Part 423.12.
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

Oil and grease

1. Previous Permit Limits:
   Monthly average: 15 mg/l

Daily Maximum: 20 mg/l
Sampling Frequency: 1/Month
Sample type: Grab

2. NPDES Application: (No. of analyses: 12)
   Maximum Daily Value: <5.00 mg/l (< 9.10 lb/d)
   Long Term Avg Value: <5.00 mg/l (< 4.42lb/d)
3. DMR Data: All data was reported as 0 mg/l.
4. Water Quality Data: Narrative water quality criteria for oil and grease is covered by Reg.61-68.E.5.
5. Effluent limitation guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
6. Other information: None
7. PQL: 5 mg/l
8. Conclusion: The oil and grease limits remain in accordance with 40 CFR Part 423.12.
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab

pH

1. Previous Permit Limits: None
2. NPDES Application: (# of analyses: 40)
   Maximum Daily Value: Min: 6.01 su, Max: 8.85 su
3. DMR Data: No DMR data.
4. Water Quality Data: Water quality limits are addressed at the final 001 outfall.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: This discharge consists of blowdown (defined as low volume waste per 40 CFR Part 423). In accordance with the USEPA Memorandum dated March 21, 1986, the pH limitation in 40 CFR Part 423.12 for low volume waste which commingles with once through cooling water may be met after combination with the once through cooling water.
7. PQL: Not applicable
8. Conclusion: pH is not limited at this internal outfall, as limitations have been set at the final outfall.

FINAL OUTFALL 003: Outfall 003 discharges to the Broad River via Penstocks of Fairfield Hydro. This discharge consists of low volume waste (radioactive waste) and non-chemical metal cleaning waste (from nuclear steam generator cleaning). Treatment consists of evaporation and demineralization. The wastewater is then held in Waste Monitor Tanks designated as Tank “A” and “B” for monitoring to check that the wastewater is within NPDES & NRC limits prior to discharging. Note that this outfall is an alternative discharge point for internal outfall 004 (also low volume waste) as well. Note that although this is a batch discharge, it is a consistent discharge. One of the two waste monitor tanks is filled, recirculated for a minimum of 15 minutes, and then sampled prior to discharge. As such, grab samples continue to be sufficient for this outfall. Note that limits for the non-chemical metal cleaning waste in this outfall have been set equal to BPT limits for low volume waste.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Estimate
2. NPDES Application: (# of analyses: 242)
   Maximum Daily Value: 0.004700 MGD
   Long Term Avg Value: 0.004196 MGD
3. DMR Data: The highest flow was reported in 8/21 as 0.043 MGD
4. Actual long term average flow (from DMR and/or application): 0.0043 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Estimate

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab
2. NPDES Application: (# of analyses: 25)
   Maximum Daily Value: 8.2 mg/l (0.32 lb/d)
   Long Term Avg Value: 1.79 mg/l (0.063 lb/d)
3. DMR Data: The highest TSS was reported in 9/16 as 14.1 mg/l.
4. Water Quality Data: NA
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
6. Other information: None
7. PQL: 1000 µg/l
8. Conclusion: The TSS limits remain in accordance with 40 CFR Part 423.12.
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

Oil and grease

1. Previous Permit Limits:
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (No. of analyses: 24)

Maximum Daily Value: <5.00 mg/l (<0.196 lb/d)
Long Term Avg Value: <5.00 mg/l (<0.175 lb/d)

3. DMR Data: The highest oil and grease value was reported in 9/21 as 2.28 mg/l.
4. Water Quality Data: Narrative water quality criteria for oil and grease is covered by Reg.61-68.E.5.
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
6. Other information: None
7. PQL: 5 mg/l
8. Conclusion: The oil and grease limits remain in accordance with 40 CFR Part 423.12.
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

pH

1. Previous Permit Limits: 6.0-9.0 standard units.
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (# of analyses: 244)
   Maximum Daily Value: Min: 6.08 su, Max: 8.49 su
3. DMR Data: The highest and lowest pH was reported in 8/20 as 8.8 standard units and in 4/18 as 8.1 standard units.
4. Water Quality Data: Water quality standards for pH are established in Reg. 61-68.G.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: This discharge consists of low volume waste.
7. PQL: Not applicable
8. Conclusion: Due to the large stream dilution in comparison to the discharge, a maximum pH of 9.0 standard units shall be granted. This small change should not have any adverse impact on the receiving stream. This pH limits are as follows: 6.0-9.0 standard units.
   Sampling frequency: 1/Month
   Sample Type: Grab

FINAL OUTFALL 014: Outfall 014 discharges to the Monticello Reservoir. This discharge is the combination of the following internal outfalls: 005 (sanitary wastewater), 06A (low volume waste from the alum sludge basin), 06B (low volume waste and stormwater from the transformer and fuel oil storage/handling areas all discharging from the plant waste surge/retention basin), 008 (metal cleaning waste and low volume waste from the plant startup waste holding basin, oil collection sump and clarifier blowdown sump).

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: Continuous
   Sample Type: Continuous

2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: 0.340967 MGD
   Long Term Avg Value: 0.070510 MGD
3. DMR Data: The highest flow was reported in 10/18 as 1.784203 MGD.
4. Actual long term average flow (from DMR and/or application): 0.064 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: Continuous
   Sample Type: Continuous

pH

1. Previous Permit Limits: 6.0-9.0 standard units April-Oct and 6-8.5 standard units from Nov-March.
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (# of analyses:12)
   Maximum Daily Value: Min: 6.39 su, Max: 7.29 su
3. DMR Data: The highest and lowest pH was reported in 12/21 as 8.8 standard units and in 5/20 as 6.1 standard units.
4. Water Quality Data: Water quality standards for pH are established in Reg. 61-68.G.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: The Department previously approved the maximum limit of 9.0 standard units for April through October as the permittee indicated algae blooms cause high pH however there are impaired stations with the Reservoir for pH. After further data review of STORET, the Department considers Stations RL-17067 and RL-19170 to be impaired as well.
7. PQL: Not applicable
8. Conclusion: The pH limits are in accordance with Reg.61-68.G.
   Range: 6.0-8.5 standard units
   Sampling frequency: 1/Month
   Sample Type: Grab

Phosphorus

1. Previous Permit Limits:
   Monthly average: MR mg/l
   Daily Maximum: MR mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (No. of analyses: 12)
   Maximum Daily Value: 5.1 mg/l (14.51 lb/d)
   Long Term Avg Value: 1.74 mg/l (1.02 lb/d)
3. DMR Data: The highest value was reported in 8/16 as 7.3 mg/l.
4. Water Quality Data: See Section III.G.1.c of this rationale.
5. Effluent limitation guidelines: not applicable
6. Other information: Outfall 014 includes the discharge from internal outfall 005 which is sanitary wastewater.

7. PQL: 50 µg/l
8. Conclusion: Considering the high dilution available at the discharge, the long term average discharge of total phosphorus (TP), and the fact that the Monticello Reservoir and the Parr Reservoirs are not impaired for TP, continued monitoring is not needed at this time.

Ammonia-Nitrogen, Total as N

1. Previous permit limits: None
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: 13.8 mg/l (39.27 lb/d)
3. DMR Data: No DMR data
4. Waste Load Allocation: Monthly Average: 2631 mg/l (the ammonia toxicity number)
5. Water Quality Criteria for Protection of Aquatic Life from Reg. 61-68, Appendix, Attachment 3: Freshwater:
   In situations where salmonids are absent, the CMC is calculated as:

$$CMC = \left\{ \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}} \right\}$$

   Establish the CCC when fish early life stages (ELS) are present:

$$CCC = \left\{ \frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}} \right\} \times \left\{ \min\left(2.85, 1.45 \times 10^{0.028 \times (25-T)}\right) \right\}$$

   Note: The Department always considers fish early life stages to be present unless data is presented which demonstrates their absence.
   Where:
   Stream pH = 8.14 su
   Stream temp (critical) = 30°C
   Stream temp (seasonal) = 19°C
   Upstream flow: 396 cfs
   Upstream ammonia concentration = 0.11 mg/l

   Critical months are March – October and November - February is seasonal.
   CCC (critical) = 0.727 mg/l CCC (seasonal) = 1.477 mg/l
   CMC (critical) = 6.433 mg/l CMC (seasonal) = 6.433 mg/l

   With dilution:
   Monthly average (critical chronic): 2631 mg/l Monthly average(seasonal chronic): 5831 mg/l
   Daily maximum (critical acute): 26978 mg/l Daily maximum (seasonal acute): 26978
6. Does the discharge cause, have the Reasonable Potential to Cause or Contribute? No
7. Other information: None
8. PQL: 100 µg/l
9. Conclusion: Limitations are not necessary at this time.

Whole Effluent Toxicity (WET)

1. Previous permit requirements:
   Chronic whole effluent toxicity testing using *Ceriodaphnia dubia* at a CTC = 100%

Dilution series 0%, 50%, 60%, 71%, 84% and 100%
Monthly Average: MR% effect (total, reproduction, & mortality)
Daily Maximum: MR% effect (total, reproduction, & mortality)
Sampling Frequency: 1/Permit Term
Sample Type: Grab

2. DMR Data: 23% effect was reported on 8/14. The IC25 and 48-hour LC50 were both reported as >100%.
3. Mixing Zone and Zone of Initial Dilution (ZID) Information: The permittee has not requested a mixing zone.
4. Reasonable potential evaluation: Based on available data, the Department feels reasonable potential does not exist.
5. Other information: 014 consists of sanitary wastewater, low volume waste, metal cleaning waste and stormwater.

6. Conclusion: Monitoring will continue to be included in the permit for this outfall to collect data for the future permit reissuance. Testing using multiple dilutions will be required. A geometric series is used to determine the dilution series as follows: To determine a geometric series of effluent concentrations given a low concentration L, a high concentration *H,* and *n* concentrations, the concentration factor is $F = (\frac{H}{L})^{\frac{1}{n-1}}$ and the *i*th concentration is $C_i = L * F^{i-1}$. Therefore, for n = 5; L = 6.25 and H = 100 the dilution series is as follows (minimum of 5 dilutions and a control): 0% (control), 6.25%, 12.5%, 25%, 50% and 100%. Chronic toxicity testing shall be performed for this outfall as described below:

Chronic whole effluent toxicity testing using *Ceriodaphnia dubia* at a CTC = 100%
Dilution series 0%, 50%, 60%, 71%, 84% and 100%
Monthly Average: MR% effect (total, reproduction, & mortality)
Daily Maximum: MR% effect (total, reproduction, & mortality)
Sampling Frequency: Once/5 Years
Sample Type: Grab

Internal Outfall 005: This discharge consists of sanitary wastewater. Treatment consists of two dosing tanks, an aeration basin with 6 aerators, two sand filters, two chlorination basins and two dechlorination basins.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: 0.026000 MGD
   Long Term Avg Value: 0.007250 MGD
3. DMR Data: The highest flow was reported in 7/16 as 0.0796 MGD.
4. Actual long term average flow (from DMR and/or application): 0.0093 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous

Biochemical Oxygen Demand (BOD_5)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily maximum: 45 mg/l
   Sampling frequency: 1/Month
   Sample type: 24 Hour Composite
2. NPDES Application: (# of analyses: 13)
   Maximum Daily Value: 12 mg/l (2.6 lb/d)
   Long Term Avg Value: 6.6 mg/l (0.40 lb/d)
3. DMR Data: The highest BOD_5 was reported in 12/19 22 mg/l.
4. Effluent limitations guidelines: Not applicable to this outfall.
5. PQL: 2.0 mg/l
6. Waste Load Allocation: Not applicable to this internal outfall.
7. Other information: Reg 61-9.133, Secondary Treatment Regulation gives a monthly average of 30 mg/l and a weekly average of 45 mg/l. The daily maximum is calculated as twice the monthly average limit (note R.61-68.122.45(d) for continuous discharges).
8. Conclusion: The limits shall remain in accordance with Reg 61-9.133
   Monthly average: 30 mg/l
   Daily maximum: 45 mg/l
   Sampling frequency: 1/Month
   Sample type: 24 Hour Composite

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily maximum: 45 mg/l
   Sampling frequency: 1/Month
   Sample type: 24 Hour Composite
2. NPDES Application: (# of analyses: 13)
   Maximum Daily Value: 4.2 mg/l (0.91lb/d)
   Long Term Avg Value: 2.8 mg/l (0.17 lb/d)
3. DMR Data: The highest TSS was reported in 10/2021 as 13 mg/l.
4. Water Quality Data: NA
5. Effluent limitations guidelines: Not applicable to this outfall.
6. Other information: Reg 61-9.133, Secondary Treatment Regulation gives a monthly average of 30 mg/l and a weekly average of 45 mg/l. The daily maximum is calculated as twice the monthly average limit (note R.61-68.122.45(d) for continuous discharges).
7. PQL: 1000 µg/l
8. Conclusion: The limits shall remain in accordance with Reg 61-9.133
   Monthly average: 30 mg/l
   Daily maximum: 45 mg/l
   Sampling frequency: 1/Month
   Sample type: 24 Hour Composite

E. coli

1. Previous Permit Limits:

Monthly average: 126/100 ml
Daily maximum: 349/100 ml
Sampling Frequency: 1/Month
Sample type: Grab

2. NPDES Application: not applicable
3. DMR Data: The highest value was reported in 11/17 as 86/100 ml
4. Water Quality Data: E. coli standards in Regulation 61-68.E.14.c(8): In order to protect recreational uses in freshwaters (including FW, and all types of Trout Waters) of the State, NPDES permit effluent limitations shall be specified as a monthly average of 126 MPN/100ml and a daily maximum of 349 MPN/100 ml. Provisions for meeting alternate daily maximum bacteria limits shall be in accordance with R.61-68.E.14.c(12).
5. Effluent limitation guidelines: not applicable
6. Other information: See water quality standards above for E. coli.
7. PQL: 1/100 ml
8. Conclusion: E. coli, per R.61-68.E.14(c)(8), will be limited to
   Monthly average: 126/100 ml
   Daily maximum: 349/100 ml
   Sampling Frequency:
   Sample type: Grab

Total Residual Chlorine (TRC)

1. Previous Permit Limits: None
2. NPDES Application: (No. of analyses: 1)
   Maximum Daily Value: 0.07 mg/l (0.015 lb/d)
3. DMR Data: No DMR data
4. Water Quality Criteria: Reasonable potential has been assessed at the final outfall.
5. Effluent limitation guidelines: Not applicable
6. Other information: None
7. Does the discharge cause, have the Reasonable Potential to Cause or Contribute: Reasonable potential has been assessed at Outfall 014, the final outfall.
8. PQL: 0.05 mg/l
9. Conclusion: Chlorine limits are not necessary as reasonable potential has been assessed at Outfall 014.

Internal Outfall 06A: This discharge consists of low volume waste from the alum sludge basin.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous
2. NPDES Application: (# of analyses: 10)
   Maximum Daily Value: 0.028900 MGD
   Long Term Avg Value: 0.00936 MGD
3. DMR Data: The highest flow was reported in 1/21 as 0.2075 MGD.
4. Actual long term average flow (from DMR and/or application): 0.032 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.

Monthly average: MR MGD
Daily Maximum: MR MGD
Sampling Frequency: 1/Month
Sample Type: Instantaneous

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab
2. NPDES Application: (# of analyses: 10)
   Maximum Daily Value: 2.5 mg/l (0.6 lb/d)
   Long Term Avg Value: 1.67 mg/l (0.13 lb/d)
3. DMR Data: The highest TSS was reported in 9/17 as 6 mg/l
4. Water Quality Data: Not applicable
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
6. Other information: None
7. PQL: 1000 µg/l
8. Conclusion: The limits remain in accordance with 40 CFR Part 423.12
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

Oil and grease

1. Previous Permit Limits:
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (No. of analyses: 10)
   Maximum Daily Value: < 5.00 mg/l (< 1.21 lb/d)
   Long Term Avg Value: < 5.00 mg/l (< 0.391 lb/d)
3. DMR Data: All DMR data was reported as 0 mg/l.
4. Water Quality Data: Narrative water quality criteria for oil and grease is covered by Reg.61-68.E.5.
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
6. Other information: None
7. PQL: 5 mg/l
8. Conclusion: The oil and grease limits remain in accordance with 40 CFR Part 423.12.
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l

Sampling frequency: 1/Month
Sample Type: Grab

pH

1. Previous Permit Limits: None
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: Min: 8.5 su, Max: 8.5 su
3. DMR Data: No DMR data.
4. Water Quality Data: Water quality limits are addressed at the final outfalls.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: The pH limits on the final are at least as stringent as or more stringent than the effluent guidelines.
7. PQL: Not applicable
8. Conclusion: pH is not limited at this internal outfall, as limitations have been set at the final outfalls.

Internal Outfall 06B: This discharge consists of low volume waste from the plant waste surge basin.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: 0.14000 MGD
   Long Term Avg Value: 0.048300 MGD
3. DMR Data: The highest flow was reported in 4/17 as 0.367 MGD.
4. Actual long term average flow (from DMR and/or application): 0.043 MGD
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily Maximum: 98 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab
2. NPDES Application: (# of analyses: 12)
   Maximum Daily Value: 10 mg/l (12.02 lb/d)
   Long Term Avg Value: 4.4 mg/l (1.77lb/d)
3. DMR Data: The highest TSS was reported in 8/16 as 17 mg/l.
4. Water Quality Data: NA

5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
6. Other information: None
7. PQL: 1000 µg/l
8. Conclusion: The monthly average limit remains in accordance with 40 CFR Part 423.12. The daily maximum limit is set equal to the previous daily maximum limit, as it is more stringent than 40 CFR Part 423.12.
   Monthly average: 30 mg/l
   Daily Maximum: 98 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

Oil and grease

1. Previous Permit Limits:
   Monthly average: 15 mg/l
   Daily Maximum: 19 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (No. of analyses: 12)
   Maximum Daily Value: <5.00 mg/l (< 6.01lb/d)
   Long Term Avg Value: < 5.00 mg/l (< 2.02 lb/d)
3. DMR Data: The highest data point was reported in 6/21 as 5.7 mg/l.
4. Water Quality Data: Narrative water quality criteria for oil and grease is covered by Reg.61-68.E.5.
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
6. Other information: None
7. PQL: 5 mg/l
8. Conclusion: The monthly average limit remains in accordance with 40 CFR Part 423.12. The daily maximum limit is set equal to the previous daily maximum limit, as it is more stringent than 40 CFR Part 423.12.
   Monthly average: 15 mg/l
   Daily Maximum: 19 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab

pH

1. Previous Permit Limits: None
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: Min: 7.23 su, Max: 7.23 su
3. DMR Data: No DMR data.
4. Water Quality Data: Water quality limits are addressed at the final outfalls.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: The pH limits on the final are at least as stringent as or more stringent than the effluent guidelines.
7. PQL: Not applicable

8. Conclusion: pH is not limited at this internal outfall, as limitations have been set at the final outfalls.

Internal Outfall 008: This discharge consists of chemical metal cleaning waste, non-chemical metal cleaning waste (from nuclear steam generator cleaning) and low volume waste from the plant startup waste holding basin. Note that limits for the non-chemical metal cleaning waste in this outfall have been set equal to BPT limits for low volume waste. A footnote has been added to the permit only requiring that iron and copper monitoring be completed when *chemical* metal cleaning waste is discharged.

Flow

1. Previous permit limits:
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous
2. NPDES Application: (# of analyses: 0) no flow since October 2009
3. DMR Data: No reported discharge
4. Actual long term average flow (from DMR and/or application): No flow since October 2009 but the long term average last reissuance was 0.30 MGD.
5. Conclusion: The permittee shall continue to monitor and report flow.
   Monthly average: MR MGD
   Daily Maximum: MR MGD
   Sampling Frequency: 1/Month
   Sample Type: Instantaneous

Total Suspended Solids (TSS)

1. Previous permit limits:
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: <2.5 mg/l (0 lb/d)
3. DMR Data: No reported discharge
4. Water Quality Data: NA
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste and metal cleaning waste
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
6. Other information: None
7. PQL: 1000 µg/l
8. Conclusion: The limits remains in accordance with 40 CFR Part 423.12.
   Monthly average: 30 mg/l
   Daily Maximum: 100 mg/l
   Sampling frequency: 1/Month
   Sample Type: Grab

Oil and grease

1. Previous Permit Limits:
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (No. of analyses: 1)
   Maximum Daily Value: < 5.00 mg/l (0 lb/d)
3. DMR Data: No reported discharge
4. Water Quality Data: Narrative water quality criteria for oil and grease is covered by Reg.61-68.E.5.
5. Effluent Limitation Guidelines: 40 CFR Part 423.12 for low volume waste and metal cleaning waste
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
6. Other information: None
7. PQL: 5 mg/l
8. Conclusion: The limits remains in accordance with 40 CFR Part 423.12.
   Monthly average: 15 mg/l
   Daily Maximum: 20 mg/l
   Sampling Frequency: 1/Month
   Sample type: Grab

pH

1. Previous Permit Limits: None
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: Min: 8.30 su, Max: 8.30 su
3. DMR Data: No DMR data
4. Water Quality Data: Water quality limits are addressed at the final outfalls.
5. Effluent limitation guidelines: 40 CFR Part 423.12: the pH of all discharges, except once-though cooling water shall be within the range of 6.0-9.0 standard units.
6. Other information: The pH limits on the final are at least as stringent as or more stringent than the effluent guidelines.
7. PQL: Not applicable
8. Conclusion: pH is not limited at this internal outfall, as limitations have been set at the final outfalls.

Total Copper

1. Previous permit limits:
   Monthly average: 1.0 mg/l
   Daily maximum: 1.0 mg/l
   Sampling frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: < 100.00 mg/l (0 lb/d)
3. DMR Data: No reported discharge
4. Water Quality Data: see spreadsheet
5. Other Information:
6. Does the discharge cause, have the Reasonable Potential to Cause or Contribute: Not applicable (this is an

internal outfall).

7. Effluent Limitations Guidelines: 40 CFR Part 423.12 for metal cleaning waste
   Monthly average: 1.0 mg/l
   Daily maximum: 1.0 mg/l
8. PQL: 0.010 mg/l
9. Conclusion: The limits are in accordance with 40 CFR Part 423.12. Monitoring is only required when *chemical* metal cleaning waste is discharged.
   Monthly average: 1.0 mg/l
   Daily maximum: 1.0 mg/l
   Sampling frequency: 1/Month
   Sample type: Grab

Iron

1. Previous permit limits:
   Monthly average: 1.0 mg/l
   Daily maximum: 1.0 mg/l
   Sampling frequency: 1/Month
   Sample type: Grab
2. NPDES Application: (# of analyses: 1)
   Maximum Daily Value: 256 µg/l (0 lb/d)
3. DMR Data: No reported discharge
4. Water Quality Data: see spreadsheet
5. Other Information:
6. Does the discharge cause, have the Reasonable Potential to Cause or Contribute: Not applicable (this is an internal outfall).
7. Effluent Limitations Guidelines: 40 CFR Part 423.12 for metal cleaning waste
   Monthly average: 1.0 mg/l
   Daily maximum: 1.0 mg/l
8. PQL: 0.020 mg/l
9. Conclusion: The limits remains in accordance with 40 CFR Part 423.12. Monitoring is only required when *chemical* metal cleaning waste is discharged.
   Monthly average: 1.0 mg/l
   Daily maximum: 1.0 mg/l
   Sampling frequency: 1/Month
   Sample type: Grab

Groundwater Monitoring Requirements No changes have been made to the groundwater monitoring requirements in the permit with the exception of the additional groundwater well 17 that is existing. The six existing groundwater monitoring wells (GW-8, 9, 12, 13A, 15A and 17) shall continue to be monitored as specified in the permit.

Threatened and Endangered Species Information Bald Eagles, a South Carolina Threatened Species, have been spotted in the vicinity of this discharge. Based on known information, the Department feels this permit is protective of the threatened and endangered species identified that this discharge may have the potential to affect.

316(b) Requirements

Section 316(b) of the CWA requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing environmental impact. On October 14, 2014, new regulations, called the Existing Facilities Rule, became effective for cooling water intake structures at existing NPDES facilities. The regulations were published in the Federal Register on Aug. 15, 2014 (79 FR 48424). The regulations are listed in 40 CFR 125.90-99 (Subpart J) and 122.21(r).

The V C Summer Station is an existing facility because construction commenced prior to January 17, 2002. Therefore, the cooling water intake structure there is subject to these new regulations.

The intake structure at the V C Summer Station, located in the Monticello Reservoir has a design intake capacity of 768 MGD with an actual intake flow higher than 125 MGD. Although the existing cooling water system operates as once-through, the Monticello Reservoir was constructed to function as the cooling water system. As such, the EPA and the Department have determined this system meets the definition of 'closed-cycle recirculating system' in 40 CFR 125.92(c)(2). In addition, 122.21(r)(1)(ii)(E) allows the Department to waive the application requirements of 122.21(r)(9) – (13) for closed-cycle cooling facilities that withdraw greater than 125 MGD, and the Department has granted this waiver.

The 93 feet wide intake structure consists of six intake bays about 13 feet wide each; parallel retainer walls; skimmer wall with trash racks (10-inch spacing); vertical traveling screens located 25 feet from the trash racks and with 3/8 inch mesh openings; three 395.94 cfs circulating pumps and two 225 gpm screen wash pumps. The intake velocity is 1.31 fps through the traveling screens.

Impingement Mortality Best Technology Available (BTA): The V C Summer cooling water system meets the definition of 'closed-system recirculating system', the first of the BTA Standards for Impingement Mortality in 40 CFR 125.94(c).

Entrainment Best Technology Available: 40 CFR 125.98(f)(1) and (2) require that the rationale include the information below regarding the Department's site-specific BTA determination for entrainment.

40 CFR 125.98(f)(1): "The Director must provide a written explanation of the proposed entrainment determination in the fact sheet or statement of basis for the proposed permit under 40 CFR 124.7 or 124.8. The written explanation must describe why the Director has rejected any entrainment control technologies or measures that perform better than the selected technologies or measures, and must reflect consideration of all reasonable attempts to mitigate any adverse impacts of otherwise available better performing entrainment technologies."

The EPA and the Department agree this facility operates as a 'closed-cycle recirculating system' as defined in 40 CFR 125.92(c)(2).

In the following statements from the August 15, 2014 Federal Register, the U.S. EPA state their conclusion that a closed-cycle recirculating system is the best performing entrainment reduction technology. Note that there are no better performing entrainment technologies than closed-cycle recirculating systems.

"In addition, there is a need to regulate even those facilities that adopt the most effective technology. Closed-cycle cooling is a technology that..." p. 48303

"EPA identified only one high performing technology as a potential BTA candidate for entrainment: closed-cycle recirculating systems as defined at 125.92(c)(1). While there are other technologies for entrainment that are available or demonstrated, they are not uniformly high performing technologies." p. 48330

"While EPA concluded that closed-cycle recirculating systems reduce entrainment (and impingement mortality) to the greatest extent and are the most effective performing technology..." p. 48340

"EPA also determined that there were no other "available" technologies for entrainment whose performance came close to that of closed-cycle recirculating systems." p. 48340

40 CFR 125.98(f)(2): The proposed determination in the fact sheet or statement of basis must be based on consideration of any additional information required by the Director at §125.98(i) and the following factors listed below. The weight given to each factor is within the Director's discretion based upon the circumstances of each facility.

(i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);

Entrainment studies were completed at VC Summer in 1983-1984 for the original 316(b) study, in 2008-2009 and again in March-August 2016. Planktonic fish larvae is the most susceptible life stage entrained at V C Summer. Threadfin shad, gizzard shad, and white perch are the most susceptible species entrained. These species are in abundance in the Monticello Reservoir and are very fertile. Note there are no aquatic threatened or endangered species or designated critical habitat in the Monticello Reservoir.

The EPA and the Department agree this facility operates as a closed-cycle cooling system, which EPA has determined is the most effective technology (p. 48303, August 15, 2014 Federal Register), reduces entrainment to the greatest extent (p. 48340), and that there were no other available technologies whose performance came close to that of closed-cycle recirculating systems (p. 48340). EPA considered selecting closed-cycle cooling as the best technology available standard for entrainment but did not do so (p. 48330) because the technology is not available nationally (p. 48338).

(ii) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;

This is not a factor in this BTA determination for because V C Summer utilizes the most effective entrainment reduction technology.

iii) Land availability in as much as it relates to the feasibility of entrainment technology;

This is not a factor in this BTA determination for because the V C Summer utilizes the most effective entrainment reduction technology.

iv) Remaining useful plant life; and

This is a factor only if investments for other technologies are justified. This is not a factor in this BTA

determination for because the V C Summer utilizes the most effective entrainment reduction technology.

(v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

Information on quantified and qualitative social benefits and cost of available entrainment technologies is not of sufficient rigor to make a decision. VC Summer already employs the technology that EPA considers to be the best performing technology.

The Department has determined that the cooling water intake structure reflects the best technology available for entrainment and impingement mortality by operating a closed-cycle recirculating cooling system.

II. GENERAL INFORMATION

A. The effluent from this facility may be subject to the requirements of any of the following regulations: R.61-68, R.61-69, R.61-9.122, 124, 125, 129, 133, and 403; 40 CFR Part 136; Subchapter N (40 CFR Parts 400 through 402 and 404 through 471); and R.61-9.503, 504 and 505.

B. Authority: This permit is written in accordance with applicable laws and regulations including, but not limited to, Regulation 61-9, Regulation 61-68, Pollution Control Act and Clean Water Act.

C. Under R.61-9.124.8 (Fact Sheet), a fact sheet shall be prepared for every draft permit for a major NPDES facility or activity, for every Class I sludge management facility, for every NPDES draft permit that incorporates a variance or requires an explanation under section 124.56(b), and for every draft permit which the Department finds is the subject of wide-spread public interest or raises major issues.

D. The conclusions noted in the Rationale establish proposed effluent limitations and permit requirements addressed in R.61-9.122.43 (Establishing Permit Conditions), R.61-9.122.44 (Establishing Limitations, Standards and other permit conditions) and other appropriate sections of R.61-9.

III. BACKGROUND AND PROCEDURES FOR PERMIT LIMIT DEVELOPMENT

A. The receiving waterbody 7Q10, annual average flow or other critical flow condition at the discharge point, and 7Q10, annual average flow, or other critical flow condition for source water protection are determined by the SCDHEC's Wasteload Allocation Section. The 7Q10, Annual Average Flow or other critical flow conditions are based on information published or verified by the USGS, an estimate extrapolation from published or verified USGS data or from data provided by the permittee. These flows may be adjusted by the Wasteload Allocation Section to account for existing water withdrawals that impact the flow. The 7Q10 (or 30Q5 if provided by the applicant), annual average flow at the discharge point, or other critical flow condition or 7Q10 (or 30Q5 if provided by the applicant), annual average flow or other critical flow condition for source water protection for a proposed or existing surface water drinking water intake will be used to determine dilution factors, as appropriate, in accordance with R.61-68.C.4.a & 4.b for aquatic life, human health, and organoleptic effects respectively.

B. Water and organism consumption and drinking water MCL criteria will be evaluated for protection of human health when calculating dilution factors. "The Department may, after Notice of Intent included

in a notice of a proposed NPDES permit in accordance with Regulation 61-9.124.10, determine that drinking water MCLs or W/O shall not apply to discharges to those waterbodies where there is: no potential to affect an existing or proposed drinking water source and no state-approved source water protection area." For permitting purposes, "a proposed drinking water source is one for which a complete permit application, including plans and specifications for the intake, is on file with the Department at the time of consideration of an NPDES permit application for a discharge that will affect or has the potential to affect the drinking water source" (R.61-68.E.14.c(5)).

The Department will implement this protection in NPDES permits using the source water protection program already developed for the drinking water program. A source water protection program was developed originally in 1999 to define the source water protection areas for each drinking water intake. The program was designed to identify source water protection areas (SWPAs) to aid drinking water systems in identifying sources of potential contamination that could affect their intakes. In September 2009, this program was modified to redefine the SWPAs as smaller, more manageable areas. The revised document developed in September 2009 is entitled "South Carolina Drinking Water Source Assessment and Protection Program." For the purposes of NPDES permitting, the SWPA referred to in Regulation 61-68.E.14.c(5) is the Primary Protection Area defined in the revised assessment and protection document. More information regarding the use of these protection areas is provided later in this rationale with the discussion of the procedure for establishing permit limits in Section G.2.

C. Application of numeric criteria to protect human health: If separate numeric criteria are given for organism consumption, water and organism consumption (W/O), and drinking water Maximum Contaminant Levels (MCLs), they shall be applied as appropriate. The most stringent of the criteria shall be applied to protect the existing and classified uses of the waters of the State (R.61-68.E.14.b(1)).

D. Numeric criteria have been established in R.61-68 based on organoleptic data (prevention of undesirable taste and odor). For those substances which have aquatic life and/or human health numeric criteria and organoleptic numeric criteria, the most stringent of the three shall be used for derivation of permit effluent limitations. See R.61-68.E.13.

E. Sampling Frequency: Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in the permit (R.61-9.122.41(j)(4)). Typically, requirements to report monitoring results shall be established on a case-by-case basis with a frequency dependent on the nature and effect of the discharge but in no case less than once a year (R.61-9.122.44(i)(2)).

F. Compliance Schedules:

1. A person issued an NPDES permit by the Department who is not in compliance with applicable effluent standards and limitations or other requirements contained therein at the time the permit is issued, shall be required to achieve compliance within a period of time as set forth by the Department, with effluent standards and limitations, with water quality standards, or with specific requirements or conditions set by the Department. The Department shall require compliance with terms and conditions of the permit in the shortest reasonable period of time as determined thereby or within a time schedule for compliance which shall be specified in the issued permit. (R.61-

9.122.47(c)(1))

2. If a time schedule for compliance specified in an NPDES permit which is established by the Department, exceeds nine (9) months, the time schedule shall provide for interim dates of achievement for compliance with certain applicable terms and conditions of the permit. (R.61-9.122.47(c)(2))

G. Procedure for establishing effluent limitations:

1. Effluent limits (mass and concentration) for Five day Biochemical Oxygen Demand (BOD_5), Ultimate Oxygen Demand (UOD), Dissolved Oxygen (DO), Total Ammonia Nitrogen (as N), and Nutrients (e.g., nitrogen and phosphorus) are established by the Wasteload Allocation (WLA) Section, with consideration given to technology-based limitations.

   a. Five day Biochemical Oxygen Demand BOD_5, Ultimate Oxygen Demand (UOD), Dissolved Oxygen (DO):

      Effluent limits for conventional oxygen demanding constituents (BOD_5, UOD and DO) are established to protect in-stream water quality, while utilizing a portion of the assimilative capacity of the receiving water. The ability of a water body to assimilate oxygen-demanding substances is a function of its physical and chemical characteristics above and below the discharge point. Various mathematical techniques, called models, have been developed to estimate this capacity. The Department follows the procedures as outlined in the "State/EPA Region IV Agreement on the Development of Wasteload Allocations/Total Maximum Daily Loads and NPDES Permit Limitations" dated October 30, 1991 (as updated) for determining the assimilative capacity of a given water body. Mathematical models such as QUAL2E and QUAL2E-UNCAS are used in accordance with "Enhanced Stream Water Quality Models QUAL2E and QUAL2E-UNCAS: Documentation and Users Manual" (EPA/600/3-87/007; dated May 1987) as updated. BOD_5 and UOD values determined from modeling results will be used in permitting as monthly average derived limits (C_{wla}). Daily maximum derived limits will typically be determined by multiplying the monthly average value by two.

      For facilities subject to effluent guidelines limitations or other technology-based limitations, BOD_5 will also be evaluated in accordance with the applicable industrial categorical guidelines. These guidelines will be identified in Part I of this rationale when they are applicable to the permit.

   b. Total Ammonia Nitrogen (as N):

      Ammonia limitations based on oxygen demand will be determined from modeling information as described above. These values will be used as monthly average derived limits and a daily maximum will typically be determined by multiplying the monthly average derived limit by two. These values will be compared with the ammonia water quality criteria for protection of aquatic life from Regulation 61-68, Attachment 3 and any categorical limitations. The more stringent of the limitations will be imposed. Calculations for aquatic life criteria and other wasteload recommendations are shown in Part I of this rationale when ammonia is a pollutant of concern.

c. Discharges of Nutrients:

In order to protect and maintain lakes and other waters of the State, consideration is given to the control of nutrients reaching the waters of the State. Therefore, in accordance with regulation R.61-68.E.11**,** the Department controls the nutrients as prescribed below. Nutrient limitations will be determined from the best available information and/or modeling performed by the Wasteload Allocation Section to meet these water quality standards.

i. Discharges of nutrients from all sources, including point and nonpoint, to waters of the State shall be prohibited or limited if the discharge would result in or if the waters experience growths of microscopic or macroscopic vegetation such that the water quality standards would be violated or the existing or classified uses of the waters would be impaired. Loading of nutrients shall be addressed on an individual basis as necessary to ensure compliance with the narrative and numeric criteria.

ii. Numeric nutrient criteria for lakes are based on an ecoregional approach which takes into account the geographic location of the lakes within the State and are listed below. These numeric criteria are applicable to lakes of 40 acres or more. Lakes of less than 40 acres will continue to be protected by the narrative criteria.

1. For the Blue Ridge Mountains ecoregion of the State, total phosphorus shall not exceed 0.02 mg/l, chlorophyll *a* shall not exceed 10 ug/l, and total nitrogen shall not exceed 0.35 mg/l

2. For the Piedmont and Southeastern Plains ecoregions of the State, total phosphorus shall not exceed 0.06 mg/l, chlorophyll *a* shall not exceed 40 ug/l, and total nitrogen shall not exceed 1.50 mg/l

3. For the Middle Atlantic Coastal Plains ecoregion of the State, total phosphorus shall not exceed 0.09 mg/l, chlorophyll *a* shall not exceed 40 ug/l, and total nitrogen shall not exceed 1.50 mg/l.

iii. In evaluating the effects of nutrients upon the quality of lakes and other waters of the State, the Department may consider, but not be limited to, such factors as the hydrology and morphometry of the waterbody, the existing and projected trophic state, characteristics of the loadings, and other control mechanisms in order to protect the existing and classified uses of the waters.

iv. The Department shall take appropriate action, to include, but not limited to: establishing numeric effluent limitations in permits, establishing Total Maximum Daily Loads, establishing waste load allocations, and establishing load allocations for nutrients to ensure that the lakes attain and maintain the narrative and numeric criteria and other applicable water quality standards.

v. The criteria specific to lakes shall be applicable to all portions of the lake. For this purpose,

the Department shall define the applicable area to be that area covered when measured at full pool elevation.

2. Effluent concentration limits (C_{efflim}) for parameters other than the parameters listed in G.1.a-c (except ammonia toxicity calculations) above are established using the following procedures:

Q_{7Q10}	7Q10 or other critical flow condition of the receiving water at the discharge point in mgd. (may require adjustment for withdrawals)
AAF_d	Average Annual Flow (AAF) or other critical flow condition of the receiving water at the discharge point in mgd. (may require adjustment for withdrawals)
Q_{7Q10i}	7Q10 or other critical flow condition of the receiving water at either the SWP Area 15-river mile boundary or at the intake, as appropriate, in mgd.
AAF_i	Average Annual Flow (AAF) of the receiving water at either the SWP Area 15-river mile boundary or at the intake, as appropriate, in mgd.
Q_d	Long term average discharge flow in mgd.

a. Determine dilution factors:
The following information is to be used (where applicable) for establishing effluent concentration limits:

DF_1: This dilution factor is based on 7Q10 or other critical flow condition of the receiving water at the discharge point (Q_{7Q10}). This dilution factor is used to determine the derived limits for protection of the following aquatic life and human health concerns for the reasons indicated:

i. Aquatic Life (see R.61-68.C.4.a(1)). Protection of aquatic life on a short-term basis is needed at the point where aquatic organisms become exposed to the discharge.

ii. Human Health – Organism Consumption for parameters identified as non-carcinogens per R.61-68.C.4.b(1). Protection for human health on a short-term basis for consumption of aquatic organisms is needed at the point the aquatic organisms become exposed to the discharge.

$$DF_1 = \left(\frac{Q_{7Q10} + Q_d}{Q_d} \right)$$

DF_2: This dilution factor is based on the Average Annual Flow or other critical flow of the receiving water at the discharge point (AAF_d). This dilution factor is used to determine the derived limits for protection of the following human health and organoleptic concerns for the reasons indicated:

i. Human Health – Organism Consumption for parameters identified as carcinogens per R.61-68.C.4.b(1). Protection for human health on a long-term basis to prevent cancer due to consumption of aquatic organisms is needed at the point the aquatic organisms become exposed to the discharge.

ii. Organoleptic effects per R.61-68.C.4.b(1). Protection for taste and odor issues related to the discharge is needed at the point where the discharge enters the receiving water.

$$DF_2 = \left(\frac{AAF_d + Q_d}{Q_d} \right)$$

DF$_3$: This dilution factor is based on the 7Q10 or other critical flow condition (Q_{7Q10i}) for protection of a proposed or existing surface water drinking water intake that the discharge has the potential to affect. This dilution factor is used to determine the derived limits for protection of the following human health concerns for the reasons indicated:

i. Human Health – Water and Organism (W/O) Consumption for parameters identified as non-carcinogens per R.61-68.C.4.b(1) and E.14.c(5) to protect for short-term health effects when the discharge has the potential to affect a surface water drinking water intake. Protection of human health relative to drinking the water from the waterbody and consuming aquatic organisms from the same waterbody is provided by this criterion, but drinking the water withdrawn from the waterbody may require a higher level of protection in terms of applicable dilution than consumption of organisms.

ii. Human Health - Drinking Water Maximum Contaminant Level (MCL) for parameters identified as non-carcinogens per R.61-68.C.4.b(1) and E.14.c(5) to protect for short-term health effects when the discharge has the potential to affect a surface water drinking water intake. Protection of human health relative to drinking the water from the waterbody after conventional treatment per R.61-68.G is provided by this criterion.

$$DF_3 = \left(\frac{Q_{7Q10i} + Q_d}{Q_d} \right)$$

DF$_4$: This dilution factor is based on the Average Annual Flow or other critical flow condition (AAF_i) for protection of a proposed or existing surface water drinking water intake that the discharge has the potential to affect. This dilution factor is used to determine the derived limits for protection of the following human health concerns for the reasons indicated:

i. Human Health–Water and Organism Consumption for parameters identified as carcinogens per R.61-68.C.4.b(1) and E.14.c(5) to protect for long-term health effects due to cancer when the discharge has the potential to affect a surface water drinking water intake. Protection of human health relative to drinking the water from the waterbody and consuming aquatic organisms from the same waterbody is

provided by this criterion, but drinking the water withdrawn from the waterbody may require a higher level of protection in terms of applicable dilution than consumption of organisms.

ii. Human Health - Drinking Water Maximum Contaminant Level (MCL) for parameters identified as carcinogens per R.61-68.C.4.b(1) and E.14.c(5) to protect for long-term health effects due to cancer when the discharge has the potential to affect a surface water drinking water intake. Protection of human health relative to drinking the water from the waterbody after conventional treatment per R.61-68.G is provided by this criterion.

$$DF_4 = \left(\frac{AAF_i + Q_d}{Q_d} \right)$$

For both DF_3 and DF_4, to satisfy the mixing zone requirements of R.61-68.C.10(a) for both W/O and MCL criteria, the Department will use the following flows to determine dilution:

1. The following applies to discharges and intakes in flowing rivers:

   a. Where the discharge is within the SWPA (15 river miles) of the intake, the flow at the 15-river mile boundary of the tributary with the largest applicable critical flow will be used.

   b. Where the discharge is outside the SWPA (15 river miles) of the intake, the applicable critical flow at the intake will be used.

2. When the discharge is either in the tributary to a lake or in a lake and the intake is in the same lake that does not behave as a run-of- river impoundment*, the flow is determined using the sum of the applicable critical flows of all tributaries entering the lake.

3. The following applies when both the discharge and the intake are in a lake arm that behaves as a run-of-river impoundment*:

   a. Where the discharge is within the SWPA (15-mile buffer which may include both lake and river miles) of the intake, the flow at the 15-mile boundary of the tributary with the largest applicable critical flow will be used.

   b. Where the discharge is outside the SWPA (15-mile buffer which may include both lake and river miles) of the intake, the applicable critical flow at the intake will be used.

4. Where the discharge is in the arm of a lake and the intake is in the upper reach of another arm of the lake, no protection of W/O or MCL criteria is needed because the discharge does not have the potential to affect the intake,

5. If the discharge has the potential to affect multiple intakes, the SWPA of the intake closest to the discharge will be protected. However, the permittee may be required to provide

notification to all potentially affected intakes.

* Run-of-river impoundment is defined as a lake or reservoir (or arm of a lake or reservoir) that is narrow and/or shallow offering little dilution or delay in contaminant flow toward an intake.

b. Determine derived limits using the following procedures:

WQS_{al} Freshwater Standard (based on an established criteria or other published data per R.61-68) for protection of Aquatic Life; may be a CCC or CMC as defined below

WQS_{org} Standard (based on an established criteria or other published data per R.61-68) for protection of Human Health – Organism Consumption

WQS_{wo} Standard (based on an established criteria or other published data per R.61-68) for protection of Human Health – Water & Organism Consumption.

WQS_{mcl} Standard (based on an established criteria or other published data per R.61-68) for Drinking Water MCL (Maximum Contaminant Level).

WQS_{ol}: Standard (based on an established criteria or other published data per R.61-68) based on Organoleptic Data.

C_{aqlife} Concentration limit derived from aquatic life data

C_{HH} Concentration limit derived from human health data as determined from organism (C_{org}), water/organism (C_{wo})and MCL (C_{mcl}) data

C_{ol} Concentration limit derived from organoleptic data

C_b The background concentration of the concerned parameter in mg/l is typically determined from ambient monitoring data or data provided by applicant. If the waterbody to which the discharge flows is not on the 303(d) list, the 90th percentile of ambient monitoring data for aquatic life protection for the parameters identified in the Appendix (Water Quality Numeric Criteria) to Regulation 61-68 from the last 3 years, or whatever is available if less than 3 years, will typically be used. If the waterbody to which the discharge flows is not on the 303(d) list, the median value of ambient monitoring data for human health protection for the parameters identified in the Appendix (Water Quality Numeric Criteria) to Regulation 61-68 from the last 3 years, or whatever is available if less than 3 years, will typically be used. The background concentration is assumed to be zero (0) in the absence of actual data based on Departmental guidance and EPA recommendation.

i. Determine the derived limits for protection of Aquatic Life (C_{aqlife})

1. The following guidelines apply to determining aquatic life limits using this basic equation:

$$C_{aqlife} = (DF_1 \times WQS_{al}) - \left\{ C_b \times \left(\frac{Q_{7Q10}}{Q_d} \right) \right\}$$

a. Typically, the Criterion Maximum Concentration (CMC) is applied as a daily maximum derived limit and the Criterion Continuous Concentration (CCC) is applied

as a monthly average derived limit, after consideration of dilution and background concentrations. The CMC and CCC for specific metals will be adjusted using the procedures in 60 FR 22229, "Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance-Revision of Metals Criteria," May 4, 1995 and the "Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria," Oct. 1, 1993 and applied as a daily maximum and monthly average, respectively, after consideration of dilution and background concentrations. For specific metals, this calculation is explained in detail later in this rationale.

monthly average = C_{aqlife} using CCC as WQS_{al}
daily maximum = C_{aqlife} using CMC as WQS_{al}

b. If only a CMC exists for a particular parameter, the daily maximum derived permit limit will be set using that value, after consideration of dilution and background concentrations. If no other values (e.g., human health) exist for that parameter on which to base a monthly average limit and the discharge is continuous, the monthly average will be set equal to the daily maximum to satisfy Regulation 61-9.122.45(d). In no case shall the monthly average limit be set higher than the daily maximum limit. If only a CCC is given, it will be used as a monthly average derived limit and the daily maximum derived limit will be two (2) times the value obtained for the monthly average based on a simplified statistical procedure for determining permit limits recommended in Section 5.4.2 of the US EPA's "Technical Support Document for Water Quality-based Toxics Control", EPA/505/2-90-001, March 1991 (hereafter known as the TSD).

If a CCC exists and no CMC exists and no other acute or chronic data exists, the aquatic life limits are

monthly average = C_{aqlife} using CCC as WQS_{al}
daily maximum = 2 x C_{aqlife}

If a CMC and no CCC exists, and no other acute or chronic data exists, the aquatic life limits are

monthly average = C_{aqlife} using CMC as WQS_{al}
daily maximum = C_{aqlife} using CMC as WQS_{al}

c. If only an acute toxicity effect concentration for a number of species for a particular pollutant is given as a LC_{50}, the lowest concentration should be divided by an acute-to-chronic ratio (ACR) of 10 and a sensitivity factor of 3.3, for an acceptable instream concentration in order to protect against chronic toxicity effects (R.61-68.E.16.a(1)). Other acute toxicity data will be handled similarly. The value obtained from this calculation will be used as a monthly average derived limit after consideration of dilution and background concentrations. The daily maximum will be two (2) times the value obtained for the monthly average based on a simplified statistical

procedure for determining permit limits recommended in Section 5.4.2 of the TSD.

monthly average = C_{aqlife} using other data as WQS_{al}
daily maximum = 2 x C_{aqlife}

d. If a chronic toxicity effect concentration for a number of species for a particular pollutant is given as a no observed effect concentration (NOEC), the lowest concentration should be divided by a sensitivity factor of 3.3 in order to protect against chronic toxicity to the most sensitive species (R.61-68.E.16.a(2)). Other chronic toxicity data will be handled similarly. The value obtained from this calculation will be used as a monthly average derived limit after consideration of dilution and background concentrations. The daily maximum will be two (2) times the value obtained for the monthly average based on a simplified statistical procedure for determining permit limits recommended in Section 5.4.2 of the TSD.

monthly average = C_{aqlife} using other data as WQS_{al}
daily maximum = 2 x C_{aqlife}

e. If both acute and chronic data are available for a particular pollutant, monthly average derived limit will be calculated as in c and d above for each acute and chronic, respectively. The more stringent of the monthly average derived limits will be the monthly average derived limit used after consideration of dilution and background concentrations. The daily maximum will be two (2) times the value obtained for the monthly average based on a simplified statistical procedure for determining permit limits recommended in Section 5.4.2 of the TSD.

monthly average = C_{aqlife} using other data as WQS_{al}
daily maximum = 2 x C_{aqlife}

f. Consider the background concentration (C_b) of the parameter of concern. If the background concentration is equal to or greater than the applicable standard (*WQS,* as defined above) for the parameter of concern, then the derived concentration limit (C_{aqlife}) for that parameter is established equal to the standard (*WQS*) so that no additional amount of that pollutant is added to the waterbody. An exception exists where the naturally occurring instream concentration for a substance is higher than the derived permit effluent limitation. In those situations, the Department may establish permit effluent limitations (C_{efflim}) at a level higher than the derived limit, but no higher than the natural background concentration (i.e. a "rise above background" limit). In such cases, the Department may require biological instream monitoring and/or whole effluent toxicity (WET) testing (R.61-68.E.14.c(2)).

If C_b is not based on naturally occurring concentrations and

$$C_b \geq WQS$$

Then, generally,

$$C_{\text{aqlife}} = WQS.$$

If C_b is based on naturally occurring concentrations and

$$C_b \geq WQS$$

Then, generally,

$$C_{\text{aqlife}} < C_{eff\,\text{lim}} \leq C_b .$$

2. Metals: Regulation 61-9.122.45(c) requires that permit limits be expressed in terms of total recoverable metal (with limited exceptions). In order to translate from the water quality criterion to a total recoverable metal, Regulation R.61-68.E.14.c(4) provides for the use of the EPA Office of Water Policy and "Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria", October 1, 1993. A subsequent revision published in the Federal Register (60 FR 22229) on May 4, 1995 updated the data in the original report. See R.61-68 Appendix for CMC and CCC values and equations, Attachment 1 for "Conversion Factors for Dissolved Metals" and Attachment 2 "Parameters for Calculating Freshwater Dissolved Metals Criteria that are Hardness-Dependent".

   Per R.61-68.E.14.a(3), the CMC and CCC are based on a hardness of 25 mg/l if the ambient or mixed stream hardness is equal to or less than 25 mg/l. Concentrations of hardness less than 400 mg/l may be based on the mixed stream hardness if it is greater than 25 mg/l and less than 400 mg/l and 400 mg/l if the ambient stream hardness is greater than 400 mg/l. The ambient stream hardness is assumed to be 25 mg/l in the absence of actual stream data. Mixed stream hardness may be determined using flow-weighted effluent hardness and stream hardness.

   The following equations and constants will be used to calculate aquatic life metals limits based on these documents. The values of the terms referenced in this section and determined from the equations below are included in the Metals spreadsheet attached to this rationale. The following metals are subject to this section:

arsenic	lead
cadmium	mercury
chromium (III & VI)	nickel
copper	zinc

   The equation for C_d below changes the total metal to dissolved metal. From Technical Guidance Manual for Performing Waste Load Allocations Book II, Rivers and Streams, EPA/440/484/022,

$$S = CCC \; or \; CMC \quad \text{(adjusted for hardness)}$$
$$C_d = S \times CF$$

   where C_d = Dissolved metal concentration (µg/l)
   S = a constant to represent the CCC or CMC (µg/l)
   CF = Conversion factor considered most relevant in fresh water for aquatic

life as defined by EPA for each metal

Once the dissolved metal concentration is known, determine C_p using the equation for C_d above and the following equations.

$$C_p = C_d \times \left\{1 + \left(K_{pb} \times TSS_b \times 10^{-6}\right)\right\}$$

$$K_{p_b} = K_{po} \times (TSS_b)^a$$

where C_p = Particulate sorbed metal concentration (µg/l). This value represents the revised water quality criterion for the metal to be used for ambient data comparison.

K_{pb} = Linear partition coefficient using the stream TSS (liters/mg)

K_{po} = Metal-specific equilibrium constant (liters/mg)

a = Metal-specific constant

TSS_b = Background or in-stream Total Suspended Solids (TSS) concentration (mg/l). The background TSS is assumed to be 1 mg/l in the absence of actual instream data based on the 5th percentile of ambient TSS data on South Carolina waterbodies from 1993-2000.

To determine the effluent limit (C_{aqlife}), use the following equations to translate the limits into a total recoverable metal concentration.

$$TSS_{avg} = \frac{(Q_d \times TSS_e) + \left(Q_{7Q10} \times TSS_b\right)}{Q_d + Q_{7Q10}}$$

where TSS_e = Effluent Total Suspended Solids (TSS) concentration (mg/l) determined from actual long-term average data or proposed permit limits if no data available.

TSS_{avg} = Average in-stream (mixed) TSS concentration (mg/l)

$$C_t = C_d \times \left\{1 + \left(K_p \times TSS_{avg} \times 10^{-6}\right)\right\}$$

$$K_p = K_{po} \times (TSS_{avg})^a$$

where C_t = Total metal concentration (µg/l)

K_p = Linear partition coefficient (liters/mg). This is the distribution of metal at equilibrium between the particulate and dissolved forms.

