

EXHIBIT E
ENVIRONMENTAL EXHIBIT

**PARR HYDROELECTRIC PROJECT
FERC PROJECT NO. 1894**

**APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM**

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ENVIRONMENTAL EXHIBIT**

TABLE OF CONTENTS

EXECUTIVE SUMMARY VII

1.0 INTRODUCTION 1-1

 1.1 APPLICATION 1-1

 1.2 PURPOSE OF ACTION AND NEED FOR POWER 1-3

 1.2.1 PURPOSE OF ACTION 1-3

 1.2.2 NEED FOR POWER 1-3

 1.3 PUBLIC REVIEW AND COMMENT 1-4

 1.3.1 INITIAL ISSUES SCOPING 1-4

 1.3.2 FIRST-STAGE CONSULTATION 1-5

 1.3.3 SECOND-STAGE CONSULTATION 1-6

 1.3.4 THIRD-STAGE CONSULTATION 1-6

2.0 STATUTORY AND REGULATORY REQUIREMENTS 2-1

 2.1 FEDERAL POWER ACT 2-1

 2.1.1 SECTION 18 FISHWAY PRESCRIPTIONS 2-1

 2.1.2 SECTION 4(E) CONDITIONS 2-1

 2.1.3 SECTION 10(J) RECOMMENDATIONS 2-1

 2.2 CLEAN WATER ACT – SECTION 401 2-2

 2.3 ENDANGERED SPECIES ACT 2-2

 2.4 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT
 ACT 2-3

 2.5 COASTAL ZONE MANAGEMENT ACT 2-3

 2.6 NATIONAL HISTORIC PRESERVATION ACT 2-4

 2.7 WILD AND SCENIC RIVERS AND WILDERNESS ACTS 2-4

 2.8 FEDERAL LANDS 2-4

3.0 PROPOSED ACTION AND ALTERNATIVES 3-1

 3.1 NO-ACTION ALTERNATIVE 3-1

 3.1.1 PROJECT DESCRIPTION 3-1

 3.2 APPLICANT’S PROPOSAL 3-6

 3.2.1 PROPOSED PROJECT FACILITIES AND OPERATIONS AND
 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES 3-6

 3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY 3-15

 3.3.1 FEDERAL TAKEOVER OF PROJECT FACILITIES 3-15

 3.3.2 ISSUANCE OF NON-POWER LICENSE 3-15

 3.3.3 PROJECT DECOMMISSIONING 3-15

 3.3.4 PROPOSED PROTECTION, MITIGATION AND ENHANCEMENT
 MEASURES ELIMINATED FROM FURTHER ANALYSIS UNDER THE
 FINAL LICENSE APPLICATION 3-16

3.4	REFERENCES.....	3-18
4.0	ENVIRONMENTAL ANALYSIS.....	4-1
4.1	GENERAL DESCRIPTION OF THE RIVER BASIN	4-1
	4.1.1 TOPOGRAPHY	4-1
	4.1.2 CLIMATE	4-2
	4.1.3 MAJOR LAND USES.....	4-2
	4.1.4 ECONOMIC ACTIVITIES	4-3
	4.1.5 REFERENCES	4-4
4.2	CUMULATIVE EFFECTS	4-6
4.3	GEOLOGY AND SOILS	4-7
	4.3.1 AFFECTED ENVIRONMENT	4-7
	4.3.2 ENVIRONMENTAL EFFECTS.....	4-18
	4.3.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-23
	4.3.4 UNAVOIDABLE ADVERSE EFFECTS	4-23
	4.3.5 REFERENCES	4-24
4.4	WATER RESOURCES	4-25
	4.4.1 AFFECTED ENVIRONMENT	4-25
	4.4.2 ENVIRONMENTAL EFFECTS.....	4-32
	4.4.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-51
	4.4.4 UNAVOIDABLE ADVERSE EFFECTS	4-52
	4.4.5 REFERENCES	4-52
4.5	FISHERY RESOURCES	4-54
	4.5.1 AFFECTED ENVIRONMENT	4-54
	4.5.2 ENVIRONMENTAL EFFECTS.....	4-64
	4.5.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-71
	4.5.4 UNAVOIDABLE ADVERSE EFFECTS	4-72
	4.5.5 CUMULATIVE EFFECTS.....	4-73
	4.5.6 REFERENCES	4-73
4.6	TERRESTRIAL RESOURCES	4-76
	4.6.1 AFFECTED ENVIRONMENT	4-76
	4.6.2 ENVIRONMENTAL EFFECTS.....	4-86
	4.6.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-87
	4.6.4 UNAVOIDABLE ADVERSE EFFECTS	4-87
	4.6.5 REFERENCES	4-88
4.7	RARE, THREATENED AND ENDANGERED SPECIES	4-90
	4.7.1 AFFECTED ENVIRONMENT	4-90
	4.7.2 ENVIRONMENTAL EFFECTS.....	4-103
	4.7.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-108
	4.7.4 UNAVOIDABLE ADVERSE EFFECTS	4-109
	4.7.5 REFERENCES	4-109
4.8	RECREATION RESOURCES.....	4-115
	4.8.1 AFFECTED ENVIRONMENT	4-115
	4.8.2 ENVIRONMENTAL EFFECTS.....	4-120
	4.8.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-131
	4.8.4 UNAVOIDABLE ADVERSE EFFECTS	4-131
	4.8.5 REFERENCES	4-131
4.9	CULTURAL AND TRIBAL RESOURCES	4-133
	4.9.1 AFFECTED ENVIRONMENT	4-133
	4.9.2 ENVIRONMENTAL EFFECTS.....	4-135
	4.9.3 ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-141

TABLE OF CONTENTS (CONT'D.)

4.9.4	UNAVOIDABLE ADVERSE EFFECTS	4-141
4.9.5	REFERENCES	4-141
4.10	LAND USE AND AESTHETICS	4-143
4.10.1	AFFECTED ENVIRONMENT	4-143
4.10.2	ENVIRONMENTAL EFFECTS.....	4-148
4.10.3	ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-155
4.10.4	UNAVOIDABLE ADVERSE EFFECTS	4-155
4.10.5	REFERENCES	4-155
4.11	SOCIOECONOMIC RESOURCES.....	4-157
4.11.1	AFFECTED ENVIRONMENT	4-157
4.11.2	ENVIRONMENTAL EFFECTS.....	4-160
4.11.3	ENVIRONMENTAL EFFECTS – NO ACTION ALTERNATIVE	4-161
4.11.4	UNAVOIDABLE ADVERSE EFFECTS.....	4-162
4.11.5	REFERENCES	4-162
5.0	DEVELOPMENTAL ANALYSIS	5-1
5.1	POWER AND ECONOMIC BENEFITS	5-1
5.2	COMPARISON OF ALTERNATIVES	5-1
5.2.1	PROPOSED ACTION	5-1
5.2.2	NO ACTION ALTERNATIVE	5-2
5.3	COST OF ENVIRONMENTAL MEASURES.....	5-2
6.0	CONCLUSIONS AND RECOMMENDATIONS	6-1
6.1	COMPARISON OF ALTERNATIVES	6-1
6.2	UNAVOIDABLE ADVERSE EFFECTS	6-3
6.3	CONSISTENCY WITH COMPREHENSIVE PLANS	6-3
7.0	LIST OF CONSULTED PARTIES	7-1

LIST OF TABLES

TABLE 1-1	PUBLIC SCOPING COMMENTING ENTITY.....	1-6
TABLE 3-1	PARR MINIMUM FLOW RECOMMENDATION	3-7
TABLE 4-1	LIST OF SOILS BY TYPE, SIZE ¹ AND PERCENT SURROUNDING THE PROJECT	4-11
TABLE 4-2	EROSION AT PARR RESERVOIR IN OCTOBER 2017	4-18
TABLE 4-3	EROSION AT MONTICELLO RESERVOIR IN OCTOBER 2017	4-20
TABLE 4-4	MONTHLY MEAN, MAXIMUM AND MINIMUM DATA FOR THE U.S. GEOLOGICAL SURVEY GAGE AT ALSTON (02161000)*	4-25
TABLE 4-5	SCDHEC WATER QUALITY STANDARDS FOR FRESHWATERS	4-27
TABLE 4-6	SCDHEC NUTRIENT STANDARDS FOR WATERS IN THE PIEDMONT AND SOUTHEASTERN PLAINS ECOREGIONS ¹	4-28
TABLE 4-7	SCDHEC MONITORING STATIONS LISTED AS IMPAIRED WITHIN THE PROJECT BOUNDARY AND DOWNSTREAM OF PARR SHOALS DAM	4-29
TABLE 4-8	PARR SHOALS DAM TAILRACE TYPICAL DO EXCURSION: JULY 2010... ..	4-32
TABLE 4-9	DISSOLVED OXYGEN DATA AT USGS STATION 02160991 AND PARR SHOALS TAILRACE JULY – SEPTEMBER 2014.....	4-34
TABLE 4-10	PARR SHOALS DAM DISSOLVED OXYGEN MEASUREMENTS DURING TURBINE VENTING TESTING ¹ (MG/L).....	4-39

TABLE OF CONTENTS (CONT'D.)

TABLE 4-11	PARR SHOALS TURBINE VENTING UNIT 4 TEST – AUGUST 2016	4-40
TABLE 4-12	PARR SHOALS TAILRACE MAXIMUM AND MINIMUM DISSOLVED OXYGEN AND TEMPERATURE JUNE 15- JULY 31, 2016.....	4-40
TABLE 4-13	FISH SPECIES DOCUMENTED AT PARR AND MONTICELLO RESERVOIRS	4-55
TABLE 4-14	FISH ABUNDANCE IN THE BROAD RIVER DOWNSTREAM OF PARR SHOALS DAM, FALL 2009 THROUGH SPRING 2013	4-57
TABLE 4-15	RELATIVE ABUNDANCE OF FISH SPECIES COLLECTED BY BOAT AND BACKPACK ELECTROFISHING BELOW BOOKMAN ISLAND	4-59
TABLE 4-16	AMERICAN SHAD PASSAGE AT COLUMBIA PROJECT	4-61
TABLE 4-17	FRESHWATER MUSSELS DOCUMENTED IN PARR RESERVOIR AND BROAD RIVER	4-63
TABLE 4-18	MUSSEL SPECIES COLLECTED IN MONTICELLO RESERVOIR DURING 2015	4-66
TABLE 4-19	PARR MINIMUM FLOW RECOMMENDATION	4-68
TABLE 4-20	AVIAN SPECIES OBSERVED IN THE PROJECT VICINITY	4-81
TABLE 4-21	SEVERE EXOTIC PLANT PEST SPECIES OCCURRING IN THE PIEDMONT ECOREGION.....	4-82
TABLE 4-22	FEDERALLY LISTED AND CANDIDATE SPECIES OCCURRING IN RICHLAND, FAIRFIELD, AND NEWBERRY COUNTIES, SOUTH CAROLINA	4-91
TABLE 4-23	FEDERAL AT-RISK SPECIES WITH THE POTENTIAL OF OCCURRING IN THE PROJECT AREA.....	4-97
TABLE 4-24	STATE-LISTED SPECIES OCCURRING IN RICHLAND, FAIRFIELD AND NEWBERRY COUNTIES, SOUTH CAROLINA	4-100
TABLE 4-25	SELECTED STATE CONSERVATION PRIORITY SPECIES.....	4-102
TABLE 4-26	RECREATION FACILITIES IN FAIRFIELD AND NEWBERRY COUNTIES.....	4-116
TABLE 4-27	EXISTING PROJECT RECREATION SITE INVENTORY SUMMARY FOR MONTICELLO AND PARR RESERVOIRS	4-118
TABLE 4-28	PROPOSED PROJECT RECREATION SITE ENHANCEMENTS	4-124
TABLE 4-29	HISTORIC PROPERTIES AND POTENTIAL HISTORIC PROPERTIES WITHIN THE PARR PROJECT APE.....	4-139
TABLE 4-30	LAND USES IN FAIRFIELD COUNTY	4-143
TABLE 4-31	LAND USES IN NEWBERRY COUNTY	4-144
TABLE 4-32	PARR RESERVOIR SHORELINE MILES AND ACREAGES BY LAND USE CLASSIFICATION.....	4-150
TABLE 4-33	MONTICELLO RESERVOIR SHORELINE MILES AND ACREAGES BY LAND USE CLASSIFICATION	4-153
TABLE 4-34	POPULATION PATTERNS	4-158
TABLE 6-1:	COMPARISON OF EFFECTS OF PROPOSED ACTION AND NO ACTION ALTERNATIVES.....	6-1
TABLE 6-2	LIST OF QUALIFYING FEDERAL AND STATE COMPREHENSIVE WATERWAY PLANS POTENTIALLY RELEVANT TO THE PROJECT AND PROJECT CONSISTENCY	6-5

LIST OF FIGURES

FIGURE 1-1	PROJECT LOCATION MAP	1-2
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TABLE OF CONTENTS (CONT'D.)

FIGURE 4-1	GENERAL TOPOGRAPHY SURROUNDING THE PROJECT.....	4-2
FIGURE 4-2	PHYSIOGRAPHIC REGIONS AND ECOREGIONS SURROUNDING THE PROJECT	4-8
FIGURE 4-3	GENERAL GEOLOGY SURROUNDING THE PROJECT	4-9
FIGURE 4-4	SOILS SURROUNDING THE PROJECT AREA OF INTEREST	4-16
FIGURE 4-5	REPRESENTATIVE SLOPE RATINGS WITHIN THE PROJECT AREA OF INTEREST	4-17
FIGURE 4-6	EROSION AT PARR RESERVOIR IN OCTOBER 2017	4-19
FIGURE 4-7	EROSION AT MONTICELLO RESERVOIR IN OCTOBER 2017	4-21
FIGURE 4-8	SCDHEC MONITORING STATIONS WITHIN THE PROJECT BOUNDARY AT PARR RESERVOIR	4-30
FIGURE 4-9	PARR SHOALS DAM FOREBAY DISSOLVED OXYGEN	4-36
FIGURE 4-10	PARR SHOALS TAILRACE DO AND TEMPERATURE JUNE 15 – JULY 31, 2016.....	4-40
FIGURE 4-11	PARR SHOALS DOWNSTREAM WATER QUALITY MONITORING SITES....	4-42
FIGURE 4-12	PARR SHOALS DOWNSTREAM WEST CHANNEL WATER QUALITY FOR AUGUST 2015.....	4-43
FIGURE 4-13	PARR SHOALS DOWNSTREAM EAST CHANNEL WATER QUALITY FOR AUGUST 2015.....	4-43
FIGURE 4-14	UPPER WEST CHANNEL DO – AUGUST 2015 AND 2016	4-44
FIGURE 4-15	PARR SHOALS DOWNSTREAM UPPER WEST CHANNEL MONITORING SITES - 2016.....	4-46
FIGURE 4-16	PARR SHOALS DOWNSTREAM LOWER WEST CHANNEL MONITORING SITES - 2016.....	4-47
FIGURE 4-17	MIDDLE WEST CHANNEL DISSOLVED OXYGEN – AUGUST 2015 AND 2016	4-48
FIGURE 4-18	LOWER WEST CHANNEL DISSOLVED OXYGEN – AUGUST 2015 AND 2016.....	4-49
FIGURE 4-19	PROJECT VICINITY WETLAND HABITAT	4-79
FIGURE 4-20	BROAD RIVER WATERFOWL MANAGEMENT AREA.....	4-84
FIGURE 4-21	ENOREE RIVER WATERFOWL MANAGEMENT AREA.....	4-85
FIGURE 4-22	EXISTING & PROPOSED RECREATION FACILITIES AT THE PROJECT....	4-126
FIGURE 4-23	POTENTIAL POINTS OF NAVIGATIONAL CONSTRICTION.....	4-129
FIGURE 4-24	PARR PROJECT AREA OF POTENTIAL EFFECT	4-134
FIGURE 4-25	LAND USE MAP OF PROJECT	4-145
FIGURE 4-26	SHORELINE CLASSIFICATIONS MAP FOR PARR RESERVOIR.....	4-151
FIGURE 4-27	SHORELINE CLASSIFICATIONS MAP FOR MONTICELLO RESERVOIR	4-154

LIST OF PHOTOS

PHOTO 4-1	PARR SHOALS DAM PIPING FOR VACUUM BREAKERS IN HEADCOVER..	4-37
PHOTO 4-2	PARR SHOALS DAM TURBINE DISCHARGE WITH VENTS OPEN	4-38

LIST OF APPENDICES

EXHIBIT E-1	STAKEHOLDER CONSULTATION AND CORRESPONDENCE
EXHIBIT E-2	OPERATIONS – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-3	GEOLOGY AND SOILS – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-4	WATER RESOURCES – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-5	FISHERIES RESOURCES – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-6	TERRESTRIAL RESOURCES – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-7	RARE, THREATENED AND ENDANGERED SPECIES – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-8	RECREATION RESOURCES – STUDY PLANS, REPORTS AND PM&E PLANS
EXHIBIT E-9	CULTURAL RESOURCES – STUDY PLANS, REPORTS AND PM&E PLANS (PRIVILEGED)
EXHIBIT E-10	LAND USE AND AESTHETICS – STUDY PLANS, REPORTS AND PM&E PLANS

EXECUTIVE SUMMARY

South Carolina Electric & Gas Company (SCE&G) (Licensee or Applicant) proposes to continue to operate the existing 526.08-megawatt (MW) Parr Hydroelectric Project, Federal Energy Regulatory Commission (FERC) No. 1894 (Project) located on the Broad River near the Town of Jenkinsville in Fairfield and Newberry counties, South Carolina. The Project includes the 14.88 MW Parr Shoals Development (Parr Development) and the 511.2 MW Fairfield Pumped Storage Development (Fairfield Development). The Parr Development operates in a modified run-of-river mode, and generates using available inflows up to the maximum station hydraulic capacity of 4,800 cubic feet per second (cfs). The Fairfield Development operates in a peaking mode, and as a reserve generation asset when it is not being used to meet peak demand, providing important regulating services within the Licensee's own system and within the interconnected regional transmission system. The project boundary currently encompasses 162.61 acres of federal land owned by the United States Forest Service (USFS).

PROPOSED ACTION

The Project consists of the Parr Development, which includes (1) an approximately 4,250 acre impoundment (Parr Reservoir) that serves as the lower reservoir for the pumped storage facility, (2) generating facilities within the Parr Development powerhouse, (3) Parr Shoals Dam, and (4) transmission and appurtenant facilities; and the Fairfield Development, which includes (1) an approximately 6,600 acre impoundment (Monticello Reservoir) that serves as the upper reservoir for the pumped storage facility, (2) pumping and generating facilities contained within the Fairfield Development powerhouse, (3) four earthen dams, (4) an intake channel, (5) a gated intake structure, (6) four surface penstocks that bifurcate into eight concrete-encased penstocks, and (7) appurtenant facilities. The Project, therefore, is operated both as a modified run-of-river and a pumped storage project. During the period of the new license, SCE&G plans to upgrade the existing generators or install new generators of increased capacity. Details on the generator upgrades and associated capacity increase are included in Section 3.2. In addition to these changes, SCE&G is proposing the following Protection, Mitigation and Enhancement (PM&E) Measures.

1. Revised downstream minimum flows, the purpose of which is to address aquatic species/habitat, fish passage, and navigational needs. This will be accomplished through implementation of the Minimum Flows Downstream of Parr Shoals Dam Adaptive Management Plan (AMP) developed by SCE&G in consultation with stakeholders.
2. Reduced downstream flow fluctuations during spring spawning periods via reductions in the mean deviation of inflows. This will be accomplished through implementation of the Flow Fluctuations Downstream of Parr Shoals Dam AMP developed by SCE&G which outlines the actions proposed for stabilizing downstream flows during spring spawning periods.
3. Reduced downstream flow fluctuations year-round through the following measures:
 - a. Reduce excess inventory releases volumes or release excess inventory through reduced volumes released over longer periods of time.
 - b. Install a remote control camera on the west abutment of Parr Shoals Dam to facilitate system control operators determinations when the plant is not manned, of whether conditions are such as to be safe for raising or lowering crest gates 1 and 2.
 - c. Allow operation of those crest gates viewable by the camera as described above, by the system control operators, thereby facilitating required adjustments in gate settings based on changes in inflows or reservoir levels when the plant is not manned.
 - d. Modify or replace the generators at the Parr Development so as to allow the turbines to operate at their original designed hydraulic capacity and potentially reduce the frequency of spillage at Parr Shoals Dam. All generators will be upgraded or replaced by the end of the tenth calendar year following the year of License issuance as described in the Generator Upgrade Implementation Plan.
 - e. In addition, SCE&G developed the Flow Fluctuations Downstream of Parr Shoals Dam AMP that outlines the proposed actions that will be implemented for stabilizing downstream flow year-round during the term of the new license.
4. Increased dissolved oxygen (DO) levels downstream of the Parr Shoals Dam in the west channel area. SCE&G developed the Enhancements to the West Channel

Downstream of Parr Shoals Dam AMP (“West Channel AMP”) that includes proposed actions that will be implemented to improve water quality during the term of the new license.

5. Implementation of the Turbine Venting Plan, where turbines will be vented from June 15-August 31 in an effort to increase DO levels downstream of the dam in the tailrace area.
6. Implementation of the Historic Properties Management Plan and Programmatic Agreement.
7. Preparation of cultural resources educational material/signage, which will be maintained on SCE&G’s website and placed in publicly accessible areas around the Project. Stabilization/mitigation for one additional archaeological site.
8. Implementation of the new Parr and Monticello Shoreline Management Plans.
9. Installation of fish habitat enhancements in Monticello Reservoir, to provide enhanced fish production and recreational fishing in Monticello Reservoir, as described in the Monticello Reservoir Fisheries Habitat Enhancement Plan.
10. Implementation of the American Eel Abundance Monitoring Plan.
11. Implementation of the Hydroacoustic Estimates and Distribution of Fish in Monticello and Parr Reservoirs in August 2017 - PM&E Recommendation.
12. Implementation of the Freshwater Mussel Monitoring Plan.
13. Establishment of the Habitat Enhancement Program (HEP) for the purpose of restoring, enhancing, and protecting aquatic, wetland and riparian habitats and the associated natural resources of the project area and portions of the Broad, Saluda, and Congaree River watersheds.
14. Implementation of the Recreation Management Plan (RMP) that includes project recreational facilities enhancements at five existing sites and the addition of three recreational sites with facilities and formal designation of the new canoe portage at Parr Shoals Dam.

15. Continue efforts already in place, including:
- a. Erosion monitoring and control, through implementation of the Erosion Monitoring Plan.
 - b. Recreation site monitoring and maintenance.
 - c. Participation in the Santee River Basin Accord¹ for Diadromous Fish Protection, Restoration and Enhancement Program (Accord).

PUBLIC INVOLVEMENT

Before filing the final license application, SCE&G conducted pre-filing consultation processes under the Traditional Licensing Process (TLP). A Pre-Application Document (PAD) was filed and provided to agencies and stakeholders in January 2015. A Joint Agency Meeting (JAM) was conducted on April 14, 2015. SCE&G filed the Draft License Application (DLA) on May 31, 2017. SCE&G has hosted numerous study plan and study report meetings with Resource Conservation Groups and Technical Working Committees, beginning in 2013 and continuing through the present date. A detailed listing of public involvement is provided in Section 1.3, and meeting notes from the various study plan and study report meetings are included in Exhibit E-1.

PROJECT EFFECTS

Resources potentially affected by the proposed action are summarized below:

Geology and Soils – Under the Licensee’s proposal, geology and soils would not be materially affected. There may be minor ground disturbances during implementation of the Monticello Reservoir Fish Habitat Enhancements, and installation of the proposed recreation enhancements. Erosion monitoring and control will continue during the term of the new license as specified in the proposed Erosion Monitoring Plan.

Water Resources and Water Quality – Implementation of the Enhancements to the West Channel Downstream of Parr Shoals Dam AMP, likely will result in modification to an existing rock channel on the northern end of Hampton Island to provide flows in the west channel downstream of Parr Dam. This, plus the implementation of the Turbine Venting

¹ The Accord is an agreement among South Carolina Electric & Gas, Duke Energy Carolinas, LLC, South Carolina Department of Natural Resources, North Carolina Wildlife Resources Commission, and the US Fish and Wildlife Service for the protection, restoration, and enhancement of diadromous fish in the Santee River Basin. The Accord is discussed further in Section 3.2.1.

Plan will likely result in higher DO levels in the “west channel” and tailrace areas downstream of the Project.

Fishery – The Licensee’s proposal to install the Monticello Reservoir Fish Habitat Enhancements likely will increase fish production in the Monticello Reservoir. Downstream flow fluctuation modifications and new minimum flows AMP will also have a positive effect on fisheries downstream of the Project.

Terrestrial – Under the Licensee’s proposal, terrestrial resources would be largely unaffected.

Rare, Threatened and Endangered Species – Under the Licensee’s proposal, rare, threatened and endangered (RTE) species should not be affected.

Recreation – Under the Licensee’s proposal included in the RMP, the public would have increased access to the Broad River and improved downstream canoeing/kayaking opportunities resulting from the development of a canoe portage at the Parr Shoals Dam. The public also will have improved recreational experiences because of recreation enhancements proposed at many of the existing public access sites throughout the Project. Recreational fishing will be improved on Monticello Reservoir because of fish habitat enhancements.

Shoreline Management – Under the Licensee’s proposal, improvements to the management of reservoir shorelines and education of adjacent owners will occur through the implementation of the new Parr Reservoir Shoreline Management Plan and the new Monticello Reservoir Shoreline Management Plan.

Cultural – Implementation of the Licensee’s proposed Historic Properties Management Plan should improve protections for and awareness of cultural and historic resources.

Socioeconomics – The Licensee’s proposal for increased recreational opportunities through the implementation of the canoe portage and other recreation enhancements will support the potential for increased tourism in the project area and thereby benefit socioeconomic resources.

Under a no action alternative, environmental conditions would remain as they have been, with no enhancement of environmental resources.

**PARR HYDROELECTRIC PROJECT
FERC No. 1894**

**APPLICATION FOR NEW LICENSE
FOR MAJOR PROJECT – EXISTING DAM**

**EXHIBIT E
ENVIRONMENTAL EXHIBIT**

1.0 INTRODUCTION

1.1 APPLICATION

This application is for a new license for the existing Parr Hydroelectric Project, Federal Energy Regulatory Commission (FERC) No. 1894 (Project), which includes the 14.88-megawatt (MW) Parr Shoals Development (Parr Development) and the 511.2-MW Fairfield Pumped Storage Development (Fairfield Development) (Figure 1-1). South Carolina Electric & Gas Company (SCE&G) (Licensee or Applicant) proposes to continue to operate the existing Project, located on the Broad River in Fairfield and Newberry counties, South Carolina. The existing project license was issued by FERC on August 28, 1974 for a period of 46 years, terminating on June 30, 2020. This Exhibit, as part of SCE&G's application for a new license, has been structured to follow the form of an Environmental Assessment (EA) to aid in FERC's environmental review process.

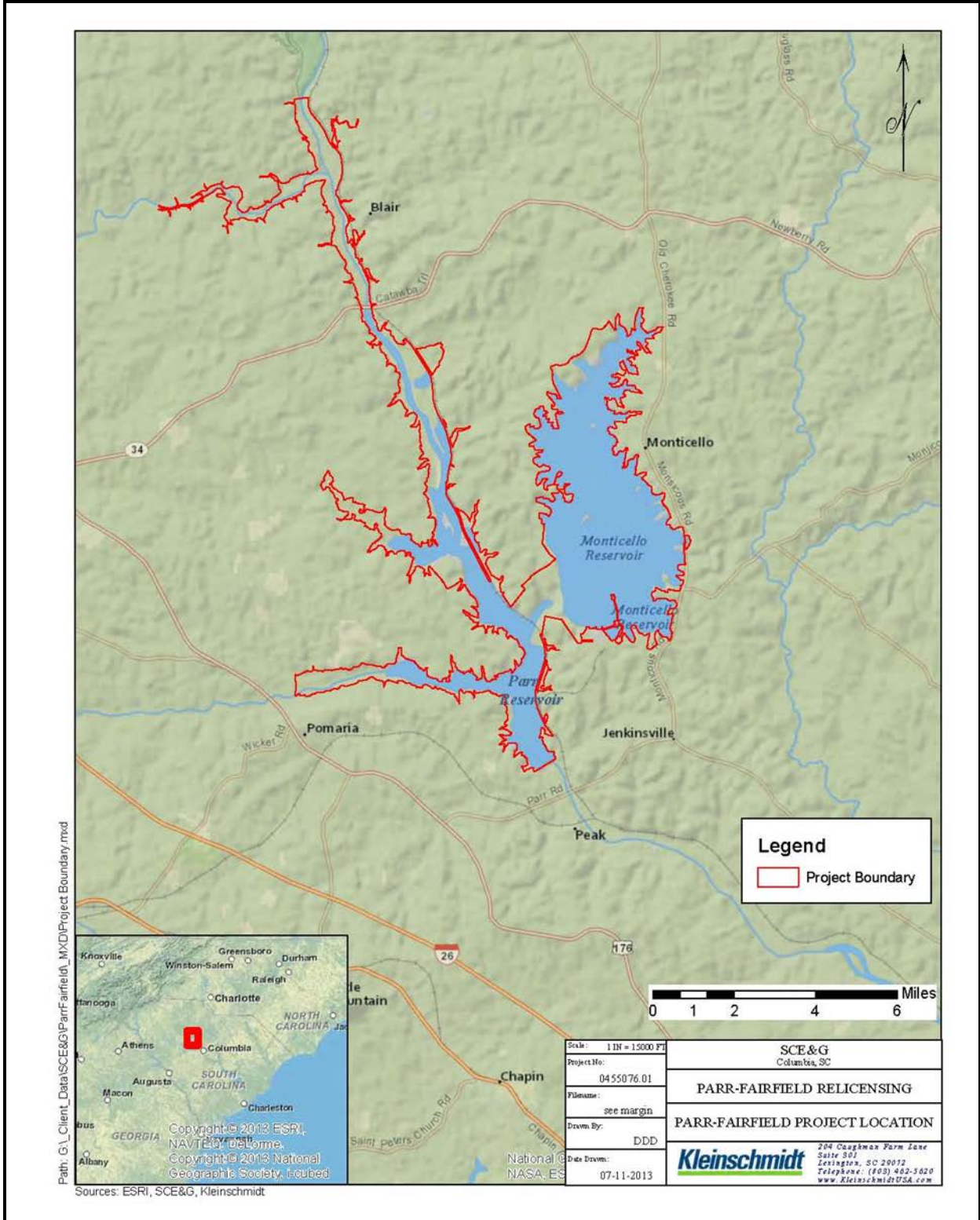


FIGURE 1-1 PROJECT LOCATION MAP

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The FERC must decide whether to issue a license to the Licensee for continued operation of the Project and what conditions should be in place should a license be issued. When deciding whether to issue a license for a hydroelectric project, FERC must determine that, as proposed in Licensee's application, the Project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, FERC must give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife, the protection of recreational opportunities and the preservation of other aspects of environmental quality. Issuing a new license for the Project would allow the Licensee to generate electricity for the term of the new license, making electric power from a renewable resource available to SCE&G customers. This Environmental Report assesses the environmental and economic effects associated with continued operation of the Project with proposed protection, mitigation and enhancement (PM&E) measures, and makes recommendations to FERC on conditions to be included in the new license. This Environmental Report considers the effects of the no-action alternative. Important issues that are addressed include minimum flows; water quality; rare, threatened and endangered species (RTE); recreation access; and fish resources.

1.2.2 Need for Power

The Project includes a run-of-river generating facility at the Parr Development and a pumped storage facility at the Fairfield Development. The Fairfield Development provides pumped storage generation during periods of peak electricity demand and acts as a load on the system during non-peak periods. Parr Development has an installed capacity of 14.88-MW and Fairfield Development has an installed capacity of 511.2-MW. The Project's dependable capacity estimate is based on the Fairfield Development, since low-inflow conditions diminish the contributions of the Parr Development. The dependable capacity of the Project is the capacity of Fairfield Development at the minimum head, 511.2-MW, which occurs at the end of a full generating cycle. As shown in Exhibit B-1, from 2000 through 2017, average annual gross generation was 55,893 megawatts per hour (MWH) for the Parr Development and

660,582 MWH for the Fairfield Development. During this time, the Fairfield Development accounted for over 90 percent of the Project's total gross generation.

In addition to meeting peak energy needs, the Project's ability to use base load electricity during periods of low demand for pumping operations provides important grid stabilization benefits to SCE&G. Likewise, the Fairfield Development is often relied on as a reserve asset, as units can be started and brought to full load within 15 minutes. Because of this, the Licensee has a very short response time to emergencies within the Licensee's system. This also helps fulfill the Licensee's reserve share obligation as a member of the Virginia-Carolinas Electric Reliability Council (VACAR) under the VACAR Reserve Sharing Agreement (VRSA).

1.3 PUBLIC REVIEW AND COMMENT

Section 16.8 of the FERC regulations (18 Code of Federal Regulation [CFR] § 16.8) requires that applicants consult with appropriate resource agencies, tribes and other entities before filing an application for a new license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be complete and documented according to FERC regulations. A list of names and addresses of every federal, state, and interstate resource agency, Indian tribe, non-governmental organization (NGO), and individual, unaffiliated member of the public with which the Licensee consulted in preparation of this document is provided in Section 7.0. SCE&G's actions with respect to each stage of consultation are discussed in greater detail in the subsequent paragraphs.

1.3.1 Initial Issues Scoping

Prior to the issuance of the Pre-Application Document (PAD), SCE&G formed Resource Conservation Groups (RCGs) and Technical Working Committees (TWCs) with representatives from federal and state agencies, NGOs, and interested, non-affiliated members of the public. Three RCGs were created: the Water Quality, Fish and Wildlife RCG; Recreation and Lake and Land Management RCG; and the Operations RCG. Also created were six TWCs: Fisheries TWC; Instream Flows TWC; RTE TWC; Water Quality TWC; Lake and Land Management TWC; and Recreation TWC. The RCGs and TWCs met on a regular basis prior to and throughout all three stages of consultation, to identify and discuss project issues and to develop recommendations for addressing and resolving these issues (meeting

notes are included in Exhibit E-1). In consultation with the RCGs and TWCs, SCE&G developed study plans to perform the following studies and management plans:

- Water Quality in Downstream West Channel Study
- Monticello Reservoir Freshwater Mussel Reconnaissance Survey Study
- Reservoir Fluctuation Study
- Instream Flow Study
- Desktop Fish Entrainment Study
- American Eel Abundance Study
- Monticello Reservoir and Parr Reservoir Waterfowl Survey Study
- Rare, Threatened and Endangered Species Study
- Rocky Shoals Spider Lily Study
- Broad River Spiny Crayfish Study
- Recreation Use and Needs Study
- Downstream Recreational Flow Assessment Study
- Downstream Navigational Flow Assessment Study
- Hydraulic and Project Operations Model Study
- Parr Shoreline Management Plan (SMP)
- Monticello Shoreline Management Plan

Study and management plans were distributed with the PAD on January 5, 2015, as discussed below.

1.3.2 First-Stage Consultation

On January 5, 2015, SCE&G filed a Notice of Intent (NOI) to relicense the Project, filed the PAD and requested that it be approved to use the Traditional Licensing Process (TLP). Additionally, SCE&G published public notice of its filing of the NOI and PAD and request to use the TLP in the *Newberry Observer* and *Herald Independent* on December 26, 2014 and *The State* on January 14, 2015. Comments on the request to use the TLP were due to FERC within 30 days of the PAD filing, making them due on or before February 4, 2015. FERC approved SCE&G's request to use the TLP on February 20, 2015. In accordance with deadlines set by FERC, SCE&G held the JAM and site visit on April 14, 2015 at two times, 2:00 pm and 6:00 pm, to accommodate as many people as possible. Notice of the JAM was published in *The State*, the *Newberry Observer*, and the *Herald Independent*, on

March 22, 2015, March 25, 2015, and March 27, 2015 respectively. FERC was notified of this meeting on March 20, 2015. A court reporter recorded all comments and statements made at the two JAM meetings, and these comments are part of the FERC’s public record for the Project. In addition to comments provided at the JAM, the following entities provided written comments:

TABLE 1-1 PUBLIC SCOPING COMMENTING ENTITY

COMMENTING ENTITY	DATE FILED
Mr. William B. Hendrix, Jr.	June 9, 2015
USFWS	June 15, 2015
SCDNR	June 15, 2015
NMFS	June 15, 2015

Key: USFWS U.S. Fish and Wildlife Service
 SCDNR South Carolina Department of Natural Resources
 NMFS National Marine Fisheries Service

1.3.3 Second-Stage Consultation

Resource studies were performed in 2015, 2016 and 2017 per agreed-upon study plans. Study results were distributed to consulting parties upon completion of each study, as specified in the study plan, and discussed during RCG and TWC meetings (meeting notes included in Exhibit E-1). Study results were also included in the Draft License Application (DLA) and are discussed in Section 4.0 Environmental Analysis.

The DLA was submitted to consulting parties for review on May 31, 2017 and written comments were due within 90 days, i.e. on or before August 29, 2017. Comments on the DLA were received from the following entities:

- South Carolina Department of Natural Resources (SCDNR)
- U.S. Fish and Wildlife Service (USFWS)
- National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS)
- U.S. Forest Service (USFS)
- Cherokee Nation

1.3.4 Third-Stage Consultation

The third stage of the TLP was initiated by SCE&G through the filing of this Final License Application (FLA) with FERC. All study and information requests received in response to the

Section 1

PAD and DLA are summarized in Exhibit E-1–Relicensing Comment Response Matrix and addressed within this FLA, as appropriate.

Section 7.0 identifies stakeholders that SCE&G consulted with during resource issue scoping, study plan development, and preparation of the license application. Exhibit E-1 provides consultation documentation from the relicensing process, including development and filing of draft and revised study plans and notes from stakeholder meetings.

2.0 STATUTORY AND REGULATORY REQUIREMENTS

SCE&G, as Licensee for the Project, is subject to the requirements of the Federal Power Act (FPA) and other applicable statutes. The major regulatory and statutory requirements are summarized below.

2.1 FEDERAL POWER ACT

2.1.1 Section 18 Fishway Prescriptions

Under Section 18 of the FPA, the USFWS and the NMFS have the authority to prescribe fishways at federally regulated hydropower projects. Currently, no preliminary prescriptions have been filed by either agency. USFWS is a member of the Accord² and has agreed that a Fish Passage Feasibility Assessment (an evaluation of the upstream and downstream passage alternatives and their conceptual designs) will be conducted pursuant to the Accord, by SCE&G, and will commence upon attainment of the biological triggers as required in the Accord.

2.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by FERC for a project within a federal reservation shall contain and be subject to such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. The Project currently encompasses 162.61 acres of federal land administered by the USFS. SCE&G has been in consultation with the USFS throughout the process and has provided preliminary 4(e) conditions in response to the filing of the DLA, which are included in Exhibit E-1. SCE&G has been in consultation with the USFS regarding these preliminary conditions.

2.1.3 Section 10(j) Recommendations

Under Section 10(j) of the FPA, FERC must consider recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation or enhancement of fish and

² The Accord is an agreement among SCE&G, Duke Energy Carolinas, LLC, SCDNR, North Carolina Wildlife Resources Commission (NCWRC), and the USFWS for the protection, restoration, and enhancement of diadromous fish in the Santee River Basin. The Accord is discussed further in Section 3.2.1.

wildlife resources affected by the Project prior to issuing the new license. FERC will include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Currently, no preliminary 10(j) recommendations have been provided for inclusion in this Environmental Report. Moreover, SCE&G is working towards the development of a Comprehensive Relicensing Settlement Agreement (CRSA) to be filed with the FLA. The CRSA will address potential project effects upon fish and wildlife resources through the implementation of PM&E measures.

2.2 CLEAN WATER ACT – SECTION 401

The Licensee is required to seek and secure Water Quality Certification under Section 401(a)(1) of the federal Clean Water Act (CWA) of 1977. The South Carolina Department of Health and Environmental Control (SCDHEC) establishes water quality standards consistent with South Carolina Code Section 48-1-10 et seq. Per CFR § 4.34(b)(5)(i), SCE&G will file an application for 401 Water Quality Certification within 60 days of FERC's notice of ready for environmental analysis.

2.3 ENDANGERED SPECIES ACT

Under provisions of Section 7(a)(2) of the ESA, a federal agency that authorizes, permits, or carries out environmentally impactful activities must consult with the USFWS and/or NMFS to ensure that such actions will not jeopardize the continued existence of any listed species. A federal agency is required to consult USFWS and/or NMFS if an action “may affect” listed species or designated critical habitat, even if the effects are expected to be beneficial. A “may affect” determination includes actions that are “not likely to adversely affect,” as well as “likely to adversely affect” listed species. If the action is “not likely to adversely affect” listed species (i.e., the effects are beneficial, insignificant, or discountable), and the USFWS and/or NMFS agree with that determination, the USFWS and/or NMFS may provide concurrence in writing and no further consultation is required. If the action is “likely to adversely affect” listed species, then the federal action agency must request initiation of formal consultation. This request is made in writing to the USFWS and/or NMFS, and must include a complete initiation package. Formal consultation concludes with the USFWS and/or NMFS issuing a biological opinion to the federal action agency.

On January 5, 2015, with the filing of the NOI, SCE&G requested that FERC designate it as the non-federal representative for purposes of consultation under Section 7 of the ESA. On

February 20, 2015, FERC granted this request. Currently, there are no federally threatened and endangered species known to occur within the project boundary. Federally threatened and endangered species known to occur within the two counties where the Project is located and one additional county that is influenced by the Project are discussed in Section 4.7 RTE Species. SCE&G will consult with the USFWS and NMFS on any potential effects to these species.

2.4 MAGNUSON-STEVEN'S FISHERY CONSERVATION AND MANAGEMENT ACT

This act is the primary law governing marine fisheries management in United States federal waters. First passed in 1976, the Magnuson-Stevens Act fosters long-term biological and economic sustainability of our nation's marine fisheries extending to 200 nautical miles from shore. The Magnuson-Stevens Act requires the eight regional Fishery Management Councils, in collaboration with NOAA, consider Essential Fish Habitat (EFH) in resource management decisions. Congress defines EFH as "those waters and substrates necessary to fish for spawning, breeding, feeding or growth and maturity." The designation and consideration of EFH seeks to minimize adverse effects on habitat caused by fishing and non-fishing activities.

In their comments on the DLA, NMFS indicated that the project area does not contain EFH, and that project influences are unlikely to extend downstream to estuarine waters where EFH occurs. Accordingly, SCE&G believes that EFH consultation pursuant to Section 305(b) of the Magnuson-Stevens Act is not required for this relicensing.

2.5 COASTAL ZONE MANAGEMENT ACT

Pursuant to Section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. Section 1456(3)(A), FERC must receive concurrence from the state CZMA agency that the Project is not within or affecting the state's coastal zone prior to issuing a license for the Project.

The Project is not located within a Coastal Zone, however the Licensee submitted a CZMA consistency determination letter to SCDHEC on March 9, 2017. SCDHEC replied on March 16, 2017, informing SCE&G that the project relicensing will not cause spillover effects to coastal resources, because the Project is located outside of South Carolina's Coastal Zone. Both letters are included in Exhibit E-1.

2.6 NATIONAL HISTORIC PRESERVATION ACT

The NHPA (Public Law 89-665; 16 U.S.C. § 470 et seq.) is legislation intended to preserve historical and archaeological sites in the United States of America. Section 106 of the NHPA and its implementing regulation (35 C.F.R. Part 800) require federal agencies to consider the effect of any proposed undertaking on properties listed or eligible for listing in the National Register of Historic Places (NRHP). If an agency determines that an undertaking may have adverse effects on properties listed or eligible for listing in the NRHP, the agency must afford an opportunity for the Advisory Council on Historic Preservation (ACHP) to comment on the undertaking.

On February 20, 2015, FERC designated SCE&G as the non-federal representative for informal consultation regarding Section 106 of the NHPA. SCE&G has completed the process of coordinating with the South Carolina State Historic Preservation Officer (SHPO) relative to the Project, as detailed in Section 4.9.

2.7 WILD AND SCENIC RIVERS AND WILDERNESS ACTS

The Wild and Scenic Rivers Act was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The Wilderness Act of 1964 (Public Law 88-577; 16 U.S.C. 23 et seq.) created the National Wilderness Preservation System. It also defined wilderness as “an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain” and “an area of undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions.”

There are no rivers designated under the Federal Wild and Scenic Rivers Act within the project boundary. Furthermore, the Project is not located on or adjacent to nor will it affect any areas designated under the Wilderness Act of 1964.

2.8 FEDERAL LANDS

The Project encompasses 162.61 acres of land owned by the USFS. The Licensee has flowage rights subject to a FPA section 24 reservation for the use of USFS land within the Project, and pays annual charges for that use.

3.0 PROPOSED ACTION AND ALTERNATIVES

3.1 NO-ACTION ALTERNATIVE

The no-action alternative is the baseline from which to compare the proposed action and all action alternatives that are assessed within this document. Under the no-action alternative, the Project would continue to operate under the terms and conditions of the current license.

The Project is more thoroughly described in Exhibit A of this FLA. However, a brief description of the Project is provided below as a reference for later discussions.

3.1.1 Project Description

The Project is located in Newberry and Fairfield counties, South Carolina, on the Broad River, approximately 26-river-miles upstream from the City of Columbia, South Carolina (Figure 1-1). The FERC project boundary is depicted in the Exhibit G drawings.

The Project includes the existing Parr Development, which consists of a powerhouse with six generators, a 2,390-foot-long dam (including spillway and non-overflow sections), a 4,400-acre reservoir, and transmission and appurtenant facilities. The Project also includes the existing Fairfield Development, which is composed of a 6,800-acre reservoir, four earthen dams, an intake channel, a gated intake structure, four surface penstocks bifurcating into eight concrete-encased penstocks, a generating station housing eight pump-turbine units and transmission and appurtenant facilities.

3.1.1.1 Powerhouses, Dams, Spillways and Penstocks

Parr Development

Parr Shoals Dam is situated across the Broad River, oriented in a northeast-southwest direction, and consists of the northeast non-overflow section and integral powerhouse, the gated spillway, and the southwest non-overflow embankment.

The northeast non-overflow section is a 90-foot-long concrete gravity structure with a crest elevation of 270.4³ feet. The adjacent powerhouse is concrete with a steel-framed

³ Unless otherwise noted, all elevation references in this Exhibit are referenced to the North American Vertical Datum of 1988 (NAVD 88); conversion to National Geodetic Vertical Datum of 1929 (NGVD29), used in numerous

superstructure, and is approximately 60-feet-wide by 300-feet-long. The powerhouse substructure has an integral intake with eight primary turbine bays and two smaller bays cast into the concrete. Six turbine-generator units occupy the primary bays, and the two bays nearest the shore are empty. The two smaller bays contain turbine-generators for excitation of the primary generators, but those are no longer required and have been abandoned in place. A trash raking system mounted on the intake deck is used to clean debris from the forebay area and the trashracks.

At the southwest end of the powerhouse, the gated spillway section of the dam extends for 2,000 feet across the river. Six abandoned sluice gate bays occupy the 112-foot section adjacent to the powerhouse; two sluice gates have been filled with concrete, while sedimentation in the impoundment prevents the use of the other four. The spillway dam is a concrete gravity structure approximately 37 feet high, with a permanent crest elevation (El.) of 256.3 feet. Ten bottom-hinged bascule gates mounted on the crest of the dam are used to raise the impoundment to El. 265.3 feet.

The non-overflow earthen embankment with crest El. 271.4 feet is located at the southwest end of the spillway and extends approximately 300 feet to the southwest abutment. A concrete wing-wall retains the embankment, separating it from the adjacent spillway section.

Fairfield Development

The Fairfield Development consists of four earthen embankment dams that impound Monticello Reservoir, an intake channel and structure in the upper impoundment, four penstocks, and the Fairfield powerhouse with a tailrace channel connected to the Parr Reservoir. There are also two highway relocation embankments and a freeboard protection dike located on the reservoir perimeter.

The four dams are constructed of random fill and have crests at El. 433.3 feet. Each has an impervious blanket on the reservoir side, as well as a low permeability clay core wall. Fairfield Dam A is located on the west side of the impoundment, and has a crest length of 3,130 feet, and a maximum structural height of 85 feet. Dam B is located to the south of Dam A and is the largest of the four dams at a total length of 4,700 feet and a maximum height of 160 feet. Dam C abuts the south side of the intake structure and has a crest length of approximately

supporting studies for this license application and often erroneously referred to as mean sea level (MSL), requires the addition of 0.7 feet to elevation values referenced to NAVD88.

2,000 feet and a maximum height of 60 feet. Dam D is located just south of Dam C and has a crest length of approximately 1,300 feet and a maximum height of approximately 30 feet. All four dams have riprap protection on the upstream slopes and grassed downstream slopes.

The intake feature in the Monticello Reservoir is located between Dam B and Dam C and consists of an open-channel intake and adjacent intake structure. The concrete-lined intake channel is approximately 300-feet-long and tapers from 260-feet-wide at the mouth to 132-feet-wide at the interface with the intake structure. The reinforced concrete intake structure is 265-feet-long; the first 225 feet consist of four separate water passages that taper uniformly from the upstream trash racks down to the headgate end. The final 40-foot length of the intake is a transitional section with 26-foot-diameter, concrete water passages at the gated end leading to the top of the penstocks. The trashracks, which are connected to the intake structures, consist of 6 inches of clear space and 1-inch bars.

The four steel penstocks are 26 feet in diameter and approximately 800-feet-long and fan out horizontally as they extend down the slope to the powerhouse on the Parr Reservoir. The penstocks are above ground, and the lower 270 feet are encased in concrete. The penstocks bifurcate within the encased section of the conveyance, transitioning to a total of eight water conveyances approximately 18.5 feet in diameter, each connected to a turbine scroll case in the powerhouse.

The powerhouse is a reinforced concrete structure approximately 520-feet-long by 150-feet-wide with a total structural height of 108 feet. The powerhouse has eight bays, each 65-feet-wide and each containing one reversible pump-turbine unit. There are 16 draft tube gates at the downstream end of the elbow draft tubes, and center support piers split the draft tube exits. A 185-ton gantry crane sits over the powerhouse, outdoors and above the surrounding grade.

3.1.1.2 Upper Reservoir

Monticello Reservoir serves as the upper reservoir for the pumped storage facility. It has a surface area of approximately 6,600 acres and a gross storage of 400,000 acre-feet. The normal maximum water level in Monticello Reservoir is El. 424.3 feet, although it can fluctuate up to 4.5 feet daily as part of the pumped storage operations. An active storage of up to 29,000 acre-feet can be transferred between the Monticello Reservoir and Parr Reservoir, which acts as the lower reservoir, by the pumped storage operations.

An approximately 300-acre portion of Monticello Reservoir, known as the Recreation Lake, is separated from the main body of the reservoir by an embankment. The Recreation Lake's sole purpose is to provide recreation for the public and is not affected by the operation of the pumped storage facility and thus is maintained at a stable water level.

3.1.1.3 Lower Reservoir

Parr Reservoir has a surface area of approximately 4,250 acres and a gross storage of approximately 32,000 acre-feet. The normal maximum water level is El. 265.3 feet, although the reservoir may fluctuate up to 10 feet daily as part of the pumped storage operations. Parr Reservoir extends 15 miles upstream to the tip of Henderson Island⁴.

3.1.1.4 Project Transmission

Primary transmission lines associated with the Parr Development include the 13.8-kV tie from the hydro station to the Parr 115 kV substation, and appurtenant facilities at the existing Parr Hydroelectric Project. Primary transmission lines at the Fairfield Development include the two 230-kV lines from Fairfield powerhouse to the V.C. Summer Nuclear Station switchyard and appurtenant facilities. All other lines connected to the V.C. Summer Nuclear Station switchyard are part of the Licensee's interconnected system.

Single line drawings for the Project are included in Exhibit F, and a map of the Licensee's transmission system is included in Exhibit H. These drawings and maps are Critical Energy Infrastructure Information (CEII) and were filed as such with FERC.

3.1.1.5 Existing Project Operation

The Parr Development generates using available inflows up to the maximum station hydraulic capacity of 4,800 cubic feet per second (cfs)⁵. When inflows are below 4,800 cfs, the Parr Development's turbines are operated to meet the minimum flow requirements. The minimum flow required to be released from the Project during the months of March, April and May is the lesser of 1,000 cfs or daily average inflow (minus evaporative losses from both reservoirs). During the remainder of the year, the minimum flow requirements are 150 cfs instantaneous

⁴ Some study plans and reports reference Parr Reservoir has having a length of 13 miles. However, the correct length of the reservoir is 15 miles.

⁵ See Section 1.0 of Exhibit B.

flow and 800 cfs daily average flow, or the daily average inflow (minus evaporative losses), whichever is less.

The Fairfield Development generates and pumps using an active storage of 29,000 acre-feet. During the generation cycle, active storage in the upper Monticello Reservoir is released from the powerhouse into the lower Parr Reservoir. During the pumping cycle, all or a portion of the active storage is transferred from the Parr Reservoir back into the Monticello Reservoir. This cycle occurs daily, and the transfer of the full active storage results in an upper reservoir maximum fluctuation of 4.5 feet, and a corresponding lower reservoir fluctuation of 10 feet.

When inflows to the Project are projected to exceed 4,800 cfs, the bascule gates on the Parr Dam spillway are systematically lowered to prevent the Parr Reservoir from exceeding the maximum elevations shown in Exhibit H-6. Generation from the Fairfield Development is also partially curtailed during these conditions to prevent total project flow releases from contributing to downstream flooding. When inflows reach a threshold that causes flooding downstream of the Project, all spillway gates are fully lowered to pass natural inflows, and the Fairfield Development generation is completely suspended until flows recede. Fairfield Development pumping operations may occur with any flow in the Broad River. On the falling leg of a flood event, the gates are gradually raised to retain active storage while preventing the reservoir from exceeding the maximum elevations shown in Exhibit H-6.

3.1.1.6 Existing Environmental Measures

Per the existing license, the Licensee is required to maintain the lesser of a minimum flow of 150 cfs and a minimum daily average flow of 800 cfs, or the daily natural inflow to the Parr Reservoir (minus evaporative losses from the Parr and Monticello reservoirs), except during March, April and May. During these months, a minimum flow of the lesser of 1,000 cfs or the average daily natural inflow into the Parr Reservoir (minus evaporative losses from the Parr and Monticello reservoirs), is required to protect striped bass spawning.

The Licensee provides public access to project waters and adjacent project lands for navigation and outdoor recreational purposes. In addition, the Licensee controls project lands and waters, primarily Monticello Reservoir, through the existing SMP.

SCE&G monitors erosion of the shoreline of Parr Reservoir on an annual basis and at Monticello Reservoir on a bi-annual basis. When areas of severe erosion are noted, SCE&G

addresses the erosion by installing riprap, following United States Army Corps of Engineers (USACE) permitting procedures as required.

3.2 APPLICANT'S PROPOSAL

The following sections list project facility and operational modifications and PM&E measures that the Licensee is proposing.

3.2.1 Proposed Project Facilities and Operations and Protection, Mitigation and Enhancement Measures

3.2.1.1 Downstream Minimum Flows

Stakeholders are requesting a minimum flow at the Parr Development that considers aquatic species/habitat and fish passage needs. SCE&G conducted an Instream Flow Incremental Methodology (IFIM) study to determine what flows are needed to ensure the protection of aquatic life. SCE&G developed the Minimum Flows Downstream of Parr Shoals Dam Adaptive Management Plan (AMP) in consultation with stakeholders to address the implementation of new downstream minimum flows. The AMP includes three minimum flow periods and a series of minimum flow targets for each period. The recommendation includes a "Target Flow" and a "Compliance Limit." Because the Project is not a storage project, outflows should be related to inflow to the Project. The target flow is a minimum flow based on habitat data from the IFIM study results and the compliance limit is based on inflow exceedance values. These two items will be evaluated as part of the AMP, which is anticipated to last for the first 5 years of the new license. The AMP includes a series of low flow scenarios within each flow period that would allow for operation during low flow periods. This recommendation provides the basis for a Low Inflow Protocol.

The Minimum Flow Recommendation for the Project (Table 3-1) and the final Minimum Flows Downstream of Parr Shoals Dam AMP (Exhibit E-5) include specifics on how target flow and compliance limits would be set in relation to net inflows into the Project.

TABLE 3-1 PARR MINIMUM FLOW RECOMMENDATION

	Net Inflow (cfs)	Minimum Target Outflow (cfs)	Compliance Outflow (cfs)
High Flow Period Feb 1 – April 30	> 2300	2300	2100
	≤ 2300 and > 2200	net inflow	2100
	≤ 2200 and ≥ 600	net inflow	(net inflow minus 100 cfs) or 550 cfs whichever is greater
	< 600	net inflow	net inflow minus 50 cfs
Transitional Flow Periods Dec 1 – Jan 31; May 1 – May 31	>1500	1500	1300
	≤ 1500 and > 1400	net inflow	1300
	≤ 1400 and ≥ 600	net inflow	(net inflow minus 100 cfs) or 550 cfs whichever is greater
	< 600	net inflow	net inflow minus 50 cfs
Low Flow Period June 1 – Nov 30	> 1000	1000	900
	≤ 1000 and ≥ 600	net inflow	(net inflow minus 100 cfs) or 550 cfs whichever is greater
	< 600	net inflow	net inflow minus 50 cfs

3.2.1.2 Navigation Flows

The Recreation TWC expressed concern over the navigability of the Broad River downstream of Parr Shoals Dam. The TWC requested that a minimum flow consider flows necessary for navigation. SCE&G conducted a Downstream Navigational Flow Assessment (Exhibit E-8), where the two most constricted points of the Broad River downstream of Parr Shoals Dam were evaluated according to the state issued navigation recommendations. The results of the assessment suggested that a flow of 1,000 cfs is necessary to meet state navigation criteria at both constriction points investigated. These results were considered along with the results of the IFIM Study in developing a minimum flow recommendation for the new license. The minimum flows described above and included in the Minimum Flows Downstream of Parr Shoals Dam AMP consider navigation needs within the Project.

3.2.1.3 Downstream Flow Fluctuations

Stakeholders requested that SCE&G reduce flow fluctuations downstream of the Parr Shoals Dam associated with operation of the Fairfield Development. The stakeholders specified two types of flow fluctuation reductions: spring spawning stabilization and general, year round reductions of flow fluctuations. SCE&G developed the Flow Fluctuations Downstream of Parr Shoals Dam AMP that outlines the proposed actions for stabilizing downstream flow, as

described below. The Flow Fluctuations Downstream of Parr Shoals Dam AMP is included in Exhibit E-5.

Spring Spawning Stabilization

During the spawning periods listed below, the goal is for inflow (based on a summary of flows from the Carlisle (02156500), Tyger (02160105) and Enoree (02160700) U.S. Geological Survey [USGS] gages) to equal outflow (based on flow from the Alston (02161000) gage). The Fisheries TWC requested stabilized flow fluctuations during the following periods:

- For 14 days during the last two weeks in March (March 15-March 31) for flow stabilization for shortnose sturgeon in the Congaree River.
- For two 7-day blocks (during April 1 through May 10, to be determined annually by the AMP Review Committee) for flow stabilization for numerous species including striped bass, American shad, and robust redhorse.

Specifics on how stabilization will be accomplished are included in the Flow Fluctuations Downstream of Parr Shoals Dam AMP (Exhibit E-5).

General Year-Round Flow Fluctuation Reductions

SCE&G will take the following measures to achieve the goal of reducing fluctuations in downstream flow due to project operations:

- System controllers will more closely monitor the water inventory in Parr Reservoir to release spills over a longer period and use multiple sets of gates to provide lower flow “spikes”. This inventory management will be implemented by the end of the first calendar year following the year of License issuance.
- Install a remote control camera on the west abutment of Parr Shoals Dam to allow system control operators to determine if conditions are safe to raise or lower the crest gates when the plant is not manned. Also, install controls to allow system controllers the ability to operate the crest gates based on changes in inflow or reservoir level. This will be implemented by the end of the second calendar year following the year of License issuance.
- Modify or replace the generators at the Parr Development to allow the turbines to operate at their original designed hydraulic capacity and potentially reduce the frequency of spillage at Parr Shoals Dam. All generators will be upgraded or replaced

by the end of the tenth calendar year following the year of License issuance, per the Upgrade/Replacement of Generators at Parr Shoals Development Implementation Plan.

3.2.1.4 Parr Shoals Dam Generator Upgrades

Over time, the equipment at the Parr Development has become less efficient at controlling project flows. As set forth in the “Upgrade/Replacement of Generators at Parr Shoals Development Implementation Plan” included in Exhibit E-2, SCE&G is proposing an upgrade on the generators to ensure they can pass flows up to at least 6,000 cfs.

3.2.1.5 West Channel Water Quality Improvement

Stakeholders expressed concern about potential low DO levels downstream of Parr Shoals Dam in the west channel area. SCE&G developed the Enhancements to the West Channel Downstream of Parr Shoals Dam AMP in consultation with stakeholders to address this issue (Exhibit E-4). As part of the AMP, SCE&G has identified several measures to increase DO levels in the west channel to be implemented during the period of the new operating license. These measures are listed below.

- The AMP Review Committee will determine an approximate target flow that it believes will adequately maintain DO levels in the west channel. Target flows of between 50 to 200 cfs have been discussed during the development of the AMP.
- The implementation of new instantaneous minimum flows for the Project should result in a more consistent amount of water flowing into the west channel from the east channel, compared to the previous license requirement of daily average minimum flows. Monitoring during initial implementation of these minimum flows will determine the extent of the benefits to the west channel DO levels.
- If the AMP Review Committee determines that new instantaneous minimum flows will not provide a sufficient flow into the west channel to maintain DO levels, it will direct efforts to physically modify existing channel(s) leading into the west channel. Once the appropriate permits are obtained, the channel will be modified to provide the identified target flow during low minimum flow periods, exclusive of low-inflow periods. Potential channel modifications could include notching or deepening of a small channel at the

north tip of Hampton Island, and/or removal of material that currently serves as a hydraulic control closer to the Parr Shoals Dam.

- If inflows to Parr Reservoir decrease to a point that outflows from the dam do not provide any flows to the west channel, SCE&G will investigate the use of spillway gates to provide periodic flow pulses to “refresh” the west channel during periods when DO levels are expected to fall below acceptable levels. During such low inflow periods, SCE&G will confer with the Review Committee to ensure that all appropriate downstream resources are considered and that releases are distributed in an appropriate, achievably balanced manner between the main channel and the west channel.
- During each year of the AMP, monitoring will be conducted from May 15 to September 30.

3.2.1.6 Turbine Venting Plan

Stakeholders expressed concern over past, and thus potential future occasional instances of DO levels below the state standard in the tailrace area downstream of Parr Shoals Dam. To address the concern about future DO levels in this area, SCE&G developed the Turbine Venting Plan (Exhibit E-4), where turbines will be vented from June 15-August 31.

3.2.1.7 Cultural Resources PMEs

As part of relicensing, SCE&G completed Phase I and Phase II studies to determine if the Project has any impact on cultural resources in the project area. As a result of these studies SCE&G is completing several PM&E measures to address cultural resources.

Historic Properties Management Plan and Programmatic Agreement

In consultation with the South Carolina SHPO, and appropriate tribes, SCE&G developed a Historic Properties Management Plan (HPMP) that includes information regarding the identification, management, and protection of historic properties located within the project area of potential effect (APE). The HPMP was filed with FERC on January 4, 2017 (Exhibit E-9). FERC initiated development of a Programmatic Agreement (PA) with SCE&G, SHPO and appropriate tribes. It has yet to be finalized.

Cultural Resources Educational Material/Signage

The Phase I study determined that the Lyles Ford site has been impacted by project operations and therefore recommended that SCE&G consult with FERC and SHPO on ways to mitigate for this adverse effect. SCE&G is currently preparing educational material/signage that will be maintained on SCE&G's website and placed in publicly accessible areas around the Parr and Fairfield developments. This information will include: 1) historical information about the Lyles family, Lyles Ford, and if appropriate, the ruins of a mill/store and a canal built and run by the Lyles family in the eighteenth/nineteenth century; and 2) historical information about the Parr and Fairfield developments. Additionally, there is one archaeological site that will either be stabilized or have the adverse effects mitigated (e.g., through data recovery excavations). This stabilization or mitigation will be completed after the new license is issued.

3.2.1.8 Parr and Monticello Shoreline Management Plans

The existing SMP primarily covers activities on Monticello Reservoir and its shoreline. The Lake and Land Management TWC determined that the existing SMP needed updating and that a separate SMP would be required for the Parr Reservoir. SCE&G developed two new SMPs, one for Monticello Reservoir and one for Parr Reservoir and plans to meet with stakeholders on a regular basis throughout the term of the new license to discuss upgrades to the SMPs that may be needed during the new license period. More information on the proposed SMPs is included in Section 4.10: Land Use and Aesthetics. The Parr and Monticello reservoir SMPs are included in Exhibit E-10.

3.2.1.9 Monticello Reservoir Fisheries Habitat Enhancement Plan

Stakeholders expressed concern over how the fluctuations of Monticello Reservoir, associated with pumped storage operations, are affecting fish populations. Specifically, SCDNR is concerned about reservoir fluctuation related impacts to littoral zones and spawning and juvenile rearing habitats, as well as any loss of fish from turbine mortality. SCE&G worked with SCDNR and other agencies to develop a plan for the installation of habitat enhancements for Monticello Reservoir. The habitat enhancement structures should result in enhanced fish production within Monticello Reservoir and possibly concentrate fish as an enhancement for recreational fishermen. Additional details on this enhancement effort can be found in the Monticello Reservoir Fisheries Habitat Enhancement Plan (Exhibit E-5).

3.2.1.10 American Eel Monitoring

During a study of American eels, conducted during relicensing, juvenile American eels were found downstream of Parr Shoals Dam. NMFS requested that additional monitoring be conducted during the term of the new license to determine if American eel presence downstream of Parr Shoals Dam is increasing. SCE&G proposes to continue periodic American eel monitoring downstream of Parr Shoals Dam, and in consultation with stakeholders, developed the American Eel Monitoring Plan (Exhibit E-5). SCE&G is proposing to conduct surveys during the first year after the new license is issued and then every 5 years thereafter (until the completion of eel passage at the Santee Cooper Project, at which time sampling will be increased to once every 3 years). During each sampling year, sampling efforts will be conducted one day each in March, April and May.

3.2.1.11 Habitat Enhancement Program

At the request of stakeholders during Comprehensive Relicensing Settlement Agreement (CRSA) negotiations, SCE&G proposes to establish a Habitat Enhancement Program (HEP) Agreement (Exhibit E-5) to restore, enhance, and protect aquatic, wetland, and riparian habitats and the associated natural resources of the Parr Hydroelectric Project area and portions of the Broad, Saluda, and Congaree river watersheds. The goal of the HEP is to fund on-the-ground conservation actions and will exist for the term of the new license and be administered by SCE&G to encourage, review, evaluate, and fund project proposals to accomplish this purpose.

3.2.1.12 Freshwater Mussel Monitoring

During relicensing efforts, the USFWS requested that SCE&G perform periodic assessments of the composition and abundance of freshwater mussel species in or adjacent to the Project throughout the course of the new license. SCE&G, in consultation with stakeholders, developed the proposed Freshwater Mussel Monitoring Plan (Exhibit E-5). SCE&G will conduct a baseline mussel survey in Monticello Reservoir and the Broad River downstream of Parr Shoals Dam during the first year after the new license is issued. A second survey will occur six years later and additional surveys will be conducted 10 years thereafter for the course of the new license term.

3.2.1.13 Fish Entrainment Protection, Mitigation and Enhancement Recommendation

At the request of the Fisheries TWC, SCE&G conducted a desktop fish entrainment and turbine mortality study as part of relicensing to determine the potential impacts of the Project on fisheries communities in Parr and Monticello reservoirs. A recommendation of the study was to identify potential ways to reduce fish entrainment at the Project, such as reducing lighting at night in the intake areas. In 2017, a hydroacoustic evaluation was conducted and resulted in a PM&E recommendation for fish entrainment at the Fairfield Development. SCE&G proposes to turn off the lights at the Fairfield Development under normal operating conditions. The full recommendation is included in the Hydroacoustic Estimates and Distribution of Fish in Monticello and Parr Reservoirs in August 2017 – Protection, Mitigation, Enhancement Measure Recommendation (Exhibit E-5).

3.2.1.14 Recreation Management Plan and Associated Recreation Improvements

SCE&G developed a Recreation Management Plan (RMP) (Exhibit E-8) in consultation with stakeholders, using the results of the 2016 Recreation Use and Needs Study. The RMP includes an adaptive management process to address project-related recreation issues that may arise during the term of the new license. SCE&G plans several recreation site enhancements at five existing project recreation sites and three new proposed project recreation sites. More information on these enhancements can be found in Section 4.8.2: Environmental Effects – Proposed Action.

3.2.1.15 Canoe Portage

At the request of SCDNR, SCE&G built an experimental/trial canoe portage on the Newberry (west) side of the Parr Shoals Dam. An approximately 1600-foot trail was cleared and appropriate signage was installed. Following evaluation of usability and feedback from agencies, SCE&G plans to formalize the canoe portage and maintain it as an additional recreational facility, as specified in the RMP.

3.2.1.16 Recreation Site Monitoring/Maintenance

Over time, recreation sites require maintenance to preserve quality and functionality. Additionally, some recreation sites may need upgrades to remain in compliance with FERC's barrier free requirements. SCE&G will continue to monitor their recreation sites on Parr and Monticello reservoirs for ordinary wear and tear as well as extraordinary nature- and human-

related damage, and will make repairs, perform maintenance, and make improvements as needed. Monitoring and maintenance of project recreation sites will occur as outlined in the RMP.

3.2.1.17 Erosion Monitoring and Control

Daily fluctuations of Parr and Monticello reservoirs, related to operation of the Fairfield Development, contribute somewhat to erosion of the shoreline over time. SCE&G currently monitors the erosion on Parr Reservoir's shoreline on an annual basis and Monticello Reservoir's shoreline on a bi-annual basis. When and if areas of severe erosion are identified, SCE&G acts to address the erosion, primarily through the placement of riprap to reinforce the shoreline. SCE&G will continue this practice through the term of the new license and has developed a formal Erosion Monitoring Plan (Exhibit E-3).

3.2.1.18 Santee River Basin Accord for Diadromous Fish Protection Restoration, and Enhancement

Agencies have expressed concern about diadromous fish in the Santee River Basin, specifically their ability to pass upstream in a river system heavily segmented by hydro facilities. In 2008, SCE&G and Duke Energy signed the Santee River Basin Accord for Diadromous Fish Protection, Restoration, and Enhancement (Accord) with the SCDNR, the North Carolina Wildlife Resources Commission (NCWRC), and the USFWS, therein agreeing to a 10-year action plan, funding for a variety of diadromous fish studies, and implementation of fish passage at hydro facilities in the Santee River Basin based on biological triggers. Specifically, for the Parr Development, SCE&G will perform a Fish Passage Feasibility Assessment when 50% of the specified total restoration numbers for adult anadromous American shad or blueback herring are being passed at Columbia Dam in accordance with the Accord criteria (CAP 2008). When 75% of the specified total restoration numbers for adult anadromous American shad or blueback herring are being passed at Columbia Dam in accordance with the Accord criteria, SCE&G will initiate construction of a Fish Passage Facility at Parr Shoals Dam (CAP 2008).

3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

3.3.1 Federal Takeover of Project Facilities

A federal takeover of the Project has not been raised as an alternative by any federal agency, nor has it thus far been raised as a reasonable alternative during relicensing by any party involved. Although further consideration of this alternative may occur, a federal takeover of a project requires congressional approval and there is no evidence suggesting that a federal takeover should be recommended to Congress.

3.3.2 Issuance of Non-Power License

A non-power license is a temporary license issued by FERC upon its determination that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered under the non-power license. Thus far, this option has not been proven necessary or suggested as a viable option during relicensing. There is no basis for concluding that the operation of the Project should not continue to occur for power production. Because of this, the issuance of a non-power license has not been deemed a reasonable alternative and has not been analyzed as part of this report.

3.3.3 Project Decommissioning

The decommissioning of a power project could include either the partial or complete removal of the dam. Through the relicensing process, project decommissioning has not been presented as an issue by any entity involved and is not considered a reasonable alternative. The Project as operated for electricity generation, especially as operationally connected to a supply of non-emitting nuclear power that replaces and forestalls the need for fossil generation, is an important and reliable source of clean, renewable energy. Were it to be decommissioned, a source of replacement power would need to be identified. Additionally, the Project provides many recreational opportunities and socioeconomic benefits to the surrounding region. Consequently, project decommissioning is not an alternative that is evaluated in this report.

3.3.4 Proposed Protection, Mitigation and Enhancement Measures Eliminated from Further Analysis under the Final License Application

3.3.4.1 Dam Removal in the Santee Basin

American Rivers requested that SCE&G consider funding specifically for dam removals in the Broad River Basin throughout the term of the new license. American Rivers believes that removal of dams in the basin would help restore stream connectivity and help to offset the impacts of habitat fragmentation and reservoir fluctuation caused by the Parr Shoals Dam and project operations. SCE&G realizes that there are many continuing project impacts associated with the Project. However, SCE&G does not agree that removal of relict or active dams in the basin will help offset project impacts in or adjacent to the Project. Therefore, SCE&G will not provide funding for dam removals. However, through the Habitat Enhancement Program, SCE&G may provide funding for the removal of barriers to aquatic species and the restoration and enhancement of stream channels, stream banks, riparian areas, shorelines and wetlands.

3.3.4.2 Palmetto Trail Contribution

NGOs and agencies have expressed a desire to have additional recreation access downstream of Parr Shoals Dam on the Broad River. The lands located in this area are not included in the project boundary. Therefore, the stakeholders are asking that a one-time monetary contribution be made to the Palmetto Trail to help fund the construction of a new recreation site. SCE&G already provides funding and easements to this organization through non-hydro avenues. Therefore, SCE&G does not support this request.

3.3.4.3 Recreation Flows

The Recreation TWC requested that SCE&G consider scheduling flows specifically for recreational purposes. SCE&G performed a Downstream Recreational Flows Assessment (Exhibit E-8) where information was collected on recreational flow preferences from TWC members and other interested individuals. The TWC suggested having recreation flows between 2,000 cfs and 3,500 cfs on holidays and weekends between 8 am and 2 pm, May through September. The Project cannot store sufficient water to allow the scheduling of releases at specific times. In addition, inflows normally will not support these releases during peak recreation times of the year. For these reasons, SCE&G does not support this request.

3.3.4.4 Rocky Shoals Spider Lily Monitoring and Restoration

The Congaree Riverkeeper requested that SCE&G perform periodic monitoring and restoration of Rocky Shoals Spider Lily (RSSL) populations located downstream of Parr Shoals Dam but upstream of Columbia Dam and that it join ongoing efforts for restoration at the Columbia Hydro Project throughout the term of the new license. SCE&G does not plan to perform monitoring and restoration as requested because the RSSL populations are outside the project boundary and access to these populations is limited and difficult. In addition, SCE&G already proposed to participate in the Columbia Hydro RSSL restoration efforts as identified in the Saluda Hydro new license application and its Comprehensive Relicensing Settlement Agreement due to the proximity of the plants to that project. SCE&G believes that new minimum flows at the Project will encourage the downstream RSSL populations to thrive.

3.3.4.5 Minimum Flow Mitigation Payment

SCDNR requested that SCE&G provide mitigation payment to compensate for not delivering target flows when inflow to the Project is available to meet or exceed the target flow. SCE&G views this as tantamount to a “fine” against the Project. The FERC has the authority to fine Licensees that violate license articles whether associated with minimum flows or other compliance issues. In each situation potentially subject to the FERC’s regulatory penal powers, the factors weighed in a determination of whether or not such payments are warranted or allowed, are multiple and complex. The SCDNR proposal for automatic payments presumes that none of the complexities that the FERC would consider can ever be present in a target flow vs. inflow circumstance. This, of course, is not true. And where there is disagreement between licensee and SCDNR in such circumstances, the FERC would be called upon to hear the dispute and make a decision in what would amount to a state penalty claim against a FERC licensee for an alleged FERC license failure. SCE&G does not believe this to be proper and disagrees that it can or should be fined by both the FERC and the state if a license article is violated.

3.3.4.6 Boat Launch on Broad River

To offset negative impacts on water based recreation from the combined operation of the Fairfield and Parr developments, American Rivers requested that SCE&G provide funding and donate land for a non-motorized boat launch on the west bank of the Broad River near Haltiwanger Island. SCE&G believes it already is providing sufficient recreational opportunities

within the project boundary. SCE&G is providing improvements to the existing project recreation sites and is proposing new project recreation sites within the project boundary. SCE&G reiterates its position that it will not provide recreational sites outside of the FERC approved project boundary.

3.3.4.7 Recreation Website

To offset negative impacts to water based recreation from the combined operation of the Fairfield and Parr developments, American Rivers requested that SCE&G provide funding to develop a website that promotes recreation opportunities at the Broad and Enoree rivers in Richland, Lexington, Fairfield, Newberry, Laurens, and Union counties. SCE&G does not support this funding request as it will use its own website for documents to provide for public use of recreation within the project boundary.

3.4 REFERENCES

Cooperative Accord Partnership (CAP). 2008. Santee River Basin Accord for Diadromous Fish Protection, Restoration, and Enhancement. Santee River Basin Accord: Final Administrative and Policy Document. April 9, 2008.

4.0 ENVIRONMENTAL ANALYSIS

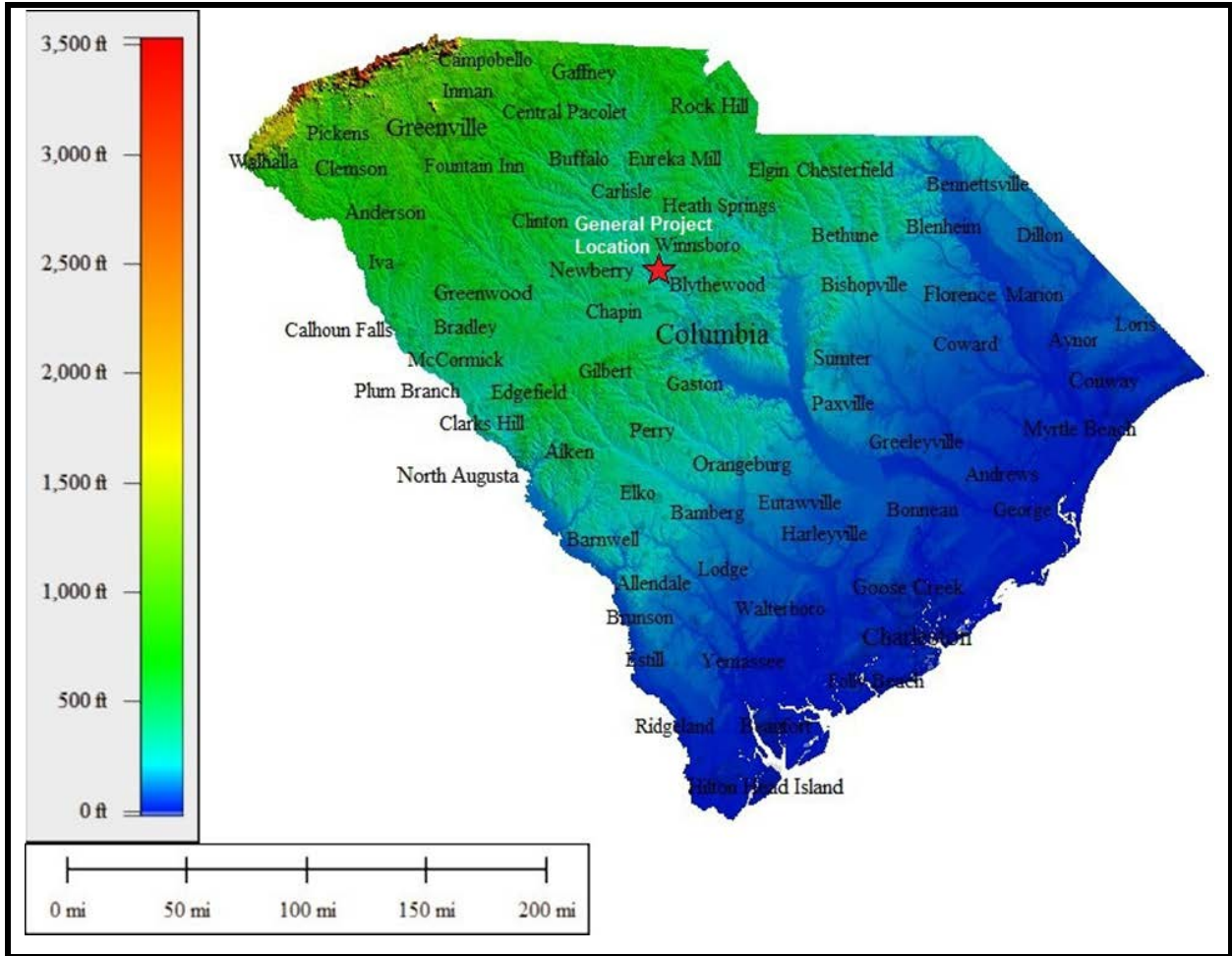
4.1 GENERAL DESCRIPTION OF THE RIVER BASIN

Beginning in the Blue Ridge region and extending across the Piedmont region of North and South Carolina, the Broad River Basin includes a total of 4,691 stream miles and 18,533 acres of lake waters. In South Carolina, the Broad River Basin incorporates 27 watersheds and some 2.5 million acres (SCDHEC 2007).

The Project is located within the lower Broad River Basin, a sub-basin of the larger Broad River Basin. The lower Broad River Basin forms at the confluence of the Broad and Pacolet rivers, approximately 34 miles northwest of the project area, and has a total drainage area of approximately 824,000 acres (NRCS 2010). From its headwaters in the Blue Ridge Mountains of North Carolina to where it joins the Saluda River to form the Congaree River in Columbia, South Carolina, the Broad River flows for approximately 153 miles. Approximately 67 miles of the southern extent of the river is included in the Lower Broad River Basin (USGS 2014). The Tyger and Enoree rivers are the two major tributaries that join the Broad River in the lower Broad River Basin. The confluence of the Enoree River with the Broad River occurs within the project boundary, while the Tyger River joins the Broad River less than 4 miles north of the project boundary. Minor tributaries that join the Broad River in this sub-basin include Turkey Creek, approximately 32 miles north of the Project; the Sandy River, approximately 9 miles north of the Project; and the Little River, approximately 13 miles southeast of the Project (USGS 2014).

4.1.1 Topography

The Broad River Basin lies within the Blue Ridge and Piedmont physiographic provinces of North and South Carolina. The Blue Ridge province is comprised of a diverse landscape of rugged terrain ranging from narrow ridges to hilly plateaus to more mountainous areas with high peaks. Elevations generally range from 900 feet to 3,000 feet, with Sassafras Mountain marking the highest peak in South Carolina at 3,560 feet (Griffith et al. 2002). The Piedmont province consists of gently rolling hills with stream-cut valleys and only a few floodplains. Elevations range from approximately 400 feet to 1,000 feet (SCDNR 2014). Figure 4-1 depicts the general topography.



Source: http://topocreator.com/download_city_a.php#SC 2014

FIGURE 4-1 GENERAL TOPOGRAPHY SURROUNDING THE PROJECT

4.1.2 Climate

Climate within the Broad River Basin is subtropical to temperate. Temperatures can range from a low daily average of 52°F in January to a high daily average of 88°F in July. Although there is no wet or dry season, late winter and early spring tend to be the wettest parts of the year, while early fall tends to be the driest. Rainfall averages 48 inches per year with average monthly precipitation between 4 and 6 inches. The Midlands of South Carolina, where the Project is located, is generally the driest portion of the state (SCDNR 2016).

4.1.3 Major Land Uses

The Broad River Basin is dominated by forestland, which encompasses approximately 60.6 percent of the total land cover, followed by agriculture at approximately 23.8 percent of the

land cover. Overall, only a small percentage of the Broad River Basin is developed (9.8 percent). The cities of Spartanburg, Gaffney, and Chester, and portions of the cities of York, Union, and Columbia comprise most of the developed land in the basin (SCDHEC 2007). There are a number of sand-mining operations within the Broad River Basin, with one located within the project vicinity.

Within the project vicinity, forestland is the dominant land cover. Portions of Sumter National Forest are located in Newberry and Fairfield counties, where the Project is located. Agricultural land covers approximately 12,000 acres in both counties; cropland and hayland are the dominant agricultural land types in Newberry and Fairfield counties, respectively. Developed land in the project vicinity is generally limited to the city of Winnsboro, approximately 14 miles east of the Project; and the city of Columbia, approximately 12 miles southeast of the Project (NRCS 2014).

4.1.4 Economic Activities

The Project is located in Newberry and Fairfield counties. Between 2012 and 2016, Newberry County had 14,504 households with 2.52 people in each household. The median household income was \$39,841, which was lower than the state median (\$46,898). Approximately 18.9 percent of the population in Newberry County lives below the poverty level (U.S. Census 2016). During the same period, Fairfield County had 8,878 households with 2.55 people in each household. The median household income was \$33,798, which was significantly lower than the state median. Approximately 21.2 percent of the population in Fairfield County lives below the poverty level (U.S. Census 2016).

The largest source of employment in Newberry County was manufacturing. The second largest employment sector was retail trade and the third largest was administrative and waste services. The smallest source of employment was information services (S.C. Department of Commerce 2016b). Like Newberry County, the largest source of employment in Fairfield County was manufacturing. The second largest employment sector was retail trade and the third largest was health care and social assistance. The smallest source of employment was management of companies and enterprises (S.C. Department of Commerce 2016a).

4.1.5 References

- Griffith, G.E., Omernik, J.M., Comstock, J.A., Schafale, M.P., McNab, W.H., Lenat, D.R., MacPherson, T.F., Glover, J.B., and Shelburne, V.B. (Griffith et al.) 2002. Ecoregions of North Carolina and South Carolina, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).
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- U.S. Census. 2016. QuickFacts: South Carolina. [Online] URL: <https://www.census.gov/quickfacts/fact/table/fairfieldcountysouthcarolina,newberrycountysouthcarolina,SC,US/PST045217>. Accessed February 16, 2018.

Section 4

U.S. Geological Survey (USGS). 2014. 200301, HYDROGL020 - U.S. National Atlas Water Feature Areas: aqueducts, canals, dams, intercoastal waterways, rivers, and streams: U.S. Geological Survey. Reston, VA.

4.2 CUMULATIVE EFFECTS

A cumulative effect is defined as an impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR §1508.7). Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities. Fisheries is the only resource identified that could be cumulatively affected by the proposed relicensing of the Project. Fisheries was selected because hydroelectric developments along the waterway have affected the fishery and habitat by altering the flow regime, blocking or delaying fish movement, and entraining fish into diversion canals or penstocks.

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effect on the resources. The geographic scope for fisheries resources encompasses the Broad River from the upstream end of the Parr Development boundary, including the Monticello Reservoir, and extending downstream to river reaches affected by releases from waters at Parr Shoals Dam.

The temporal scope of the cumulative effects analysis includes a discussion of past, present, and future actions and their respective effects on each resource that could be cumulatively affected. Based on the potential term of any new licenses issued for a project, the temporal scope will last 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future actions. The historical discussion will be limited to the amount of information available for fisheries within the geographic scope.