Once C_t has been calculated, it is multiplied by DF_1 and background concentrations are accounted for to obtain the derived limit (max or avg) (C_{aqlife}):

$$C_{aqlife} = (C_t \times DF_1) - \left\{ C_b \times \left(\frac{Q_{7Q10}}{Q_d} \right) \right\}$$

monthly average = C_{aqlife} based on CCC
daily maximum = C_{aqlife} based on CMC

3. Where a Water Effects Ratio (WER) is used to adjust a criterion, derived limits for the adjusted aquatic life criterion ($C_{aqlife\text{-}adj}$) are calculated as follows. The WER is a type of site-specific permit effluent limit (as allowed by R.61-68.E.14.c(7)) derived using a ratio determined from EPA methodology. Both DHEC and EPA must approve the WER prior to implementation. See EPA's 1994 "Interim Guidance on the Determination and Use of Water-Effect Ratios (WERs) for Metals." The approved WER will be shown in the water quality spreadsheets on the Data sheet. The revised aquatic life value will be shown with the WER, hardness and dissolved metals adjustments, as appropriate, in the aquatic life columns on the Pollutant spreadsheet.

   a. For metals identified in #2 above, revise the equation for S as follows:

      S = [CCC or CMC (adjusted for hardness)] x WER

      Follow the remaining calculations in #2 above to get an adjusted C_{aqlife} value that will be used to determine derived limits:

      monthly average = $C_{aqlife\text{-}adj}$ based on CCC
      daily maximum = $C_{aqlife\text{-}adj}$ based on CMC

   b. For other parameters, use the appropriate equation in #1 above to derive an adjusted C_{aqlife} value. The monthly average will be calculated as follows using the appropriate WQS_{al} and the daily maximum calculated using the appropriate equations in #1 above.

$$C_{aqlife-adj} = (DF_1 \times WQS_{al} \times WER) - \left\{ C_b \times \left(\frac{Q_{7Q10}}{Q_d} \right) \right\}$$

4. Where the Recalculation Procedure is used to adjust a criterion, derived limits for the adjusted aquatic life criterion ($C_{aqlife\text{-}adj}$) are calculated as follows. The Recalculation Procedure is intended to cause a site-specific criterion to appropriately differ from the State-adopted national aquatic life criterion if justified by demonstrated pertinent toxicological differences between the aquatic species that occur at the site and those that were used in the derivation of the criterion. It is important to note that the site (the portion of the waterbody or watershed being affected) must be clearly defined. This procedure is used to develop site-specific criteria in accordance with R.61-68.C.12. Both DHEC and EPA must approve the recalculated criterion prior to implementation. The recalculated criterion will require an update to the Water Classifications and Standards

Regulations, R.61-68 and 61-69.

The approved recalculated aquatic life criteria (*SS*-CCC and *SS*-CMC, as appropriate) will be shown adjusted for hardness on the Data spreadsheet. The additional dissolved metals adjustments, as appropriate, will be shown in the aquatic life columns on the Pollutant spreadsheet. If the parameter being adjusted is one of the metals in #2 above, SS will include all the appropriate metals adjustments.

$$C_{aqlife-adj} = (DF_1 \times SS - \left\{ C_b \times \left(\frac{Q_{7Q10}}{Q_d} \right) \right\}$$

monthly average = $C_{aqlife\text{-}adj}$ based on CCC
daily maximum = $C_{aqlife\text{-}adj}$ based on CMC

5. Where a WER and recalculation procedure are combined to adjust a criterion, derived limits ($C_{aqlife\text{-}adj}$) for aquatic life protection are calculated by combining the calculations in #3 and #4.

$$C_{aqlife-adj} = (DF_1 \times SS \times WER) - \left\{ C_b \times \left(\frac{Q_{7Q10}}{Q_d} \right) \right\}$$

monthly average = $C_{aqlife\text{-}adj}$ based on CCC
daily maximum = $C_{aqlife\text{-}adj}$ based on CMC

6. Other scientifically defensible methods for developing site-specific aquatic life effluent limits or site-specific criterion may be used on a case-by-case basis.

ii. Determine derived limits for protection of Human Health

1. The following guidelines apply to determining human health limits:

a. The human health criterion given by Regulation 61-68 will be applied as a monthly average derived limit after consideration of dilution and background concentrations ($C_{HH\text{-}avg}$). Exceptions exist based on EPA criteria and are indicated for specific parameters. No limits on human health based on water and organism consumption or drinking water MCLs will be imposed if there is no potential to affect an existing or proposed surface water drinking water intake and no state-approved source water protection area in accordance with Regulation 61-68.E.14.c(5).

b. The daily maximum permit limit will be determined from the monthly average value from (a) above and a multiplier (*M)* determined using a statistical procedure recommended in Section 5.5 using average = 95th percentile from Table 5-3 in the TSD. The permitted or proposed number of samples per month (n) is used with the coefficient of variation (CV) to determine *M*.

$$M = \frac{e^{(Z_m\sigma - 0.5\sigma^2)}}{e^{(Z_a\sigma_n - 0.5\sigma_n^2)}}$$

where:

$$\sigma_n^2 = \ln\left(\frac{CV^2}{n} + 1\right)$$

$$\sigma^2 = \ln\left(CV^2 + 1\right)$$

CV = coefficient of variation of the effluent concentration. For a data set where *n*>10, the *CV* is calculated as standard deviation divided by mean for the data set being evaluated. For data set where *n*<10, the *CV* is estimated to equal 0.6. For less than 10 items of data, the uncertainty in the *CV* is too large to calculate a standard deviation or mean with sufficient confidence.

n = the number of effluent samples per month (where frequency is less than 1/month, *n* =1)

z_m = the percentile exceedance probability for the daily maximum permit limit (=2.326 for 99th percentile basis)

z_a = the percentile exceedance probability for the monthly average permit limit (=1.645 for 95th percentile basis)

$C_{HH\text{-}max} = M * C_{HH\text{-}avg}$

c. Consider the background concentration (C_b) of the parameter of concern. If the background concentration is equal to or greater than the applicable standard (*WQS,* as defined above) for the parameter of concern, then the derived concentration limit (C_{HHe}) for that parameter and for the protection of that standard is established equal to the standard (*WQS*). An exception exists where the naturally occurring instream concentration for a substance is higher than the derived permit effluent limitation. In those situations, the Department may establish permit effluent limitations (C_{efflim}) at a level higher than the derived limit, but no higher than the natural background concentration (i.e. a "rise above background" limit). In such cases, the Department may require biological instream monitoring and/or whole effluent toxicity (WET) testing (See R.61-68.E.14.c(3)).

If C_b is not based on naturally occurring concentrations and

$$C_b \geq WQS$$

Then, generally,

$$C_{\text{HH}} = WQS\,.$$

If C_b is based on naturally occurring concentrations and

$$C_b \geq WQS$$

Then, generally,

$$C_{HH} < C_{eff\,\text{lim}} \leq C_b\,.$$

2. Human Health – Organism Consumption (C_{org}).

a. For Carcinogens

The Monthly Average is calculated as follows:

$$C_{org} = (DF_2 \times WQS_{org}) - \left\{ C_b \times \left(\frac{AAF_d}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{org\text{-}max} = M * C_{org}$

b. For Non-carcinogens

The Monthly Average is calculated as follows:

$$C_{org} = (DF_1 \times WQS_{org}) - \left\{ C_b \times \left(\frac{Q_{7Q10}}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{org\text{-}max} = M * C_{org}$

3. Human Health – Water and Organism Consumption (C_{wo})

a. For Carcinogens

The Monthly Average is calculated as follows:

$$C_{wo} = (DF_4 \times WQS_{wo}) - \left\{ C_b \times \left(\frac{AAF_i}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{wo\text{-}max} = M * C_{wo}$

b. For Non-carcinogens

The Monthly Average is calculated as follows:

$$C_{wo} = (DF_3 \times WQS_{wo}) - \left\{ C_b \times \left(\frac{Q_{7Q10i}}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{wo\text{-}max} = M * C_{wo}$

4. Human Health – Drinking Water Maximum Contaminant Level (MCL) (C_{mcl}).

a. For Carcinogens

The Monthly Average is calculated as follows:

$$C_{mcl} = (DF_4 \times WQS_{mcl}) - \left\{ C_b \times \left(\frac{AAF_i}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{mcl\text{-}max} = M * C_{mcl}$

b. For Non-carcinogens
The Monthly Average is calculated as follows:

$$C_{mcl} = (DF_3 \times WQS_{mcl}) - \left\{ C_b \times \left(\frac{Q_{7Q10i}}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{mcl\text{-}max} = M * C_{mcl}$

5. Organoleptic criteria (C_{ol}).

The Monthly Average is calculated as follows:

$$C_{ol} = (DF_2 \times WQS_{ol}) - \left\{ C_b \times \left(\frac{AAF_d}{Q_d} \right) \right\}$$

The Daily Maximum is calculated as

$C_{ol\text{-}max} = M * C_{ol}$

iii. Parameters given in a wasteload allocation for oxygen-demanding pollutants and nutrients will be limited as
monthly average = C_{wla}
daily maximum = 2 x C_{wla}

c. Determine the most stringent of applicable water quality data using the derived limits determined above:

monthly average C_{efflim} = minimum of derived monthly averages (C_{aqlife}, C_{org}, C_{wo}, C_{mcl}, C_{ol} , C_{wla})
daily maximum C_{efflim} = minimum of derived daily maximums (C_{aqlife}, $C_{org\text{-}max}$, $C_{wo\text{-}max}$, $C_{mcl\text{-}max}$, $C_{ol\text{-}max}$, $C_{wla\text{-}max}$)

d. Determine whether the discharge causes, has the reasonable potential to cause or contributes

to a water quality violation.

Regulation 61-9.122.44(d)(1)(i) states: "Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Department determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality."

When determining whether a discharge causes, has the reasonable potential to cause or contributes to an instream excursion, the Department will use procedures which account for controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and, where appropriate, the dilution of the effluent in the receiving water (R.61-9.122.44(d)(1)(ii)).

Based on the above statements, there are three scenarios when limitations are required, as follows:

i. When data provided by the permit applicant indicates discharge values greater than the proposed limitation derived above, that discharge may <u>cause</u> an excursion above a narrative or numeric water quality criterion.

ii. A discharge may be determined to <u>contribute</u> to an excursion of a water quality criterion when the waterbody is impaired (e.g., on the 303(d) list) for the parameter of concern and that parameter is also being discharged at levels above the water quality criterion.

iii. <u>Reasonable potential to cause</u> a water quality violation is determined using the following information:

The Department will primarily use EPA's Technical Support Document (TSD) for determining reasonable potential using effluent data. Other methods may be used as well to evaluate data sets. All pollutants given in a wasteload allocation or an effluent limitation guideline will be limited in the permit.

When effluent data consists of non-quantifiable/non-detectable values or when no effluent data is available, other factors and information are considered to determine reasonable potential. In situations where a pollutant is known to be present in the wastestream (due to production data or other information), we know it is being discharged and has the potential to impact even though it may not be quantifiable. The fact that it is present will be enough information to say reasonable potential exists for that pollutant. Therefore, a reasonable potential decision is based on various data and information, and not just non-quantifiable/non-detectable data. Consideration is given to existing data, dilution in the waterbody, type of receiving water, designated use, type of industry/wastestream, ambient data, history of compliance, and history of toxic impact. If any source of information indicates reasonable potential to cause or contribute to an exceedance of the water quality standard, a water quality limit will be established.

Note: The result of the following calculations may indicate that reasonable potential does not exist. However, as stated above, other information may "override" this numerical determination to justify the need for a limit.

1. The procedure for determining reasonable potential from actual effluent data is explained in Box 3-2 on page 53 of the TSD. Multiplying factors are determined from Table 3-2 at a 95% confidence level and 95% probability in Section 3.3.2. The following describes the procedures used for determining reasonable potential for chemical-specific parameters and WET, under certain circumstances. More information on determining reasonable potential for WET is given in Item 2 below.

   Step 1: Data Analysis: The statistical calculations involved in the "Reasonable Potential" analysis require discrete numerical data. The following describes how the effluent data will be used in determining reasonable potential.

   Actual analytical results should be used whenever possible. Results less than detection and quantification should be used as follows:

   a. If the permittee reports results below the practical quantitation limit (PQL) (as defined by the permit), then the reported "less than PQL" value for a given sample is generally assumed to be zero.

   b. If the permittee uses a detection/quantification level that is **greater** than the PQL, then the reported "less than" value for a given sample is generally assumed to be a discrete value equal to the detection/quantification level used by the permittee.

   c. If the reported data consists of both discrete and non-discrete values and/or the data is reported using varying detection/quantification levels, then, generally, a combination of the above two approaches is used, or the data is evaluated in a manner that is most appropriate for that data set.

   Note: For information on the acceptable analytical methods and PQLs please refer to NPDES permit application attachment titled "Practical Quantitation Limits (PQL) and Approved Test Methods."

   Step 2: Using data from the permit application, other data supplied by the applicant and/or Discharge Monitoring Report (DMR) data, determine the total number of observations (n) for a particular set of effluent data and determine the highest value (C_{max}) from that data set. For the monthly average comparison, the data set will include monthly average results and n will be the number of months in which they sampled in the time period being evaluated. For the daily maximum comparison, the data set will include daily maximum results and n will be the total number of samples in the time period being evaluated. Individual results may not necessarily be used in the calculation.

Step 3: Determine the coefficient of variation (*CV*) for the data set. For a data set where *n*>10, the *CV* is calculated as standard deviation divided by mean for the data set being evaluated. For data set where *n*<10, the *CV* is estimated to equal 0.6. For less than 10 items of data, the uncertainty in the *CV* is too large to calculate a standard deviation or mean with sufficient confidence.

$$CV = 0.6 \quad \text{for} \quad n < 10$$

$$CV = \frac{\sigma}{\mu} \quad \text{for} \quad n > 10$$

where: σ = Standard Deviation of the samples
μ = Mean of the samples

Step 4: Determine the appropriate multiplying factor (*MF*) from either Table 3-2 or using the formulae in Section 3.3.2 of the TSD.

a. Determine the percentile represented by the highest concentration in the sample data.

$$p_n = (1 - Confidence\ Level)^{1/n}$$

where: p_n = Percentile represented by the highest concentration in the data
n = number of samples
Confidence Level = 0.95 i.e. 95%

b. Determine the multiplying factor (*MF*), which is the relationship between the percentile described above (C_p) and the selected upper bound of the lognormal effluent distribution, which in this case will be the 95th percentile (C_{95}).

$$MF = \frac{C_{95}}{C_p} = \frac{e^{(Z_{95}\sigma + 0.5\sigma^2)}}{e^{(Z_p\sigma + 0.5\sigma^2)}}$$

where: Z_{95} is the standardized Z-score for the 95th percentile of the standardized normal distribution = 1.645

Z_p is the standardized Z-score for the p^{th} percentile of the standardized normal distribution.(determined in (b) above)

Note: The values of Z-scores are listed in tables for the normal distribution. If using Microsoft® Excel, this can be calculated using the NORMSINV function.

$$\sigma^2 = \ln(CV^2 + 1)$$

$$\sigma = \sqrt{\ln(CV^2 + 1)}$$

Step 5: Multiply the highest value from the data set (C_{max}) by the multiplying factor (*MF*) determined in Step 4 to obtain the maximum receiving water concentration (*RWC*).

$$RWC = C_{\max} \times MF$$

Step 6: *RWC* ≤ Derived limit (C_{efflim}) implies that reasonable potential does not exist.

RWC > Derived limit (C_{efflim}) implies that reasonable potential exists.

2. Reasonable potential for Whole Effluent Toxicity (WET) may be determined from numerical data using the following procedure:

a. When the effluent data is given in terms of percent effluent as an IC_{25}, LC_{50} and/or NOEC values:

Step 1: Convert the given values to toxic units: TU_a for acute data and TU_c for chronic data, respectively, using the following formulae. Please note that an NOEC derived using the IC_{25} is approximately the analogue of an NOEC derived using hypothesis testing. The IC_{25} is the preferred statistical method for determining the NOEC (EPA TSD, March 1991, p.6).

$$TU_a = \frac{100}{LC_{50}}$$

$$TU_c = \frac{100}{NOEC} \quad \text{or} \quad TU_c = \frac{100}{IC_{25}} \text{ if } IC_{25} \text{ available}$$

Step 2: Using DMR data or other data provided by the applicant, determine the total number of observations (*n*) for a particular set of effluent data and determine the highest value ($TU_{a,\,max}$ or $TU_{c,\,max}$) from that data set.

Step 3: Determine the coefficient of variation (*CV*) for the data set. For a data set where *n*>10, the *CV* is calculated as standard deviation divided by mean. For data set where *n*<10, the *CV* is estimated to equal 0.6. For less than 10 items of data, the uncertainty in the *CV* is too large to calculate a standard deviation or mean with sufficient confidence.

Step 4: Determine the appropriate multiplying factor (*MF*) from either Table 3-2 or using the formulae in Section 3.3.2. (see iii.1, Step 4 above).

Step 5: Multiply the highest value of $TU_{a,\ max}$ or $TU_{c,\ max}$ from the data set by the multiplying factor (*MF*) determined in Step 4 and the dilution at the edge of the mixing zone (the test concentration obtained from mixing zone modeling or demonstration) to obtain the maximum receiving water concentration (*RWC*)

RWC for Acute Toxicity = [$TU_{a,\ max}$ * *MF* * *conc. at MZ boundary]*
RWC for Chronic Toxicity = [$TU_{c,\ max}$ * *MF* * *conc. at MZ boundary*]

Step 6: *RWC* for Acute Toxicity ≤ $0.3TU_a$ implies that a reasonable potential does not exist
RWC for Acute Toxicity > $0.3TU_a$ implies that a reasonable potential exists

RWC for Chronic Toxicity ≤ $1.0TU_c$ implies that a reasonable potential does not exist
RWC for Chronic Toxicity >$1.0TU_c$ implies that a reasonable potential exists

b. Other methods for determining reasonable potential may be used if appropriately justified.

e. Consider Effluent Limitations Guidelines (ELG or Categorical guidelines)

The more stringent of the effluent limitations guidelines average and maximum derived limits and water quality-derived average and maximum limits shall be used as permit limits, unless other information indicates more stringent limits are needed (e.g. previous permit limits due to backsliding). Categorical limitations based on mass may be converted to concentration using the long-term average flow of the discharge for comparison to the monthly average and daily maximum derived limits.

1. For effluent guidelines based on production, limits will be calculated as follows:

$$ELG\lim = \sum (ELGprod)(ELG) \text{ where}$$

*ELG*lim*:* the mass limit, in lbs/day, for an applicable pollutant based on the production
ELGprod: the production rate, in lbs, for the applicable guideline(s), usually based on long-term average data
ELG: the effluent guideline limitation, given as a measure of production (e.g. lbs/1000 lbs), for an applicable pollutant

2. For effluent guidelines based on flow, limits will typically be calculated as follows:

$$ELG\lim = \sum (ELGflow)(ELG)(8.345)$$

*ELG*lim: the mass limit, in lbs/day, for the applicable pollutant based on the applicable flow
ELGflow: the long-term average process flow rate, in MGD, for the applicable guideline(s) (unless otherwise specified in the guideline)
ELG: the concentration limitation, in mg/l, for the applicable pollutant from the applicable guideline(s)

H. Other considerations

1. When the derived permit effluent limitation based on aquatic life numeric criteria is below the practical quantitation limit for a substance, the derived permit effluent limitation shall include an accompanying statement in the permit that the practical quantitation limit using approved analytical methods shall be considered as being in compliance with the limit. Appropriate biological monitoring requirements shall be incorporated into the permit to determine compliance with appropriate water quality standards (R.61-68.E.14.c(2)).

2. When the derived permit effluent limitation based on human health numeric criteria is below the practical quantitation limit for a substance, the derived permit effluent limitation shall include an accompanying statement in the permit that the practical quantitation limit using approved analytical methods shall be considered as being in compliance with the limit (R.61-68.E.14.c(3)).

3. The effluent concentration limits determined above may not necessarily be the NPDES permit limit. NPDES Permit limits are determined after a reasonable potential analysis is conducted using these derived limits and also after evaluating other issues such as anti-backsliding and antidegradation.

4. When mass limits are calculated, the formula to be used is as follows.

*Mass (lb/day) = Flow (mgd) * Concentration (mg/l) * 8.345*

5. Per Regulation 61-9.122.45(d), for continuous discharges all permit effluent limitations, standards, and prohibitions, including those necessary to achieve water quality standards, shall unless impracticable be stated as maximum daily and average monthly discharge limitations for all dischargers other than publicly owned treatment works.

6. Antibacksliding: When a permit is reissued, the terms and conditions of the reissued permit must be at least as stringent as those final limits in the previous permit unless certain exceptions are met (see Regulation 61-9.122.44.l).

IV. PROCEDURES FOR REACHING A FINAL PERMIT DECISION

A. Comment Period (R.61-9.124.10 and 11)

The Department of Health and Environmental Control proposes to issue an NPDES permit to this applicant subject to the effluent limitations and special conditions outlined in this document. These determinations are tentative.

During the public comment period, any interested person may submit written comments on the draft permit to the following address:

SC Dept. of Health and Environmental Control
Water Facilities Permitting Division
Bureau of Water

2600 Bull Street
Columbia, South Carolina 29201

For additional information, interested persons may contact Melinda Vickers at 803-898-4186.

All written comments received during the public comment period shall be considered in making the final decision and shall be responded to as prescribed below.

Per R.61-9.124.17, the Department is only required to issue a response to comments when a final permit is issued. This response shall:

1. Specify which provisions, if any, of the draft permit have been changed in the final permit decision, and the reasons for the change; and

2. Briefly describe and respond to all significant comments on the draft permit raised during the public comment period, or during any hearing.

The response to comments shall be available to the public.

B. Public Hearings (R.61-9.124.11 and 12)

During the public comment period, any interested person may request a public hearing, if no hearing has already been scheduled. A request for a public hearing shall be in writing and shall state the nature of the issues proposed to be raised in the hearing.

Determinations and Scheduling.

1. Within the thirty (30) day comment period or other applicable comment period provided after posting or publishing of a public notice, an applicant, any affected state or interstate agency, the Regional Administrator or any other interested person or agency may file a petition with the Department for a public hearing on an application for a permit. A petition for a public hearing shall indicate the specific reasons why a hearing is requested, the existing or proposed discharge identified therein and specifically indicate which portions of the application or other permit form or information constitutes necessity for a public hearing. If the Department determines that a petition constitutes significant cause or that there is sufficient public interest in an application for a public hearing, it may direct the scheduling of a hearing thereon.

2. A hearing shall be scheduled not less than four (4) nor more than eight (8) weeks after the Department determines the necessity of the hearing in the geographical location of the applicant or, at the discretion of the Department, at another appropriate location, and shall be noticed at least thirty (30) days before the hearing. The notice of public hearing shall be transmitted to the applicant and shall be published in at least one (1) newspaper of general circulation in the geographical area of the existing or proposed discharge identified on the permit application and shall be mailed to any person or group upon request thereof. Notice shall be mailed to all persons and governmental agencies which received a copy of the notice or the fact sheet for the permit application.

3. The Department may hold a single public hearing on related groups of permit applications.

4. The Department may also hold a public hearing at its discretion, whenever, for instance, such a hearing might clarify one or more issues involved in the permit decision;

5. Public notice of the hearing shall be given in accordance with R.61-9.124.10.

Any person may submit oral or written statements and data concerning the draft permit. Reasonable limits may be set upon the time allowed for oral statements, and the submission of statements in writing may be required. The public comment period under R.61-9.124.10 shall automatically be extended to the close of any public hearing under this section. The hearing officer may also extend the comment period by so stating at the hearing.

A tape recording or written transcript of the hearing shall be made available to the public.

C. Obligation to raise issues and provide information during the public comment period. (R.61-9.124.13)

All persons, including applicants, who believe any condition of a draft permit is inappropriate or that the Department's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, must raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). No issue shall be raised during an appeal by any party that was not submitted to the administrative record as part of the preparation and comment on a draft permit, unless good cause is shown for the failure to submit it. Any supporting materials which are submitted shall be included in full and may not be incorporated by reference, unless they are already part of the administrative record in the same proceeding, or consist of State or Federal statutes and regulations, Department and EPA documents of general applicability, or other generally available reference materials. Commenters shall make supporting materials not already included in the administrative record available. (A comment period longer than 30 days may be necessary to give commenters a reasonable opportunity to comply with the requirements of this section. Additional time shall be granted under R.61-9.124.10 to the extent that a commenter who requests additional time demonstrates the need for such time).

D. Issuance and Effective Date of the Permit

1. After the close of the public comment period on a draft permit, the Department shall issue a final permit decision. The Department shall notify the applicant and each person who has submitted written comments or requested notice of the final permit decision. This notice shall include reference to the procedures for appealing a decision on a permit. For the purposes of this section, a final permit decision means a final decision to issue, deny, modify, revoke and reissue, or terminate a permit.

2. A final permit decision shall become effective 30 days after the service of notice of the decision unless:

(a) A later effective date is specified in the decision; or

(b) No comments requested a change in the draft permit, in which case the permit shall become effective on the effective date shown in the issued permit.

3. Issuance or Denial of Permits. An appeal to a final determination of the Department or to a condition of a permit issued or the denial of a permit pursuant to the State law and Regulation 61-9, shall be in accordance with and subject to 48-1-200 of the SC Code (see E below).

E. Adjudicatory Hearings

Please see the Department's Guide to Board Review:
https://www.scdhec.gov/about-dhec/sc-board-health-and-environmental-control/guide-board-review.

National Pollutant Discharge Elimination System Permit

NPDES General Permit
for
Water Treatment Plant Dischargers

This permit authorizes Water Treatment Plant discharges (or other covered activities) to waters of the State of South Carolina in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I thru Part X. 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."

Shawn M. Clarke, P.E., Director
Water Facilities Permitting Division
Bureau of Water

Issue Date: July 15, 2022

Effective Date: August 1, 2022

Expiration Date[1]: July 31, 2027

***Permit No.:* SCG646000**

[1] This permit will continue to be in effect beyond the expiration date if a complete timely re-application is received pursuant to Regulation 61-9.122.6 and signed per Regulation 61-9.122.22.

dhec

S.C. Department of Health and Environmental Control

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PART I. Definitions

Any term not defined in this Part has the definition stated in the South Carolina Pollution Control Act (PCA) or in "Water Pollution Control Permits", R.61-9 or its normal meaning.

A. The "Act", or CWA shall refer to the Clean Water Act (Formerly referred to as the Federal Water Pollution Control Act) Public Law 92-500, as amended means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117, 33 U.S.C. 1251 et seq. Specific references to sections within the CWA will be according to Pub. L. 92-500 notation.

B. The "arithmetic mean" of any set of values is the summation of the individual values divided by the number of individual values.

C. "Best Management Practices" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

D. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

E. A "composite sample" shall be defined as one of the following four types:

1. An influent or effluent portion collected continuously over a specified period of time at a rate proportional to the flow.

2. A combination of not less than 8 influent or effluent grab samples collected at regular (equal) intervals over a specified period of time and composited by increasing the volume of each aliquot in proportion to flow. If continuous flow measurement is not used to composite in proportion to flow, the following method will be used: An instantaneous flow measurement should be taken each time a grab sample is collected. At the end of the sampling period, the instantaneous flow measurements should be summed to obtain a total flow. The instantaneous flow measurement can then be divided by the total flow to determine the percentage of each grab sample to be combined. These combined samples form the composite sample.

3. A combination of not less than 8 influent or effluent grab samples of equal volume but at variable time intervals that are inversely proportional to the volume of the flow. In other words, the time interval between aliquots is reduced as the volume of flow increases.

4. If the effluent flow varies by less than 15 percent, a combination of not less than 8 influent or effluent grab samples of constant (equal) volume collected at regular (equal) time intervals over a specified period of time. (This method maybe used with prior Department approval.)

All samples shall be properly preserved in accordance with Part II.J.4. Continuous flow or the sum of instantaneous flows measured and averaged for the specified compositing time period shall be used with composite results to calculate mass.

F. "CWA" means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub.L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483 and Pub. L. 97-117, 33 U.S.C. 1251 et.seq.

G. "Daily discharge" means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the average measurement of the pollutant over the day.

H. "Daily maximum" other than for bacterial indicators (i.e. fecal coliform, E. coli and enterococci) is the highest average value recorded of samples collected on any single day during the calendar month. Daily average for bacterial indicators means the highest arithmetic average of bacterial samples collected for each bacterial indicator species (i.e. fecal coliform, E. coli and/or enterococci) in any 24 hour period during a calendar month.

I. "Daily minimum" is the lowest average value recorded of samples collected on any single day during the calendar month.

J. The "Department" or "DHEC" shall refer to the South Carolina Department of Health and Environmental Control.

K. "Director" means the EPA Regional Administrator or an authorized representative.

L. "DMR" means a Discharge Monitoring Report.

M. "EPA" means the Environmental Protection Agency.

N. "Freshwater" means any freshwater as defined by Regulation 61-68 and classified by Regulation 61-69.

O. The "geometric mean" of any set of values is the N^{th} root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

P. A "grab sample" is an individual, discrete or single influent or effluent portion of at least 100 milliliters collected at a time representative of the discharge and over a period not exceeding 15 minutes and retained separately for analysis.

Q. The "instantaneous maximum or minimum" is the highest or lowest value recorded of all samples

collected during the calendar month.

R. "MGD" means million gallons per day.

S. The "monthly average", other than for fecal coliform, E. coli and enterococci, is the arithmetic mean of all samples collected in a calendar month period. Monthly average (for bacterial indicators only) means the calendar month (i.e., 28 days, 29 days, 30 days, or 31 days) geometric mean of all bacterial samples collected [for each of the bacterial indicator species (i.e., E. coli, enterococcus, and/or fecal coliform)] during that calendar month. The monthly average loading is the arithmetic average of all daily discharges made during the month.

T. "NOI" means notice of intent to be covered by this permit.

U. "NOT" means notice of termination.

V. "Outfall" or "Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, or vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agricultural or agricultural storm water runoff.

W. "Permittee" means any individual, facility or company to whom this permit has been issued.

X. "POTW" means a treatment works as defined by section 212 of the Clean Water Act, which is owned by a state or municipality (as defined by section 502[4] of the CWA). This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of a liquid nature or a regional entity composed of two (2) or more municipalities or parts thereof. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW Treatment Plant. The term also means the municipality, as defined in section 502(4) of the CWA, which has jurisdiction over the Indirect Discharges to and the discharge from such a treatment works.

Y. "Practical Quantitation Limit (PQL)" is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. It is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method-specific sample weights, volumes, and processing steps have been followed. It is also referred to as the reporting limit.

Z. "Privately owned treatment works" means any device or system which both is used to treat wastes from any facility whose operator is not the operator of the treatment works and is not a POTW.

AA. "Quarter" is defined as the first three calendar months beginning with the month that this permit becomes effective (unless otherwise specified in this permit) and each group of three calendar months thereafter.

BB. "Quarterly average" is the arithmetic mean of all samples collected in a quarter.

CC. "Regional Administrator" means the Regional Administrator of Region IV of the Environmental Protection Agency or the authorized representative of the Regional Administrator.

DD. "Saltwater" means any tidal saltwater defined as Class SA, SB or Shellfish Harvesting (SFH) by Regulation 61-68 and classified by Regulation 61-69.

EE. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

FF. "Significant spills" includes, but is not limited to: releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (see 40 CFR 110.10 and CFR 117.21) or Section 102 of CERCLA (see 40 CFR 302.4).

GG. "UspU" an "sp" by the water class means the Department has established site-specific standards for certain parameters for that waterbody. The site-specific standards are listed in parentheses after the waterbody description in Regulation 61-69.

HH. "Storm Water" means storm water runoff, snowmelt runoff, and surface runoff and drainage.

II. "TRC" means Total Residual Chlorine.

JJ. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

KK. "Waters of South Carolina" means all waters of the United States within the political boundaries of the State of South Carolina.

LL. "Waters of the United States" means:

1. All waters, which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;

2. All interstate waters, including interstate "wetlands";

3. All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sand flats, wetlands, sloughs, wet meadows, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters:

    a. Which are or could be used by interstate or foreign travelers for recreational or other purposes;

b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

c. Which are used or could be used for industrial purposes by industries in interstate commerce;

4. All impoundments of waters otherwise defined as waters of South Carolina under this definition.

5. Tributaries of waters identified in paragraphs 1 through 4 of this definition;

6. The territorial sea; and

7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs 1 through 6 of this definition.

Note: Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA are not waters of South Carolina. This exclusion applies only to manmade bodies of water, which neither were originally created in waters of South Carolina (such as disposal areas in wetlands) nor resulted from the impoundment of waters of South Carolina.

MM. "Weekly average", is the arithmetic mean of all the samples collected during a one-week period. For self-monitoring purposes, weekly periods in a calendar month are defined as three (3) consecutive seven-day intervals starting with the first day of the calendar month and a fourth interval containing seven (7) days plus those days beyond the 28th day in a calendar month. The value to be reported is the single highest of the four (4) weekly averages computed during a calendar month. The weekly average loading is the arithmetic average of all daily discharges made during the week.

Legend (See Effluent Limitations and Monitoring Requirements)

Abbreviation	Meaning/Definition	Abbreviation	Meaning/Definition
BOD_5	5-Day Biochemical Oxygen Demand	24 Hr C	24 Hour Composite
TSS	Total Suspended Solids	Cont.	Continuous
DO	Dissolved Oxygen	Cal	Calculated
TRC	Total Residual Chlorine	Eff.	Effluent
NH_3-N	Ammonia Nitrogen	Inst	Instantaneous

PART II. Coverage Under This Permit

A. Permit Area

The permit covers all areas of South Carolina, where the discharge is into FRESHWATER (Class FW or FW sp) or SALTWATER (Class SA, SA sp, SB, or SB sp) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters. The permit also covers all areas of South Carolina, where the discharge is into SALTWATER (Class SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters for existing dischargers only (as of the date of the issue date for the general permit) and does not include either new or expanding dischargers into SFH waters.

B. Eligibility

This permit may cover all new and existing point source discharges of backwash, sedimentation washdown, and decant water from water treatment plants (or other covered activities) into waters of the state of South Carolina.

2. This permit is for discharges from water treatment facilities. The effluent limits for Total Residual Chlorine (TRC), Total Iron, and Total Manganese will be based on the 7Q10 of the receiving stream and calculated using the formulas from the general permit rationale.

3. This permit does not authorize discharges that are mixed with other wastewater discharges.

4. Types of Coverage: This permit authorizes discharge of the following types of wastewater as further specified in this permit:

   a. Filter backwash water, sedimentation basin washdown, and decant from water treatment facilities (or other covered activities) using aluminum based coagulation agents.

   b. Filter backwash water, sedimentation basin washdown, and decant from water treatment facilities (or other covered activities) using iron based coagulation agents.

   c. Filter backwash water, sedimentation basin washdown, and decant from water treatment facilities (or other covered activities) using polymer based coagulation agents.

   d. Filter backwash water, sedimentation basin washdown, and decant from treatment using technologies designed for iron and/or manganese removal and/or softening without the addition of chemical coagulants.

   e. Filter backwash water, sedimentation basin washdown, and decant from treatment using technologies designed for ion exchange.

   f. Filter backwash water, sedimentation basin washdown, and decant from treatment using technologies designed for reverse osmosis.

   g. Activities that involve aluminum based coagulation agents, iron based coagulation agents,

polymer based coagulation agents, or other technologies which are associated with the operation and maintenance of water treatment facilities including collection and distribution systems.

5. Limitations on Coverage

The following water treatment plant discharges are not authorized by this permit:

a. discharges that are:

(1) mixed with other discharges and process wastewater unless those discharges are in compliance with a different NPDES permit; or

(2) discharges of hazardous substances or oils, identified by and in compliance with Part IX.A;

b. discharges which are subject to an existing effluent limitation guideline addressing them;

c. discharges that are subject to an existing NPDES individual or general permit; are located at a facility where an NPDES permit has been terminated or denied; or which are issued a permit in accordance with Part VI.N (Requiring an Individual Permit or an Alternative General Permit) of this permit. Such discharges may be authorized under this permit after an existing permit expires or is canceled.

d. discharges for waters other than those described;

e. discharges whose receiving waters are not FRESHWATER (Class FW or FW sp) or Saltwater (Class SA, SA sp, SB, or SB sp) as classified by *S.C. Reg. 61-68, Water Classifications and Standards and 61-69, Classified Waters*. This permit does not authorize discharges to Trout Waters (Class TPGT or TN), Outstanding Resource Waters (Class ORW), or Outstanding National Resource Waters (ONRW) as classified by *S.C. Regulation 61-69*.

f. discharges that the Department has determined to be or which may reasonably be expected to be contributing to a violation of a water quality standard; and

g. discharges that would adversely affect a listed endangered or threatened species or its critical habitat.

C. Authorization

1. Water treatment plant dischargers (or other covered activities) desiring coverage under this general permit must:

a. have submitted timely, appropriate reapplication forms for an existing individual permit or

b. either;

(1) submit a Notice of Intent (NOI), for discharges as described in II.B, above, using completed Forms 1 and 2C, 1 and 2D, or 1 and 2E (or, if the above-mentioned forms have been submitted within the last five years and no action on the application has been taken by the Department, an NOI form provided by the Department (or photocopy thereof)), in accordance with the requirements of Part III of this permit, to be authorized to discharge under this general permit, or,

(2) submit a NOI form provided by the Department.

2. Discharges for which individual permit applications have been submitted are authorized to discharge under the terms and conditions of this permit beginning on the date of written notice from the Department of such coverage.

3. Unless notified by the Department to the contrary, owners or operators who submit such notification are authorized to discharge under the terms and conditions of this permit on the first day of the first month at least sixty (60) days after the date that the NOI is postmarked.

4. The Department may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the NOI or other information.

D. Continuation of Expired General Permit

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with R61-9 122.6 and remain in force and effect. If you were authorized to discharge under this permit any discharges authorized under this permit will automatically remain covered by this permit. Coverage under this permit continues in force and effect only if the conditions in Part II.E below are satisfied.

E. Duty to Reapply

1. Permittees must submit an NOI (or other application forms) in accordance with the requirements of Part III of this permit at least 180 days prior to the permit expiration date (unless an extension has been granted but in no case beyond the expiration date) to remain covered under the continued permit after expiration. The completed NOI (or other application forms) should be submitted to the Department in accordance with Part III.C.

2. Permittees who submit NOIs less than 9 months from permit expiration and obtain coverage during that time are automatically considered covered under the continued permit after expiration.

3. An NOI submitted in accordance with E.1 or E.2 above will be used to determine coverage under the new General Permit when this permit is reissued. The Department may, at the time of permit reissuance, required additional information to be submitted based on changes in the reissued general permit.

Part III. Notice of Intent Requirements

A. Deadlines for Notifications

1. Except as provided in Part III.A.2 (Late NOIs) or III.F (Transfer of Ownership or Control), operators of facilities who intend to obtain coverage for a new or existing water treatment plant discharge (or other covered activities) under this permit shall submit a NOI in accordance with the requirements of this part at least sixty (60) days before coverage is desired;

2. An operator of a water treatment facility (or other covered activities) is not precluded from submitting a NOI in accordance with the requirements of this part after the effective date of this permit. In such instances, the Department may bring an enforcement action for failure to submit a NOI in a timely manner or for any unauthorized discharges of wastewaters that have occurred.

B. Contents of Notice of Intent

The Notice of Intent shall be signed in accordance with Part VI.I of this permit and shall include the following information:

1. Name of facility, mailing address, location of the facility for which the notification is submitted and location of the outfall(s) stated as latitude and longitude to the nearest 15 seconds.

2. Up to four 4-digit Standard Industrial Classification (SIC) codes and up to four 6-digit North American Industry Classification System (NAICS) codes that best represent the principal products or activities provided by the facility; or for hazardous waste treatment, storage or disposal facilities, land disposal facilities that receive or have received any industrial waste, steam electric power generating facilities, or treatment works treating domestic sewage, a narrative identification of those activities;

3. The operator's name, address, email address, telephone number, and status as Federal, State, private, public or other entity;

4. The permit number of additional NPDES permits for any discharges (including storm water discharges, etc.) from the site that are currently, or have been previously, authorized by an NPDES permit;

5. Emergency contact information for at least two (2) contacts that includes contact name, mobile number and email address;

6. The name of the receiving water(s), or if the discharge is through a municipal separate storm sewer, the name of the municipal operator of the storm sewer and the receiving water(s) for the discharge through the municipal separate storm sewer;

7. Information related to the quality and quantity of wastewater to be discharged;

8. A statement that easements for the discharge have been obtained by the permittee for any conveyances of the discharge not on property of the permittee and which do not constitute

waters of the State;

9. A map indicating facility and discharge locations.

C. Where to Submit

1. Facilities required to submit an NOI per Part III.D of this permit to the Department must use the appropriate form through ePermitting. NOIs must be signed in accordance with Part VI.I of this permit. The permittee shall use the electronic application system through ePermitting. If the permittee encounters technical difficulties using the electronic application system, contact DHEC at epermittinghelp@dhec.sc.gov for technical assistance. Please contact the Compliance Manager for your permit to obtain approval to submit paper NOIs until the technical issue is resolved.

D. Renotification

Upon issuance of a new general permit, the permittee is required to notify the DHEC/Bureau of Water/Water Facilities Permitting Division of its intent to be covered by the new general permit.

E. Individual Applications

Any applicant eligible for coverage under the general permit who has previously filed an individual application and has not received an NPDES permit can receive coverage under this general permit. To do so, a letter must be sent to the DHEC/Bureau of Water/Water Facilities Permitting Division requesting coverage in lieu of an individual permit.

F. Transfer of Ownership or Control

1. Coverage under a general permit may be transferred to another party under the following conditions:

   a. The permittee notifies the DHEC/Bureau of Water/Water Facilities Permitting Division of the proposed transfer at least thirty (30) days in advance of the proposed transfer date;

   b. A written agreement is submitted to the DHEC/Bureau of Water/Water Facilities Permitting Division between the existing and new permittee containing a specific date of permit responsibility, coverage and liability for violations up to that date and thereafter.

   c. A NOI is filed by the new owner.

   d. The proposed owner complies with Viability Requirements in accordance with SC Regulation R.61-9.600

2. Transfers are not effective until approved by the Department. A permit is non-transferable without prior Department approval.

Part IV. Schedule of Compliance

A. Schedule(s)

1. The permittee shall achieve compliance with the effluent limitations specified for discharges.

2. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted through ePermitting no later than 11:59 PM on the 14th day following each scheduled date.

Part V. Monitoring and Report Requirements

A. Monitoring Reports

1. Facilities covered by this general permit must report effluent monitoring results obtained during each reporting period. Effluent monitoring results obtained at the required frequency shall be reported on a Discharge Monitoring Report. The complete DMR must be submitted through ePermitting no later than 11:59 PM on the 28th day of the month following the end of the monitoring period.

2. The permittee shall use the DMR system through ePermitting. If the permittee encounters technical difficulties using the DMR system, contact DHEC at epermittinghelp@dhec.sc.gov for technical assistance. Please contact the Compliance Manager for your permit to obtain approval to submit paper DMRs until the technical issue is resolved.

3. If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or as specified in the permit, all valid results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR form specified by the Department. The permittee has sole responsibility for scheduling analyses to ensure there is sufficient opportunity to complete and report the required number of valid results for each monitoring period.

4. Calculations for all limitation which require averaging of measurements shall utilize an arithmetic mean except as provided in the Definitions (Part I).

B. Monitoring and Records

1. a. Samples and measurements

(1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(2) Samples shall be reasonably distributed in time, while maintaining representative sampling.

(3) No analysis, which is otherwise valid, shall be terminated for the purpose of preventing the analysis from showing a permit or water quality violation.

b. Flow Measurements

(1) Where permits require an estimate of flow, the permittee shall maintain at the permitted facility a record of the method(s) used in estimating the discharge flow (e.g., pump curves, production charts, water use records) for the outfall(s) designated on limits pages to monitor flow by an estimate.

(2) Records of any necessary calibrations must be kept.

2. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

3. Records of monitoring information shall include:

   a. The date, exact place, and time of sampling or measurements;

   b. The individual(s) who performed the sampling or measurements;

   c. The date(s) analyses were performed;

   d. The individual(s) who performed the analyses;

   e. The analytical techniques or methods used; and

   f. The results of such analyses.

4. a. Analyses for required monitoring must be conducted according to test procedures approved under 40 CFR Part 136 unless other test procedures have been specified in the permit

   b. Unless addressed elsewhere in this permit, the permittee shall use a sufficiently sensitive analytical method for each sample that achieves a value below the derived permit limit (s) stated in Part X. If more than one method of analysis is approved for use, the Department recommends for reasonable potential determinations that the permittee use the method having the lowest practical quantitation limit (PQL) unless otherwise specified. For the purposes of reporting analytical data on the Discharge Monitoring Report (DMR):

      (1) Analytical results below the PQL from methods available in 40 CFR 136 or otherwise specified in the permit shall be reported as zero (0), provided the PQL is below the value specified in Part(s) IX.F. & X.T and the result is also below the PQL. Zero (0) shall also be used to average results which are below the PQL. When zero (0) is reported or used to average results, the permittee shall report, in the "Comment Section" or in an attachment to the DMR, the analytical method used, the PQL achieved, and the number of times results below the PQL were reported as zero (0).

      (2) Analytical results above the PQL from methods available in 40 CFR 136 or otherwise specified in the permit shall be reported as the value achieved, even if the PQL is below the value specified in Part(s) IX.F. & X.T. When averaging results using a value containing a < the average shall be calculated using the value and reported as < the average of all results collected.

(3) (a) Mass value for a pollutant collected using a grab sample shall be calculated using the 24-hour totalized flow for the day the sample was collected (if available) or the instantaneous flow at the time of the sample and either the concentration value actually achieved or the value as determined from the procedures in (1) or (2) above, as appropriate. Grab samples should be collected at a time representative of the discharge.

(b) Mass value for a pollutant collected using a composite sample shall be calculated using the 24-hour totalized flow measured for the day the sample was collected and either the concentration value actually achieved or the value as determined from the procedures in (1) or (2) above, as appropriate.

5. The PCA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000 or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment provided by the Clean Water Act is also by imprisonment of not more than 4 years.

Part VI. Standard Permit Conditions

A. Duty to comply

The permittee must comply with all conditions of the permit. Any permit noncompliance constitutes a violation of the Clean Water Act and the Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. The Department's approval of wastewater facility plans and specifications does not relieve the permittee of responsibility to meet permit limits.

1. a. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for water plant sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for water plant sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

   b. It is the responsibility of the permittee to have a treatment facility that will meet the final effluent limitations of this permit. The approval of plans and specifications by the Department does not relieve the permittee of responsibility for compliance.

2. Failure to comply with permit conditions or the provisions of this permit may subject the permittee to civil penalties under S.C. Code Section 48-1-330 or criminal sanctions under S.C. Code Section 48-1-320. Sanctions for violations of the Federal Clean Water Act may be imposed in accordance with the provisions of 40 CFR Part 122.41(a)(2) and (3).

3. A person who violates any provision of this permit, a term, condition or schedule of compliance contained within a valid NPDES permit, or the State law is subject to the actions defined in the State law.

B. Need to halt or reduce activity not a defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

C. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or water plant sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

D. Proper Operation and Maintenance

1. The permittee shall at all times properly operate and maintain in good working order and operate as efficiently as possible all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes effective

performance based on design facility removals, adequate funding, adequate operator staffing and training and also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Power Failures.

   In order to maintain compliance with effluent limitations and prohibitions of this permit, the permittee shall either:

   a. provide an alternative power source sufficient to operate the wastewater control facilities;

   b. or have a plan of operation which will halt, reduce, or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

3. The permittee shall develop and maintain at the facility a complete Operations and Maintenance Manual for the waste treatment facility's portion of the water plant and/or land application system for the water plant residuals. The manual shall be made available for on-site review during normal working hours. The manual shall contain operation and maintenance instructions for all equipment and appurtenances associated with the waste treatment facilities and land application system. The manual shall contain a general description of: the treatment process(es), the operational procedures to meet the requirements of (E)(1) above, and the corrective action to be taken should operating difficulties be encountered.

4. The permittee shall provide for the performance of daily treatment facility inspections by a certified operator of the appropriate grade as defined in the facility construction permit issued by the Department. The Department may make exceptions to the daily operator requirement in accordance with R.61-9.122.41(e)(3)(ii). The inspections shall include, but should not necessarily be limited to, areas which require visual observation to determine efficient operation and for which immediate corrective measures can be taken using the O & M manual as a guide. All inspections shall be recorded and shall include the date, time, and name of the person making the inspection, corrective measures taken, and routine equipment maintenance, repair, or replacement performed. The permittee shall maintain all records of inspections at the permitted facility as required by the permit, and the records shall be made available for on-site review during normal working hours.

5. A roster of operators associated with the facility's operation and their certification grades shall be maintained onsite and be made available to the Department upon request.

E. Permit actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

F. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege nor does it authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations.

G. Duty to provide information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.

H. Inspection and entry

The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and Pollution Control Act, any substances or parameters at any location.

I. Signatory requirement

1. All Notices of Intent, Notices of Termination, Best Management Practices plans, reports, certifications or information submitted to the Department, or that this permit requires be maintained by the permittee shall be signed and certified.

    a. Notices of Intent and Notices of Termination shall be signed as follows:

        (1) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

            (a) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or

(b) The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) For a municipality, State, Federal, or other public agency or public facility: By either a principal executive officer, mayor, or other duly authorized employee or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(a) The chief executive officer of the agency, or

(b) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator, Region IV, EPA).

b. All reports required by permits, and other information requested by the Department, shall be signed by a person described in Part II.I.1.a of this section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in Part II.K.1.a of this section;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) and,

(3) The written authorization is submitted to the Department.

c. Changes to authorization. If an authorization under Part II.K.1.b of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part II.K.1.b of this section must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

d. Certification. Any person signing a document under Part II.K.1.a or b of this section shall

make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

2. The PCA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $25,000 per violation, or by imprisonment for not more than two years per violation, or by both.

J. Reporting requirements

1. Planned changes

The permittee shall give written notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. The permittee shall notify the Department if the Water Treatment Plant changes type of treatment (e.g., aluminum-based coagulants to iron-based coagulants). Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in R 61-9.122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Part II.L.8 of this section.

c. The alteration or addition results in a significant change in the permittee's water plant sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan (included in the NPDES permit directly or by reference);

2. Anticipated noncompliance

The permittee shall give advance notice to DHEC/Bureau of Water/Water Pollution Control Division of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers

This general permit is not transferable to any person except after notice to DHEC/Bureau of Water/NPDES Administration Section. If an NOI is required, the new owner/operator shall submit an NOI through ePermitting in accordance with Part III at least 30 days in advance of the proposed transfer of ownership/control. Upon notification of coverage to the new permittee, the existing permittee may request termination by submission of a Notice of Termination in accordance with Part VIII of this permit.

4. Twenty-four hour reporting

   a. The permittee/system owner (or applicable representative) (hereafter permittee/system owner) shall report any noncompliance that meets the criteria in Part VI.J.4.b. Any information shall be provided orally or electronically to the local DHEC office as soon as possible but no later than 24 hours from the time the permittee/system owner becomes aware of the circumstances. During normal working hours (8:30 AM - 5:00 PM Eastern Standard Time) call the appropriate regional office in the table below.

County	DHEC Region	Phone No.
Anderson, Oconee	Upstate Region BEHS Anderson	864-260-5585
Abbeville, Greenwood, Laurens, McCormick	Upstate Region BEHS Greenwood	864-227-5915
Greenville, Pickens	Upstate Region BEHS Greenville	864-372-3273
Cherokee, Spartanburg, Union	Upstate Region BEHS Spartanburg	864-596-3327
Fairfield, Lexington, Newberry, Richland	Midlands Region BEHS Columbia	803-896-0620
Chester, Lancaster, York	Midlands Region BEHS Lancaster	803-285-7461
Aiken, Barnwell, Edgefield, Saluda	Midlands Region BEHS Aiken	803-642-1637
Chesterfield, Darlington, Dillon, Florence, Marion, Marlboro	Pee Dee Region BEHS Florence	843-661-4825
Clarendon, Kershaw, Lee, Sumter	Pee Dee Region BEHS Sumter	803-778-6548
Georgetown, Horry, Williamsburg	Pee Dee Region BEHS Myrtle Beach	843-238-4378
Berkeley, Charleston, Dorchester	Low Country Region BEHS Charleston	843-953-0150
Beaufort, Colleton, Hampton, Jasper	Low Country Region BEHS Beaufort	843-846-1030
Allendale, Bamberg, Calhoun, Orangeburg	Low Country Region BEHS Orangeburg	803-533-5490

* After hour reporting should be made to the 24-hour Emergency Response telephone number 1-888-481-0125.

A follow-up report shall also be provided to DHEC within 5 days of the time the permittee/system owner becomes aware of the circumstances. For noncompliance meeting the criteria of II.L.5.b, the '5-Day Reporting' schedule in ePermitting should be used. If the permittee encounters technical difficulties using the reporting schedules in ePermitting, a written submission using DHEC Form 3685 (or submission with equivalent information) should be submitted to the

address below. For ePermitting technical assistance, contact DHEC at epermittinghelp@dhec.sc.gov. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

S.C, Department of Health and Environmental Control
Bureau of Water/Water Pollution Control Division
Data and Records Management Section
2600 Bull Street
Columbia, South Carolina 29201

b. The following shall be included as information which must be reported within 24 hours under this paragraph.

(1) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See R.61-9.122.44(g)).

(2) Any upset which exceeds any effluent limitation in the permit.

(3) Any non-compliance which may endanger human health or the environment.

(4) Any spill or release that reaches the surface waters of the State.

(5) Any spill or release that exceeds an estimated 500 gallons.

c. The Department may waive the written report on a case-by-case basis for reports under Part II.L.5.b of this section if the oral report has been received within 24 hours.

5. Other noncompliance.

The permittee shall report all instances of noncompliance not reported under Part IV.A.1 and 4 of this section at the time monitoring reports are submitted. The reports shall contain the information listed in Part VI.J.4 of this section.

6. Other information.

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information. This information may result in permit modification, revocation and reissuance, or termination in accordance with Regulation 61-9.

7. Existing Dischargers

In addition to the reporting requirements under Part VI.J.1-6 of this section, all existing dischargers must notify the DHEC/Bureau of Water/Compliance & Enforcement Section of the Department as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) One hundred micrograms per liter (100 µg/l);

(2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application or NOI; or

(4) The level established by the Department in accordance with section R.61-9.122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed in the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 µg/l);

(2) One milligram per liter (1 mg/l) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with R.61-9.122.21(g)(7).

(4) The level established by the Department in accordance with section R.61-9.122.44(f).

c. Any activity that has occurred or will occur that contravenes Part II B. (Eligibility) for coverage under this permit.

K. Bypass

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Part.VI.K.2 and 3 of this section.

2. Notice

a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible, at least ten days before the date of the bypass to DHEC/Bureau of Water/Water Facilities Permitting Division.

b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part VI.J.4 of this permit (24-hour reporting).

3. Prohibition of bypass

   a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless:

      (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

      (3) The permittee submitted notices as required under Part VI.K.2 of this section.

   b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in Part VI.K.3.a of this section.

L. Upset

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of Part VI.L.2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated; and

   c. The permittee submitted notice of the upset as required in Part II.L.5.b(2) of this section.

   d. The permittee complied with any remedial measures required under Part II.D of this section.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

M. Misrepresentation of Information

1. Any person making application for a NPDES discharge permit or filing any record, report, or other document pursuant to a regulation of the Department, shall certify that all information contained in such document is true. All application facts certified to by the applicant shall be considered valid conditions of the permit issued pursuant to the application.

2. Any person who knowingly makes any false statement, representation, or certification in any application, record, report, or other documents filed with the Department pursuant to the State law, and the rules and regulations pursuant to that law, shall be deemed to have violated a permit condition and shall be subject to the penalties provided for pursuant to 48-1-320 or 48-1-330.

N. Requiring an Individual Permit or an Alternative General Permit

1. The Department may require any person authorized by this permit to apply for and/or obtain either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition the Department to take action under this paragraph. The Department may require any owner or operator authorized to discharge under this permit to apply for an individual NPDES permit only if the owner or operator has been notified in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the owner or operator to file the application, and a statement that on the effective date of the individual NPDES permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. Individual permit applications shall be submitted to the address shown in Part III.E of this permit. The Department may grant additional time to submit the application upon request of the applicant. If an owner or operator fails to submit in a timely manner an individual NPDES permit application as required by the Department, then the applicability of this permit to the individual NPDES permittee is automatically terminated at the end of the day specified for application submittal.

2. Any owner or operator authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application (Form 1 and Form 2C, 2D, or 2E, as appropriate) with reasons supporting the request to the Department. Individual permit applications shall be submitted to the address in Part III.C of this permit. The request may be granted by the issuance of an individual permit or an alternative general permit if the reasons cited by the owner or operator are adequate to support the request.

3. When an individual NPDES permit is issued to an owner or operator otherwise subject to this permit, or the owner or operator is authorized for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. When an individual NPDES permit is denied to an owner or operator otherwise subject to this permit, or the owner or operator is denied coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the date of such denial, unless otherwise specified by the Department.

4. Existing Facilities only, covered on the effective date of the General Permit.

a) Facilities that discharge directly to, or into a tributary to, an impaired stream segment (either on the 303(d) list or have an issued TMDL) for turbidity must conduct twelve (12) months of sampling consisting of at least four (4) samples at each outfall location and in the receiving stream(s) at locations upstream and downstream of the facility. Samples at the various points tributary to the same receiving water shall be taken concurrently, if feasible. The upstream sample for each receiving water(s) must be taken immediately upstream of the discharge from the site. The downstream sample for each receiving water must be taken from the site after allowing an appropriate distance for mixing.

If there is existing turbidity data which is no more than three (3) years old and which is representative of the current discharge that data may be used in lieu of the sampling results required above. The Department reserves the right to review any such data and require new sampling results if it determines that the existing data is no longer representative of the current conditions at your facility.

b) (i) For substantially identical outfalls, where two (2) or more outfalls discharge to, or into a tributary to, an impaired stream segment (either on the 303(d) list or have an issued TMDL), the permittee may conduct sampling at one of these outfalls and report that the quantitative data applies to the substantially identical outfalls.

(ii) Where safety or accessibility prevents sampling an outfall or stream, an alternative sampling point may be used. Any such alternative must provide equivalent information to sampling at the outfall. All facilities subject to the turbidity sampling requirements must begin conducting the sampling no later than the effective date of the permit.

c) Facilities that have turbidity limits must either (i) develop and implement a plan to meet the standard within three years (3) from the effective date of the permit or (ii) apply for an individual NPDES permit and obtain individual permit coverage within three (3) years from the effective date of the general permit.

Part VII. Reopener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any water treatment plant discharge covered by this permit, the owner or operator of such discharge may be required obtain an individual permit or an alternative general permit in accordance with Par VI.N (Requiring an Individual Permit or Alternative General Permit) of this permit or the permit may be modified to include different limitations and/or requirements.

2. Permit modification or revocation of coverage will be conducted according to S.C. Pollution Control Act and S.C. Regulation 61-9.

Part VIII. TERMINATION OF COVERAGE

A. Notice of Termination

Where all water treatment plant discharges that are authorized by this permit are eliminated or where a facility's operation changes as to reclassify it under another type of eligible operation, the owner/operator of the facility shall submit a Notice of Termination. The Notice of Termination shall include the following information:

1. Name, mailing address, and location of the facility for which the notification is submitted. Where a mailing address for the site is not available, the location can be described in terms of the latitude and longitude of the facility to the nearest 15 seconds that the facility is located in;

2. Up to four 4-digit SIC codes that best represent the principal products or activities provided by the facility;

3. Up to four 6-digit NAICS codes that best represent the principal products or activities provided by the facility;

4. The operator's name, address, telephone number, ownership status and status as Federal, State, private, public or other entity;

5. The NPDES permit number for the water plant discharge identified by the Notice of Termination;

6. The reason(s) for termination; and

7. The NOT must be signed in accordance with Part VI.I of this permit.

B. Where to Submit

All Notices of Termination are to be submitted through ePermitting or sent to the following address:

SC Dept. of Health and Environmental Control
Bureau of Water
NPDES Permit Administration
2600 Bull Street
Columbia, SC 29201

Part IX. SPECIAL CONDITIONS

A. Releases in Excess of Reportable Quantities

1. The discharge of hazardous substances or oil in the discharge(s) from a facility shall be prevented or minimized in accordance with the applicable BMP plan for the facility. This permit does not relieve the permittee of the reporting requirements of 40 CFR Part 117 and 40 CFR Part 302. Where a release containing a hazardous substance in an amount equal to or in excess of reporting quantity established under either 40 CFR 117 or 40 CFR 302, occurs during a 24 hour period:

   a. The discharger is required to notify both the Department's Emergency Response Section at (803) 253-6488 and the National Response Center (NRC) (800-424-8802) in accordance with the requirements of 40 CFR 117 and 40 CFR 302 as soon as he or she has knowledge of the discharge;

   b. The permittee shall submit within 14 calendar days of knowledge of the release a written description of the release (including the type and estimate of the amount of material released), the date that such release occurred, the circumstances leading to the release, and steps to be taken in accordance with Part IX.A.1.c (below) of this permit to both:

      Emergency Response Section
      SC Dept. of Health and Environmental Control
      2600 Bull Street
      Columbia, S.C. 29201; and

      EPA Region IV
      61 Forsyth Street SW
      Atlanta, Ga. 30303-3104

   c. The BMP plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

2. Spills. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

B. Best Management Practices Plan

1. For activities covered under Part II.B.4.a-g, the permittee shall develop and implement a Best Management Practices (BMP) Plan, or update and maintain an existing plan, to identify and control the discharge of significant amounts of oils and the hazardous and toxic substances listed in 40 CFR Part 117 and Tables II and III of Appendix D to 40 CFR Part 122. The plan shall include a listing of all potential sources of spills or leaks of these materials, a method for containment, a description of training, inspection and security procedures, and emergency response measures to be taken in the event of a discharge to surface waters, or it shall include plans and/or procedures which constitute an equivalent BMP. Sources of such discharges may include materials storage areas; in-plant transfer, process and material handling areas; loading and unloading operations; plant site runoff; and sludge and waste disposal areas. The BMP plan shall be developed in accordance with good engineering practices, shall be documented in narrative form, and shall include any necessary plot plans, drawings, or maps.

2. Where no previous permit issued for the site has required a BMP plan, the BMP plan shall be developed no later than six months after the effective date of coverage of this permit, and shall be implemented no later than one year after the effective date of coverage of this permit. Where a plan has been required under a previous permit to the facility and after implementation of a plan, appropriate changes to the plan shall be developed and implemented before facility changes are put into operation.

3. The BMP plan shall be maintained at the plant site and shall be available for inspection by U.S. EPA and Department personnel.

D. Covered Activities

Permits for identified covered activities (Part II.B.4.g), by their nature, will be for a limited period. The expiration date of the permit for those covered activities will be specified on the permit and will not exceed the expiration date of the general permit. After the expiration date, the permittee must reapply for coverage under the general permit following procedures outlined in Part III of this permit.

E. Sludge Disposal Requirements

1. Sludge Use and Disposal

a. The permittee shall comply with effluent standards and/or prohibitions established under Section 307(a) of the Clean Water Act (CWA) for toxic pollutants, standards for sludge use and disposal established in 40 CFR Parts 122, 123, 258, 501 and 503, under Section 405(d) of the CWA, and R.61-9.503 State Domestic Sludge Regulations, within the time provided in the regulations that establish these prohibitions or standards for sludge use or disposal, even if the NPDES permit has not yet been modified to incorporate the requirement.

b. The Permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

c. This permit may be modified to address any standard for sludge use or disposal promulgated under Section 405(d) and Section 503 of the Clean Water Act and R.61-9.503 State Domestic Sludge Regulations or additional controls of a pollutant or practice not currently limited in this permit.

d. It must be noted that 40 CFR Part 503 Standards for the Use or Disposal of Sewage Sludge, Federal Register Volume 58, No. 32, pages 9248 through 9415, dated February 19,1993, was effective March 22, 1993, and R.61-9.503 State Domestic Sludge Regulations was effective June 28, 1996 and continues in effect. The compliance with the Federal sludge regulations is directly enforceable as identified in 40 CFR Part 503.3. No person shall use or dispose of sewage sludge through any practice for which requirements are established except in accordance with 40 CFR Part 503. Any sludge disposal permits issued by the Department will remain in effect and all conditions and requirements will apply; however, this does not relieve the permittee from complying with the conditions of 40 CFR Part 503 or State Regulation 61-9.503. The compliance dates are as follows;

2. Sludge Disposal Locations

The permittee may only transport or dispose of drinking water plant sludges with prior Department approval. The permittee must request prior approval of any anticipated change to the sludge disposal method presently approved.

F. Reserved.

G. Reserved.

H. Coverage Schedule of Compliance

A schedule of compliance (to be determined for each individual permittee) may be allowed for instances where a permittee with existing coverage is unable to meet more stringent or additional limitations upon coverage under this permit. These schedules of compliance shall require compliance in the shortest reasonable time period and will be specified in correspondence sent to the permittee with the interim and final dates specified on the DMR. Any new facility applying for coverage after the effective date of this permit shall meet the specified limits from the beginning of the discharge.

Part X. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Aluminum based coagulants and discharging to Freshwaters (FW) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 01A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Quarter	Grab
Total Aluminum	MR	---	MR	1/Quarter	Grab
Total Phosphorus⚬	MR		MR	1/Quarter	Grab
pH	6.0-8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⚬ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

B. Aluminum based coagulants discharging to Freshwaters (FW sp) with site-specific standards as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 01B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Quarter	Grab
Total Aluminum	MR	---	MR	1/Quarter	Grab
Total Phosphorus⚬	MR	---	MR	1/Quarter	Grab
pH	5.0- 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⚬ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

C. Aluminum based coagulants and discharging to Saltwaters (SA, SA sp, SB, SB sp, SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 01C**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Quarter	Grab
Total Aluminum	MR	---	MR	1/ Quarter	Grab
Total Phosphorus◉	MR	---	MR	1/ Quarter	Grab
pH	6.5 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

◉ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

D. Iron based coagulants and discharging to Freshwaters (FW) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 02A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/ Quarter	Grab
Total Iron	MR	---	MR	1/ Quarter	Grab
Total Phosphorus⚬	MR		MR	1/ Quarter	Grab
pH	6.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⚬ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

E. Iron based coagulants and discharging to Freshwaters (FW sp) with site-specific standards as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 02B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/ Quarter	Grab
Total Iron	MR	---	MR	1/ Quarter	Grab
Total Phosphorus⚬	MR	---	MR	1/ Quarter	Grab
pH	5.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⚬ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

F. Iron based coagulants and discharging to Saltwaters (SA, SA sp, SB, SB sp, SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 02C**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/ Quarter	Grab
Total Iron	MR	---	MR	1/ Quarter	Grab
Total Phosphorus[o]	MR	---	MR	1/ Quarter	Grab
pH	6.5 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

o This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

G. Polymer based coagulants and discharging to Freshwaters (FW) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 03A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus⚬	MR	---	MR	1/Month	Grab
pH	6.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⚬ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

H. Polymer based coagulants and discharging to Freshwaters (FW sp) with site-specific standards as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 03B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus⭘	MR	---	MR	1/Month	Grab
pH	5.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⭘ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

I. Polymer based coagulants and discharging to Saltwaters (SA, SA sp, SB, SB sp, SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 03C**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus°	MR	---	MR	1/Month	Grab
pH	6.5 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

° This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

J. Ion exchange and discharging to Freshwaters (FW) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 04A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus⊙	MR	---	MR	1/Month	Grab
PH	6.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⊙ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

K. Ion exchange and discharging to Freshwaters (FW sp) with site-specific standards as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 04B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus⚬	MR	---	MR	1/Month	Grab
PH	5.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⚬ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

L. Ion exchange and discharging to Saltwaters (SA, SA sp, SB, SB sp, SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 04C**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus⭘	MR	---	MR	1/Month	Grab
PH	6.5 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⭘ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

M. Reverse osmosis and discharging to Freshwaters (FW) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 05A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR		MR	1/Month	
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus[o]	MR	---	MR	1/Month	Grab
pH	6.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

o This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

N. Reverse osmosis and discharging to Freshwaters (FW sp) with site-specific standards as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 05B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus⭘	MR	---	MR	1/Month	Grab
pH	5.0 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

⭘ This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

O. Reverse osmosis and discharging to Saltwaters (SA, SA sp, SB, SB sp, SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 05C**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Flow	MR◆ in MGD	---	MR in MGD	1/week	Instantaneous
Total Suspended Solids (TSS)	30 mg/l	---	60 mg/l	1/Month	Grab
Total Iron	MR	---	MR	1/Month	Grab
Total Manganese	MR	---	MR	1/Month	Grab
Total Phosphorus[o]	MR	---	MR	1/Month	Grab
pH	6.5 - 8.5 Standard Units			1/Month	Grab

◆ MR = Monitor and Report

o This parameter is applicable only for facilities that use phosphorus in their system. If no phosphate or phosphorus- based compounds are used, the permittee may report "*9" in place of completing an analysis.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

P. Whole Effluent Toxicity Limitations and Monitoring Requirements discharging to Freshwaters (FW or FW sp) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

Final Limitations:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 06A;** treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Other Units			
	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Whole Effluent Toxicity **Acute** Testing @ ATC = $%	---	0	***	24 Hour Composite

a. Samples used to demonstrate compliance with the discharge limitations and monitoring requirements specified above shall be taken at or near the final point-of-discharge but, prior to mixing with the receiving waters or other waste streams.

b. A 48-hour static acute toxicity test shall be conducted at the frequency stated above using a control and the acute test concentration (ATC) of $%. The test shall be conducted using Ceriodaphnia dubia as the test organism using EPA Method 2002.0 in accordance with "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms," EPA 821/R-02/012 (October 2002). The test shall be conducted at 25°C ±1°C.

c. If the test group Ceriodaphnia dubia survival is less than the control group survival at the 0.05α level of a left-tailed Fisher's exact test, the test shall be deemed a failure.

d. The permittee must report on the discharge monitoring report (DMR) form whether the test passes or fails at the specified ATC. If the test fails, the number "1" shall be placed on the form. If the test passes, the number "0" shall be placed on the form. If more than one test is performed during a monitoring period (including tests from split samples), the worst case result shall be reported on the DMR. The DMR Attachment for Toxicity Test Results schedule in ePermitting shall also be completed and submitted with the DMR.

e. $% = See Permit Rationale. Default IWC is 100% if no mixing zone analysis provided if IWC calculation is less than 80%. IWC will be actual dilution between 80% and 100%.

***The sampling frequency will be no less than once per year (1/year) and no more than once per month (1/month) determined based on the information available on the individual discharge permit application and/or NOI. For new facility coverage or in cases where toxicity testing has not yet been collected, the default frequency is (1/year) once/year.

Q. Whole Effluent Toxicity Limitations and Monitoring Requirements discharging to Saltwaters (SA, SA sp, SB sp, SB, or SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

Final Limitations:

During the period on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 06B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS		MONITORING REQUIREMENTS	
	Other Units			
	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type
Whole Effluent Toxicity **Acute** Testing @ ATC = $%	---	0	***	24 Hour Composite

a. Samples used to demonstrate compliance with the discharge limitations and monitoring requirements specified above shall be taken at or near the final point-of-discharge but, prior to mixing with the receiving waters or other waste streams.

b. A 48-hour static acute toxicity test shall be conducted at the frequency stated above using a control and the acute test concentration (ATC) of $%. The test shall be conducted using *Mysidopsis bahia* as the test organism using Method 2007.0 in accordance with "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms," EPA 821-R-02-012, 5th ed., 2002. The test shall be conducted at 25°C ±1°C. The effluent's salinity may be adjusted to 20 to 30 parts per thousand (ppt) by the addition of salts before the test is performed. The effluent shall not be diluted to achieve a lower salinity.

c. If the test group *Mysidopsis bahia* survival is less than the control group survival at the 0.05α level of a left-tailed Fisher's exact test, the test shall be deemed a failure.

d. The permittee must report on the discharge monitoring report (DMR) form whether the test passes or fails at the specified ATC. If the test fails, the number "1" shall be placed on the form. If the test passes, the number "0" shall be placed on the form. If more than one test is performed during a monitoring period (including tests from split samples), the worst case result shall be reported on the DMR. The DMR Attachment for Toxicity Test Results schedule in ePermitting shall also be completed and submitted with the DMR.

e. $% = See Permit Rationale. Default IWC is 100% if no mixing zone analysis provided if IWC calculation is less than 80%. IWC will be actual dilution between 80% and 100%.

*** The sampling frequency will be no less than once per year (1/year) and no more than once per month (1/month) determined based on the information available on the individual discharge permit application and/or NOI. For new facility coverage or in cases where toxicity testing has not yet been collected, the default frequency is (1/year) once/year.

R. Ion exchange and Reverse osmosis discharging to all water classifications (FW, FW sp with site-specific standards, SA, SA sp, SB, SB sp, or SFH waters) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 07A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Total Arsenic	MR	---	MR	1/Quarter	Comp[1]
Total Barium	MR	---	MR	1/Quarter	Comp
Total Cadmium	MR	---	MR	1/Quarter	Comp
Total Copper	MR	---	MR	1/Quarter	Comp
Total Mercury	MR	---	MR	1/Year	Grab
Total Selenium	MR	---	MR	1/Quarter	Comp
Total Zinc	MR	---	MR	1/Quarter	Comp
Temperature (effluent)	MR	---	MR	1/Month	Grab
Salinity (effluent)	MR	---	MR	1/Quarter	Grab

MR = Monitor and Report

Comp[1] shall mean composite sample as defined in Part I - Item E.2

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

For the parameters listed, the practical quantitation limit (PQL) using the analytical method stated below shall be considered as being in compliance with the limit provided. In cases where the limit is not quantifiable using EPA approved analytical methods, appropriate biological monitoring requirements are incorporated into the permit.

S. All dischargers subject to Turbidity Standards discharging to Freshwaters (FW, FW sp with site-specific standards) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 08A**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(NTUs unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Turbidity	50	---	50	1/Quarter	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

The Department may determine that an NPDES permitted discharge will not cause, have reasonable potential to cause, or contribute to an exceedance of the numeric criteria for turbidity under the following conditions:

1) The facility withdraws its surface intake water containing turbidity from the same body of water into which the discharge is made;
2) The facility does not significantly concentrate or contribute additional turbidity to the discharged water;
3) The facility does not alter the turbidity through chemical or physical means that would cause adverse water quality impacts to occur.

T. All dischargers subject to Turbidity Standards discharging to Saltwaters or Lakes (SA, SA sp, SB, SB sp, SFH or Lakes) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge from **outfall 08B**; treated filter backwash water, sedimentation basin wash down water and decant water. Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(NTUs unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Turbidity	25	---	25	1/Quarter	Grab

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

The Department may determine that an NPDES permitted discharge will not cause, have reasonable potential to cause, or contribute to an exceedence of the numeric criteria for turbidity under the following conditions:

1) The facility withdraws its surface intake water containing turbidity from the same body of water into which the discharge is made;
2) The facility does not significantly concentrate or contribute additional turbidity to the discharged water;
3) The facility does not alter the turbidity through chemical or physical means that would cause adverse water quality impacts to occur.

U. Total Residual Chlorine (TRC) limits for all water classifications (FW, FW sp, SA, SB, SA sp, SB sp, SFH) as classified by S.C. Regulation 61-68, Water Classifications and Standards, and Regulation 61-69, Classified Waters:

a. During the period beginning on the effective date and lasting until the expiration date of this permit, the permittee is authorized to discharge from **outfall 09A.** Such discharge shall be limited at each outfall and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS **(mg/l unless stated otherwise)**			**MONITORING REQUIREMENTS**	
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type
Total Residual Chlorine (TRC)□		---		1/Month	Grab

□ Effluent limits for TRC shall be calculated based on the procedure outlined in the permit rationale and will depend on the 7Q10 flow at the discharge location.

See Part IV – Schedule of Compliance for information.

The grab samples taken must be representative of the effluent characteristics. The permittee may be required to provide composite samples using the method listed in Part I, E.2, 3 or 4 in place of grab samples. If required, the permittee must change from grab to composite sample beginning sixty (60) days from written notice by the Department.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): at each monitored outfall but prior to mixing with the receiving waters.

For purposes of reporting, the Permittee shall use the reporting threshold equivalent to the PQL listed below and conduct analyses in accordance with the method specified below:

Where the permit limitation in Part X is below the practical quantitation limit (PQL), the PQL and analytical method stated below shall be considered as being in compliance with the permit limit. Additionally, where the permit requires only monitoring and reporting (MR) in Part X, the PQL and analytical method stated below shall be used for reporting results.

Parameter	Analytical Method μ	PQL μ
Total Iron	§	0.02 mg/l
Total Manganese	§	0.01 mg/l
Total Phosphorus	§	0.05 mg/l
Total Arsenic	§	0.0050 mg/l
Total Barium	§	0.050 mg/l
Total Cadmium	§	0.00010 mg/l
Total Copper	§	0.010 mg/l
Total Mercury	1669(sampling); EPA 1631E (analysis) Low Level Mercury Method	0.00000050 mg/l
Total Selenium	200.8, 200.9, SM3113B	0.0050 mg/l
Total Zinc	§	0.010 mg/l
Total Residual Chlorine	§	0.05 mg/l

μ See Part V.B.4.b.

§ The Permittee must use a suitable analytical method (40 CFR Par 136 approved) from a SCDHEC certified laboratory with a PQL equal to or lower than the PQL listed above. If the permittee is using a PQL below the PQL listed above, then for purposes of reporting, the lower PQL shall be used in accordance with Part V.B.4.b.

Attachment B: Threatened and Endangered Species Consultation Letters

Intentionally Blank

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Tom McCoy
USFWS
176 Croghan Spur Road, Suite 200
Charleston, SC 29407

RE: Dominion Energy – Virgil C. Summer Nuclear Station Unit 1 Subsequent License Renewal

Dear Mr. McCoy,

Dominion Energy is preparing an application for renewing the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years beyond the current 60-year operating license.

VCSNS Licensing Dates

VCS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

VCSNS is in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir.

VCSNS has provided safe, reliable, and carbon-free electricity to South Carolina customers for decades. VCSNS also provides economic benefits to the region and South Carolina through its employment of a large workforce, annual tax payments, and contributions to local community organizations. Extending the license of VCSNS would allow these benefits to continue for our customers, communities, and environment.

As a valued partner, Dominion Energy is sending this letter to inform you of our license renewal activities – any pertinent information you might share would be appreciated. Should you have any questions or comments about VCSNS or the subsequent license renewal process, please feel free to contact Ken Roller at (804) 592-7825 or via email at kenneth.roller@dominionenergy.com.

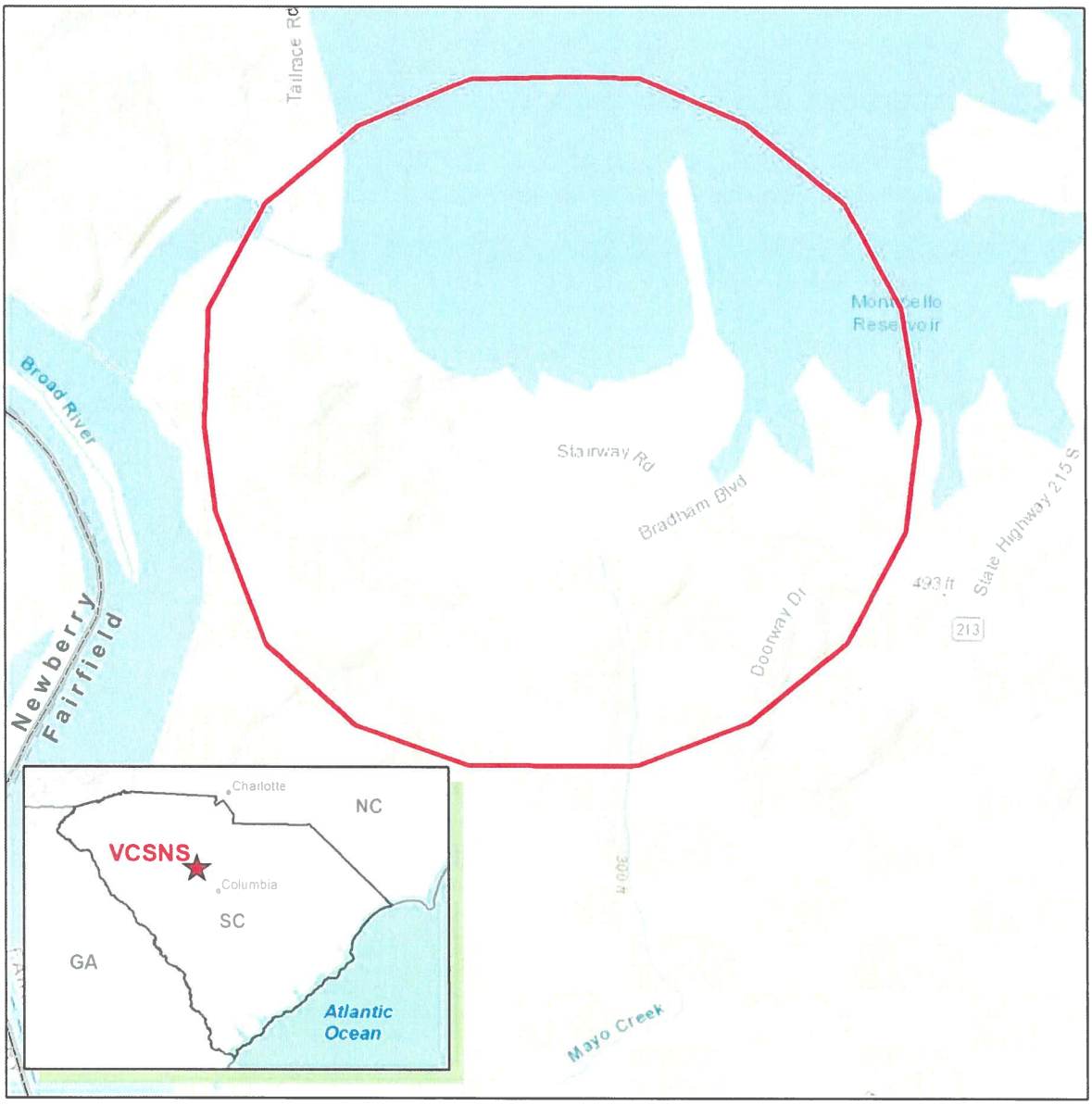
Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Figure 1. VCSNS Site



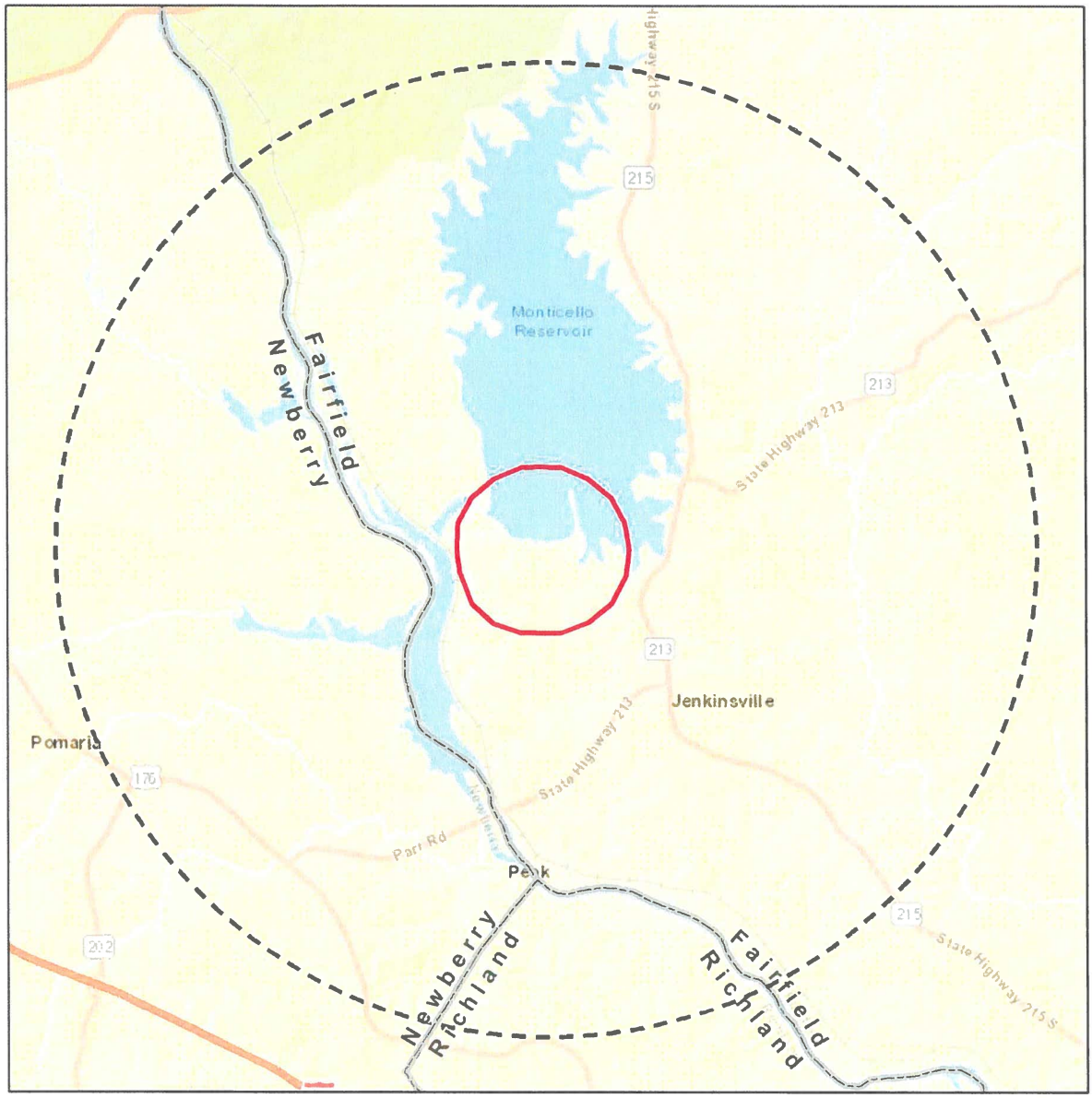
Legend

VCSNS Site Boundary

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User

Miles
0 0.25 0.5

Figure 2. VCSNS 6-mile Vicinity



Ellery J Baker (Services - 6)

From: Olds, Melanie J <melanie_olds@fws.gov> on behalf of Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>
Sent: Monday, December 5, 2022 4:31 PM
To: Ellery J Baker (Services - 6)
Subject: [EXTERNAL] Re: [EXTERNAL] VCS Subsequent License Renewal Project

Mr. Baker,

The Service has reviewed the VC Summers Nuclear Station Subsequent License Renewal and has no comments.

In the future, there is no need to send hard copy mail, we prefer electronic versions and you can use this email address to submit all notices and project reviews.

Melanie

From: ellery.j.baker@dominionenergy.com <ellery.j.baker@dominionenergy.com>
Sent: Wednesday, November 30, 2022 11:45 AM
To: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>
Subject: [EXTERNAL] VCS Subsequent License Renewal Project

To Whom It May Concern:
I spoke with a Melanie Ould (apologies if I have her last name incorrect) earlier today about the subject project. In that conversation, I let her know I would send an electronic copy of the attached letter previously sent via US Post Mail. Please feel free to reach out with any questions, comments, or concerns.
Best,
- Ellery

Ellery J. Baker, PE, PMP
Generation Project Manager
Subsequent License Renewal

Dominion Energy Services
5000 Dominion Blvd 23060
Mobile: 804.240.9118

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

David Dale
NOAA Fisheries
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

RE: Dominion Energy – Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal

Dear Mr. Dale,

Dominion Energy is preparing an application for renewing the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years (see Table 1). As part of the subsequent license renewal process, the U.S. Nuclear Regulatory Commission (NRC) may request an informal or formal consultation with your agency. Our intent, by way of this letter, is to introduce you to the project, and to make available any data you need to ensure an efficient and effective consultation process.

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

As part of the renewal process, the NRC requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the unit. The ER will address the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA. The ER will also address essential fish habitat (EFH) as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from National Oceanic and Atmospheric Administration (NOAA) Fisheries regarding such effects in the vicinity of VCSNS. Our evaluation indicates that no diadromous species are impacted by operations of VCSNS and we are seeking your concurrence that no species or designated critical habitat (DCH) under your jurisdiction or EFH would be

adversely affected by continued operations at VCSNS. Also, as part of the renewal process, the NRC may request a consultation with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for late 2023.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that subsequent license renewal activities may have on listed species (or candidates proposed for listing) under your jurisdiction and important aquatic habitats within the station's environs, and any questions or additional information necessary for the consultation process. A figure depicting the station's 50-mile region and the nearest EFH is enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

VCSNS is located in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir.

During the subsequent license renewal term, Dominion Energy proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities anticipated other than routine maintenance associated with the operation of VCSNS during the subsequent license renewal period. Additionally, Dominion Energy does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion Energy does not anticipate the continued operation of VCSNS to adversely affect the environment, sensitive species, or habitats.

As stated above, this letter seeks your concurrence that continued operation of VCSNS would not affect listed species (or candidates proposed for listing) or DCH under your jurisdiction or any EFH. We appreciate your notifying us of your comments and any information or actions required of Dominion Energy to assist in the preparation of our ER. Your input is requested by September 30, 2022. Dominion Energy plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Caleb Gaston at (803) 206-3014 or via email at caleb.gaston@dominionenergy.com.

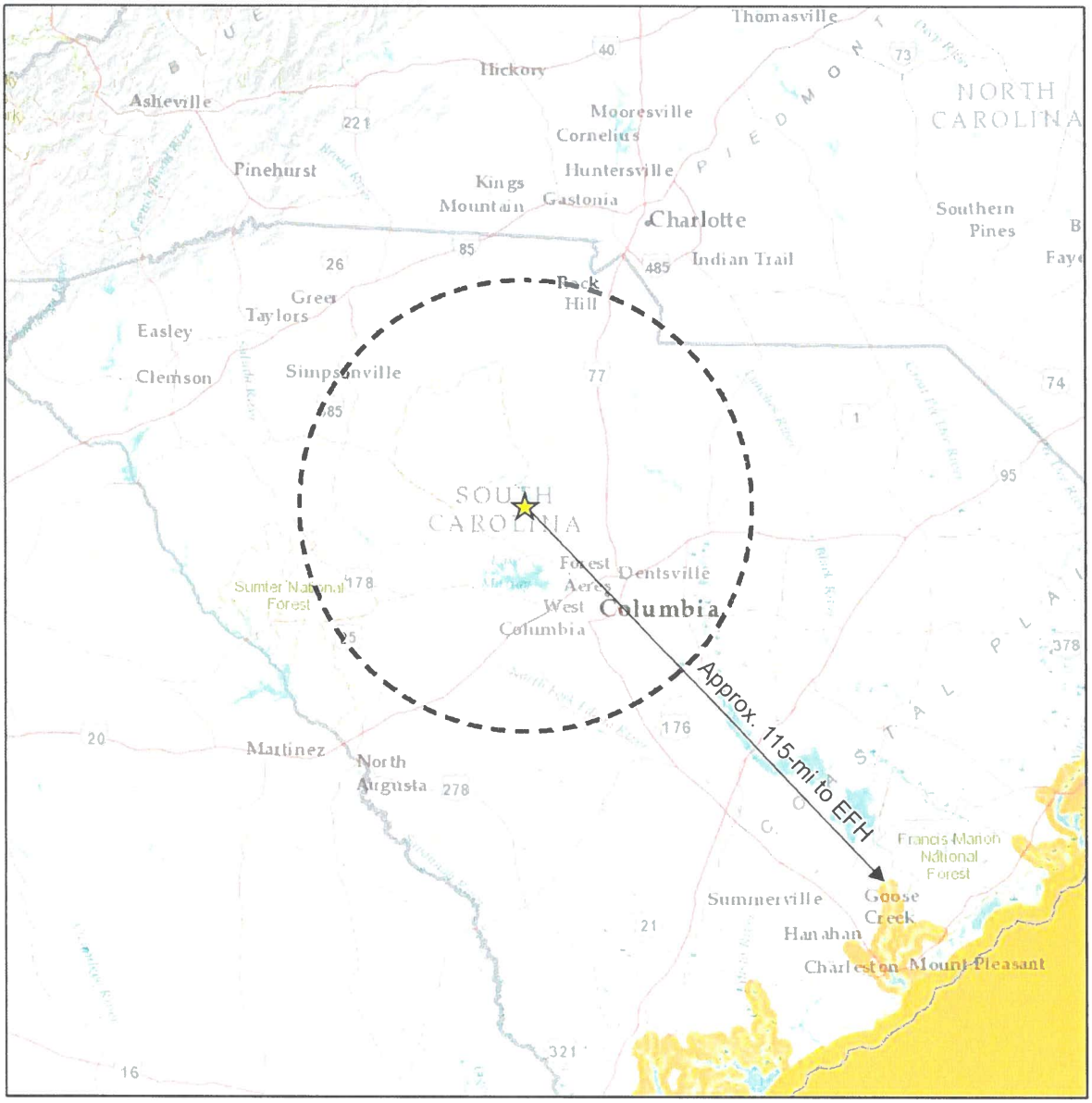
Sincerely,

Jason E. Williams
Vice President, Environmental

Attachment:

Figure 1. VCSNS 50-mile Region and EFH

Figure 1. VCSNS 50-mile Region and Nearest EFH



Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Lorianne Riggin
Director of Environmental Programs
South Carolina Department of Natural Resources
1000 Assembly Street
Columbia, SC 29201-3117

RE: Dominion Energy – Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal

Dear Ms. Riggin,

Dominion Energy is preparing an application for renewing the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years (see Table 1). As part of the subsequent license renewal process, the U.S. Nuclear Regulatory Commission (NRC) may request an informal or formal consultation with your agency. Our intent, by way of this letter, is to introduce you to the project, and to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Confirmation from you on the identified list of species, and
- Input on listed species under your jurisdiction and important habitats within the surrounding area of the VCSNS.

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

As part of the process, the NRC requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. The ER will address the potential to impact species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA. The ER will also address essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the South Carolina Department of Natural Resources (SCDNR) regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the VCSNS site and the vicinity within a 6--mile radius of VCSNS, as well as a table of listed species in the plant's vicinity are enclosed. A brief discussion of the station and its expected operations during the renewal period is provided below.

VCSNS is located in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir.

Species potentially occurring near the VCSNS site, or within Fairfield, Newberry, and Richland Counties (counties within a 6-mile radius of the site) that are state and/or federally listed as threatened or endangered are included in the enclosed Table 2.

During the license renewal term, Dominion Energy proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities anticipated other than routine maintenance associated with continued operation of VCSNS during the subsequent license renewal period. Additionally, Dominion Energy does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion Energy does not anticipate the continued operation of VCSNS to adversely affect the environment or any threatened and/or endangered species and/or important plant and animal habitat.

As stated earlier, this letter seeks your input on the proposed continued operation of VCSNS regarding listed species and important habitats within the environs of the station. We appreciate your notifying us of your comments and any information you believe Dominion Energy should consider in the preparation of the ER. Your input is requested by September 30, 2022. Dominion Energy plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Caleb Gaston at (803) 206-3014 or via email at caleb.gaston@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Table 2. Threatened or Endangered Species occurring near VCSNS or within Fairfield, Newberry, and Richland Counties, South Carolina
Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Table 2. Threatened or Endangered Species Occurring Near VCSNS or within Fairfield, Newberry, and Richfield Counties, South Carolina

Common Name	Legal Status
Plants	
American chaffseed	FE
Canby's dropwort	FE
Michaux's sumac	FE
Rough-leaved loosestrife	FE
Smooth coneflower	FE
Schweinitz's sunflower	FE
Pocosin loosestrife	FE
Smooth purple Coneflower	FE
Mussels	
Carolina heelsplitter	FE
Insects	
Monarch butterfly	FC
Fish	
Carolina pygmy sunfish	ST
Shortnose sturgeon	FE/SE
Amphibians	
Carolina gopher frog	SE
Pine Barrens treefrog	ST
Reptiles	
Southern hog-nosed snake	ST
Spotted turtle	ST
Birds	
Bald eagle	ST
Wood stork	FE/SE
Red-cockaded woodpecker	FE/SE
Mammals	
Rafinesque's big-eared bat	ST
Northern long-eared bat	FT
West Indian manatee	FT

FE = federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FC = federal candidate species

Table 2 Sources:

SCDNR (South Carolina Department of Natural Resources). 2022. Rare, Threatened & Endangered Species Inventory – Tracked Species by County. Retrieved from <https://experience.arcgis.com/experience/af61ba156d054cc7b3e27d09a0c35c0f> (accessed March 14, 2022)

USFWS (U.S. Fish and Wildlife Service). 2022. IPaC Resource List. Retrieved from <https://ipac.ecosphere.fws.gov/location/E5TTI3BKEZDKZIENLSQDHLK5IY/resources> (accessed March 14, 2022).

Figure 1. VCSNS Site

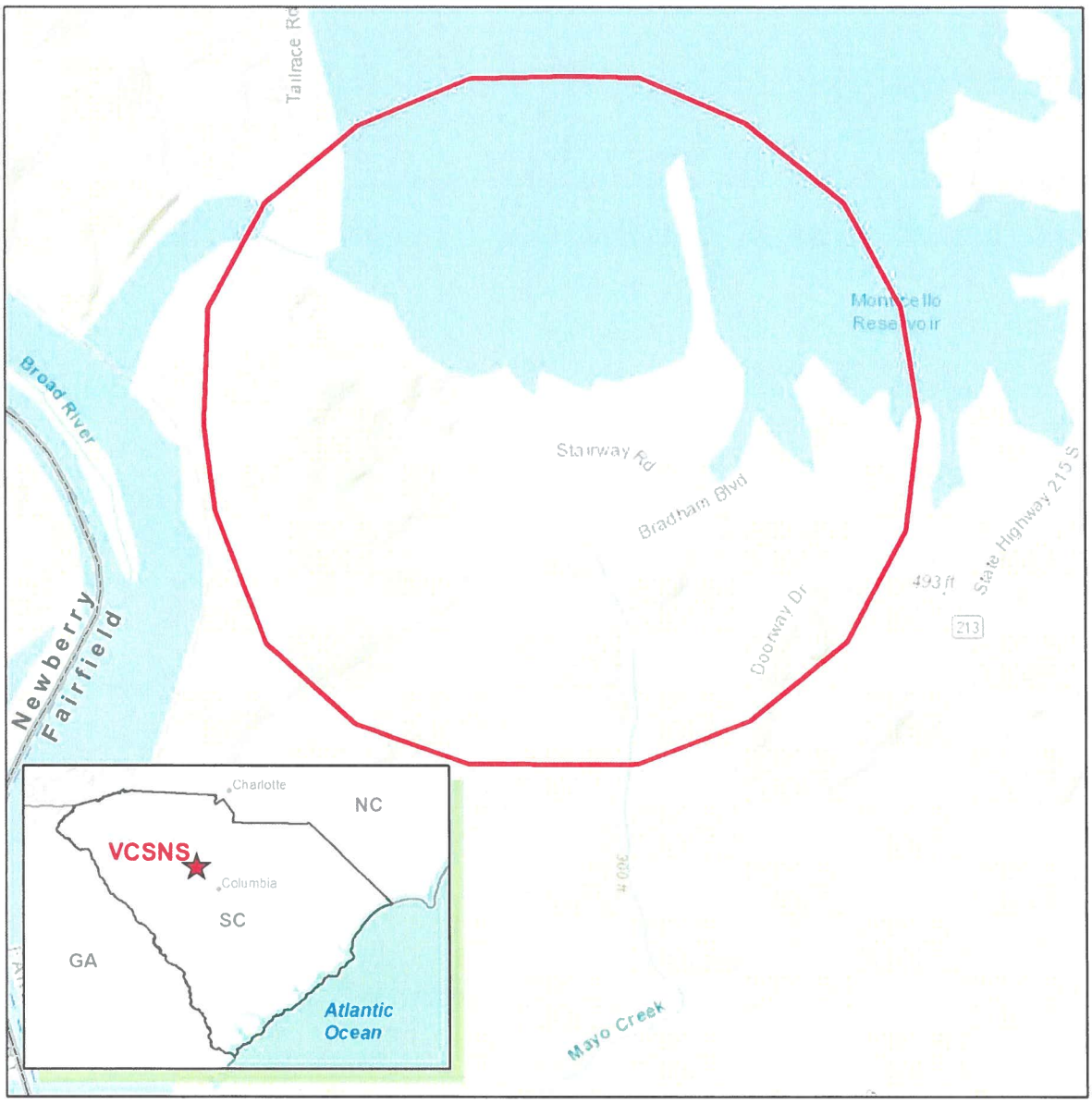
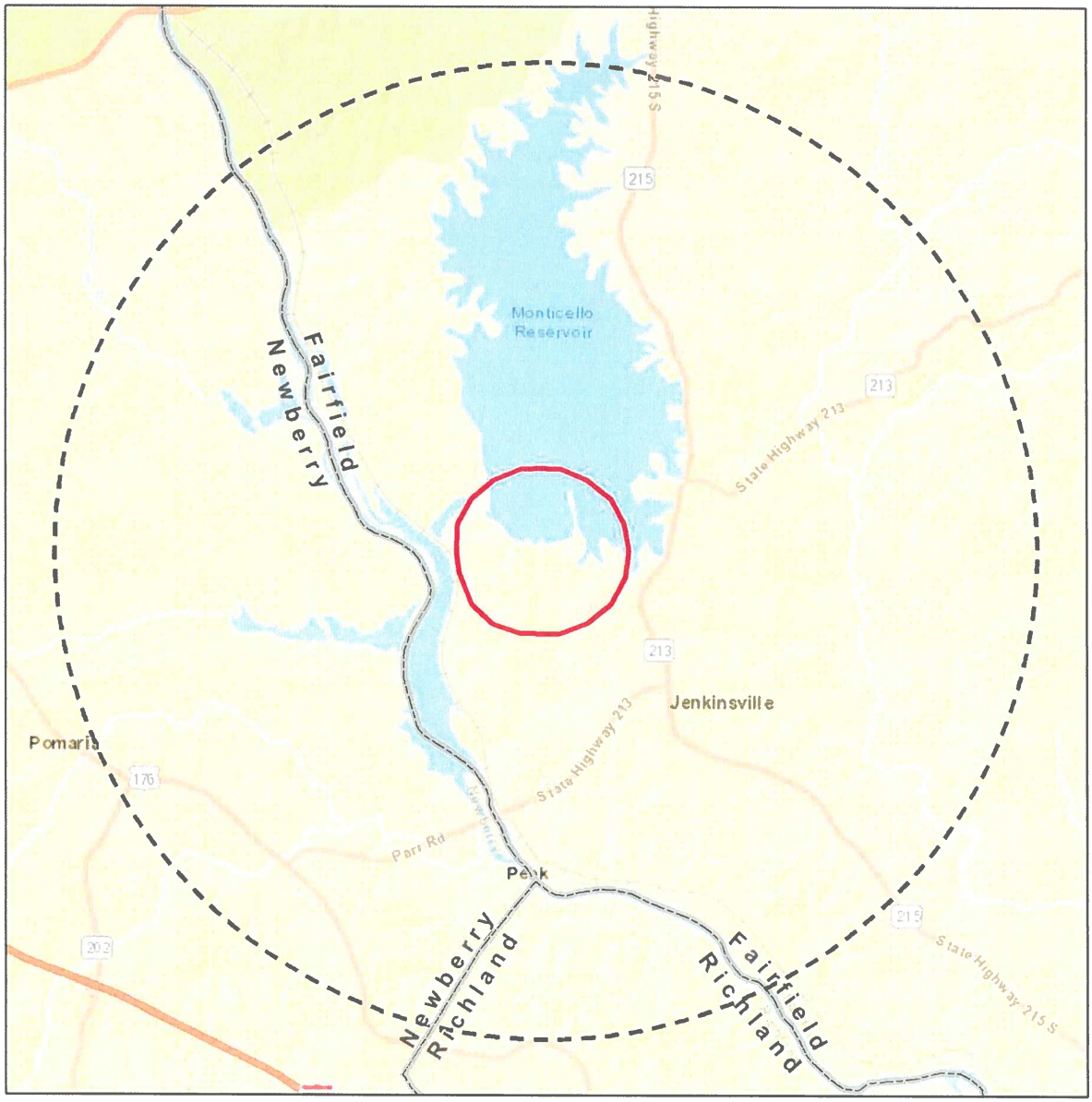


Figure 2. VCSNS 6-mile Vicinity



Legend

- VCSNS Site Boundary
- 6-Mile Radius

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

0 1 2 Miles

Attachment C: Cultural Resource Consultation Letters

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Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Elizabeth Johnson
Director, Historical Services, D-SHPO
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29233

RE: Dominion Energy – The Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal

Dear Ms. Johnson,

Dominion Energy is preparing an application for renewing the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years (see Table 1). As part of the process, the U.S. Nuclear Regulatory Commission (NRC) requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the VCSNS site.

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

This letter seeks input from the South Carolina Department of Archives and History (SHPO) regarding any such effect in the vicinity of VCSNS.

Also, as part of the renewal process, the NRC may request consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with your agency regarding the subsequent license renewal. The timeframe for the NRC consultation request is anticipated to be within a few months of Dominion Energy's application submittal, currently scheduled for late 2023.

To facilitate our preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius (Figures 1 and 2) and tables of known historic properties and archaeological sites within the plant's vicinity (Tables 1 and 2) are enclosed. A brief discussion of the plant and its operations during the renewal period of operation is provided below.

VCSNS is located in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir.