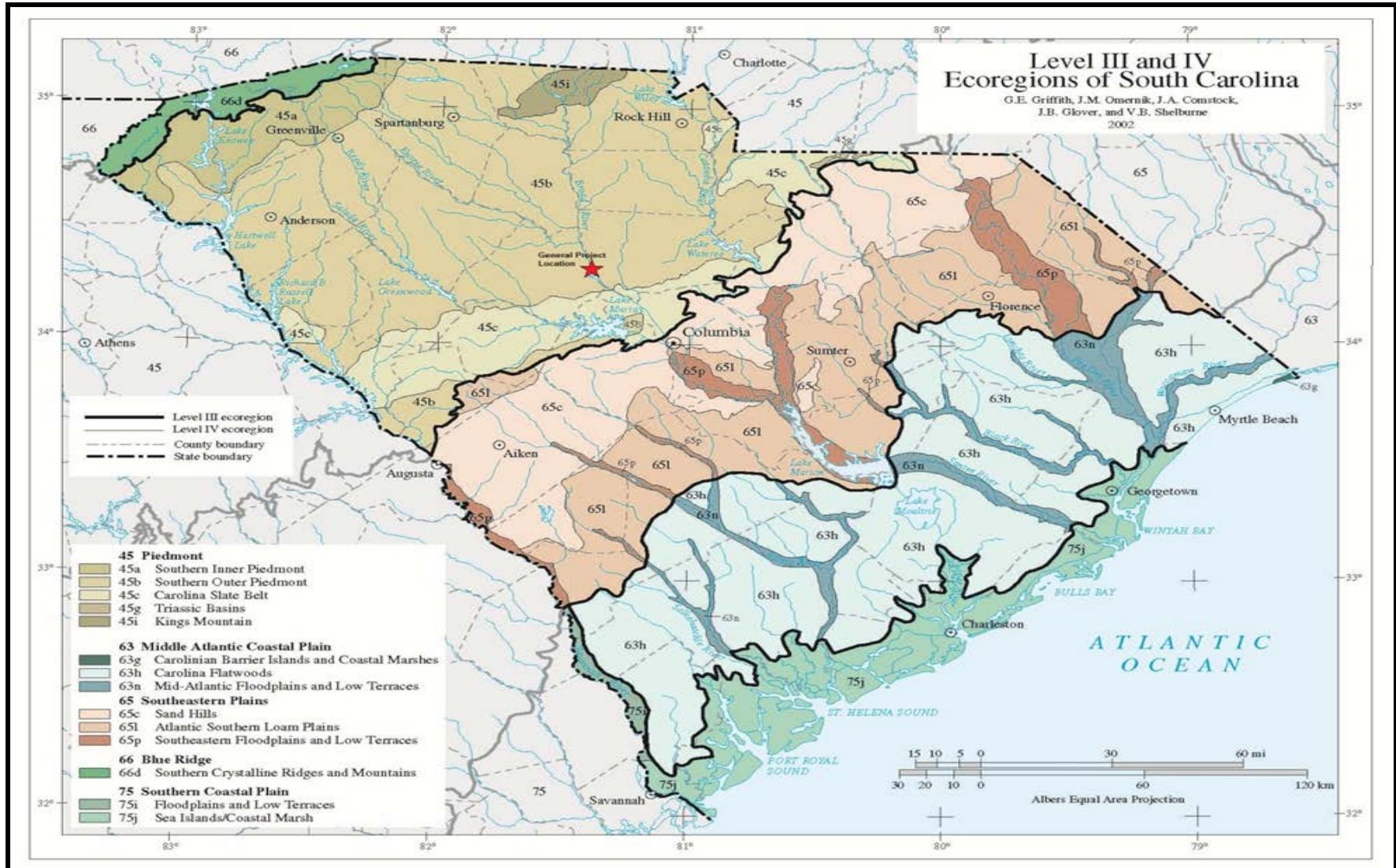
4.3 GEOLOGY AND SOILS

The Project is located in both Fairfield and Newberry counties, South Carolina, in the Piedmont physiographic region. This region is comprised of gently rolling hills dissected by narrow stream and river valleys; forests, farms, and orchards dominate most of the landscape. The elevations range from approximately 400 feet to 1,000 feet (SCDNR 2014). Typical rock types associated within this region are gneiss, schist, and granite covered with deep saprolite and generally red, clayey subsoils (EOE 2014).

4.3.1 Affected Environment

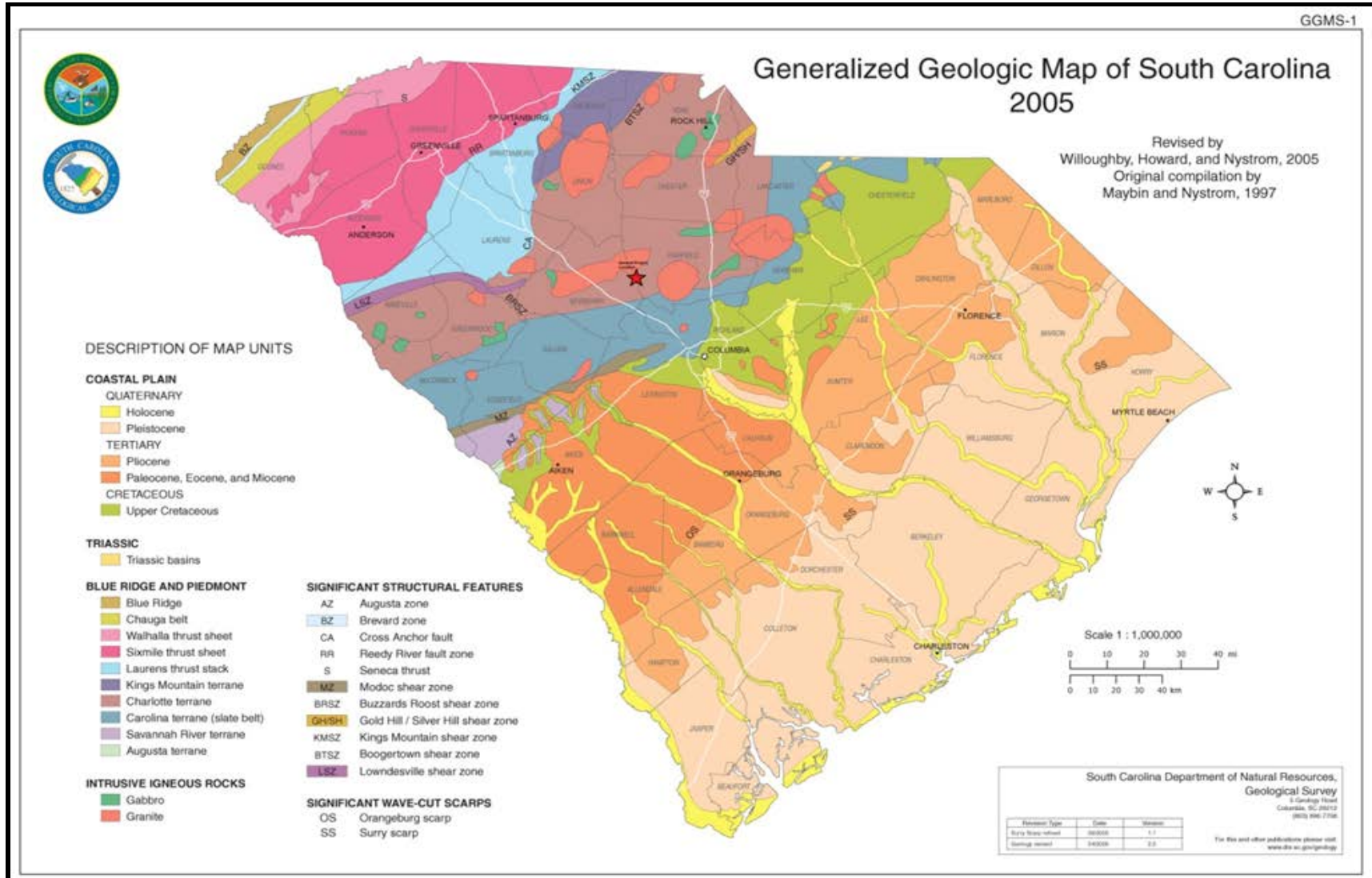
4.3.1.1 Geology

In South Carolina the Piedmont physiographic region is further divided into four unique ecoregions. The Project is located in the Southern Outer Piedmont ecoregion. In comparison to South Carolina's other Piedmont ecoregions, this region tends to have lower elevations, less relief, and irregular plains instead of plains with hills. This ecoregion is adjacent to the Carolina Slate Belt ecoregion, which comprises metavolcanic and metasedimentary rocks that are less metamorphosed than those in most Piedmont regions. Many areas of this region are more rugged and are distinguished by trellised drainage patterns with silt and silty clay soils, and streams that tend to desiccate (EOE 2014). Figure 4-2 and Figure 4-3 depict physiographic regions and ecoregions and general geology surrounding the project area.



Reference: Griffith et al. 2002

FIGURE 4-2 PHYSIOGRAPHIC REGIONS AND ECOREGIONS SURROUNDING THE PROJECT



Reference: SCGS 2005

FIGURE 4-3 GENERAL GEOLOGY SURROUNDING THE PROJECT

4.3.1.2 Soils

Table 4-1 and Figure 4-4 depict the soil types in the general area surrounding the Project. Generally, the soils surrounding the Project consist of sandy clay and sandy loams. The soils with the greatest representation within the project area include those from the Cecil, Pacolet, Hiwassee, Wynott-Winnsboro, Hard Labor, and Madison families.

- Cecil family soils, consisting of sandy clay and sandy loam, are well drained with a 2-percent to 15-percent slope.
- Pacolet family soils, consisting of sand, clay, and sandy clay loam, are well drained with a 10-percent to 50-percent slope.
- Hiwassee family soils, consisting of sandy clay and sandy loam, are well drained with a 2-percent to 10-percent slope.
- Wynott-Winnsboro family soils, consisting of sandy clay loam, are well drained with a 2-percent to 10-percent slope.
- Hard Labor family soils, consisting of sandy loam, are moderately well drained with a 2-percent to 10-percent slope.
- Madison family soils, consisting of sandy clay and sandy loam, are well drained with a 2-percent to 25-percent slope.

Table 4-1 lists the various soil types in the area surrounding the Project and describes the extent to which they occur. In general, soils within the project area consist of sandy loams with slopes ranging from 0 percent to 50 percent with a slight to moderate erosion potential (NRCS 2014).

**TABLE 4-1 LIST OF SOILS BY TYPE, SIZE¹ AND PERCENT SURROUNDING THE PROJECT
FAIRFIELD COUNTY, SOUTH CAROLINA (SC039)**

MAP UNIT SYMBOL	MAP UNIT NAME	ACRES IN AOI	PERCENT OF AOI
ApB	Appling loamy sand, 2 to 6 percent slopes	95.9	0.20%
ApC	Appling loamy sand, 6 to 10 percent slopes	167.5	0.30%
CaB	Cataula sandy loam, 2 to 6 percent slopes	90.7	0.20%
CcC2	Cataula sandy clay loam, 6 to 10 percent slopes, eroded	585.6	1.20%
CeB	Cecil sandy loam, 2 to 6 percent slopes	142.4	0.30%
CnB2	Cecil sandy clay loam, 2 to 6 percent slopes, eroded	528.8	1.10%
CnC2	Cecil sandy clay loam, 6 to 10 percent slopes, eroded	1073.0	2.20%
Cw	Chewacla loam, 0 to 2 percent slopes, frequently flooded	1812.6	3.70%
DuB	Durham loamy sand, 2 to 6 percent slopes	31.2	0.10%
HaB	Helena sandy loam, 2 to 6 percent slopes	41.3	0.10%
HsB	Hiwassee sandy loam, 2 to 6 percent slopes	796.5	1.60%
HsC	Hiwassee sandy loam, 6 to 10 percent slopes	274.9	0.60%
HwB2	Hiwassee sandy clay loam, 2 to 6 percent slopes, eroded	1226.0	2.50%
HwC2	Hiwassee sandy clay loam, 6 to 10 percent slopes, eroded	1962.1	4.00%
IdB	Iredell fine sandy loam, 1 to 6 percent slopes	44.4	0.10%
MaB	Madison sandy loam, 2 to 6 percent slopes	445.7	0.90%
MdC2	Madison sandy clay loam, 6 to 10 percent slopes, eroded	546.9	1.10%
MdE2	Madison sandy clay loam, 10 to 25 percent slopes, eroded	1820.9	3.70%
MeB	Mecklenburg fine sandy loam, 2 to 6 percent slopes	179.2	0.40%
MkC2	Mecklenburg sandy clay loam, 6 to 10 percent slopes, eroded	140.2	0.30%
PaE	Pacolet sandy loam, 10 to 25 percent slopes	4007.4	8.10%
RnF	Rion loamy sand, 15 to 40 percent slopes	486.8	1.00%
To	Toccoa loam	1041.5	2.10%
UD	Udorthents, loamy and clayey	51.8	0.10%
VnC2	Vance sandy clay loam, 6 to 10 percent slopes, eroded	22.9	0.00%
W	Water	862.0	1.70%
WaD	Wateree-Rion complex, 6 to 15 percent slopes	21.7	0.00%
WaF	Wateree-Rion complex, 15 to 40 percent slopes	188.5	0.40%
WkD	Wilkes sandy loam, 6 to 15 percent slopes	704.4	1.40%
WkF	Wilkes sandy loam, 15 to 40 percent slopes	1189.7	2.40%
WnB	Winnsboro sandy loam, 2 to 6 percent slopes	12.6	0.00%

Section 4

FAIRFIELD COUNTY, SOUTH CAROLINA (SC039)			
MAP UNIT SYMBOL	MAP UNIT NAME	ACRES IN AOI	PERCENT OF AOI
WnC	Winnsboro sandy loam, 6 to 10 percent slopes	375.0	0.80%
WnE	Winnsboro sandy loam, 10 to 25 percent slopes	233.8	0.50%
Subtotals for Soil Survey Area		21204.0	42.80%

¹ Measured in acres

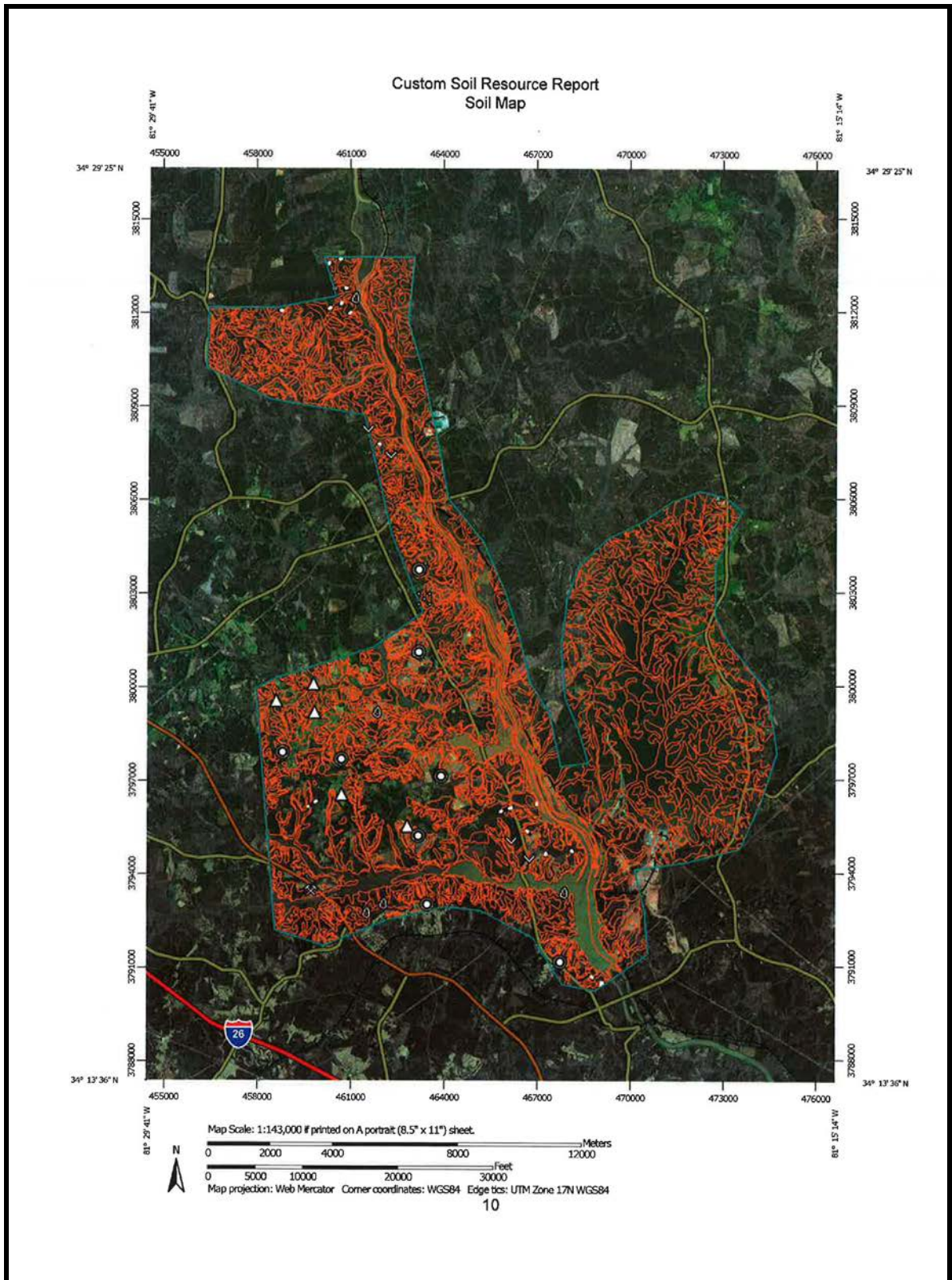
NEWBERRY COUNTY, SOUTH CAROLINA (SC071)			
MAP UNIT SYMBOL	MAP UNIT NAME	ACRES IN AOI	Percent of AOI
1B	Appling loamy sand, 2 to 7 percent slopes	6.8	0.00%
5A	Cartecay sandy loam, 0 to 2 percent slopes, occasionally flooded	2.3	0.00%
8C2	Cataula sandy clay loam, 7 to 15 percent slopes, moderately eroded	9.2	0.00%
10B	Cecil sandy loam, 2 to 7 percent slopes	10.7	0.00%
11B2	Cecil sandy clay loam, 2 to 7 percent slopes, moderately eroded	425.1	0.90%
11C2	Cecil sandy clay loam, 7 to 15 percent slopes, moderately eroded	595.2	1.20%
12C3	Cecil clay loam, 7 to 15 percent slopes, severely eroded	1.0	0.00%
13A	Chenneby silt loam, 0 to 2 percent slopes, occasionally flooded	47.8	0.10%
15A	Shellbluff silty clay loam, 0 to 2 percent slopes, occasionally flooded	124.7	0.30%
23B2	Winnsboro sandy clay loam, 2 to 7 percent slopes, moderately eroded	11.6	0.00%
23C2	Winnsboro sandy clay loam, 7 to 15 percent slopes, moderately eroded	40.5	0.10%
23D2	Winnsboro sandy clay loam, 15 to 25 percent slopes, moderately eroded	50.6	0.10%
28B	Santuc loamy coarse sand, 2 to 7 percent slopes	18.8	0.00%
28C	Santuc loamy coarse sand, 7 to 15 percent slopes	38.2	0.10%
32B2	Hiwassee sandy clay loam, 2 to 7 percent slopes, moderately eroded	27.6	0.10%
40B	Mecklenburg sandy loam, 2 to 7 percent slopes	9.8	0.00%
41C2	Mecklenburg sandy clay loam, 7 to 15 percent slopes, moderately eroded	3.7	0.00%
44D2	Pacolet sandy clay loam, 15 to 25 percent slopes, moderately eroded	190.3	0.40%
44E3	Pacolet sandy clay loam, 25 to 50 percent slopes, moderately eroded	45.7	0.10%
45E4	Pacolet clay loam, 25 to 50 percent slopes, severely eroded	22.6	0.00%
47C2	Rion sandy loam, 7 to 15 percent slopes, moderately eroded	70.6	0.10%
47D2	Rion sandy loam, 15 to 25 percent slopes, moderately eroded	275.1	0.60%
47E3	Rion sandy loam, 25 to 50 percent slopes, moderately eroded	98.0	0.20%
49A	Toccoa sandy loam, 0 to 2 percent slopes, occasionally flooded	60.4	0.10%
60D2	Wilkes sandy loam, 15 to 25 percent slopes, moderately eroded	2.5	0.00%

NEWBERRY COUNTY, SOUTH CAROLINA (SC071)			
MAP UNIT SYMBOL	MAP UNIT NAME	ACRES IN AOI	Percent of AOI
CcA	Cartecay sandy loam, 0 to 2 percent slopes, frequently flooded	6.3	0.00%
CdB2	Cataula sandy loam, 2 to 6 percent slopes, moderately eroded	5.3	0.00%
CdC2	Cataula sandy loam, 6 to 10 percent slopes, moderately eroded	1.0	0.00%
CeB	Cecil sandy loam, 2 to 6 percent slopes	35.6	0.10%
CfB2	Cecil sandy clay loam, 2 to 6 percent slopes, moderately eroded	6417.6	13.00%
CfC2	Cecil sandy clay loam, 6 to 10 percent slopes, moderately eroded	2685.9	5.40%
CfD2	Cecil sandy clay loam, 10 to 15 percent slopes, moderately eroded	2.8	0.00%
CnA	Chenneby silt loam, 0 to 2 percent slopes, frequently flooded	1536.0	3.10%
CyA	Chenneby silt loam, 0 to 2 percent slopes, ponded	275.0	0.60%
HaB	Hard Labor sandy loam, 2 to 6 percent slopes	1977.9	4.00%
HaC	Hard Labor sandy loam, 6 to 10 percent slopes	846.6	1.70%
HeB	Helena sandy loam, 2 to 6 percent slopes	605.0	1.20%
HeC	Helena sandy loam, 6 to 10 percent slopes	211.1	0.40%
HwB2	Hiwassee sandy loam, 2 to 6 percent slopes, moderately eroded	1.0	0.00%
MeB2	Mecklenburg sandy clay loam, 2 to 6 percent slopes, moderately eroded	2.3	0.00%
MeC2	Mecklenburg sandy clay loam, 6 to 10 percent slopes, moderately eroded	25.5	0.10%
PaD2	Pacolet sandy clay loam, 10 to 15 percent slopes, moderately eroded	419.5	0.80%
PaE2	Pacolet sandy clay loam, 15 to 25 percent slopes, moderately eroded	1303.2	2.60%
PaF2	Pacolet sandy clay loam, 25 to 50 percent slopes, moderately eroded	166.5	0.30%
PcC3	Pacolet clay loam, 6 to 10 percent slopes, severely eroded	1.2	0.00%
PmB	Prosperity-Bush River-Helena complex, 2 to 6 percent slopes	21.2	0.00%
PmC	Prosperity-Bush River-Helena complex, 6 to 10 percent slopes	197.8	0.40%
RnC2	Rion sandy loam, 6 to 10 percent slopes, moderately eroded	101.2	0.20%
RnD2	Rion sandy loam, 10 to 15 percent slopes, moderately eroded	209.7	0.40%
RnE2	Rion sandy loam, 15 to 25 percent slopes, moderately eroded	1145.5	2.30%

NEWBERRY COUNTY, SOUTH CAROLINA (SC071)			
MAP UNIT SYMBOL	MAP UNIT NAME	ACRES IN AOI	Percent of AOI
RnF2	Rion sandy loam, 25 to 50 percent slopes, moderately eroded	351.8	0.70%
SaB	Santuc loamy coarse sand, 2 to 6 percent slopes	79.8	0.20%
SaC	Santuc loamy coarse sand, 6 to 10 percent slopes	120.0	0.20%
ShA	Shellbluff silty clay loam, 0 to 2 percent slopes, frequently flooded	70.0	0.10%
ToA	Toccoa sandy loam, 0 to 3 percent slopes, frequently flooded	881.7	1.80%
W	Water	2056.2	4.20%
WnB	Winnsboro sandy loam, 2 to 6 percent slopes	244.6	0.50%
WwD2	Wynott-Wilkes complex, 10 to 15 percent slopes, moderately eroded	241.8	0.50%
WwE2	Wynott-Wilkes complex, 15 to 25 percent slopes, moderately eroded	804.5	1.60%
WyB2	Wynott-Winnsboro complex, 2 to 6 percent slopes, moderately eroded	1100.1	2.20%
WyC2	Wynott-Winnsboro complex, 6 to 10 percent slopes, moderately eroded	1948.4	3.90%
Subtotals for Soil Survey Area		28288.3	57.20%
Totals for Area of Interest		49492.2	100.00%

Source: NRCS 2014

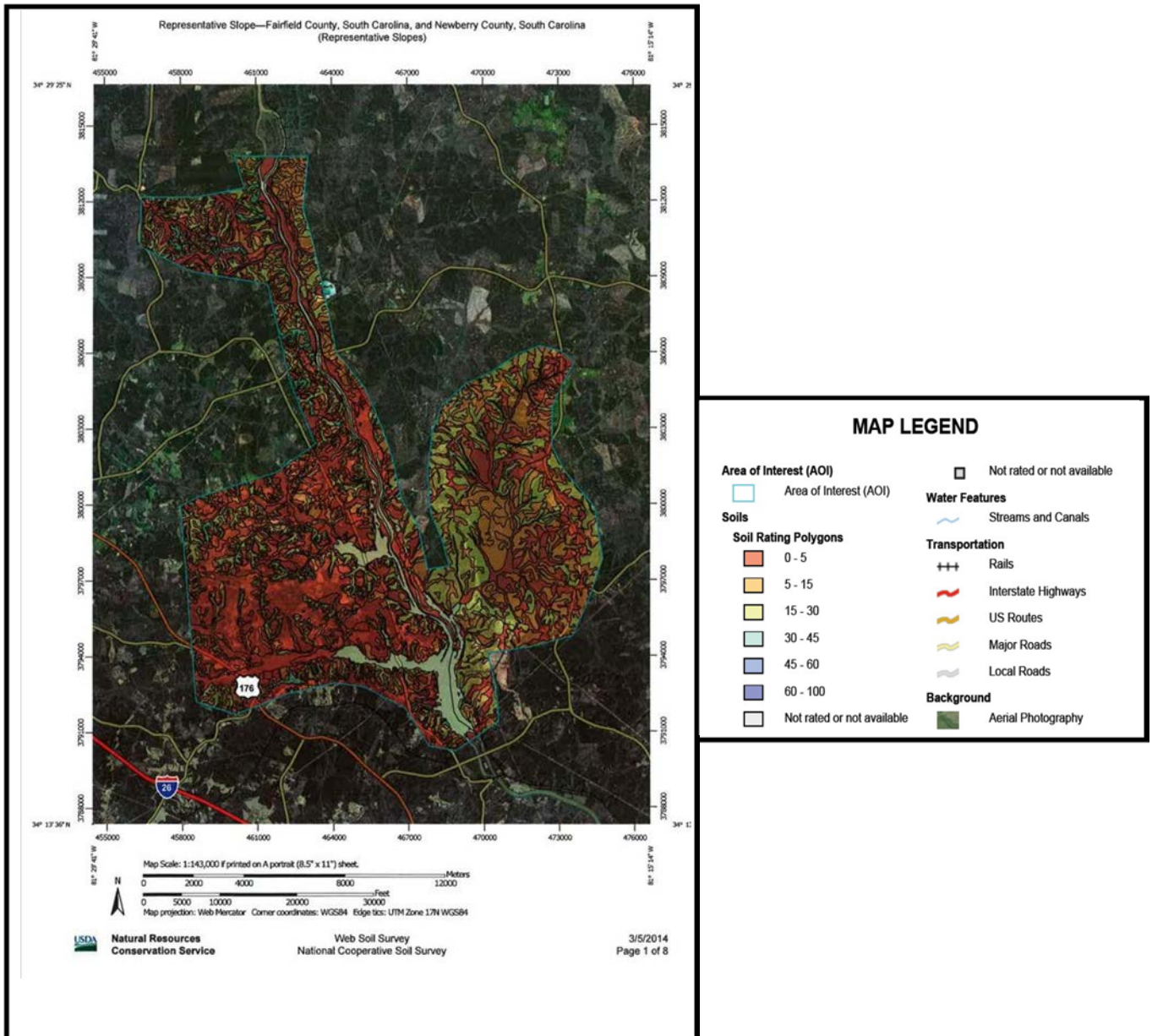
¹ Measured in acres



Source: NRCS 2014

FIGURE 4-4 SOILS SURROUNDING THE PROJECT AREA OF INTEREST

Most of the project area consists of gradual slopes ranging from 0 percent to 15 percent, as depicted in Figure 4-5.



Source: NRCS 2014

FIGURE 4-5 REPRESENTATIVE SLOPE RATINGS WITHIN THE PROJECT AREA OF INTEREST

The shorelines within the project area are subject to anthropogenic disturbances, including roadways near the waterline and structures to support recreational and project-related activities. Shorelines surrounding project structures are armored with concrete embankments and rip-rap. Vegetation surrounding the project area varies, but forested shorelines are the most prevalent feature throughout most of the landscape. The eastern shoreline area of the

Monticello Reservoir is more developed compared to that of the remaining project shoreline and has less forested area and more homes with grassy lawns.

4.3.2 Environmental Effects

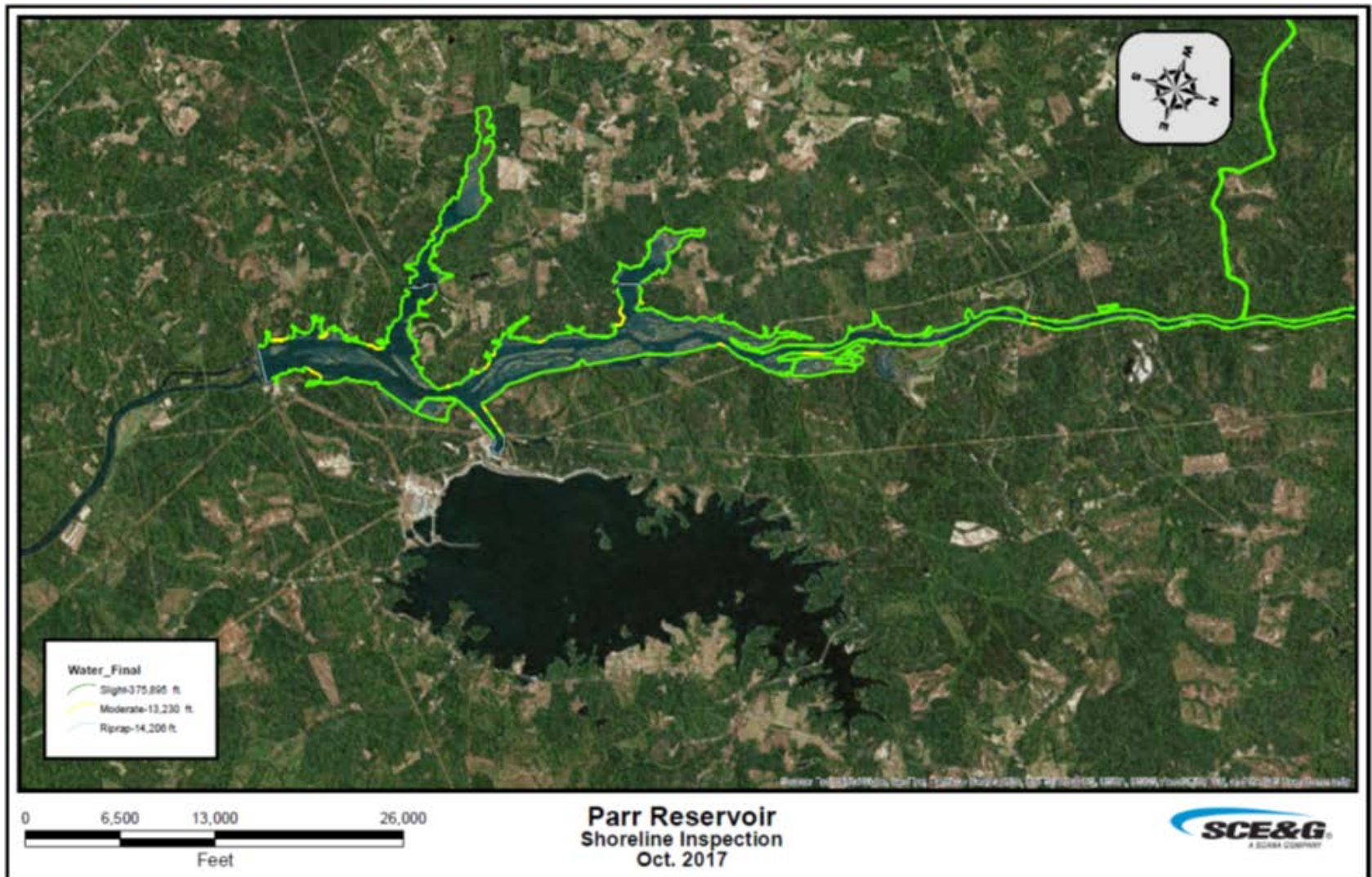
4.3.2.1 Completed Studies

PARR RESERVOIR EROSION MONITORING SURVEYS

The shoreline of Parr Reservoir is monitored annually for erosion by SCE&G. Parr Reservoir was last surveyed in October of 2017 using standards developed by SCE&G. Areas of erosion were identified and classified into one of three categories; slight, moderate, or severe. Results of the October 2017 survey are in Table 4-2 (Chapman 2017), and an illustration of the shoreline erosion is shown as (Chapman 2017).

TABLE 4-2 EROSION AT PARR RESERVOIR IN OCTOBER 2017

Erosion	Amount of Erosion	Amount Shoreline Eroded
Slight	375,895 ft.	93.2%
Moderate	13,230 ft.	3.3%
Severe	0 ft.	0%
Total	389,125 ft.	96.5%



SOURCE: CHAPMAN 2017

FIGURE 4-6 EROSION AT PARR RESERVOIR IN OCTOBER 2017

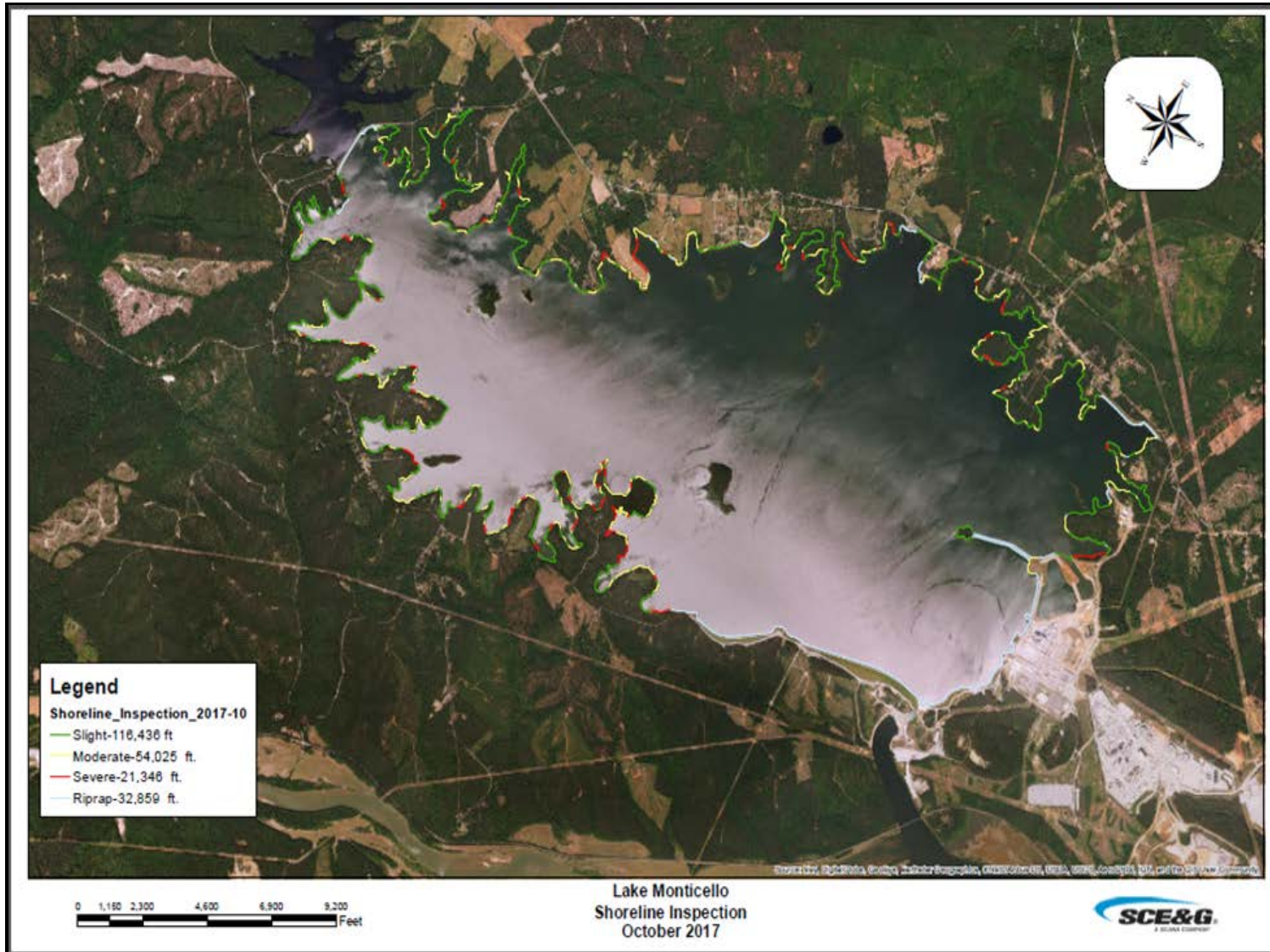
During the 2017 survey, no areas were identified as needing corrective action (Chapman 2017). The surveys noted that the backwater shoreline and the main-stem shoreline is well vegetated, protecting the shorelines from significant erosion due to plant operations. SCE&G will continue their annual monitoring of Parr Reservoir for erosion consistent with previous surveys.

MONTICELLO RESERVOIR EROSION MONITORING SURVEYS

The shoreline of Monticello Reservoir is monitored bi-annually for erosion by SCE&G and was last surveyed in October of 2017 using standards developed by SCE&G. Areas of erosion were identified and classified into one of three categories: slight, moderate, or severe. Results of the October 2017 survey are included in Table 4-3 (Stoudemire 2017) and an illustration of shoreline erosion from the survey is shown in Figure 4-7 (Stoudemire 2017).

TABLE 4-3 EROSION AT MONTICELLO RESERVOIR IN OCTOBER 2017

Erosion	Amount of Erosion	Amount Shoreline Eroded
Slight	116,436 ft.	51.8%
Moderate	54,025 ft.	24.0%
Severe	21,346 ft.	9.5%
Total	191,807 ft.	85.3%



SOURCE: STOUDEMIRE, 2017

FIGURE 4-7 EROSION AT MONTICELLO RESERVOIR IN OCTOBER 2017

There was a slight shift in the amount and severity of shoreline affected by erosion from 2016 to 2017. It was noted in the October 2017 report, that the erosion has been slowly advancing in the direction of the project boundary line (Stoudemire 2017). The report noted that there is ongoing evaluation of the severely eroded areas and different repair methods. SCE&G will continue the bi-annual monitoring of Monticello Reservoir for erosion consistent with previous surveys.

4.3.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. The following PM&E measures have been proposed that may impact geology and soil resources:

- Parr and Monticello Reservoir Shoreline Management Plans (Exhibit E-10)
- Erosion Monitoring Plan (Exhibit E-3)

Parr and Monticello Reservoir Shoreline Management Plans

SCE&G developed an SMP for Monticello Reservoir and a separate SMP for Parr Reservoir. The SMPs set forth and define permitting procedures and best management practices for a wide variety of shoreline activities for each project land classification, as well as guidance for construction, maintenance, and placement of docks, shoreline stabilization, lake access pathways and other shoreline activities. The SMPs will help the management and mitigation of erosion and land disturbances around both reservoirs through the required implementation of best management practices.

Erosion Monitoring Plan

The fluctuations of Parr Reservoir and Monticello Reservoir, caused by the operation of the Fairfield Development, do contribute to some localized shoreline erosion and siltation in each reservoir. SCE&G currently monitors the shorelines of Parr and Monticello reservoirs regularly for signs of erosion as part of their Dam Safety, Surveillance and Monitoring Report (DSSMR). As part of this new license application process, SCE&G developed a formal Erosion Monitoring Plan for Monticello and Parr reservoirs. Monitoring will continue to occur on an annual basis for Parr Reservoir and a bi-annual basis for Monticello Reservoir and will be reported to the FERC- Atlanta Regional Office on the annual DSSMR. The Erosion Monitoring Plan will be implemented upon issuance of a new license.

The plan sets forth and defines survey methods, the erosion repair procedure, and a monitoring schedule as well as documentation and reporting standards. Erosion repair is triggered when an identified erosion area is found to be encroaching the project boundary, project infrastructure, or significant natural or cultural resources. The erosion repair steps are as follows:

- **Verification:** Take measurements or install reference pins and evaluate rate and severity of active erosion quantitatively.
- **Plan:** Meet with SCE&G management to determine the extent of repairs. Develop plan to repair. Acquire cost estimates.
- **Notification:** Notify FERC of SCE&G's intent to repair.
- **Budget:** Budget money and time to perform the work.
- **Permit:** Determine what permits are required and prepare applications. Coordinate access with landowners if there is no SCE&G or public access to gain entry to the site.
- **Repair:** Mobilize workforce, material and equipment to make the repairs. Dam safety personnel will monitor the work.
- **Prepare:** Close out report and notify all necessary agencies of project completion.

4.3.3 Environmental Effects – No Action Alternative

Under the no action alternative, conditions would remain as they presently exist under the current license. Shoreline erosion and siltation on both reservoirs related to project fluctuations would likely continue at their current levels. There would be localized limited negative impacts on shoreline areas. Monitoring and repair of erosion by SCE&G would continue as part of the Dam Safety, Surveillance and Monitoring Program. However, the formal Erosion Monitoring Plan would not be implemented.

4.3.4 Unavoidable Adverse Effects

Reservoir fluctuations, as well as wind and boat driven wave action will continue to have adverse impacts on erodible soils around the shoreline areas and siltation within the reservoirs. Continued mitigation and armoring of these areas by SCE&G will likely reduce the extent of these continuing adverse impacts.

4.3.5 References

- Chapman, Matt. 2017. "Parr Hydroelectric Project Annual Shoreline Inspection FERC Project No. 1894-01." Memo. SCE&G. Columbia, SC. October 23, 2017.
- Griffith, G.E., Omernik, J.M., Comstock, J.A., Schafale, M.P., McNab, W.H., Lenat, D.R., MacPherson, T.F., Glover, J.B., and Shelburne, V.B. (Griffith et al.) 2002. Ecoregions of North Carolina and South Carolina (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. U.S. Geological Survey (map scale 1:1,500,000).
- South Carolina Department of Natural Resources (SCDNR). 2014. Piedmont Ecoregion Aquatic Habitats. [Online] [URL:https://www.dnr.sc.gov/cwcs/pdf/habitat/PiedmontAquatic.pdf.](https://www.dnr.sc.gov/cwcs/pdf/habitat/PiedmontAquatic.pdf) Accessed on February 27, 2014.
- South Carolina Geological Survey (SCGS). 2005. Generalized Geologic Map of South Carolina 2005. [Online] URL: [https://dc.statelibrary.sc.gov/handle/10827/23730.](https://dc.statelibrary.sc.gov/handle/10827/23730) Accessed March 5, 2018.
- Stoudemire, Chad. 2017. "FERC Project No. 1894 Fairfield Pumped Storage Facility Monticello Reservoir Routine Shoreline Surveillance." Memo. SCE&G. Columbia, SC. November 2, 2017.
- The Encyclopedia of Earth (EOE). 2014. Ecoregions of North Carolina and South Carolina (EPA). [Online] URL: [http://www.eoearth.org/view/article/152148/.](http://www.eoearth.org/view/article/152148/) Accessed on February 27, 2014.
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). 2014. Web Soil Survey. [Online] URL: [http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.](http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx) Accessed March 4, 2014.

4.4 WATER RESOURCES

The Project consists of two developments, the Parr Development and the Fairfield Development. Parr Reservoir is formed within the Broad River as a result of the construction of Parr Shoals Dam, and serves as the lower reservoir for the Fairfield Development. Monticello Reservoir is formed by a series of four earthen dams adjacent to and uphill of Parr Reservoir creating an impoundment area that serves as the upper reservoir for the Fairfield Development.

4.4.1 Affected Environment

4.4.1.1 Water Quantity

Parr Reservoir has a surface area of approximately 4,250 acres and a total storage capacity of approximately 32,000 acre-feet. Monticello Reservoir has a surface area of approximately 6,600 acres with a total storage capacity of approximately 400,000 acre-feet. The drainage area for the Parr Development is 4,750 square miles, and the drainage area for the Fairfield Development is 15 square miles.

The monthly mean, minimum and maximum flows for the Project are listed below. Flows are recorded downstream of the Project (USGS 02161000 Broad River at Alston) as total releases, and therefore evaporation that occurs from the reservoirs is already accounted for in the statistics.

TABLE 4-4 MONTHLY MEAN, MAXIMUM AND MINIMUM DATA FOR THE U.S. GEOLOGICAL SURVEY GAGE AT ALSTON (02161000)*

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Mean	3,504	3,973	5,715	7,252	7,722	8,862	6,682	4,926	3,715	3,125	3,412	2,703
Max	17,360	14,499	14,190	17,790	16,960	21,560	18,040	14,829	8,909	12,440	10,210	14,740
(WY)	(1991)	(1993)	(2010)	(1993)	(1990)	(1993)	(2003)	(2003)	(2003)	(2013)	(1995)	(2004)
Min	638	725	1,251	2,106	1,985	3,170	2,821	1,782	763	600	546	624
(WY)	(2008)	(2008)	(2008)	(2011)	(2009)	(2006)	(2012)	(2001)	(2008)	(2008)	(2002)	(2007)

Source: USGS 2016

*For Water Years 1981-2015, By Water Year (WY) (in Cubic Feet Per Second)

Private development around the Parr and Fairfield developments is minimal and generally consists of rural communities (FERC 2011). The primary use of project waters, excluding

hydropower, is for a cooling water system at the V.C. Summer Nuclear Station. SCE&G applied for a renewal of the National Pollutant Discharge Elimination System (NPDES) permit for V.C. Summer Nuclear Station and the new permit was issued on May 7, 2014 (effective June 1, 2014). The V.C. Summer Nuclear Station 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 channel (SCE&G 2012). Approximately 1,190 cfs is withdrawn and returned to Monticello Reservoir through this once-through operation.