During the license renewal term, Dominion Energy proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the VCSNS site during the subsequent license renewal period. Currently, Dominion Energy does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion Energy does not anticipate the continued operation of VCSNS to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on the proposed continued operation of VCSNS on historic and cultural resources, including tribal cultural resources, within the environs of the plant. Please notify us of concerns and any information you believe Dominion Energy should consider in the preparation of the ER. If possible, Dominion Energy would appreciate receiving your input by September 30, 2022. Dominion Energy plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Ken Roller at

(804) 592-7825 or via email at kenneth.roller@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Table 2. Historic Properties within a 6-mile radius of VCSNS
Table 3. Archaeological Sites within a 6-mile radius of VCSNS
Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Table 2. Historic Properties within a 6-mile Radius of VCSNS (1 of 3)

Site ID#	County	Name	NRHP Status
71000775	Fairfield	Ebenezer Associate Reformed Presbyterian Church/Old Brick Church	Listed 08/19/1971
7100776	Fairfield	Davis Plantation	Listed 10/05/1971
72001208	Fairfield	Little River Baptist Church	Listed 04/13/1972
74001852	Fairfield	Kincaid-Anderson House	Listed 07/30/1974
78002527	Newberry	St. John's Lutheran Church	Listed 12/08/1978
79003321	Newberry	Pomaria	Listed 04/24/1979
84000572	Fairfield	Dr. John Glenn House	Listed 12/06/1984
84000576	Fairfield	Highpoint	Listed 12/06/1984
84000578	Fairfield	Monticello Methodist Church	Listed 12/06/1984
84000585	Fairfield	Monticello Store and Post Office	Listed 12/06/1984
84000617	Fairfield	Rockton and Rion Railroad Historic District	Listed 12/06/1984
85000246	Fairfield	Mayfair	Listed 02/06/1985
07001045	Newberry	Hope Rosenwald School	Listed 10/03/2007
0058	Fairfield	N/A (7769 State Highway 215 South)	Unassessed
0059	Fairfield	N/A (7835 State Highway 215 South)	Unassessed
0060	Fairfield	N/A (on Shady Lane)	Unassessed
0061	Fairfield	N/A (7599 State Highway 215 South)	Unassessed
0070	Fairfield	White Hall Elementary School	Eligible
0081	Fairfield	Parr Shoals Hydroelectric Facility	Eligible
0082	Fairfield	Fairfield Pump Storage	Eligible
0086	Fairfield	Unnamed House (182 Sleepy Hollow Road)	Not Eligible
0087	Fairfield	Unnamed House (143 Sleepy Hollow Road)	Not Eligible
0088	Fairfield	Morris Creek Baptist Church	Not Eligible
0091	Fairfield	Southern Railway (segment)	Not eligible
1098	Newberry	N/A (Highway 176, east side, ½ mile south of intersection with SC 213)	Not Eligible
1190	Newberry	N/A (605 Hope Station Road)	Not Eligible
1191	Newberry	St. John's Evangelical Lutheran Church	Listed 12/08/1978
1192	Newberry	N/A (1129 Hope Station Road)	Not Eligible
1193	Newberry	Hope School	Listed 10/03/2007
1194	Newberry	N/A (243 Peak Road)	Not Eligible
1195	Newberry	N/A (267 Peak Road)	Not Eligible

Table 2. Historic Properties within a 6-mile Radius of VCSNS (2 of 3)

Site ID#	County	Name	NRHP Status
1196	Newberry	N/A (Peak Road, south side, ¼ mile west of intersection with Broad River Road)	Not Eligible
1197	Newberry	N/A (2953 Broad River Road)	Not Eligible
1198	Newberry	N/A (4494 Broad River Road)	Not Eligible
1199	Newberry	N/A (145 Magnolia Lane)	Not Eligible
1200	Newberry	N/A (1766 Broad River Road)	Not Eligible
1201	Newberry	N/A (1405 Broad River Road)	Not Eligible
1202	Newberry	N/A (Highway 176, east side, ½ mile south of intersection with SC 202)	Not Eligible
1203	Newberry	Pomaria	Listed 04/24/1979
1204	Newberry	N/A (3922 Highway 176)	Not Eligible
1205	Newberry	N/A (295 Confederate Road)	Not Eligible
1206	Newberry	N/A (4500 Highway 176)	Not Eligible
1207	Newberry	N/A (4958 Highway 176)	Not Eligible
1208	Newberry	N/A (2833 Peak Road)	Not Eligible
1209	Newberry	N/A (Peak Road, north side, one mile east of intersection with Holloway Street)	Not Eligible
1210	Newberry	N/A (1733 Peak Road)	Not Eligible
1211	Newberry	N/A (1031 Peak Road)	Not Eligible
1212	Newberry	N/A (Peak Road, south side, two miles east of intersection with Holloway Street)	Not Eligible
1213	Newberry	N/A (Peak Road, south side, 1.5 miles east of intersection with Holloway Street)	Not Eligible
1246	Newberry	N/A (2033 Hughey Ferry Road)	Not Eligible
1247	Newberry	N/A (1771 Hughey Ferry Road)	Not Eligible
1248	Newberry	N/A (Hughey Ferry Road, south side, 1.5 miles east of intersection with New Hope Road)	Not Eligible
1249	Newberry	N/A (Hughey Ferry Road, northeast corner of intersection with Leitzsey Road	Not Eligible
1250	Newberry	N/A (1870 Leitzsey Road)	Not Eligible
1251	Newberry	N/A (1245 Leitzsey Road)	Not Eligible
1252	Newberry	N/A (Hughey Road, south side, one mile east of intersection with Hope Road	Not Eligible

Table 2. Historic Properties within a 6-mile Radius of VCSNS (3 of 3)

Site ID#	County	Name	NRHP Status
1253	Newberry	N/A (Hughey Ferry Road, south side, one mile east of intersection with Hope Road)	Not Eligible
1254	Newberry	N/A (400 Bundrick Road)	Not Eligible
1285	Newberry	New Hope United Methodist Church	Not Eligible
1287	Newberry	N/A (4239 New Hope Road)	Not Eligible
1288	Newberry	N/A (5527 New Hope Road)	
1290	Newberry	N/A (8708 Broad River Road)	Not Eligible
1291	Newberry	N/A (Broad River Road, west side, just south of intersection with New Hope Road)	Not Eligible
1292	Newberry	N/A (Broad River Road, east side, across from intersection with New Hope Road)	Not Eligible
1293	Newberry	N/A (7443 Broad River Road)	Eligible
1294	Newberry	N/A (Broad River Road, west side, ½ mile south of intersection with New Hope Road)	Not Eligible
1295	Newberry	N/A (8269 Broad River Road)	Not Eligible
1296	Newberry	N/A (8157 Broad River Road)	Not Eligible
4907	Richland	House, unidentified (1213 R. Stoudemayer Road)	Not Eligible
4908	Richland	House, unidentified (East side of R. Stoudemayer Road, 1.1 mile northwest of intersection with Broad River Road)	Not Eligible
4909	Richland	House, unidentified (1216 R. Stoudemayer Road)	Not Eligible
4910	Richland	Stuck House	Not Eligible
4911	Richland	House, unidentified (1324 Mike Stuck Road)	Not Eligible
U/39/254/0073	Fairfield	Monticello Mercantile	Listed 12/06/1984
U/39/254/0074	Fairfield	N/A (4067 Highway 215 South)	Not Eligible
U/39/254/0076	Fairfield	N/A (Frees Creek Drive)	Not Eligible
U/71/407/1932	Newberry	New Hope Store	Eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (1 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0029	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown Archaic artifacts	Not assessed
38FA0030	Fairfield	Jenkinsville	Prehistoric site with Early, Middle Archaic, and unknown prehistoric components	Not assessed
38FA0033	Fairfield	Jenkinsville	Prehistoric site with Early, Middle, and Late Archaic, and unknown prehistoric components	No determination listed Determination date 11/19/2003
38FA0037	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Determined Not eligible 11/19/2003
38FA0038	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38A0038	Fairfield	Jenkinsville	Prehistoric site with Early, Middle, and Late Archaic components	Not assessed
38FA0040	Fairfield	Jenkinsville	Prehistoric lithic scatter with a Late Archaic and unknown prehistoric components	Not assessed
74001854 38FA0041	Fairfield	Jenkinsville	McMeekin Rock shelter with unknown Archaic, Woodland, unknown prehistoric, and 18th century components	Listed 08/23/1974
38FA0042	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0043	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
38FA0044	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not Eligible
38FA0045	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Not assessed
38FA0046	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
38FA0047	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0049	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0051	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (2 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0053	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Late Archaic, and unknown prehistoric components	Not assessed
7100776 38FA0056	Fairfield	Jenkinsville	19th century Davis Plantation	Listed 05/06/1971
71000775 38FA0057	Fairfield	Jenkinsville	18th century Ebenezer Associate Reformed Presbyterian Church	Listed 08/19/1971
72001208 38FA0058	Fairfield	Jenkinsville	19th century Little River Baptist Church	Listed 04/13/1972
38FA0121	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0122	Fairfield	Jenkinsville	Disturbed scatter of unknown Archaic prehistoric lithic material in a spoils pile	Recommendation listed by recorder was "none" Not assessed
38FA0124	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0125	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0126	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0164	Fairfield	Jenkinsville	Prehistoric lithic scatter of six flakes, a Late Woodland point, and a whiteware sherd	Recommended not eligible
38FA0175	Fairfield	Jenkinsville	20th century site with no additional information	Not eligible
38FA0298	Fairfield	Salem Crossroads	Two Late Archaic steatite bowl fragments	Further work recommended
38FA0319	Fairfield	Richtex	Surface scatter of 19th and 20th century glass, whiteware, and stoneware	Probably not eligible
38FA0320	Fairfield	Richtex	Surface scatter of 19th and 20th century glass and whiteware	Probably not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (3 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0321	Fairfield	Richtex	Surface scatter of 19th and 20th century glass, blue transferware, and whiteware	Probably not eligible
38FA0322	Fairfield	Jenkinsville	Multicomponent site with Middle and Late Archaic, unknown prehistoric, and 19th to 20th century components	Probably not Eligible
38FA0323	Fairfield	Jenkinsville	Scatter of unknown historic era debris	Not Eligible
38FA0324	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric and unknown historic era materials	Not eligible
38FA0325	Fairfield	Jenkinsville	18th Century debris scatter	Not eligible
38FA0326	Fairfield	Jenkinsville	Site with an unknown historic era component	Not eligible
38FA0327	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric and unknown historic era components	Not eligible
38FA0328	Fairfield	Jenkinsville	Site with an unknown historic era component	Not eligible
38FA0329	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0330	Fairfield	Jenkinsville	19th century debris	Probably not eligible
38FA0331	Fairfield	Jenkinsville	Multicomponent site with Late Archaic, unknown prehistoric, and 19th and 20th century components	Probably not eligible
38FA0332	Fairfield	Jenkinsville	19th and 20th century debris scatter	Probably not eligible
38FA0333	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Probably not eligible
38FA0334	Fairfield	Jenkinsville	Multicomponent site with Late Archaic, Middle Woodland, unknown prehistoric, and 20th century components	Probably not eligible
38FA0335	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Probably not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (4 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0336	Fairfield	Jenkinsville	Multicomponent site with Middle, Late, and unknown Archaic, unknown prehistoric, 19th century, and 1933 Pearson CCC camp components	Probably not eligible
38FA0337	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Woodland components	Probably no eligible
38FA0338	Fairfield	Jenkinsville	Multicomponent site with Middle and Late Woodland, unknown prehistoric, and 17th to 18th century artifacts	Probably not eligible
38FA0339	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38FA0340	Fairfield	Jenkinsville	Prehistoric lithic scatter with Paleo, Early, Middle, and Late Archaic, and unknown prehistoric components	Probably not eligible
38FA0341	Fairfield	Jenkinsville	Scatter of 19th and 20th century glass, stoneware, whiteware, porcelain, milk glass, metal, and stones	Probably not eligible
38FA0342	Fairfield	Jenkinsville	Multicomponent site with Paleo, Early Archaic, unknown prehistoric, and a 20 century stoneware fragment	Probably not eligible
38FA0343	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Late Archaic, and unknown prehistoric components	Probably not eligible
38FA0344	Fairfield	Jenkinsville	Prehistoric artifact scatter with Early Woodland pottery sherd, and unknown prehistoric lithic components	Probably not eligible
38FA0345	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Middle Archaic, and unknown prehistoric artifacts	Probably not eligible
38FA0346	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Probably not eligible
38FA0347	Fairfield	Jenkinsville	19th and 20th century debris scatter	Probably not eligible
38FA0348	Fairfield	Jenkinsville	Site with unknown historic era artifacts	Probably not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (5 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0349	Fairfield	Jenkinsville	20th century debris scatter	Probably not eligible
38FA0359	Fairfield	Jenkinsville	20th century debris scatter	Not eligible
38FA0360	Fairfield	Jenkinsville	Prehistoric small camp site with post molds, lithics and a pottery sherd from the Middle and Late Woodland period (Tested)	Potentially eligible, recommended for excavation
38FA0361	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Middle Archaic artifacts	Not eligible
38FA0362	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic artifacts	Not eligible
38FA0363	Fairfield	Jenkinsville	19th to 20th century artifacts	Not eligible
38FA0364	Fairfield	Jenkinsville	20th century debris scatter	Not eligible
38FA0365	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic artifacts	Probably not eligible
38FA0366	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Potentially eligible
38FA0373	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early Archaic and Mississippian artifacts	Not eligible
38FA0454	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic artifacts	Probably not eligible
38FA0456	Fairfield	Salem Crossroads	Scatter of 18th to 20th century debris	Probably not eligible
38FA0457	Fairfield	Jenkinsville	Multicomponent site with a prehistoric lithic scatter of unknown affiliation, and 18th to 20th century debris	Probably not eligible
38FA0458	Fairfield	Jenkinsville	Two 19th to 20th century artifacts	Probably not eligible
38FA0459	Fairfield	Jenkinsville	Prehistoric isolated find of unknown affiliation and an unknown historic artifact	Probably not eligible
38FA0463	Fairfield	Jenkinsville	A 19th to 20th century artifact	Probably not eligible
38FA0464	Fairfield	Jenkinsville	Multicomponent prehistoric lithic scatter and 19th to 20th century debris scatter	Probably not eligible
38FA0547	Richland	Chapin	Prehistoric lithic scatter with Middle and Late Archaic material and ceramic scatter with a Mississippian component	Eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (6 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0560	Fairfield	Jenkinsville	Light scatter of glass and whiteware of unknown age	Not eligible
38FA0561	Fairfield	Jenkinsville	Multicomponent site consisting of a prehistoric flake, and a scatter of 20th century glass, whiteware, a wire nail, a brick fragment, and three mortar fragments	Not eligible
38FA0562	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0563	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0564	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, and an 20th century isolate find	Not eligible
38FA0565	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, and a 20th century isolate artifact	Not eligible
38FA0566	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, a standing 20th century brick chimney and a scatter glass, blue transferware, and a nail	Not eligible
38FA0567	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0571	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter on an outcrop of quartzite, with a Middle Archaic point, and a scatter of whiteware and glass of unknown historic era temporal affiliation	Potentially eligible
38FA0576	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and a scatter of glass and metal fragments of unknown historic era temporal affiliation	Not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (7 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0577	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and two cut nails of unknown historic era affiliation	Not eligible
38FA0578	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter granite, bricks and modern materials from a house depicted on the 1969 topo	Not eligible
38FA0579	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter of stone and bricks	Not eligible
38FA0580	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter five glass fragments from a mid-20th century house depicted on the 1969 topo	Not eligible
38FA0581	Fairfield	Salem Crossroads	A scatter of rough cut stone and brick fragments of unknown historic affiliation	Not eligible
38FA0582	Fairfield	Jenkinsville	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a fragment of blown glass of unknown historic affiliation	Not eligible
38FA0583	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric flake of unknown temporal affiliation, and a scatter of brick, stone, glass, earthenware, pearlware, and metal of unknown historic affiliation	Not eligible
38FA0584	Fairfield	Jenkinsville	A scatter of stone, brick, glass, whiteware, creamware, stoneware, and two cut nails	Not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (8 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0585	Fairfield	Salem Crossroads	A multicomponent site consisting of a prehistoric flake of unknown temporal affiliation and a 20th century scatter of glass, creamware, stoneware, a cut nail, and a button	Not eligible
38FA0586	Fairfield	Jenkinsville	A scatter of stones, bricks glass, porcelain, a wire nail, a cut spike, earthenware, and metal fragments of unknown historic affiliation	Not eligible
38FA0587	Fairfield	Jenkinsville	A scatter of glass, an animal bone, and eight wire nails of unknown historic affiliation	Not eligible
38FA0588	Fairfield	Jenkinsville	A scatter of brick, stone, a porcelain fragment, and a glass fragment of unknown historic affiliation	Not eligible
38FA0589	Fairfield	Jenkinsville	A scatter of brick, stone, a whiteware and glass fragments of unknown historic affiliation	Not eligible
38FA0590	Fairfield	Jenkinsville	A scatter of brick, stone, and a whiteware fragments of unknown historic affiliation	Not eligible
38FA0591	Fairfield	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and a 19th to 20th century scatter of pearlware and earthenware	Not eligible
38FA0616	Fairfield	Chapin	A prehistoric site discovered in four back hoe trenches, materials identified as flakes, debitage, and tools with unknown Archaic and unknown Woodland Period material	Eligible
38FA0617	Fairfield	Chapin	A prehistoric site discovered in nine back hoe trenches, materials identified as flakes, debitage, hammerstones with unknown prehistoric period affiliations, a Late Archaic C14 date was obtained from charcoal buried in one trench	Recommended for testing, Unassessed

(SCDAH + SCIAA 2022)

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (9 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38NE0006	Newberry	Jenkinsville	An Early Archaic to Woodland site originally reported in the 1930s, with many points, stone steatite bowl fragments and net sinkers, and hand mills.	Probably not eligible
38NE0007	Newberry	Jenkinsville	A Middle Archaic and unknown prehistoric site	Probably not eligible
38NE0008	Newberry	Jenkinsville	An Early to Late Archaic, Early to Late Woodland, and Mississippian prehistoric site	Eligible
38NE0009	Newberry	Jenkinsville	A prehistoric lithic scatter with Late Archaic and unknown prehistoric affiliation	Not eligible
38NE0010	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter with Middle and Late Archaic, Early and Middle Woodland, and Mississippian cultural material	Not eligible
38NE0011	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle and Late Archaic, and unknown prehistoric artifacts	Probably not eligible
38NE0012	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0013	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0014	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0030	Newberry	Chapin	A prehistoric lithic scatter with Middle and Late Archaic components	Probably not eligible
38NE0042	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter of unknown affiliation and two 19th to 20th century whiteware and creamware fragments	Probably not eligible
38NE0644	Newberry	Chapin	A scatter of prehistoric lithics and ceramics of probable Early to Middle Woodland affiliation	Probably not eligible
38NE0646	Newberry	Jenkinsville	An 19th to 20th century roadbed	Probably not eligible

Table 3. Archaeological Sites within 6-mile Radius of VCSNS (10 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38NE1062	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter of unknown prehistoric affiliation	Not eligible
38NE1063	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Probably not eligible
38NE1064	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Not eligible
38NE1065	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter of unknown prehistoric affiliation	Not eligible
38NE1066	Newberry	Jenkinsville	A prehistoric lithic scatter of five debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1067	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Not eligible
38NE1068	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter, and 19th to 20th century cemetery with 20 graves, and a whiteware fragment	Prehistoric is probably not eligible/Cemetery is potentially eligible
38NE1069	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1070	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1072	Newberry	Pomaria	A Middle Woodland ceramic and lithic scatter	Not eligible
38NE1073	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1074	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation and a whiteware fragment	Not eligible
38NE1075	Newberry	Pomaria	A prehistoric lithic scatter of unknown affiliation	Not eligible
38NE1076	Newberry	Pomaria	A prehistoric lithic scatter of unknown affiliation	Not eligible
38NE1077	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric late Archaic lithic scatter, and a historic component with unknown temporal affiliation	Potentially eligible

Tables 2 and 3 Source:

SCAS (South Carolina ArchSite). 2022. South Carolina Institute of Anthropology and Archaeology, and South Carolina Department of Archives and History. Retrieved from <http://www.scarchsite.org/PublicView.aspx> (accessed March 17, 2022).

Figure 1. VCSNS Site

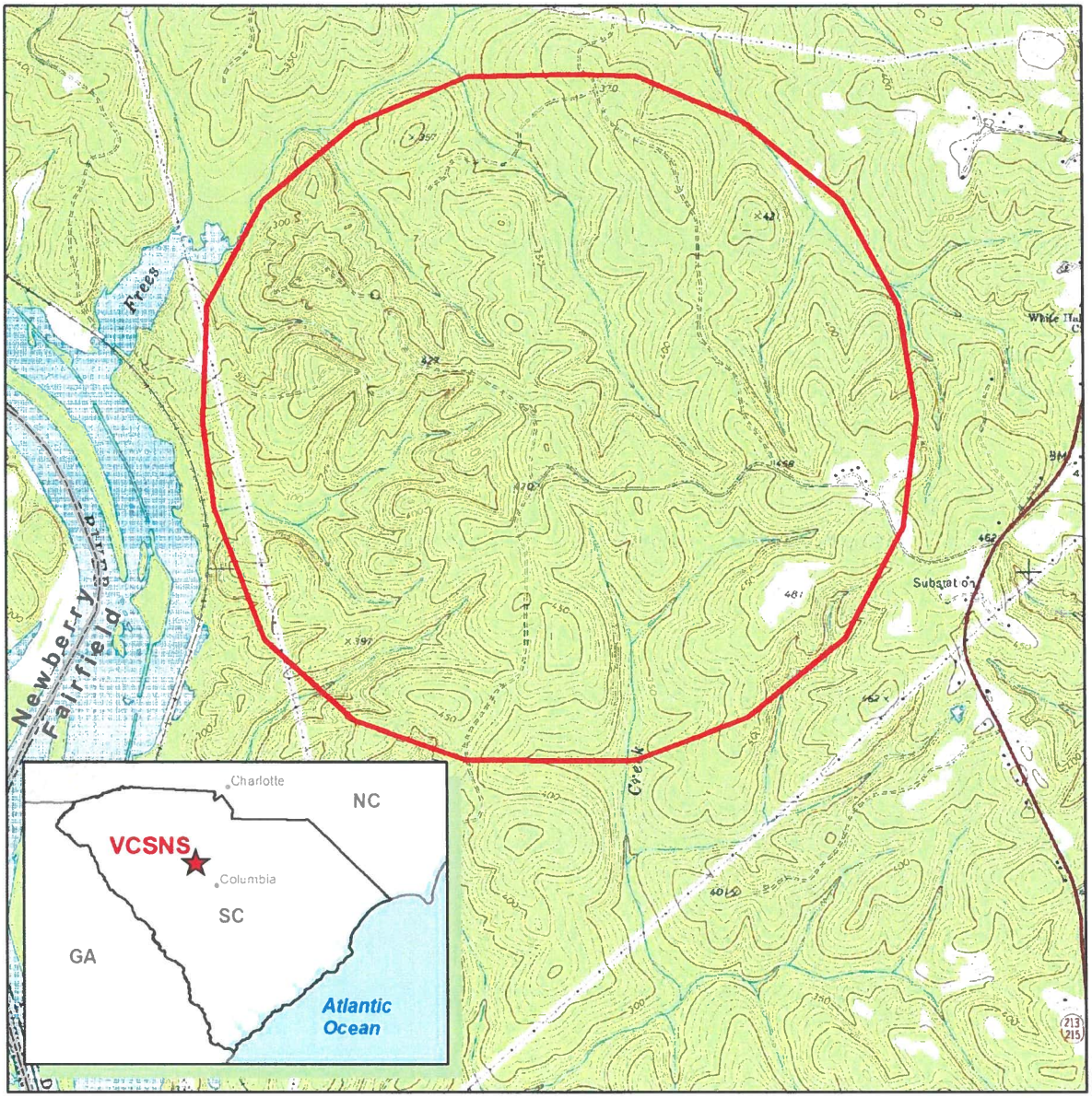
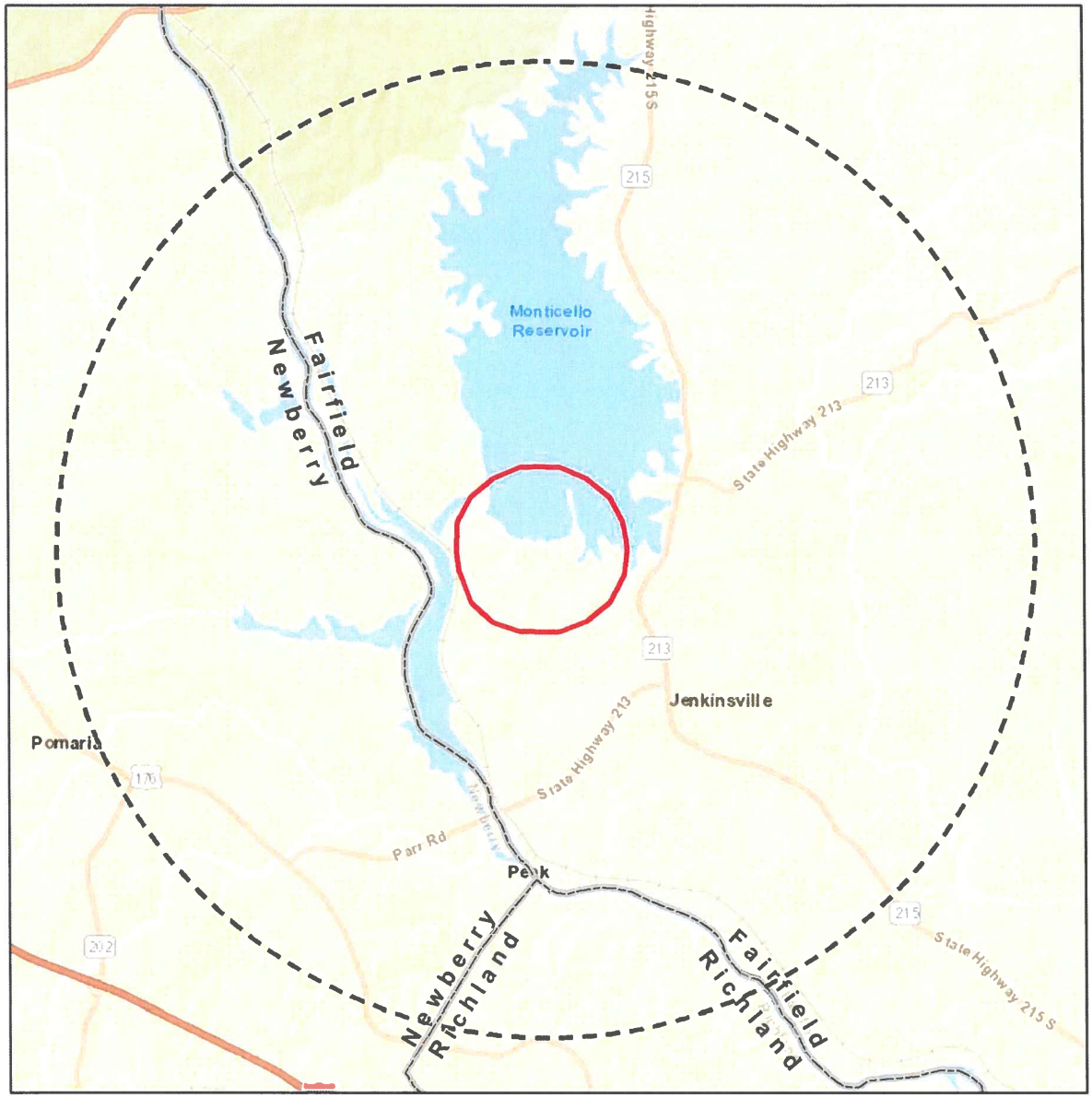


Figure 2. VCSNS 6-mile Vicinity



EST. 1905
SOUTH CAROLINA DEPARTMENT OF
ARCHIVES & HISTORY

August 23, 2022

Jason E. Williams
Dominion Energy

Via email to Ken Roller
Kenneth.Roller@dominionenergy.com

Re: The Virgil C. Summer Nuclear Station Unit 1 Subsequent License Renewal
Fairfield County, South Carolina
SHPO Project No. 22-EJ0147

Dear Mr. Williams:

Thank you for your letter of August 3, 2022, which we received on August 8, regarding the Virgil C. Summer Nuclear Station (VCSNS) Unit 1 Subsequent License Renewal. The State Historic Preservation Office (SHPO) is providing comments to Dominion Energy as part of the license renewal application to the U.S. Nuclear Regulatory Commission requirement for an environmental report (ER). As we understand from your letter the ER addresses the potential impact to historic and cultural resources.

We also understand that the Nuclear Regulatory Commission may request consultation with the State Historic Preservation Office pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations at 36 CFR Part 800. Consultation with the SHPO is not a substitution for consultation with Tribal Historic Preservation Offices, other Native American tribes including those with state recognition, local governments, or the public.

Thank you for providing the list of previously recorded historic and cultural resources within a 6 mile radius of the VCSNS. Our office also has records of Section 106 consultation for the construction of Units 2 and 3 at V.C. Summer Nuclear Station and transmission lines associated with this construction. This resulted in a Cultural Resources Management Plan and Agreement among the SC Department of Archives and History, State Historic Preservation Office; the U.S. Army Corps of Engineers; and the South Carolina Electric & Gas Company (SCE&G) Regarding the V.C. Summer Nuclear Station Units 2 and 3 Sites and Associated New 230 KV SCE&G Transmission Lines (October 2010).

A review of the files indicates that the focus of the cultural resources survey work for that undertaking was on the identification of archaeological sites. The existing Unit 1 would not have been evaluated for eligibility for the National Register of Historic Places at that time due to its age (less than 50 years old). With application for a license renewal to August 6, 2062, our office would recommend to the Nuclear Regulatory Commission that the VCSNS be evaluated for eligibility for the National Register of Historic Places when it reaches 50 years of age.

We would also request more information regarding how Dominion Energy would address damage to the National Register listed or eligible historic properties as the result of any accidental contamination. In the unlikely event of an impact to historic properties beyond the boundaries of the V.C. Summer facility, how do plans address the potential for damage to historic properties, including potential mitigation?

Thank you for the opportunity to provide comments. Please refer to SHPO Project Number 22-EJ0147 in any future correspondence regarding this project. If you have any questions, please contact me at (803) 896-6168 or ejohnson@scdah.sc.gov.

Sincerely,

Elizabeth M. Johnson

Elizabeth M. Johnson
Director, Historical Services, D-SHPO
State Historic Preservation Office

Jason E. Williams
VP, Environmental & Sustainability
Dominion Energy
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

March 17, 2023

BY ELECTRONIC MAIL

Elizabeth Johnson
Director, Historical Services, D-SHPO
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29233

RE: Dominion Energy – The Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal
Fairfield County, South Carolina
SHPO Project No. 22-EJ0147

Dear Ms. Johnson,

Thank you for your letter of August 23, 2022, and the follow-up discussions that have been held with you and subsequently with your staff members, John Sylvest and Robert Larsen. Based on our consultation, Dominion Energy offers the following information that is responsive to State Historic Preservation Office (SHPO) comments.

With respect to the first comment regarding the eligibility of Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for the National Register of Historic Places (NRHP) once it reaches 50 years of age, be advised that Dominion Energy has recently completed an Architectural Survey. Based on Dominion's past experiences with relicensing nuclear stations in Virginia, we contracted with SEARCH, a cultural resources consulting firm, to have the survey performed in the summer of 2022. SEARCH's evaluation determined that VCSNS Unit 1 site structures are NOT of historical significance (i.e., therefore are not NRHP eligible). Fairfield Pumped Storage Facility (FPSF) meets criteria; however, this was also previously determined during the FPSF relicensing (circa 2017). A Historic Properties Management Plan was established as part of the FPSF relicensing. Based on criteria for qualifications as historically significant, the findings of our 2022 survey of VCSNS are not expected to change between now and plant life year 50. As such, Dominion Energy requests reconsideration for removal of the performance of the survey at plant life year 50. A DRAFT report is attached for your further review and consideration.

The other request in your letter was for more information about how Dominion Energy would address damage to the National Register listed or eligible historic properties as the result of any accidental contamination. The protection of historic properties will be considered during emergency situations in accordance with 36 CFR § 800.12. If historic properties are damaged during emergency situations, Dominion will assess the damage and develop site-specific treatment plans to address appropriate restoration of these historic properties in collaboration with the Consulting Parties. Additionally, emergency communication protocols require VCSNS staff to provide plant status and radiological information to the state and surrounding counties via emergency notification forms and voice communication throughout an event. The South Carolina

Emergency Management Division (SC EMD) serves as the lead state agency for radiological emergency response and re-entry activities. After a nuclear plant incident with off-site or potential off-site consequences, the SC EMD's Emergency Support Function (ESF) 14, Initial Recovery and Mitigation, would be activated and begin scoping recovery needs and planning for recovery operations. This would include recovery of natural and cultural resources in affected areas. If needed, the Natural and Cultural Resources Recovery Support Function (RSF) would be engaged to provide state-level expertise, coordination, and support to identify natural and cultural sites, collections, and features that may need to be addressed in recovery, per the SC Recovery Plan-Annex 6 Natural and Cultural Resources Recovery Support Function.

Dominion Energy does not anticipate the continued operation of VCSNS to adversely affect the environment or any cultural or historic resources and we seek your concurrence on the proposed continued operation of VCSNS.

Please notify us of concerns and any information you believe Dominion Energy should consider in the preparation of the Environmental Report (ER). If possible, Dominion Energy would appreciate receiving your input by May 30, 2023. Dominion Energy plans to include this letter and any response you provide in the ER, which is a sub-part of the Subsequent License Renewal Application scheduled for submittal to the Nuclear Regulatory Commission by the end of 2023.

Should you or your staff have additional questions or comments, please contact Tom Effinger at (803) 608-3303 or via email at thomas.effinger@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental & Sustainability

Attachments:
DRAFT Architectural Survey, SEARCH, 2022

REVISED DRAFT REPORT

V.C. SUMMER NUCLEAR STATION ARCHITECTURAL SURVEY AND EVALUATION
FAIRFIELD COUNTY, SOUTH CAROLINA

PREPARED FOR

ENERCON

PREPARED BY

SEARCH

SEARCH PROJECT NO. E22122

MARCH 2023

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V.C. Summer Nuclear Station Architectural Survey and Evaluation
Fairfield County, South Carolina
Revised Draft Report

Prepared for

Enercon

Report authored by
Mikel Travisano, Kelly Guerrieri, Anna Downing, and Allen Kent

---

Mikel Travisano, MS
Principal Investigator

March 2023

SEARCH Project No. E22122

www.searchinc.com

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EXECUTIVE SUMMARY

From July 12, 2022, to July 14, 2022, SEARCH completed an architectural history survey and National Register of Historic Places (NRHP) evaluation of the V.C. Summer Nuclear Station (VCSNS) in Fairfield County, South Carolina. This survey consisted of two distinct areas: the main VCSNS facility on V.C. Stairway Road on the south side of the Monticello Reservoir and the Fairfield Pumped Storage Development Facility (39-0082), which is 1 mile northwest of the VCSNS facility in Jenkinsville, South Carolina.

Mikel Travisano, MS, served as the principal investigator for this project. Mr. Travisano meets the Secretary of the Interior's Standards and Guidelines for Architectural History and Historic Preservation (48 Federal Register 44716-42) Mr. Travisano and Kelly Guerrieri, MA, completed the architectural fieldwork.

Architectural history data from the South Carolina State Historic Preservation Office (SC SHPO) database revealed one previously recorded cultural resource associated with the VCSNS: the Fairfield Pumped Storage Development Facility (39-0082). The remaining buildings and structures have not been surveyed or evaluated.

SEARCH conducted an intensive-level survey on behalf of Enercon to fulfill historic-property identification requirements under Section 106 of the National Historic Preservation Act of 1966, as amended, and SC SHPO guidelines for architectural survey, specifically Survey Manual: *South Carolina Statewide Survey of Historic Properties*.

This report includes intensive-level survey forms for the properties to provide new and updated photographs to the SC SHPO. SEARCH recommends one previously recorded historic resource (the Fairfield Pumped Storage Development Facility [39-0082]) NRHP eligible under Criteria A and C. SEARCH recommends the remaining 38 historic resources not eligible for inclusion in the NRHP due to their lack of historic significance and engineering or architectural distinction. It is SEARCH's opinion that the proposed project poses no adverse effects to the NRHP-listed or -eligible historic properties. SEARCH recommends no further cultural resources work.

SEARCH PROJECT TEAM

Management
Travis Fulk, MA, Project Manager
Mikel Travisano, MS, Principal Investigator

Field Crew
Mikel Travisano, MS
Kelly Guerrieri, MA

Report Preparation
Mikel Travisano, MS
Anna Downing, MA
Kelly Guerrieri, MA
Allen Kent, PhD

GIS Mapping
Angelica Costa, MA

Peer Review and Technical Editing
Travis Fulk, MA
Ali Sundook, BA

Logistics and Administration
Matthew Mele, BA
Sarah Sheenan, BA

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INTRODUCTION

From July 12, 2022, to July 14, 2022, SEARCH completed an architectural history survey of one predetermined area that encompasses the V.C. Summer Nuclear Station (VCSNS) and the Fairfield Pumped Storage Development Facility (Figure 1). The project area, provided by VCSNS, covers 2,134 acres (ac) at the south side of the Monticello Reservoir (Figure 2).

The survey included historic buildings and structures constructed prior to 1984. While the National Register of Historic Places (NRHP) typically considers resources old enough to be historic at 50 years of age or older, SEARCH selected 1984 because it is the year Unit 1 (nuclear reactor) was commissioned. Using this year will allow the survey to capture more of the primary buildings that were part of the original VCSNS construction.

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RESEARCH DESIGN AND METHODS

The primary objective of this survey was to inventory historic architectural resources in the defined survey areas and to make eligibility recommendations for the identified resources based on appropriate criteria for inclusion in the NRHP.

BACKGROUND RESEARCH

For background research, SEARCH reviewed available information on the project area. This review included historical records, which SEARCH used to identify previously recorded architectural resources on or near the survey parcels. A review of the South Carolina State Historic Preservation Office (SC SHPO) database (ARCHSITE) revealed one previously recorded historic resource (**Figure 3**) in the area of potential effects (APE): the Fairfield Pumped Storage Development Facility (39-0082). This historic resource was determined NRHP eligible in 2014 (Nagle 2014). Furthermore, SEARCH also conducted a literature review to provide information about the region's past environment and historic occupation and contexts for the cultural resources identified during the survey.

FIELDWORK

SEARCH used the results of the background research combined with information provided by Dominion Energy and VCSNS to develop a list of facilities to survey. Exterior and select interior photographs and minimal landscape views were included. SEARCH recorded each surveyed resource's facility number, construction date, architectural features, and apparent alterations.

INVENTORY

An inventory of the built environment was prepared based on the fieldwork and background research. The inventory is summarized in **Table 1** and a physical description and photograph of each surveyed resource is included in the Architectural Resources section of this report.

NRHP EVALUATION

Using the standards described in *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*, other appropriate guidance from the US Department of the Interior, and the data gathered from the inventory process, SEARCH applied NRHP significance and integrity criteria to evaluate the documented resources. This evaluation determined if the resources located on the installation are eligible for listing in the NRHP as individual or contributing resources of a district.

Using the standards described in *National Register Bulletin: How to Apply the National Register Criteria for Evaluation*, other appropriate guidance from the US Department of the Interior, and the data gathered from the inventory process, SEARCH applied NRHP significance and integrity criteria to evaluate the built resources. This evaluation determined if the built resources located at VCSNS are eligible for inclusion in the NRHP as individual resources or as part of a district. While the National Register of Historic Places (NRHP) typically considers resources old enough to be historic at 50 years of age or older, SEARCH selected 1984 because it is the year Unit 1 (nuclear reactor) was commissioned. Using this year will allow the survey to capture more of the primary buildings that were part of the original VCSNS construction.

For the NRHP, there are five categories of historic properties: buildings, structures, objects, sites, and districts (US Department of the Interior 1995:4-5). To be eligible for listing in the NRHP, a building, structure, object, site, or district must represent a significant part of the history, architecture, archaeology, engineering, or culture of an area (US Department of the Interior 1995:7). The significance of a building, structure, object, site, or district can only be determined when evaluated within its historic context. The following four criteria for evaluation describe how properties are significant within their historic context for their association with important events or persons, for their importance in design or construction, or for their information potential. According to 36 CFR 60, a building, structure, object, site, or district may be eligible for listing in the NRHP if it meets at least one of the four following criteria:

A. is associated with events or activities that have made a significant contribution to the broad patterns of our history; or
B. is associated with the lives of persons significant in our past; or
C. embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; or
D. has yielded, or may be likely to yield, information important in prehistory or history.

The buildings, structures, objects, sites, and districts documented during the survey were evaluated according to the NRHP criteria.

Certain types of buildings, structures, objects, sites, and districts are not typically evaluated for listing in the NRHP: religious properties, moved properties, birthplaces and graves, cemeteries, reconstructed properties, commemorative properties, and properties less than 50 years old unless they fall within one of the following criteria considerations (US Department of the Interior 1995:25):

A. a religious property deriving primary significance from architectural or artistic distinction or historical importance; or
B. a building or structure removed from its original location but which is primarily significant for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or

C. a birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his or her productive life; or
D. a cemetery which derives its primary importance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or
E. a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or
F. a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or
G. a property achieving significance within the past 50 years if it is of exceptional importance.

NRHP-eligible districts must possess "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development" (US Department of the Interior 1997:5).

A property can meet one of the criteria for listing in the NRHP and represent a historic context, but it must also have integrity. *National Register Bulletin 15* defines integrity as "the ability of a property to convey its significance" (US Department of the Interior 1995:44).

The NRHP criteria recognize seven aspects or qualities that, in various combinations, define integrity:

- Location: The place where the historic property was constructed or the place where the historic event occurred.
- Design: The combination of elements that create the form, plan, space, structure, and style of a property.
- Setting: The physical environment of a historic property.
- Materials: The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
- Workmanship: The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- Feeling: A property's expression of the aesthetic or historic sense of a particular period of time.
- Association: The direct link between an important historic event or person and a historic property.

If a property retains all or most of these aspects or qualities, it retains integrity. There also is recognition that, over time, a property will change. Although it may not be necessary for a property to retain all of its physical features:

> [t]he property must retain ... the essential physical features that enable it to convey its historic identity. The essential physical features are those features that define why a property is significant, and when it was significant (US Department of the Interior 1995:46).

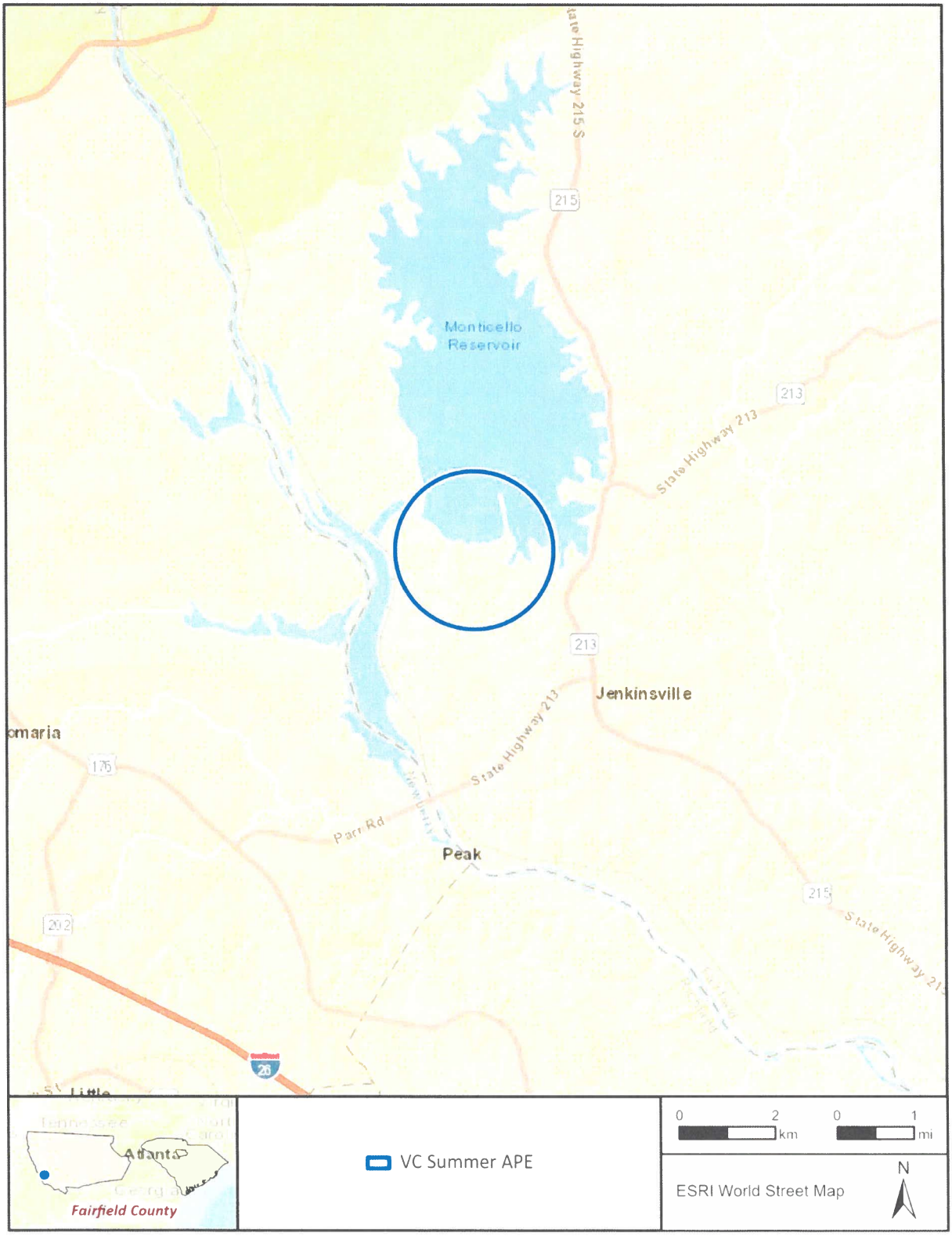

Figure 1. The VCSNS project location in Fairfield County, South Carolina.

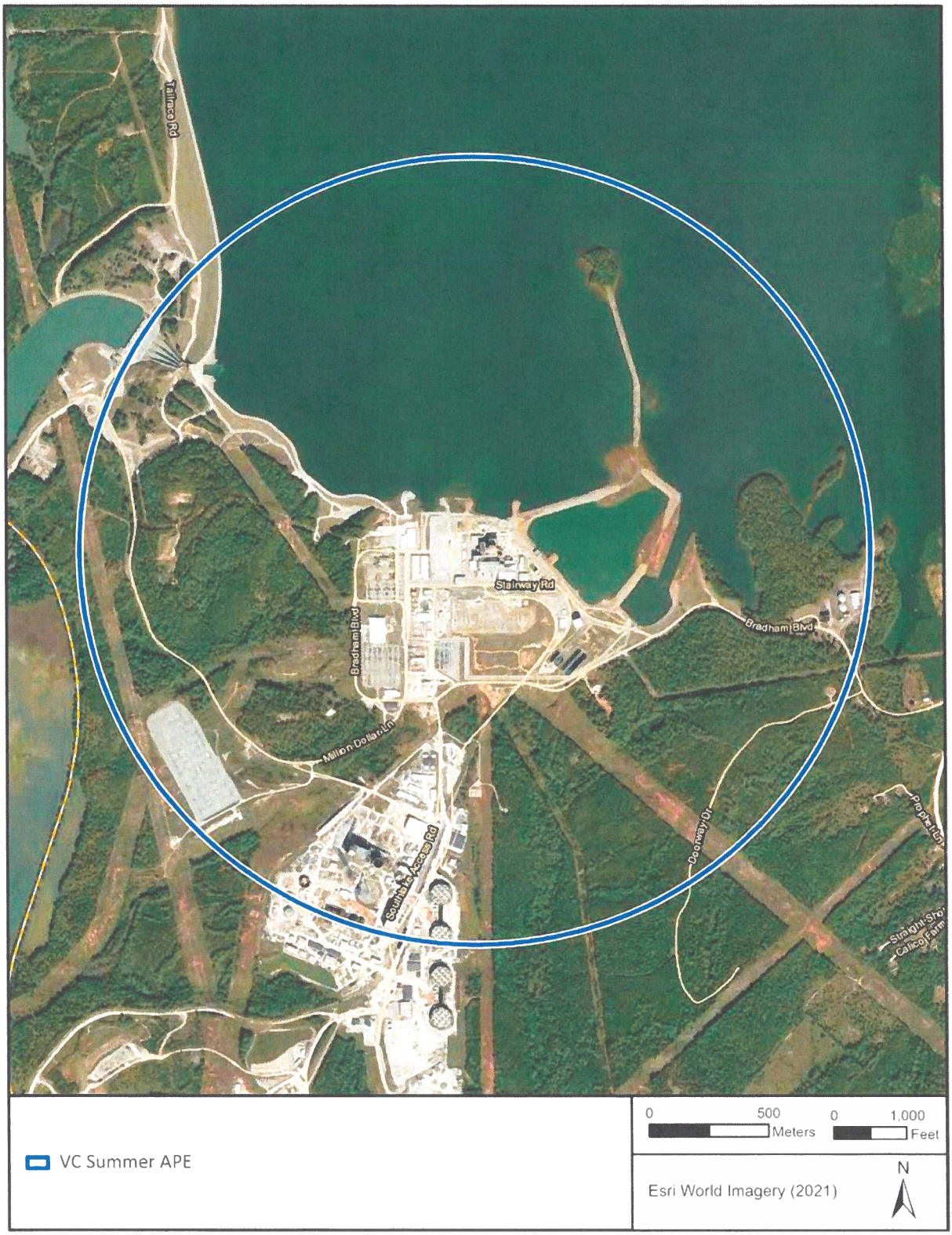

Figure 2. The VCSNS APE in Fairfield County, South Carolina.

Figure 3. Previously recorded historic building.

HISTORIC OVERVIEW

NUCLEAR POWER DEVELOPMENT IN THE UNITED STATES

The development of powerful weaponry dominated research dealing with nuclear reactions during World War II and the Cold War. Governments around the world tasked scientists with creating nuclear bombs and missiles capable of bringing destruction on an unforeseen level during the World War II, with nuclear technology as it related to weaponry progressing rapidly during the mid- to late twentieth century. Though much of the global focus remained on weaponizing nuclear reactions, scientists and government officials also understood nuclear reactions' usefulness in creating energy for domestic purposes. Soon after the end of World War II, which ended at least partially due to the use of atomic weapons in the Japanese cities of Hiroshima and Nagasaki, the United States supported further scientific research and established governmental infrastructure that would lead to the harnessing of nuclear power for the express purpose of providing a new means of energy for civilian purposes.

Scientists first discovered nuclear fission in the 1930s, learning that splitting atoms produced a release of energy that might be harnessed and replicated. European scientists, including Enrico Fermi in Rome, Otto Hahn and Fritz Strassman in Germany, Lise Meitner (who fled from the Nazis in Austria), and Niels Bohr in Denmark, hypothesized and tested atom splitting, eventually bringing their findings to the United States. These scientists involved German-born physicist Albert Einstein in their work, and several researchers led by Fermi at the University of Chicago successfully created a self-sustaining nuclear reaction in December 1942. With the practical application of nuclear theories complete, the nuclear age began. Though these discoveries were used to create weapons with unprecedented destructive power, the original and future purposes of this research remained in developing a new source of energy (US Department of Energy [DOE] 1993:4—7).

Even as the Manhattan Project and weaponizing nuclear reactions dominated research during the war period, scientists experimented with producing and harnessing energy from these processes. The United States created the Atomic Energy Commission (AEC) in 1946, specifically setting up an agency tasked with researching and understanding the uses of nuclear power, including both weaponry and the development of energy technologies for civilian and peaceful purposes. The Federation of Atomic Scientists pushed for additional civilian control and oversight in nuclear technology experimentation, as the classified nature and secrecy of military weapons development hampered cooperation between scientists and delayed progress. Additionally, many scientists involved with these projects even called for banning atomic weapons production and a complete focus on creating clean energy solutions through nuclear power (Cantelon et al 1991:69—70). During the late 1940s and 1950s, the AEC directed several projects to assess nuclear power's ability to provide energy for commercial purposes. In 1949, the AEC authorized the first venture, Experimental Breeder Reactor I, in Arco, Idaho. By the end of 1951, the reactor successfully lit four 200-watt lightbulbs, demonstrating the capabilities of commercial energy production with nuclear reactions. By 1955, the facility provided power to the small town of Arco,

with a population of around 1,000, making it the first town to be powered by nuclear technology (DOE 1993:8—14; US Nuclear Regulatory Commission [NRC] 2021a).

The development spurred additional private and commercial interest in using this technology for power purposes and pushed the US government to contribute additional funding and support. After his 1953 "Atoms for Peace" speech urging the world to cooperate in exploring the benefits of nuclear power, President Dwight Eisenhower signed the Atomic Energy Act in 1954, bolstering the AEC's ability to research and develop commercial nuclear facilities and providing additional support for private investments into the nuclear energy sector (DOE 1993:8—14; NRC 2021a). By 1957, a large-scale nuclear powerplant was operational in Shippingport, Pennsylvania, marking "the first commercial electricity-generating plant powered by nuclear energy." The Shippingport facility operated as a light water reactor, which used "ordinary water to cool the reactor core" during the heating process, creating and cooling the self-sustaining chain reaction nuclear scientists had studied since the early 1940s (DOE 1993:8).

The heyday for atomic energy production occurred between the 1950s and 1960s. Though growth continued into the 1970s and 1980s, energy companies began to invest less time and money in nuclear power, furthered by public concerns over the safety of nuclear facilities and the disposal of nuclear waste. Much of this concern stemmed from the 1979 events at Three Mile Island in Pennsylvania, when the worst accident in US nuclear power history occurred; though no one was harmed or sustained radiation poisoning, the accident perpetuated the fear of nuclear power reactor failure and the fallout that could occur. In 1971, 21 power plants were operational in the US and provided 2.4% of the country's power; this rose to 72 reactors providing 12% of electricity in 1979, and then 109 reactors providing 19% in 1989. By 1992, nuclear power provided 22% of the electricity in the United States. Many of the original nuclear power facilities began to close by the 1990s, by which point the industry was in decline and saw minimal further investment by energy companies (DOE 1993:8–21).

Boiling and Pressurized Light Water Nuclear Reactors

Though nuclear researchers believed that water could be used to transfer the heat of nuclear reactions to useable energy, it was not a foregone conclusion. Researchers understood the need for cooling and transferring the nuclear energy, and water was a natural candidate for the process. However, the sensitivity of the fissioning elements and potential for an accidental release of nuclear materials meant that researchers had to complete significant testing to assure that the water boiled at a consistent pace; slight changes in temperature or the inability to maintain a smooth, consistent water surface could have potentially devastating effects. Samuel Untermyer II, a vocal proponent of boiling water's potential as a cooling method, experimented with this process beginning in the 1950s. After graduating from MIT in 1934, Untermyer and Walter Zinn developed the Boiling Water Reactor Experiment (BORAX) to test the ability and safety of boiling water to contribute to harnessing nuclear power (*New York Times* 31 January 2001:A19; Stacy 2000:128—130). The Argonne National Laboratory, an Illinois facility designed

and operated by the University of Chicago, helped to organize and conduct the experiments at the federally operated National Reaction Testing Station in Idaho. By May 1953, the first testing reactor was completed and ready for the experiments. Over 14 months, Untermyer and the team conducted over 200 tests, helping to solidify his theory and prove the practice successes of a boiling water reactor. At the end of these experiments, the team held a "threshold" test, leading to the assumed destruction of the facilities to prepare for potential fallout. After the first threshold test, the team built a new, larger reactor known as BORAX II; the series continued through BORAX V and further solidified the use of boiling water reactors to produce nuclear power (Stacy 2000:128—131).

The success of the BORAX testing units further encouraged the development of private commercial facilities. Several ventures were already in development in the early 1950s, following along with the technological progress in Idaho and becoming operational by the mid- to late 1950s. Beginning in 1955, the power provided to Acro, Idaho, was made possible by the BORAX III boiling water reactor. Other nuclear power facilities came online during the 1950s, including the Sodium Reactor Experiment in Santa Susana, California, which became the first facility in the state to use nuclear power to provide electricity to a commercial grid, serving the city of Moorpark (DOE 1993:13—15). As opposed to the boiling water reactor process, this facility used sodium to cool the reactions; when the facility began supplying power to the grid on July 12, 1957, it was recognized as "the country's first civilian nuclear plant and the first 'commercial' nuclear power plant to provide electricity to the public" (California Energy Commission 2020:7).

While boiling water reactors proved highly useful to the development of nuclear power plants, the technology did not serve as the only means of producing safe and useful energy from fission. Beginning in the 1940s and 1950s, the US Navy worked with the AEC to produce nuclear power through pressurized water reactors. Also classified as a light water reactor, pressurized water reactors use water as part of the cooling process, though the water does not reach boiling temperature. Instead, pressurized water specifically works to prevent the water from boiling while still serving as the coolant, moderator, and heat-transfer agent. These power generators require two systems, with pressurized water passing through the reactor core in a primary system and transferring its heat energy to a secondary water loop that generates the steam necessary to power a turbine. The Navy and AEC oversaw early research in pressurized water reactors in tandem, with the former designing ships and submarines capable of utilizing the technology and the latter continuing its work in developing commercial power possibilities (Duncan 1990:3–4).

As was the case with boiling water reactors, research for pressurized water reactors involved overlapping and coordinated efforts between US governmental agencies and private energy companies working to develop new power technologies and facilities. The creation of nuclear-powered submarines and ships provided the impetus for the technology, and Admiral Hyman G. Rickover of the US Navy provided much of the direction and leadership in its development from the 1940s through the 1970s (Duncan 1990:12—13). Work on the first pressurized water reactors began at the Oak Ridge National Laboratory in 1946, a governmental facility created as part of the Manhattan Project to research the extraction and uses of plutonium and uranium (Freeman 2015:1). Working with the director of Oak Ridge, Alvin Weinberg, Rickover directed a team of

scientists and engineers (though he would insist on a focus on the latter) to develop a nuclear-powered water reactor capable of propelling a submarine. In 1949, Rickover was appointed the head of the Naval Nuclear Propulsion Program, also known as the Naval Reactors, and to an administrative position within the AEC, further pointing to the cooperation between the civilian and military agencies. Both governmental agencies also worked directly with private companies; beginning in 1948, the Naval Nuclear Propulsion Program authorized additional research and development of pressurized water reactors at the Bettis Atomic Power Laboratory operated by the Westinghouse Electric Corporation. These combined efforts resulted in the first operational nuclear-powered submarine, *Nautilus*, in 1955 (Duncan 1990:13—14; Marguet 2022:16—22; Naval Nuclear Laboratory 2021).

The successes of these collaborative projects in constructing pressurized water reactors for military purposes helped further research on creating energy for domestic use. The experiments at Oak Ridge and Bettis led directly to the development of the Shippingport facility mentioned above. Working in tandem with Westinghouse, the AEC directed its Naval Reactors division, headed by Rickover, to modify a pressurized water reactor designed for an aircraft carrier for commercial power uses. The Duquesne Light Company served as the local utility partner. A groundbreaking ceremony in September 1954 included President Eisenhower, the director of the AEC, and officials from Duquesne Light and Westinghouse, with the highly anticipated event broadcast across the country. In addition to providing power to the Pittsburgh area, the Shippingport facility was specifically designed as a test study in the usefulness of nuclear power reactors to commercial energy. This was officially achieved in 1957 when the facility went critical and supplied power to the grid, marking the first nuclear power plant to supply commercial energy in the United States (American Society of Mechanical Engineers 1980).