The existing project license requires a minimum flow release into the Broad River from the Parr Development of 1,000 cfs, or the average daily natural inflow into the Parr Reservoir, whichever is the lesser amount, during the months of March, April, and May. During all other months of the year, the license requires a minimum flow of 150 cfs and a minimum daily average flow of 800 cfs, or the daily natural inflow into Parr Reservoir, whichever is the lesser amount (FERC 2011). Existing minimum flows are designed to protect instream flow uses of the Broad River, which include recreation, navigation and aquatic resources.

4.4.1.2 Water Quality

Project waters are classified as freshwater, which SCDHEC identifies as; suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with SCDHEC requirements; suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora; and suitable for industrial and agricultural uses. Table 4-5 and Table 4-6 list the SCDHEC water quality standards applicable to project waters (SCDHEC 2012).

TABLE 4-5 SCDHEC WATER QUALITY STANDARDS FOR FRESHWATERS

PARAMETER ¹	STANDARD
Temperature	<ul style="list-style-type: none"> • 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 site-specific temperature standard as provided 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 CWA has been completed.
pH	Between 6.0 and 8.5.
DO	Daily average not less than 5.0mg/l with a low of 4.0 mg/l
Turbidity (reservoirs only)	Not to exceed 25 NTUs provided existing uses are maintained.
Turbidity (excluding reservoirs)	Not to exceed 50 NTUs provided existing uses are maintained
<i>E. coli</i>	Not to exceed a geometric mean of 126/100 ml based on at least four samples collected from a given sampling site over a 30-day period, nor shall a single sample maximum exceed 349/100 ml.
Garbage, cinders, ashes, oils, sludge, or other refuse	None allowed.
Treated wastes, toxic wastes, deleterious substances, colored or other wastes except garbage, cinders, ashes, oils, sludge, or other refuse	None alone or in combination with other substances or wastes in sufficient amounts to make the waters unsafe or unsuitable for primary contact recreation or to impair the waters for any other best usage as determined for the specific waters which are assigned to this class.
Stormwater, and other non-point source runoff, including that from agricultural uses, or permitted discharge from aquatic farms, concentrated aquatic animal production facilities, and uncontaminated groundwater from mining.	Allowed if water quality necessary for existing and classified uses shall be maintained and protected consistent with anti-degradation rules.

¹Water quality standards for toxic pollutants can be found in Section E and the appendix of the SCDHEC R. 61-68, Water Classifications & Standards

Source: SCDHEC 2012

Key: mg/L milligrams per liter
 ml milliliter
 NTU Nephelometric Turbidity Unit

TABLE 4-6 SCDHEC NUTRIENT STANDARDS FOR WATERS IN THE PIEDMONT AND SOUTHEASTERN PLAINS ECOREGIONS¹

PARAMETER	STANDARD
Total nitrogen	≤1.50 mg/l
Total phosphorus	≤0.06 mg/l
Chlorophyll a	≤40 µg/l

Source: SCDHEC 2012

¹Listed are the nutrient standards for lakes and reservoirs.

Currently, there are no nutrient standards for streams and rivers.

Key: mg/l milligrams per liter

µg/l micrograms per liter

SCDHEC identified several "core indicator" metals considered to be essential as indicators of the ability of a body of water to support aquatic life: cadmium, chromium, copper, lead, mercury, nickel and zinc.

Federal and state water quality standards for the state of South Carolina are guided through implementation of Sections 303(d) and 305(b) of the CWA. The CWA directs individual states to monitor and report on the condition of their water resources. SCDHEC is charged with monitoring water quality for the state. Pursuant to Section 305(b) of the CWA, SCDHEC prepares a biennial integrated report on its assessment of the condition of water quality and water pollution control programs. It also publishes a companion document containing a list of waters impaired, as required by Section 303(d) (SCDHEC 2016a, 2016b). Water bodies not meeting standards are included on South Carolina's list of water bodies impaired as required by Section 303(d). South Carolina has a program for water bodies listed as impaired that establishes total maximum daily loads (TMDLs) (which includes point and non-point sources and controls) that are managed through the NPDES permitting program, with the objective of bringing water quality to within set criteria.

In the 2016 303(d) list for the state of South Carolina, several point locations in both Parr and Monticello reservoirs were listed as impaired. SCDHEC lists point locations based on water quality sampling stations but specifies that the impairment is considered to extend to the surrounding waters upstream and downstream of the sampling station. Table 4-7 lists the impaired waters in the project area along with the cause for the impaired listing (SCDHEC 2016a). Figure 4-8 is a map of the SCDHEC monitoring stations at the Project.

TABLE 4-7 SCDHEC MONITORING STATIONS LISTED AS IMPAIRED WITHIN THE PROJECT BOUNDARY AND DOWNSTREAM OF PARR SHOALS DAM

STATION	LOCATION	USE	CAUSE FOR IMPAIRMENT LISTING	TARGET YEAR FOR TMDL DEVELOPMENT
B-327	Monticello Lake ¹ Lower impoundment between large islands	Aquatic life	pH	2022
RL-04370	Monticello Lake 1.7 miles northwest of Monticello	Aquatic life	pH	2022
RL-04374	Monticello Lake 3.5 miles north of Jenkinsville	Aquatic life	pH	2022
RL-13089	Monticello Reservoir Approx 0.8-mile SW of Lake Monticello East Landing	Aquatic life	pH	2022
B-346 (inactive site)	Parr Reservoir Approx. 3 miles north of dam, upstream Monticello Lake	Aquatic life	Total phosphorus	2022
RL-12049	Parr Reservoir Approx 0.7-mile NNW OF B-346 and approx 0.9-mile SE of mouth of Hellers Creek	Aquatic life	Total phosphorus	2022
B-236 (inactive site)	Broad River At So. Railroad Trestle, 0.5 miles downstream of SC213	Aquatic life	Copper	2022
B-151	Hellers Creek at SR 97	Aquatic life	Bio (macroinvertebrate)	2022

¹SCDHEC defines a lake as any water of the State that is a freshwater pond, reservoir, impoundment, or similar body of water located wholly or partially within the state (SCDHEC 2012). Therefore, SCDHEC classifies Monticello Reservoir as a lake.

Source: SCDHEC 2016a

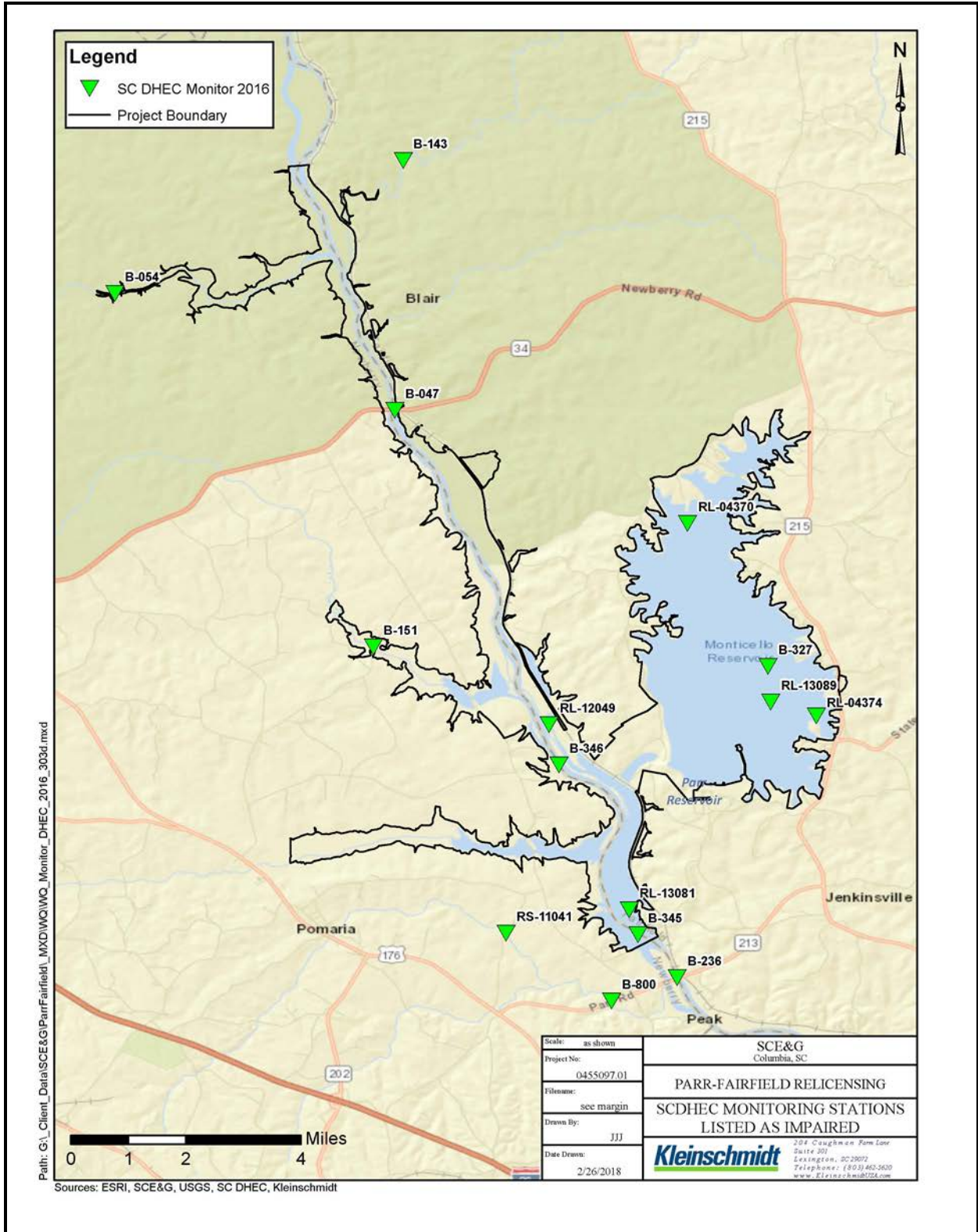


FIGURE 4-8 SCDHEC MONITORING STATIONS WITHIN THE PROJECT BOUNDARY AT PARR RESERVOIR

BASELINE WATER QUALITY REPORT

In January 2014, SCE&G prepared a Baseline Water Quality Report in anticipation of relicensing the Project. The report used existing water quality data available for the waters associated with the Project to establish a water quality baseline for the Project and identify any water quality trends that may be associated with project operations. The report focused on the following indicators of water quality: DO, conductivity, pH, turbidity, nitrogen, phosphorus, chlorophyll *a* and metals.

The Baseline Water Quality Report included a detailed analysis of the water quality data and was filed with FERC on January 5, 2015 as part of the PAD.

The Baseline Water Quality Report included analysis of upstream and downstream waters associated with the Project along with the project waters and concluded that project operations could affect water quality below Parr Shoals Dam (Kleinschmidt 2014). At the Water Quality TWC meeting on February 4, 2014, the TWC noted that the Baseline Water Quality Report identified period excursions of DO levels below 4.0 mg/l in the Parr Shoals Dam tailrace, as reported by the USGS station 02160991. The TWC agreed that SCE&G would consolidate historic USGS data to examine those excursions and identify operations that might be associated with the data. DO, temperature and river flow data from 2004 through 2013 were consolidated from the following USGS stations: USGS 02160991 Broad River near Jenkinsville, South Carolina; USGS 02156500 Broad River near Carlisle, South Carolina; USGS 02160700 Enoree River at Whitmire, South Carolina; and USGS 02160105 Tyger River near Delta, South Carolina. Review of the data verified that there are periodic excursions of DO levels less than 4.0 mg/L at the Jenkinsville gage. These events were not consistent from year to year and did not typically have a long duration. Table 4-8 illustrates a typical excursion event in the Parr Shoals Dam tailrace.

TABLE 4-8 PARR SHOALS DAM TAILRACE TYPICAL DO EXCURSION: JULY 2010

DATE	TIME	DO (MG/L)	TEMPERATURE (°C)	FLOW (CFS)
7/19/2010	9:00 pm	4.3	29.5	901
7/19/2010	10:00 pm	4.0	29.4	901
7/19/2010	11:00 pm	3.7	29.4	901
7/20/2010	12:00 am	3.9	29.3	901
7/20/2010	1:00 am	3.8	29.3	901
7/20/2010	2:00 am	3.8	29.2	888
7/20/2010	3:00 am	3.7	29.2	875
7/20/2010	4:00 am	3.6	29.1	863
7/20/2010	5:00 am	3.3	29.1	863
7/20/2010	6:00 am	3.7	29.0	838
7/20/2010	7:00 am	4.0	29.1	838
7/20/2010	8:00 am	4.5	29.2	825

Source: Kleinschmidt 2014

4.4.2 Environmental Effects

4.4.2.1 Water Quantity – Completed Studies

SCE&G did not conduct any studies directly relating to water quantity at the Project. However, the IFIM study, which is discussed in detail in the Fisheries Resources Section 4.5.2.1, was used to determine new minimum flows.

4.4.2.2 Water Quantity - Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. Therein, SCE&G proposed the following PM&E measures that would affect water quantity in the project area:

- Minimum Flows Downstream of Parr Shoals Dam AMP (Exhibit E-5)
- Parr Reservoir and Monticello Reservoir Shoreline Management Plans (Exhibit E-10)

Upon issuance of the new license, SCE&G will begin releases of the newly identified minimum flows, as determined through the IFIM study. This will result in more consistent flows for the protection of aquatic resources and enhancement of recreation and navigation downstream of the Project.

In addition, SCE&G will implement the updated SMPs for both reservoirs. The SMPs outline the required permitting process for the approval of surface water withdrawals installed along the shoreline or the littoral zone of both reservoirs. Water withdrawals for residential properties

are limited to irrigation purposes only. All applications for water withdrawal permits are submitted to SCE&G for review. Applications for withdrawal of greater than 1-million gallons per day (MGD) must be forwarded to the FERC for approval. Applications for withdrawal of 1 MGD or less can be approved by SCE&G with the possibility of state and/or federal agency consultation prior to approval. SCE&G may impose limits in addition to those contained in state and/or federally approved applications. SCE&G reserves the right to prohibit withdrawal during times of drought or low water conditions, or for any other operationally or environmentally related reasons. The SMPs and permitting processes for each reservoir will allow SCE&G to manage and regulate water withdrawals, thus protecting project resources.

4.4.2.3 Water Quality - Completed Studies

In comments received on the PAD, the USFWS indicated a concern over water quality in Parr and Monticello reservoirs, as well as immediately downstream of the Project. Additionally, prior to the filing of the PAD during early consultation with stakeholders, SCDNR indicated a concern over water quality in the west channel area of the Broad River, immediately downstream of the Project. In response to these concerns, SCE&G conducted several studies to examine water quality in the Parr Shoals Dam forebay and tailrace and in the west channel downstream of the dam. These studies resulted in the creation of the Turbine Venting Plan and West Channel AMP.

PARR SHOALS DAM FOREBAY AND TAILRACE WATER QUALITY STUDIES

In June of 2011, the USGS installed a new sensor at the Jenkinsville gage (station 02160991). From January 2011 through December 2014, there were approximately 13 hourly excursions in DO below the 4.0 mg/l SCDHEC standard, which is approximately 0.04 percent of that period. At the request of the Water Quality TWC, SCE&G collected additional water quality data in the tailrace and forebay of Parr Shoals Dam from July to September 2014 to determine whether project operations were causing these excursions, and if so, how SCE&G might prevent them from occurring. SCE&G collected temperature and DO data at seven sites along the downstream face of the Parr Shoals Dam, adjacent to the USGS station 02160991, and at a location approximately 400 feet downstream of Parr Shoals Dam. Data was collected on a weekly basis, 3 times per day; starting 1 hour before sunrise, at sunrise, and 1 hour after sunrise. To determine if unit location effected DO, the turbine(s) running during collections

and the number of lowered crest gates was also recorded. Results from this effort can be found in Table 4-9 (Kleinschmidt 2015).

TABLE 4-9 DISSOLVED OXYGEN DATA AT USGS STATION 02160991 AND PARR SHOALS TAILRACE JULY – SEPTEMBER 2014

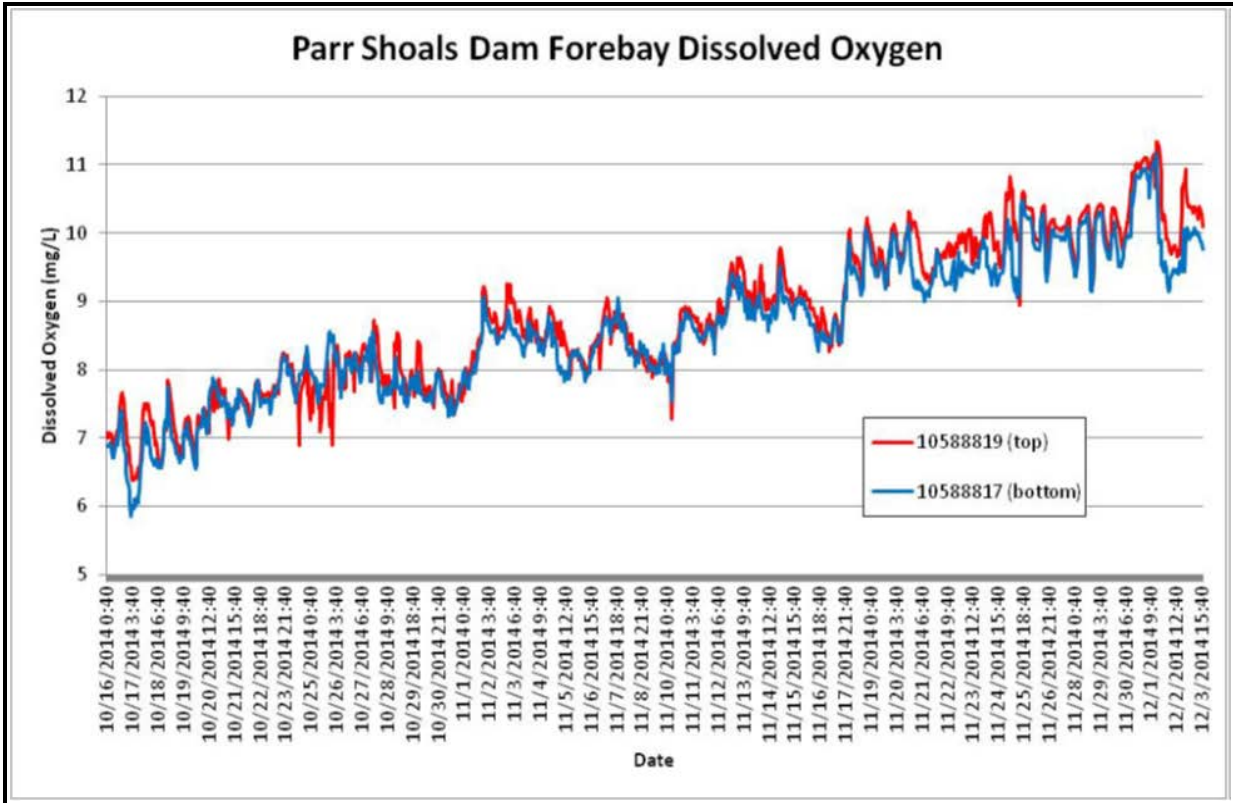
DATE	USGS DATA		SCE&G DATA	
	TIME	DO MG/L	TIME	DO MG/L
7/2/14	5:00 AM	6.2	5:35 AM	6.12
	6:00 AM	6.0	6:37 AM	5.95
	7:00 AM	6.0	7:42 AM	5.86
	8:00 AM	6.0		
7/10/14	5:00 AM	6.0	5:32 AM	6.24
	6:00 AM	5.9	6:27 AM	6.16
	7:00 AM	5.7	7:33 AM	6.08
	8:00 AM	5.5		
7/15/14	5:00 AM	5.5	5:34 AM	5.62
	6:00 AM	5.4	6:32 AM	5.32
	7:00 AM	4.9	7:42 AM	4.91
	8:00 AM	5.0		
7/24/14	5:00 AM	5.2	5:41 AM	5.15
	6:00 AM	5.2	6:51 AM	5.03
	7:00 AM	5.1	7:50 AM	5.49
	8:00 AM	5.3		
7/31/14	5:00 AM	5.8	5:43 AM	5.66
	6:00 AM	5.7	6:42 AM	5.55
	7:00 AM	5.7	7:54 AM	5.53
	8:00 AM	5.7		
8/7/14	5:00 AM	6.0	5:39 AM	5.90
	6:00 AM	6.0	6:48 AM	5.84
	7:00 AM	5.9	7:49 AM	5.74
	8:00 AM	5.9		
8/13/14	5:00 AM	5.9	5:30 AM	5.83
	6:00 AM	5.9	6:33 AM	5.86
	7:00 AM	5.9	7:33 AM	5.83
	8:00 AM	5.9		
8/20/14	5:00 AM	5.8	5:48 AM	5.90
	6:00 AM	5.8	6:46 AM	5.97
	7:00 AM	5.7	7:56 AM	5.86
	8:00 AM	5.7		
8/26/14	5:00 AM	6.3	5:41 AM	6.26
	6:00 AM	6.4	6:51 AM	6.51
	7:00 AM	6.4	7:48 AM	6.35
	8:00 AM	6.3		
9/3/14	5:00 AM	5.7	5:29 AM	6.02
	6:00 AM	5.8	6:40 AM	5.73
	7:00 AM	5.4	7:53 AM	5.46
	8:00 AM	5.4		
9/10/14	6:00 AM	5.6	6:30 AM	5.62
	7:00 AM	5.7	7:46 AM	5.78
	8:00 AM	5.7	8:46 AM	5.71
	9:00 AM	5.7		
9/16/14	6:00 AM	5.0	6:22 AM	4.94

DATE	USGS DATA		SCE&G DATA	
	TIME	DO MG/L	TIME	DO MG/L
	7:00 AM	5.0	7:24 AM	4.98
	8:00 AM	5.0	8:24 AM	4.92
	9:00 AM	5.0		
9/25/14	6:00 AM	7.3	6:33 AM	7.10
	7:00 AM	7.3	7:34 AM	7.65
	8:00 AM	7.3	8:29 AM	7.62
	9:00 AM	7.3		

Source: Kleinschmidt 2015

SCE&G collected data in the tailrace for two main reasons: (1) to verify the accuracy of the USGS Jenkinsville gage and (2) to determine if DO could be correlated to early morning DO sags or to which turbine units were running at the time of data collection. During the sampling period, DO levels consistently stayed above 4.0 mg/l. No excursions were recorded by SCE&G or on the USGS gage. Data collected by SCE&G at the site of the USGS Jenkinsville gage were consistent with the USGS gage data. Results did not reveal a clear correlation between DO readings and the units running at the time of data collection (Kleinschmidt 2015).

Water quality data, including DO and temperature, were collected in the forebay of the Parr Shoals Dam to determine if low DO water was being released through the turbines, causing the DO in the tailrace to drop. The data was collected using two HOBO data loggers, with one logger located approximately 1-foot above the bottom of the reservoir and the other located approximately 1-foot below the surface of the reservoir. Data was logged on an hourly basis from October 16, 2014 through December 3, 2014. Results showed the expected correlations between DO and temperature and natural diel fluctuations. As shown in Figure 4-9, DO levels at the bottom of the forebay were consistently slightly lower than those at the top of the forebay, and there was no evidence of stratification in the forebay area of the reservoir. There were no low DO events observed in the tailrace during the monitoring effort (Kleinschmidt 2015).



Source: Kleinschmidt 2015

FIGURE 4-9 PARR SHOALS DAM FOREBAY DISSOLVED OXYGEN

SCE&G followed up this effort by collecting another series of water quality data in the Parr forebay from May through mid-October 2015 (Kleinschmidt 2016a). Due to the fluctuations of the reservoir, periods of low inflows, and the general location of the HOBO loggers in the forebay of the dam, the loggers were highly susceptible to fouling due to debris, sediment and algae. After approximately one week of data collection in the reservoir, the HOBO loggers became severely compromised and no longer collected accurate data. This fouling made it more difficult to determine clear trends in the DO levels experienced in the forebay, but not unexpectedly, they did detect lower DO levels and a diel shift in DO levels starting at the end of June and extending through the end of September. During 2015, there were no DO levels below 4.2 mg/L detected at the USGS Jenkinsville tailrace gage. After July 31, there was only one DO reading lower than 5.0 mg/l and that was 4.9 mg/l on August 2 (Kleinschmidt 2016a).

TURBINE VENTING TESTING

SCE&G proposed to test all of the Parr turbines for their ability to self-vent and potentially increase the DO in the tailrace during specific periods of the year. An initial test of the turbines'

capacity to vent was performed August 2014; a second test to determine which turbines produced the most significant increases in DO was performed in July 2015.

During the 2014 test, the primary objective was to determine the turbines' physical capacity to self-vent. This required both the presence of vacuum breakers (which are used during dewatering operations) (Photo 4-1), a focus on proper turbine vertical settings and sufficient gross head to draw air into the turbine during operation. During turbine operations, when the vacuum breaker valve opens, venting can be audibly determined. In addition, aeration of the water can be visually observed in the tailrace (Photo 4-2) (Kleinschmidt 2016a).



PHOTO 4-1 PARR SHOALS DAM PIPING FOR VACUUM BREAKERS IN HEADCOVER



PHOTO 4-2 PARR SHOALS DAM TURBINE DISCHARGE WITH VENTS OPEN

Several of the turbines were undergoing maintenance, and testing of all units was not possible. In addition, the tailrace DO and total saturation levels were high prior to opening the vents, likely reducing the effectiveness of venting. Given these limitations, an effectiveness venting test was planned for summer 2015 when additional turbines could be evaluated. Prior to the 2015 testing date, DO levels were monitored via the downstream USGS Jenkinsville gage (No. 02160991) to identify a test period with lower DO conditions.

During the 2015 test, all turbines were tested except Unit 4, which was inoperable due to ongoing maintenance. However, Unit 4 was tested in 2014. Results of the 2015 testing indicated that Unit 3 venting produced the most significant increase in DO, followed by Units 1, 5 and 2 (respectively). The increases are shown in Table 4-10 (Kleinschmidt 2016a).

TABLE 4-10 PARR SHOALS DAM DISSOLVED OXYGEN MEASUREMENTS DURING TURBINE VENTING TESTING¹ (MG/L)

UNIT No.	VENT CLOSED	VENT OPEN	INCREASE IN DO
1	4.65	5.04	0.39
2	4.60	4.80	0.20
3	4.70	5.15	0.45
4*	5.66	5.82	0.16
5	4.84	5.20	0.36
6**	5.10	N/A	N/A

*test data from 2014

**Unit 6 is not equipped with a vacuum breaker

¹mg/L measured in milligrams per liter

While the 2014 test indicated a DO increase of 0.16 mg/L induced by venting Unit 4, the increase was likely dampened by the starting saturation level as compared to the testing in 2015. It can be assumed that the lower levels in 2015 would have resulted in better uptake, but the exact level of increase is not known. However, operating priorities for the Turbine Venting Plan were not modified to place Unit 4 above other turbines, given that the other turbines have a better demonstrated uptake capacity (Kleinschmidt 2016a).

Based on testing results, SCE&G developed a Turbine Venting Plan in consultation with SCDHEC and other stakeholders, with the objective of increasing DO levels downstream of Parr Shoals Dam during the low DO season. The plan is discussed in detail in Section 4.4.2.4 Water Quality – Proposed Action.

At the March 2016 Water Quality TWC meeting, SCE&G made a proposal to test the Turbine Venting Plan during June 15 through July 31, 2016. In addition to testing the plan during 2016, SCE&G conducted a re-test of Unit 4 after installation of the new “air-cooled wooden bearings” (Table 4-11). The success of turbine venting was measured at the USGS Jenkinsville gage. Dissolved oxygen and temperatures observed in the tailrace are presented in Table 4-12. No excursions of DO levels less than 4.0 mg/L were observed during the testing period (Table 4-12 and Figure 4-10) (Kleinschmidt 2016b).

TABLE 4-11 PARR SHOALS TURBINE VENTING UNIT 4 TEST – AUGUST 2016

Test #	Time (DST)	Breaker Position Open/Closed	DO (mg/l)	Temp (°C)	TDG	% Sat	HP EI	TW EI	KW	Kvars Act.	Gates Act. (%)	BP
1	9:00	closed	5.08	29.42	713	67.2	257.22	220.70	1360±	150	45	759
2	9:40	open	5.3	29.48	718	70.2	257.53	220.72	1360±	151	46	759
Notes:												
Requested plant/system control to have all gates up and a max. of 2 units generating by 07:00 (DST).												
Units 4 & 6 were operating and all gates up upon arrival at the plant. Unit 6 was shutdown at 08:20 (DST).												
Breaker valve on Unit 4 was opened at approx. 09:20 (DST).												

Source: Kleinschmidt 2016b

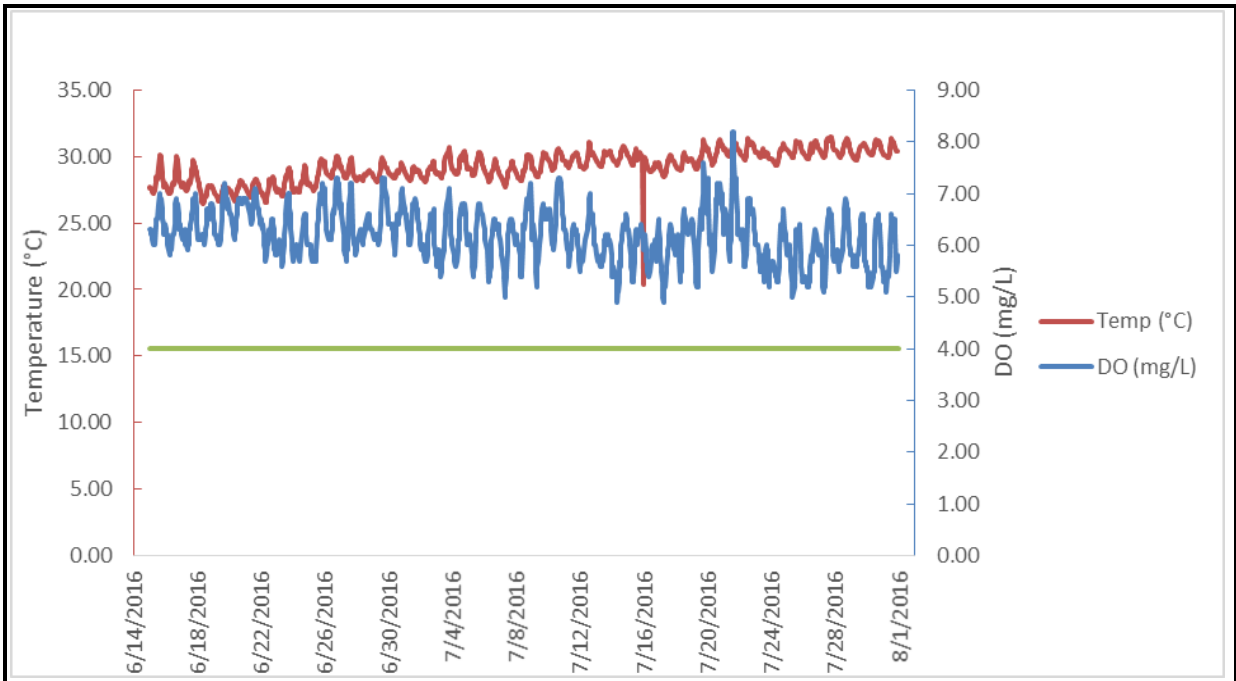
TABLE 4-12 PARR SHOALS TAILRACE MAXIMUM AND MINIMUM DISSOLVED OXYGEN AND TEMPERATURE JUNE 15- JULY 31, 2016

	JUNE		JULY	
	DO (MG/L)	TEMPERATURE (°C)	DO (MG/L)	TEMPERATURE (°C)
Maximum	7.30	30.10	8.20	31.50
Minimum	5.60	26.50	4.90	20.40

Source: Kleinschmidt 2016b

Key:

- DO dissolved oxygen
- C Celsius
- mg/L milligrams per liter



Source: Kleinschmidt 2016b

FIGURE 4-10 PARR SHOALS TAILRACE DO AND TEMPERATURE JUNE 15 – JULY 31, 2016

It was noted that there was a general decline in DO levels recorded at the USGS Jenkinsville gage during the first two weeks of August 2016, after venting had been stopped for the season.

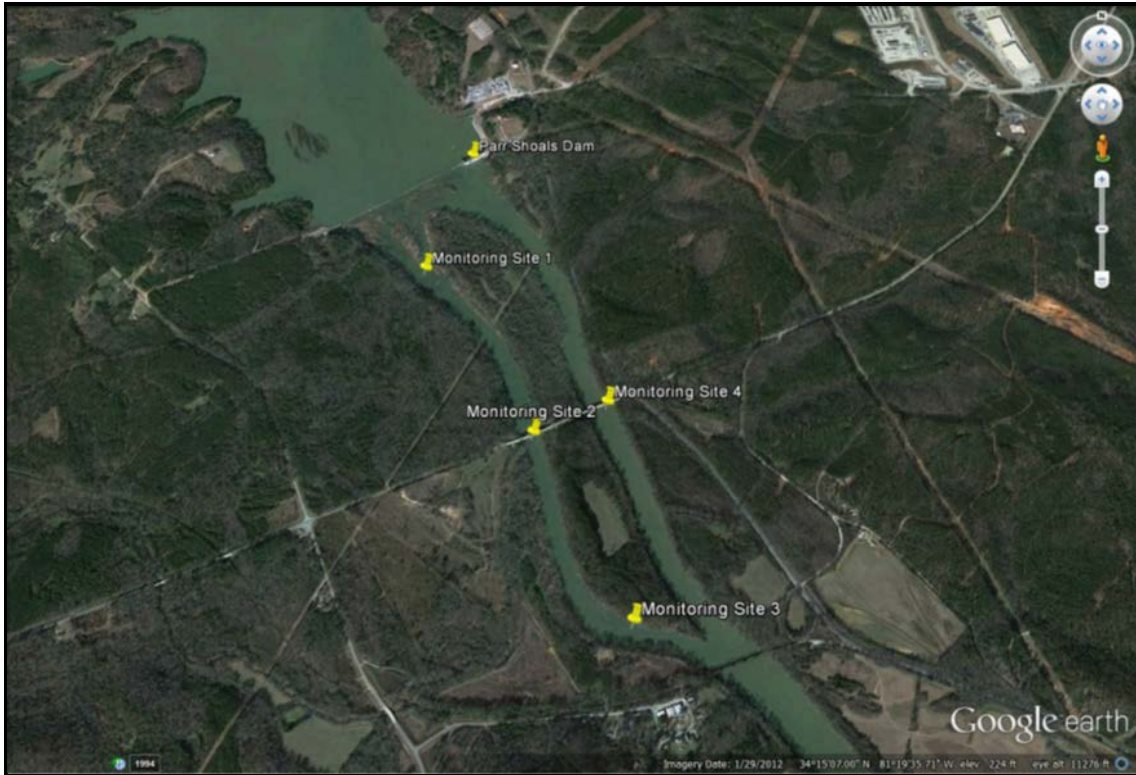
It is unknown if this was related to reductions associated with the cessation of turbine venting or environmental factors. Due to the success of the 2016 Turbine Venting Plan test, SCE&G proposed to perform turbine venting tests during 2017 and to extend the venting season to include June 15 through August 31. SCE&G operated the Parr Development according to the Turbine Venting Plan from June 15 to August 31, 2017. While instantaneous DO levels generally remained above 5 mg/l during the venting period, levels dropped below 5 mg/l during a 5-day period in late July and again for one hour on August 19th. This was likely caused by rain events that occurred immediately prior to the DO excursions (Kleinschmidt 2017). SCE&G used the results of the 2016 and 2017 testing and the individual unit test to update and modify the Turbine Venting Plan.

WEST CHANNEL WATER QUALITY STUDIES

2015 West Channel Study

The Water Quality TWC identified the west channel area of the Broad River downstream of the Parr Dam as a potential area in need of water quality study. SCDNR expressed concern regarding low DO levels in this area of the Broad River during the warmer months. SCE&G developed a study plan to assess the water quality, specifically DO levels, of the west channel of the Broad River, immediately downstream the Parr Shoals Dam (Kleinschmidt 2016c). The complete Water Quality in Downstream West Channel Study Report is included in Exhibit E-4. The study results are summarized below.

Water temperature and DO were continuously monitored at four sites downstream of the Parr Shoals Dam from April 1 through October 15, 2015. Hourly data was collected using HOBO U26 Dissolved Oxygen Loggers with spot measurements collected using a YSI-85 DO meter during monthly downloads of the HOBO data. There were three monitoring sites in the west channel and one in the east channel (Figure 4-11).



SOURCE: KLEINSCHMIDT 2016C

FIGURE 4-11 PARR SHOALS DOWNSTREAM WATER QUALITY MONITORING SITES

The study identified that DO levels in the west channel are periodically below the SCDHEC standard of 4.0 mg/L. Dissolved oxygen levels in the upper west channel of the Broad River, downstream of Parr Shoals Dam, were consistently lower than those further down the west channel and in the east channel. This is likely due to the shallowness of the river in this area, as well as the presence of dense algal mats. Also, during drier weather conditions, the west channel does not receive a consistent flow of water. Throughout the study, fouling of the HOB0 loggers was a constant issue. DO measurements recorded by the YSI meter often displayed very different readings than those collected by the HOB0 loggers in the same locations. There were periods of missing data due to equipment malfunctions and monitors being lost during high flows.

The study data showed that DO levels in the west channel are variable. Dissolved oxygen levels are lowest in the west channel directly downstream of the dam during the summer months, however these levels increase as the distance from the dam increases. Dissolved oxygen levels at the lower west channel site, located approximately 1 mile downstream of the dam, and at the east channel site, located approximately 0.5 mile downstream of the dam, were generally above the SCDHEC instantaneous standard of 4.0 mg/L and were often similar.

Figure 4-12 and Figure 4-13 illustrate results from August 2015, including the general data trends as well as instances of bad data caused by fouling (Kleinschmidt 2016c).

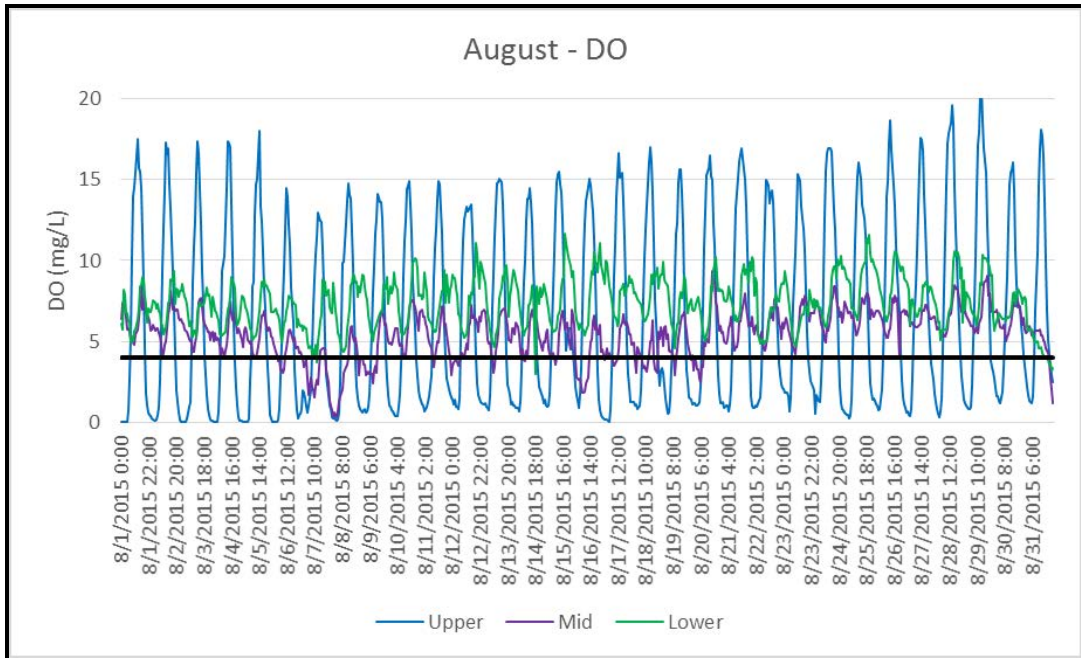


FIGURE 4-12 PARR SHOALS DOWNSTREAM WEST CHANNEL WATER QUALITY FOR AUGUST 2015

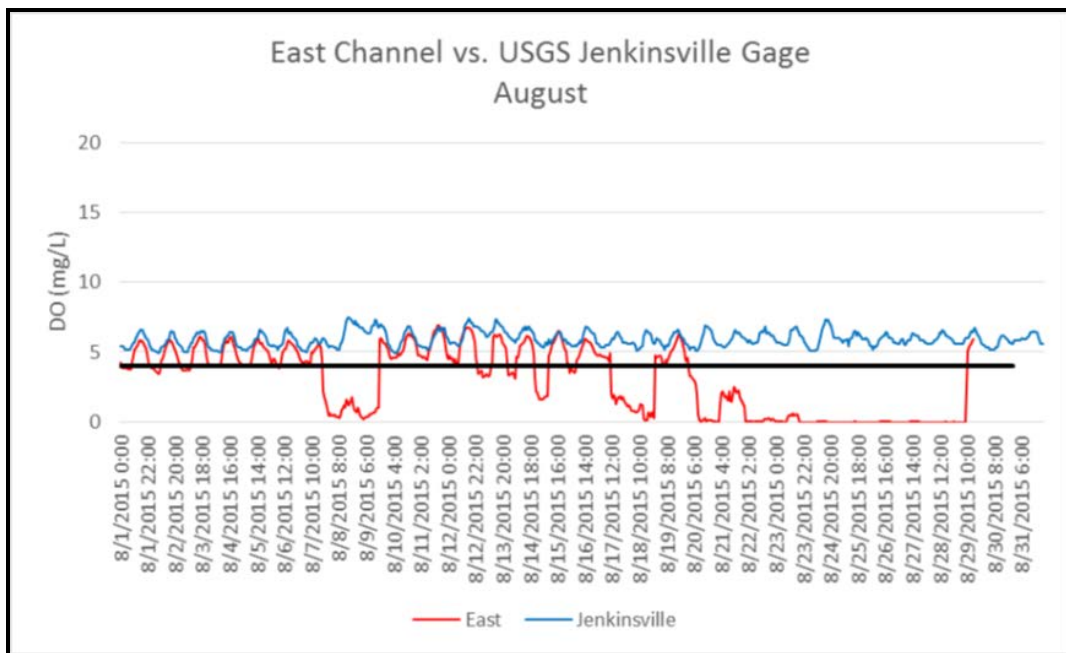
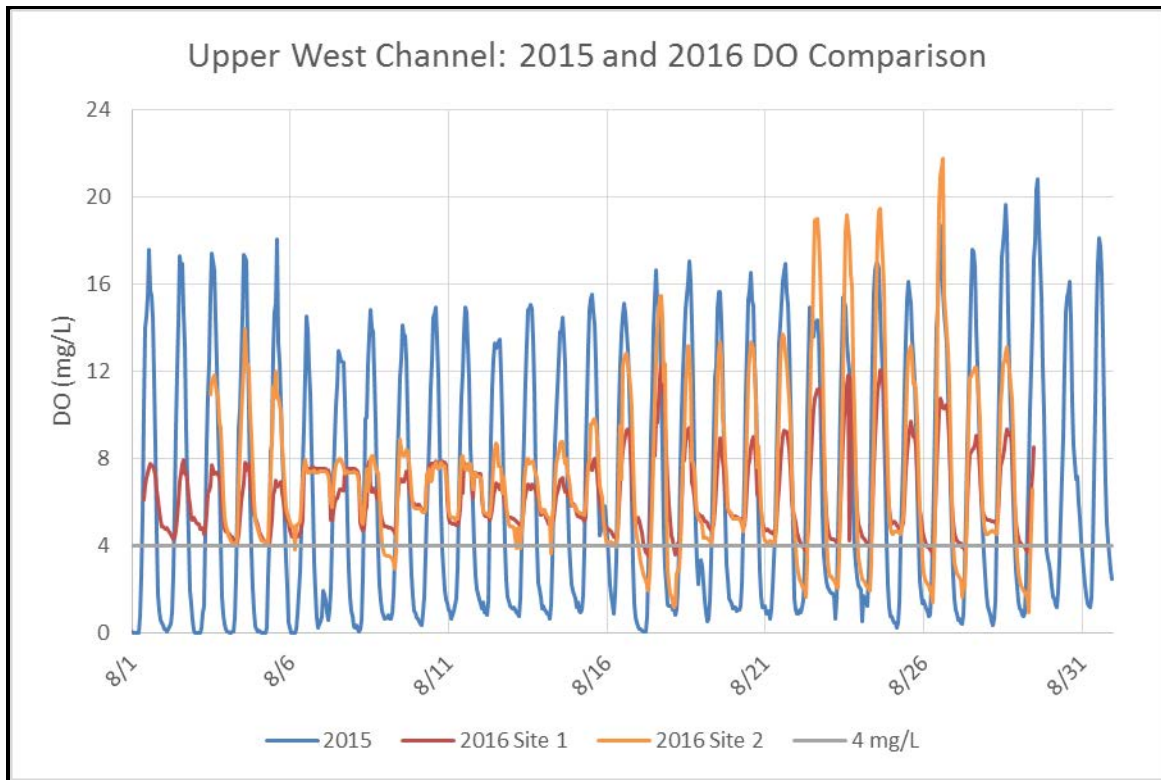


FIGURE 4-13 PARR SHOALS DOWNSTREAM EAST CHANNEL WATER QUALITY FOR AUGUST 2015

As water depths increase at the middle west channel site, the influence of diel respiration was less drastic and some re-aeration likely occurred in the shallow sections of the lower west channel. In the lower west channel site, DO levels may periodically (based on turbine flows) receive some positive influence from main channel flows.

2016 West Channel Study

SCE&G performed initial sampling in the west channel during 2015 and presented that data to the Water Quality TWC. The TWC recommended that SCE&G perform additional collections during 2016 to verify some of the high-water temperatures and low DO readings recorded during late summer of 2015. The complete West Channel Water Quality Second Year Study Report is included in Exhibit E-4. The study results are summarized below.



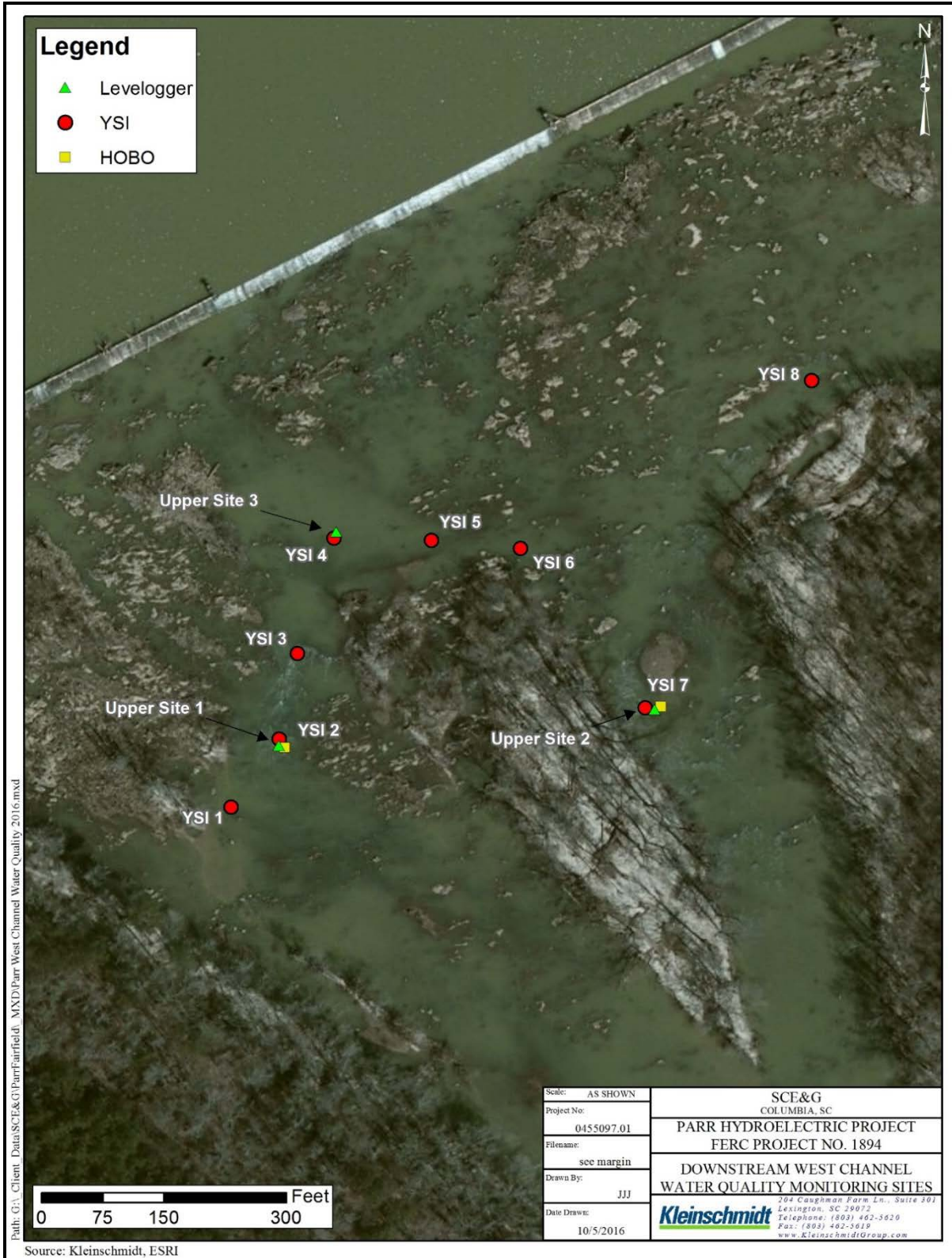
Source: Kleinschmidt 2016d

FIGURE 4-14 UPPER WEST CHANNEL DO – AUGUST 2015 AND 2016

SCE&G collected water temperature and DO data during August 2016 to verify baseline conditions and to evaluate how discrete spillway releases or pulses through the spillway gates affect water quality in the west channel. The pulse flows consisted of distinct releases through

spillway gates 1 and 2 for approximately 3 hours. The spills were targeted to release 25 acre-feet of water into the west channel.

Water temperature and DO were continuously monitored at four sites along the western channel using HOBO U26 DO loggers: two locations just downstream of the Parr Dam (Upper Site 1 and Upper Site 2), one location midway down Hampton Island near the Highway 213 bridge (Middle West Channel), and one location at the lower extent of the western channel, just upstream of the confluence with the Broad River main channel (Lower West Channel). Additional water quality sites were sampled for DO and water temperature periodically during the study using a YSI-85 DO meter (YSI-1 through YSI-8). Level logger data were collected at three locations in the upper west channel (Upper Site 1, Upper Site 2 and Upper Site 3), and stream flow measurements were collected at two locations in the upper west channel (Upper Site 1 and Upper Site 2). Each of the monitoring sites are shown in Figure 4-15 and Figure 4-16 (Kleinschmidt 2016d).



Source: Kleinschmidt 2016d

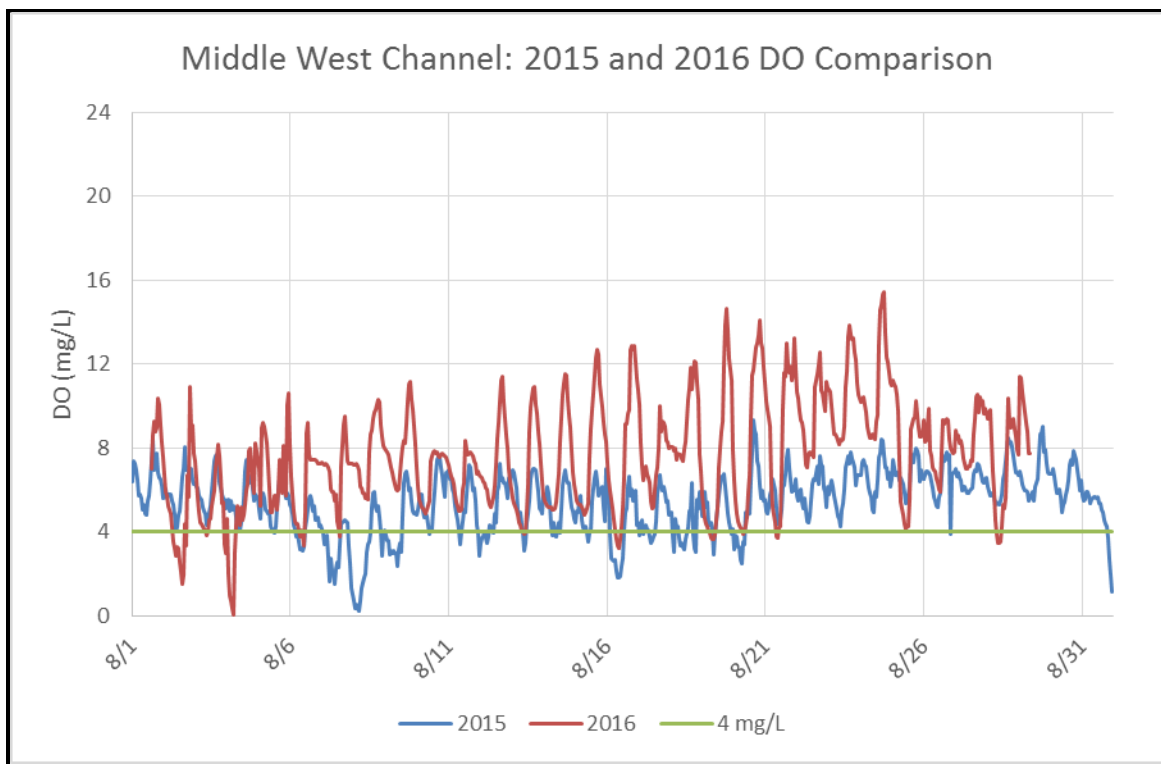
FIGURE 4-15 PARR SHOALS DOWNSTREAM UPPER WEST CHANNEL MONITORING SITES - 2016



Source: Kleinschmidt 2016d

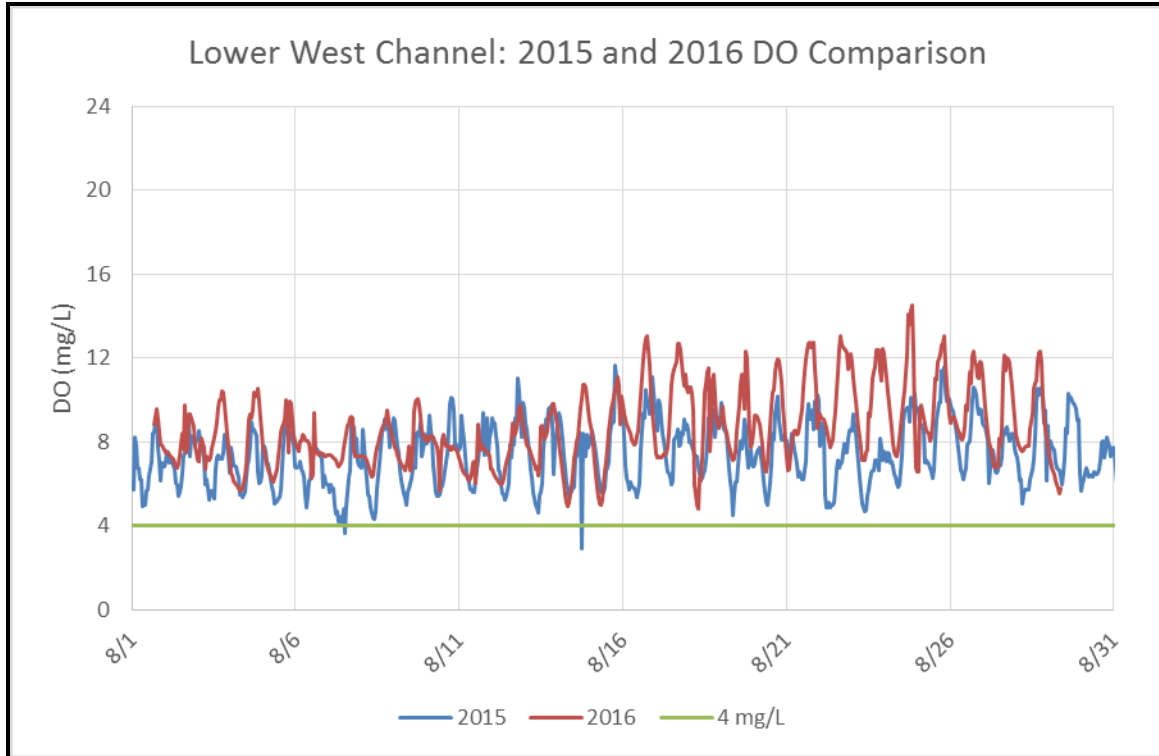
FIGURE 4-16 PARR SHOALS DOWNSTREAM LOWER WEST CHANNEL MONITORING SITES - 2016

DO levels generally remained above the SCDHEC standard of 4 mg/L (SCDHEC 2012) during 2016, with diel fluctuations in both temperature and DO occurring throughout the study, as shown in Figure 4-17 and Figure 4-18. Greater fluctuations in DO were observed later in the month as aquatic vegetation increased and spillway flows were curtailed. Unlike the original 2015 study, where equipment was continually fouled by aquatic vegetation, equipment during this 2016 study was cleaned on a weekly basis, suggesting that the results of this study offer more accurate readings for DO experienced in the west channel during the late summer period. Dissolved oxygen levels in 2016 were generally greater than those observed during 2015, reaching higher levels, and not reaching minimum levels observed during 2015.



Source: Kleinschmidt 2016d

FIGURE 4-17 MIDDLE WEST CHANNEL DISSOLVED OXYGEN – AUGUST 2015 AND 2016



Source: Kleinschmidt 2016d

FIGURE 4-18 LOWER WEST CHANNEL DISSOLVED OXYGEN – AUGUST 2015 AND 2016

The study also determined that water levels in the west channel are strongly influenced by flows from the powerhouse and indicate that portions of the tailrace flows enter the west channel. An increase in the amount of water passing through the powerhouse will increase the amount of water in the west channel and should help to improve DO levels in the west channel. It is possible that the higher DO levels observed during 2016 were a result of both the flows to the west channel from the tailrace combined with periodic spills of approximately 25 acre-feet.

Overall, water quality in the west channel seems to be most impacted during the later summer months, when stream flows are typically lower, temperatures are warmer, and vegetation growth is at a higher level. The planned smaller spillway pulses appeared to have a positive effect on DO levels in the west channel, as observed DO levels were measurably increased with each of the planned pulse events. The pulses of approximately 25 acre-feet, in combination with the unplanned spills, maintained higher levels of water quality in the west channel.

4.4.2.4 Water Quality – Proposed Action

A complete description of SCE&G’s proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed the following PM&E measures that would affect water quality in the project area:

- Parr Shoals Dam Turbine Venting Plan (Exhibit E-4)
- Enhancements to the West Channel Downstream of Parr Shoals Dam Adaptive Management Plan (AMP) (Exhibit E-4)
- Parr Reservoir and Monticello Reservoir Shoreline Management Plans (Exhibit E-10)
- Erosion Monitoring Plan (Exhibit E-3)

Parr Shoals Dam Turbine Venting Plan

SCE&G proposes to implement the Turbine Venting Plan at Parr Shoals Dam during the first year following license issuance. This will improve water quality downstream of the dam, minimizing excursions from the instantaneous minimum.

The plan states that turbine venting shall occur continuously during a “venting period” for each calendar year, with vents opened as turbines are started and brought online. During the venting period, the turbines will be operated with vents opened in a first-on / last-off order as follows: 3, 1, 5, 2, 4, and 6. Exceptions to this operating order will occur due to equipment maintenance that results in unit outages, or emergency conditions. SCE&G shall follow the venting procedures from June 15 through August 31 of each year. This period captures all of the excursions recorded by the nearby USGS Jenkinsville gage since the newer style probe was installed in 2011 (Kleinschmidt 2016a).

SCE&G will provide documentation to SCDHEC of DO excursions below the standard within 10 days of occurrence. Upon request from a consulting agency, SCE&G will provide hourly records to agency representatives to demonstrate adherence to the order of turbine operating during a venting period. Documentation of maintenance activities to justify deviation from the turbine operating order will be provided, should a deviation occur (Kleinschmidt 2016a).

Enhancements to the West Channel Downstream of Parr Shoals Dam Adaptive Management Plan

SCE&G plans to implement the West Channel AMP during the first 5 years of the new license. The objective of the AMP is to improve water quality year-round (specifically to meet state

standards for DO and to improve DO levels in the West Channel during summer/fall periods), to provide a more natural water temperature profile, and to improve water depth and velocity. SCE&G will work with stakeholders throughout the 5-year term of the AMP to accomplish this objective. The AMP details several methods for water quality improvement and habitat enhancement including: determining a flow target that will maintain DO levels in the west channel, increased minimum flows, channel modifications, and low inflow pulses. During each year of the AMP, monitoring will be conducted from May 15 to September 30. Water temperature and DO will be continuously monitored at three sites along the west channel. In addition, random samples of temperature and DO will be collected every 2 weeks in the west channel. SCE&G will meet annually with a Review Committee to review monitoring results and an annual report will be filed with FERC. At the end of the 5-year AMP period, the Review Committee will provide final recommendations to FERC on extension or completion of the AMP.

Shoreline Management Plans and Erosion Monitoring Plans

SCE&G will implement the updated SMPs and Erosion Monitoring Plan for both reservoirs. The Erosion Monitoring Plan is discussed in detail in Section 4.3 and the SMPs are discussed in detail in Section 4.10. The SMPs will require permittees to utilize best management practices when performing any construction or activities within the project boundary, thus protecting water quality in the reservoirs. The Erosion Monitoring Plan will provide annual monitoring of shoreline erosion at both reservoirs. These measures will mitigate for introduction of new point sources of pollution for the reservoir.

4.4.3 Environmental Effects – No Action Alternative

Under the no action alternative, the existing systems would continue to operate. Periodic incidences of DO levels less than 4 mg/L in the tailrace of Parr Shoals Dam during late summer would continue to occur. Also, the downstream west channel would continue to experience low DO during periods of low inflow. These instances would occur more frequently during both generation and non-generation periods under the no action alternative than they would under the proposed action due to the lack of turbine venting and operational changes at the developments.

4.4.4 Unavoidable Adverse Effects

The proposed operations and enhancements described should not lead to any unavoidable adverse effects on water resources at the Project.

4.4.5 References

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Section 4

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4.5 FISHERY RESOURCES

4.5.1 Affected Environment

Parr Reservoir, Monticello Reservoir, and the Broad River downstream of Parr Shoals Dam are the three water bodies affected by the Project. Only Parr Reservoir and Monticello Reservoir are located within the project boundary. Parr Reservoir is an impoundment on the Broad River and normally operates in a modified run-of-river mode to continuously pass Broad River flow. The 15-mile-long Parr Reservoir has a surface area of approximately 4,250 acres at full pool and serves as the lower reservoir for pumped-storage operations. The current license allows for Parr Reservoir to fluctuate up to 10 feet, which dewater aquatic habitat daily. During February through April, when many fish species are spawning in shallow water habitat, average daily water level fluctuations range from 2.9 feet to 4.2 feet in Parr Reservoir, and the majority of substrate consists of silt, with some sand.

The Fairfield Development is located directly off the Broad River and forms the approximately 6,600-acre upper reservoir, Monticello Reservoir, with four earthen dams. The current license allows for Monticello Reservoir to fluctuate up to 4.5 feet, which dewater aquatic habitat daily. During February through April, when many fish species are spawning in shallow water habitat, average daily water level fluctuations range from 1.6 feet to 2.4 feet in Monticello Reservoir.

In 2013, SCE&G assessed baseline fisheries data for Parr Reservoir, Monticello Reservoir, and the downstream reach of the Broad River in the Baseline Fisheries Report, which was filed with the PAD on January 5, 2015. A summary of the information contained in that report is included in the sections below.

4.5.1.1 Parr Reservoir Fisheries

Thirty fish species have been documented in Parr Reservoir (Table 4-13). Although some seasonal variations in community structure have been documented, the fish communities are similar between the Parr and Monticello reservoirs, with gizzard shad, blue catfish, bluegill, channel catfish and white perch as the dominant species (Kleinschmidt 2013a). Large numbers of gizzard shad have been documented during the summer months; however, data suggest that these populations decline rapidly during the fall and winter, presumably due to high levels of predation, seasonal die-offs, or both (Normandeau 2007, 2008, 2009; SCANA 2013). The robust redhorse, a species of highest conservation priority in South Carolina

(SCDNR 2005) has been found in Parr Reservoir and in the Broad River downstream of Parr Shoals Dam.

TABLE 4-13 FISH SPECIES DOCUMENTED AT PARR AND MONTICELLO RESERVOIRS

COMMON NAME	SCIENTIFIC NAME	PARR	MONTICELLO
black crappie	<i>Pomoxis nigromaculatus</i>	x	x
blue catfish	<i>Ictalurus furcatus</i>	x	x
bluegill	<i>Lepomis macrochirus</i>	x	x
channel catfish	<i>Ictalurus punctatus</i>	x	x
flat bullhead	<i>Ameiurus platycephalus</i>	x	x
flathead catfish	<i>Pylodictis olivaris</i>	x	
gizzard shad	<i>Dorosoma cepedianum</i>	x	x
golden shiner	<i>Notemigonus chrysoleucas</i>	x	x
highfin carpsucker	<i>Carpoides velifer</i>	x	
largemouth bass	<i>Micropterus salmoides</i>	x	x
longnose gar	<i>Lepisosteus osseus</i>	x	
northern hogsucker	<i>Hypentelium nigricans</i>	x	x
notchlip redhorse	<i>Moxostoma collapsum</i>	x	x
pumpkinseed	<i>Lepomis gibbosus</i>	x	x
quillback	<i>Carpoides cyprinus</i>	x	x
redbreast sunfish	<i>Lepomis auritus</i>	x	x
redeer sunfish	<i>Lepomis microlophus</i>	x	x
robust redhorse	<i>Moxostoma robustum</i>	x	x
sandbar shiner	<i>Notropis szepticus</i>	x	
shorthead redhorse	<i>Moxostoma macrolepidotum</i>	x	x
smallmouth bass	<i>Micropterus dolomieu</i>	x	x
snail bullhead	<i>Ameiurus brunneus</i>		x
spottail shiner	<i>Notropis hudsonius</i>	x	x
threadfin shad	<i>Dorosoma petenense</i>	x	x
warmouth	<i>Lepomis gulosus</i>	x	x
white bass	<i>Morone chrysops</i>	x	
white catfish	<i>Ameiurus catus</i>	x	x
white perch	<i>Morone americana</i>	x	x
whitfin shiner	<i>Cyprinella nivea</i>	x	x
yellow bullhead	<i>Amierus natalis</i>	x	x
yellow perch	<i>Perca flavescens</i>	x	x

Source: Normandeau 2007, 2008, 2009; SCANA 2013; Caleb Gaston, personal communication, January 17, 2017

4.5.1.2 Monticello Reservoir Fisheries

Twenty-six fish species have been documented in Monticello Reservoir (Table 4-13). 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 (Kleinschmidt 2013a). As in Parr Reservoir, large numbers of gizzard shad have been documented during the summer months, and these populations decline during the fall and winter, presumably due to high levels of predation, seasonal die-offs, or both (Normandeau 2007, 2008, 2009; SCANA 2013).

4.5.1.3 Fisheries in the Broad River Downstream of Parr Shoals Dam

An ongoing fish community study conducted by SCDNR Region 3 fisheries staff has provided significant data describing the fish community in the lower Broad River downstream of the Parr Shoals Dam. This study has sampled the lower Broad River fish community since 2009. Data compiled from 2009-2013 indicates that there is higher species diversity in the downstream reaches, as compared to the two upstream reservoirs (54 species in the Broad River downstream of Parr Shoals Dam, compared to 24-30 species in the Parr and Monticello reservoirs) (Table 4-14). The number of species increases with increased distance from the dam, although redbreast sunfish, whitefin shiner, bluegill and snail bullhead dominate boat electrofishing samples throughout the downstream reaches. The west channel area displays the lowest diversity (13 species) and is dominated by Centrarchids, with bluegill and redbreast sunfish accounting for more than 85% of the total catch in that reach. Bettinger et al. (2003) also sampled a site downstream of the Parr Shoals Dam (just below Bookman Island) as part of a basin-wide aquatic resource inventory and documented 34 fish species in that reach. Boat electrofishing samples were dominated by redbreast sunfish, redear sunfish, whitefin shiner and sandbar shiner. Redbreast sunfish, margined madtom, Piedmont darter, whitefin shiner and seagreen darter dominated backpack electrofishing samples (Table 4-15).

TABLE 4-14 FISH ABUNDANCE IN THE BROAD RIVER DOWNSTREAM OF PARR SHOALS DAM, FALL 2009 THROUGH SPRING 2013

COMMON NAME	SCIENTIFIC NAME	N ¹	RELATIVE ABUNDANCE
redbreast sunfish	<i>Lepomis auritus</i>	5455	30.21%
snail bullhead	<i>Ameiurus brunneus</i>	2884	15.97%
whitefin shiner	<i>Cyprinella nivea</i>	1824	10.10%
bluegill	<i>Lepomis macrochirus</i>	1440	7.97%
brassy jumprock	<i>Scartomyzon sp.</i>	774	4.29%
sandbar shiner	<i>Notropis szepticus</i>	585	3.24%
largemouth bass	<i>Micropterus salmoides</i>	446	2.47%
margined madtom	<i>Noturus insignis</i>	415	2.30%
spottail shiner	<i>Notropis hudsonius</i>	414	2.29%
longnose gar	<i>Lepisosteus osseus</i>	345	1.91%
notchlip redhorse	<i>Moxostoma collapsum</i>	315	1.74%
shorthead redhorse	<i>Moxostoma</i>	294	1.63%
piedmont darter	<i>Percina crassa</i>	285	1.58%
redeer sunfish	<i>Lepomis microlophus</i>	275	1.52%
flat bullhead	<i>Ameiurus platycephalus</i>	212	1.17%
channel catfish	<i>Ictalurus punctatus</i>	188	1.04%
v-lip redhorse	<i>Moxostoma pappillosum</i>	161	0.89%
smallmouth bass	<i>Micropterus dolomieu</i>	159	0.88%
bluehead chub	<i>Nocomis leptcephalus</i>	145	0.80%
threadfin shad	<i>Dorosoma petenense</i>	140	0.78%
coastal shiner	<i>Notropis petersoni</i>	126	0.70%
gizzard shad	<i>Dorosoma cepedianum</i>	114	0.63%
american shad	<i>Alosa sapidissima</i>	109	0.60%
northern hogsucker	<i>Hypentelium nigricans</i>	102	0.56%
greenfin shiner	<i>Cyprinella chloristia</i>	85	0.47%
blue catfish	<i>Ictalurus furcatus</i>	67	0.37%
seagreen darter	<i>Etheostoma thalassinum</i>	55	0.30%
thicklip chub	<i>Cyprinella labrosa</i>	51	0.28%
tessellated darter	<i>Etheostoma olmstedii</i>	51	0.28%
highback chub	<i>Hybopsis hypsinotus</i>	46	0.25%
eastern mosquitofish	<i>Gambusia holbrooki</i>	43	0.24%
green sunfish	<i>Lepomis cyanellus</i>	36	0.20%
warmouth	<i>Lepomis gulosus</i>	32	0.18%
spotted sucker	<i>Minytrema melanops</i>	29	0.16%
quillback	<i>Carpionodes cyprinus</i>	26	0.14%
white perch	<i>Morone americana</i>	26	0.14%
white catfish	<i>Ameiurus catus</i>	19	0.11%
robust redhorse	<i>Moxostoma robustum</i>	18	0.10%
American eel	<i>Anguilla rostrata</i>	17	0.09%
striped jumprock	<i>Moxostoma rupiscartes</i>	17	0.09%
black crappie	<i>Pomoxis nigromaculatus</i>	14	0.08%

Section 4

COMMON NAME	SCIENTIFIC NAME	N ¹	RELATIVE ABUNDANCE
swallowtail shiner	<i>Notropis procne</i>	14	0.08%
carp	<i>Cyprinus carpio</i>	11	0.06%
flathead catfish	<i>Pylodictis olivaris</i>	9	0.05%
blackbanded darter	<i>Percina nigrofasciata</i>	3	0.02%
grass carp	<i>Ctenopharyngodon idella</i>	2	0.01%
striped bass	<i>Morone saxatilis</i>	2	0.01%
tadpole madtom	<i>Noturus gyrinus</i>	2	0.01%
creek chubsucker	<i>Erimyzon oblongus</i>	1	0.01%
Santee chub	<i>Hybopsis zanema</i>	1	0.01%
white bass	<i>Morone chrysops</i>	1	0.01%
yellow perch	<i>Perca flavescens</i>	1	0.01%

Source: Ron Ahle, SCDNR Freshwater Fisheries Region 3, Unpublished data

¹ Number

Table 4-15 Relative Abundance of Fish Species Collected by Boat and Backpack Electrofishing Below Bookman Island

SPECIES	BOAT	BACKPACK
longnose gar	0.8	
gizzard shad	0.1	
threadfin shad	0.4	
greenfin shiner	0.1	0.4
whitefin shiner	6.4	9
common carp	0.1	
eastern silvery minnow	0.1	
thicklip chub		4.3
bluehead chub		1.7
spottail shiner	0.5	0.9
yellowfin shiner	0.2	1.3
sandbar shiner	8.3	3.2
silver redhorse	4.8	
shorthead redhorse	0.1	
striped jumprock	0.2	
brassy jumprock	3.6	
snail bullhead	0.9	7.7
flat bullhead	0.6	1.0
channel catfish	0.2	0.1
marginated madtom	0.2	13.6
white perch	0.3	
white bass	0.1	
flier	0.1	
redbreast sunfish	41.8	35.9
pumpkinseed	0.1	
warmouth	0.8	
bluegill	16.2	0.3
redeer sunfish	7.5	
largemouth bass	4.2	0.5
black crappie	0.4	
tessellated darter	0.1	1.0
yellow perch	0.8	
seagreen darter		8.3
Piedmont darter	0.1	10.6
	100%	100%

Source: Bettinger et al. 2003

Smallmouth bass were first introduced to the Broad River by SCDNR in 1984 to enhance sportfishing opportunities, and they are currently found throughout the Broad River, and in Parr and Monticello reservoirs (Bettinger et al. 2003). Stocking has recently been curtailed due to sustainable levels of natural recruitment (Hal Beard, SCDNR, Personal Communication). Smallmouth bass growth rates in the Broad River are similar to those found in other Piedmont systems in the southeast (Bettinger et al. 2003).

Robust redhorse are present throughout the Project. Several areas downstream of Parr Shoals Dam offer suitable spawning habitat for robust redhorse, and may be utilized by the species during spring spawning (see Robust Redhorse Spawning Areas Memo in Exhibit E-5). At least four potential spawning habitats for robust redhorse have been identified downstream of the Project and spawning has been observed at one of the four locations.

4.5.1.4 Diadromous Fish

Historically, many rivers in the Santee River Basin, including the lower Broad River where the Project is located, supported diadromous fish populations. Diadromous species that occurred in the Santee River Basin prior to the construction of dams include anadromous American shad, blueback herring, hickory shad, striped bass, Atlantic sturgeon and shortnose sturgeon, as well as the catadromous American eel (Newcome and Fuller 2001). Currently, only American shad, striped bass and American eel are known to occur in the Broad River downstream of the Project. Striped bass that occur in the lower Broad River are part of the dam-locked Santee-Cooper lakes population (Rohde et al. 2009) and thus are not truly anadromous. American shad and American eel are both listed as SCDNR species of highest conservation priority (SCDNR 2005) and have been the focus of restoration efforts in the basin.

American shad have been documented downstream of Parr Shoals Dam at the Columbia Hydroelectric Project (Columbia Project) (FERC No. 1895) (Table 4-16). The anadromous species pass through the Santee-Cooper lake system via the St. Stephen Fish Lift and the Pinopolis Navigation Lock, and move up into the Congaree River. Some individuals continue to pass upstream into the Broad River through the Columbia Fishway. The Columbia Fishway was constructed in 2006 at the Columbia Project, located on the lower Broad River approximately 23 miles downstream of the Parr Shoals Dam. The fishway was designed to provide safe, timely and effective upstream passage for anadromous American shad and blueback herring to historical spawning and maturation habitats upstream of the Columbia

Diversion Dam (i.e. areas of the lower Broad River downstream of the Parr Shoals Dam). The most recent monitoring data suggests that an estimated 693 American shad were passed upstream during the 2017 migration season, 1,154 shad were passed during the 2016 migration season, and 3,733 shad were passed during the 2015 migration season (Kleinschmidt 2016a) (Table 4-16). Although American shad passage numbers at the Columbia Fishway have generally increased with time, telemetry research suggests that the majority of Santee Basin shad (76% of tagged fish in 2010) terminate their annual upstream migration somewhere between the Congaree and Wateree confluence and the Interstate 95 Bridge crossing on the Santee River (Post 2010). This reach is located approximately 70 miles downstream of the Project. In addition to passage through the fishway at the Columbia Project, SCDNR stocked American shad fry in the lower Broad River downstream of the Project annually since 2009, with more than 7 million fry having been stocked to date in the Broad River and more than 2 million in 2013 (Rose 2013). However, recent otolith analyses suggest very low hatchery contribution to the Santee Basin shad population, with only 0.08 to 2.8% percent of fish captured during 2010 through 2012 being of hatchery origin (Gibbons and Post 2013). These studies indicate that American shad are currently at low levels downstream of the Project.

TABLE 4-16 AMERICAN SHAD PASSAGE AT COLUMBIA PROJECT

YEAR	SHAD OBSERVED (N)	ESTIMATED TOTAL SHAD PASSAGE	ST. STEPHENS PASSAGE
2007	15	224	328,828
2008	7	102	29,000
2009	35	243	389,000
2010	45	323	348,300
2011	77	615	272,961
2012	240	1182	150,082
2013	183	1730	324,984
2014	163	843	42,535
2015	899	3733	85,417
2016	268	1154	41,375
2017	141	693	46,522

Source: Kleinschmidt 2016a; JMT 2017

4.5.1.5 Mussels

In 2013, SCE&G compiled existing data on mussels and macroinvertebrates within Parr Reservoir and the Broad River downstream of the Project in the Macroinvertebrate and Mussel Report, which was filed with the PAD on January 5, 2015 (Kleinschmidt 2013b).

Dense mussel populations and suitable mussel habitat have been noted throughout the reach of the Broad River downstream of Parr Shoals Dam (Price 2010). Similarly, it has been noted that the greatest documented freshwater mussel diversity in the Broad River sub-basin in North and South Carolina upriver from the Columbia Dam occurs in the Parr tailrace (Alderman and Alderman 2012). In addition, the Parr tailrace has the most upriver occurrence of the yellow lampmussel recorded to date and the largest extant population of eastern creekshell in the Santee Basin (Alderman and Alderman 2012). Finally, Roanoke slabshell juveniles, which are thought to require an anadromous fish host, have been documented in the Parr tailrace (Table 4-17). None of the species found in the Parr Reservoir or in the downstream reach of the Broad River are listed as threatened or endangered; however, SCDNR (2006) has classified several as priority species (Table 4-17).

TABLE 4-17 FRESHWATER MUSSELS DOCUMENTED IN PARR RESERVOIR AND BROAD RIVER

COMMON NAME	SCIENTIFIC NAME	Parr Reservoir ¹	Broad River ¹	Parr Tailrace ²	Priority Status ³
common elliptio	<i>Elliptio complanata</i>	x	x	x	Moderate
Roanoke slabshell	<i>E. roanokensis</i>			x	High
variable spike	<i>E. icterina</i>			x	Moderate
Carolina lance	<i>E. angustata</i>			x	Moderate
northern lance	<i>E. fisheriana</i>			x	High
yellow lance	<i>E. lanceolata</i>	x	x		
Florida pondhorn	<i>Unio merus carolinianus</i>	x	x	x	
paper pondshell	<i>Utterbackia imbecillis</i>			x	
eastern creekshell	<i>Villosa delumbis</i>	x	x	x	Moderate
yellow lampmussel	<i>Lampsilis cariosa</i>			x	Highest
¹ Source: Price 2010 ² Source: Alderman and Alderman 2012 ³ Source: SCDNR 2006					

4.5.2 Environmental Effects

4.5.2.1 Completed Studies

DESKTOP FISH ENTRAINMENT STUDY

The Fisheries TWC recommended that a desktop fish entrainment and turbine mortality study be conducted as part of project relicensing to determine the potential impacts that operation of the Parr and Monticello developments has on the fish communities at the Project. Entrainment rates were estimated via a desktop analysis, using fish entrainment data for similar projects throughout the southeast. After the report was completed in early 2016, stakeholders provided additional information that assisted in calculating a more precise estimate of entrainment mortality at the Project. SCE&G reevaluated the study results using the new data. The Desktop Fish Entrainment Study Report, and the Revised Fairfield Entrainment Mortality Estimate Memo from May 30, 2017, outlining the methods and results associated with the new entrainment mortality estimates, are included in Exhibit E-5.

FAIRFIELD HYDROACOUSTICS STUDY

One recommendation of the Desktop Fish Entrainment Study Report was to identify potential ways to reduce fish entrainment at the Project. The Fisheries TWC discussed the reduction of lighting at night in Fairfield Development intake areas as a way to reduce fish entrainment. SCE&G performed hydroacoustic evaluations in the intake areas during conventional and pump-back generation, at night, with lights on and lights off, to determine if reduction of lighting in the intake area could reduce concentrations of fish at the intakes and therefore reduce entrainment potential. The complete results of this study are outlined in the Hydroacoustic Estimates and Distribution of Fish in Monticello and Parr Reservoirs in August 2017 Report (Fairfield Hydroacoustics Study), included in Exhibit E-5. This study resulted in a PM&E recommendation that is discussed in Section 4.5.2.2 Proposed Action.

RESERVOIR FLUCTUATION STUDY

During issues scoping meetings and in comments on the PAD, the Fisheries TWC identified the need for a reservoir fluctuation study on Parr and Monticello reservoirs (Exhibit E-1). The operating regime for the Project currently consists of lowering and refilling the Project's two reservoirs daily. Parr Reservoir is currently permitted by the FERC license to fluctuate up to

10 feet and Monticello Reservoir is permitted to fluctuate up to 4.5 feet. However, the amount that the project reservoirs fluctuate is dependent on load demands and system needs. Geographic Information System (GIS) and photogrammetry were used to estimate total reservoir acreage exposed at different reservoir elevations in Parr Reservoir, and to characterize the types of substrate found throughout the reservoir (Kleinschmidt 2016b). On Monticello Reservoir, SCE&G collected digital imagery during a partial drawdown and used it to create a digital elevation model that could be viewed and assessed using GIS (Kleinschmidt 2016b). During this drawdown event on Monticello Reservoir, areas that could be part of habitat enhancement efforts were identified. The Fisheries TWC, specifically SCDNR representatives, requested that a Monticello Reservoir Fish Habitat Enhancement Study be conducted (Exhibit E-5). This study resulted in PM&E measures which are outlined in the Proposed Action Section 4.5.2.2.

IFIM STUDY AND DOWNSTREAM FLOW FLUCTUATIONS

Stakeholders requested a study of the current downstream minimum flows requirements for the Parr Development and their potential effect on downstream aquatic habitat. SCE&G performed a Mesohabitat Assessment to characterize downstream aquatic habitats and an IFIM study downstream of Parr Shoals Dam. Part of the downstream evaluation included a qualitative assessment of spawning habitat for robust redhorse. Biologists with SCANA Corporate Environmental Services, Kleinschmidt Associates, and SCDNR evaluated reaches of the Broad River downstream of Parr Shoals Dam that could provide suitable robust redhorse spawning habitat. The group utilized published habitat suitability criteria to identify areas along the river as part of the robust redhorse spawning site assessment. The complete IFIM Report and Mesohabitat Assessment are included in Exhibit E-5.

In a response to comments received on the PAD, SCE&G performed additional desktop analyses of downstream flow fluctuations from the Project associated with combined Parr and Fairfield operations and their potential impact on fish spawning habitat in the Broad River downstream of the Project. Two Downstream Flow Fluctuations Memos dated December 16, 2015 and June 9, 2016 are included Exhibit E-5. This analysis resulted in the development of the Flow Fluctuations Downstream of Parr Shoals Dam AMP, which is discussed further in Section 4.5.2.2 Proposed Action.

AMERICAN EEL ABUNDANCE STUDY

As a part of the project relicensing efforts, SCE&G conducted American eel surveys in 2015 and 2016 to characterize the abundance and distribution of American eels immediately downstream of Parr Shoals Dam. These surveys found that American eels are present downstream of Parr Shoals Dam, however in low numbers (Kleinschmidt 2016c). The complete results of this study are outlined in Exhibit E-5.

MONTICELLO RESERVOIR FRESHWATER MUSSEL SURVEY REPORT

Six species of freshwater mussels were found in the Monticello Reservoir during the Monticello Reservoir Freshwater Mussel Survey (Kleinschmidt 2016d) (Exhibit E-5). Multiple size classes were found for five of the six species (i.e. multiple ages/lifestages), suggesting that daily water level fluctuations do not limit the population sustainability of the mussels found in the reservoir, and that the mussels are successfully reproducing. Three of the species found during the study (Carolina creekshell, Carolina lance, and Eastern creekshell) have some reported level of conservation concern (SCDNR 2005) (Table 4-18). The Carolina creekshell has a highest priority status according to SCDNR and has not previously been identified as occurring within the Monticello Reservoir. The Monticello Reservoir Freshwater Mussel Survey noted that Carolina creekshell does not typically inhabit lentic habitats like those found in Monticello Reservoir. However, at the request of agencies, specifically SCDHEC, further genetic testing was completed to confirm that the Carolina creekshell individuals collected from Monticello Reservoir were correctly identified. The testing confirmed the presence of the Carolina creekshell in the reservoir. The full results of the genetic testing are included in the Freshwater Mussel Genetics Study Report (Exhibit E-5).

TABLE 4-18 MUSSEL SPECIES COLLECTED IN MONTICELLO RESERVOIR DURING 2015

SPECIES	SCIENTIFIC NAME	SCDNR PRIORITY STATUS
Carolina lance	<i>Elliptio angustata</i>	Moderate
Eastern floater	<i>Pyganadon cataracta</i>	n/a
Florida pondhorn	<i>Unio merus carolinianus</i>	n/a
Paper pondshell	<i>Utterbackia imbecillis</i>	n/a
Eastern creekshell	<i>Villosa delumbis</i>	Moderate
Carolina creekshell	<i>Villosa vaughaniana</i>	Highest

Source: Kleinschmidt 2016d

4.5.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed the following PM&E measures that would affect fisheries in the project area:

- Flow Fluctuations Downstream of Parr Shoals Dam AMP (Exhibit E-5)
- Minimum Flows Downstream of Parr Shoals Dam AMP (Exhibit E-5)
- Hydroacoustic Estimates and Distribution of Fish in Monticello and Parr Reservoirs in August 2017 - PM&E Recommendation (Exhibit E-5)
- Monticello Reservoir Fisheries Habitat Enhancement Plan (Exhibit E-5)
- Habitat Enhancement Program (Exhibit E-5)
- Santee River Basin Accord for Diadromous Fish Protection, Restoration, and Enhancement Program (Exhibit E-5)
- American Eel Abundance Monitoring Plan (Exhibit E-5)
- Freshwater Mussel Monitoring Plan (Exhibit E-5)
- Enhancements to the West Channel Downstream of Parr Shoals Dam AMP (Exhibit E-4)
- Turbine Venting Plan (Exhibit E-4)

Downstream Flows

SCE&G plans to reduce flow fluctuations downstream of the Parr Development that are associated with operation of the Project through the implementation of the Flow Fluctuations Downstream of Parr Shoals Dam AMP. Through this plan, SCE&G proposes to reduce general year-round fluctuations that will benefit aquatic habitat and reduce fluctuations during discrete spring fish spawning periods. Reduction of year-round flow fluctuations will be accomplished by improving the operation of the Parr Shoals Dam crest gates and by increasing the hydraulic capacity of the Parr Development.

During spring spawning stabilization, SCE&G will work to more closely match outflows with inflows based on the computed sum of flows measured at the three USGS gage stations upstream of the Project. The two spawning periods are to benefit shortnose sturgeon spawning during March of each year and for other species during April and early May each year.