Twentieth-Century Energy Infrastructure in Fairfield and Newberry Counties, 1896–1967

The Midlands region of South Carolina relied upon area rivers for many of its energy purposes in the late nineteenth and early twentieth centuries. For Fairfield and Newberry Counties, the Broad River—crossing through the region and serving as the dividing line between the two counties—aided in the operation of mills, and local landowners constructed canals from the river to water agricultural fields. The Columbia Canal's completion in 1891 furthered the possibilities of water-driven power production. Beginning in 1896, Henry Larkin Parr looked for ways to further harness the power of the Broad River, hiring surveyors to determine its capabilities. Convinced that the land he owned along the riverfront could produce hydroelectric energy for the surrounding area, Parr founded the Parr Shoals Power Company and bought additional land and water rights adjacent to his own beginning in 1904. Excitement built in the surrounding towns, including Columbia, for a new source of electric power (Nagle 2014:39—40).

As Parr struggled to bring the project to fruition, the president of the Columbia Railway, Gas, and Electric Company, Edwin W. Robertson, bought the land and rights to the waterway in 1912. That

same year, work began on a series of stone and concrete dams across the Broad River on the north side of Hampton Island. By May 1914, the project was completed, with the dams creating the Parr Shoals Reservoir. A powerhouse used water-activated vertical turbines that powered generators, producing energy that could be sent out through nearly 30 miles (mi) of completed transmission lines. By 1917, the facility produced much of the power in Columbia and many of the surrounding communities. In the 1920s, the Broad River Power Company bought out the Columbia Railway, Gas, and Electric Company's assets, taking control of the Parr Shoals facilities. The new company began expanding these operations, including developing a steam plant that reduced the reliance of the river's flow and aided in power creation during droughts. Several more expansions of the facilities between the 1920s and 1940s increased its potential output. Additionally, Broad River Power began buying smaller, local power companies; in the 1930s, the company changed its name to South Carolina Electric and Gas (SCE&G) (Nagle 2014:40—53; Pierce 2022).

In the 1950s, planning and construction began on a nuclear facility near the Parr Shoals powerhouse on the Broad River. Following President Eisenhower's "Atoms of Peace" speech and the growing interesting in private facilities utilizing nuclear power, several power companies in North Carolina, South Carolina, and Virginia joined together to explore nuclear opportunities in their states. Four companies in the three-state area—Carolina Power & Light, Duke Power, SCE&G, and Virginia Electric & Power—collaborated on the first nuclear power plant in the south (McGovern 2017; Nagle 2014:54). A newspaper headline proclaimed "Power Firms Figure Plans for Dixie Atomic Plants" as the group formed the Carolinas Virginia Nuclear Power Associates (CVNPA) (Wister 4 Oct 1956:1B). By 1957, the group chose the site in Parr, South Carolina, described as a "village of about 20 families" owned by SCE&G "on what is believed to be the widest part of the Broad River ... about 30 miles northwest of Columbia," noting that the company already operated the steam and hydroelectric facilities there (Roseman 10 Nov 1957:1A). The AEC approved CVNPA's initial proposal in April 1958. After years of negotiating contracts with engineering firms and pressing the AEC for final approval of its plans, the group broke ground on the new facility in October 1960 (*Columbia Record* 26 April 1958:5-A; *Charlotte Observer* 8 October 1960:1-C).

As the first nuclear power plant in the American Southeast, the Parr site operated as a test facility and a training ground for future investments in nuclear power for the region. Known as both the Parr Nuclear Station and the Carolinas Virginia Tube Reactor, CVNPA completed and dedicated the project in October 1962, with company officials and the governors of the three states on hand, heralding the peaceful uses of nuclear technology (*Charlotte Observer* 24 October 1962:3-A). The facility, which reached criticality in March 1963, operated a pressure-tube reactor and was utilized by the company as a 17,000-kilowatt prototype reactor "to develop and study economic ways of producing and utilizing nuclear power" (*News and Observer* 31 March 1963:I-15). With the addition of the nuclear site, Parr became the first site in the world that harnessed power from hydroelectric, steam, and atomic facilities (*Times and Democrat* 15 March 1963:12). Though the nuclear site did not direct produce power for area grids, steam from the process was utilized by the Parr Steam Plant for that purpose (Nagle 2014:54). The Parr Nuclear Station only operated for a few years and was decommissioned in 1967, but the knowledge and training paved

the way for the development of additional nuclear power facilities in the American Southeast in the following years (McGovern 2017; University of South Carolina Libraries 2022).

VC Summer Nuclear Station and Fairfield Pumped Storage Facility

The VCSNS grew directly out of these pioneering energy ventures, with SCE&G announcing plans for a new atomic power plant along the Broad River in Fairfield County, South Carolina, in 1971. The company expected that the "mammoth operation" would take 10 years to complete at a cost of $500 million and involved several phases, planning for a project that would culminate in multiple nuclear reactors for energy creation, a new reservoir, and a pumped-storage facility. Early construction focused on the latter, which came to be called the Fairfield Pumped Storage Facility. The project included improvements to the existing dam infrastructure along the Broad River, which originally created the Parr Shoals Reservoir, and additional dredging, diverting, and damming of Frees Creek that created a larger second reservoir, named Monticello Reservoir. The original reservoir expanded in over 2,500 ac in size, reaching 4,400 ac total, while the work on Frees Creek created a nearly 7,000 ac lake. Plans called for a pump facility that served several purposes; water released from the larger, upper reservoir would pass through the hydroelectric turbines, creating useable energy, and would then be pumped back into the larger reservoir (Mauldin 12 Feb 1971:1; Spade 3 Oct 1971:9B).

By May 1976, construction began on new dam infrastructure to divert Frees Creek and additions and improvements to the dams on the Broad River (Terracon 2016:19). Around 4,000 workers began digging out the new reservoir in September, with the hopes of having the hydroelectric plan operational by 1977. Once operational, SCE&G expected an output of 480,000 megawatts from the hydroelectric facility (Mitchell 5 Sept 1976:1B). The Fairfield station consisted of eight units, each with its own reversible pump, turbine, and a generator that would aid in creating additional energy during peak periods (Nagle 2014:57). The pumping station construction was completed and began its operations in 1978 (Laney 14 June 1981:8D). Before the completion of the hydroelectric facilities, key pieces of the nuclear plant were already in place, including the nuclear reactor that would produce power for the atomic portions of facility. Westinghouse Electric produced the 320-ton pressurized water reactor; the company had a long history of developing atomic reactors, dating back to the first commercial nuclear power facility at Shippingport in 1957. By the 1970s, Westinghouse had established itself as a leader in nuclear reactor development (Mitchell 5 Sept 1976:1B; Shirk 2012).

The nuclear facility was named for Virgil Clifton Summer Jr., a long-time employee of SCE&G who worked his way up to a leadership position. Born in Spartanburg, South Carolina, Summer began his work sweeping floors at the Parr Steam Plant in the 1930s at the age of 16. Though he took the job to provide for his parents and siblings, he took an interest in the engineering works of the company, taking classes and earning an engineering license and completing a master's degree in engineering at the University of South Carolina in 1968. Summer's hard work paid off, earning him additional positions with the company; he served as the president, chairman of the board,

chief operating officer, and chief executive officer during the late 1970s and early 1980s. After retiring from SCE&G and its parent company, SCANA, Summer completed a doctorate degree in 1999, and he received additional honorary doctorate degrees as well. In 1971, SCE&G honored Dr. Summer by naming its planned nuclear facility for him and his service to the company (Lewis 2002; South Carolina General Assembly, 114th Session, Bill 4631).

The VCSNS site developed during an uncertain yet productive time in the history of commercial nuclear power in the United States. Though concerns about the safety of nuclear power rose to an all-time high at the end of the 1970s and in the early 1980s, particularly due to the disaster at Three Mile Island in 1979, the percentage of US energy provided by nuclear fission continued to grow over the 1980s and 1990s (DOE 1993:8—21). Additionally, a growing environmental movement in the 1960s and 1970s scrutinized government regulations, including the AEC's standards for nuclear power plants. These efforts brought about major federal legislation, such as National Environmental Policy Act of 1970, the Clean Air Act of 1970, and the Clean Water Act of 1972. Relating specifically to nuclear power, the Energy Reorganization Act of 1974 abolished the AEC, creating a new agency, the US NRC, and tasking it with stricter standards for regulating the effects of nuclear power on human safety and the natural environment (Gottlieb 2009:301—302; NRC 2021a). Construction progress for the VCSNS project took longer than initially planned, bringing additional criticism, and the cost of the operation grew from an initially estimated $253 million to more than $630 million by 1977 (Surratt 23 Oct 1977:1B). In response, SCE&G raised the rate it charged its energy customers, proposing a 14% change in 1978 (*Columbia Record* 1 April 1978:7A).

Regardless of the obstacles, SCE&G remained committed to the project, with construction and implementation of the nuclear system extending into the early 1980s. The NRC officially licensed the facility in August 1982, allowing SCE&G officially to begin loading the reactor with uranium and testing the equipment at low power, and the VCSNS reached criticality in January 1983 (Horan 5 Aug 1982:2B; *The State* 1 Jan 1983:3B). At that time, at least two other nuclear power sites were operational in South Carolina, near Hartsville and Oconee (Horan 5 Aug 1982:2B). The NRC limited the reactor to 50% of its capacity, noting design issues with its steam facilities; SCE&G corrected the concerns by May 1983 and achieved full power by June (*The State* 1 Jan 1983:3B; *Times and Democrat* 26 May 1984:1a). A formal site dedication occurred in May 1984. The water of the Monticello Reservoir provided the coolant needed to operate the plant and housed public recreational facilities (*Time and Democrat* 26 May 1984:1a). In 2004, the nuclear reactor at the VCSNS received a renewal on its license (NRC 2022).

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ARCHITECTURAL RESOURCES

The architectural survey resulted in the identification and evaluation of 39 historic resources within the V.C. Summer APE in Fairfield County. The historic resources include 38 newly recorded resources and one previously identified resource (**Table 1**; **Figure 4**).

SEARCH recommends all the newly recorded historic resources (0116–1153) ineligible due to their lack of historic significance and architectural and engineering distinction. These resources make up the Nuclear Reactor Complex (Summer 1) (0116) and associated support buildings and structures. The reactor consists of 12 physically connected buildings and therefore was assigned one number. The buildings include the Diesel Generator Building; Nuclear Reactor Containment Building; Auxiliary Building and Emergency Water Tanks; Control Building; Turbine Building; Water Treatment Building; Radioactive Materials Building; Hot Machine Shop; Fuel Handling Building; Intermediate Building; Service Building; and Auxiliary Services Building (**Figure 5**).

SEARCH recommends the previously recorded Fairfield Pumped Storage Development Facility (39-0082) remains eligible for listing in the NRHP for its significance under Criteria A and C. The survey did not identify any potential historic district or any other NRHP-eligible resources. Photography from certain vantage points was not allowed for security reasons. As such, views of some buildings and structures are limited.

Table 1. Historic Resources Recorded Within the V.C. Summer APE

SC SHPO Number	Name/Address	Style	Year Built	Recommended NRHP Status
39-0082	Fairfield Pumped Storage Development Facility	Industrial Vernacular	circa (ca.) 1978	Eligible
0116	Nuclear Reactor Complex (Summer 1)	Industrial Vernacular	ca. 1982	Ineligible
0117	Craft Training Center	Industrial Vernacular	ca. 1974	Ineligible
0118	Warehouse A and B	Industrial Vernacular	ca. 1975	Ineligible
0119	Contaminated Storage Warehouse	Industrial Vernacular	ca. 1982	Ineligible
0120	Electrical Modifications	Industrial Vernacular	ca. 1982	Ineligible
0121	Fire Service Pump House	Industrial Vernacular	ca. 1982	Ineligible
0122	Outage Electrical Distribution Building	Industrial Vernacular	ca. 1982	Ineligible
0123	Service Water Pump House	Industrial Vernacular	ca. 1982	Ineligible
0124	Auxiliary Boiler House	Industrial Vernacular	ca. 1982	Ineligible
0125	Potable Water Building and Tanks	Industrial Vernacular	ca. 1982	Ineligible
0126	Warehouse D	Industrial Vernacular	ca. 1982	Ineligible
0127	Warehouse C	Industrial Vernacular	ca. 1982	Ineligible
0128	Old Fitness Center	Industrial Vernacular	ca. 1984	Ineligible

Table 1. Historic Resources Recorded Within the V.C. Summer APE

SC SHPO Number	Name/Address	Style	Year Built	Recommended NRHP Status
0129	Meteorological Tower	Industrial Vernacular	ca. 1984	Ineligible
0130	Switchyard Control House	Industrial Vernacular	ca. 1982	Ineligible
0131	Auxiliary Access Portal	Industrial Vernacular	ca. 1984	Ineligible
0132	Respiratory Building (Facilities Ground Maintenance)	Industrial Vernacular	ca. 1974	Ineligible
0133	Old Time Clock Portal	Industrial Vernacular	ca. 1982	Ineligible
0134	Old Pipe Shop	Industrial Vernacular	ca. 1975	Ineligible
0135	Electric Mods Shop	Industrial Vernacular	ca. 1984	Ineligible
0136	Shop Road Restrooms (Old Fitness for Duty Building)	Masonry Vernacular	ca. 1984	Ineligible
0137	Paint Shop/Facility Services Building	Industrial Vernacular	ca. 1984	Ineligible
0138	Paint Storage and Blast Shed	Industrial Vernacular	ca. 1984	Ineligible
0139	Civil Shop	Industrial Vernacular	ca. 1984	Ineligible
0140	Carpenter and Weld Shop (New Pipe Shop)	Industrial Vernacular	ca. 1984	Ineligible
0141	Warehouse E	Industrial Vernacular	ca. 1975	Ineligible
0142	Warehouse F	Industrial Vernacular	ca. 1975	Ineligible
0143	Outside Facility Services Office/High Bay (Facilities Storage Building)	Industrial Vernacular	ca. 1984	Ineligible
0144	Vehicle Fleet Maintenance Shop	Industrial Vernacular	ca. 1975	Ineligible
0145	Bucket Truck Shed	Industrial Vernacular	ca. 1984	Ineligible
0146	Oil and Lubricants Shed	Industrial Vernacular	ca. 1984	Ineligible
0147	Railroad Spur	No Style	ca. 1982	Ineligible
0148	Access Control Point	Frame Vernacular	ca. 1982	Ineligible
0149	Large Dedication Plaque	No Style	ca. 1984	Ineligible
0150	Small Dedication Plaque	No Style	ca. 1984	Ineligible
0151	Circulation Water Discharge	Industrial Vernacular	ca. 1982	Ineligible
0152	Circulation Water Discharge Pond	No Style	ca. 1982	Ineligible
0153	Service Water Pond	No Style	ca. 1982	Ineligible

Yellow shading indicates NRHP-eligible resource

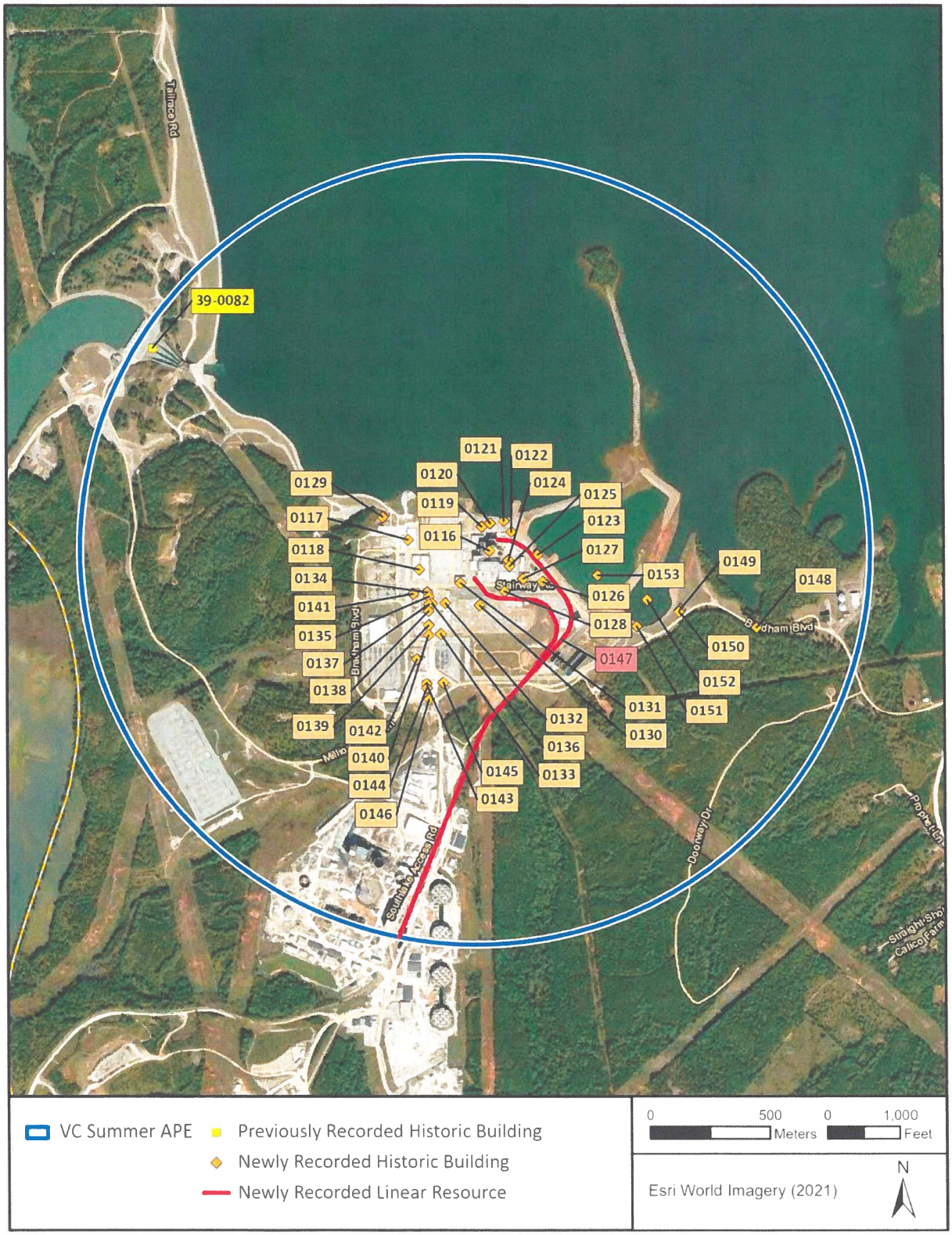

Figure 4. Historic resources recorded in the V.C. Summer APE.

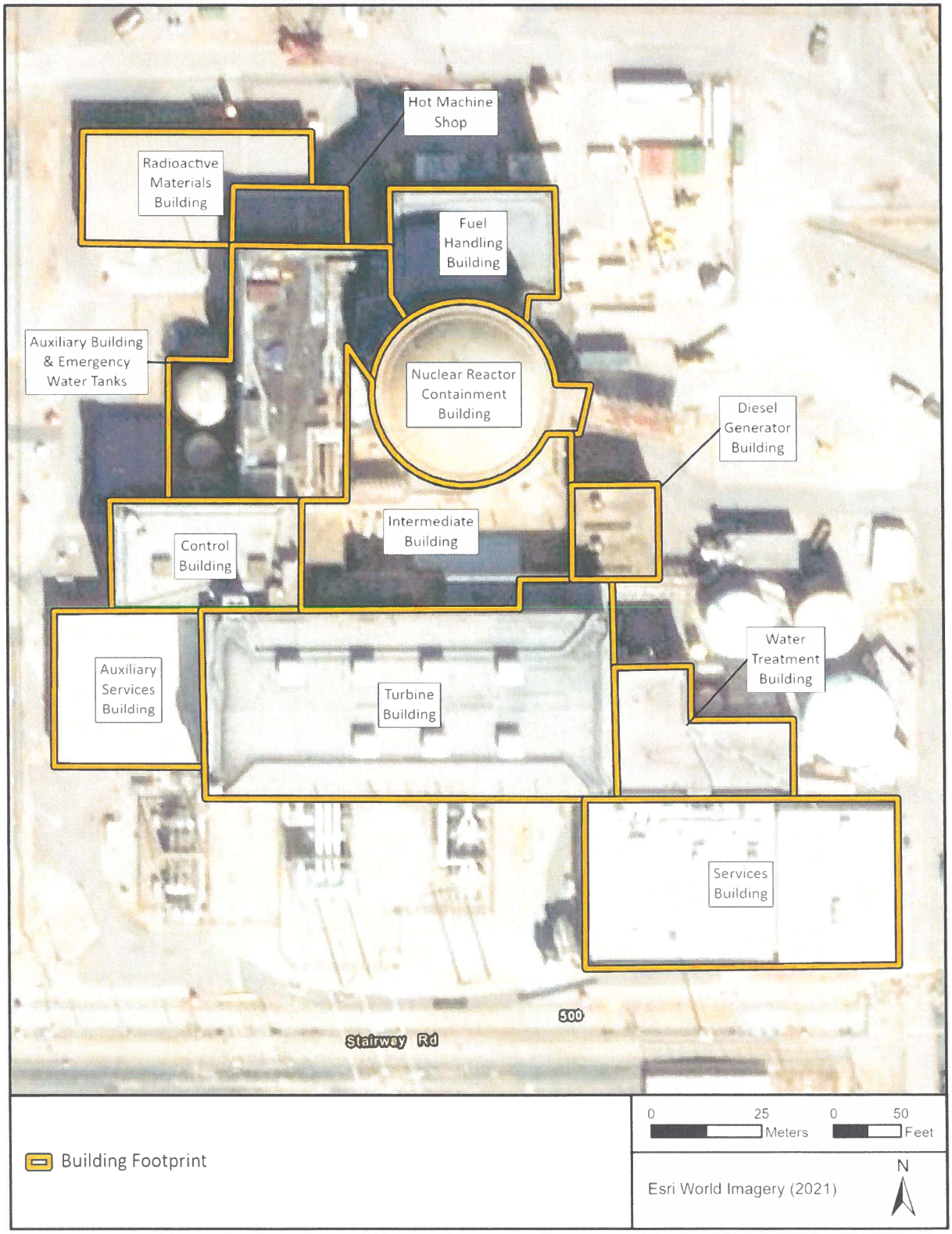

Figure 5. Resource 0116, Nuclear Reactor Complex (Summer 1).

RESOURCE 39-0082–FAIRFIELD PUMPED STORAGE DEVELOPMENT FACILITY

The Fairfield Pumped Storage Development Facility is a ca. 1978 power-generating complex and dam (**Figure 6**). The facility utilizes two reservoirs: the upper Monticello Reservoir and the lower Parr Shoals Reservoir. Electricity is generated by releasing water from the upper reservoir into the lower reservoir and then pumping water back to the upper reservoir during times of low power needs (Nagle 2014:251). The facility consists of an earthen dam, penstocks,

Figure 6. Overviews of Resource 39-0082–Fairfield Pumped Storage Development Facility. Top: facing northwest toward the gated water intake. Bottom: facing northeast across a section of the facility.

powerhouse, water intake. While not directly tied to the daily operation of the VCSNS, the facility, including the dam, helped to create the Monticello Reservoir that provides water to the VCSNS. Resource 39-0082 retains its significance under NRHP Criterion A for its association with the growth of the Midlands region of South Carolina and NRHP Criterion C for its engineering associations with pumped storage (Nagle 2014:256).

RESOURCE 0116–NUCLEAR REACTOR COMPLEX (SUMMER 1)

The Nuclear Reactor Complex (Summer 1) is a group of interconnected buildings and structures with primary and secondary functions for electrical power generation. Construction of the complex began in March 1973, with the first connection to the electrical grid completed in November 1982 and commercial operation in January 1984. From 1982 to 2021, the complex supplied 263.42 terawatt hours of electricity (International Atomic Energy Administration 2022). All commercial nuclear power plants in the United States use light water reactors, which utilize water for cooling and as a neutron moderator (water used to control the chain reaction) (DOE 2021). Power generation is achieved via a pressurized water reactor in a four-step process shown in **Figure 7**. The reactor core generates heat, which heats a loop of pressurized water. This heated pressurized water generates steam in a secondary loop, which turns the turbine fan blades that spin the generator producing electricity (NRC 2015).

Resource 0116–Nuclear Reactor Complex (Summer 1) covers more than 4 ac. As shown in **Figure 5**, it is a vast complex of interconnected buildings and structures.

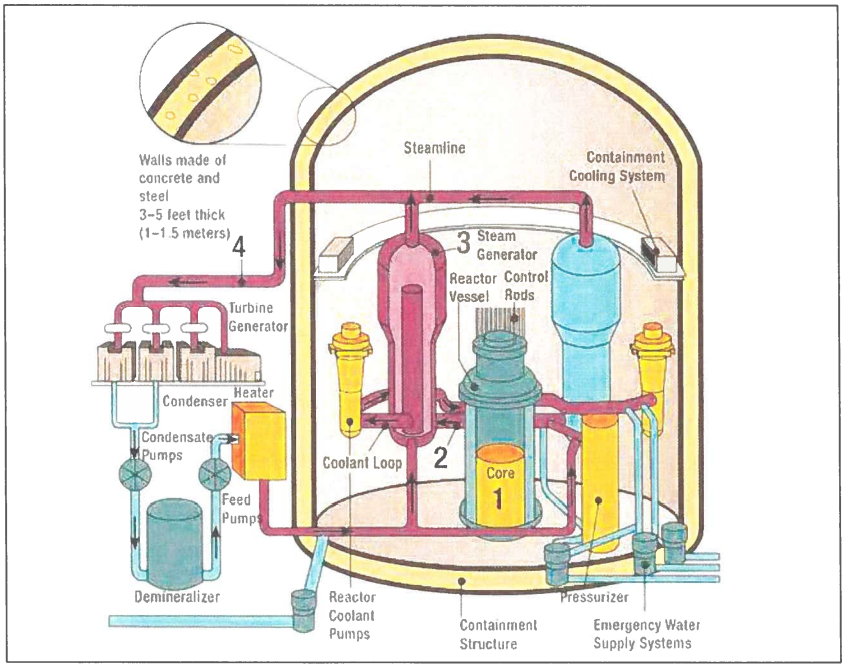

Figure 7. Diagram of the process for electrical power generation via a pressurized water reactor. Source: NRC 2015.

The Nuclear Reactor Containment Building is a ca. 1982 multilevel building constructed in an Industrial Vernacular style. The building has a round plan, a cylindrical form, and a dome roof.

Portions of the containment building extend below grade. Based upon its specific design specifications, the containment building may be similar to the illustration and cross-section drawing in **Figures 7** and **8**. The entire building is constructed from steel reinforce concrete that could be up to 5 feet (ft) thick (see **Figure 7**) with an integral carbon steel plate liner that forms the containment membrane (SCE&G 2022:147). Notably the building was designed and constructed with a post-tensioned concrete system, which is visible in **Figures 9** and **10** as the "seam" along the east side of the building and the "ring" on the base of the dome. Post tensioning of the containment building allows for increased strength of the concrete in the event of a reactor breach (VSL 2019). The east side of the building contains an equipment hatch consisting of a roll-up metal equipment door. A steel bridge connects the reactor building to the Diesel Generator Building.

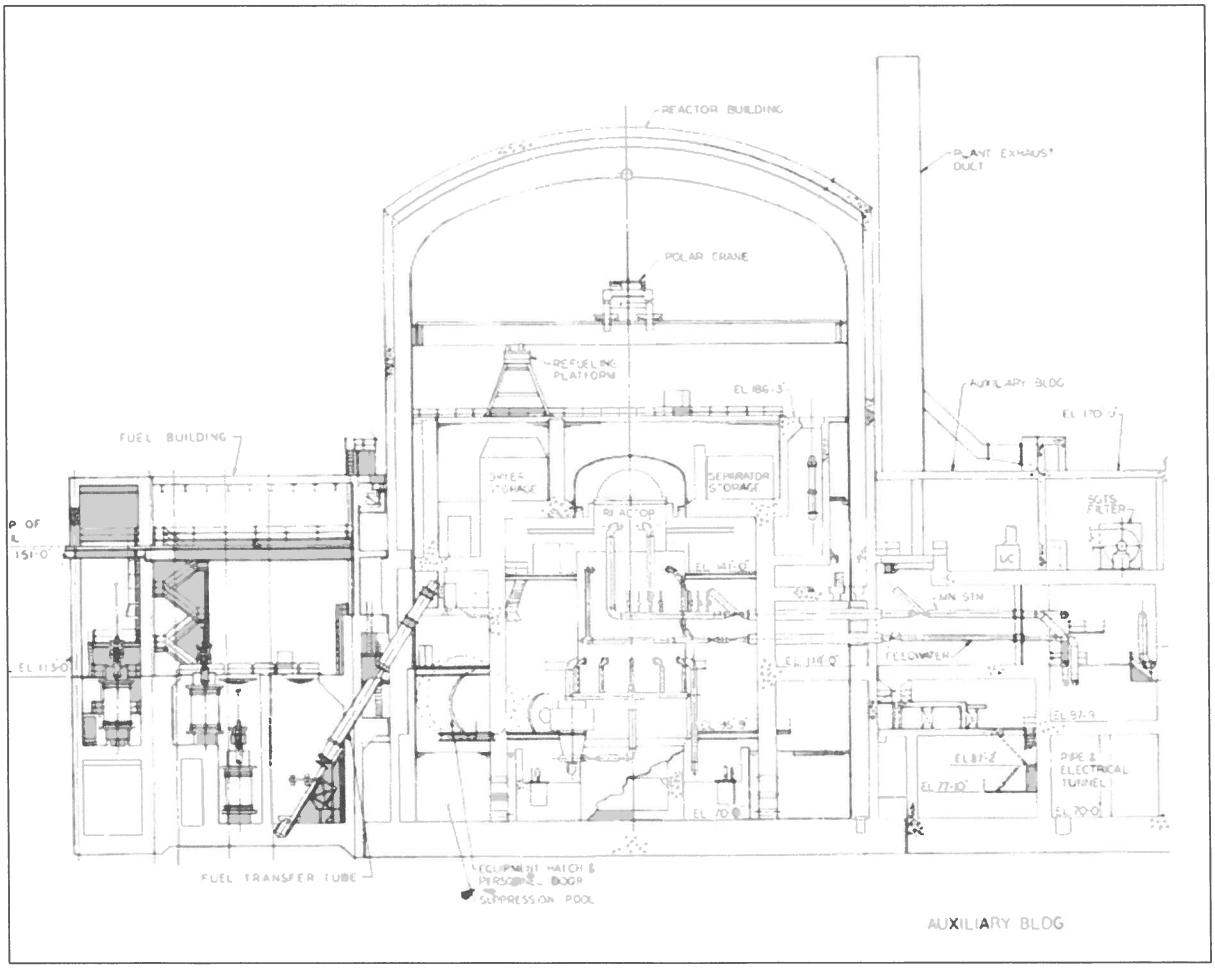

Figure 8. Reactor Building, Fuel Building, and Auxiliary Building Elevation Drawing. Source: NRC n.d.

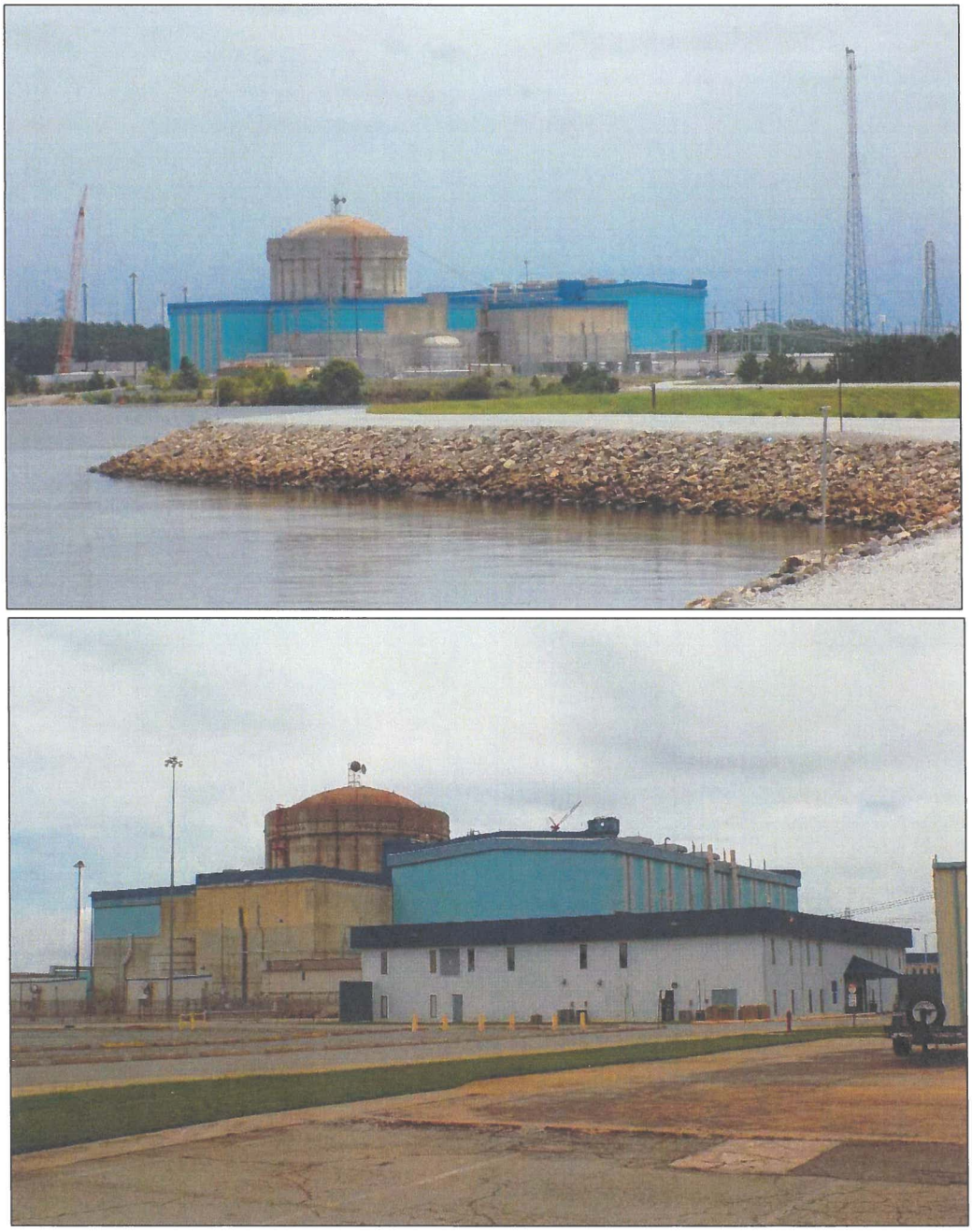

Figure 9. Overviews of the 0116–Nuclear Reactor Complex (Summer 1). Top photo: facing southeast with the Monticello Reservoir in the foreground. Bottom photo: facing northeast.

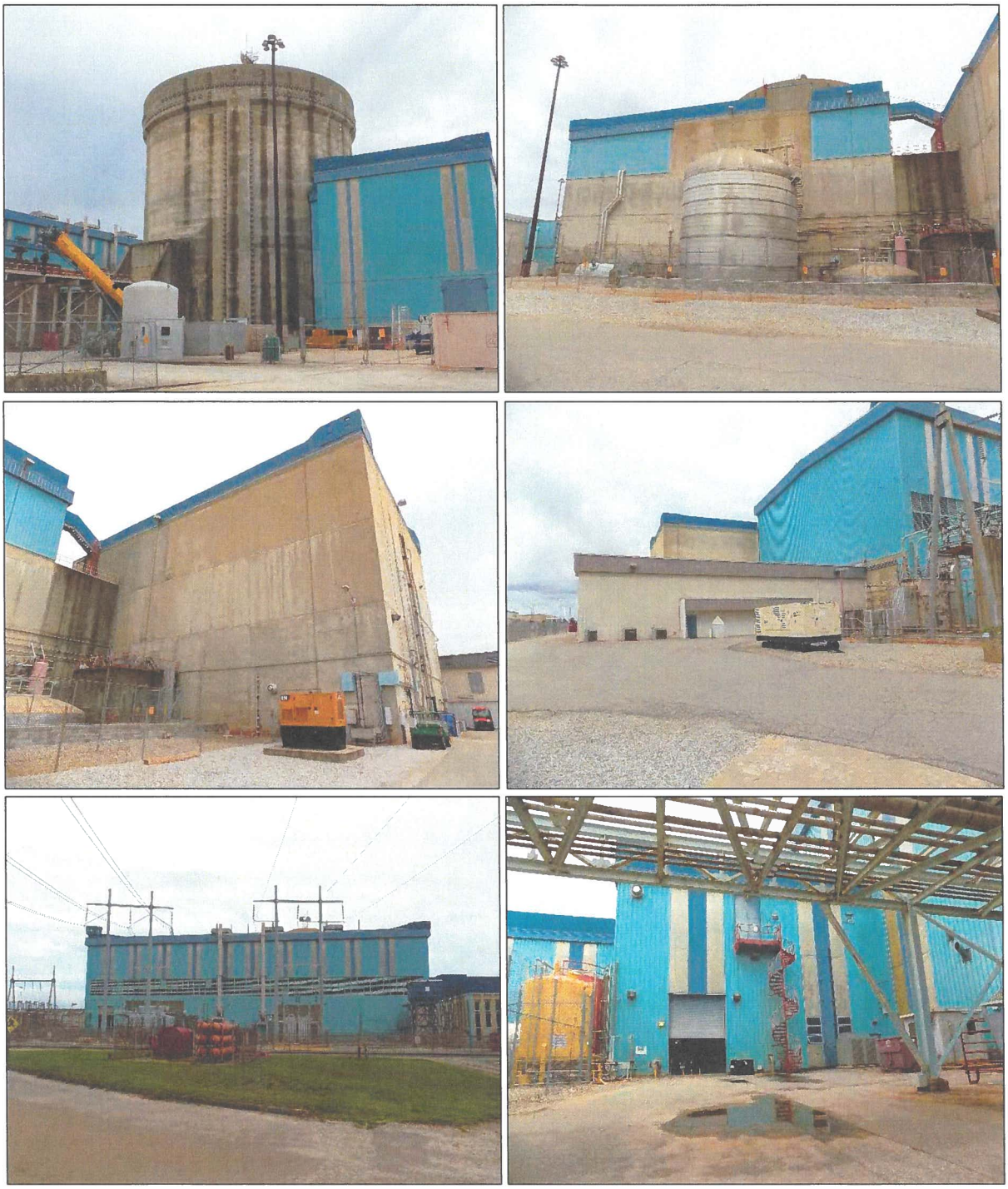

Figure 10. Representative view of 0116–Nuclear Reactor Complex (Summer 1). Top left: Reactor, Intermediate and Diesel Generator Building, facing southwest. Top right: Auxiliary Building and Emergency Water Tanks, facing east. Middle left: Control Building, facing southeast. Middle right: Auxiliary Services Building, facing northeast. Bottom left: Turbine Building, facing north. Bottom right: Water Treatment Building, facing south.

The Diesel Generator Building is a ca. 1982, one-story, Industrial Vernacular building with a square plan. The building is set at grade on a concrete slab foundation. The flat roof and exterior walls consist of steel-reinforced concrete (see **Figure 10**). There are two steel-reinforced concrete slabs attached to the main façade that function as doors. The concrete slabs are bolted to the façade and can only be removed by crane. Two louvered metal vents are on the main façade above the slab doors. The diesel generators inside the building are used to operate emergency pumps to circulate cooling water from Resource 0153–The Service Water Pond through the reactor core in the event of a power loss (NRC 2015).

The Auxiliary Building is a ca. 1982 multilevel support building built in the Industrial Vernacular style. The building is directly west of and attached to the Nuclear Reactor Containment Building. The complex's Emergency Water Tanks are in a small, fenced yard west of the Auxiliary Building (see **Figure 10**). The building contains safety and auxiliary systems for the facility, including but not limited to the emergency water system (NRC 2021b). The building has a rectangular plan and is set at grade on a concrete slab foundation. The exterior walls consist of concrete and are partially clad in standing seam metal. There is no visible fenestration or entryway from the allotted viewpoint.

The Control Building is a ca. 1982 multilevel building built in the Industrial Vernacular style. The building has a rectangular plan and is set on a concrete foundation. The exterior walls and flat roof consist of steel-reinforced concrete. Various metal conduit and panels are attached to the wall (see **Figure 10**). The Control Building houses control operations for the reactor. There is no visible fenestration or entryways on the exterior. Instead, the building is accessed via the Turbine Building.

The Auxiliary Services Building is a ca. 1982 Industrial Vernacular-style building with a rectangular plan (see **Figure 10**). The building is set at grade on a concrete slab foundation. Built-up material clads the flat roof, and standing seam metal covers the exterior walls. The fenestration consists of metal-framed fixed windows arranged individually along the west façade. Two entrances, both composed of flush metal doors set under a partial width and attached porch, are on the south façade. The Auxiliary Services Building contains offices for operation of the nuclear reactor complex.

The Water Treatment Building is a ca. 1982 Industrial Vernacular-style building with an L-plan. The building is set at grade on a concrete slab foundation (see **Figure 10**). The building has a flat roof, and standing seam metal clads the exterior walls. The north façade contains a roll-up metal garage door set west of center. Centered within the façade is a set of double flush metal doors accessed via metal winding staircase. The only visible fenestration consists of a set of metal-framed three-light awning windows. The Water Treatment Building serves a variety of functions associated with cooling water.

The Turbine Building is a ca. 1982 multilevel building built in the Industrial Vernacular style (see **Figure 10**). The building features a rectangular plan and is set at grade on a concrete slab foundation. The low-pitched gable roof and the exterior walls are covered with standing seam

metal. The Turbine Building is one of the largest in the complex and contains the steam turbines that power generators producing electricity (**Figure 11**). The building contains several entrances on each façade that consist of flush single-leaf doors and metal roll-up equipment doors. One of the equipment doors on the south side of the building has the railroad spur line going inside. The spur line is not active but was used in the past to move heavy equipment directly into the building. A double-height row of louvered metal vents spans across the south façade at mid-height. A fenced electrical equipment yard is adjacent to the south side of the building.

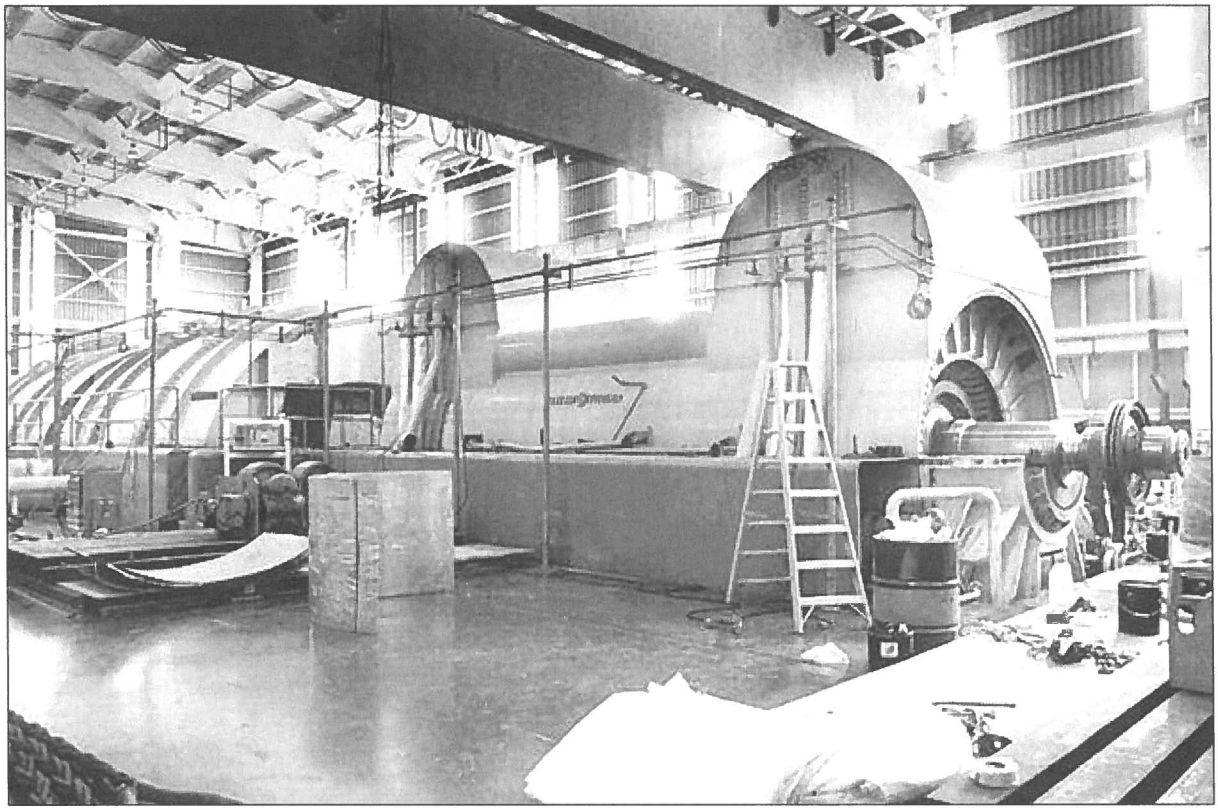

Figure 11. The steam turbine inside the turbine building at VCSNS. Source: Dominick 1984.

The Radioactive Materials Building is a ca. 1982 Industrial Vernacular-style building. The building has an L-plan and is set on a concrete slab foundation **(Figure 12**). The building features a slightly pitched metal gable roof and concrete block exterior walls. The simple building lacks fenestration. There are three entryways: two on the north façade and one on the south. The northern façade contains a set of flush, double-metal doors set west of center, and a second entryway contains a single-leaf flush metal door set under a metal portico west of the double doors. The third entry consists of a single-leaf flush metal door also under a metal portico, set west of center on the south façade.

The Hot Machine Shop is a ca. 1982 facility that is part of the Auxiliary Building but with an interior partition (see **Figure 12**). The term "hot" refers to its use as a machine shop for materials and equipment that have been exposed to radiation. The facility was built in the Industrial Vernacular

style. The building has a rectangular plan and is set on a concrete slab foundation. Built-up material covers the flat roof while concrete blocks and standing seam metal make up the exterior walls. The facility has no visible fenestration and one roll-up equipment door on the north side.

Figure 12. Representative view of 0116–Nuclear Reactor Complex (Summer 1). Top left: radioactive materials building, facing east. Top right: hot machine shop, facing south. Bottom left: fuel handling building, facing south. Bottom right: services building, facing southwest.

The Fuel Handling Building is a ca. 1982 Industrial Vernacular-style building with a rectangular plan (see **Figure 12**). The building is set at grade on a concrete slab foundation. The building has a flat roof, and standing seam metal clads the exterior walls. The west side of the building contains large, flush, double metal doors set north of center. The building has no visible fenestration. The Fuel Handling Building serves a variety of functions associated with cooling with the nuclear fuel used to power the reactor and is connected directly to the Nuclear Reactor Containment Building.

The Intermediate Building is a ca. 1982 building with no style and an irregular plan. The building is encapsulated or surrounded by other building on all sides (see **Figure 12**). The building is bound to the north by the Nuclear Reactor Containment Building, to the south by the Turbine Building,

to the east by the Diesel Generator Building, and to the west by the Auxiliary and Control Buildings. The Intermediate Building serves a variety of functions associated with its surrounding buildings.

The Service Building is a ca. 1982, two-story, Modern-style office building (see **Figure 12**). The building has a rectangular plan and is set at grade on a concrete slab foundation. Built-up material covers the flat roof, while the exterior walls are composed of prefabricate concrete panels. The south façade contains the main entryway, composed of a set of metal commercial doors with one light each centered on the façade. The west façade contains several entryways, including a central metal door with one upper light, accessed via concrete landing with metal railing, as well as an additional door set east of center. Two metal, roll-up, metal garage doors and single-leaf doors are set to the north and south on the west façade. Fenestration consists of fixed, metal-framed windows arranged individually throughout the building. The Service Building contains offices for operation of the nuclear reactor complex.

Assessment

Resource 0116–Nuclear Reactor Complex (Summer 1) is not representative of an early power plant, prototype, or plant distinct for its design or engineering. Resource 0116 is not associated with events that have made a significant contribution to the broad patterns of history and is not recommended significant under Criterion A. Background research indicates the plant lacks association with any person(s) significant in history, so it is not recommended significant under Criterion B. The plant generally lacks architectural or engineering distinction and is not recommended significant under Criterion C. The plant is not recommended significant under Criterion D because it lacks the potential to yield further information of historical importance. SEARCH recommends Resource 0116 ineligible for listing in the NRHP or as part of a district.

RESOURCE 0117–CRAFT TRAINING CENTER

Resource 0117 is a ca. 1974, one-story, Industrial Vernacular warehouse. The building predates most of the other buildings that are part of the complex and likely functioned as offices during construction of VCSNS prior to its current use as a craft training center (**Figure 13**). The building features an irregular plan and is set on a concrete slab foundation. The building consists of an east wing and west wing that are set north–south with a connecting structure that runs east–west in the middle of the two buildings. Standing seam metal clads the gable roof and exterior walls. Building entrances are visible on the south façade, and the fenestration consists of sliding metal two-light windows throughout the building. Resource 0117 is west of the Nuclear Reactor Complex (Summer 1) and south of the Monticello Reservoir.

Resource 0117 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in

conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0117 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0117 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

Figure 13. Resource 0117, facing northeast.

RESOURCE 0118–WAREHOUSE A AND B

Resource 0118 consists of two attached warehouses: Warehouse A and B. The warehouses are ca. 1975 Industrial Vernacular-style buildings that predate most of the other buildings that are part of the complex. The warehouses likely functioned as storage or assembly buildings during construction of VCSNS. Warehouse A features a rectangular plan raised above grade on a concrete slab foundation (**Figure 14**). Corrugated sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building. A metal door with a central rectangular light is in the center of the south side of the building and is sheltered by a metal awning. A pair of roll-down metal vehicular access doors are east of center on the south side of

the building. A partial-width open porch shelters these doors, featuring a shallowly pitched gable roof supported by slanted metal posts over a concrete platform bounded by metal railings. The platform is accessed by a concrete ramp to the west of the platform. Additional roll-down metal doors are on the east and west sides of the building. Those on the east side of the building are sheltered by shed roof extensions supported by metal beams and are accessed by concrete ramps. A gable-roofed walkway connects Warehouse A with Warehouse B to the west.

Figure 14. Resource 0118, facing northwest.

Warehouse B has a rectangular plan raised above grade on a concrete slab foundation (**Figure 15**). Corrugated sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building. A metal door with a central rectangular light is in the center of the south side of the building and is sheltered by a metal awning. A pair of roll-down metal vehicular access doors are west of center on the south side of the building. A partial-width open porch shelters these doors, featuring a shallowly pitched gable roof supported by slanted metal posts over a concrete platform. The platform is accessed by concrete ramps and concrete stairs with metal railings. Additional roll-down metal doors are on the east and west sides of the building.

Resource 0118 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in

Figure 15. Resource 0118, facing northwest.

conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0118 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0118 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0119–CONTAMINATED STORAGE WAREHOUSE

Resource 0119, the Contaminated Storage Warehouse, is a 1982 Industrial Vernacular-style building with a rectangular-shaped plan. The building is set at grade on a concrete slab foundation (**Figure 16**). Standing seam metal covers the gable roof and exterior walls. The fenestration consists of one-over-one, single hung sash, metal-framed windows arranged individually on the south façade. The main entrance is west of center on the south façade and has a hollow core metal door with one upper light and a metal frame. A secondary entrance is north of center on the western façade, consisting of a flush metal door with a metal frame. Adjacent to both entrances are metal roll-up garage doors. The western façade is surrounded by a chain-link fence.

Figure 16. Resource 0119, facing northeast.

Resource 0119 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0119 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0119 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0120–ELECTRICAL MODIFICATIONS BUILDING

Resource 0120, the Electrical Modifications building, is an Industrial Vernacular-style support building constructed ca. 1982. The building features a rectangular plan and is set at grade on a concrete slab foundation (**Figure 17**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building. The main entrance is in the center of the south side of the building and features a solid metal door. To the west of this door is an additional roll-down metal vehicular access door. A gravel and dirt lot is to the south of the

building and is used for storing equipment and temporary sheet-metal crates. Chain-link fencing abuts the building on the east side.

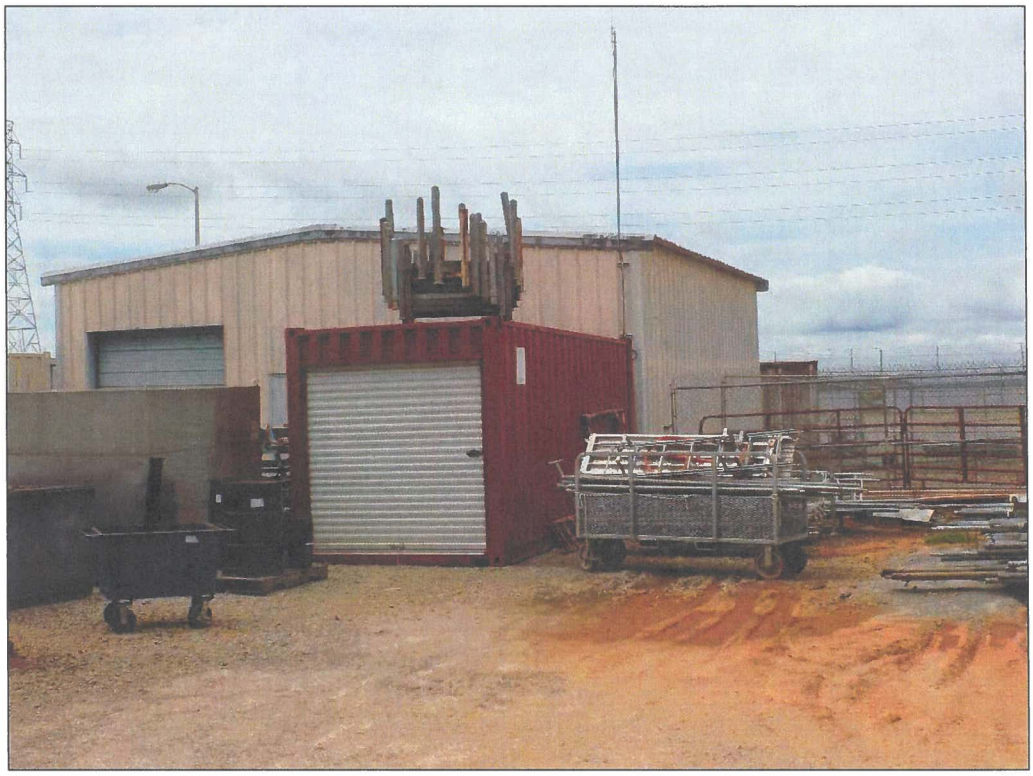

Figure 17. Resource 0120, facing northwest.

Resource 0120 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0120 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0120 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0121–FIRE SERVICE PUMP HOUSE

Resource 0121, the Fire Service Pump House, is a 1982 Industrial Vernacular-style building. The resource has a rectangular plan and is set at grade on a concrete slab foundation (**Figure 18**). Built-up material covers the flat roof, and concrete blocks make up the exterior walls. The building has no visible windows or entryways from the allotted viewpoint. The southern façade contains two louvered metal vents. A metal ladder is attached south of center on the western façade. The facility is set within an area separated by a chain-link fence. The building contains one electric and one diesel fire pump (SCE&G 2022:194).

Figure 18. Building 0121, facing northeast.

Resource 0121 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0121 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's

opinion that Resource 0121 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0122–OUTAGE ELECTRICAL DISTRIBUTION BUILDING

Resource 0122, the Outage Electrical Distribution Building, is an Industrial Vernacular-style support building constructed ca. 1982. The resource features a rectangular plan and is set at grade on a concrete slab foundation (**Figure 19**). Composition shingles cover the gable roof, which features raked eaves and pork chop returns. The walls are constructed of concrete block. There are no windows on the building. The main entrance is in the center of the south side of the building and features a solid metal door. Various electric panel boxes are attached to the west façade.

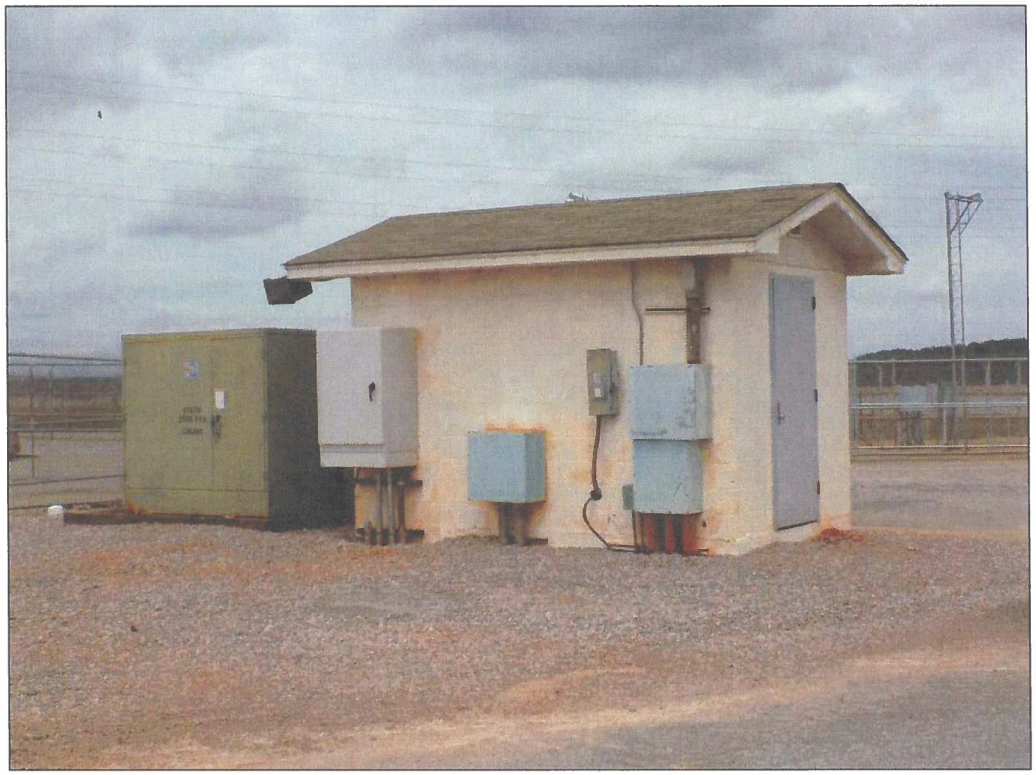

Figure 19. Building 0122, facing northeast.

Resource 0122 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0122 is

not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0122 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0123–SERVICE WATER PUMP HOUSE

Resource 0123, the Service Water Pump House, is a ca. 1982 Industrial Vernacular-style building. The resource has a rectangular plan set on a concrete slab foundation (**Figure 20**). Built-up material coves the flat roof, and a metal parapet surrounds the roofline. The exterior walls are composed of steel-reinforced poured concrete. The building has no visible fenestration. A metal staircase on the north façade leads from the ground to the roof. The building houses pumps that provide water from the Service Water Pond to the service water system (SCE&G 2022:187).

Figure 20. Resource 0123, facing south

Resource 0123 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era

and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0123 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0123 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0124–AUXILIARY BOILER HOUSE

Resource 0124, the Auxiliary Boiler House, is an Industrial Vernacular-style support building constructed ca. 1982. The resource has a rectangular plan and is set at grade on a concrete slab foundation (**Figure 21**). The flat roof is built up, and standing seam sheet metal clads the walls. There are no visible windows on the building. The main entrance is slightly east of center on the north side of the building and features double metal doors with central rectangular lights.

Figure 21. Building 0124, facing south.

Resource 0124 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0124 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0124 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0125–POTABLE WATER BUILDING AND TANKS

Resource 0125, the Potable Water Building and Tanks, consists of two ca. 1982 buildings and three water tanks. The two buildings have a rectangular plan and are set at grade on concrete slab foundations (**Figure 22**). The welded steel tanks have a circular plan and are also set on concrete foundations. The building south of the tanks has a gable roof, and exterior walls are clad in standing seam metal. The building is accessed via a metal double door set east of center on the north façade. The building north of the tanks has a gable roof, and exterior walls are clad in

Figure 22. Resource 0125, facing southwest

standing seam metal. A single metal door with one window is on the south side of the building. The buildings and tanks are east and northeast of the Water Treatment Building.

Resource 0125 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0125 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0125 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0126–WAREHOUSE D

Resource 0126, Warehouse D, is a ca. 1982 warehouse built in the Industrial Vernacular style. The warehouse features a rectangular plan and is set at grade on a concrete slab foundation (**Figure 23**). Standing seam metal clads the gable roof and exterior walls. The building is accessed via set of double flush metal doors centered on the west façade. There is no visible fenestration.

Figure 23. Resource 0126, facing southeast

Resource 0126 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0126 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0126 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0127–WAREHOUSE C

Resource 0127, Warehouse C, is a ca.1982 warehouse built in the Industrial Vernacular style. The warehouse features a rectangular plan and is set at grade on a concrete slab foundation. Standing seam metal clads the gable roof and exterior walls (**Figure 24**). The building contains several entryways, including a double metal door with one light each set west of center on the north façade. Additionally, the west façade contains four flush metal doors arranged on the southern half of the façade. There is no visible fenestration.

Figure 24. Resource 0127, facing southeast

Resource 0127 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0127 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0127 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0128–OLD FITNESS CENTER

Resource 0128, the Old Fitness Center, is a ca. 1984 Industrial Vernacular-style warehouse. The building features a rectangular plan and is set at grade on a concrete slab foundation. Standing seam metal clads the gable roof and exterior walls (**Figure 25**). No visible entryway or fenestration is visible from the right of way. The building is set west of a parking lot and north of Stairway Road. The building, originally used as a fitness center, is now used for storage.

Figure 25. Resource 0128, facing northeast.

Resource 0128 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0128 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0128 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0129–METEOROLOGICAL TOWER

Resource 0129, the Meteorological Tower, is a ca. 1984 metal tower. The four-legged tower is joined together by crisscross metal rods and measures approximately 100 ft in height (**Figure 26**). The tower supports meteorological equipment placed within the center of the top of the tower. The tower is within a fenced-in area, surrounded entirely by a metal chain-link fence.

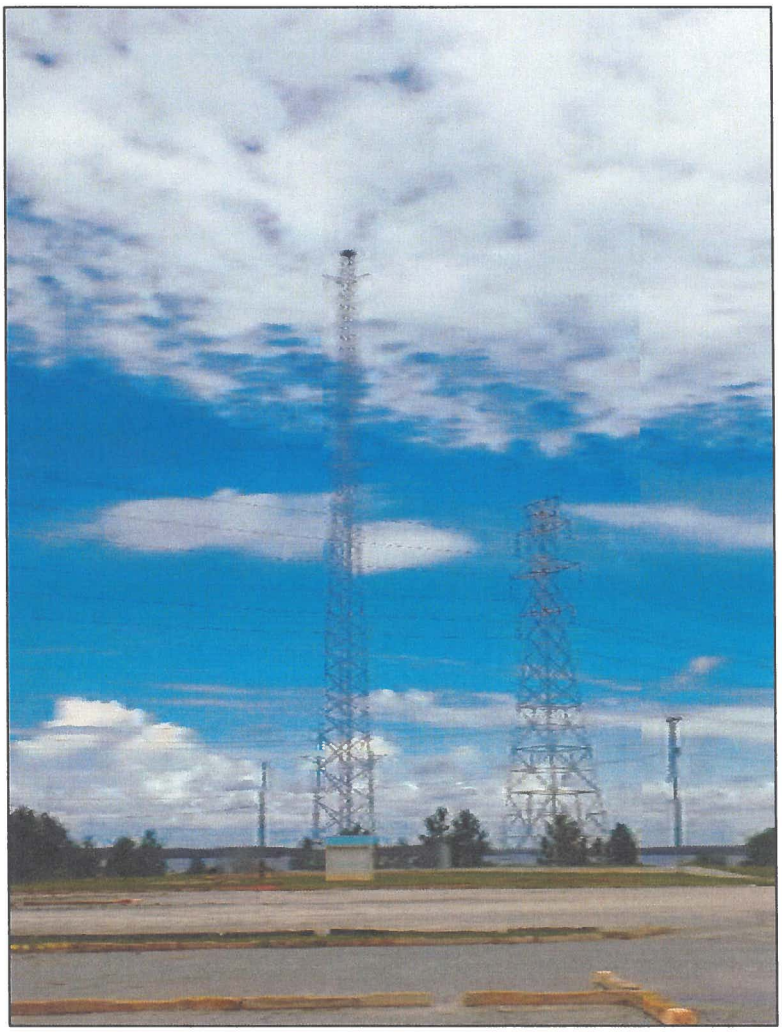

Figure 26. Resource 0129, facing north

Resource 0129 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any

person(s) significant in history. Resource 0129 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0129 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0130–SWITCHYARD CONTROL HOUSE

Resource 0130, the Switchyard Control House, is a ca. 1982 Industrial Vernacular-style building with a rectangular plan. The building is set at grade on a concrete slab foundation. Concrete covers the shallow gabled roof, and the exterior walls are composed of prefabricated concrete panels (**Figure 27**). The north façade contains three entryways, including a single-leaf flush metal door and two sets of double flush metal doors, all set under concrete awnings. Three circular metal vents extend from the north façade. The building is set within a fenced in area of the nuclear facility within a switchyard.

Figure 27. Building 0130, facing southwest

Resource 0130 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0130 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0130 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0131–AUXILIARY ACCESS PORTAL

Resource 0131 is a ca. 1984 Industrial Vernacular-style building with a rectangular plan. The building is set at grade on a concrete slab foundation (**Figure 28**). The flat roof is built up and features a corrugated sheet metal-clad boxed flat eave extension encircling the building. Standing seam sheet metal clads the walls. There are no windows on the building. A group of four metal doors with rectangular lights is in the center of the east side of the building. These doors are set within an incised porch with a metal eave overhang and a concrete slab. Concrete walkways

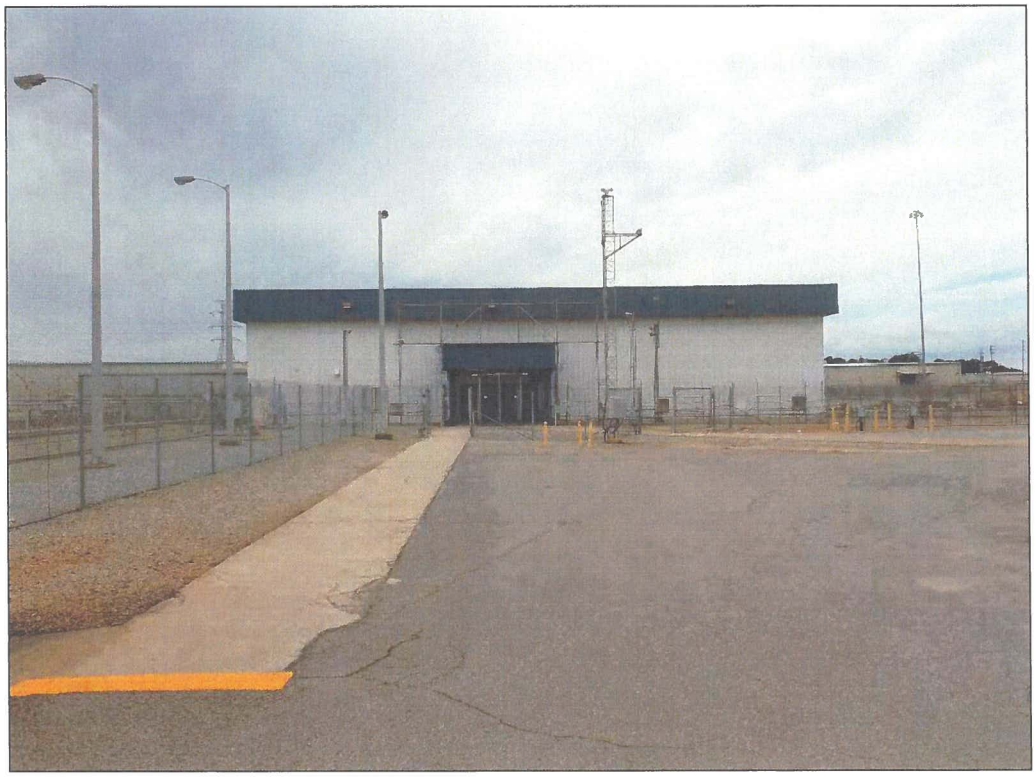

Figure 28. Resource 0131, facing west.

approach this porch from the east. A chain-link fence with gates is to the east of the building. The building serves as a security portal to access the Nuclear Reactor Complex (Summer 1) .

Resource 0131 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0131 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0131 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0132–RESPIRATORY BUILDING (FACILITIES GROUND MAINTENANCE)

Resource 0132 is a ca. 1974 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation (**Figure 29**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building, but a louvered rectangular metal vent is on the west end of the north side. Individual metal doors with central rectangular lights are in the center of the north side of the building and north and

Figure 29. Resource 0132, facing southeast.

south of center on the west side of the building. A roll-down metal vehicular access door is on the west side of the building.

Resource 0132 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0132 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0132 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0133–OLD TIME CLOCK PORTAL

Resource 0133 is a ca. 1982 Industrial Vernacular-style support building with a rectangular plan. The building is set at grade on a concrete slab foundation (**Figure 30**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building. There are six pairs of metal doors on each the north and south sides of the building, with an

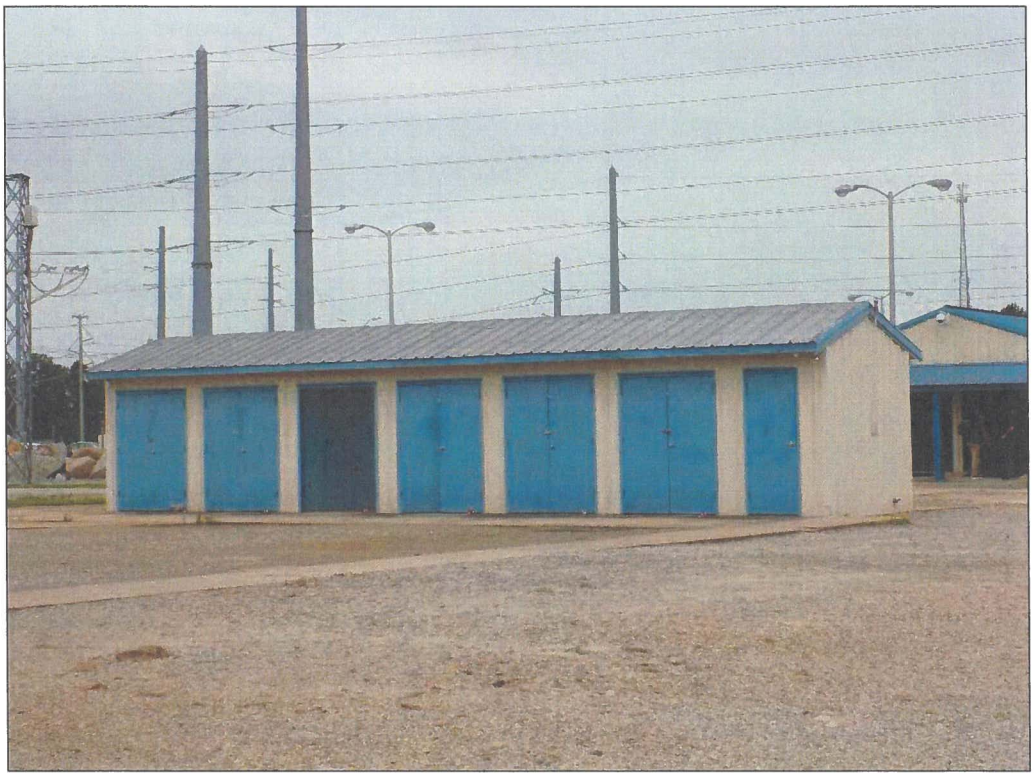

Figure 30. Resource 0133, facing southeast.

additional individual metal door on the north side of the building. A concrete slab is on the north and south sides of the building, and a gravel lot is to the east and west of the building. Resource 0133 is not in use anymore, but it was the time clock building where employees punched in and out for the day.

Resource 0133 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0133 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0133 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0134–OLD PIPE SHOP

Resource 0134 is a ca. 1975 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation (**Figure 31**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building. A metal door with a central rectangular light is south of center on the east side of the building. A roll-down metal vehicular access door is in the center of the east side of the building and is accessed by a concrete slab. A flat-roofed walkway connects Resource 0134 with Resource 0135 to the south. The building is on an asphalt lot north of Resource 0134.

Resource 0134 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0134 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0134 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

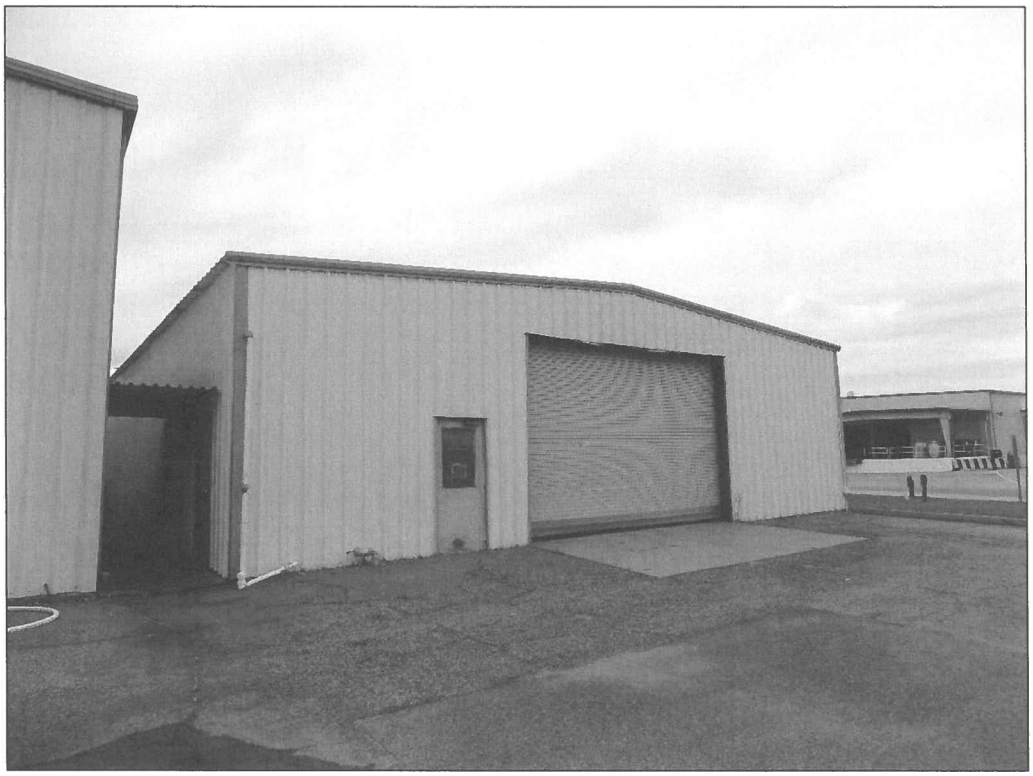

Figure 31. Resource 0134, facing northwest.

RESOURCE 0135–ELECTRIC MODS SHOP

Resource 0135 is a ca. 1984 Industrial Vernacular-style warehouse that features a rectangular plan. The warehoused is set at grade on a concrete slab foundation (**Figure 32**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building. A metal door with a central rectangular light is east of center on the south side of the building. A roll-down metal vehicular access door is in the center of the east side of the building. The building is on a concrete and gravel lot, and Building 0134 is to the north.

Resource 0135 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0135 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's

opinion that Resource 0135 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

Figure 32. Resource 0135, facing northwest.

RESOURCE 0136–SHOP ROAD RESTROOMS (OLD FITNESS FOR DUTY BUILDING)

Resource 0136 is a ca. 1984 Masonry Vernacular building with a T-shaped plan that is set at grade on a concrete slab foundation (**Figure 33**). Composition shingles cover the intersecting gable roof. The raked eaves feature pork chop returns. The walls are constructed of concrete blocks, and plywood clads the walls within the gable ends. There are no visible windows on the building. An external metal vent is on the south side of the building. The main entrance is in the center of the east side of the building and features a hollow-core wood door with a wood door frame. A concrete walkway leads to the entrance. The building is set on a gravel and concrete lot east of Building 0137.

Resource 0136 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0136 is

Figure 33. Resource 0136, facing northwest.

not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0136 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0137–PAINT SHOP/FACILITY SERVICES BUILDING

Resource 0137 is a ca. 1984 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation (**Figure 34**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. A metal vent is toward the north end of the roof. There are no windows on the building, but rectangular metal vents are in the gable ends. A roll-down metal door is in the center of the north side of the building. The building is placed on a gravel lot next to Resource 0136.

Resource 0137 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under

Figure 34. Resource 0137, facing southwest.

Criterion B because it lacks association with any person(s) significant in history. Resource 0137 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0137 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0138–PAINT STORAGE AND BLAST SHED

Resource 0138 is a ca. 1984 Industrial Vernacular-style shed with a rectangular plan. The shed is set at grade on a concrete slab foundation (**Figure 35**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the inclined walls. There are no windows on the building, but rectangular metal vents are near the roof line on the north and south sides of the building. A roll-down metal door is on the east side of the building. A concrete driveway leads to the main entry on the east side, and the building is set on an asphalt lot. The building is north of the non-historic Combined Maintenance Shop and south of the Resource 0137–Paint Shop/Facility Services Building.

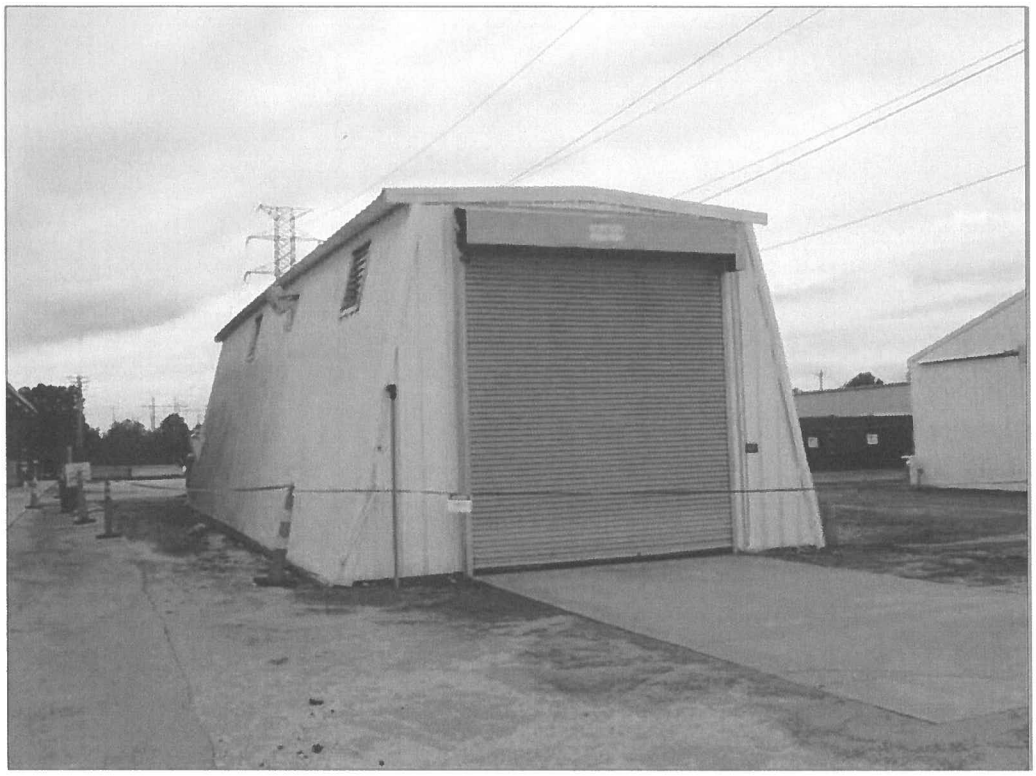

Figure 35. Resource 0138, facing northwest.

Resource 0138 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0138 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0138 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0139–CIVIL SHOP

Resource 0139 is a ca. 1984 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation (**Figure 36**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. The fenestration consists of sliding metal two-light windows spaced along the east side of the building. Two metal doors are placed in the middle of the north and south ends of the east side. These doors feature central rectangular lights and are reached via concrete walkways. The building is surrounded by a gravel lot.

Figure 36. Resource 0139, facing southwest.

Resource 0139 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0139 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0139 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

Resource 0140–Carpenter and Weld Shop (New Pipe Shop)

Resource 0140 is a ca. 1984 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation (**Figure 37**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no visible windows on the building, but rectangular metal vents are placed in the gable ends and on the east side. A metal door is south of center on the east side of the building. In the center and on the south end of the east side are full-height roll-down metal vehicular access doors. A concrete parking lot is to the east of the building, and a small metal shed abuts the north side of the building.

Figure 37. Resource 0140, facing southwest.

Resource 0140 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0140 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0140 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0141–WAREHOUSE E

Resource 0141 is a ca. 1975 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation (**Figure 38**). Standing seam sheet metal covers the shallowly pitched gable roof and clads the walls. There are no windows on the building, but rectangular metal vents are on the east and west sides of the building. A metal door with a central rectangular light is east of center on the north side of the building, and a roll-down metal

door is in the

Figure 38. Resource 0141, facing southwest.

center of the north side of the building. A concrete driveway leads to the roll-down door, and a concrete walkway branches off the driveway and leads to the north entry.

Resource 0141 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0141 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0141 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0142–WAREHOUSE F

Resource 0142 is a ca. 1975 Industrial Vernacular-style warehouse with a rectangular plan. The warehouse is set at grade on a concrete slab foundation. Standing seam metal clads the gable roof and exterior walls. The main entry, set east of center on the south facing façade, consists of

a flush, single-leaf door (**Figure 39**). West of the main entry is a metal roll-up equipment door. The facility is within a fenced area, positioned east and west of two large parking lots.

Figure 39. Resource 0142, facing northwest

Resource 0142 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0142 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0142 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0143–OUTSIDE FACILITY SERVICES OFFICE/HIGH BAY (FACILITIES STORAGE BUILDING)

Resource 0143, the Outside Facility Services Office/High Bay (Facilities Storage Building), is a ca. 1984 warehouse built in the Industrial Vernacular style. The building features a rectangular plan and is set at grade on a concrete slab foundation. Standing seam metal clads the gable roof and exterior walls. The building is accessed via standing seam metal sliding equipment doors on the east-facing façade (**Figure 40**). The door is flanked by a vented opening to the south of the entry. The building is to the north of Million Dollar Lane.

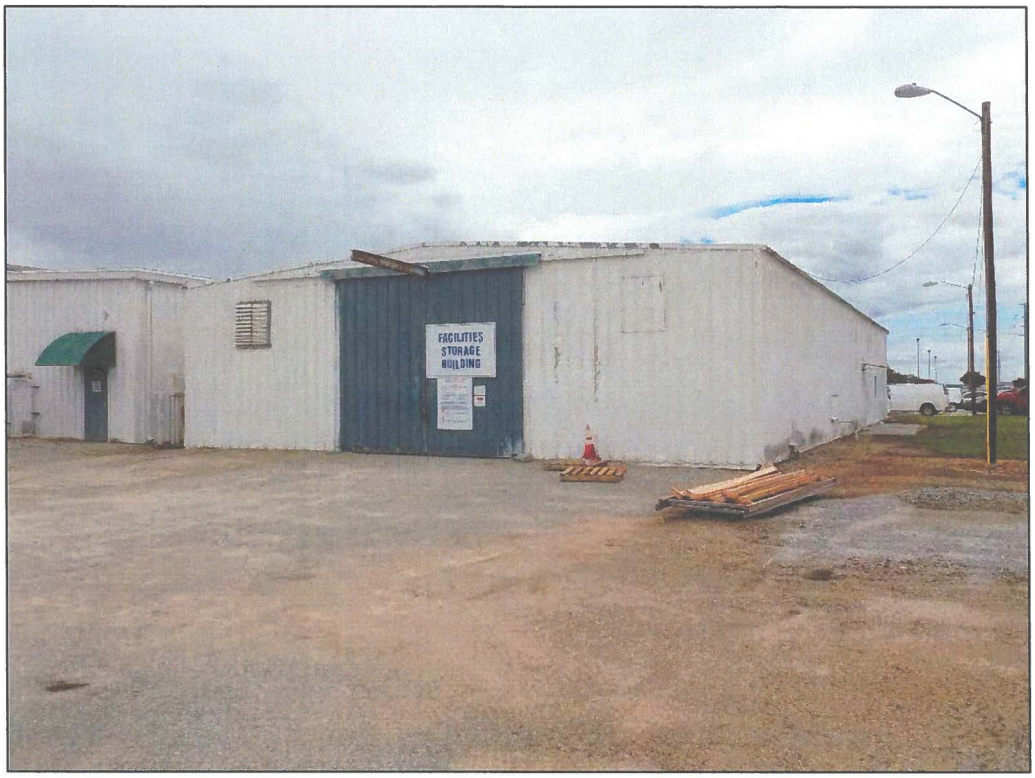

Figure 40. Resource0143, facing southwest

Resource 0143 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0143 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's

opinion that Resource 0143 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0144–VEHICLE FLEET MAINTENANCE SHOP

Resource 0144 is a ca. 1975 Industrial Vernacular-style warehouse that features a rectangular plan. The warehouse is set at grade on a concrete slab foundation. Standing seam metal clads the gable roof and exterior walls. The southern façade contains five vehicle bays, each with metal roll-up equipment doors (**Figure 41**). A single-leaf flush metal door is set west of center on the southern façade under a vinyl awning. A metal-framed, single-hung sash sliding window is set west of the entryway. The building is set south of Building 0143, just north of Million Dollar Lane.

Figure 41. Resource 0144, facing north.

Resource 0144 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0144 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with

significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0144 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0145–BUCKET TRUCK SHED

Resource 0145, the Bucket Truck Shed, is a ca. 1984 Industrial Vernacular-style shed that features a rectangular plan. The shed is set at grade on a concrete slab foundation. Standing seam metal clads the gable roof and exterior walls (**Figure 42**). A metal roll-up equipment door takes up the width of the west and east facing façade. A wooden shed roof structure is attached west of center on the northern façade. The facility is set northeast of Building 0143 and Building 0144.

Figure 42. Resource 0145, facing southeast.

Resource 0145 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0145 is not significant under Criterion C due to its lack of architectural or engineering distinction. The

resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0145 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0146–OIL AND LUBRICANTS SHED

Resource 0146, the Oil and Lubricants Shed, is a ca. 1984 Industrial Vernacular-style shed that features a rectangular plan. The shed is set at grade on a concrete slab foundation (**Figure 43**). Standing seam metal clads the gable roof and exterior walls. A metal roll-up garage door takes up the entire width of the western façade. The building is set southeast of Building 0143 and Building 144.

Figure 43. Resource 0146, facing southeast.

Resource 0146 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0146 is

not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0146 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RAILROAD SPUR 0147–SPUR LINE TO THE SOUTHERN RAILROAD

Resource 0147 is a ca. 1982 railroad spur line that connects to the main line of the Southern Railroad near the Broad River (**Figure 44**). The railroad features two parallel steel tracks set at grade. The spur line was constructed so heavy equipment could be moved to the VCSNS and has no historic connection to the Southern Railroad. The spur line remains in fair condition but is no longer used for transportation.

Figure 44. Resource 0147, facing west

Resource 0147 is a railroad spur line associated with the building of the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s)

significant in history. Resource 0147 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a has no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0147 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

Resource 0148–Access Control Point

Resource 0148 is a ca.1982 one-story guard shack that features a Frame Vernacular style and a rectangular plan. The building is set at grade on a concrete slab foundation. The guard shack is set in the middle of Bradham Boulevard with a traffic gate on the northeastern façade (**Figure 45**). The gable roof is clad in asphalt shingles while the exterior is clad in vinyl siding. The entry, set on the northeastern façade, consists of a metal door with one upper light. The entry is set under a gable portico entry. Fixed metal-framed windows are set on each façade.

Figure 45. Resource 0148, facing west.

Resource 0148 is a support building to the VCSNS. Based on the results of the current survey, the resource is not significant under NRHP Criterion A because it is not indicative of a particular era

and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS complex. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0148 is not significant under Criterion C due to its lack of architectural or engineering distinction. The resource is a common building type with no stylistic ornamentation or associations with significant architects or engineers. Finally, the resource is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0148 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0149–LARGE DEDICATION PLAQUE

Resource 0149 is a ca. 1984 dedication plaque establishing the V.C. Summer Station. In 1984, the Board of Directors of the South Carolina Electric & Gas Company established the plaque in honor of Virgil Clifton Summer Jr. The bronze plaque is mounted on a slab of granite backing, upheld by asymmetrical granite supports, including a single post and a rectangle (**Figure 46**). There is a larger granite trapezoidal block to the rear of the plaque. The monument is in a small park at the south end of the Monticello reservoir.

Figure 46. Resource 0149, facing northwest.

Resource 0149 is a small monument to the VCSNS. Based on the results of the current survey, the dedication plaque is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0149 is not significant under Criterion C due to its lack of artistic distinction. Finally, Resource 0149 is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0149 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0150–SMALL DEDICATION PLAQUE

Resource 0150 is a ca. 1984 bronze dedication plaque to Robert Spence Davis on a granite base and pedestal. Davis served as chairman of the South Public Service Authority from 1969 to 1974 and 1976 to 1985 (**Figure 47**). According to the inscription, the plaque is dedicated to Davis's guidance to achieve cooperation between investors and publicly owned electric utilities within South Carolina. The board of directors dedicated the plaque in 1984. The monument is in a small park at the south end of the Monticello reservoir and is just to the south of the larger monument.

Figure 47. Resource 0150, facing northwest.

Resource 0150 is a small monument to the VCSNS. Based on the results of the current survey, the dedication plaque is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0150 is not significant under Criterion C due to its lack of artistic distinction. Finally, Resource 0150 is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0150 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0151–CIRCULATION WATER DISCHARGE

Resource 0151 is a ca. 1982 concrete culvert that was constructed in conjunction with the discharge pond. The discharge culvert releases the reactor's pre-cooled circulation water into the pond. Resource 0151 is roughly triangular in plan and is built into the embankment at the southwest side of the Circulation Water Discharge Pond (**Figure 48**).

Figure 48. Resource 0151, facing southwest.

Resource 0151 is an engineered concrete culvert at the VCSNS. Based on the results of the current survey, it is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in

conjunction with the larger VCSNS. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0151 is not significant under Criterion C due to its lack of engineering distinction. Finally, Resource 0151 is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0151 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0152–CIRCULATION WATER DISCHARGE POND

Resource 0152 is a ca. 1982 pond with an 11 ac surface area. The pond was constructed as a discharge pond for the reactor's circulation water, which is cooled before being discharged into the pond. Resource 0152 is adjacent to but separated from the service water pond by a seismic dam. Unlike the service water pond, the Circulation Water Discharge Pond flows into the Monticello Reservoir through a short canal (**Figure 49**).

Figure 49. Resource 0152, facing northwest.

Resource 0152 is an engineered water pond at the VCSNS. Based on the results of the current survey, it is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0152 is not

significant under Criterion C due to its lack of engineering distinction. Finally, Resource 0152 is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0152 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

RESOURCE 0153–SERVICE WATER POND

Resource 0153 is a ca. 1982 pond with a 39 ac surface area. It was constructed to provide water to the service water system (**Figure 50**). The Service Water Pond is at the south end of the Monticello Reservoir and is bounded on all sides by dams constructed to seismic category 1 specifications, which withstand the maximum earthquake stresses of the region (NRC 2021c). The Service Water Pond is designed to function as a dedicated water source to the reactor building cooling units (SCE&G 2022:125).

Figure 50. Resource 0153. Source: ESRI 2020.

Resource 0153 is an engineered water pond at the VCSNS. Based on the results of the current survey, it is not significant under NRHP Criterion A because it is not indicative of a particular era and is not associated with any significant period, event, or theme, either individually or in conjunction with the larger VCSNS. Furthermore, the resource is not significant under Criterion B because it lacks association with any person(s) significant in history. Resource 0153 is not significant under Criterion C due to its lack of engineering distinction. Finally, Resource 0153 is not significant under Criterion D because it lacks the potential to yield further information of historical importance. It is SEARCH's opinion that Resource 0153 is not eligible for listing in the NRHP, either individually or as a contributor to an existing or potential historic district.

CONCLUSIONS AND RECOMMENDATIONS

From July 12, 2022 to July14, 2022, SEARCH completed an architectural history survey and NRHP evaluation of the VCSNS in Fairfield County, South Carolina. This survey consisted of two distinct areas: the main VCSNS facility on the south side of the Monticello Reservoir and the Fairfield Pumped Storage Development Facility (39-0082), which is 1 mi northwest of the VCSNS facility in Jenkinsville, South Carolina.

SEARCH conducted an intensive-level survey on behalf of Enercon to fulfill historic-property identification requirements under Section 106 of the National Historic Preservation Act of 1966, as amended, and SC SHPO guidelines for architectural survey, specifically *Survey Manual: South Carolina Statewide Survey of Historic Properties*.

This report includes intensive-level survey forms for the properties to provide new and updated photographs to the SC SHPO. SEARCH recommends one previously recorded historic resource (the Fairfield Pumped Storage Development Facility [39-0082]) NRHP eligible under Criteria A and C. SEARCH recommends the remaining 38 resources not eligible for inclusion in the NRHP due to their lack of historic significance and engineering or architectural distinction. It is SEARCH's opinion that the proposed project poses no adverse effects to the NRHP-listed or -eligible historic properties. SEARCH recommends no further cultural resources work.

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APPENDIX A:

SITE FORMS

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Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0082 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Fairfield Pumped Storage Development Facility

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Structure

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Eligible

Property Description

Construction Date: 1974-1978

Construction: Masonry Construction (if Other):

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other): concrete

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Concrete structure, located primarily below ground and measuring 520 ft long by 150 feet wide by 108 ft tall. The powerhouse contains eight units, each with a pump/turbine and a generator.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Will be eligible in 2028 under Criterion A for its association with increased power consumption & growth, and C, for the engineering components associated with the pumped storage system.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00082001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:	00082001	Digital Photo ID 07:
View 02	Facing Northeast	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0116 Revisit: ☐
Status Site No.

Quadrangle Name:

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Nuclear Reactor Complex (Summer 1)

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Vicinity of ☐ County:

Ownership: Category: Building

Historical Use: Historical Use (if Other):

Current Use: Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1978

Construction:	Masonry	Construction (if Other):	Frame/multiple
Historic Core Shape:		Historic Core Shape (if Other):	Multiple
Exterior Walls:		Exterior Walls (if Other):	Multiple
Foundation:		Foundation (if Other):	Multiple
Commercial Form:		Commercial Form (if Other):	Multiple
Roof Shape:		Roof Shape (if Other):	Multiple
Roof Materials:		Roof Materials (if Other)	Multiple
Stories:		Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The nuclear reactor complex is a group of 11 interconnected buildings and structures with primary and secondary functions for electrical power generation.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0116-Nuclear Reactor Complex (Summer 1) is not representative of an early power plant, prototype, or a plant distinct for its design or engineering. Reccomended not eligible under Criterions A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00116001	Digital Photo ID 06:	00116006
View 01	Facing Northeast	View 06	Facing Northeast
Digital Photo ID 02:	00116002	Digital Photo ID 07:	00116007
View 02	Facing Southeast	View 07	Facing North
Digital Photo ID 03:	00116003	Digital Photo ID 08:	00116008
View 03	Facing Southwest	View 08	Facing South
Digital Photo ID 04:	00116004	Digital Photo ID 09:	00116009
View 04	Facing East	View 09	Facing Southeast
Digital Photo ID 05:	00116005	Digital Photo ID 10:	00116010
View 05	Facing South	View 10	Facing Southwest

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0117 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Craft Training Center

Common Name: Facility 58

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1974

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	H	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:	Other	Porch Width (if Other):	N/A
Porch Shape:	Other	Porch Shape (if Other)	N/A

Description/Significant Features: Thhe buildings contain metal doors, each with one upper light, centered on the southern façade. Fenestration consists of single hung sash, metal-framed, sliding windows arranged individually on each exterior.

Alterations (include date(s), if known)

Architect(s)/Builder(s): Unknown

Historical Information

Historical Information: Resource 0117 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00117001	Digital Photo ID 06:
View 01	Facing North	View 06
Digital Photo ID 02:	00117001	Digital Photo ID 07:
View 02	Facing Northeast	View 07
Digital Photo ID 03:	00117002	Digital Photo ID 08:
View 03	Facing Northeast	View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0118 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Warehouse A and B

Common Name: Facility 32 and 33

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1975

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:	Other	Porch Width (if Other):	2 bay
Porch Shape:	Gable	Porch Shape (if Other)	

Description/Significant Features: A metal door with a central rectangular light is located in the center of the south side of the building and is sheltered by a metal awning. A pair of roll-down metal vehicular access doors are located east of center on the south side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s): Unknown

Historical Information

Historical Information: Resource 0118 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00118001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:	00118002	Digital Photo ID 07:
View 02	Facing Northeast	View 07
Digital Photo ID 03:	00118003	Digital Photo ID 08:
View 03	Facing Northwest	View 08
Digital Photo ID 04:	00118004	Digital Photo ID 09:
View 04	Facing North	View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0119 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Contaminated Storage Warehouse

Common Name: Facility 6

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The fenestration consists of one-over-one, single hung sash, metal-framed windows arranged individually on the south façade. The main entrance is located west of center on the south façade hollow core metal door with one upper light and a metal frame.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0119 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00119001	Digital Photo ID 06:
View 01	Facing Northeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0120 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Electrical Modifications

Common Name: Facility 31

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction: Frame Construction (if Other):

Historic Core Shape: rectangular Historic Core Shape (if Other):

Exterior Walls: other Exterior Walls (if Other): Standing seam metal

Foundation: slab construction Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Gable, end-to-front Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: 1 story Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: There are no windows on the building. The main entrance is located in the center of the south side of the building and features a solid metal door. To the west of this door is an additional roll-down metal vehicular access door.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0120 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00120001	Digital Photo ID 06:	
View 01	Facing Northwest	View 06	
Digital Photo ID 02:		Digital Photo ID 07:	
View 02		View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0121 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Fire Service Pump House

Common Name: Facility 8

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Masonry	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	concrete block
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Flat	Roof Shape (if Other):	
Roof Materials:	Other	Roof Materials (if Other)	Built-up material
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The building has no visible windows of entryways from the allotted viewpoint. The southern façade contains two louvered metal vents. A metal ladder is attached south of center on the western façade.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0121 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00121001	Digital Photo ID 06:
View 01	Facing Northeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0122 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Outage Electrical Distribution

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Masonry	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Concrete block
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Composition shingle	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building. The main entrance is located in the center of the south side of the building and features a solid metal door. Various electric panel boxes are attached to the west façade.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0122 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00122001	Digital Photo ID 06:
View 01	Facing Northeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0123 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Service Water Pump House

Common Name: Facility 9

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Masonry	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Flat	Roof Shape (if Other):	
Roof Materials:	Other	Roof Materials (if Other)	Built-up material
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The building has no visible fenestration. A metal staircase on the north façade leads from the ground to the roof. The building houses pumps that provide water from the service water pond to the service water system.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0123 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00123001	Digital Photo ID 06:	
View 01	Facing South	View 06	
Digital Photo ID 02:		Digital Photo ID 07:	
View 02		View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0124 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Auxiliary Boiler House

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Flat	Roof Shape (if Other):	
Roof Materials:	Other	Roof Materials (if Other)	Built-up Materials
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The main entrance is located slightly east of center on the north side of the building and features double metal doors with central rectangular lights.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0124 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00124001	Digital Photo ID 06:
View 01	Facing South	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0125 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Potable Water Building and Tanks

Common Name: Facility 11

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Masonry	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: Two shed buildings with two metal water tanks.The southern shed has a double door set east of center on the north façade. A single, metal door with one window is located on the south side of the southern building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0125 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00125001	Digital Photo ID 06:
View 01	Facing Southwest	View 06
Digital Photo ID 02:	00125002	Digital Photo ID 07:
View 02	Facing Northwest	View 07
Digital Photo ID 03:	00125003	Digital Photo ID 08:
View 03	Facing Southwest	View 08
Digital Photo ID 04:	00125004	Digital Photo ID 09:
View 04	Facing Northwest	View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0126 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Warehouse D

Common Name: Facility 13

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The building is accessed via set of double, flush metal doors centered on the west façade. There is no visible fenestration.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0126 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00126001	Digital Photo ID 06:
View 01	Facing Southeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0127 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Warehouse C

Common Name: Facility 12

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 1/2 stories	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: several entryways, including a double metal door with one light each set west of center on the north façade. Additionally, the west façade contains four flush metal doors arranged on the southern half of the façade. There is no visible fenestration.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0127 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00127001	Digital Photo ID 06:
View 01	Facing Southeast	View 06
Digital Photo ID 02:	00127002	Digital Photo ID 07:
View 02	Facing Southwest	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0128 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Old Fitness Center

Common Name: Facility 43

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: No visible entryway or fenestration is visible from the right of way. The building is set west of a parking lot, north of Stairway Road. Originally, the fitness center, the building is now used for storage.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0128 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00128001	Digital Photo ID 06:
View 01	Facing Northeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0129 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Meteorological Tower

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	other	Historic Core Shape (if Other):	three-legged tower
Exterior Walls:	other	Exterior Walls (if Other):	
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Other	Roof Shape (if Other):	N/A
Roof Materials:	Other	Roof Materials (if Other)	N/A
Stories:		Stories (if Other):	
Porch Width:	Other	Porch Width (if Other):	N/A
Porch Shape:	Other	Porch Shape (if Other)	N/A

Description/Significant Features: The four-legged tower is joined together by crisscross metal rods and measures approximately 100 feet in height. The tower supports meteorological equipment placed within the center of the top of the tower.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0129 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00129001	Digital Photo ID 06:	
View 01	Facing North	View 06	
Digital Photo ID 02:		Digital Photo ID 07:	
View 02		View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0130 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Switchyard Control House

Common Name: Facility 42

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Masonry	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	prefabricated concrete panels
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, lateral	Roof Shape (if Other):	
Roof Materials:	Other	Roof Materials (if Other)	concrete
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The north façade contains three entryways, including a single leaf, flush metal door as well as two sets of double, flush metal doors, all set under concrete awnings. Three metal events extend from the north façade.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0130 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00130001	Digital Photo ID 06:
View 01	Facing Southwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0131 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Auxiliary Access Portal

Common Name: Facility 35

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Flat	Roof Shape (if Other):	
Roof Materials:	Other	Roof Materials (if Other)	Built-up material
Stories:	1 story	Stories (if Other):	
Porch Width:	Entrance bay only	Porch Width (if Other):	
Porch Shape:	Flat	Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building. A group of four metal doors with rectangular lights is located in the center of the east side of the building. These doors are inset within an incised porch with a metal eave overhang and a concrete slab.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0131 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00131001	Digital Photo ID 06:	
View 01	Facing West	View 06	
Digital Photo ID 02:		Digital Photo ID 07:	
View 02		View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0132 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Respiratory Building

Common Name: Facility 36

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1974

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building. Individual metal doors with central rectangular lights are located in the center of the north side of the building and north and south of center on the west side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0132 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00132001	Digital Photo ID 06:
View 01	Facing South	View 06
Digital Photo ID 02:	00132002	Digital Photo ID 07:
View 02	Facing Southeast	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0133 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Old Time Clock Portal

Common Name: Facility 40

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, lateral	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building. There are six pairs of metal doors on each the north and south sides of the building, with an additional individual metal door on the north side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0133 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00133001	Digital Photo ID 06:
View 01	Facing Southeast	View 06
Digital Photo ID 02:	00133002	Digital Photo ID 07:
View 02	Facing East	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0134 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Old Pipe Shop

Common Name: Facility 34

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1975

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building. A metal door with a central rectangular light is located south of center on the east side of the building. A roll-down metal vehicular access door is located in the center of the east side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0134 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00134001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0135 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Electric Mods Shop

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building. A metal door with a central rectangular light is located east of center on the south side of the building. A roll-down metal vehicular access door is located in the center of the east side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0135 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00135001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0136 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Shop Road Restrooms

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction: Masonry Construction (if Other):

Historic Core Shape: T Historic Core Shape (if Other):

Exterior Walls: other Exterior Walls (if Other): concrete block

Foundation: slab construction Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Cross gable Roof Shape (if Other):

Roof Materials: Composition shingle Roof Materials (if Other)

Stories: 1 story Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: No visible windows. The main entrance is located in the center of the east side of the building and features a hollow-core wood door with a wood door frame.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0136 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00136001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties
State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0137 Revisit: ☐
Status Site No.
Quadrangle Name: Jenkinsville
Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Paint Shop/Facility Services Building
Common Name: Facility 28
Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building
Historical Use: Industry Historical Use (if Other):
Current Use: Industry Current Use (if Other):
SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: There are no windows on the building, but rectangular metal vents are located in the gable ends. A roll-down metal door is located in the center of the north side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0137 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00137001	Digital Photo ID 06:
View 01	Facing Southwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0138 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Paint Storage and Blast Shed

Common Name: Facility 27

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction: Frame Construction (if Other):

Historic Core Shape: rectangular Historic Core Shape (if Other):

Exterior Walls: other Exterior Walls (if Other): standing seam metal

Foundation: slab construction Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Gable, end-to-front Roof Shape (if Other):

Roof Materials: Raised seam metal Roof Materials (if Other)

Stories: 1 story Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Therea are no visible windows. A roll-down metal door is located on the east side of the building. A concrete driveway leads to the main entry on the east side.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0138 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00138001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0139 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Civil Shop

Common Name: Facility 25

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction: Frame Construction (if Other):

Historic Core Shape: rectangular Historic Core Shape (if Other):

Exterior Walls: other Exterior Walls (if Other): standing seam metal

Foundation: slab construction Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Gable, lateral Roof Shape (if Other):

Roof Materials: Raised seam metal Roof Materials (if Other)

Stories: 1 story Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: The fenestration consists of sliding metal two-light windows spaced along the east side of the building. Two metal doors are placed in the middle of the north and south ends of the east side.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0139 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00139001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:	00139002	Digital Photo ID 07:
View 02	Facing Southwest	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0140 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Carpenter and Weld Shop (New Pipe Shop)

Common Name: Facility 24

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction: Frame Construction (if Other):

Historic Core Shape: rectangular Historic Core Shape (if Other):

Exterior Walls: other Exterior Walls (if Other): standing seam metal

Foundation: slab construction Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Gable, end-to-front Roof Shape (if Other):

Roof Materials: Raised seam metal Roof Materials (if Other)

Stories: 1 story Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: No visible windows. A metal door is located south of center on the east side of the building. In the center and on the south end of the east side are full-height roll-down metal vehicular access doors.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0140 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00140001	Digital Photo ID 06:	
View 01	Facing Southwest	View 06	
Digital Photo ID 02:		Digital Photo ID 07:	
View 02		View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0141 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Warehouse E

Common Name: Facility 29

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1975

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, lateral	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: No windows. A metal door with a central rectangular light is located east of center on the north side of the building, and a roll-down metal door is located in the center of the north side of the building.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0141 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00141001	Digital Photo ID 06:	
View 01	Facing Southeast	View 06	
Digital Photo ID 02:	00141002	Digital Photo ID 07:	
View 02	Facing Southwest	View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0142 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Warehouse F

Common Name: Facility 53

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1975

Construction: Frame Construction (if Other):

Historic Core Shape: rectangular Historic Core Shape (if Other):

Exterior Walls: other Exterior Walls (if Other): standing seam metal

Foundation: slab construction Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Gable, lateral Roof Shape (if Other):

Roof Materials: Raised seam metal Roof Materials (if Other)

Stories: 1 story Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: The main entry, set east of center on the south facing façade, consists of a flush, single leaf door. West of the main entry is a metal, roll up equipment door.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0142 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00142001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0143 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Outside Facility Services Office/High Bay

Common Name: Facility 52

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The building is accessed via standing seam metal, sliding equipment doors situated on the east facing façade. The door is flanked by a vented opening to the south of the entry.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0143 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00143001	Digital Photo ID 06:	
View 01	Facing Southwest	View 06	
Digital Photo ID 02:		Digital Photo ID 07:	
View 02		View 07	
Digital Photo ID 03:		Digital Photo ID 08:	
View 03		View 08	
Digital Photo ID 04:		Digital Photo ID 09:	
View 04		View 09	
Digital Photo ID 05:		Digital Photo ID 10:	
View 05		View 10	

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0144 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Vehicle Fleet Maintenance Shop

Common Name: Facility 51

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1975

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, lateral	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The southern façade contains five vehicle bays, each with metal roll-up equipment doors. A single leaf, flush metal door is set west of center on the southern façade set under a vinyl awning.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0144 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00144001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:	00144002	Digital Photo ID 07:
View 02	Facing North	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0145 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Bucket Truck Shed

Common Name: Facility 48

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	Standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: A metal, roll-up equipment door takes up the width of the west and east facing façade. A wood, shed roof structure is attached west of center on the northern façade.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0145 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00145001	Digital Photo ID 06:
View 01	Facing Southeast	View 06
Digital Photo ID 02:	00145002	Digital Photo ID 07:
View 02	Facing East	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0146 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Oil and Lubricants Shed

Common Name: Facility 49

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	other	Exterior Walls (if Other):	standing seam metal
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, end-to-front	Roof Shape (if Other):	
Roof Materials:	Raised seam metal	Roof Materials (if Other)	
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: A metal, roll-up garage door takes up the entire width of the western façade.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0146 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00146001	Digital Photo ID 06:
View 01	Facing Southeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0147 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Railroad Spur

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Structure

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction: Other Construction (if Other): Railroad

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other):

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Railroad spur line that connects to the main line of the Southern Railroad near the Broad River.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0147 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00147001	Digital Photo ID 06:
View 01	Facing Northeast	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0148 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Access Control Point

Common Name: Facility 61

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Building

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction:	Frame	Construction (if Other):	
Historic Core Shape:	rectangular	Historic Core Shape (if Other):	
Exterior Walls:	synthetic siding	Exterior Walls (if Other):	
Foundation:	slab construction	Foundation (if Other):	
Commercial Form:		Commercial Form (if Other):	
Roof Shape:	Gable, lateral	Roof Shape (if Other):	
Roof Materials:	Other	Roof Materials (if Other)	asphalt shingles
Stories:	1 story	Stories (if Other):	
Porch Width:		Porch Width (if Other):	
Porch Shape:		Porch Shape (if Other)	

Description/Significant Features: The entry, set on the northeastern façade, consists of a metal door with one upper light. The entry is set under a gable portico entry. Fixed, metal framed windows are set on each façade.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0148 is a support building to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00148001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:	00148002	Digital Photo ID 07:
View 02	Facing West	View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0149 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Large Dedication Plaque

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Object

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction: Masonry Construction (if Other):

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other):

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: The bronze plaque is mounted on a slab of granite backing, upheld by asymmetrical granite supports, including a single post and a rectangle. There is a larger granite, trapezoidal block to the rear of the plaque.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0149 is a dedicaiton plaque for the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00149001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by:

Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0150 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Small Dedication Plaque

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Object

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1984

Construction: Construction (if Other):

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other):

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Bronze dedication plaque on granite base and pedestal to Robert Spence Davis.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0150 is a dedication plaque for the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00150001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0151 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Circulation Water Discharge

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Structure

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction: Masonry Construction (if Other):

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other):

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Resource 0151 concrete culvert that was constructed in conjunction with the discharge pond. Resource 0151 is roughly triangular in plan and is built into the embankment at the southwest side of the Circulation Water Discharge Pond.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0151 is a support structure to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00151001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0152 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Circulation Water Discharge Pond

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Structure

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction: Construction (if Other):

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other):

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Pond with a surface area of 11 ac that was constructed as a discharge pond for the reactor's circulation water. Resource 0152 is located adjacent to but separated from the service water pond by a seismic dam.