SCE&G will pass a new set of higher minimum flows for the Project to increase wetted usable aquatic habitat year-round. These flows are detailed in the Minimum Flows Downstream of Parr Shoals Dam AMP and include a high spring spawning flow, a medium transition flow, and a summer/fall low flow. Each of these flows was selected by the Fisheries and Instream Flows TWCs based on the results of the IFIM study. The AMP includes a target flow and a compliance limit. Because the Project is not a storage project and outflows should be related to inflow, the target flow is a minimum flow based on habitat data from the IFIM study results and the compliance limit is based on inflow exceedance values. These two items will be evaluated as part of the AMP, which is anticipated to last for the first 5 years of the new license. The AMP also includes a series of low flow scenarios within each flow period that would allow for operations during low flow periods. This recommendation provides the basis for a Low Inflow Protocol. The minimum flow will provide depths in the Broad River downstream of the Parr Shoals Dam sufficient for upstream and downstream fish passage in the river. Recommended minimum flows are shown in Table 4-19.

TABLE 4-19 PARR MINIMUM FLOW RECOMMENDATION

	Net Inflow*	Minimum Target Outflow*	Compliance Outflow*
High Flow Period Feb 1 – April 30	> 2300	2300	2100
	≤ 2300 and > 2200	net inflow	2100
	≤ 2200 and ≥ 600	net inflow	(net inflow minus 100 cfs) or 550 cfs whichever is greater
	< 600	net inflow	net inflow minus 50 cfs
Transitional Flow Periods Dec 1 – Jan 31; May 1 – May 31	>1500	1500	1300
	≤ 1500 and > 1400	net inflow	1300
	≤ 1400 and ≥ 600	net inflow	(net inflow minus 100 cfs) or 550 cfs whichever is greater
	< 600	net inflow	net inflow minus 50 cfs
Low Flow Period June 1 – Nov 30	> 1000	1000	900
	≤ 1000 and ≥ 600	net inflow	(net inflow minus 100 cfs) or 550 cfs whichever is greater
	< 600	net inflow	net inflow minus 50 cfs

*cfs

Key:

> greater than

< less than

cfs cubic feet per second

Fish Entrainment

The results of the Fairfield Hydroacoustics Study indicated that a lighting reduction in the Fairfield discharge (Parr Reservoir) would reduce the concentration of fish in the intake area. This reduction could reduce potential fish entrainment during nighttime operations. Therefore, SCE&G is proposing to turn off lights in the Fairfield Development tailrace during normal operating conditions. Lights may be turned on and may stay on if the Department of Homeland Security National Terrorism Advisory System (or an equivalent program) or other law enforcement agency determine that the security threat level should be elevated. Lights will be turned off again after the threat level is lowered to normal levels.

Monticello Fish Habitat Enhancements

To offset potential impacts to fish habitat in Monticello Reservoir due to reservoir fluctuations, SCE&G worked with stakeholders to develop a plan for the installation of aquatic habitat enhancements in Monticello Reservoir. The habitat enhancement structures could provide enhanced fish production within Monticello Reservoir and they could also concentrate fish as an enhancement for recreational fishermen (Wagner 2016). Spawning, nursery/juvenile, and deep-water habitat enhancements will be placed in designated areas of the reservoir. The areas selected are located on the upper end of the reservoir away from the turbine intakes, which should help to offset fish entrainment losses. The enhancement measures will be made of man-made materials that should not deteriorate over the life of the new license. SCE&G and stakeholders developed an AMP approach for installation of these enhancements. Timing of installation, numbers of enhancements, enhancement evaluation process, and maps of the proposed locations within Monticello Reservoir for habitat enhancement are included in the Monticello Reservoir Fisheries Habitat Enhancement Plan in Exhibit E-5.

Habitat Enhancement Program

In addition to fish habitat enhancements in Monticello Reservoir, SCE&G is proposing to develop a HEP to restore, enhance, and protect aquatic, wetland, and riparian habitats and the associated natural resources of the project area and portions of the Broad, Saluda, and Congaree River watersheds. The HEP will fund on-the-ground conservation actions for the term of the new license. SCE&G will develop a charter and administer the program and will make annual contributions according to methods agreed upon with stakeholders. Additional

information on the proposed HEP is included in the Habitat Enhancement Program Agreement in Exhibit E-5.

Diadromous Species

SCE&G will continue to participate in the Accord (Exhibit E-5). Currently, the most upstream hydro development on the Broad River with fish passage is the Columbia Project, located 23 miles downstream of Parr Shoals Dam. Fish that pass above the Columbia Project can utilize the 23 miles of habitat, and the existing tributaries, but cannot move beyond Parr Shoals Dam. Measures have been put in place with the Accord that include the construction of a fish passage facility at Parr Shoals Dam when American shad (target species) passage at the downstream Columbia Fishway reach 69,600 individuals during a season (CAP 2008). Current numbers of American shad passing at the Columbia Project are well below this threshold, with an estimated 3,733 individuals passing in 2015 and 1,154 individuals passing in 2016, and 693 individuals passing in 2017 (Kleinschmidt 2016a; JMT 2017).

American eels are another species that may require passage in the future. Currently, low densities of American eel utilize habitat downstream of Parr Shoals Dam and existing tributaries, but as with American shad, cannot pass beyond the dam. Per the request of the Fisheries TWC, SCE&G will continue American eel monitoring throughout the term of the new license. SCE&G developed an American Eel Abundance Monitoring Plan in consultation with stakeholders. This plan outlines the timing and collection methods that will be used during the duration of the new license. Surveys will be conducted for the first year of the new license, and every 5 years thereafter. Sampling would increase to every 3 years upon completion of American eel passage at the Santee Cooper Project. Three surveys will be conducted in each sampling year, with one survey occurring in April, May and June. After the first year of sampling, the Review Committee will determine when the 3 surveys will occur each sampling year, to potentially include other months such as October. Sampling methods will include backpack electrofishing and boat electrofishing. SCE&G will meet with the Review Committee after each sampling year and will file a report with FERC after each sampling year.

Mussel Monitoring Plan

Due to the presence of the Carolina creekshell in Monticello Reservoir and the proposed changes to flows downstream of the project dam, SCE&G agreed to perform periodic assessments of the composition and abundance of freshwater mussel species in Monticello

Reservoir and the reach of the Broad River immediately downstream of Parr Shoals Dam. SCE&G developed a Mussel Monitoring Plan in consultation with stakeholders that describes the timing, locations, methodology, and reporting methods for mussel monitoring during licensing. SCE&G will work with a malacologist to monitor mussel species in year one after the license is issued. A second survey will occur 6 years later, with additional surveys being conducted every 10 years thereafter for the course of the new license term. Sampling frequency will be adjusted if fish passage is installed at the Project. Sampling areas will be surveyed using bathyscopes, snorkeling, and/or tactile searches to locate, identify and enumerate mussel species over a 2-day period. SCE&G will meet with the Review Committee following each sampling year and will file a report with FERC after each sampling year.

Downstream Water Quality

SCE&G and the Water Quality TWC developed an AMP that focuses on improving water quality in the west channel during licensing. Increased year-round stream flows in the west channel area are expected to result in improved water quality conditions, more natural water temperature profiles, and improvements to water depth and velocity. Ultimately, the goal of this AMP is to improve year-round aquatic habitat quality for resident fish species in the west channel area. The West Channel AMP is discussed in greater detail in Section 4.4.2.

SCE&G is proposing to implement the Turbine Venting Plan. The potential increases in DO levels associated with this plan would improve conditions for fish in downstream reaches of the Broad River, especially during the warmer months when DO levels are generally lower and habitat suitability decreases. The Turbine Venting Plan is discussed in greater detail in Section 4.4.2.

4.5.3 Environmental Effects – No Action Alternative

Under a no action alternative, the Project would continue to operate under the same conditions as those described in the current license. Parr Reservoir would continue to fluctuate up to 10 feet daily and Monticello Reservoir would continue to fluctuate up to 4.5 feet daily. The minimum flow during June through February would continue to be 150 cfs with a minimum daily average flow of 800 cfs, or the daily natural inflow to the Parr Reservoir (minus evaporative losses from the Parr and Monticello reservoirs), whichever is less. The minimum flow during March, April and May would continue to be 1,000 cfs or the average daily natural

inflow into the Parr Reservoir (minus evaporative losses from the Parr and Monticello reservoirs), whichever is less.

Effects on entrainment and entrainment mortality under the no action alternative would continue at the same rates as they currently do under the existing license conditions.

4.5.4 Unavoidable Adverse Effects

Reservoir Fluctuation

Currently, Parr Reservoir experiences fluctuations associated with pumped storage operations of up to 10 feet per day. These fluctuations can dewater potential spawning habitat, and may reduce spawning success or recruitment of juvenile fish to adult lifestages. It is not anticipated that habitat enhancements would greatly benefit spawning success in Parr Reservoir given these conditions. Efforts to improve spawning and recruitment success in the project area are instead being implemented in Monticello Reservoir, in the Broad River downstream of the Project, and throughout portions of the Broad, Saluda, and Congaree river watersheds (Section 4.5.2.2 Proposed Action).

Impingement and Entrainment

Fish entrainment and turbine mortality are one of the unavoidable impacts of hydropower operations. There are ways to reduce fish entrainment with the use of avoidance technology, which include smaller trashrack spacing, changing of lighting near the intakes, reducing intake velocity, and modification of the intake area. Adding some of these changes at the Parr and Monticello developments would be very expensive and likely not completely offset impacts. However, SCE&G is proposing to reduce lighting in the Fairfield discharge to decrease potential entrainment in this area. In addition, SCE&G has identified a way to increase fish production and enhance aquatic habitats away from the development's intakes on Monticello Reservoir, which should help to offset fish entrainment. Even with these measures in place, some entrainment will continue at both developments at levels that will impact the reservoir fisheries.

4.5.5 Cumulative Effects

The Council on Environmental Quality defines a cumulative effect as an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. Proposed changes to the Project include an increased minimum flow, which could potentially benefit the aquatic community downstream of the Project. The Licensee is a signatory to the Accord, which initiates future fish passage construction at the Project when specific triggers are met. When a significant number of diadromous fish are present downstream of the Project, the Licensee will accommodate upstream passage for these fish by constructing a fish passage facility. In addition, the Licensee is proposing to install fish habitat enhancements in Monticello Reservoir and reduce lighting in the Fairfield discharge, to decrease entrainment and mortality at the Fairfield Development and encourage fish spawning and rearing in the reservoir. Due to these changes and provisions, it is unlikely that continued operation of the Project would contribute to any cumulative effects to the fishery.

4.5.6 References

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4.6 TERRESTRIAL RESOURCES

4.6.1 Affected Environment

The Project is located in the Southern Outer Piedmont Ecoregion of South Carolina (Griffith et al. 2002). This region is characterized by gently rolling hills with broad, relatively shallow stream-cut valleys and elevations that range from 375 feet to 1,000 feet mean sea level (msl) (SCDNR 2005a). A subtropical climate prevails in this area marked by high summer humidity, moderate winters, and relatively high rainfall, which results in a vegetative growing season in the range of 250 days annually (Messina and Conner 1998; Bailey 1995). Common vegetation communities in the ecoregion include mixed oak forest and oak-hickory-pine forest (Griffith et al. 2002). The landscape in the Piedmont ecoregion has a long history of forest/wood clearing and other economic uses that date back to the earliest European settlements, resulting in a contemporary mosaic dominated by agricultural land, managed woodlands and forests (SCDNR 2005a). These habitats support wildlife typical of the Piedmont including white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), box turtle (*Terrapene carolina*), copperhead (*Agkistrodon contortrix*) and the American toad (*Bufo americanus*) (DeGraaf and Rudis 1986; Conant and Collins 1998). The following sections provide additional detail regarding the wildlife and botanical communities found in the project area and vicinity.

UPLAND HABITATS

Upland habitats in the project area and vicinity are primarily forested. Some limited pasturelands and residential development occur around Monticello Reservoir. Recent surveys associated with the adjacent V.C. Summer Nuclear Station provide significant data describing the upland habitats and associated wildlife occurring in the project vicinity (SCE&G 2010). Primary cover types occurring in the project vicinity include planted pine, naturally vegetated pine, mixed pine-hardwood, and hardwood forests. Pine forests are primarily second-growth stands of either naturally propagated or planted loblolly pine (*Pinus taeda*); older stands are characterized by presence of hardwoods such as white oak (*Quercus alba*). Hardwood-dominant stands occur mainly along streams and side slopes (SCE&G 2010).

Pine Forests

Natural and planted pine forests in the project vicinity consist mostly of naturally vegetated and cultivated loblolly pine. These forests are early successional, even-aged stands that produce a closed canopy with little to no understory of either woody or herbaceous cover (FPC 1974). Because much of this forest type consists of planted pines, it is generally poor wildlife habitat, lacking in both food and cover needed by native wildlife (SCDNR 2005a).

Mixed Pine-Hardwood Forests

Mixed pine-hardwood forests occurring in the project vicinity consist primarily of loblolly pine and longleaf pine (*Pinus palustris*) accompanied by a variety of other species, including tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), winged elm (*Ulmus alata*), persimmon (*Diospyros virginiana*), eastern redcedar (*Juniperus virginiana*), black gum (*Nyssa sylvatica*), American beech (*Fagus grandifolia*), American holly (*Ilex opaca*), black cherry (*Prunus serotina*), and sweetgum (*Liquidambar styraciflua*) (SCE&G 2002; Nelson 2006).

Hardwood Forests

Hardwood forests are located predominately along stream bottoms and in ravines and make up a relatively small portion of the forested communities in the project vicinity (USNRC 2004). Typical canopy species present include white oak, southern red oak (*Quercus falcata*), black gum, and some American beech (Nelson 2007). Flowering dogwood (*Cornus florida*) is a dominant understory species, and herbaceous species such as hepatica (*Hepatica americana*), golden alexander (*Zizia trifoliata*), sanicle (*Sanicula marilandica*), Christmas fern (*Polystichum acrostichoides*), and little nut-rush (*Scleria oligantha*) are common along small streams (SCE&G 2002).

FLOODPLAINS, WETLANDS, RIPARIAN, AND LITTORAL HABITAT

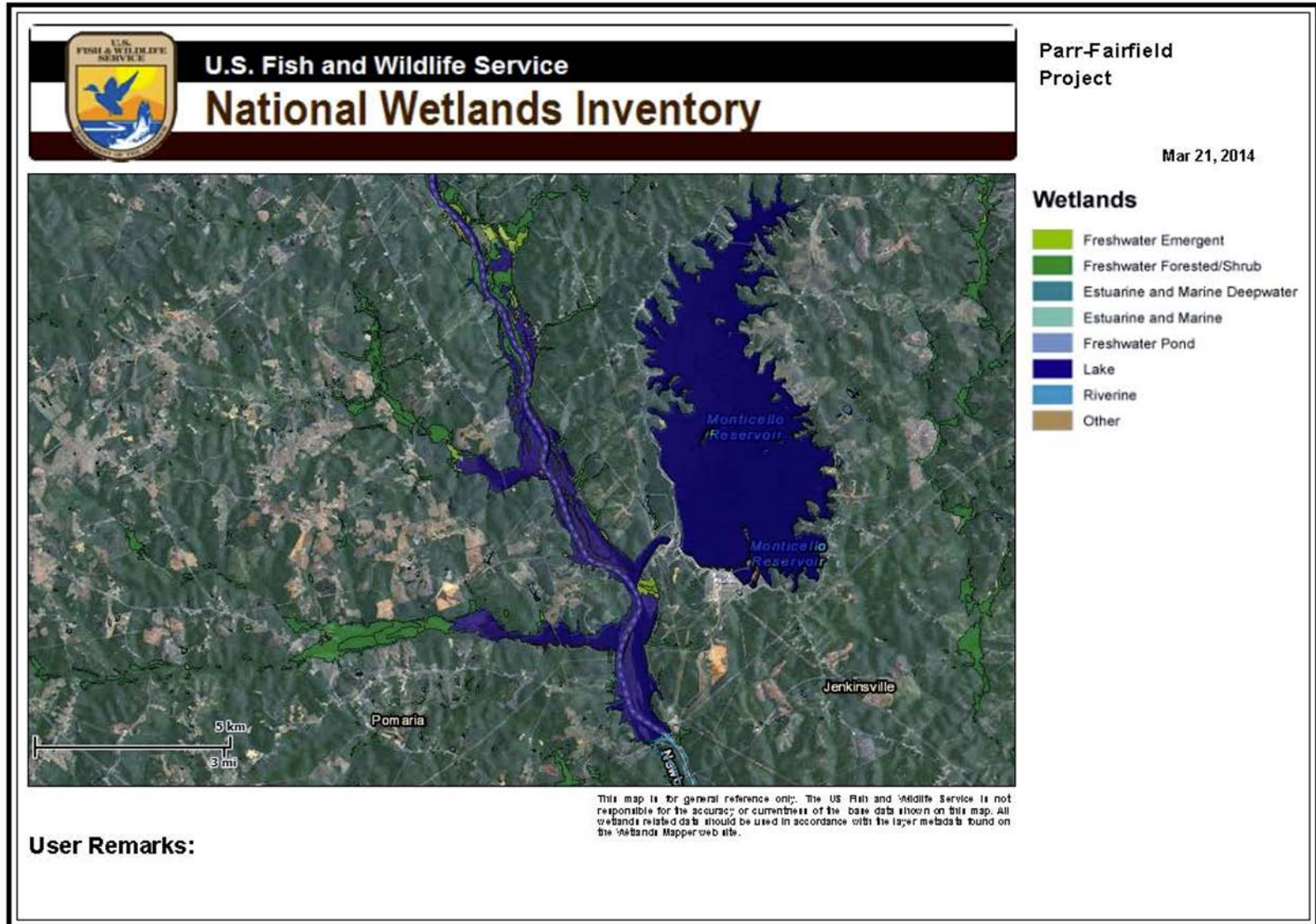
Wetlands in the project vicinity are typical of those found in the South Carolina Piedmont and include both palustrine (e.g., marshes, bogs and fens) and lacustrine (on the shores of lakes and reservoirs) wetlands. Species typical of forested wetlands in the project vicinity include those in the mixed pine-hardwood and hardwood cover types described previously, as well as tulip poplar, sweetgum, white ash (*Fraxinus americana*), black cherry, sedge (*Carex* spp.), and red maple. Limited freshwater marsh habitat occurs in shallow backwaters along Parr Reservoir; the marsh habitat contains emergent wetland species, such as cattail (*Typha*

latifolia), bulrushes (*Scirpus* spp.), rushes (*Juncus* spp.), sedges, smartweed (*Polygonum hydropiperoides*), pickerelweed (*Pontederia cordata*), lizard's tail (*Saururus cernuus*), water primrose (*Ludwigia* spp.), and water pennywort (*Hydrocotyle* spp.) (SCE&G 2010).

The USFWS maintains the National Wetlands Inventory (NWI) that provides reconnaissance level information on the location, type, and size of wetlands and deepwater habitats (USFWS 2014). The NWI indicates that wetland and deepwater habitats occurring within the project vicinity include freshwater emergent, freshwater forested and shrub wetlands, freshwater ponds and lakes, and riverine habitat (Figure 4-19). Most of the mapped wetlands in the project area are classified as L1UBHh, which is a lacustrine system. The project area is bordered by palustrine emergent, palustrine forested and/or palustrine shrub, and palustrine unconsolidated bottom systems.

The lacustrine (i.e., freshwater lake) habitat in the project vicinity comprises permanently flooded/impounded habitat located at the Parr and Monticello reservoirs. This classification is typical of deepwater habitats formed by dammed river channels and is defined as having less than 30 percent vegetative cover (USGS 2013a).

Palustrine habitat is defined as all freshwater wetlands including freshwater emergent wetlands, freshwater forest and shrub wetlands, and freshwater ponds (defined as a freshwater body of water with an area of less than 20 acres). Palustrine wetlands often occur along the shores of lakes or rivers and are defined as having a water depth of less than 6.5 feet and salinity of less than 0.5 percent (USGS 2013b).



SOURCE: USFWS 2014

FIGURE 4-19 PROJECT VICINITY WETLAND HABITAT

Wildlife

Mammals

Mammals that occur in the project vicinity include those typically found in the Piedmont, such as white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), muskrat (*Ondatra zibethica*), bobcat (*Lynx rufus*), beaver (*Castor canadensis*), opossum (*Didelphis virginiana*), hispid cotton rat (*Sigmodon hispidus*), eastern mole (*Scalopus aquaticus*), house mouse (*Mus musculus*), whitefooted mouse (*Peromyscus leucopus*), gray fox (*Urocyon cinereoargenteus*), and eastern spotted skunk (*Spilogale putorius*) (SCDNR 2005a).

Reptiles and Amphibians

The Piedmont of South Carolina is not as rich in herpetofauna as other parts of the state (SCDNR 2005b); however, several species of reptiles and amphibians are known to occur in the project vicinity. These include the black racer snake (*Coluber constrictor*), ringneck snake (*Diadophis punctatus*), rat snake (*Elaphe obsoleta*), Carolina anole (*Anolis carolinensis*), fence lizard (*Sceloporus undulates*) and various skinks and toads (FPC 1974; SCE&G 2010).

Birds

Birds that occur in the project vicinity are typical of the Piedmont. Various species of dabbling ducks such as wood duck (*Aix sponsa*), mallard (*Anas platyrhynchos*), black duck (*Anas rubripes*), and green-winged teal (*Anas carolinensis*) use the freshwater marsh habitat in Parr Reservoir, and Monticello Reservoir supports a resident population of Canada geese (*Branta Canadensis leucopareia*). Bald eagles (*Haliaeetus leucocephalus*) nest near the site and are observed frequently, and a variety of wading birds, songbirds, birds of prey, and other migratory and non-migratory birds are expected to occur in the project vicinity. Table 4-20 lists avian species observed during recent surveys at the adjacent V.C. Summer Nuclear Station.

TABLE 4-20 AVIAN SPECIES OBSERVED IN THE PROJECT VICINITY

WADING BIRDS, SHOREBIRDS, AND OTHER WATER BIRDS	PASSERINES AND OTHER BIRDS (CONT.)
Blue-winged teal (<i>Anas discors</i>)	Mourning dove (<i>Zenaida macroura</i>)
Mallard (<i>Anas platyrhynchos</i>)	Blue jay (<i>Cyanocitta cristata</i>)
Black duck (<i>Anas rubripes</i>)	Yellow-rumped warbler (<i>Dendroica coronata</i>)
Great egret (<i>Ardea alba</i>)	Prairie warbler (<i>Dendroica discolor</i>)
Great blue heron (<i>Ardea herodias</i>)	Pine warbler (<i>Dendroica pinus</i>)
Canada goose (<i>Branta canadensis</i>)	Pileated woodpecker (<i>Dryocopus pileatus</i>)
Green heron (<i>Butorides virescens</i>)	Dark-eyed junco (<i>Junco hyemalis</i>)
Killdeer (<i>Charadrius vociferous</i>)	Loggerhead shrike (<i>Lanius ludovicianus</i>)
Little blue heron (<i>Egretta caerulea</i>)	Belted kingfisher (<i>Megaceryle alcyon</i>)
Herring gull (<i>Larus argentatus</i>)	Red-bellied woodpecker (<i>Melanerpes carlinus</i>)
Double-crested cormorant (<i>Phalacrocorax auritus</i>)	Wild turkey (<i>Meleagris gallopavo</i>)
BIRDS OF PREY AND SOARING BIRDS	Song sparrow (<i>Melospiza melodia</i>)
Cooper's hawk (<i>Accipiter cooperii</i>)	Northern mockingbird (<i>Mimus polyglottos</i>)
Red-tailed hawk (<i>Buteo jamaicensis</i>)	Great crested flycatcher (<i>Myiarchus crinitus</i>)
Red-shouldered hawk (<i>Buteo lineatus</i>)	Tufted titmouse (<i>Parus bicolor</i>)
Turkey vulture (<i>Cathartes aura</i>)	Carolina chickadee (<i>Parus carolinensis</i>)
Black vulture (<i>Coragyps atratus</i>)	Indigo bunting (<i>Passerina cyanea</i>)
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Downy woodpecker (<i>Picoides pubescens</i>)
PASSERINES AND OTHER BIRDS	Rufous-sided towhee (<i>Pipilo erythrophthalmus</i>)
Red winged blackbird (<i>Agelaius phoeniceus</i>)	Summer tanager (<i>Piranga rubra</i>)
Ruby-throated hummingbird (<i>Archilochus colubris</i>)	Golden-crowned kinglet (<i>Regulus satrapa</i>)
Great horned owl (<i>Bubo virginiana</i>)	Eastern phoebe (<i>Sayornis phoebe</i>)
Northern cardinal (<i>Cardinalis cardinalis</i>)	Eastern bluebird (<i>Siala sialis</i>)
Pine siskin (<i>Carduelis pinus</i>)	Brown-headed nuthatch (<i>Sitta pusilla</i>)
Northern bobwhite (<i>Colinus virginianus</i>)	Yellow-bellied sapsucker (<i>Sphyrapicus varius</i>)
Yellow-bellied cuckoo (<i>Coccyzus americanus</i>)	Northern rough-winged swallow (<i>Steigodopteryx serripennis</i>)
Northern flicker (<i>Colaptes auratus</i>)	Barred owl (<i>Strix varia</i>)
Eastern wood pewee (<i>Contopus virens</i>)	Carolina wren (<i>Thryothorus ludovicianus</i>)
American crow (<i>Corvus brachyrhynchos</i>)	Brown thrasher (<i>Toxostoma rufum</i>)
White-throated sparrow (<i>Zonotrichia albicollis</i>)	White-eyed vireo (<i>Vireo griseus</i>)
Red-eyed vireo (<i>Vireo olivaceus</i>)	

(Sources: SCDNR 2005a; SCE&G 2010)

Note: Taxa in bold are South Carolina Priority Species (SCDNR 2005b)

Exotic Species

Exotic upland wildlife species known to occur in the project vicinity include feral hogs and dogs, and coyotes (SCDNR 2005a); additionally, exotic upland plants are prevalent in the Piedmont ecoregion and are likely to occur within the project area and vicinity. Data collected by the USFS for the Forest Inventory Analysis indicate that almost three quarters of sampled plots within the Piedmont ecoregion contain at least one exotic plant (SCDNR 2005b). The South Carolina Exotic Pest Plant Council (SCEPPC) identifies several plants as

severe exotic plant pest species in the Piedmont ecoregion (Table 4-21). Although no site-specific data are available, any of the species listed in Table 4-21 could occur in the project area, and several of the more ubiquitous species (e.g., kudzu, mimosa, Japanese honeysuckle, and *Wisteria* spp.) are likely to occur in abundance.

TABLE 4-21 SEVERE EXOTIC PLANT PEST SPECIES OCCURRING IN THE PIEDMONT ECOREGION

COMMON NAME	SCIENTIFIC NAME
Trees	
tree of heaven	<i>Ailanthus altissima</i>
mimosa, silktree	<i>Albizia julibrissin</i>
chinaberry	<i>Melia azedarach</i>
princess tree/royal paulownia	<i>Paulownia tomentosa</i>
Chinese tallow tree	<i>Triadica sebifera</i>
Shrubs	
thorny olive	<i>Elaeagnus pungens</i>
autumn olive	<i>Elaeagnus umbellata</i>
two-color bush clover, shrub lespedeza	<i>Lespedeza bicolor</i>
Japanese privet	<i>Ligustrum japonicum</i>
Chinese privet	<i>Ligustrum sinense</i>
Japanese knotweed	<i>Polygonum cuspidatum</i>
multiflora rose	<i>Rosa multiflora</i>
Vines	
English ivy	<i>Hedera helix</i>
Japanese climbing fern	<i>Lygodium japonicum</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
kudzu	<i>Pueraria montana</i>
Asian/Japanese wisteria	<i>Wisteria floribunda</i>
Chinese wisteria	<i>Wisteria sinensis</i>
bigleaf periwinkle	<i>Vinca major</i>
common periwinkle	<i>Vinca minor</i>
Grasses/Sedges	
tall fescue	<i>Lolium arundinaceus</i>
Japanese stilt grass, Nepalese browntop	<i>Microstegium vimineum</i>
Chinese silvergrass	<i>Miscanthus sinensis</i>
bahia grass	<i>Paspalum notatum</i>
golden bamboo, fishpole bamboo	<i>Phyllostachys aurea</i>
Johnson grass	<i>Sorghum halepense</i>
Herbs	
tropical spiderwort, Bengal dayflower	<i>Commelina bengalensis</i>
wart removing herb, marsh dewflower, aneilema	<i>Murdannia keisak</i>
tropical soda apple	<i>Solanum viarum</i>

Source: SCEPPC 2008

Broad River and Enoree River Waterfowl Management Areas

The Broad River and Enoree River Waterfowl Management Areas located in the northern portion of the project area, provide important habitat for overwintering waterfowl, as well as

recreational waterfowl hunting opportunities that are important to the local economy. Both areas, which are currently managed by SCDNR, were established in the late 1970s as mitigation when Parr Reservoir was expanded during construction of the Fairfield Development.

The Broad River Waterfowl Management Area includes five impoundments totaling approximately 130 acres of waterfowl habitat. The area includes one greentree reservoir with an oak canopy; the remaining four impoundments are planted in corn or millet and flooded seasonally. Over 500 acres of the remaining area are either upland or uncontrolled backwater. Although a wide variety of duck species may be present, the primary species harvested are ring-necked ducks (*Aythya collaris*), wood ducks, mallards and green-winged teal. Mallards were the primary species present for many years, but their numbers have decreased due to flyway migration changes (SCDNR 2007a).

The Enoree River Waterfowl Management Area includes a combination of open field agriculture (planted seasonally in corn and millet) and flooded hardwood forest (Figure 4-22). Suber Creek is used to flood the 50-acre greentree impoundment. Wood ducks, ring-necked ducks, and green-winged teal are the primary species harvested on the Enoree River Waterfowl Management Area (SCDNR 2007b).

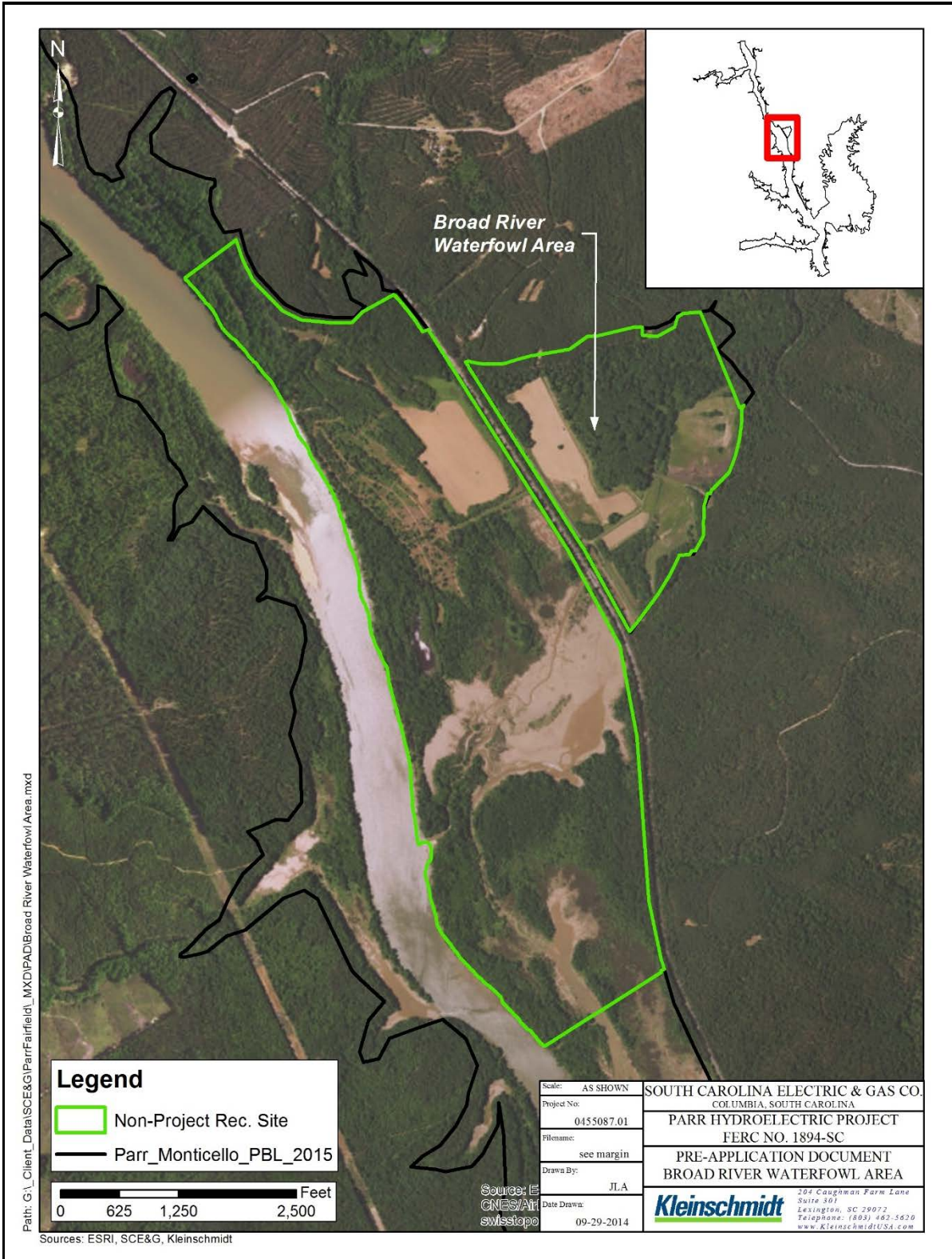


FIGURE 4-20 BROAD RIVER WATERFOWL MANAGEMENT AREA

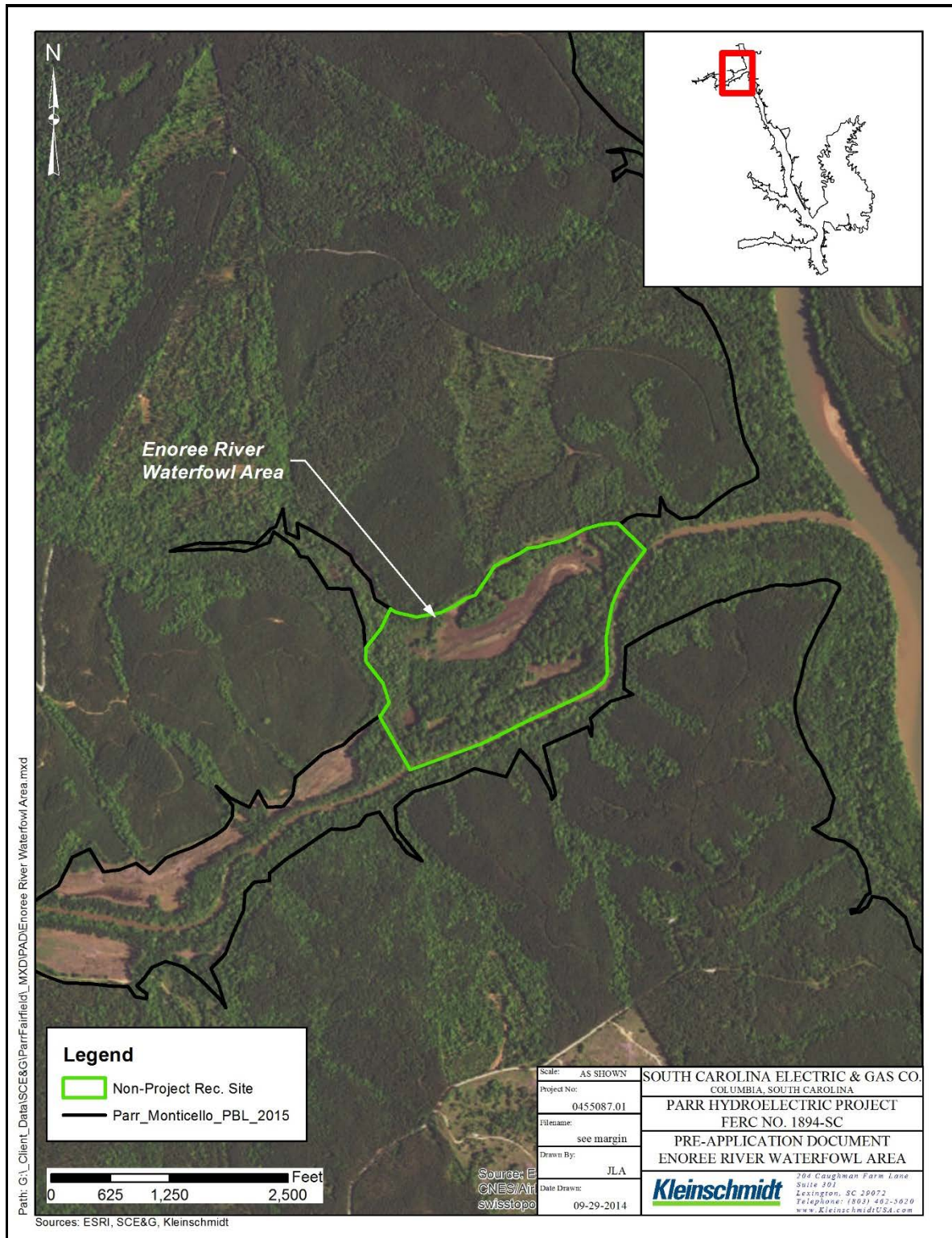


FIGURE 4-21 ENOREE RIVER WATERFOWL MANAGEMENT AREA

4.6.2 Environmental Effects

4.6.2.1 Completed Studies

Aerial Waterfowl Surveys

Open water and shallow water habitats within the project area support a variety of waterfowl species, particularly during the fall and winter months of their annual migration. As part of the relicensing process, the stakeholders requested aerial waterfowl surveys be performed to document the type and abundance of waterfowl in the project area. During 2015 and early 2016, nine aerial waterfowl surveys of Monticello Reservoir, Parr Reservoir, and the downstream reach of the Broad River were conducted. In late 2016 and early 2017, an additional nine aerial surveys were conducted.

During 2015 and early 2016, 2,200 waterfowl (9 species) were observed on Monticello Reservoir, and 4,900 waterfowl (11 species) were recorded on Parr Reservoir (SREL and Kleinschmidt 2017). During late 2016 and early 2017, 1,250 waterfowl (10 species) were documented using the Monticello Reservoir and over 3,000 waterfowl (11 species) were documented at Parr Reservoir. The Parr Reservoir surveys include the Broad River and Enoree River Waterfowl Management Areas, where waterfowl habitat management is conducted by the SCDNR. These areas contained the greatest number of waterfowl individuals and waterfowl species (SREL and Kleinschmidt 2017). Complete results of the 2015-2016 and 2016-2017 waterfowl surveys are included in Exhibit E-6.

4.6.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed the following PM&E measures that would affect terrestrial resources in the project area:

- Erosion Monitoring Plan (Exhibit E-3)
- Parr and Monticello Shoreline Management Plans (Exhibit E-10)
- Flow Fluctuations Downstream of Parr Shoals Dam AMP (Exhibit E-5)
- Habitat Enhancement Program (Exhibit E-5)

Continued project operations will expose shoreline areas during daily pumped storage activities. However, no major impacts related to wildlife or botanical resources were identified during the relicensing process. Nevertheless, the Erosion Monitoring Plan developed by SCE&G will be useful for monitoring, identifying and repairing areas of erosion along the reservoir shorelines, resulting in protecting terrestrial habitat. In addition, SCE&G will implement the new SMPs for Parr and Monticello reservoirs, which will also provide protection to terrestrial habitats from shoreline development through the permitting process.

In addition to these plans, SCE&G developed a Downstream Flow Fluctuations AMP, through which downstream flows will be stabilized during portions of the year, thus reducing shoreline erosion and stabilizing riparian habitat in the Broad River downstream of the Project. These efforts are expected to minimize any possible effects to terrestrial habitat by project operations.

SCE&G proposes to implement the HEP, to mitigate for any habitat lost due to continued project operations. Primarily this program will focus on mitigating for lost aquatic habitat, however, the program's Proposal Review Committee will consider projects that restore and enhance riparian areas, wetlands, and shorelines and create or construct habitats and nesting boxes for fish and wildlife species.

4.6.3 Environmental Effects – No Action Alternative

Under the no action alternative, the Project would continue to operate as it does under the existing license. The littoral and riparian areas around the reservoirs would continue to experience some effects caused by daily fluctuations of the reservoirs.

4.6.4 Unavoidable Adverse Effects

No major unavoidable adverse effects or issues related to terrestrial wildlife and botanical resources have been identified at this time and none are expected to occur due to continued project operations. While no adverse impacts or issues are expected regarding floodplains and wetlands within the project area, there is the potential for continued project operations to impact littoral and riparian areas within the project boundary. Fluctuations in reservoir levels due to operation of the Project has resulted in limited erosion and potential loss of littoral habitat.

4.6.5 References

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4.7 RARE, THREATENED AND ENDANGERED SPECIES

4.7.1 Affected Environment

During consultation, federal and state agencies and other stakeholders identified a list of RTE species and species of concern that have the potential to occur within the project area. The Licensee conducted the Rare, Threatened, and Endangered Species Desktop Assessment to determine likelihood of occurrence for these species within Fairfield, Newberry, and Richland counties (see Exhibit E-7 for the complete assessment). Specifically, the study included areas within the project boundary (Fairfield and Newberry counties), as well as the reach of the Broad River from Parr Shoals Dam through Frost Shoals, near Boatwright Island (Richland County).

FEDERALLY LISTED AND CANDIDATE SPECIES

Ten species that are listed as federally threatened or endangered, or are candidates for such listing were identified by the USFWS for the three counties of interest (Table 4-22). Although the Northern long-eared bat has not been documented as occurring within the counties of interest, it is likely that the species could potentially occur in appropriate habitat within the midlands of South Carolina. The Atlantic sturgeon has critical habitat downstream of lakes Marion and Moultrie in the Cooper and Santee rivers, however, there is no Atlantic sturgeon critical habitat upstream of the Santee Cooper system in the Congaree River or its tributaries (NOAA 2017). There is no designated critical habitat in the project boundary for any species. Life history information and habitat requirements for federally listed species that may occur in the three counties of interest are summarized below.

TABLE 4-22 FEDERALLY LISTED AND CANDIDATE SPECIES OCCURRING IN RICHLAND, FAIRFIELD, AND NEWBERRY COUNTIES, SOUTH CAROLINA

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS ¹	STATE STATUS ²	COUNTIES
Birds				
Bald eagle	<i>Haliaeetus leucocephalus</i>	P	T	Newberry, Fairfield, Richland
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	E	Richland
Wood stork	<i>Mycteria americana</i>	T	E	Newberry, Richland
Fish				
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>	E	E	Richland
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	E	E	Richland
Mammals				
Northern long-eared bat	<i>Myotis septentrionalis</i>	T		unknown
Invertebrates				
Carolina heelsplitter	<i>Lasmigona decorata</i>	E		Newberry, Fairfield, Richland
Plants				
Canby's dropwort	<i>Oxypolis canbyi</i>	E		Richland
Rough-leaved loosestrife	<i>Lysimachia asperulaefolia</i>	E		Richland
Smooth coneflower	<i>Echinacea laevigata</i>	E		Richland

SOURCE: USFWS 2013a

¹ Federal Status – E (listed as Endangered under ESA); T (listed as Threatened under ESA); C (Candidate for Federal listing); SC (Federal Species of Concern); P (Federally protected).² State Status – E (state listed as endangered); T (state listed as threatened)

Bald eagle

The bald eagle was removed from the federal list of threatened species in 2007 (USFWS 2007a) but remains protected as a state endangered species under the South Carolina Nongame and Endangered Species Conservation Act, and federally under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (16 U.S.C.668-668d) (72 FR 37345-37372). Bald eagles are found throughout North America, typically around water bodies, where they feed primarily on fish and carrion. Studies suggest that reservoirs, especially those associated with hydroelectric facilities, are particularly attractive to foraging bald eagles (Brown

1996). Eagles nest in large trees near water and typically repair and use the same nest for several years (Degraaf and Rudis 1986). In South Carolina, the distribution of bald eagle nesting has expanded from the coast to encompass more inland areas. This expansion has been attributed to the construction of approximately 491,000 acres of large reservoirs in the state since the early 1900s (Wilde et al. 2003). In South Carolina, the number of estimated nesting pairs has increased from 13 in 1977 to 181 in 2003 (Wilde et al. 2003). Bald eagles are commonly observed in the project boundary (SCE&G 2010), with Monticello and Parr reservoirs, as well as the lower Broad River, providing abundant foraging habitat and nesting.

Red-cockaded woodpecker

The red-cockaded woodpecker (RCW) is endemic to open, mature and old growth pine ecosystems in the southeastern United States (USFWS 2003). Over 97% of the pre-colonial era RCW population has been eradicated, leaving only roughly 14,000 RCWs living in approximately 5,600 colonies scattered across eleven states, including South Carolina. RCW decline is generally attributed to a loss of suitable nesting and foraging habitats, including longleaf pine systems, due to logging, agriculture, fire suppression, and other factors (USFWS 2003). Suitable nesting habitat generally consists of open pine forests and savannahs with large, older pines and minimal hardwood midstory or overstory. Living longleaf pine trees, especially older trees that are susceptible to redheart disease making them more easily excavated, provide the RCWs preferred nesting cavities. Suitable foraging habitat consists of open-canopy, mature pine forests with low densities of small pines, little midstory vegetation, limited hardwood overstory, and abundant bunchgrass and forb groundcover (USFWS 2003). There are no known reports of RCWs in areas surrounding the Project or along the lower Broad River. Further, there is no known longleaf pine savanna habitat in the project boundary.