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0152 is a support structure to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00152001	Digital Photo ID 06:
View 01	Facing Southwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

R / 0153 Revisit: ☐
Status Site No.

Quadrangle Name: Jenkinsville

Tax Map No.: 175-00-01-002-000

Survey Form

Identification

Historic Name: Service Water Pond

Common Name:

Address/Location: Virgil C. Summer Nuclear Station, VC Stairway Road

City: Jenkinsville Vicinity of ☐ County: Fairfield

Ownership: Corporate Category: Structure

Historical Use: Industry Historical Use (if Other):

Current Use: Industry Current Use (if Other):

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1982

Construction: Construction (if Other):

Historic Core Shape: Historic Core Shape (if Other):

Exterior Walls: Exterior Walls (if Other):

Foundation: Foundation (if Other):

Commercial Form: Commercial Form (if Other):

Roof Shape: Roof Shape (if Other):

Roof Materials: Roof Materials (if Other)

Stories: Stories (if Other):

Porch Width: Porch Width (if Other):

Porch Shape: Porch Shape (if Other)

Description/Significant Features: Pond with a surface area of 39 ac. The service water pond is located at the south end of the Monticello Reservoir and is bounded on all sides by dams constructed to seismic category 1 specifications

Alterations (include date(s), if known)

Architect(s)/Builder(s):

Historical Information

Historical Information: Resource 0153 is a support structure to the V.C. Summer Nuclear Station. Research revealed the resource is not significant under Criterias A, B, C, or D.

Source of Information:

Digital Photo ID(s):

Digital Photo ID 01:	00153001	Digital Photo ID 06:
View 01	Facing Northwest	View 06
Digital Photo ID 02:		Digital Photo ID 07:
View 02		View 07
Digital Photo ID 03:		Digital Photo ID 08:
View 03		View 08
Digital Photo ID 04:		Digital Photo ID 09:
View 04		View 09
Digital Photo ID 05:		Digital Photo ID 10:
View 05		View 10

Program Management

Recorded by: Organization:

Date Recorded: 10/06/2022

Jason E. Williams
Vice President, Environmental & Sustainability
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond, VA 23219
DominionEnergy.com

May 3, 2023

BY ELECTRONIC MAIL

Elizabeth M. Johnson
Director, Historical Services, D-SHPO
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29233

RE: Dominion Energy – The Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal
Fairfield County, South Carolina
SHPO Project No. 22-EJ0147

Dear Ms. Johnson,

Thank you for your letter of April 7, 2022, and the follow-up discussions that have been held with you and your staff. Based on our consultations with SHPO, Dominion Energy understands the following:

1. The revisions to the final copies of the survey forms regarding the eligibility of Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for the National Register of Historic Places (NRHP) have been made, as requested by your office. A digital copy of the final report (in ADOBE Acrobat PDF format) has been provided that includes your comment letter in the final report. Electronic copies of the survey forms and photographs for the above-ground architectural resources have been submitted following the Electronic Submission Requirements for Planning Surveys and Review & Compliance Surveys. GIS shapefiles for the surveyed area and above-ground architectural resources will be compatible with ArcGIS (.shp file format) and have been sent as a bundle in .zip format. All draft and final survey deliverables (reports, survey forms and photographs) have also been transmitted to the SHPO at the same time using the same process to assist in project tracking.

2. Regarding the recommendation for re-evaluation of this finding and consideration of the VCSNS complex as a historic district, the re-evaluation will occur during the next subsequent license renewal (application would start sometime after 2042) if Dominion Energy were to pursue continued operation beyond the current license application to operate for 80 years.

3. It is our understanding that your request for more information about how Dominion Energy would address damage to the National Register listed or eligible historic properties as the result of any accidental contamination has been addressed by our March 17, 2023, response. As stated, the South Carolina Emergency Management Division (SC EMD) serves as the lead state agency for radiological emergency response and re-entry activities.

As part of the SC EMD's Emergency Support Function (ESF) 14, Initial Recovery and Mitigation, they would initiate a Section 106 consultation as appropriate.

Similar to the previous 40 plus years of successful operation, Dominion Energy expects VCSNS to operate in a manner that is friendly to the environment and surrounding cultural and historic resources. If you agree with our understanding explained above, please sign the concurrence statement at the bottom of this letter and return a copy.

If possible, Dominion Energy would appreciate receiving your concurrence by May 30, 2023. Dominion Energy plans to include this letter and any response you provide in the Environmental Report section of the Subsequent License Renewal Application which is scheduled for submittal to the Nuclear Regulatory Commission by the end of 2023.

Should you or your staff have additional questions or comments, please contact Tom Effinger at (803) 608-3303 or via email at thomas.effinger@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental & Sustainability

SHPO Concurrence - Project No. 22-EJ0147

I concur in the above determination.

Signed: _____ Date: _____

Elizabeth M. Johnson
Director, Historical Services, D-SHPO

Jason E. Williams
Vice President, Environmental & Sustainability
Dominion Energy Services, Inc
120 Tredegar Street, Richmond, VA 23219
DominionEnergy.com

May 5, 2023

BY ELECTRONIC MAIL

Elizabeth M. Johnson
Director, Historical Services, D-SHPO
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29233

RE: Dominion Energy – The Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal
Fairfield County, South Carolina
SHPO Project No. 22-EJ0147

Dear Ms. Johnson,

Thank you for your letter of April 7, 2022, and the follow-up discussions that have been held with you and your staff. Based on our consultations with SHPO, Dominion Energy understands the following:

1. The revisions to the final copies of the survey forms regarding the eligibility of Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for the National Register of Historic Places (NRHP) have been made, as requested by your office. A digital copy of the final report (in ADOBE Acrobat PDF format) has been provided that includes your comment letter in the final report. Electronic copies of the survey forms and photographs for the above-ground architectural resources have been submitted following the Electronic Submission Requirements for Planning Surveys and Review & Compliance Surveys. GIS shapefiles for the surveyed area and above-ground architectural resources will be compatible with ArcGIS (.shp file format) and have been sent as a bundle in .zip format. All draft and final survey deliverables (reports, survey forms and photographs) have also been transmitted to the SHPO at the same time using the same process to assist in project tracking.

2. Regarding the recommendation for re-evaluation of this finding that the V.C. Summer Nuclear Station Complex is not eligible for listing in the National Register of Historic Places, and consideration of the VCSNS complex as a historic district, the re-evaluation will occur during the next subsequent license renewal. The application would start sometime after 2042 if Dominion Energy were to pursue continued operation beyond the current license application to operate for 80 years.

3. It is our understanding that your request for more information about how Dominion Energy would address damage to the National Register listed or eligible historic properties as the

result of any accidental contamination has been addressed by our March 17, 2023, response.

Similar to the previous 40 plus years of successful operation, Dominion Energy expects VCSNS to operate in a manner that is friendly to the environment and surrounding cultural and historic resources. If you agree with our understanding explained above, please sign the concurrence statement at the bottom of this letter and return a copy.

If possible, Dominion Energy would appreciate receiving your concurrence by May 30, 2023. Dominion Energy plans to include this letter and any response you provide in the Environmental Report section of the Subsequent License Renewal Application which is scheduled for submittal to the Nuclear Regulatory Commission by the end of 2023.

Should you or your staff have additional questions or comments, please contact Tom Effinger at (803) 608-3303 or via email at thomas.effinger@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental & Sustainability

SHPO Concurrence - Project No. 22-EJ0147

I concur in the above determination.

Signed: Elizabeth M. Johnson Date: 5/19/2023

Elizabeth M. Johnson
Director, Historical Services, D-SHPO

EST. 1905
SOUTH CAROLINA DEPARTMENT OF
ARCHIVES & HISTORY

April 7, 2023

Thomas N. Effinger
Dominion Energy
220 Operation Way, MC C221
Cayce, SC 29033

Via email thomas.effinger@dominionenergy.com

Re: The Virgil C. Summer Nuclear Station Unit 1 Subsequent License Renewal
Fairfield County, South Carolina
SHPO Project No. 22-EJ0147

Dear Mr. Effinger:

Thank you for your letter of March 17, 2023, which we received via email on March 17, 2023, regarding the Virgil C. Summer Nuclear Station (VCSNS) Unit 1 Subsequent License Renewal. We also received a copy of the revised draft report *V.C. Summer Nuclear Station Architectural Survey and Evaluation, Fairfield County, South Carolina*, dated March 2023, by SEARCH. The State Historic Preservation Office (SHPO) is providing comments to Dominion Energy as part of the license renewal application to the U.S. Nuclear Regulatory Commission (NRC) requirement for an environmental report (ER). We also understand that the NRC may request consultation with the State Historic Preservation Office pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations at 36 CFR Part 800. Consultation with the SHPO is not a substitution for consultation with Tribal Historic Preservation Offices, other Native American tribes including those with state recognition, local governments, or the public.

The survey recorded 39 buildings and structures constructed prior to 1984 at the V.C. Summer Nuclear Station. We note that the Fairfield Pumped Storage Development Facility, previously determined eligible for listing in the National Register of Historic Places, was also in the project area, which covers 2,134 acres on the south side of the Monticello Reservoir in Fairfield County.

The report provided helpful historical context regarding the development of commercial nuclear power generation in the United States, and specifically in South Carolina, to help place the V.C. Summer Nuclear Station into historic context. The report recommends that the recorded buildings and structures do not meet the criteria for listing in the National Register of Historic Places. Our office concurs with this assessment at the current time, as the buildings are less than

fifty years old and the National Register Criteria Consideration G for properties that have achieved significance within the last fifty years "exclude[s] properties that achieved significance within the last fifty years unless they are of exceptional importance." While the development of the V.C. Summer Nuclear Station, the third nuclear power plant in South Carolina, was an important local development, it currently does not rise the level of "exceptional significance". Our office recommends re-evaluation of this finding and consideration of the V.C. Summer Nuclear Station complex as a historic district occur when the subsequent license that is currently being sought is up for renewal in twenty years (i.e., in 2042). We also concur with the report's recommendation that the Fairfield Pumped Storage Development Facility remains eligible for listing in the National Register.

Our office has reviewed the survey report and attached survey forms and have the following comments on the survey forms. We accept the report as final. Please have the consultant make the requested revisions before submitting the final copies of the survey forms.

- We assigned SHPO Site Numbers 0117-0161 to this project. 0154-0161 appear to be unused, so we will be taking these numbers back. In the future please notify us of any unused assigned survey numbers. See p. 17 of our Survey Manual as reference.

- Source of Information field: Please enter the name of the Cultural Resource Survey report title, author, and date that is associated with the property recorded on all survey forms. See p. 31 of our Survey Manual as reference.

- Please complete the blank "Recorded by:" and/or "Organization" fields on all survey forms. See p. 32 of our Survey Manual as reference.

- SHPO Site No. 0082: Please delete the statement from the Historical Information field. This resource has already been determined eligible.

- SHPO Site No. 0116: Please complete the City, County, Ownership, Current/Historical Use fields. Please try to list the 11 interconnected buildings and structures in the Description field.

Please provide a digital copy of the final report in ADOBE Acrobat PDF format. The survey forms do not need to be appended to the final report. Please ensure that a copy of our comments letter is included in the Appendices and Attachments of the final report.

Please provide final electronic copies of the survey forms and photographs for the above-ground architectural resources following the Electronic Submission Requirements for Planning Surveys and Review & Compliance Surveys.

Please provide GIS shapefiles for the surveyed area and above-ground architectural resources. Shapefiles should be compatible with ArcGIS (.shp file format) and should be sent as a bundle in .zip format. For additional information, please see our GIS Data Submission Requirements.

Please ensure that all Draft and Final survey deliverables (reports, survey forms and photographs, and GIS shapefiles) are sent to the SHPO at the same time using the same medium (e.g., DVD-RW, thumb drive, or FTP/file sharing site) to assist in project tracking. Files should be sent to rc@scdah.sc.gov. This new email address is only to be used for submitting survey deliverables. Contact your assigned reviewer directly for any questions or concerns.

Thank you for the opportunity to provide comments. Please refer to SHPO Project Number 22-EJ0147 in any future correspondence regarding this project. If you have any questions, please contact me at (803) 896-6168 or ejohnson@scdah.sc.gov.

Sincerely,

Elizabeth M. Johnson

Elizabeth M. Johnson
Director, Historical Services, D-SHPO
State Historic Preservation Office

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Johnathan Leader
State Archaeologist
South Carolina Institute of Archaeology and Anthropology
1321 Pendleton St, 1st Floor, Suite 16
Columbia, SC 29208

RE: Dominion Energy – Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal

Dear Mr. Leader,

Dominion Energy is preparing an application for renewing the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years (see Table 1). As part of the process, the U.S. Nuclear Regulatory Commission (NRC) requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the VCSNS site.

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

This letter seeks input from the South Carolina Institute of Archaeology and Anthropology (SCIAA) regarding such effect in the vicinity of VCSNS.

Also, as part of the renewal process, the NRC may request consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with your agency regarding the subsequent license renewal.

The timeframe for the NRC consultation request is anticipated to be within a few months of Dominion Energy's application submittal, currently scheduled for late 2023.

To facilitate our preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that license renewal activities may have on historic and cultural resources within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius (Figures 1 and 2) and tables of known historic properties and archaeological sites in the plant's vicinity (Tables 2 and 3) are enclosed. A brief discussion of the plant and its operations during the renewal period of operation is provided below.

VCSNS is located in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir.

During the license renewal term, Dominion Energy proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the VCSNS site during the subsequent license renewal period. Currently, Dominion Energy does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion Energy does not anticipate the continued operation of VCSNS to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on the proposed continued operation of VCSNS on historic and cultural resources, including tribal cultural resources, within the environs of the plant. Please notify us of concerns and any information you believe Dominion Energy should consider in the preparation of the ER. Your input is requested by September 30, 2022, if possible. Dominion Energy plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions or comments, please contact Oula Shehab-Dandan at (804) 310-4881or via email at oula.k.shehab-dandan@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Table 2. Historic Properties within a 6-mile radius of VCSNS
Table 3. Archaeological Sites within a 6-mile radius of VCSNS
Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Table 2. Historic Properties within a 6-mile Radius of VCSNS (1 of 3)

Site ID#	County	Name	NRHP Status
71000775	Fairfield	Ebenezer Associate Reformed Presbyterian Church/Old Brick Church	Listed 08/19/1971
7100776	Fairfield	Davis Plantation	Listed 10/05/1971
72001208	Fairfield	Little River Baptist Church	Listed 04/13/1972
74001852	Fairfield	Kincaid-Anderson House	Listed 07/30/1974
78002527	Newberry	St. John's Lutheran Church	Listed 12/08/1978
79003321	Newberry	Pomaria	Listed 04/24/1979
84000572	Fairfield	Dr. John Glenn House	Listed 12/06/1984
84000576	Fairfield	Highpoint	Listed 12/06/1984
84000578	Fairfield	Monticello Methodist Church	Listed 12/06/1984
84000585	Fairfield	Monticello Store and Post Office	Listed 12/06/1984
84000617	Fairfield	Rockton and Rion Railroad Historic District	Listed 12/06/1984
85000246	Fairfield	Mayfair	Listed 02/06/1985
07001045	Newberry	Hope Rosenwald School	Listed 10/03/2007
0058	Fairfield	N/A (7769 State Highway 215 South)	Unassessed
0059	Fairfield	N/A (7835 State Highway 215 South)	Unassessed
0060	Fairfield	N/A (on Shady Lane)	Unassessed
0061	Fairfield	N/A (7599 State Highway 215 South)	Unassessed
0070	Fairfield	White Hall Elementary School	Eligible
0081	Fairfield	Parr Shoals Hydroelectric Facility	Eligible
0082	Fairfield	Fairfield Pump Storage	Eligible
0086	Fairfield	Unnamed House (182 Sleepy Hollow Road)	Not Eligible
0087	Fairfield	Unnamed House (143 Sleepy Hollow Road)	Not Eligible
0088	Fairfield	Morris Creek Baptist Church	Not Eligible
0091	Fairfield	Southern Railway (segment)	Not eligible
1098	Newberry	N/A (Highway 176, east side, ½ mile south of intersection with SC 213)	Not Eligible
1190	Newberry	N/A (605 Hope Station Road)	Not Eligible
1191	Newberry	St. John's Evangelical Lutheran Church	Listed 12/08/1978
1192	Newberry	N/A (1129 Hope Station Road)	Not Eligible
1193	Newberry	Hope School	Listed 10/03/2007
1194	Newberry	N/A (243 Peak Road)	Not Eligible
1195	Newberry	N/A (267 Peak Road)	Not Eligible

Table 2. Historic Properties within a 6-mile Radius of VCSNS (2 of 3)

Site ID#	County	Name	NRHP Status
1196	Newberry	N/A (Peak Road, south side, ¼ mile west of intersection with Broad River Road)	Not Eligible
1197	Newberry	N/A (2953 Broad River Road)	Not Eligible
1198	Newberry	N/A (4494 Broad River Road)	Not Eligible
1199	Newberry	N/A (145 Magnolia Lane)	Not Eligible
1200	Newberry	N/A (1766 Broad River Road)	Not Eligible
1201	Newberry	N/A (1405 Broad River Road)	Not Eligible
1202	Newberry	N/A (Highway 176, east side, ½ mile south of intersection with SC 202)	Not Eligible
1203	Newberry	Pomaria	Listed 04/24/1979
1204	Newberry	N/A (3922 Highway 176)	Not Eligible
1205	Newberry	N/A (295 Confederate Road)	Not Eligible
1206	Newberry	N/A (4500 Highway 176)	Not Eligible
1207	Newberry	N/A (4958 Highway 176)	Not Eligible
1208	Newberry	N/A (2833 Peak Road)	Not Eligible
1209	Newberry	N/A (Peak Road, north side, one mile east of intersection with Holloway Street)	Not Eligible
1210	Newberry	N/A (1733 Peak Road)	Not Eligible
1211	Newberry	N/A (1031 Peak Road)	Not Eligible
1212	Newberry	N/A (Peak Road, south side, two miles east of intersection with Holloway Street)	Not Eligible
1213	Newberry	N/A (Peak Road, south side, 1.5 miles east of intersection with Holloway Street)	Not Eligible
1246	Newberry	N/A (2033 Hughey Ferry Road)	Not Eligible
1247	Newberry	N/A (1771 Hughey Ferry Road)	Not Eligible
1248	Newberry	N/A (Hughey Ferry Road, south side, 1.5 miles east of intersection with New Hope Road)	Not Eligible
1249	Newberry	N/A (Hughey Ferry Road, northeast corner of intersection with Leitzsey Road	Not Eligible
1250	Newberry	N/A (1870 Leitzsey Road)	Not Eligible
1251	Newberry	N/A (1245 Leitzsey Road)	Not Eligible
1252	Newberry	N/A (Hughey Road, south side, one mile east of intersection with Hope Road	Not Eligible

Table 2. Historic Properties within a 6-mile Radius of VCSNS (3 of 3)

Site ID#	County	Name	NRHP Status
1253	Newberry	N/A (Hughey Ferry Road, south side, one mile east of intersection with Hope Road)	Not Eligible
1254	Newberry	N/A (400 Bundrick Road)	Not Eligible
1285	Newberry	New Hope United Methodist Church	Not Eligible
1287	Newberry	N/A (4239 New Hope Road)	Not Eligible
1288	Newberry	N/A (5527 New Hope Road)	
1290	Newberry	N/A (8708 Broad River Road)	Not Eligible
1291	Newberry	N/A (Broad River Road, west side, just south of intersection with New Hope Road)	Not Eligible
1292	Newberry	N/A (Broad River Road, east side, across from intersection with New Hope Road)	Not Eligible
1293	Newberry	N/A (7443 Broad River Road)	Eligible
1294	Newberry	N/A (Broad River Road, west side, ½ mile south of intersection with New Hope Road)	Not Eligible
1295	Newberry	N/A (8269 Broad River Road)	Not Eligible
1296	Newberry	N/A (8157 Broad River Road)	Not Eligible
4907	Richland	House, unidentified (1213 R. Stoudemayer Road)	Not Eligible
4908	Richland	House, unidentified (East side of R. Stoudemayer Road, 1.1 mile northwest of intersection with Broad River Road)	Not Eligible
4909	Richland	House, unidentified (1216 R. Stoudemayer Road)	Not Eligible
4910	Richland	Stuck House	Not Eligible
4911	Richland	House, unidentified (1324 Mike Stuck Road)	Not Eligible
U/39/254/0073	Fairfield	Monticello Mercantile	Listed 12/06/1984
U/39/254/0074	Fairfield	N/A (4067 Highway 215 South)	Not Eligible
U/39/254/0076	Fairfield	N/A (Frees Creek Drive)	Not Eligible
U/71/407/1932	Newberry	New Hope Store	Eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (1 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0029	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown Archaic artifacts	Not assessed
38FA0030	Fairfield	Jenkinsville	Prehistoric site with Early, Middle Archaic, and unknown prehistoric components	Not assessed
38FA0033	Fairfield	Jenkinsville	Prehistoric site with Early, Middle, and Late Archaic, and unknown prehistoric components	No determination listed Determination date 11/19/2003
38FA0037	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Determined Not eligible 11/19/2003
38FA0038	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38A0038	Fairfield	Jenkinsville	Prehistoric site with Early, Middle, and Late Archaic components	Not assessed
38FA0040	Fairfield	Jenkinsville	Prehistoric lithic scatter with a Late Archaic and unknown prehistoric components	Not assessed
74001854 38FA0041	Fairfield	Jenkinsville	McMeekin Rock shelter with unknown Archaic, Woodland, unknown prehistoric, and 18th century components	Listed 08/23/1974
38FA0042	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0043	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
38FA0044	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not Eligible
38FA0045	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Not assessed
38FA0046	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Not assessed
38FA0047	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0049	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0051	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (2 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0053	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Late Archaic, and unknown prehistoric components	Not assessed
7100776 38FA0056	Fairfield	Jenkinsville	19th century Davis Plantation	Listed 05/06/1971
71000775 38FA0057	Fairfield	Jenkinsville	18th century Ebenezer Associate Reformed Presbyterian Church	Listed 08/19/1971
72001208 38FA0058	Fairfield	Jenkinsville	19th century Little River Baptist Church	Listed 04/13/1972
38FA0121	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0122	Fairfield	Jenkinsville	Disturbed scatter of unknown Archaic prehistoric lithic material in a spoils pile	Recommendation listed by recorder was "none" Not assessed
38FA0124	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0125	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Archaic, and unknown prehistoric components	Not assessed
38FA0126	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not assessed
38FA0164	Fairfield	Jenkinsville	Prehistoric lithic scatter of six flakes, a Late Woodland point, and a whiteware sherd	Recommended not eligible
38FA0175	Fairfield	Jenkinsville	20th century site with no additional information	Not eligible
38FA0298	Fairfield	Salem Crossroads	Two Late Archaic steatite bowl fragments	Further work recommended
38FA0319	Fairfield	Richtex	Surface scatter of 19th and 20th century glass, whiteware, and stoneware	Probably not eligible
38FA0320	Fairfield	Richtex	Surface scatter of 19th and 20th century glass and whiteware	Probably not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (3 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0321	Fairfield	Richtex	Surface scatter of 19th and 20th century glass, blue transferware, and whiteware	Probably not eligible
38FA0322	Fairfield	Jenkinsville	Multicomponent site with Middle and Late Archaic, unknown prehistoric, and 19th to 20th century components	Probably not Eligible
38FA0323	Fairfield	Jenkinsville	Scatter of unknown historic era debris	Not Eligible
38FA0324	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric and unknown historic era materials	Not eligible
38FA0325	Fairfield	Jenkinsville	18th Century debris scatter	Not eligible
38FA0326	Fairfield	Jenkinsville	Site with an unknown historic era component	Not eligible
38FA0327	Fairfield	Jenkinsville	Multicomponent site with unknown prehistoric and unknown historic era components	Not eligible
38FA0328	Fairfield	Jenkinsville	Site with an unknown historic era component	Not eligible
38FA0329	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0330	Fairfield	Jenkinsville	19th century debris	Probably not eligible
38FA0331	Fairfield	Jenkinsville	Multicomponent site with Late Archaic, unknown prehistoric, and 19th and 20th century components	Probably not eligible
38FA0332	Fairfield	Jenkinsville	19th and 20th century debris scatter	Probably not eligible
38FA0333	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Probably not eligible
38FA0334	Fairfield	Jenkinsville	Multicomponent site with Late Archaic, Middle Woodland, unknown prehistoric, and 20th century components	Probably not eligible
38FA0335	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic and unknown prehistoric components	Probably not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (4 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0336	Fairfield	Jenkinsville	Multicomponent site with Middle, Late, and unknown Archaic, unknown prehistoric, 19th century, and 1933 Pearson CCC camp components	Probably not eligible
38FA0337	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early, Middle, and Late Woodland components	Probably no eligible
38FA0338	Fairfield	Jenkinsville	Multicomponent site with Middle and Late Woodland, unknown prehistoric, and 17th to 18th century artifacts	Probably not eligible
38FA0339	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38FA0340	Fairfield	Jenkinsville	Prehistoric lithic scatter with Paleo, Early, Middle, and Late Archaic, and unknown prehistoric components	Probably not eligible
38FA0341	Fairfield	Jenkinsville	Scatter of 19th and 20th century glass, stoneware, whiteware, porcelain, milk glass, metal, and stones	Probably not eligible
38FA0342	Fairfield	Jenkinsville	Multicomponent site with Paleo, Early Archaic, unknown prehistoric, and a 20 century stoneware fragment	Probably not eligible
38FA0343	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Late Archaic, and unknown prehistoric components	Probably not eligible
38FA0344	Fairfield	Jenkinsville	Prehistoric artifact scatter with Early Woodland pottery sherd, and unknown prehistoric lithic components	Probably not eligible
38FA0345	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Middle Archaic, and unknown prehistoric artifacts	Probably not eligible
38FA0346	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Probably not eligible
38FA0347	Fairfield	Jenkinsville	19th and 20th century debris scatter	Probably not eligible
38FA0348	Fairfield	Jenkinsville	Site with unknown historic era artifacts	Probably not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (5 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0349	Fairfield	Jenkinsville	20th century debris scatter	Probably not eligible
38FA0359	Fairfield	Jenkinsville	20th century debris scatter	Not eligible
38FA0360	Fairfield	Jenkinsville	Prehistoric small camp site with post molds, lithics and a pottery sherd from the Middle and Late Woodland period (Tested)	Potentially eligible, recommended for excavation
38FA0361	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early and Middle Archaic artifacts	Not eligible
38FA0362	Fairfield	Jenkinsville	Prehistoric lithic scatter with Late Archaic artifacts	Not eligible
38FA0363	Fairfield	Jenkinsville	19th to 20th century artifacts	Not eligible
38FA0364	Fairfield	Jenkinsville	20th century debris scatter	Not eligible
38FA0365	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic artifacts	Probably not eligible
38FA0366	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Potentially eligible
38FA0373	Fairfield	Jenkinsville	Prehistoric lithic scatter with Early Archaic and Mississippian artifacts	Not eligible
38FA0454	Fairfield	Jenkinsville	Prehistoric lithic scatter with Middle Archaic artifacts	Probably not eligible
38FA0456	Fairfield	Salem Crossroads	Scatter of 18th to 20th century debris	Probably not eligible
38FA0457	Fairfield	Jenkinsville	Multicomponent site with a prehistoric lithic scatter of unknown affiliation, and 18th to 20th century debris	Probably not eligible
38FA0458	Fairfield	Jenkinsville	Two 19th to 20th century artifacts	Probably not eligible
38FA0459	Fairfield	Jenkinsville	Prehistoric isolated find of unknown affiliation and an unknown historic artifact	Probably not eligible
38FA0463	Fairfield	Jenkinsville	A 19th to 20th century artifact	Probably not eligible
38FA0464	Fairfield	Jenkinsville	Multicomponent prehistoric lithic scatter and 19th to 20th century debris scatter	Probably not eligible
38FA0547	Richland	Chapin	Prehistoric lithic scatter with Middle and Late Archaic material and ceramic scatter with a Mississippian component	Eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (6 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0560	Fairfield	Jenkinsville	Light scatter of glass and whiteware of unknown age	Not eligible
38FA0561	Fairfield	Jenkinsville	Multicomponent site consisting of a prehistoric flake, and a scatter of 20th century glass, whiteware, a wire nail, a brick fragment, and three mortar fragments	Not eligible
38FA0562	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0563	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0564	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, and an 20th century isolate find	Not eligible
38FA0565	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, and a 20th century isolate artifact	Not eligible
38FA0566	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation, a standing 20th century brick chimney and a scatter glass, blue transferware, and a nail	Not eligible
38FA0567	Fairfield	Jenkinsville	Prehistoric lithic scatter of unknown temporal affiliation	Not eligible
38FA0571	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter on an outcrop of quartzite, with a Middle Archaic point, and a scatter of whiteware and glass of unknown historic era temporal affiliation	Potentially eligible
38FA0576	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and a scatter of glass and metal fragments of unknown historic era temporal affiliation	Not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (7 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0577	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and two cut nails of unknown historic era affiliation	Not eligible
38FA0578	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter granite, bricks and modern materials from a house depicted on the 1969 topo	Not eligible
38FA0579	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter of stone and bricks	Not eligible
38FA0580	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a scatter five glass fragments from a mid-20th century house depicted on the 1969 topo	Not eligible
38FA0581	Fairfield	Salem Crossroads	A scatter of rough cut stone and brick fragments of unknown historic affiliation	Not eligible
38FA0582	Fairfield	Jenkinsville	Multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation, and a fragment of blown glass of unknown historic affiliation	Not eligible
38FA0583	Fairfield	Salem Crossroads	Multicomponent site consisting of a prehistoric flake of unknown temporal affiliation, and a scatter of brick, stone, glass, earthenware, pearlware, and metal of unknown historic affiliation	Not eligible
38FA0584	Fairfield	Jenkinsville	A scatter of stone, brick, glass, whiteware, creamware, stoneware, and two cut nails	Not eligible

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (8 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38FA0585	Fairfield	Salem Crossroads	A multicomponent site consisting of a prehistoric flake of unknown temporal affiliation and a 20th century scatter of glass, creamware, stoneware, a cut nail, and a button	Not eligible
38FA0586	Fairfield	Jenkinsville	A scatter of stones, bricks glass, porcelain, a wire nail, a cut spike, earthenware, and metal fragments of unknown historic affiliation	Not eligible
38FA0587	Fairfield	Jenkinsville	A scatter of glass, an animal bone, and eight wire nails of unknown historic affiliation	Not eligible
38FA0588	Fairfield	Jenkinsville	A scatter of brick, stone, a porcelain fragment, and a glass fragment of unknown historic affiliation	Not eligible
38FA0589	Fairfield	Jenkinsville	A scatter of brick, stone, a whiteware and glass fragments of unknown historic affiliation	Not eligible
38FA0590	Fairfield	Jenkinsville	A scatter of brick, stone, and a whiteware fragments of unknown historic affiliation	Not eligible
38FA0591	Fairfield	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter of unknown temporal affiliation and a 19th to 20th century scatter of pearlware and earthenware	Not eligible
38FA0616	Fairfield	Chapin	A prehistoric site discovered in four back hoe trenches, materials identified as flakes, debitage, and tools with unknown Archaic and unknown Woodland Period material	Eligible
38FA0617	Fairfield	Chapin	A prehistoric site discovered in nine back hoe trenches, materials identified as flakes, debitage, hammerstones with unknown prehistoric period affiliations, a Late Archaic C14 date was obtained from charcoal buried in one trench	Recommended for testing, Unassessed

Table 3. Archaeological Sites within a 6-mile Radius of VCSNS (9 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38NE0006	Newberry	Jenkinsville	An Early Archaic to Woodland site originally reported in the 1930s, with many points, stone steatite bowl fragments and net sinkers, and hand mills.	Probably not eligible
38NE0007	Newberry	Jenkinsville	A Middle Archaic and unknown prehistoric site	Probably not eligible
38NE0008	Newberry	Jenkinsville	An Early to Late Archaic, Early to Late Woodland, and Mississippian prehistoric site	Eligible
38NE0009	Newberry	Jenkinsville	A prehistoric lithic scatter with Late Archaic and unknown prehistoric affiliation	Not eligible
38NE0010	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter with Middle and Late Archaic, Early and Middle Woodland, and Mississippian cultural material	Not eligible
38NE0011	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle and Late Archaic, and unknown prehistoric artifacts	Probably not eligible
38NE0012	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0013	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0014	Newberry	Jenkinsville	A prehistoric lithic scatter with Middle Archaic and unknown prehistoric components	Probably not eligible
38NE0030	Newberry	Chapin	A prehistoric lithic scatter with Middle and Late Archaic components	Probably not eligible
38NE0042	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter of unknown affiliation and two 19th to 20th century whiteware and creamware fragments	Probably not eligible
38NE0644	Newberry	Chapin	A scatter of prehistoric lithics and ceramics of probable Early to Middle Woodland affiliation	Probably not eligible
38NE0646	Newberry	Jenkinsville	An 19th to 20th century roadbed	Probably not eligible

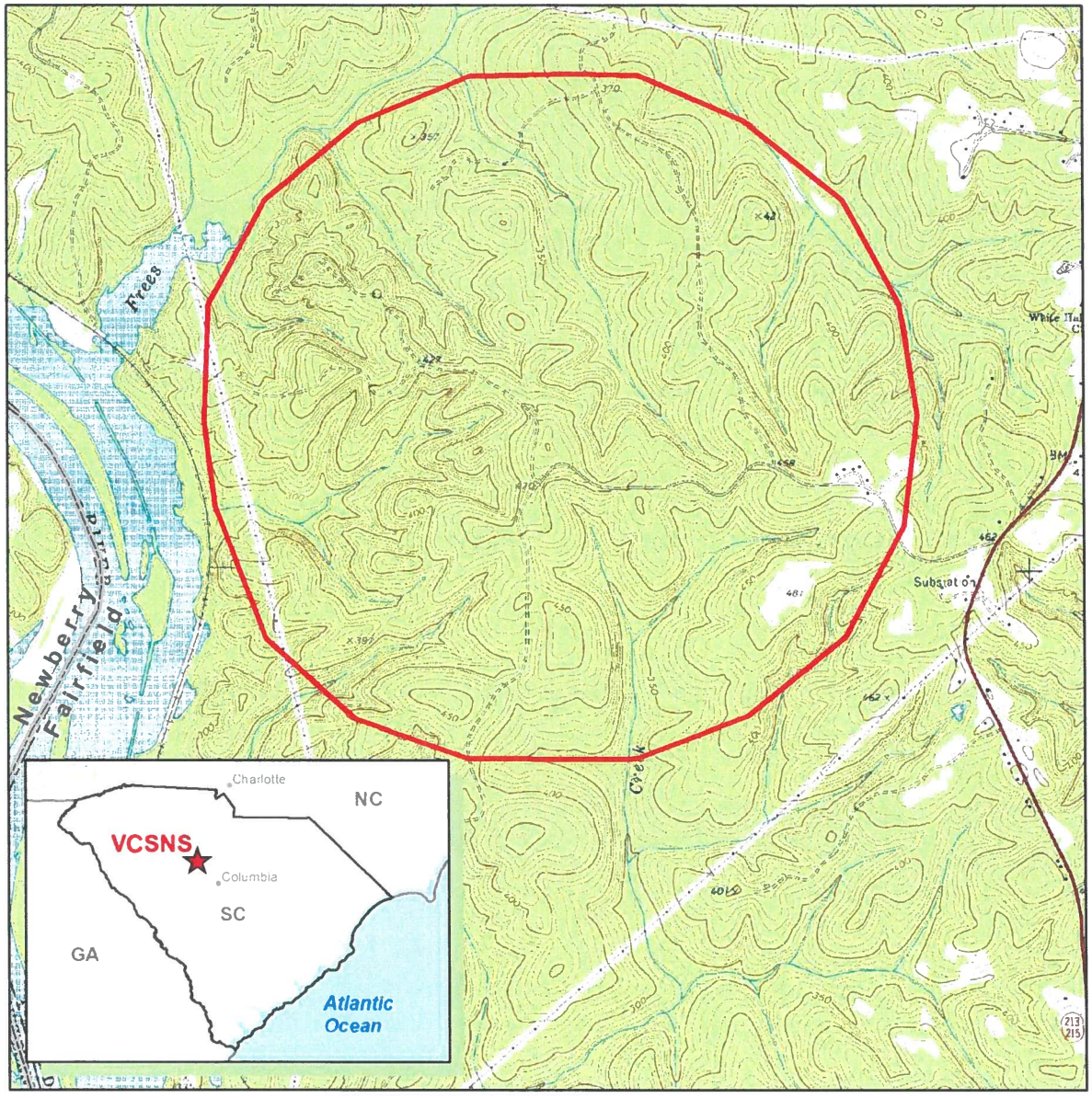
Table 3. Archaeological Sites within 6-mile Radius of VCSNS (10 of 10)

Site ID#	County	Quadrangle	Type	NRHP Status
38NE1062	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter of unknown prehistoric affiliation	Not eligible
38NE1063	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Probably not eligible
38NE1064	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Not eligible
38NE1065	Newberry	Jenkinsville	A prehistoric lithic and ceramic scatter of unknown prehistoric affiliation	Not eligible
38NE1066	Newberry	Jenkinsville	A prehistoric lithic scatter of five debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1067	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation	Not eligible
38NE1068	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric lithic scatter, and 19th to 20th century cemetery with 20 graves, and a whiteware fragment	Prehistoric is probably not eligible/Cemetery is potentially eligible
38NE1069	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1070	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1072	Newberry	Pomaria	A Middle Woodland ceramic and lithic scatter	Not eligible
38NE1073	Newberry	Jenkinsville	A prehistoric lithic scatter of three debitage fragments of unknown prehistoric affiliation	Not eligible
38NE1074	Newberry	Jenkinsville	A prehistoric lithic scatter of unknown prehistoric affiliation and a whiteware fragment	Not eligible
38NE1075	Newberry	Pomaria	A prehistoric lithic scatter of unknown affiliation	Not eligible
38NE1076	Newberry	Pomaria	A prehistoric lithic scatter of unknown affiliation	Not eligible
38NE1077	Newberry	Jenkinsville	A multicomponent site consisting of a prehistoric late Archaic lithic scatter, and a historic component with unknown temporal affiliation	Potentially eligible

Tables 2 and 3 Source:

SCAS (South Carolina ArchSite). 2022. South Carolina Institute of Anthropology and Archaeology, and South Carolina Department of Archives and History. Retrieved from <http://www.scarchsite.org/PublicView.aspx> (accessed March 17, 2022).

Figure 1. VCSNS Site



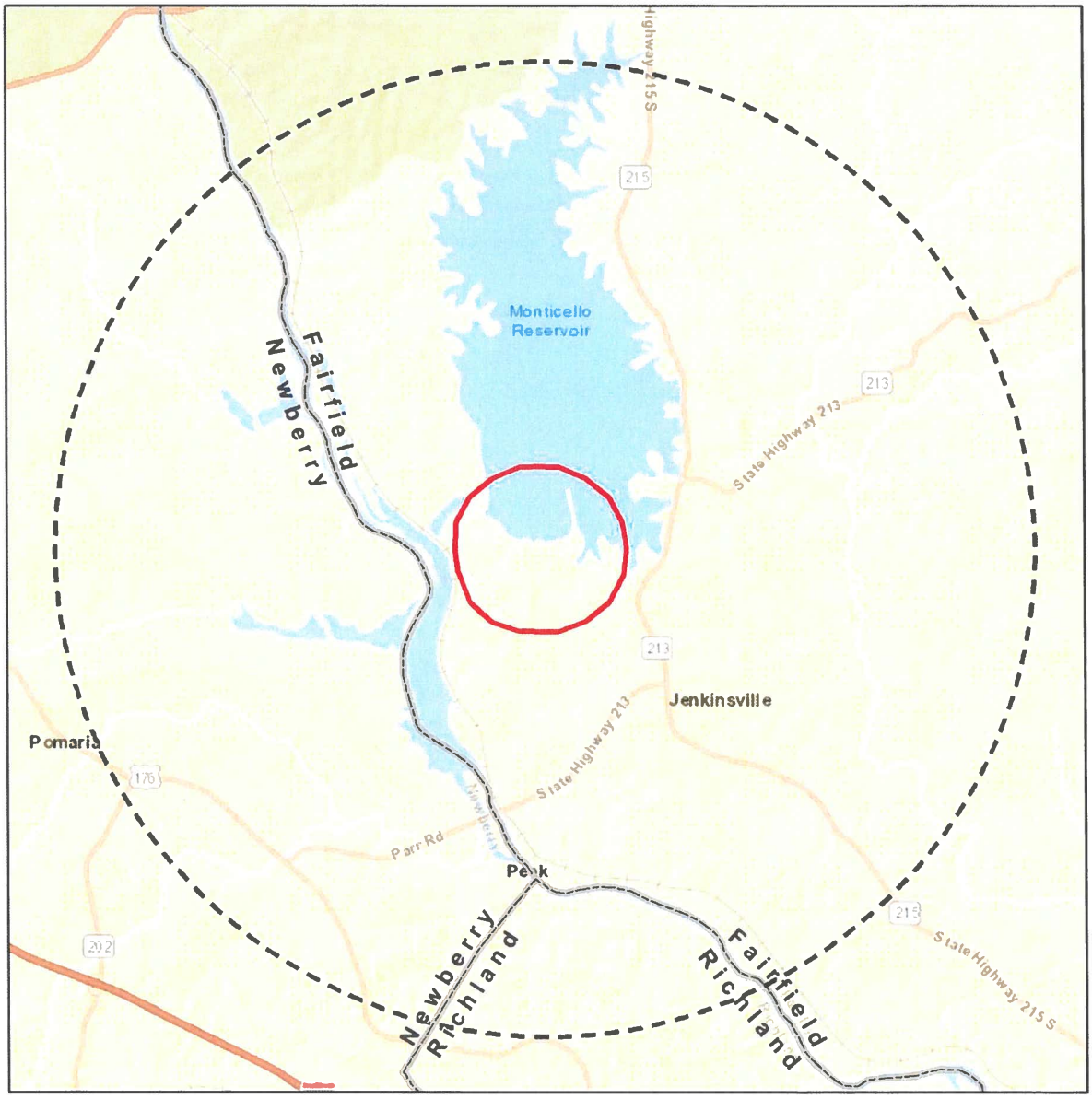
Legend

VCSNS Site Boundary

Service Layer Credits: Sources: Esri, USGS, NOAA

0 0.25 0.5 Miles

Figure 2. VCSNS 6-mile Vicinity



Ellery J Baker (Services - 6)

From: Leader, Jonathan <LEADERJ@mailbox.sc.edu>
Sent: Tuesday, November 29, 2022 2:54 PM
To: Ellery J Baker (Services - 6)
Subject: [EXTERNAL] Re: VCS SLR Project

Hi Ellery,

Good to talk with you about the project.

As long as there is no change to area of impact or expansion of facility that would bring it in direct contact with the listed sites or encompass a larger area that would need to be defined in terms of cultural features and sites, the Office of the State Archaeologist has no issues with re-licensure.

All the best
Jon

Jonathan Leader, PhD
SC State Archaeologist
South Carolina Institute of Archaeology and Anthropology
1321 Pendleton St.
Columbia, SC 29208

(803) 576- 6560, cell (803) 413 7395

South Carolina Institute of Archaeology and Anthropology

From: ellery.j.baker@dominionenergy.com <ellery.j.baker@dominionenergy.com>
Sent: Tuesday, November 29, 2022 1:20 PM
To: Leader, Jonathan <LEADERJ@mailbox.sc.edu>
Subject: VCS SLR Project

Hi John –
Just following up on our phone call earlier today on the attached letter. As we discussed on the phone, this is not an expansion project, but a relicensing effort to continue plant operations for an additional 20 years (dates as-found in the attached letter).
You noted on the phone that your office did not have any issues with the project. This email is simply follow-up confirmation of that, if you wouldn't mind please replying to confirm.

Thanks again – very much appreciated!
Best,
Ellery

Ellery J. Baker, PE, PMP
Generation Project Manager
Subsequent License Renewal

Dominion Energy Services
5000 Dominion Blvd 23060
Mobile: 804.240.9118

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Dr. Wenonah G. Haire
Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, SC 29730

RE: Dominion Energy – Virgil C. Summer Nuclear Station
Unit 1 Subsequent License Renewal

Dear Dr. Haire,

Dominion Energy is preparing an application for renewing the operating licenses for Virgil C. Summer Nuclear Station (VCSNS) for an additional 20 years (see Table 1). This process is known as a "subsequent license renewal", and as part of the process the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit.

VCSNS is located in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir. During the subsequent license renewal term, Dominion Energy proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the VCSNS site during the subsequent license renewal period. Dominion Energy does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process, nor is the continued operation of VCSNS anticipated to adversely affect the environment or any cultural, Tribal, or historic resources.

Dominion Energy is contacting you with the intent of introducing the project and to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Input from you regarding Tribal cultural resources within the plant's surrounding area, and

- Confirmation from you on our impact assessment due to the continued operation of VCSNS that, absence of ground disturbing activities other than those to maintain existing structures and operations and no refurbishment, there will be no anticipated impacts to cultural resources within the plant's environs.

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

While environmental impacts of the existing facility were assessed during original and renewal licensing, and subsequent license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the South Carolina Department of Archives and History (SHPO) and your Tribe regarding the subsequent license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion Energy's application submittal, currently scheduled for late 2023.

To facilitate preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that subsequent license renewal activities may have on cultural resources within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

As stated earlier, this letter seeks your input regarding cultural resources within the plant's surrounding area and confirmation from you that there will be no anticipated impacts to Tribal cultural resources within the plant's environs. We appreciate your notifying us of your comments and any information you believe Dominion Energy should consider in the preparation of the ER. Dominion Energy plans to include this letter and any response you provide in the ER.

Should you, Tribal members, or your staff have any questions or comments, please contact Ken Custalow at (804) 837-2067 or via email at ken.custalow@dominionenergy.com.

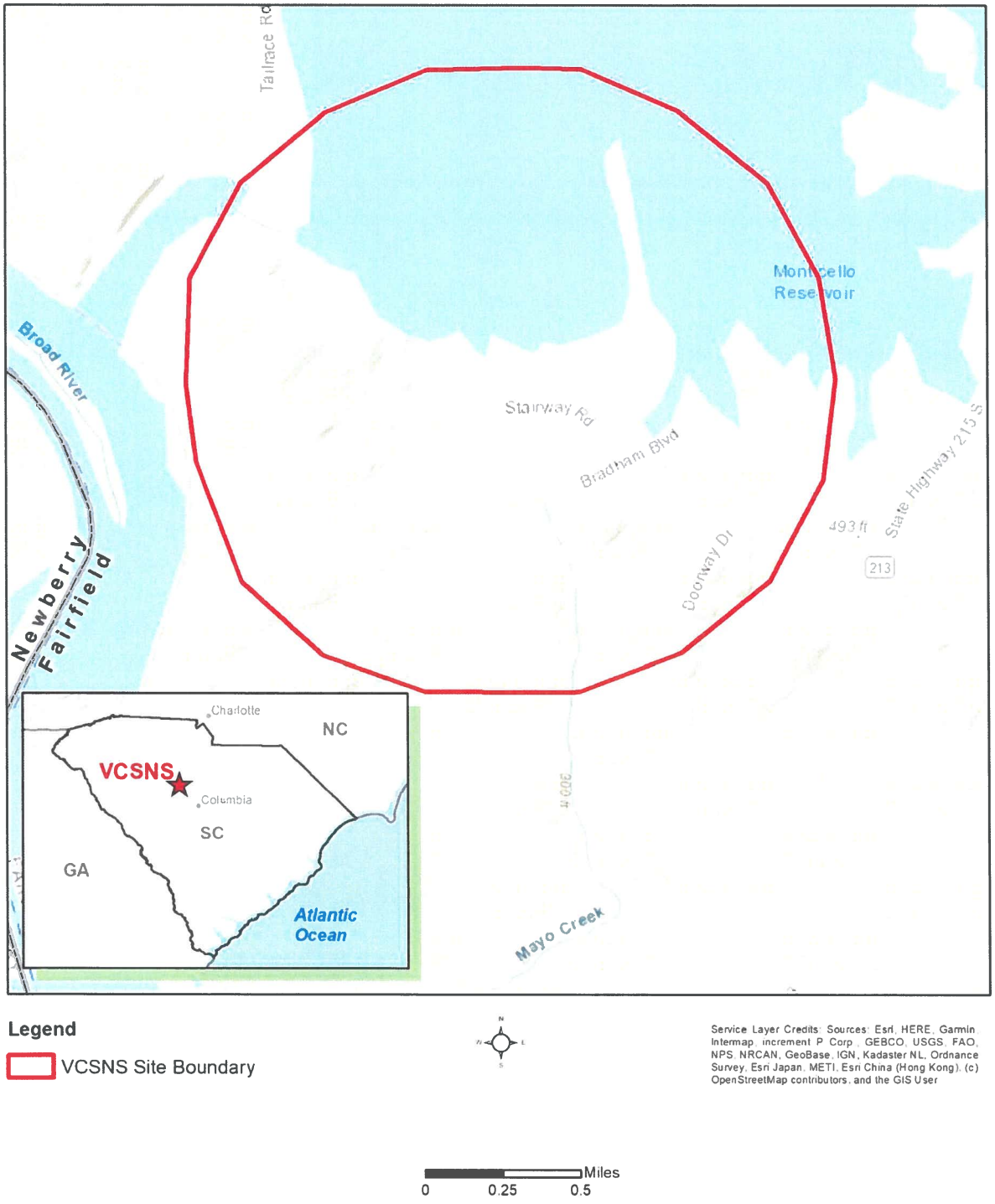
Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Figure 1. VCSNS Site



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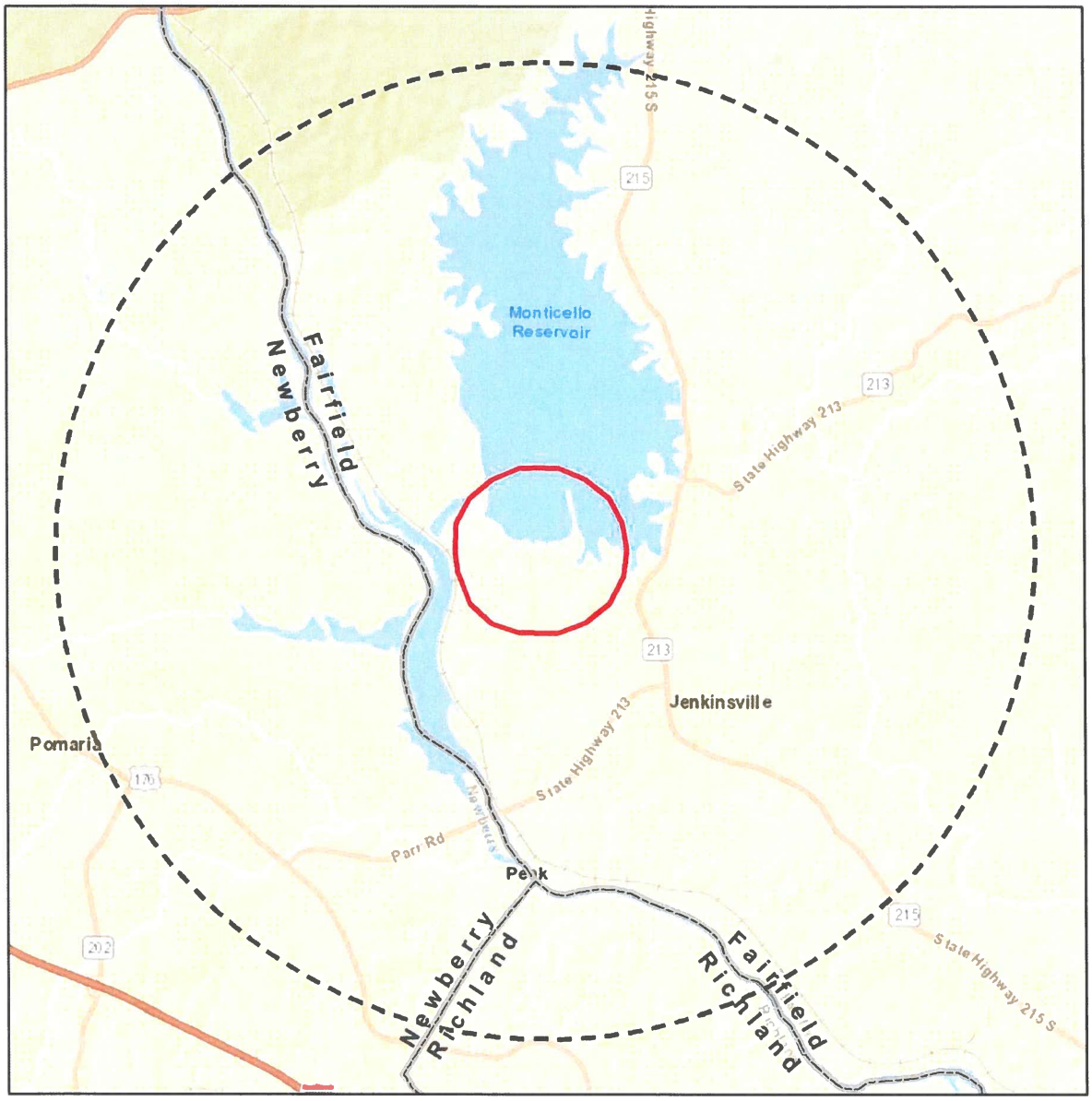
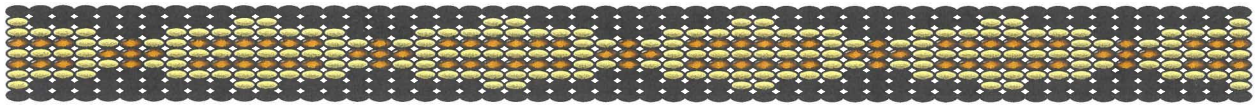


Catawba Indian Nation
Tribal Historic Preservation Office
1536 Tom Steven Road
Rock Hill, South Carolina 29730

Office 803-328-2427



September 6, 2022

Attention: Ken Custalow
Dominion Energy
P.O. Box 26666
Richmond, VA 23261

Re. THPO #	TCNS #	Project Description
2022-1108-14		Virgil C. Summer Nuclear Station – Unit 1 Subsequent License Renewal

Dear Mr. Custalow,

The Catawba have no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. **However, the Catawba are to be notified if Native American artifacts and / or human remains are located during the ground disturbance phase of this project.**

If you have questions please contact Caitlin Rogers at 803-328-2427 ext. 226, or e-mail Caitlin.Rogers@catawba.com.

Sincerely,

Caitlin Rogers for

Wenonah G. Haire
Tribal Historic Preservation Officer

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Richard Sneed, Principal Chief
Eastern Band of Cherokee Indians
Office of the Principal Chief
P.O. Box 1927
Cherokee, NC 28719

RE: Dominion Energy – Virgil C. Summer Nuclear Station
Unit 1 Subsequent License Renewal

Dear Mr. Sneed,

Dominion Energy is preparing an application for renewing the operating licenses for Virgil C. Summer Nuclear Station (VCSNS) for an additional 20 years (see Table 1). This process is known as a "subsequent license renewal", and as part of the process the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit.

VCSNS is located in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir. During the subsequent license renewal term, Dominion Energy proposes to continue operating the unit as currently operated. There are currently no ground-disturbing activities other than those to maintain existing structures and operations anticipated at the VCSNS site during the subsequent license renewal period. Dominion Energy does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process, nor is the continued operation of VCSNS anticipated to adversely affect the environment or any cultural, Tribal, or historic resources.

Dominion Energy is contacting you with the intent of introducing the project and to make available any data you need to ensure an efficient and effective consultation process, and to request the following:

- Input from you regarding Tribal cultural resources within the plant's surrounding area, and

- Confirmation from you on our impact assessment due to the continued operation of VCSNS that, absence of ground disturbing activities other than those to maintain existing structures and operations and no refurbishment, there will be no anticipated impacts to cultural resources within the plant's environs.

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

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To facilitate preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that subsequent license renewal activities may have on cultural resources within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

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Should you, Tribal members, or your staff have any questions or comments, please contact Ken Custalow at (804) 837-2067 or via email at ken.custalow@dominionenergy.com.

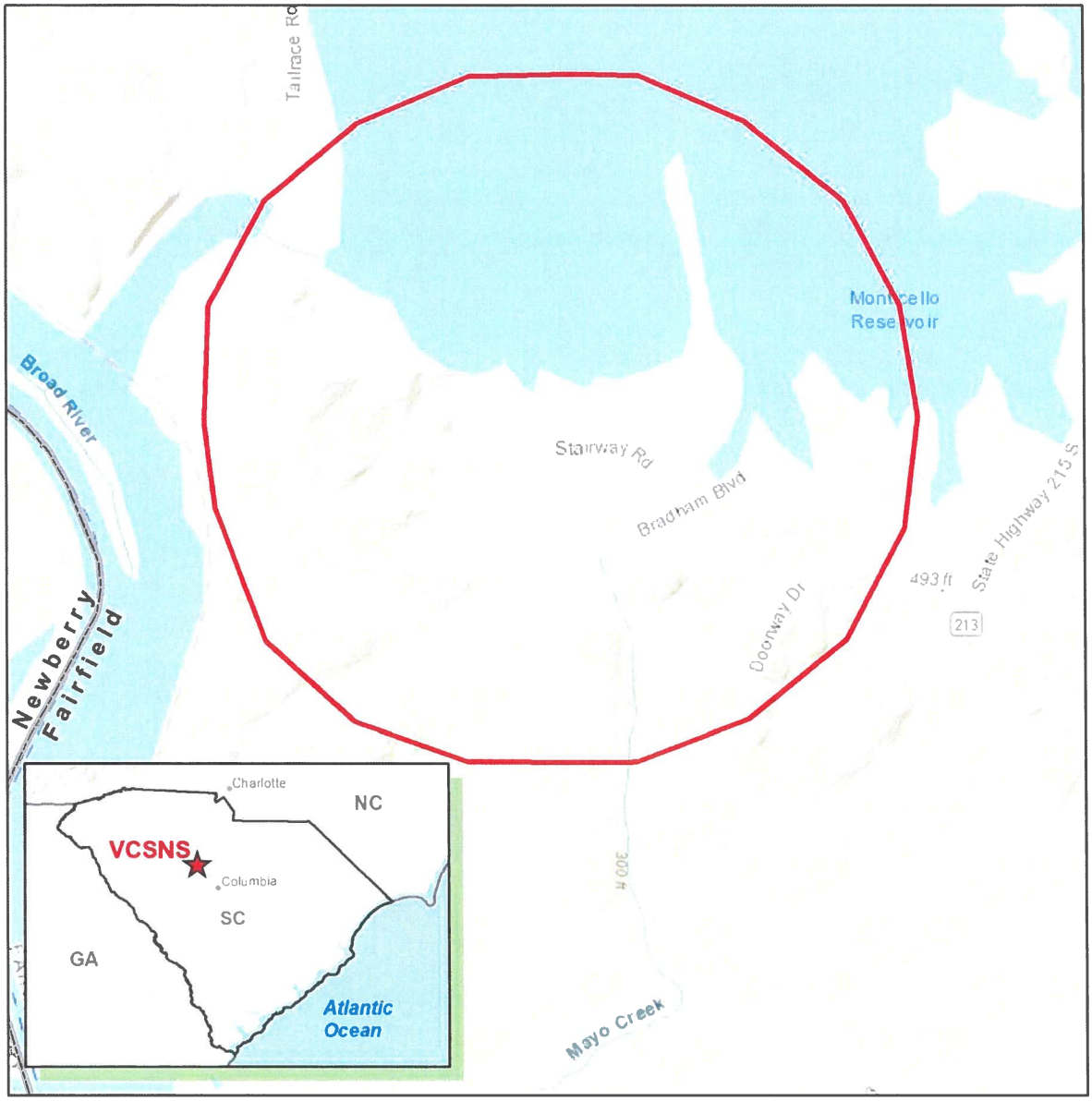
Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Figure 1. VCSNS Site



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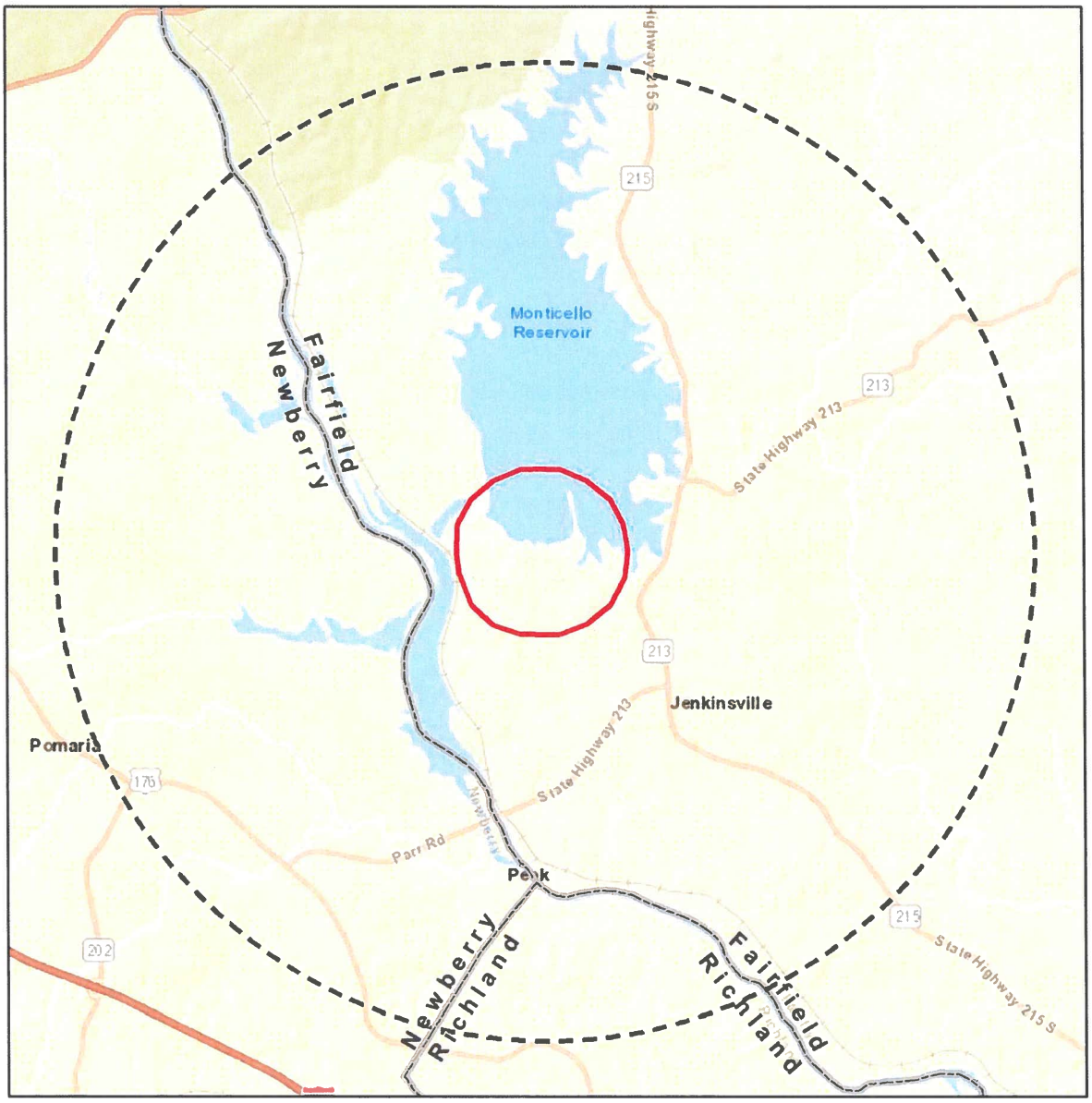

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

James Williams, Director of Environmental Services
Environmental Services
Housing Building
2591 N. Wood Dr.
PO Box 580
Okmulgee, OK 74447

RE: Dominion Energy – Virgil C. Summer Nuclear Station
Unit 1 Subsequent License Renewal

Dear Mr. Williams,

Dominion Energy is preparing an application for renewing the operating licenses for Virgil C. Summer Nuclear Station (VCSNS) for an additional 20 years (see Table 1). This process is known as a "subsequent license renewal", and as part of the process the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit.

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Should you, Tribal members, or your staff have any questions or comments, please contact Ken Custalow at (804) 837-2067 or via email at ken.custalow@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

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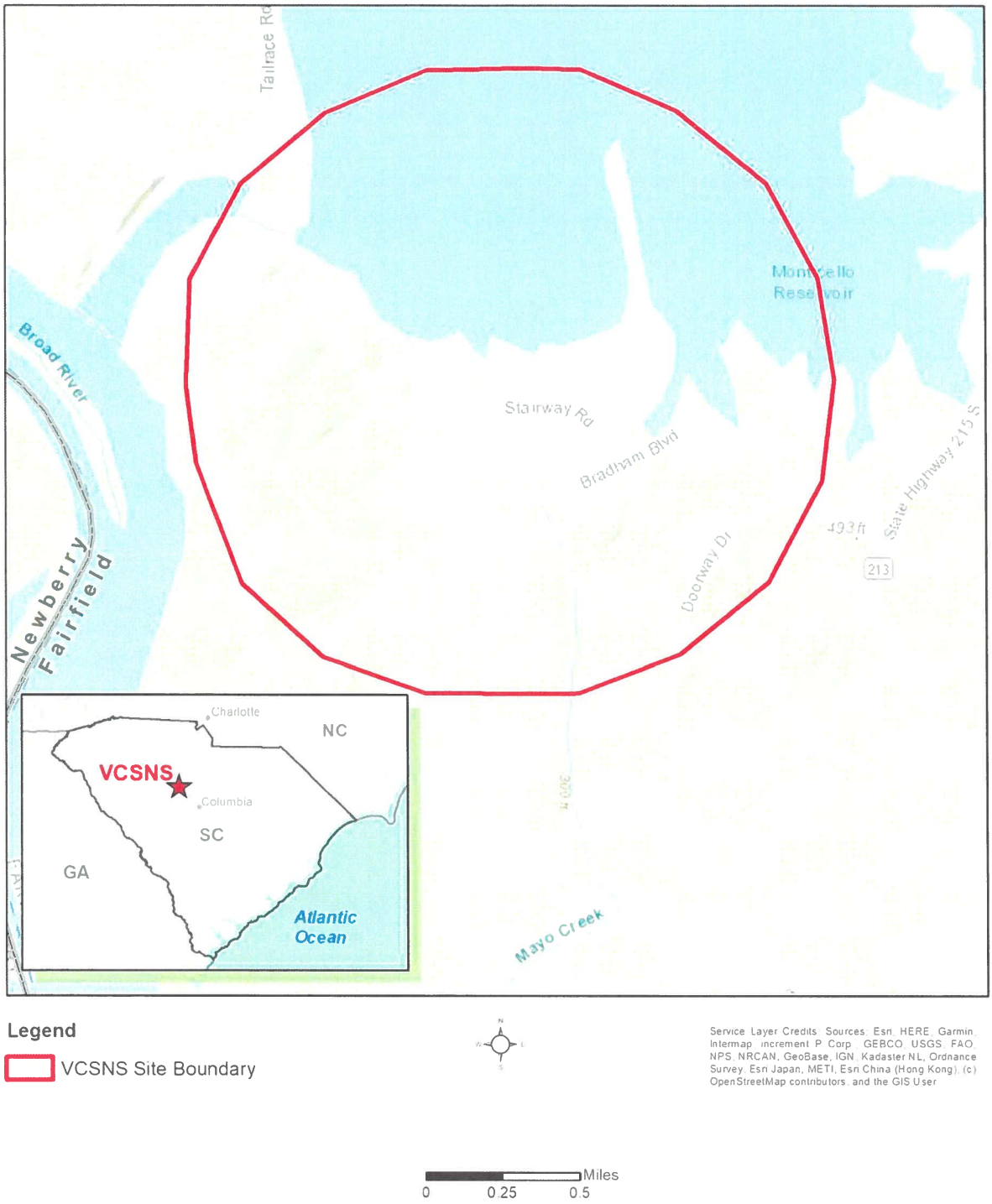

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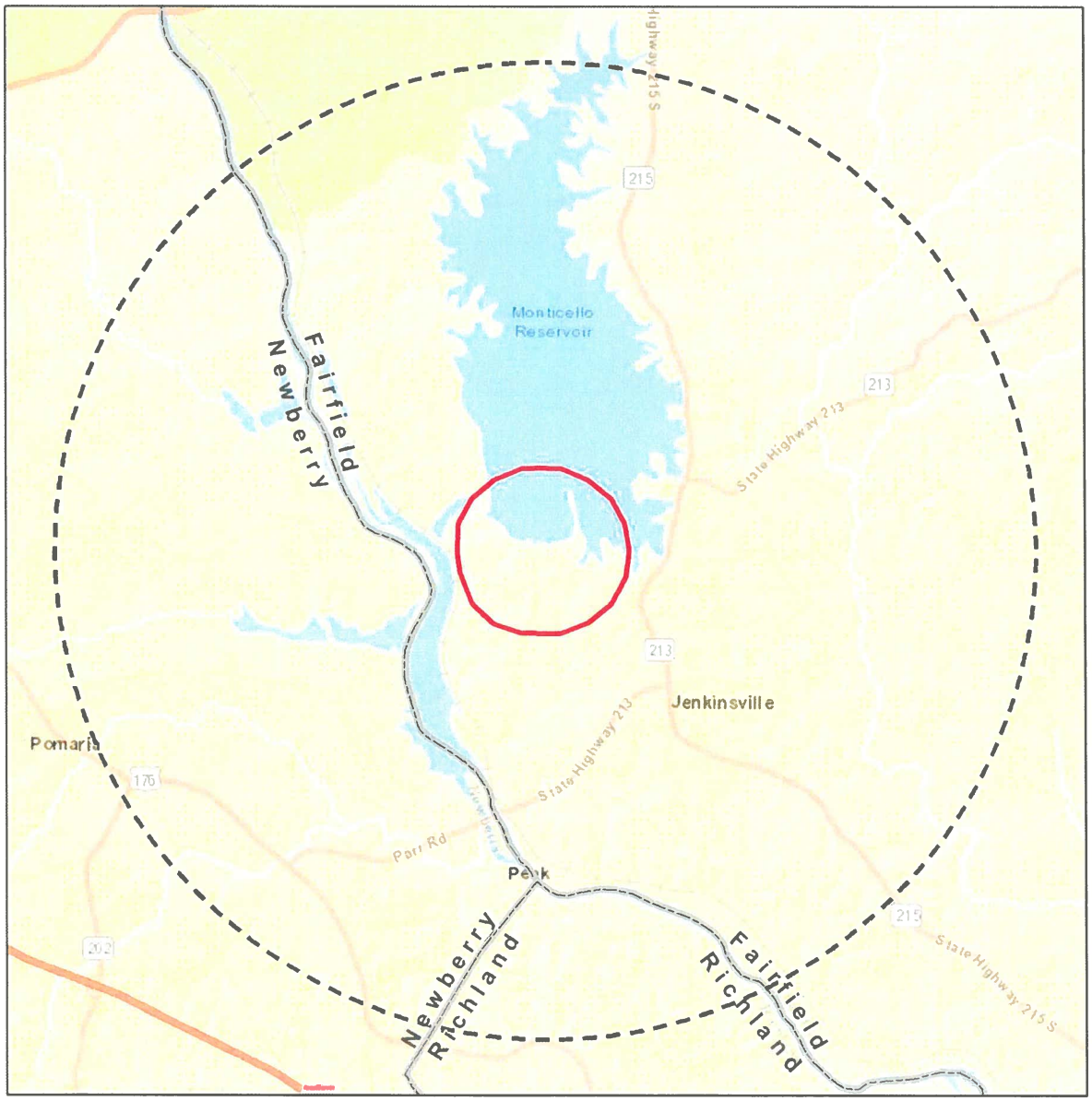

Legend

VCSNS Site Boundary

6-Mile Radius

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

0 1 2 Miles

Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Jeff Wacoche, Assistant Chief
United Keetoowah Band of Cherokee
Indians in Oklahoma
P.O. Box 746
Tahlequah, OK 74465

RE: Dominion Energy – Virgil C. Summer Nuclear Station
Unit 1 Subsequent License Renewal

Dear Mr. Wachoche,

Dominion Energy is preparing an application for renewing the operating licenses for Virgil C. Summer Nuclear Station (VCSNS) for an additional 20 years (see Table 1). This process is known as a "subsequent license renewal", and as part of the process the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit.

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Table 1. VCSNS Licensing Dates

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Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

While environmental impacts of the existing facility were assessed during original and renewal licensing, and subsequent license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the South Carolina Department of Archives and History (SHPO) and your Tribe regarding the subsequent license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion Energy's application submittal, currently scheduled for late 2023.

To facilitate preparation of the license renewal ER and a smooth consultation by the NRC, we are contacting you early in the application process seeking input regarding the effects that subsequent license renewal activities may have on cultural resources within the plant's environs and any questions or additional information necessary for the consultation process. Figures depicting the plant site and the vicinity within a 6-mile radius of the plant are enclosed.

As stated earlier, this letter seeks your input regarding cultural resources within the plant's surrounding area and confirmation from you that there will be no anticipated impacts to Tribal cultural resources within the plant's environs. We appreciate your notifying us of your comments and any information you believe Dominion Energy should consider in the preparation of the ER. Dominion Energy plans to include this letter and any response you provide in the ER.

Should you, Tribal members, or your staff have any questions or comments, please contact Ken Custalow at (804) 837-2067 or via email at ken.custalow@dominionenergy.com.

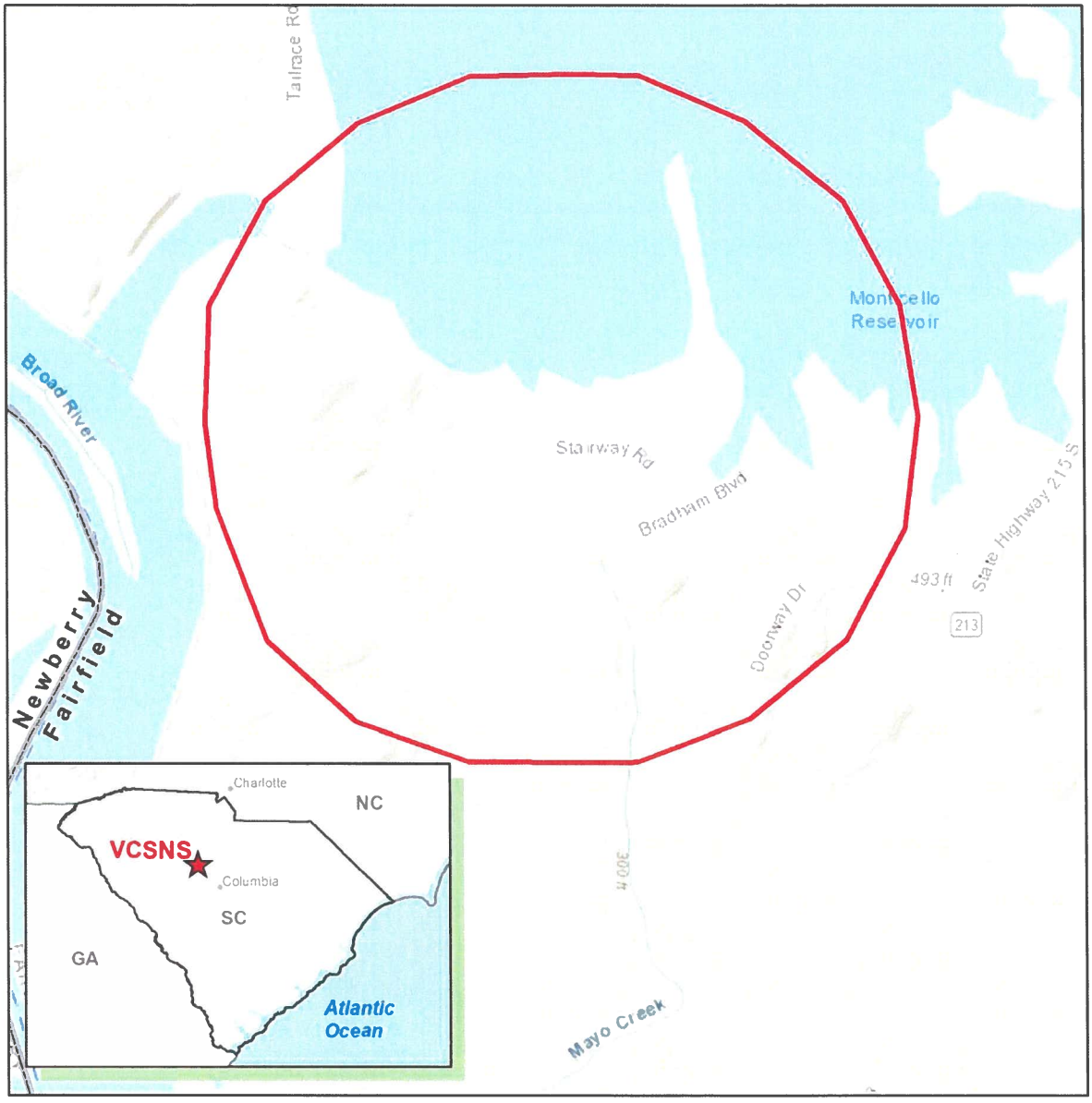
Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Figure 1. VCSNS Site



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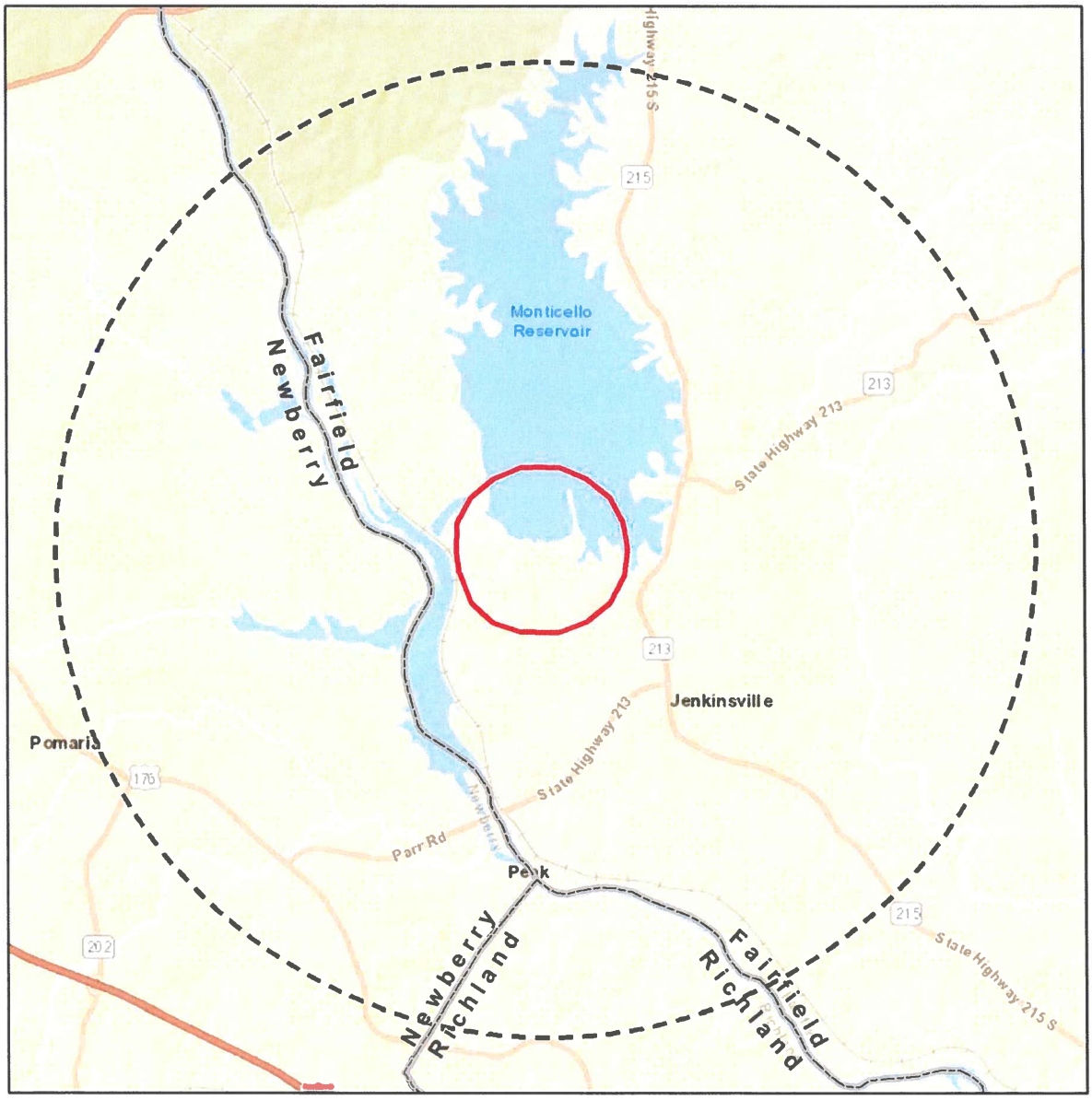

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Attachment D: CWA Water Quality 401 Certification Letters

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Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

Dominion Energy®

BY U.S. MAIL
RETURN RECEIPT REQUESTED

June 22, 2022

Mr. Nate Haber, Director
Bureau of Water - Water Quality Division
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

RE: Dominion Energy – Virgil C. Summer Nuclear Station
Unit 1 Subsequent License Renewal

Dear Mr. Haber,

Dominion Energy is preparing a subsequent license renewal application with the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years (see Table 1).

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

Relevant to §51.45(d) of NRC's regulations and as further specified under Clean Water Act (CWA) Section 401, the NRC cannot issue a renewed operating license unless the applicant provides the NRC with a water quality certification from the State. The State has the option to grant a waiver, based on information demonstrating that discharges from the project or facility to be licensed will comply with CWA requirements and will not cause or contribute to a violation of state water quality standards.

VCSNS operates under individual NPDES Permit No. SC0030856 for process wastewater discharges, the General Industrial Stormwater Permit No. SCR005713, Surface Water Withdrawal Permit No. 20PN001 and NPDES Permit No. SCG646072 for discharge from its water treatment plant. VCSNS complies with the permits and will continue to operate the plant within the limits and conditions of the permits as well as any future applicable water quality permits and conditions. Therefore, Dominion Energy is requesting that DHEC consider issuance of a 401 certification waiver for the VCSNS subsequent license renewal.

We appreciate your consideration of this request and look forward to a timely response to support Dominion Energy's plans to prepare and submit the final application to the NRC.

Should you or your staff have any questions concerning this transmittal, please contact Ken Roller at (804) 592-7825 or via email at kenneth.roller@dominionenergy.com.

Sincerely,

Jason E. Williams
Vice President, Environmental

dhec
Healthy People. Healthy Communities.

August 4, 2022

Dominion Energy Services, INC.
c/o Mr. Jason E. Williams
120 Tredegar Street
Richmond, Va 23219

Re: Dominion Energy – Virgil C. Summer Nuclear Station
Unit 1 Subsequent License Renewal
401 Waiver Request

Dear Mr. Williams,

The Department of Health and Environmental Control (DHEC), is in receipt of your letter dated June 22, 2022. The letter requests that DHEC grant a waiver of the 401 Water Quality Certification for the renewal of the U.S. Nuclear Regulatory Commission (NRC) operating license for the Virgil C. Summer Nuclear Station Unit 1. Based on the information provided and other current DHEC permits and permitting requirements, DHEC has determined that a waiver is granted for the 401 Water Quality Certification for the Virgil C. Summer Nuclear Station Unit 1 License Renewal as requested in the letter from Dominion Energy dated June 22, 2022.

Should you have questions, please contact Chuck Hightower, at (803) 898-0369 or by e-mail at *hightocw@dhec.sc.gov*.

Sincerely,

Chuck Hightower, Manager
Water Quality Certification and
Wetlands Section
DHEC – Bureau of Water

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Attachment E: Other Consultation Letters

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Jason E. Williams
VP, Environmental
Dominion Energy Services, Inc.
120 Tredegar Street, Richmond Va 23219
Dominion Energy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED

August 3, 2022

Ms. Fran Marshall
Environmental Affairs Administration
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

RE: Dominion Energy – Virgil C. Summer Nuclear Station Unit 1
Subsequent License Renewal

Dear Ms. Marshall,

Dominion Energy is seeking a response from South Carolina Department of Health and Environmental Control (DHEC) concerning the potential existence and possible public health risks associated with thermophilic organisms that may be present in the portion of Monticello Reservoir that receives the cooling water discharge from the Virgil C. Summer Nuclear Station (VCSNS). Information concerning the reason for this request and specific microorganisms of concern is presented below. Figures depicting the station site and the vicinity within a 6-mile radius of the station are attached.

Reason for this Request and Microorganisms of Concern
Dominion Energy is preparing an application with the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license for VCSNS for an additional 20 years (see Table 1).

Table 1. VCSNS Licensing Dates

VCSNS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

As part of the process, the NRC requires that the subsequent license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment to be undertaken to enable the continued operation of the unit. VCSNS has a thermal discharge to the Monticello Reservoir under NPDES permit No. SC0030856. The presence and numbers of thermophilic organisms can be increased by the addition of heat. Microorganisms of particular concern include several types of bacteria (*Legionella* species,

Salmonella species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*.

VCSNS's thermal discharge flows back into the Monticello Reservoir via a 1,000-foot-long discharge channel. Temperature of the wastewater is monitored at its entry into the discharge canal. The temperature of the wastewater as it enters the discharge canal during the summer months is limited by the NPDES permit to a daily maximum of 113°F. The long-term average temperature for March to October is 104°F. This discharge is submerged about 10 feet below the surface and then flows through the 1,000-ft discharge canal before entering the Reservoir. The discharge is diluted by the large volume of the Reservoir once it exits the discharge canal.

Most of the Monticello Reservoir is open to the public for boating and fishing. The NRC requires a one-mile radius exclusion zone surrounding VCSNS. Public access to this area is restricted. This area, encompassing approximately 7.2 miles of shoreline on the south end of Monticello Reservoir, is designated by warning signs on the landward side and by buoys on the lakeward side. Monticello Park is located on the shoreline northeast of the VCSNS discharge. The Park provides boat launching, courtesy docks, and picnic facilities for public use. Swimming is allowed. In conjunction with Fairfield County Recreation Commission, there is also a multiple use recreational area at the park. Monticello Reservoir has a sub-impoundment on the north end called the Recreational Lake which has a swimming beach.

Given that the thermal discharge is diluted into the Reservoir waters and the public access is restricted from a large area of the southern end of Monticello Reservoir, public exposure to thermally enhanced waters is limited. Furthermore, while swimming is not prohibited outside of the restricted area, the Reservoir's public swimming beach is located at the north end of the waterbody far removed from the thermal influence of the VCSNS discharge. Dominion Energy does not anticipate the continued operation of VCSNS to adversely affect the environment or public health as a result of microbiological hazards. We are seeking DHEC's concurrence with Dominion Energy's conclusion that the continued operation of VCSNS for the extended license term (subsequent license renewal) would not be expected to adversely affect the environment or public health from exposure to thermophilic pathogens in Monticello Reservoir. We appreciate your consideration of this request and look forward to a response preferably by September 30, 2022, if possible. Dominion Energy plans to include this letter and any response you provide in the final ER.

Should you or your staff have any questions concerning this transmittal, please contact Ken Roller at (804) 592-7825 or via email at kenneth.roller@dominionenergy.com

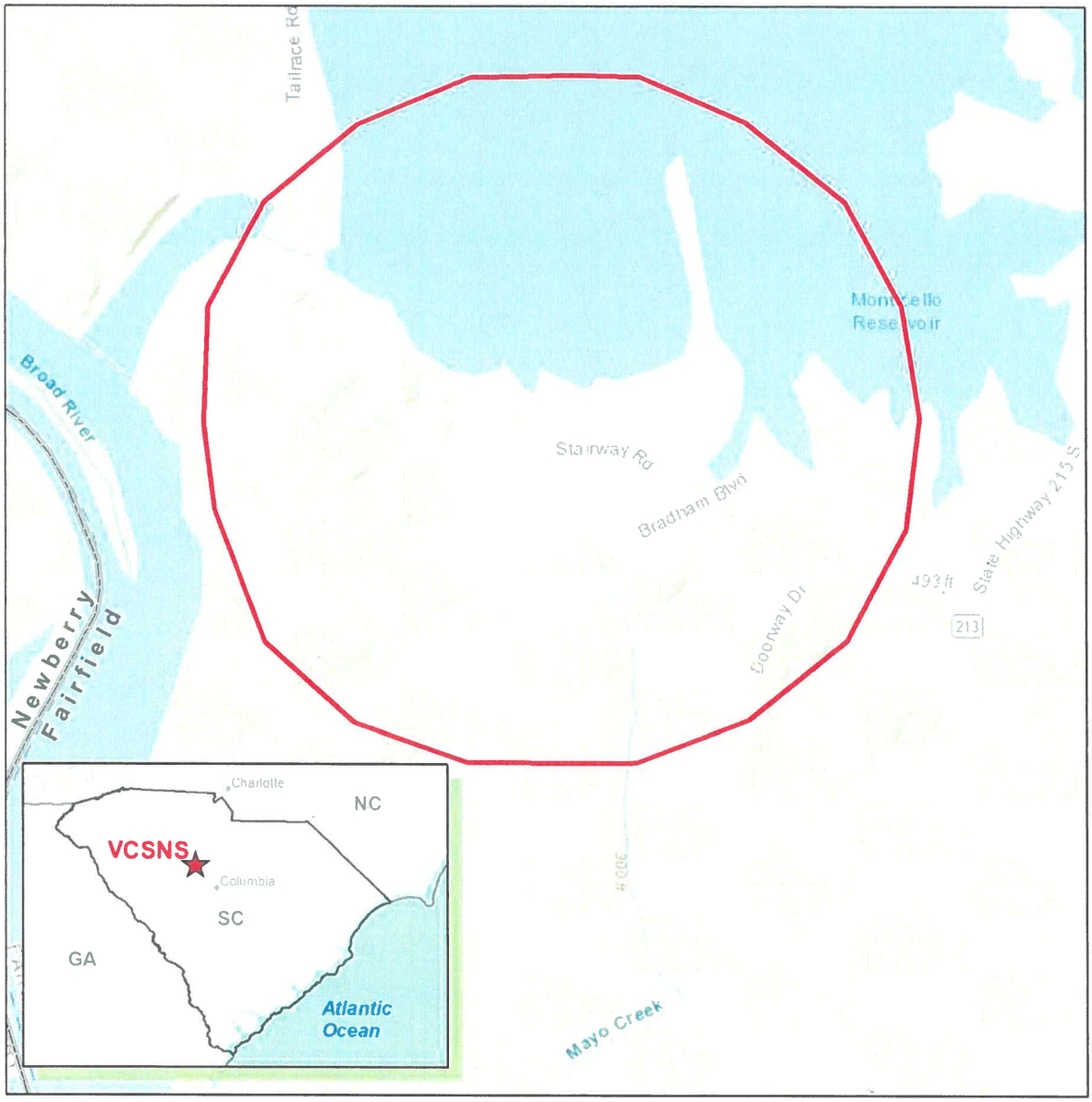
Sincerely,

Jason E. Williams
Vice President, Environmental

Attachments:

Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Figure 1. VCSNS Site



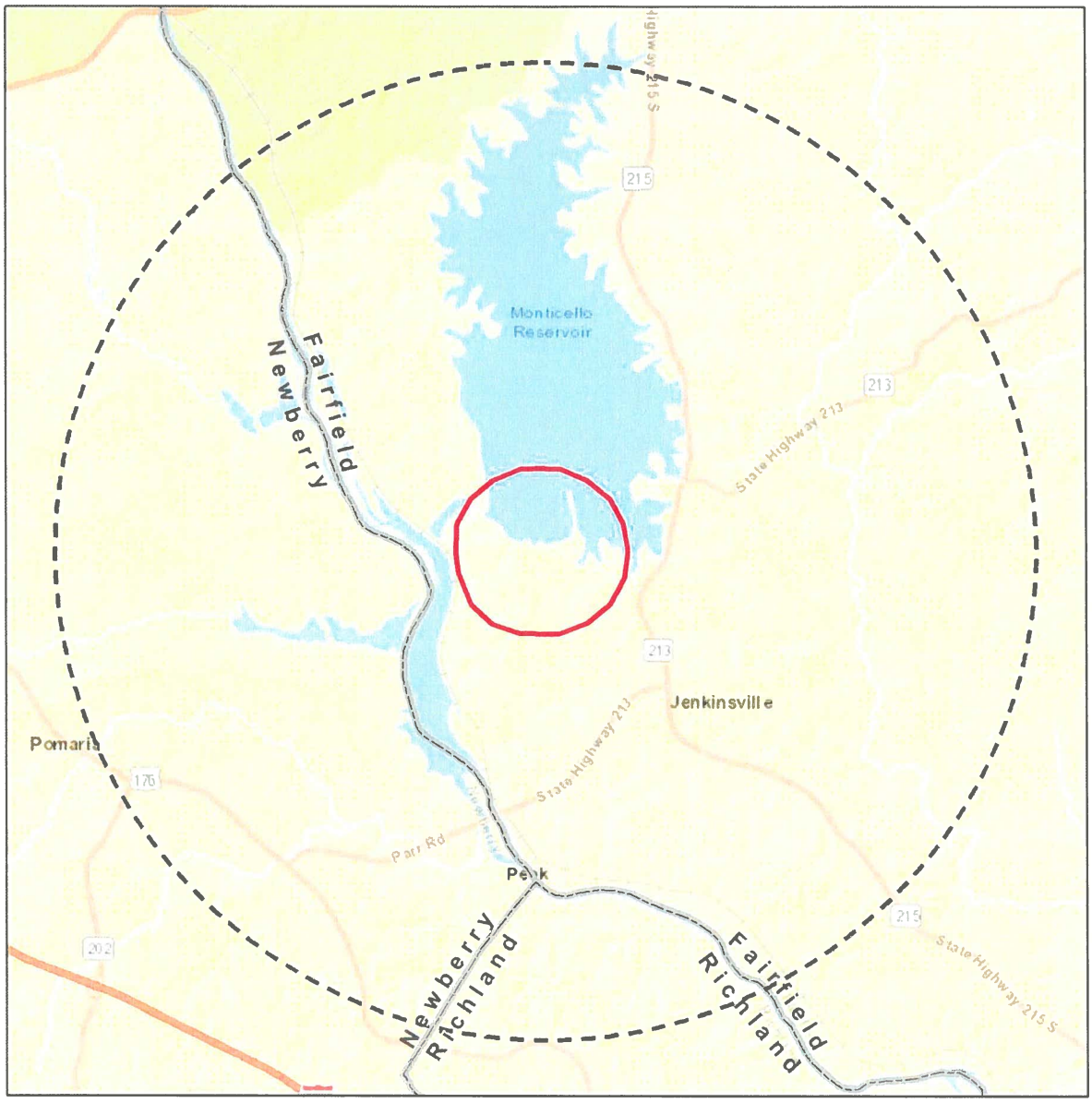
Legend

VCSNS Site Boundary

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User

Miles
0 0.25 0.5

Figure 2. VCSNS 6-mile Vicinity



dhec
Healthy People. Healthy Communities.
Edward D. Simmer, MD, MPH, DFAPA
Director

September 20, 2022

Mr. Jason E. Williams, VP – Environmental
Dominion Energy Services, Inc.
120 Tredegar Street
Richmond, Virginia 23219

Re: Dominion Energy – Virgil C. Summer Nuclear Station Unit 1 Subsequent License Renewal Thermophilic Microbe Potential Letter

Dear Mr. Williams,

We have reviewed your request and we do not take exception with the conclusions in your letter that the continued operation of Virgil C. Summer Nuclear Station (VCSNS) "for the extended license term (subsequent license renewal) would not be expected to adversely affect the environment or public health" due to exposure to thermophilic pathogens in the Monticello Reservoir.

Though the microbes of potential concern listed (*Salmonella*, *Shigella*, *Pseudomonas aeruginosa, and Naegleria fowleri*) generally reproduce at higher rates when water temperature is increased, most of these species, especially *Salmonella* and *Shigella* species aren't likely to occur in numbers that would lead to concerns for human health absent substantial human or animal fecal sources. Since no such sources are known to be present at the VCSNS or in Lake Monitcello, the increased proliferation of these bacteria should not be a concern for human health, even in scenarios where water temperature in a portion of the lake is somewhat elevated.

The bacterium *Pseudomonas aeruginosa* and the ameboflagellate *Naegleria fowleri* are ubiquitous in the natural environment. *P. aeruginosa* is associated with numerous infections, especially in immunocompromised individuals, though majority of these infections are associated with exposures in hospitals. Infections resulting from exposure to the bacterium in water are usually related to unhygienic hot tubs. The bacterium is rarely present in numbers that can cause disease in natural freshwaters used for recreation, such as Lake Monticello.

N. fowleri is widespread in warm waters throughout the region and can thrive in water at temperatures between 95- and 100-degrees F. SC Department of Health and Environmental Control (DHEC)

routinely warns recreational water users across the state of the low risk of infection from naturally occurring microorganisms like *N. fowleri* and advises against swimming when water temperatures are high and levels are low. The continued release of cooling water from the VCSNS is very unlikely to result numbers of *N. fowleri* or *P. aeruginosa* that would result in human health concerns. It is important to note that cooling water from the facility has been discharged into the lake for the last 38 years, and no outbreaks of infections from either organism associated with recreational activities in Lake Monticello have been identified.

DHEC regularly monitors levels of *Escherichia coli,* a thermophilic fecal indicator bacterium at three locations across Lake Monticello. *E. coli* levels in the lake are among the lowest in the state. There is no evidence that elevated temperatures associated with the VCSNS have led to an increase in numbers of pathogenic microorganisms.

In addition to the above references, the one-mile radius exclusion zone surrounding VCSNS where public access is restricted, along with the submerged discharge and 1,000-foot discharge channel add additional layers of protection from exposure to anythermophilic organisms which may be present.

Please don't hesitate to contact me with any questions or if you would like to discuss further.

Best regards,

Fran W. Marshall, JD, MSPH
Director of the Office of Environmental Public Health

cc: Myra C. Reece, DHEC Director of Environmental Affairs
Ray Holberger, DHEC Environmental Risk Specialist

DE sent notification letters to agencies informing them of DE's license renewal activities. A list of these recipients is provided below. An example notification letter sent by DE is provided in this attachment, as are all responses received.

Table E-1 Recipients

Agency	Name	Title
Federal Energy Regulatory Comm, ARO	Wayne King	
Federal Energy Regulatory Commission	Office of General Council	
Congaree National Park	Dr. Frank Henning	
Town of Winnsboro, South Carolina	Jason Taylor	Town Administrator
Town of Jenkinsville, South Carolina	Gregory Ginyard, Sr.	Mayor
Richland County, Columbia, South Carolina	Leonardo Brown	County Administrator
Newberry County, Newberry, South Carolina	Christopher Inglese	County Administrator
Lexington County, Lexington, South Carolina	Lynn Sturkie	County Administrator
Fairfield County, Winnsboro, South Carolina	Malik Whitaker	County Administrator
City of Columbia, South Carolina	Teresa Wilson	County Administrator
SC Parks Recreator and Tourism	Phil Gains	
SC Parks Recreator and Tourism	Mark Davis	
USACE, Savannah District	Stan Simpson	
U.S. Forest Service, Sumter National Forest	Robert Morgan	
U.S. Forest Service	Derrick Miller	
U.S. Forest Service	Mary Maercklein	

BY U.S. MAIL
RETURN RECEIPT REQUESTED

V.C. Summer Nuclear Station
Bradham Blvd & Hwy 215, Jenkinsville, SC 29065
Mailing Address:
P.O. Box 88, Jenkinsville, SC 29065
DominionEnergy.com

August 29, 2022

Wayne King
Office of Energy Projects
Federal Energy Regulatory Comm, ARO
3700 Crestwood Pkwy, NW, Ste 950
Duluth, Georgia, 30096-7155

RC 22-0030
VCS LIC/AF/Rev 0

DOMINION ENERGY SOUTH CAROLINA (DESC)
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
SUBSEQUENT LICENSE RENEWAL

Dear Mr. King,

Dominion Energy is preparing an application for renewing the operating license for Virgil C. Summer Nuclear Station Unit 1 (VCSNS) for an additional 20 years beyond the current 60-year operating license.

VCSNS Licensing Dates

VCS Unit	Initial License Expiration Date	Current License Expiration Date	Subsequent License Expiration Date
Unit 1	August 6, 2022	August 6, 2042	August 6, 2062

VCSNS is in Fairfield County, South Carolina, approximately 15 miles southwest of the county seat of Winnsboro and 26 miles northwest of Columbia, the state capital. The VCSNS site is situated on approximately 2200 acres on the south shores of Monticello Reservoir.

VCSNS has provided safe, reliable, and carbon-free electricity to South Carolina customers for decades. VCSNS also provides economic benefits to the region and South Carolina through its employment of a large workforce, annual tax payments, and contributions to local community organizations. Extending the license of VCSNS would allow these benefits to continue for our customers, communities, and environment.

As a valued partner, Dominion Energy is sending this letter to inform you of our license renewal activities – there are no actions required on your part. Should you have any questions or comments about VCSNS or the subsequent license renewal process, please feel free to contact Mr. Michael Moore at (803) 345-4752 or via email at Michael.Moore@DominionEnergy.com.

Sincerely,

George A. Lippard
Site Vice President
V.C. Summer Nuclear Station

Enclosures
Figure 1. VCSNS Site
Figure 2. VCSNS 6-mile Vicinity

Figure 1. VCSNS Site

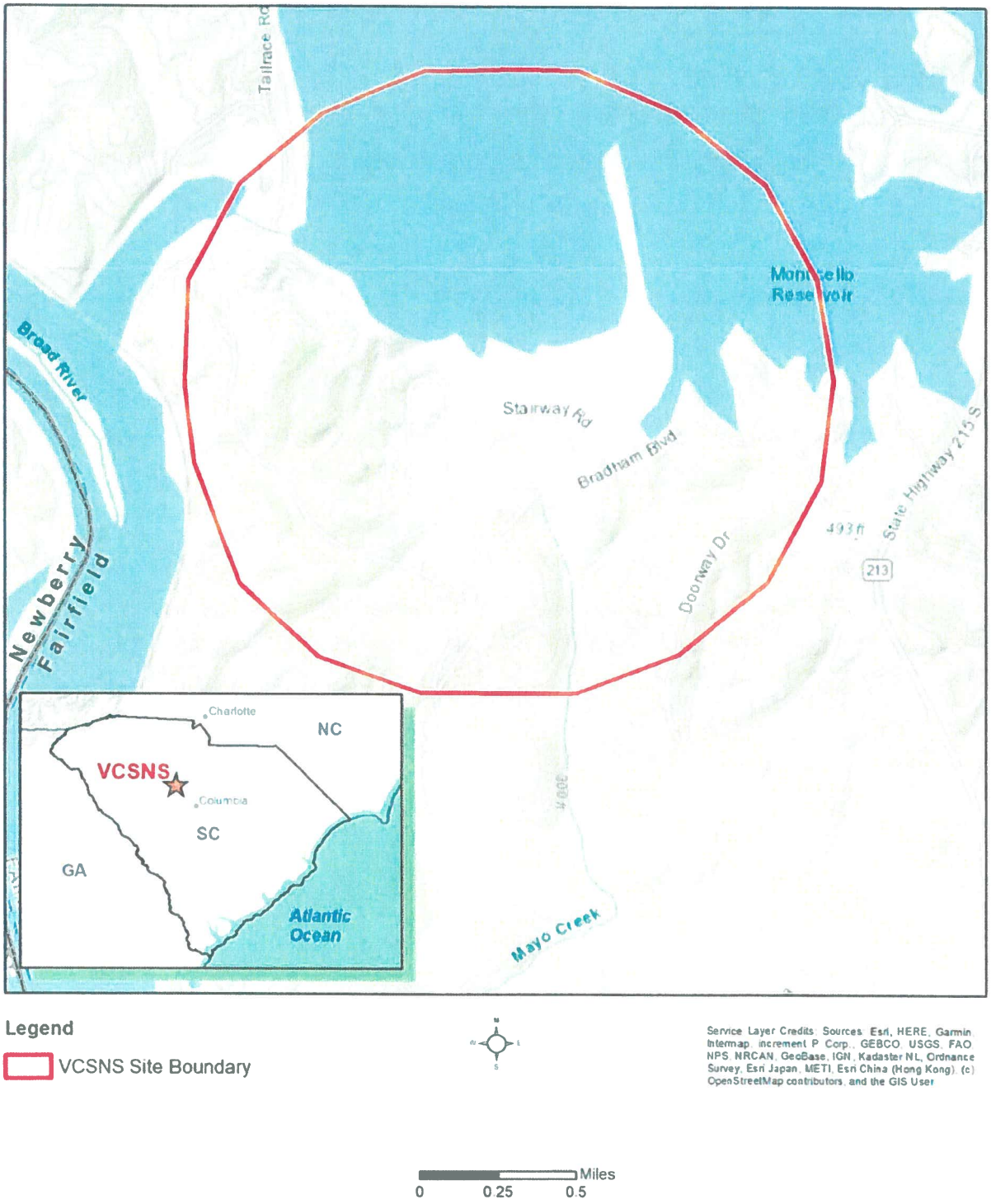
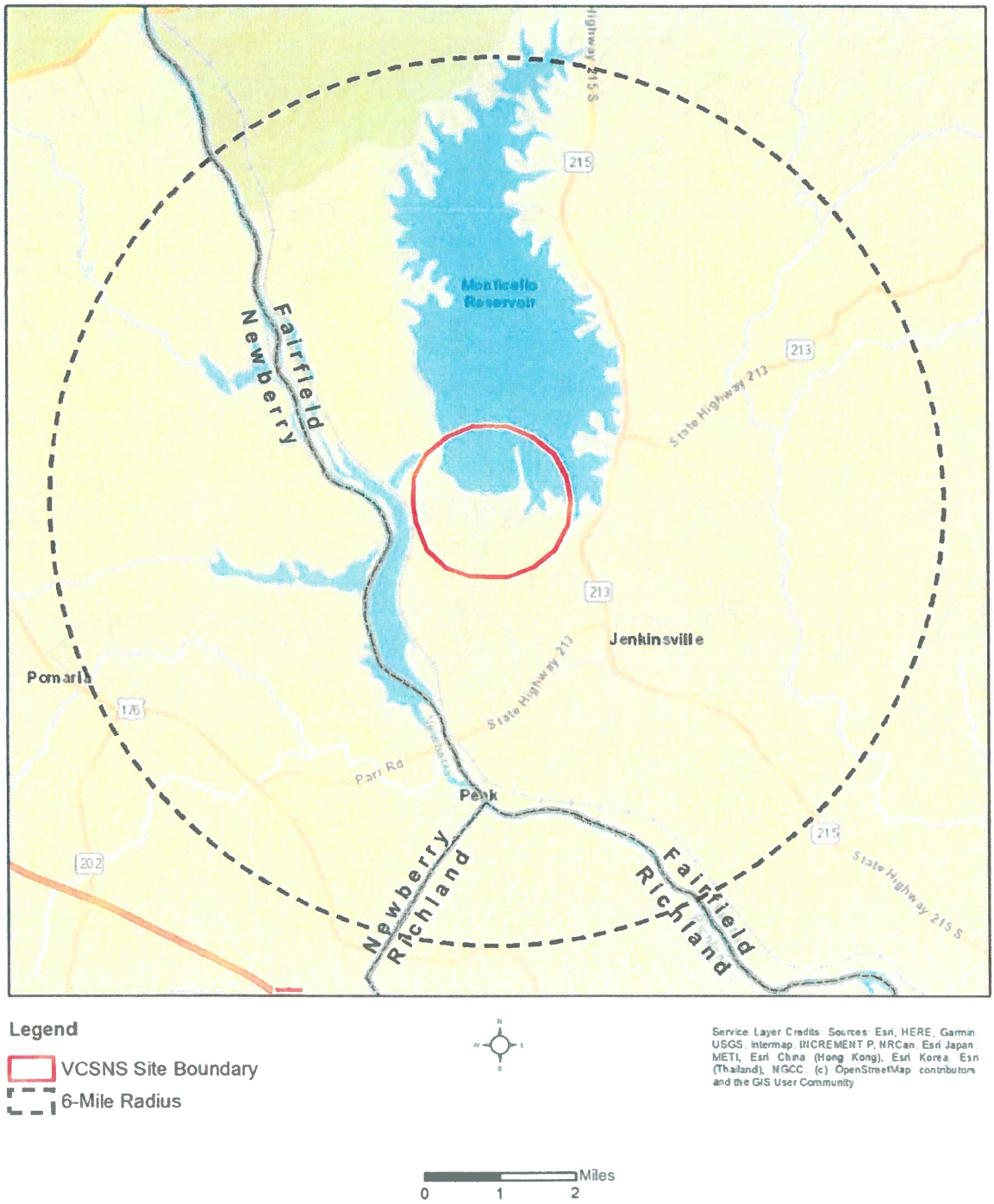


Figure 2. VCSNS 6-mile Vicinity



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