Wood stork

The wood stork is a large, colonial wading bird and is the only stork species that breeds in the United States (USFWS 1996). The wood stork was federally listed as endangered in 1984, primarily due to loss of wetland habitat throughout its range, but recently its status has been changed from endangered to threatened due to significant population recovery (USFWS 2012b). It uses a variety of wetlands for nesting, feeding, and roosting. Nesting colonies (rookeries) in South Carolina are typically surrounded by extensive palustrine forested wetlands. Nests are usually located in the upper branches of large black gum or cypress trees,

and several nests are typically located in each tree. Like most wading birds, storks feed primarily on small fish. Shallow, open water is required for successful foraging, and depressions where fish become concentrated during periods of falling water levels are particularly attractive sites. Currently, nesting of the species in the United States is thought to be limited to the coastal plain of South Carolina, North Carolina, Georgia and Florida (Murphy and Hand 2013), which is consistent with recent survey work that found no nesting on the adjacent Saluda Hydroelectric Project (FERC No. 516) (Kleinschmidt 2005). Periodic foraging of wood storks has been documented in the adjacent Saluda River Basin (Kleinschmidt 2005). Shallow backwaters in the project boundary, particularly in the upper reaches of the Parr Reservoir, may provide foraging habitat for transient wood storks. Although habitat is present, wood stork use of these areas has not been documented.

Atlantic sturgeon

The Atlantic sturgeon is a large (up to approximately 18 feet), long-lived (up to 60 years) anadromous species that was historically present in the Santee Basin at least as far inland as the fall line (Newcomb and Fuller 2001). The Carolina Distinct Population Segment of Atlantic sturgeon, which includes the Santee Basin population, is federally listed as endangered (77 FR 5914), primarily due to overharvesting for flesh and eggs (caviar) during the early to mid-20th Century, as well as habitat degradation and blockage of access to historical spawning grounds (NMFS 1998a). The Atlantic sturgeon is considered estuarine anadromous, spending most of its life in estuarine and ocean environments and undertaking spawning migrations into riverine systems during late winter and spring months (NMFS 1998a; Marcy et al. 2005). Spawning typically occurs over hard bottoms of clay, rubble, or gravel with flowing water and temperatures of 14-24°C. After spawning, females typically return to estuarine environments within 4 to 6 weeks, while males may remain in the river through the fall. Juveniles of this species gradually descend natal rivers for 3 to 5 years before reaching the ocean (Marcy et al. 2005).

Critical habitat was designated for the species on August 17, 2017 (NOAA 2017). While a proposed rule would have designated unoccupied critical habitat up into the Congaree and Broad Rivers, the final rule ultimately did not designate any critical habitat upstream of lakes Marion and Moultrie. Thus, there is no Atlantic sturgeon critical habitat in the Congaree River or its tributaries (i.e., the Broad River).

Shortnose sturgeon

The shortnose sturgeon is federally listed as endangered and is thought to have occurred historically in the reach of the Broad River encompassed by the Project (Welch 2000, Newcomb and Fuller 2001). Shortnose sturgeons are amphidromous (semi-anadromous) spending portions of their life cycle in low salinity estuaries and portions in freshwater rivers (NMFS 1998b; Kynard 1997; Buckley and Kynard 1985). Shortnose sturgeon begin migrating to spawning areas of inland riverine reaches in the spring (typically mid-February through March in South Carolina) when water temperatures rise above 9 °C (Kynard 1997, Hall et al. 1991). Shortnose sturgeon spawning has been documented in the Congaree River near the City of Columbia over substrates of sand, gravel and rock, at temperatures ranging from 9.7-15.6°C, and DO concentrations of 10.6-12.5 mg/L (Collins et al. 2003).

Population groups of shortnose sturgeon are known from downstream of the Santee-Cooper dams in the lower Santee and Cooper rivers (Collins et al. 2003). An additional dam-locked spawning population of shortnose sturgeon has been documented in the Santee-Cooper lakes (with Lake Marion and its tributaries harboring the most significant number of fish) and upstream in the Congaree River. Radio-telemetry studies have documented migration of shortnose sturgeon as far upstream on the Congaree as the Blossom Street Bridge adjacent to the City of Columbia (Finney et al. 2006). However, consultation with SCDNR Diadromous Fish Program staff suggests that this occurrence was based on a small number of observations (2 fish) and that their radiotelemetry data suggest that shortnose sturgeon activity is primarily limited to areas downstream of Granby Lock and Dam. Granby Lock and Dam is located approximately 1-mile downstream of the Blossom Street Bridge and approximately 5-miles downstream of the Columbia Hydroelectric Project Fishway (fishway). The fishway was designed to provide passage of blueback herring and American shad to historic spawning grounds in the Broad River downstream of Parr Shoals Dam and was intended to be “sturgeon friendly”. Shortnose sturgeon have not been documented upstream of the Blossom Street Bridge in recent history, nor have any been documented passing through the fishway since annual monitoring began in 2007.

Carolina heelsplitter

The Carolina heelsplitter is the only South Carolina freshwater mussel currently listed as federally endangered (Price 2006). Although it was once found in large rivers and streams,

the Carolina heelsplitter is now restricted to cool, clean, shallow, heavily shaded streams of moderate gradient. Stable streambanks and channels, with pool, riffle and run sequences, little or no fine sediment, and periodic natural flooding, appear to be required for the Carolina heelsplitter. Carolina heelsplitter is known to occur in isolated populations distributed in the Savannah, Pee Dee, and Catawba drainages and is not known to occur in the Broad River Basin (Price 2006) or within the project boundary.

Northern long-eared bat

The Northern long-eared bat is a medium-sized bat with a body length between 3 and 4 inches. Northern long-eared bats generally hibernate in caves over winter. During the summer the species roosts singly or in colonies underneath bark, in cavities, or in crevices of live and dead trees. Northern long-eared bats breed in late summer and early fall, and females store sperm until they fertilize an egg in the spring. Pregnant females migrate during the summer and roost in colonies to give birth. The white-nose syndrome has caused Northern long-eared bat populations to plummet in recent years (USFWS 2015). The species has not been observed in any of the counties associated with the Project; however, it has been observed in upstate South Carolina, as well as three counties along the coast of South Carolina (SCDNR 2017). These findings suggest that the species could occur in Newberry, Fairfield and Richland counties, because these counties are located between the areas of South Carolina where the species has been documented.

Canby's dropwort

Canby's dropwort is a perennial plant that grows in coastal plain habitats including wet meadows, wet pineland savannas, ditches, sloughs, and around the edges of cypress-pine ponds (USFWS 2010). The healthiest populations seem to occur in open bays or ponds, which are wet most of the year and have little or no canopy cover. Ideal soils for Canby's dropwort have a medium to high organic content and a high water table and are also acidic, deep, and poorly drained. Canby's dropwort is a coastal plain species and thus would not be expected to occur in the portion of Richland County affected by the Project. This assumption is consistent with result of surveys by Nelson (2006, 2007), which failed to document the species on the adjacent V.C. Summer Nuclear Plant site.

Rough-leaf Loosestrife

Rough-leaf loosestrife generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins (areas of dense shrub and vine growth usually on a wet, peaty, poorly drained soil), on moist to seasonally saturated sands, and on shallow organic soils overlaying sand (NatureServe 2013). Rough-leaf loosestrife has been found on deep peat in the low shrub community of large Carolina bays (shallow, elliptical, poorly drained depressions of unknown origin). The grass-shrub ecotone, where rough-leaf loosestrife is found, is fire maintained, as are the adjacent plant communities (longleaf pine-scrub oak, savanna, flatwoods and pocosin). Suppression of naturally occurring fire in these ecotones, results in shrubs increasing in density and height and expanding to eliminate the open edges required by this plant. The pine pocosin and Carolina bay environments required by this species do not occur in the Piedmont; therefore, rough-leaf loosestrife is extremely unlikely to occur in the project vicinity.

Smooth coneflower

Smooth coneflower is typically found in open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way, usually on magnesium and calcium rich soils associated with amphibolite, dolomite or limestone (in Virginia), gabbro (in North Carolina and Virginia), diabase (in North Carolina and South Carolina), and marble (in South Carolina and Georgia) (USFWS 2012a). Smooth coneflower occurs in plant communities that have been described as xeric hardpan forests, diabase glades or dolomite woodlands. Optimal sites are characterized by abundant sunlight and little competition in the herbaceous layer. Natural fires, as well as large herbivores, historically influenced the vegetation in this species' range. Many of the herbs associated with smooth coneflower are sun-loving species that depend on periodic disturbances to reduce the shade and competition of woody plants. The diabase glade habitat required by this species is not known to occur in areas around Monticello and Parr reservoirs or along the lower Broad River. Although no site-specific surveys have been performed, surveys by Nelson (2006, 2007) failed to document smooth coneflower on the adjacent V. C. Summer Nuclear Plant area and concluded that appropriate habitat for the species does not occur on the site.

Federal At-Risk Species

The USFWS lists an additional seventeen species as at-risk species for the three counties of interest (Table 4-23). At-risk species refers to species that the USFWS has been petitioned to list and for which a positive 90-day finding has been issued (listing may be warranted), yet no federal protections currently exist. Of the seventeen species, five species have the potential of occurring in the project area. Life history information and habitat requirements for the five species are summarized below.

TABLE 4-23 FEDERAL AT-RISK SPECIES WITH THE POTENTIAL OF OCCURRING IN THE PROJECT AREA

COMMON NAME	SCIENTIFIC NAME	COUNTIES
Crustaceans		
Broad River spiny crayfish	<i>Cambarus spicatus</i>	Fairfield, Richland
Fish		
American eel	<i>Anguilla rostrata</i>	Newberry, Fairfield, Richland
Blueback herring	<i>Alosa aestivalis</i>	Newberry, Fairfield, Richland
Robust redhorse	<i>Moxostoma robustum</i>	Richland
Mammals		
Tri-colored bat	<i>Perimyotis subflavus</i>	Newberry, Fairfield, Richland

Broad River spiny crayfish

The Broad River spiny crayfish distribution is thought to be limited to lotic environments in the Broad River drainage (Eversole 1990). Although collections are limited, Broad River spiny crayfish were found in association with leaf litter and other organic debris located along stream banks, primarily over unstable sandy substrates that lack rooted aquatic vegetation. In the project vicinity, this species has been collected in the Little River, a tributary to the Broad River, in Fairfield County (Eversole 1990).

American eel

The American eel is a catadromous species known to occur within river systems in South Carolina. Mature American eels spawn in the ocean and the egg and pre-larval stages mature into the leptocephalus stage, where they drift with ocean currents for approximately 1 year before metamorphosing into the glass eel stage. Glass eels migrate across the continental shelf, eventually entering estuaries and tidal rivers, where they mature into elvers. Elvers migrate primarily at night and can overcome obstacles that often prevent passage of other

aquatic species. Vertical obstacles, such as dams, can be traversed by small eels if the surface of the structure is textured and remains wet. As the small eels continue to mature into yellow eels, they may gradually move upstream over many years, with the greatest movement occurring during the moderate water temperatures of spring and fall (ASMFC 2000). Although the American eel currently does not have special status under state or federal regulations, it has been identified by the SCDNR as a priority species (SCDNR 2005). The federal status of this species has been further reviewed by the USFWS and NMFS several times over the past decade and the species is considered at-risk.

Blueback herring

The blueback herring is an anadromous fish that ranges along the Atlantic Coast from Nova Scotia to Florida. It can be found in the Atlantic Ocean as well as coastal rivers and streams (SCDNR 2013). As a diadromous fish, the blueback herring spends its adult life at sea and migrates up freshwater rivers and streams to spawn. Spawning area spans the tidal zone as far upstream as 100 miles (SCDNR 2013). During spawning the female releases as many as 250,000 eggs in shoreline areas of hard substrate (SCDNR 2013). The eggs are then fertilized by the male. After the spawning season of April and May, adult blueback herring return to the ocean. Freshly hatched blueback herring remain in the rivers for several months before moving to sea (SCDNR 2013). Blueback herring are known to occur in watersheds throughout South Carolina, including the Santee River Basin, where the Project is located. However, blueback herring have not been documented using the Columbia fishway located downstream of Parr Shoals Dam.

Robust redhorse

The robust redhorse is a large, heavy-bodied sucker, which was presumed extinct until being “rediscovered” during the initial stages of relicensing at Georgia Power’s Sinclair Hydroelectric Project (FERC No. 1951). Georgia Power Company, along with state and federal resource agencies, other hydropower interests, and the Georgia Wildlife Federation, formed the Robust Redhorse Conservation Committee (RRCC) in 1995 to guide recovery efforts for the species in lieu of listing under the ESA. Subsequent research has produced valuable information about the robust redhorse and its habitat requirement. Based on recent studies, it appears that the adult robust redhorse typically inhabit areas of the river where the current is moderately swift. Preferred habitat is riffle areas or in/near outside bends, where depths are greater and

accumulations of logs and other woody debris are present (Evans 1997). Spawning typically occurs at water temperatures from 18 to 24°C, usually over gravel substrate in both deep and shallow water (Hendricks 1998).

At this time, natural populations of robust redhorse are not known to exist in the Broad River (Lamprecht and Scott 2013). Stocking of fingerlings began in 2004 at sites both above and below the Parr Shoals Dam and robust redhorse have since been documented in both Parr and Monticello reservoirs, as well as the reach of the Broad River downstream of Parr Shoals Dam. In addition, robust redhorse use of the fishway at the Columbia Hydroelectric Project has been documented, suggesting that robust redhorse from the Congaree and potentially other areas of the lower Santee Basin are utilizing habitat in the reach of the Broad River downstream of Parr Shoals Dam during the spawning season.

Tri-colored bat

The tri-colored bat is very small and exhibits delayed fertilization. In the spring, the female fertilizes an egg with stored sperm and gives birth in the fall to twins (NatureServe 2015). The pups can fly within 1 month and remain with the mother for another week for foraging. Once young tri-colored bats learn how to forage for insects they leave their mothers and are independent (NatureServe 2015). This bat ranges throughout most of the eastern United States, southeastern Canada, and into eastern Mexico and Central America (NatureServe 2015). Most tri-colored bats roost in trees during the summer and hibernate in cave, mines and rock crevices during the winter (NatureServe 2015).

The tri-colored bat is considered common in South Carolina, and is found statewide (SCDNR 2015); however, here are no known hibernation caves located in the project area or vicinity.

STATE LISTED SPECIES

Three species that are state-listed as threatened or endangered are included on the SCDNR county-level listings for the three counties of interest (Table 4-24). Life history information and habitat requirements for these species are summarized below.

TABLE 4-24 STATE-LISTED SPECIES OCCURRING IN RICHLAND, FAIRFIELD AND NEWBERRY COUNTIES, SOUTH CAROLINA

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS ¹	STATE STATUS ²	COUNTIES
Amphibians				
Pine Barrens tree frog	<i>Hyla andersonii</i>		T	Richland
Mammals				
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	ARS	E	Richland
Fish				
Carolina darter	<i>Etheostoma collis</i>	SC	T	Fairfield, Richland

¹ Federal Status – E (listed as Endangered under ESA); T (listed as Threatened under ESA); C (Candidate for Federal listing); SC (Federal Species of Concern); P (Federally protected); ARS (At-risk species).

² State Status – E (state listed as endangered); T (state listed as threatened).

Pine Barrens tree frog

The Pine Barrens tree frog inhabits the swamps, bogs and acidic brownwater streams of the New Jersey Pine Barrens, as well as the pocosins (shrub bogs) of the Carolinas (Conant and Collins 1991). This species is intolerant of closed-canopy conditions and is restricted to localized wetlands such as hillside seepage bogs within dry uplands, pine barrens, and headwater swamps and disperses along drainages within these areas (NatureServe 2013). Non-breeding habitat generally is in pine-oak areas adjacent to breeding habitat. Important egg-laying and larval habitats include open cedar swamps and sphagnaceous, shrubby, acidic, seepage bogs on hillsides below pine-oak ridges. For southeastern populations, typical habitats are characterized by the topography, soils, and vegetation of the Carolina Sandhills, with pocosin or evergreen shrub swamps established along seeps and small streams within the surrounding longleaf pine-oak forest. Breeding habitat in South Carolina has been described as low vegetation with dense growth of Sphagnum mosses. Cely and Sorrow (1983) found that occurrences in South Carolina appeared to be restricted to the Fall Line Sandhills at elevations ranging between 200 feet and 400 feet.

The area surrounding the Project lacks the Carolina sandhills habitat and associated bogs and pocosins required by this species.

Rafinesque's big-eared bat

Rafinesque's big-eared bat is a colonial bat species native to the southeastern United States. Two subspecies are recognized in South Carolina, *Corynorhinus rafinesquii* in the mountains and *Corynorhinus rafinesquii macrotis* along the Coastal Plain (Bunch et al. 2006). Rafinesque's big-eared bat is nocturnal, feeding primarily on moths by echolocation. Coastal plain and sandhills populations of the species utilize I-beam and T-beam bridges for roosting.

Roosting in mountainous regions of the state occurs in large hollow trees (typically large tulip poplars), abandoned buildings and mines, rock shelters and caves. Habitat in the Blue Ridge Mountains includes rock outcrops, mesic and cove hardwood forests, forested bottomlands, bottomland agricultural fields, dry deciduous forests, pine woodlands, and forested riparian areas. Coastal zone and sandhill habitats include black gum stands, bald cypress swamp forests, maritime forests, and mature hardwood and mixed forests (Bunch et al. 2006). The range of Rafinesque's big-eared bat in South Carolina includes the coastal plain and sandhills regions and the extreme northwestern Blue Ridge, with the piedmont representing a gap in the species' distribution (Bunch et al. 2006). As such, it is extremely unlikely that this species would occur in the project area.

Carolina darter

The Carolina darter exists only in the Piedmont region from south-central Virginia through North Carolina into north-central South Carolina (Hayes and Bettinger 2006); it is state-listed as threatened and a federal species of concern. It occurs in small to moderately sized streams in areas of low current velocity, typically in backwaters among submerged tree roots or under leaves, where it feeds primarily on Chironomid larvae and micro-crustaceans. Preferred substrates are usually characterized by mud, sand and sometimes bedrock (Rohde et al. 2009). The Carolina darter has been collected at several locations in the lower Broad River, including in a tributary to Parr Reservoir (Rohde et al. 2009). However, extensive sampling by SCE&G and SCDNR in both Parr and Monticello reservoirs and in the downstream reach have failed to document this species (Kleinschmidt 2013), suggesting that it may not occur in the project area or occurs in extremely low numbers not detected by previous sampling.

SELECTED SOUTH CAROLINA CONSERVATION PRIORITY SPECIES

As previously noted, ten species that are considered state conservation priority species were added to the RTE analysis based on consultation with SCDNR and USFWS staff (Table 4-25). Life history information and habitat requirements for these species can be found within the RTE Desktop Assessment (Exhibit E-7).

TABLE 4-25 SELECTED STATE CONSERVATION PRIORITY SPECIES

COMMON NAME	SCIENTIFIC NAME	STATE PRIORITY LEVEL ¹	FEDERAL STATUS ²
Newberry burrowing crayfish	<i>Distocambarus youngineri</i>	Highest	ARS
Robust redhorse	<i>Moxostoma robustum</i>	Highest	ARS
Piedmont darter	<i>Percina crassa</i>	High	
Seagreen darter	<i>Etheostoma thalassinum</i>	High	
Highfin carpsucker	<i>Carpionodes velifer</i>	Highest	
Quillback	<i>Carpionodes cyprinus</i>	High	
Santee chub	<i>Hybopsis zanema</i>	High	
Striped bass	<i>Morone saxatilis</i>	Moderate	
Yellow lampmussel	<i>Lampsilis cariosa</i>	Highest	
Roakoke slabshell	<i>Elliptio roanokensis</i>	High	

¹ Refers to conservation priority level as listed in SCDNR's State Wildlife Action Plan (SCDNR 2015).

² ARS – At-Risk-Species. Refers to species that the USFWS has been petitioned to list and for which a positive 90- day finding has been issued (listing may be warranted), yet no Federal protections currently exist.

The Carolina creekshell (*Villosa vaughaniana*) is listed as a state conservation priority species in the State Wildlife Action Plan (SCDNR 2015), under the highest state priority level. The Carolina creekshell was identified as occurring within Monticello Reservoir during a mussel study conducted as part of relicensing, and verified during genetic testing in 2017. Similar to other members of this genus, Carolina creekshell is sexually dimorphic. Male shells are more elongate while females are more inflated and rounded in the posterior margin. The periostracum is generally dark yellow brown with many green, unbroken rays. This species is similar to the Eastern creekshell (*Villosa delumbis*), but has a thicker shell with more prominent pseudocardinal teeth. Carolina creekshell is rarely found in large bodies of water, instead residing in small or medium size streams. Prior to the Monticello Reservoir study, the species has not previously been reported as occurring in reservoirs.

4.7.2 Environmental Effects

4.7.2.1 Completed Studies

BROAD RIVER SPINY CRAYFISH STUDY

Based on a recommendation from the USFWS, Broad River spiny crayfish surveys were conducted in the Parr Reservoir and in the Broad River downstream of the Parr Shoals Dam from early September to late October 2015. No crayfish were collected during the Broad River spiny crayfish study (Kleinschmidt 2016b). During the American eel study performed in the Parr Shoals Dam tailrace area, approximately thirteen crayfish were collected in a large fyke net that sampled the west channel area during springtime collections (Kleinschmidt 2016c). Through consultation with USFWS the crayfish were identified as either acuminate crayfish (*Cambarus acuminatus*) or Carolina needlenose crayfish (*Cambarus aldermanorum*) and a reference sample was kept in 70% ethanol. No Broad River spiny crayfish were collected in the fyke net (Kleinschmidt 2016c). For the full Broad River spiny crayfish report see Exhibit E-7.

AMERICAN EEL ABUNDANCE STUDY

The Licensee conducted American eel abundance surveys during 2015 in the Broad River directly downstream of the Parr Shoals Dam. The 2015 study was performed to determine the relative abundance, size and movement patterns of American eel in the Broad River immediately downstream from the Parr Shoals Dam. Only one American eel was collected (Kleinschmidt 2016c). Three backpack and three boat electrofishing efforts were conducted in the spring of 2016 to provide an additional assessment of the abundance of American eels downstream of Parr Shoals Dam. A total of two yellow eels were observed during the assessment, although none were collected. The results of the 2016 study corroborate the findings of the previous 2015 eel sampling effort, that while American eels are present in the area downstream of Parr Shoals Dam, they do not appear to be abundant (Kleinschmidt 2016c). For the full report see Exhibit E-5.

ROCKY SHOALS SPIDER LILY STUDY

Although the RSSL is not state or federally listed as threatened, endangered, or at-risk, it is considered rare by SCDNR and is among the species tracked by the agency's Heritage Trust Program (Julie Holling, SCDNR, Pers. Comm., April 14, 2014). The RSSL occurs in significant

numbers downstream of Parr Shoals Dam and stakeholders requested a study to assess the number and spatial distribution of RSSL populations in the project area (Exhibit E-7). In the Broad River, extending from Parr Shoals Dam through Frost Shoals, near Boatwright Island, 81 plants or clumps of plants were documented during the RSSL study (Kleinschmidt 2015).

FRESHWATER MUSSEL STUDIES

During relicensing, stakeholders requested information describing the status of freshwater mussels in Parr and Monticello reservoirs, and the Broad River downstream of Parr Shoals Dam. Existing data was reviewed and determined adequate for characterizing the mussel populations in Parr Reservoir and downstream of the dam, however, new survey information was needed for Monticello Reservoir. In 2016, SCE&G surveyed Monticello Reservoir and found six mussel species, including the Carolina creekshell (Three Oaks Engineering 2016). The full Freshwater Mussel Survey Report is included in Exhibit E-5. Because the Carolina creekshell is a state priority species that had never been previously documented in Monticello Reservoir, or any reservoir, stakeholders requested genetic testing on the individuals collected to confirm their identity as Carolina creekshell. Genetic testing was conducted in 2017 and confirmed the presence of Carolina creekshell in Monticello Reservoir (Three Oaks Engineering 2018). The Monticello Reservoir Mussel Genetics Study is included in Exhibit E-5.

4.7.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed the following PM&E measures that would affect RTE species in the project area:

- Minimum Flows Downstream of Parr Shoals Dam AMP (Exhibit E-5)
- Flow Fluctuations Downstream of Parr Shoals Dam AMP (Exhibit E-5)
- Mussel Monitoring Plan (Exhibit E-5)
- American Eel Abundance Monitoring Plan (Exhibit E-5)
- Santee Basin Accord for Diadromous Fish Protection (Exhibit E-5)
- Parr and Monticello Reservoir Shoreline Management Plans (Exhibit E-10)

The Licensee worked with stakeholders to develop a Minimum Flow AMP to determine minimum flow rates that account for aquatic species/habitat and fish passage needs (Exhibit E-5). Agreed upon minimum flow rates outlined in the plan will improve aquatic habitat and navigation for species such as American eel, robust redhorse, blueback herring and Carolina darter. Specifically, the updated minimum flow rates will increase wetted usable aquatic habitat year-round.

The proposed Downstream Flow Fluctuation AMP will attempt to stabilize downstream flow fluctuations during spring spawning periods and, to a lesser degree, year-round. Per stakeholder request, SCE&G will attempt to stabilize downstream fluctuation flows for 14 days during the last 2 weeks in March to minimize effects on shortnose sturgeon spawning. SCE&G will stabilize downstream fluctuation flows for an additional 14 days later in the spring to minimize effects on striped bass, American shad and robust redhorse spawning. Stabilization of flows during the spring spawning period may increase shortnose sturgeon spawning and recruitment success.

SCE&G will implement the proposed Mussel Monitoring Plan to monitor the abundance, distribution, and species composition of mussel species in Monticello Reservoir and the Broad River downstream of Parr Shoals Dam. This plan will monitor the Carolina creekshell population within Monticello Reservoir and alert SCE&G and stakeholders to any changes that may occur.

SCE&G will implement the proposed American Eel Abundance Monitoring Plan to monitor the distribution and abundance of American eels downstream of the Parr Shoals Dam for the duration of the new license. This information will inform SCE&G and stakeholders on the potential future need for the construction of an eel ramp at the Project.

SCE&G is a signatory to the Accord, which requires them to implement fish passage at the Project when certain biological triggers are met. When species such as American shad and blueback herring are identified in significant numbers downstream of the Project, SCE&G will initiate construction of a fish passage facility at Parr Shoals Dam. This provision could result in significant positive effects on diadromous and anadromous fish living within the Broad River Basin.

Finally, the new SMPs include best management practices (BMPs) for timber management and for the prevention and management of invasive species that may compete with federally listed terrestrial species.

The USFWS suggested voluntary conservation measure for the Northern long-eared bat. In response to these suggested measures, SCE&G responded that its forest management activities would be conducted using South Carolina Forestry Commission BMPs, which includes general practices for the enhancement of wildlife species. SCE&G manages its forestry operations throughout the state in accordance with these BMPs, including its hydroelectric project lands.

Below is discussion on how these proposed changes, along with additional PM&E measures, could affect the federal and state listed species that potentially occur within the project area.

FEDERALLY LISTED AND CANDIDATE SPECIES

Birds

Only the bald eagle likely occurs in the project vicinity with any regularity. Continued operation of the Project is not likely to result in negative effects on eagle foraging or nesting. The Licensee tracks bald eagle nesting in the project area and utilizes this information to minimize potential impacts of various shoreline management activities on eagle nests. Specifically, SCE&G refrains from issuing shoreline permits for activities within 660 feet of an active nest during the nesting season (September through May) and 330 feet during the non-nesting season. This policy is in adherence to the USFWS habitat guidelines for nesting bald eagles (USFWS 2007b). SCE&G frequently consults with USFWS Ecological Services staff regarding proposed activities in the vicinity of known nests. The Licensee plans to continue these measures to ensure the bald eagle and its nests are protected within the project area.

Wood storks may periodically utilize portions of project lands and waters for seasonal foraging (primarily by post-dispersal migrants during the summer months); however, this usage tends to be sporadic and ephemeral. Project operations are expected to result in no effects on wood storks or their habitat. In fact, fluctuating water levels in Parr Reservoir could enhance foraging habitat by periodically trapping fish in shallow pool areas.

The Licensee's proposed actions should not have a negative effect on bald eagles or wood storks that may exist within the project boundary.

Fish

Population groups of shortnose sturgeon are known to occur downstream of the Santee-Cooper dams in the lower Santee and Cooper rivers (Collins et al. 2003). Shortnose sturgeon also occur upstream of the Santee-Cooper Dams, and an established population exists in the Brown's Lake area of Lake Marion (Bill Marshall, SCDNR, Personal Communication). Shortnose sturgeon spawning activity has been observed in the Congaree River downstream of the Project (Collins et al. 2003). Proposed downstream fluctuation flow reductions that will occur during shortnose sturgeon spawning periods may improve spawning and recruitment success for this species throughout the term of the new license. If this species should expand its range and begin occurring within the project area (i.e., in the reach of the Broad River immediately downstream of the Project), SCE&G would likely implement fish passage at Parr Shoals Dam per the Accord.

Several other fish species that are not federally listed, but are classified as priority conservation species have been documented in the project vicinity. Habitat requirements for these species were assessed as part of the IFIM study and proposed downstream minimum flows considered the results of this study. New minimum flow rates will result in a more consistent hydrograph that will have fewer artificial flow pulses. This more stable hydrograph will provide more natural conditions for fish species downstream of the Project, including American shad, robust redhorse and striped bass.

FEDERAL AT-RISK SPECIES

Crustaceans

During the Broad River Spiny Crayfish Study, no Broad River spiny crayfish were collected. It can be assumed that Broad River spiny crayfish do not exist within the project boundary, and therefore will not be affected by proposed actions.

Fish

The American Eel Abundance Study resulted in the collection of a single eel. Two additional eels were observed but not collected during additional sampling the following season. The Licensee is proposing to conduct additional monitoring during the term of the new license to determine if American eel presence downstream of Parr Shoals Dam is increasing, per the request of NMFS.

Currently, blueback herring do not occur in the project vicinity, however the Columbia Fishway allows for the possibility of this species to occur in the project vicinity within the term of the new license. Should blueback herring triggers be met as specified in the Accord, SCE&G will initiate the construction of a fish passage facility at Parr Shoals Dam. Other proposed actions will not likely have significant impacts to blueback herring.

Robust redhorse are known to occur in Parr and Monticello reservoirs and in the Broad River downstream of Parr Shoals Dam. Robust redhorse are documented as using the Columbia Fishway. Proposed actions, including the increased minimum flow and stabilized downstream flow fluctuations, will likely have significant positive impacts on robust redhorse.

STATE LISTED SPECIES

Fish

The Carolina darter has been collected at several locations in the lower Broad River, including one that appears to be a tributary to Parr Reservoir (Rohde et al. 2009). However, extensive sampling by SCE&G and SCDNR in both Parr and Monticello reservoirs and in the downstream reach have failed to document this species (Kleinschmidt 2013a), suggesting that it may not occur in the project boundary or occurs in extremely low numbers not detected by previous sampling. Proposed actions are not expected to have an impact on this species.

4.7.3 Environmental Effects – No Action Alternative

Under the no action alternative, a new license would not be issued and the Project would continue to operate as it does currently. The downstream minimum flow would not increase and downstream fluctuation flows could continue to occur at the same frequency and magnitude. Aquatic habitat enhancements would not be installed in Monticello Reservoir and American eel and mussel monitoring would not occur.

SCE&G would still plan for the construction and implementation of a fish passage facility at Parr Shoals Dam per the Accord, as this document is not tied to the current project license. SCE&G is dedicated to this program and plans to continue participation separate from any FERC license.

SCE&G would continue to track bald eagle nesting in the project area and refrain from issuing shoreline permits for activities within 660 feet of an active nest during the nesting season

(September through May) and 330 feet during the non-nesting season. SCE&G would continue to consult with USFWS Ecological Services staff regarding proposed activities in the vicinity of known nests.

4.7.4 Unavoidable Adverse Effects

The only unavoidable adverse effect that has been identified by continued project operation with regards to RTE resources is downstream fluctuation flows. Due to pumping and generating operations at the Fairfield Development, and when inflow is greater than hydraulic capacity of the Parr Development, water is spilled over Parr Shoals Dam, creating a fluctuation of downstream flows. This may interfere with spawning of various species including, but not limited to, shortnose sturgeon, striped bass, American shad, and robust redhorse. SCE&G is proposing to implement a variety of measures to decrease these fluctuating flows during spawning periods and year-round.

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Section 4

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4.8 RECREATION RESOURCES

4.8.1 Affected Environment

The Project is located in the Piedmont Region of South Carolina, which is home to a diversity of recreational opportunities and major tourist attractions such as Kings Mountain National Military Park, Sumter National Forest, Lake Keowee, Lake Murray, Lake Hartwell, Lake Wylie, the Catawba River, and the Saluda River (Kleinschmidt 2016a). In addition, project lands and waters offer a variety of recreational opportunities to the residents of Newberry and Fairfield counties, as well as to recreational users traveling to the Project from greater distances. Both regional and project recreation opportunities are discussed in greater detail in the following sections.

4.8.1.1 Regional Recreation Resources

Regionally and nationally recognized recreation opportunities within the project vicinity include Dreher Island State Park, Chester State Park, Kings Mountain National Military Park, Sumter National Forest, Lake Greenwood State Park, and Lake Wateree State Park. These areas provide opportunities for hunting, boating, fishing, hiking, picnicking, swimming and camping in the project vicinity (Kleinschmidt 2016a).

Sumter National Forest is a 371,000-acre national forest providing walking, riding and camping opportunities. Lake Greenwood State Park provides access to the 11,400-acre Lake Greenwood along the southwestern border of Newberry County with several miles of shoreline and public access. Lake Wateree State Park is a 72-acre state park containing outdoor and water-oriented facilities, a campground, picnic areas, and a boat ramp. Lynch's Woods Park is a 260-acre woodland area in the city of Newberry which has 7.5 miles of hiking and biking trails, 3.5 miles of equestrian trails, a primitive camp site, and picnic tables. Lake Monticello Park is a 25-acre park containing tennis courts, ball field, basketball court, picnic facilities, fishing pier, and walking trail (Kleinschmidt 2016a).

Lake Murray is a 75 square-mile hydropower reservoir located south of the Project in Newberry, Saluda, Lexington and Richland counties. Lake Murray supports numerous on-water recreation opportunities through 15 public access sites situated around the reservoir. Lake Murray hosts several national and local fishing tournaments. The lower Saluda River,

which extends 10 miles downstream of the Lake Murray Dam, supports an active recreational fishery and provides a variety of paddling experiences, from flatwater to whitewater (Kleinschmidt 2016a).

Fairfield and Newberry counties encompass several municipal recreation areas. Fairfield County has 16 public parks and recreation facilities encompassing approximately 90 acres, and Newberry County has 45 public parks and recreation facilities encompassing more than 530 acres. The Enoree River Bridge Informal Access Area, primarily⁶ located on USFS lands in Newberry County, provides paddlers and other recreators access to project waters through a primitive boat ramp. In summary, facilities located in Fairfield and Newberry counties (Table 4-26) provide the following amenities: playgrounds, picnic areas, softball fields, horseback riding, hand-carried and trailered boat launches, basketball courts, swimming pools, birding and wildlife watching opportunities, and multi-use trails that support hiking (Kleinschmidt 2016a).

TABLE 4-26 RECREATION FACILITIES IN FAIRFIELD AND NEWBERRY COUNTIES

FAIRFIELD COUNTY	NEWBERRY COUNTY
Monticello Reservoir	Parr Reservoir
Parr Reservoir	Brick House Recreation Area
Feasterville Mini Park	Broad River Canoe Access
Mitford Mini Park	Dreher Island State Park
Sheldon Mini Park	Little Mountain Reunion Park
Eunice Shelton Trail	Lynch's Woods Park
Adger Park	Peak-to-Prosperity Rail Trail
Blair Park/Willie Lee Recreation Center	Wells Japanese Garden
Garden St. Park	Little Mountain Explorer Bicycling Route
Middle Six Mini Park	
Chappelltown Mini Park	
Centerville Mini Park	
Horeb Glenn Park	
Alton Trail	
Fortunes Spring Park	

⁶ The project boundary is located on the edge of the river bank at this site.

Although the project boundary ends at Parr Shoals Dam, the Parr Development operates in a modified run-of-river mode to continuously pass Broad River flow downstream, under normal circumstances. This segment of the Broad River extends from Parr Shoals Dam approximately 23 river miles until it meets the Columbia Diversion Dam. This reach provides valuable recreational opportunities to wade-anglers, paddlers, fishermen and other recreators using small watercraft.

4.8.1.2 Recreational Resources Within the Project Boundary

The Project provides a unique recreation atmosphere, which includes riverine and lacustrine environments, waterfowl hunting areas, and areas that support many day-use activities such as picnicking, hiking and beach swimming. SCE&G maintains six project recreation sites, well distributed within the project area. These sites are generally depicted on Project Exhibit G drawings, and further described within the RMP filed with this Application. Table 4-27 lists project recreation sites at Monticello and Parr reservoirs and associated facilities provided at these sites.

TABLE 4-27 EXISTING PROJECT RECREATION SITE INVENTORY SUMMARY FOR MONTICELLO AND PARR RESERVOIRS

Recreation Site Name	\$ Fee	Part 8 Signage	Barrier Free/ADA Amenities	Picnicking	# Shelters	# of Tables	# of Grills	Trail Length (Mi)	Camping	Beach Access	Bank Fishing	Dock Fishing	# Ramps	# Docks	Parking Spaces	Restrooms	Playground and Sport Facilities	Owned by SCE&G	Operated by SCE&G	Leased to Other Entity
Monticello Reservoir																				
Scenic Overlook	\$0	●	●	●	1	8					●	●		1	100	●		●	Partial	Partial
Highway 215	\$0	●		●	1	2					●		2	1	30			●	●	
Highway 99 West	\$0	●		●	2	5	1		●		●		3	1	80	●		●	●	
Recreation Lake Access Area	\$0	●	●	●	2	26	7	0.3		●	●		1		105	●		●	●	
TOTALS	\$0				6	41	8	0.3					6	3	335					
Parr Reservoir																				
Cannon's Creek	\$0	●		●	2	2	1		●		●		1		30	●		●	●	
Heller's Creek	\$0	●		●	2	2			●		●		1		25	●		●	●	
TOTALS	\$0				4	4	1						3		60					

In addition to the project lands supporting developed project recreation sites and those proposed new recreation sites, SCE&G has set aside approximately 933 acres of undeveloped land in the public recreation land classification. This land is available for future recreation development, should the need arise. Undeveloped lands under this classification, as well as other classifications of project lands and waters⁷, are available for defined recreational activities based upon their location. Specific details regarding allowable activities are provided in the Parr and Monticello SMPs.

There are three informal recreation sites at the Project, including the Highway 99 East Recreation Site (formerly known as the Highway 99 Informal Fishing Area), the Enoree River Bridge Recreation Site (formerly known as the Enoree River Bridge canoe put-in) and the Highway 34 Recreation Site (formerly known as the Highway 34 Primitive Ramp). The Fairfield County Recreation Commission and SCDNR manage recreation areas within the project boundary. The Fairfield County Recreation Commission leases property from SCE&G and manages a multiple-use recreational area at Monticello Reservoir, adjacent to the SCE&G-managed Scenic Overlook Recreation Site. This area includes a baseball field, tennis courts, basketball courts, a walking trail, and picnic facilities (Kleinschmidt 2016a). The SCDNR maintains two waterfowl areas within the project boundary adjacent to Parr Reservoir, as depicted in Figure 4-20 and Figure 4-21: the Broad River Waterfowl Management Area and the Enoree River Waterfowl Management Area. These waterfowl management areas were previously approved by FERC in response to Article 44 in the license issued August 28, 1974, by FERC Order dated June 6, 1979, Order Approving Exhibit R Revisions and Related Changes in Land Rights, and shown on the latest version of Exhibit R-3 (FERC No. 1894-99) associated with the August 28, 1974 license. These facilities provide public waterfowl hunting access under the management jurisdiction of SCDNR and its Wildlife Management Area (WMA) program.

The Project is not located on a designated wild and scenic river segment. In addition, no project lands are being considered for inclusion in the National Trails System or as a wilderness area.

⁷ For safety and security reasons, public access is restricted on properties classified as Project Operation, as these properties contain critical project works.

4.8.2 Environmental Effects

4.8.2.1 Completed Studies

RECREATION USE AND NEEDS STUDY

During pre-PAD consultation, it was determined that a Recreation Use and Needs (RUN) study should be performed to identify current and potential recreational use, opportunities, and needs at the Project. A RUN study plan was developed in consultation with the Recreation TWC and the study was conducted at the Project during the 2015 and 2016 recreation season. Study objectives were accomplished by identifying and inventorying existing project recreation facilities, identifying patterns of recreation use and user needs and preferences at each site, and estimating future recreational use and needs at the Project over the anticipated new license term (Kleinschmidt 2016a).

Study results indicate that the Project is well used, providing an estimated 152,709 recreation days during the 2015 recreation season. Monticello Reservoir was shown to support significant recreational use during early crappie season in 2016 (February 1 through March 31) with an estimated 26,895 recreation days. Results suggest that the sites are in “good” to “very good” condition, overall. Visitors indicated a variety of reasons why they chose to recreate on Monticello Reservoir, with most noting that they chose it due to its proximity to their home or because it provided good fishing opportunities. Respondents interviewed at Monticello sites were primarily from the four-county area (Fairfield, Newberry, Lexington, and Richland). Respondents interviewed at Parr sites were primarily local, with a large representation from Newberry County (over 75 percent). Most Parr Reservoir respondents noted that they chose to recreate at Parr because it provided good fishing or boating opportunities (Kleinschmidt 2016a).

Individuals using Monticello Reservoir recreation sites during the study season were found to primarily engage in water-based recreation activities. Boat fishing was the most popular activity observed, followed by bank and pier fishing. As with Monticello Reservoir, individuals recreating at Parr Reservoir recreation sites during the study season primarily engage in water-based recreation activities. Boat fishing was the most popular activity observed, followed by bank fishing (Kleinschmidt 2016a).

Study results indicate that recreation sites on Monticello Reservoir receive very similar levels of use, with most of the use occurring on the weekends. Data indicates that the Scenic Overlook Recreation Site accommodated the greatest numbers of patrons at Monticello Reservoir over the course of the 2015 study season. Density estimates for Monticello Reservoir sites indicate that some sites may be used at rates approaching or at capacity during peak periods; however, there are alternative sites in the vicinity that provide similar amenities with lower density ratings. Overall, perceptions of crowding at Monticello Reservoir sites are low to moderate and site conditions were rated very high. No Monticello Reservoir recreation site received below a 4⁸ condition rating. Restrooms were indicated as being the most needed additional facility at Monticello Reservoir, which is very typical for recreation use studies. Other facility and amenity recommendations included picnic tables, shelters, lighting and fishing piers or docks (Kleinschmidt 2016a).

Study results at Parr Reservoir indicate that Cannon's Creek Recreation Site receives the greatest amount of use. Most of the use at Parr Reservoir occurs on weekdays. Density estimates calculated for Cannon's and Heller's Creek Recreation Sites suggest that these areas are consistently being used below their design capacities and can accommodate additional use, except for peak hours during the occasional weekend day. This was reflected in the low to moderate crowdedness ratings for these sites. Additional boat launching or docking facilities were some of the most requested additional facilities, along with lighting and additional restrooms (Kleinschmidt 2016a).

A second goal of the RUN Study was to characterize existing use of Waterfowl Management Areas within the project boundary and project recreation lands by waterfowl hunters during designated hunting seasons. Results from surveys distributed on vehicles parked at Monticello Reservoir recreation sites during Canada geese hunting season indicated that the most hunters are local residents who prefer to hunt on Saturday mornings. Results from surveys distributed at Parr Reservoir indicate that the most hunters are residents of the surrounding counties, primarily Richland and Lexington, who hunt on Saturday mornings. Waterfowl focus groups were conducted by SCE&G and attendees noted that they prefer to hunt during weekday mornings, as there are less hunters on Parr Reservoir (Kleinschmidt 2016a).

Data regarding recreation use at the Enoree River and Broad River Waterfowl Management Area was primarily obtained from SCDNR and waterfowl focus group attendees. Traffic

⁸ On a scale of 1 to 5 where a 1 is "poor" and a 5 is "excellent."

counter data from the Enoree River Waterfowl Management Area indicates that it is well used. Crowding at this site was a primary concern among waterfowl focus group attendees. Crowding is not an issue for the Broad River Waterfowl Management Area, as this site is a draw-hunt site (Kleinschmidt 2016a).

4.8.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed the following PM&E measures that would affect recreation resources in the project area:

- Recreation Management Plan (Exhibit E-8)
- Parr and Monticello Reservoir Shoreline Management Plans (Exhibit E-10)
- Monticello Reservoir Fisheries Habitat Enhancement Plan (Exhibit E-5)
- Minimum Flows Downstream of Parr Shoals Dam AMP (Exhibit E-5)

Recreation Management Plan and Parr and Monticello Reservoir SMPs

The Project serves as a significant recreation resource for the residents of Newberry and Fairfield counties, as well as those traveling from greater distances. Although many regional recreational opportunities are available, the Project provides a unique combination of water-based recreation activities such as waterfowl hunting, fishing, pleasure boating and paddling. Moreover, RUN Study results indicate that SCE&G recreation facilities at the Project are well-used and received good to very good condition ratings by users (Kleinschmidt 2016a).

When considering the proposed action, it is important to anticipate future recreational needs at the Project. As discussed in the RUN Study, the population of the surrounding counties is projected to increase by 12.9 percent from 2015 to the year 2030. Most of this growth is projected to occur in Lexington County. However, RUN study survey respondents indicated Lexington County (11 percent of project recreators) as their county of residence less frequently than Fairfield (12 percent of project recreators), Richland (19 percent of project recreators) or Newberry (33 percent of project recreators). This indicates that project recreational use may not grow at the 12.9 percent level. While there are many uncertainties when predicting future recreation use, fishing and boating are anticipated to remain the dominant recreation activities at Monticello Reservoir sites, and boat fishing and bank fishing are anticipated to remain the dominant recreation activities at Parr Reservoir sites (Kleinschmidt 2016a).

Measures to enhance project recreation resources over the anticipated license term are based on recreation site-user recommendations made during the RUN Study and resource agency and stakeholder discussions. Under the proposed action, consideration has been given to site improvements at both Parr and Monticello reservoirs. Additionally, data collected at the Enoree Bridge Informal Access Area, primarily located outside the project boundary, indicates that it receives approximately 5 percent of the use experienced at the three SCE&G maintained access areas on Parr Reservoir (Kleinschmidt 2016a). Recreation TWC stakeholders indicated that this site is key in providing paddlers, and individuals launching small watercraft, access to the upper portion of project waters (Recreation TWC Meeting Notes, October 6, 2016, Exhibit E-1). SCE&G has consulted with stakeholders to explore ways to improve access at this site. Resulting enhancement proposals for this site are outlined in Table 4-28.

Table 4-28 presents a list of preliminary recreation site enhancement and improvement measures being proposed at the Project. Proposed recreation site enhancement and improvement measures are further discussed in the RMP developed by SCE&G in consultation with stakeholders. The RMP includes an adaptive management process to address project related recreation issues that arise during the term of the new license. The RMP outlines the monitoring, maintenance and improvement of recreation sites to preserve their quality, functionality and compliance with FERC's barrier free requirements. The proposed RMP is included in Exhibit E-8.

TABLE 4-28 PROPOSED PROJECT RECREATION SITE ENHANCEMENTS

PROJECT RECREATION SITE	PROPOSED ENHANCEMENTS
<i>Parr Reservoir</i>	
Cannon's Creek Recreation Site (existing site)	Install one (1) fishing pier
	Install one (1) courtesy dock
	Install two (2) additional lights, one (1) near road and one (1) near restroom
	Pave two (2) barrier free parking spaces and access paths to picnic area, fishing pier and restrooms, upgrade restroom to barrier free standards with new handle on men's room door and install new proper height toilet seats.
	Install at least one (1) interpretive display on the cultural and historic resources of the project area.
	Bring 4.43 acres of land into the project boundary.
Heller's Creek Recreation Site (existing site)	No proposed enhancements.
Parr Shoals Dam Canoe Portage (proposed new facility)	SCE&G built an experimental canoe portage on the Newberry side of the Parr Shoals Dam. An approximately 1,600 ft. trail was cleared and appropriate signage was installed. Depending on usage and feedback from the agencies, SCE&G plans to formalize the canoe portage by bringing it into the project boundary and maintaining it as an additional recreation facility.
Highway 34 Recreation Site (proposed new site)	Improve boat ramp - install geogrid and stabilize bank.
	Grade and gravel to improve parking area.
	Remove large trees that hinder vehicle access to ramp.
	Install recreation sign on Highway 34 per FERC regulations
	Bring into project boundary, properties 211 parcel E (8.23 acres) and 285 parcel C (9.9 acres west of Railroad tracks) on Exhibit K-14 drawing.
Enoree River Bridge Recreation Site (proposed new site)	Build canoe/kayak step down access within the project boundary line.
	Install recreation sign on Maybinton Road per FERC regulations.
<i>Monticello Reservoir</i>	
Scenic Overlook Recreation Site (existing site)	Add one (1) light at existing fishing pier.
	Modify existing fishing pier for barrier free use, pave two (2) barrier free parking spaces and access path(s) to fishing pier.
	Add two (2) new picnic tables.
	Build one (1) barrier free shelter with one (1) barrier free picnic table, pave one (1) barrier free parking space and access path to new barrier free shelter.
	Pave one (1) barrier free parking space and access path (SCE&G will coordinate this improvement with County).
	Install at least one (1) interpretive display on the cultural and historic resources of the project area.
Highway 99 West Recreation Site (existing site)	Add one (1) fishing pier.
	Improve boat ramp in cove so it does not drop off.
	Change two (2) existing lights, one (1) near boat ramp/courtesy dock and one (1) near new proposed fishing pier from standard to flood type lights.

PROJECT RECREATION SITE	PROPOSED ENHANCEMENTS
	Pave access paths or build ramps and platforms to courtesy dock, fishing pier and restrooms; and convert four (4) existing parking spaces into two (2) barrier free parking spaces.
	Modify restrooms to allow year-round access - electricity exists in restrooms, so heat could be added in restroom and/or water pump room.
Recreation Lake Access Area (existing site)	Install one (1) courtesy dock
Highway 99 East Recreation Site (proposed new site)	Add one (1) fishing pier.
	Add two (2) benches.
	Add two (2) picnic tables.
	Add two (2) lights on one pole, one (1) light for fishing pier and one (1) light for parking area.

As noted in Table 4-28, above, SCE&G is currently preparing educational material/signage that will be placed at the Highway 215 Recreation Area and Cannon’s Creek Recreation Site. This information will include: 1) historical information about the Lyles family, Lyles Ford, and if appropriate, the ruins of a mill/store and a canal built and run by the Lyles family in the eighteenth/nineteenth century; and 2) historical information about the Parr Development and the Fairfield Development facilities.

Additionally, at the request of SCDNR, SCE&G built an experimental/trial canoe portage on the Newberry (west) side of the Parr Shoals Dam. An approximately 1600-foot trail was cleared and appropriate signage was installed. Following evaluation of usability and feedback from agencies, SCE&G plans to formalize the canoe portage and maintain it as an additional recreational facility, as specified in the RMP.

The protection and enhancement of project recreational resources are additionally outlined in the proposed SMPs for Monticello and Parr reservoirs. SCE&G proposes to meet with stakeholders on a regular basis throughout the term of the new license to discuss any potential upgrades needed to these documents. More information on the proposed SMPs is included in Section 4.10: Land Use and Aesthetics.

In conclusion, recreational facilities surrounding the Project will be enhanced under the proposed action, thus improving recreational opportunities at the Project. Figure 4-22 depicts all existing and proposed recreation facilities included under the proposed action.

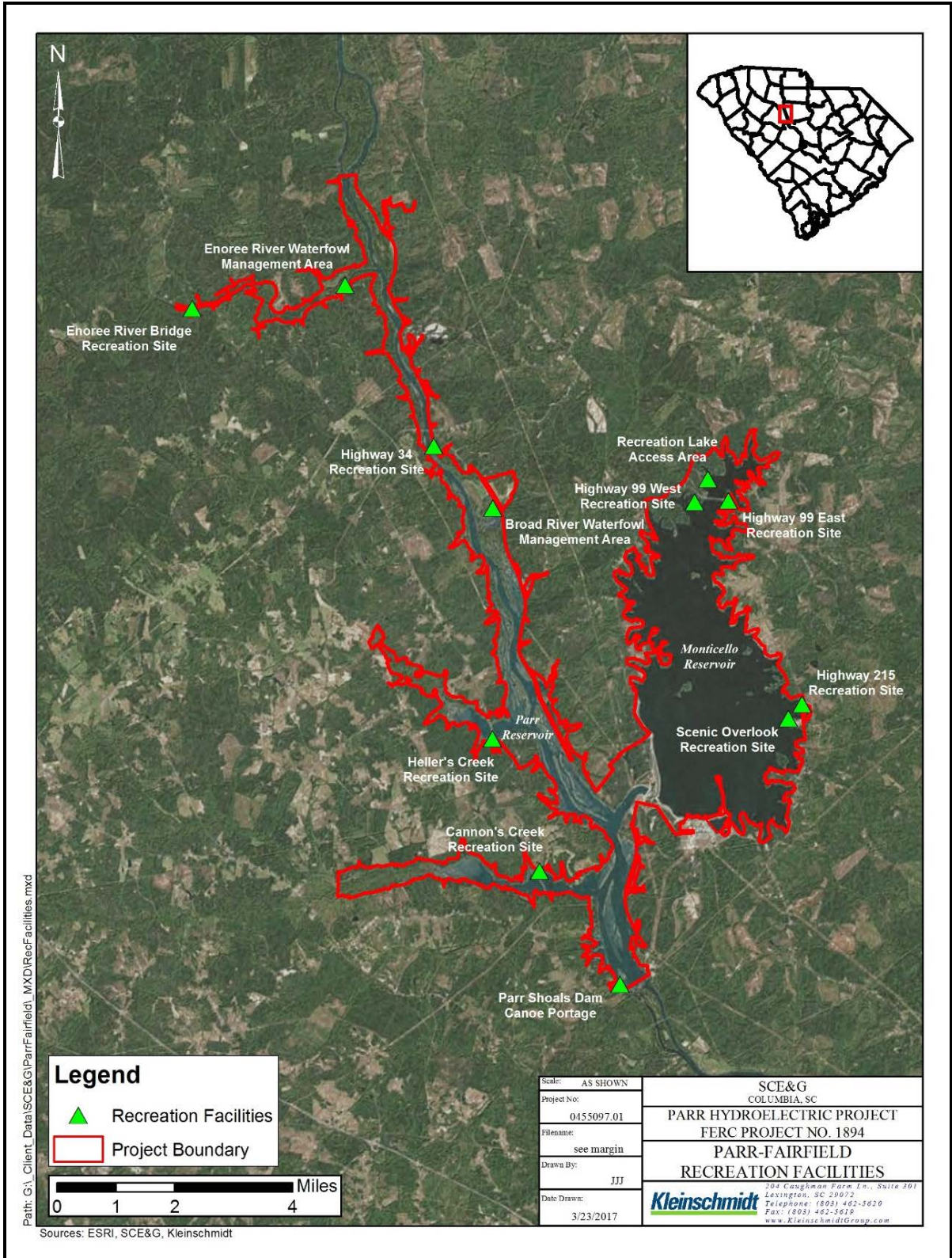


FIGURE 4-22 EXISTING & PROPOSED RECREATION FACILITIES AT THE PROJECT

Monticello Reservoir Fisheries Habitat Enhancement Plan

Stakeholders expressed concern over how the fluctuations of Monticello Reservoir, due to the pumped storage operation, are affecting fish populations. Specifically, SCDNR is concerned about the impacts of reservoir fluctuation to littoral zones and spawning and juvenile rearing habitats and any loss of fish from turbine mortality. SCE&G worked with SCDNR and other agencies to develop a plan for the installation of habitat enhancements in Monticello Reservoir. The habitat enhancement structures could provide enhanced fish production within Monticello Reservoir and they could also concentrate fish as an enhancement for recreational fishermen. Additional details on this enhancement effort can be found in the Monticello Reservoir Fisheries Habitat Enhancement Plan in Exhibit E-5.

Minimum Flows Downstream of Parr Shoals Dam AMP

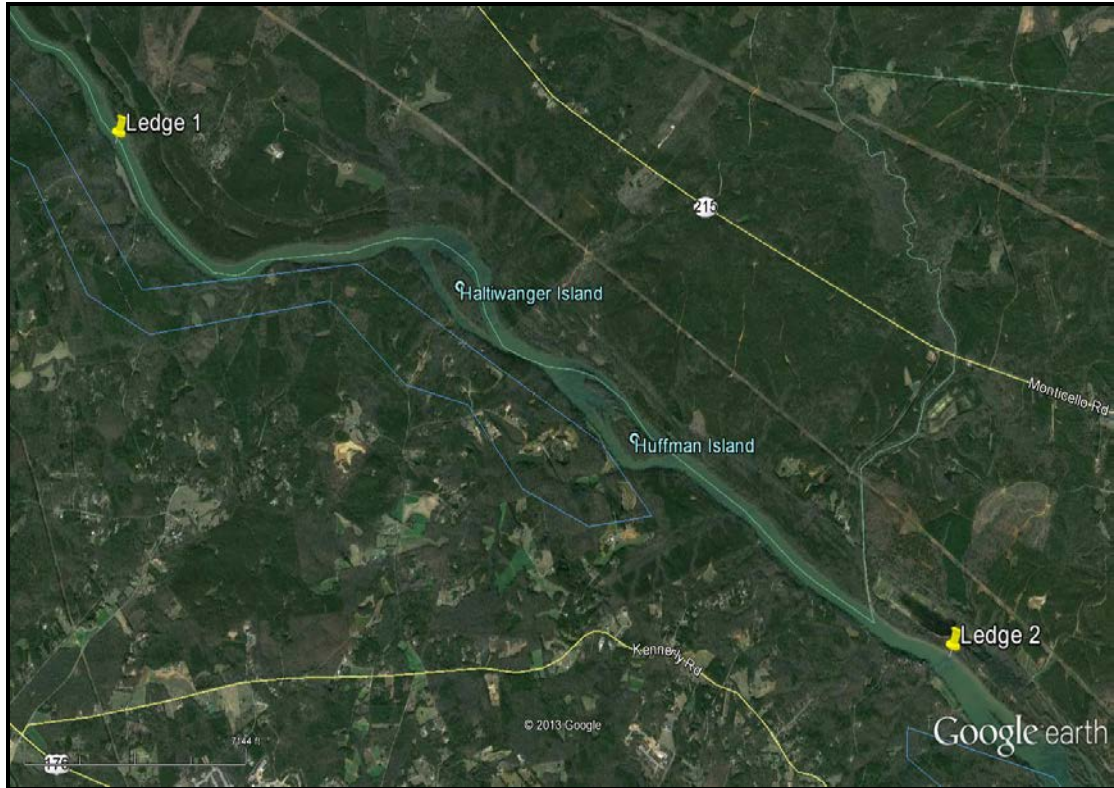
Pre-PAD consultation indicated that there was interest in exploring recreational flows downstream of Parr Shoals Dam. Additionally, during issues scoping, relicensing stakeholders identified two areas downstream of the Parr Shoals Dam as potential areas for navigation concern. These two issues resulted in the development and implementation of the Downstream Recreational Flow Assessment, and the Downstream Navigation Flow Assessment, respectively.

The Downstream Recreational Flow Assessment was designed and implemented to assess flows downstream of the Parr Shoals Dam that provide quality recreational experiences and to identify preferred flows for recreation activities, primarily as they relate to wade angling, canoeing and kayaking. In accordance with the study plan designed to fulfill this request, a panel of stakeholders that are knowledgeable about the project area was identified and convened as a focus group in late 2014. The focus group provided information regarding quality recreation opportunities, potential flow effects on recreation on the Broad River, downstream of the Parr Shoals Dam, and preferred flows for recreational activities. As a follow-up to the focus group meeting, an on-line survey was distributed to focus group members in 2015. The primary purpose of this survey was to gather user opinions on recreational use and preferred Broad River flows (downstream of Parr Shoals Dam) in 2015 (Kleinschmidt 2016b).

Although only a few individuals responded to this survey, it provided a starting point for Recreation TWC follow-up discussions. In 2016, Recreation TWC members reviewed survey

results and further refined recreational flow recommendations. Survey respondents and Recreation TWC members noted that higher flows (2,000 to 5,000 cfs) during the May – June timeframe support canoeing, kayaking and higher flow boat fishing; while 500 to 999 cfs during May - July supports lower flow boat fishing, hunting, wade-fishing and swimming. Stakeholders recommended flows of 2,000 cfs and 3,500 cfs during a 6-hour window (approximately 8 AM until 2 PM) on weekends and holidays during the recreation season (May through September). The Recreation TWC determined that downstream minimum flow recommendations, outlined in Table 3-1, would likely cover the lower ranges of flows which would be ideal for activities such as wade-fishing (Recreation TWC Meeting Notes, May 10, 2016, Exhibit E-1).

Downstream flows to facilitate one-way navigation were addressed through the Downstream Navigational Flow Assessment, designed in consultation with TWC members. The criteria for one-way navigation was defined by the South Carolina Water Resources Commission as a "minimum depth of one foot across a channel 10-feet-wide or across 10 percent of the total stream width, whichever is greater. Minimum depth does not need to occur across a continuous 10 percent of the stream width, but each point of passage must be at least 10 feet wide." One-way navigation criteria are based on the passage of a 14-foot Jon-boat without a motor in the downstream direction only (SCWRC 1988). Navigational analyses evaluated flows within the Broad River, downstream of the Parr Shoals Dam, at two areas of navigational constriction identified by the Recreation TWC. These areas were identified as Ledge 1 and Ledge 2 (Figure 4-23).



Source: Kleinschmidt, 2016c

Figure 4-23 Potential Points of Navigational Constriction

Points of navigational passage were determined in the field at Ledge 1 and Ledge 2 and bathymetric data within the navigational passage points were collected using an Acoustic Doppler Current Profiler (ADCP) and analyzed using appropriate software. Three-dimensional bathymetric models were created and the most limiting cross-section within each passage point was identified and compared with water stages-discharge data to determine navigational passage at various flow releases. Data suggested that navigational passage is not a limiting factor at Ledge 1 for flows as low as 500 cfs. At Ledge 2, data indicates that a flow of 1,000 cfs meets both the minimum depth and width aspects of the criteria, with approximately 82 feet (10 percent) of cross-sectional passage provided collectively by the two passage points at that ledge (Kleinschmidt 2016c).

Flows for recreation and navigation are just two components of the overall downstream flow recommendation. The SCDNR instream flow policy, as described in the South Carolina Water Plan, states that the minimum required flow for a stream is the greatest of the minimum flows required for: 1) the protection of water quality; 2) protection of fish and wildlife habitats; 3) maintenance of navigability; and 4) estuary maintenance and prevention of saltwater intrusion (Bill Marshall, SCDNR, Personal Communication). Downstream minimum flows for

aquatic resources and fish passage needs, which depend on the IFIM study results, were developed while considering navigational flow requests. A flow of at least 1,000 cfs is needed to meet both the minimum depth and width criteria outlined with the South Carolina Water Plan at Ledge 2, providing approximately 82 feet of cross-sectional passage by the two passage points at the ledge. The downstream minimum flows outlined in Table 3-1, and in the Minimum Flows Downstream of Parr Shoals Dam AMP, provide for this flow unless net inflow upstream of the Project is less than 1,000 cfs. Flows needed for navigational passage at Ledge 1 are relatively low, and proposed downstream minimum flows would provide ample passage at this site except under extremely low-flow conditions. As the Project is proposed to be operated in a modified run-of-river mode under the proposed action, and there is very little storage available in Parr Reservoir, the provision of scheduled high recreation flows (2,000 to 5,000 cfs) is not be feasible during peak recreation times of the year. As such, SCE&G is not evaluating recommended recreation flows.

In summary, existing downstream recreational and navigational flow opportunities would be either unaffected or improved under the proposed action.

MEASURES PROPOSED BY RESOURCE AGENCIES AND STAKEHOLDERS

Most recreation-related resource issues were addressed through the implementation of the RUN Study, Recreational Flow, and Navigational Flow studies, and through Lake and Land Management, and Recreation RCG discussions. As discussed above, SCE&G worked with resource agencies and stakeholders to develop the RMP, recreational enhancements and downstream minimum flows that are included as part of the proposed action.

Although consensus was reached regarding most recreation-related resource measures through the course of the relicensing, there were several agency and stakeholder-proposed measures that were not included as part of the proposed action. These include: the Palmetto Trail Contribution, boat launch on the Broad River and a recreation website. These issues are detailed in Section 3.3.4 – Proposed PM&Es Eliminated from Further Analysis Under the FLA.

Additionally, during initial recreation and shoreline management discussions, SCE&G proposed transferring a parcel of land located adjacent to the Fairfield Development tailrace from future recreation designation to project operations designation due to its proximity to project structures. In response to the PAD, the SCDNR and USFWS noted that it may not be necessary to reclassify the entire parcel and that any lands removed from future recreation

should be replaced elsewhere within the project boundary. In subsequent discussions with resource agencies, SCE&G determined that such a reclassification is not necessary, and the parcel will remain as Future Recreation for the new license term.

4.8.3 Environmental Effects – No Action Alternative

Under the no action alternative, SCE&G would continue to maintain existing project recreation facilities in their current state. Facility improvements developed in consultation with TWC members would not take place and associated recreational opportunities would not be realized. Downstream recreation and navigation would remain as they are under current conditions. Moreover, SCE&G would continue to maintain project recreation resources under the current terms of the Recreation Use Plan - Exhibit R sheets approved through the existing license.

4.8.4 Unavoidable Adverse Effects

The Project serves as a positive recreation resource to the public. No unavoidable adverse effects to recreation have been identified.

4.8.5 References

Kleinschmidt Associates (Kleinschmidt). 2016a. Recreation Use and Needs Study Report – Parr Hydroelectric Project (FERC No. 1894). Prepared for South Carolina Electric & Gas Company. November 2016.

Kleinschmidt Associates (Kleinschmidt). 2016b. Downstream Recreational Flow User Survey Memo – Parr Hydroelectric Project (FERC No. 1894). Prepared for South Carolina Electric & Gas Company. January 2016.

Kleinschmidt Associates (Kleinschmidt). 2016c. Downstream Navigational Flow Assessment – Parr Hydroelectric Project (FERC No. 1894). Prepared for South Carolina Electric & Gas Company. September 2016.

Bill Marshall, SCDNR, Personal Communication, August 28, 2017

South Carolina Water Resources Commission (SCWRC). 1988. Instream Flow Study Phase II: Determination of Minimum Flow Standards to Protect Instream Uses in Priority Stream Segments: A Report to the South Carolina General Assembly. Available Online. [URL]: <http://scwaterlaw.sc.gov/Instream%20Flow%20Study%20ph2.pdf>. Accessed August 2013.

4.9 CULTURAL AND TRIBAL RESOURCES

4.9.1 Affected Environment

As discussed in previous sections, the Project consists of the Parr Development, which impounds approximately 4,250 acres along the Broad River and its tributaries, from Henderson Island down to Hampton Island forming Parr Reservoir, and the Fairfield Pumped Storage Development, which impounds the approximately 6,600 acre Monticello Reservoir.

Cultural resource investigations conducted as part of the relicensing process include an Initial Historic and Archaeological Resources Study (HAR), a Phase I Cultural Resource Investigation (Phase I Study), and a Phase II study for two specific archaeological sites. All three study reports are included in Exhibit E-9.

AREA OF POTENTIAL EFFECT

The ACHP defines an APE as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. During consultation conducted as part of the HAR, it was determined that the project APE includes all the land and water within the FERC project boundary (Figure 4-24). Within the APE, 70 areas were determined to have a high potential for containing significant archaeological resources covering approximately 3,375 acres (S&ME 2013). The remaining 12,262 acres within the APE were determined to have a low potential for containing significant archaeological resources (S&ME 2013).

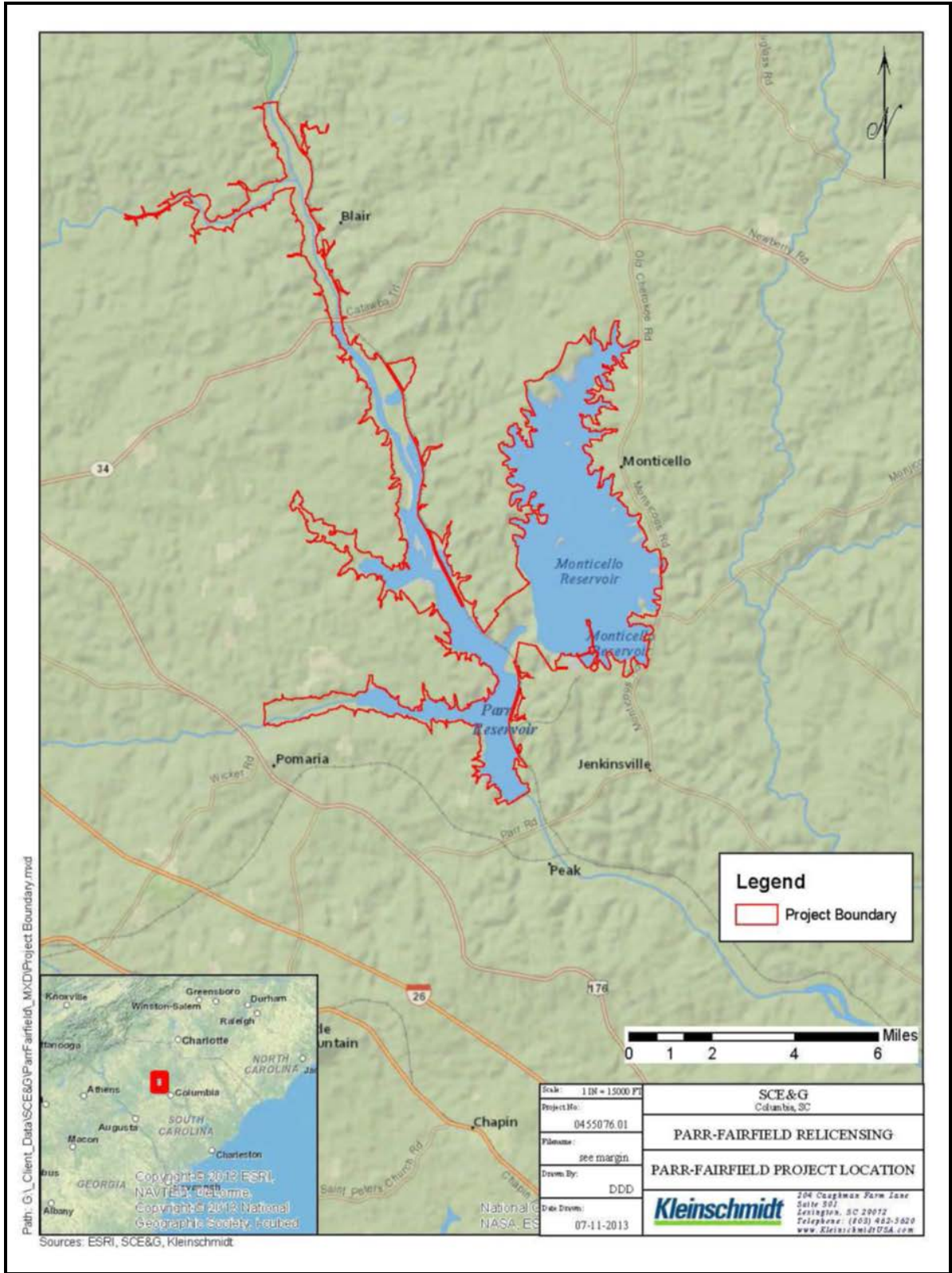


FIGURE 4-24 PARR PROJECT AREA OF POTENTIAL EFFECT

4.9.2 Environmental Effects

4.9.2.1 Completed Studies

INITIAL HISTORIC AND ARCHAEOLOGICAL RESOURCES STUDY

The HAR was completed by S&ME, Inc. (S&ME) in 2013 and was submitted to FERC, the South Carolina SHPO, the USFS, the Catawba Indian Nation Tribal Historic Preservation Office (CIN-THPO), and the Eastern Band of Cherokee Indians Tribal Historic Preservation Office (EBCI-THPO). The SHPO, USFS and CIN-THPO all concurred with the recommendations in the HAR Study Report, which included the establishment of the APE and determination of sites requiring additional study. No comments on the HAR were received from the EBCI-THPO. The Phase I Study was completed based on the HAR recommendations.

PHASE I CULTURAL RESOURCE INVESTIGATION

The Phase I Study resulted in the investigation of 65 archaeological sites, 32 isolated finds, and 2 above ground historic resources (S&ME 2014). One site that was studied, the Blair Mound, is already listed in the NRHP. Two more sites, Lyles Ford and the Parr Shoals Development Facility, are recommended eligible for the NRHP (S&ME 2014). Although the Fairfield Pumped Storage Development Facility is not eligible currently, in 2028 it will reach 50 years of age and will then be eligible for the NRHP. Additionally, 11 archaeological sites were recommended as needing additional work to determine if they qualify for NRHP eligibility (S&ME 2014). These sites include seven prehistoric sites, one eighteenth/nineteenth century canal site, and three prehistoric and historic sites. Three more sites were not assessed for NRHP eligibility since most of the site was located outside of the APE. The remaining 49 archaeological sites and 32 isolated finds were found to be ineligible for the NRHP (S&ME 2014).

The Lyles Ford site, which is located at the northern tip of the project boundary, was recommended as being eligible for the NRHP (S&ME 2014). However, due to its location within the Broad River, fluctuating water levels have impacted the site, thus disfiguring the site such that the center of the ford is no longer in place (S&ME 2014). Because of the importance of the site, S&ME recommended that SCE&G consult with FERC and the SHPO on ways to mitigate for the adverse effects that have occurred at the site.

The Parr Shoals Development Facility was determined to be eligible for the NRHP under Criterion A⁹, due to its significance to hydroelectric development in South Carolina and the increased power demand in the Midlands in the early 1900s (S&ME 2014; NPS 2016). Additionally, it was determined to be eligible for the NRHP under Criterion C¹⁰, because of the powerhouse architecture and dam, and hydroelectric engineering components (S&ME 2014; NPS 2016). Although the facility is not actively impacted by project operations, there is still a potential for adverse effects during the term of the license. S&ME recommended that SCE&G develop a HPMP and PA, in consultation with FERC and the SHPO, to address potential adverse effects.

In 2028, once the Fairfield Pumped Storage Development Facility reaches 50 years of age, it will become eligible for the NRHP under Criterion A, due to its importance to power consumption and growth in the Midlands of South Carolina during the 1970s, and Criterion C, for its pumped storage engineering components (S&ME 2014). S&ME recommended that SCE&G address the facility and the potential for adverse effects in the HPMP and PA. S&ME also recommended that in the case adverse effects occur after 2028, the facility should be reevaluated for NRHP eligibility and consultation with appropriate agencies should commence (S&ME 2014).

Nine of the eleven archaeological sites that were recommended as needing additional work to determine NRHP eligibility, as well as the National Register listed Blair Mound, are not currently impacted by project operations; therefore, no additional work is necessary at these sites. If future construction or project operations specified in the new license are found to impact these sites, they will require additional consideration and testing (S&ME 2014).

Additional work was suggested at the two remaining sites (38NE8 and 38NE10) to determine their eligibility for NRHP (S&ME 2014). These sites were experiencing erosion from project operations and S&ME recommended that the shoreline at these sites be stabilized or be

⁹ NRHP Criteria for Evaluation – The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and: (A) That are associated with events that have made a significant contribution to the broad patterns of our history.

¹⁰ NRHP Criteria for Evaluation – The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and: (C) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

subject to a Phase II archaeological testing to determine final NRHP eligibility status. The results of the Phase II study are summarized below.

PHASE II ARCHAEOLOGICAL TESTING

The Phase II archaeological testing for the two sites referenced above (38NE8 and 38NE10) was completed by Terracon Consultants, Inc. (Terracon) in January, 2016. These sites were previously identified by the South Carolina Institute of Archaeology and Anthropology (SCIAA) in 1972, when the Fairfield Development was being constructed. Neither site was assessed for NRHP eligibility during that time (Terracon 2016a).

Results of the 2016 Phase II study found that site 38NE8 is eligible for inclusion in the National Register under Criterion D¹¹ (NPS 2016; Terracon 2016a). The site contained a large quantity of artifacts, with good diversity and appeared to retain stratigraphic integrity. Additionally, two possible Middle Archaic features were recorded at the site (Terracon 2016a). Terracon recommended that SCE&G consult with FERC and SHPO on ways to minimize or mitigate any potential adverse effects caused by project operations at this site.

Site 38NE10 was found to be ineligible for inclusion in the National Register, as it met none of the criteria for evaluation and lacked archaeological integrity (Terracon 2016a). Terracon recommended that no additional work be completed at this site.

TRIBAL RESOURCES

In 2013 and 2014, SCE&G contacted 17 federally recognized Indian tribes by mail to determine if they wished to be consulting parties for the Project. The Catawba Indian Nation and the United Keetowah Band of Cherokee requested to be consulting parties. The Muscogee Creek Nation and the Seminole Indian Tribe of Florida requested that they be contacted if culturally significant remains were found during the Project. The remaining 13 tribes either indicated that they did not wish to be consulting parties or provided no response.

Of the historic sites listed on the NRHP near the Project and the newly documented sites that have been recommended for eligibility to the NRHP, none are associated with tribal interests.

¹¹ NRHP Criteria for Evaluation – The quality of significance in American history, architecture, archaeology, engineering and culture is present in districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and: (D) That have yielded or may be likely to yield, information important in history or prehistory.

4.9.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed the following PM&E measures that would affect cultural and tribal resources in the project area:

- Historic Properties Management Plan (Exhibit E-9)
- Parr and Monticello Reservoirs SMPs (Exhibit E-10)
- Erosion Monitoring Plan (Exhibit E-3)

Historic Properties Management Plan

Environmental effects on historic properties within the APE may result from project-related activities including reservoir fluctuations and project-related ground-disturbing activities. Actions such as wind and water erosion, recreational activities and vandalism can effect these properties. The extent of effects on cultural resources can vary widely, depending on the setting, size and visibility of the resource, and whether the location of the resource is public knowledge.

Following the recommendations from the Phase I and Phase II studies, SCE&G initiated the development of a HPMP with SHPO and appropriate tribes. SCE&G submitted a draft HPMP for comments on August 26, 2016; a final HPMP was filed with FERC on January 4, 2017. The HPMP contains policies and procedures for identifying effects of the projects' operations on historic properties over the term of the new license (Terracon, 2016b). It contains policies and procedures for the development and implementation of measures to avoid, minimize or mitigate any adverse effects. SCE&G will implement its finalized HPMP upon the issuance of a new license. On February 1, 2017, FERC issued a draft PA for review and comment. It has yet to be finalized.

Implementation of the HPMP will ensure that adverse effects on historic properties arising from operations of the Project or project-related activities over the term of the new license would be avoided or satisfactorily resolved.

The HPMP lists 15 historic properties and potential historic properties within the Parr Hydroelectric Project APE (Terracon, 2016b). These properties are listed below in Table 4-29.

TABLE 4-29 HISTORIC PROPERTIES AND POTENTIAL HISTORIC PROPERTIES WITHIN THE PARR PROJECT APE

SITE NAME	SITE TYPE	NRHP ELIGIBILITY	RECOMMENDED MITIGATION
Parr Shoals Development Facility (39-0081)	Hydroelectric facility	Eligible	Historical documentation
Fairfield Pumped Storage Facility (39-0082)	Hydroelectric facility	Eligible in 2023	Historical documentation
McMeekin Rock Shelter (Site 38FA41)	Rockshelter	Listed	
Blair Mound (Site 38FA48)	Mound; prehistoric lithic and ceramic scatter	Listed	
Site 38FA568	Historic canal	Needs additional work	
Site 38FA569	Prehistoric lithic and ceramic scatter	Needs additional work	
Site 38FA571	Prehistoric quarry; historic artifact scatter	Needs additional work	
Overlook Site (Site 38NE8)	Camp site	Eligible	Site stabilization or mitigation through data recovery excavations
Site 38NE16/38FA592 ¹²	Lyle's Ford	Not eligible	Historical documentation
Site 38NE1068	Prehistoric lithic scatter; cemetery	Needs additional work	
Site 38NE1077	Prehistoric camp; historic house site	Needs additional work	
Site 38NE1079	Prehistoric habitation site	Needs additional work	
Site 38NE1080	Prehistoric habitation site	Needs additional work	
Site 38NE1082	Lithic and ceramic scatter	Needs additional work	
Site 38NE1085	Prehistoric camp site	Needs additional work	

Source: Terracon 2016b

Additionally, the Phase I study determined that the Lyles Ford site has been impacted by project operations and therefore recommended that SCE&G consult with FERC and the SHPO on ways to mitigate for this adverse effect, such as developing a brochure or booklet containing

¹² The Phase I study conducted by S&ME determined this site to be eligible for the NRHP, and recommended mitigation. However, the HPMP, developed by Terracon, disagrees with this assessment, and recommends the site be determined as ineligible for inclusion in the NRHP. Terracon does believe that the location of Lyle's Ford is within the project area, even if its exact location is unknown, and is likely being impacted by project operations. Therefore, SCE&G has agreed to mitigate for impacts to this site.

archival research of the Lyles family and documentation of the area containing the ford. SCE&G is preparing educational material/signage that will be maintained on SCE&G's website and placed in publicly accessible areas around the Parr Development and Fairfield Development. The information will include: 1) historical information about the Lyles family, Lyles Ford, and if appropriate, the ruins of a mill/store and a canal built and run by the Lyles family in the eighteenth/nineteenth century; and 2) historical information about the Parr Development and the Fairfield Development facilities. These materials will be available for the term of the new license. Additionally, FERC and SHPO determined that the Overlook Site (site 38NE8) should either be stabilized or have the adverse effects mitigated (e.g., through data recovery excavations). SCE&G will complete this stabilization or mitigation after the new license is issued.

Parr and Monticello SMPs and Erosion Monitoring Plan

In addition to these mitigations, SCE&G will implement the new Parr Reservoir and Monticello Reservoir SMPs, which will help maintain and conserve project shorelines throughout the term of the new license. SCE&G will continue to monitor and protect the project shorelines through the implementation of the Erosion Monitoring Plan. Areas of severe erosion will be monitored and repaired as necessary, ensuring protection of cultural resources located at the project shoreline.

In response to the DLA, the Cherokee Nation provided several comments regarding the HPMP and PA (Exhibit E-1). The Cherokee Nation requested to be a consulting party on the HPMP and PA and asked that if educational cultural material related to archaeological sites should be released to the public, that the Cherokee Nation be provided an opportunity to consult on these materials prior to public release. The Cherokee Nation noted that the American eel is an important fish to their culture and because of this, they support SCE&G's efforts to monitor the species during the term of the new license. Finally, the Cherokee Nation requested that SCE&G halt all project activities immediately and re-contact their office for additional consultation if items of cultural significance, including archaeological or related human remains, are discovered during the Project.

During the development of the HPMP, SCE&G contacted the Cherokee Nation for consultation. While the Cherokee Nation did not respond to this request for consultation, SCE&G

recommends that the Cherokee Nation request the FERC to include them as a consulting party in the PA.

4.9.3 Environmental Effects – No Action Alternative

Under the no-action alternative, the Project would continue to operate as required by the current project license, and therefore would create no change to the existing environment. SCE&G would continue to manage the historic properties within the APE in accordance with Section 106 of the NHPA, but the new HPMP would not take effect and SCE&G would not enter a PA. Accordingly, SCE&G would comply with Section 106 on a case-by-case basis.

4.9.4 Unavoidable Adverse Effects

SCE&G proposed no changes to the operations or the facilities of the Project that would result in additional unavoidable adverse effects. Project operations will continue to result in some erosion to the project shoreline, however, SCE&G will protect and monitor the shoreline through the SMPs and Erosion Monitoring Plan. SCE&G is mitigating for project effects at the Overlook Site and Lyle's Ford Site. SCE&G proposes to enter into a PA with FERC and the South Carolina SHPO, and has developed a HPMP. Once implemented, this HPMP will provide SCE&G with guidance on resolving or mitigating any potential adverse effects to historic properties that may arise in the future.

4.9.5 References

National Park Service (NPS). 2016. National Register Bulletin: How to Apply the National Register, Criteria for Evaluation.

S&ME, Inc. (S&ME). 2013. Initial Historic and Archaeological Resources Study (HAR); Parr Hydroelectric Project, FERC Project No. 1894, Application for New License, Fairfield and Newberry counties. South Carolina. May 2013.

S&ME. 2014. Phase I Cultural Resource Investigations for the Parr Hydroelectric Project; Fairfield and Newberry counties. South Carolina. August 2014

Section 4

Terracon Consultants, Inc. (Terracon). 2016a. Phase II Testing of Archaeological Sites 38NE8 and 38NE10 at the Parr Hydroelectric Project; Fairfield and Newberry counties. South Carolina. June 2016.

Terracon Consultants, Inc. (Terracon). 2016b. Historic Properties Management Plan: Parr Hydroelectric Project, Fairfield and Newberry counties. South Carolina. December 2016.

4.10 LAND USE AND AESTHETICS

The Project consists of two developments, the Parr Development which forms the Parr Reservoir and the Fairfield Development which forms the Monticello Reservoir. The developments, including the hydroelectric stations and associated facilities, are located in Fairfield and Newberry counties, South Carolina. These counties are predominantly rural, consisting of forest and grassland areas. The following sections provide a general description of the land uses and aesthetic resources in the project vicinity.

4.10.1 Affected Environment

4.10.1.1 Land Use and Management Adjacent to the Project Boundary

The lands adjacent to the project boundary are dominated by forestland, deciduous forest and grassland types. Only a small percentage of the project vicinity is developed. In Fairfield County only 0.71 % of land is classified as developed (Table 4-30). In Newberry County only 1.4% of land is classified as developed (Table 4-31).

TABLE 4-30 LAND USES IN FAIRFIELD COUNTY

LAND USE	SQUARE MILES	PERCENT
Developed	5.03	0.71%
Agriculture	0.01	0.04%
Forestland	514.13	72.41%
Wetlands	16.86	2.37%
Grasslands	108.19	15.24%
Shrub/Scrub	5.68	0.80%
Barren Land	11.9	1.68%
Open Space	22.02	3.10%
Open Water	26.2	3.69%
Total	710.02	100.00%

TABLE 4-31 LAND USES IN NEWBERRY COUNTY

LAND USE	SQUARE MILES	PERCENT
Developed	9.08	1.40%
Agriculture	0.18	0.03%
Forestland	407.19	62.90%
Wetlands	20.70	3.20%
Grasslands	142.44	22.00%
Shrub/Scrub	5.10	0.79%
Barren Land	6.45	1.00%
Open Space	35.16	5.43%
Open Water	21.06	3.25%
Total	647.34	100.00%

The largest urban development and closest city to the Project is the City of Newberry, which is the county seat of Newberry County. Newberry is located along the I-26 corridor connecting the Columbia metropolitan area and the Greenville-Spartanburg metropolitan area (City of Newberry 2010). The city has no forested land or cropland in its center; however, its eastern areas have extensive areas of forested land, cropland and pasture. The City of Newberry is surrounded by forested and agricultural land to the west and south (City of Newberry 2010). Parks and open space is the predominant land use type at 30.6 percent; single-family residential land use is the second predominant land use type at 29.3 percent, followed by public and institutional land use at 14.4 percent (City of Newberry 2010).

4.10.1.2 Land Use and Management Within the Project Boundary

Project operations, maintenance and recreation are the primary activities on project lands. The land use types within the project boundary consist mostly of open water, wooded wetlands and evergreen forest. Figure 4-25 is a map of land use types within the project boundary.

In addition to the general land uses depicted on Figure 4-25, a non-project sand mining operation is located in the Parr Reservoir, on the Fairfield County side of the Broad River, just downstream of Highway 34. Sand mine facilities, including a mobile suction dredger, cable across the river, sedimentation pond, access road to the river and discharge pipe, are located inside the project boundary and utilize approximately 3.3 acres. There are additional facilities associated with the sand mine located outside the current project boundary, however SCE&G is proposing to bring this property into the project boundary under the Recreation classification, as specified in the Recreation Management Plan. This facility has been in operation since

2008 and SCE&G is working with the operator to seek non-project use approval through a separate FERC process (P-1894-209). As such, environmental impacts of the sand mine operation are being assessed within that application.

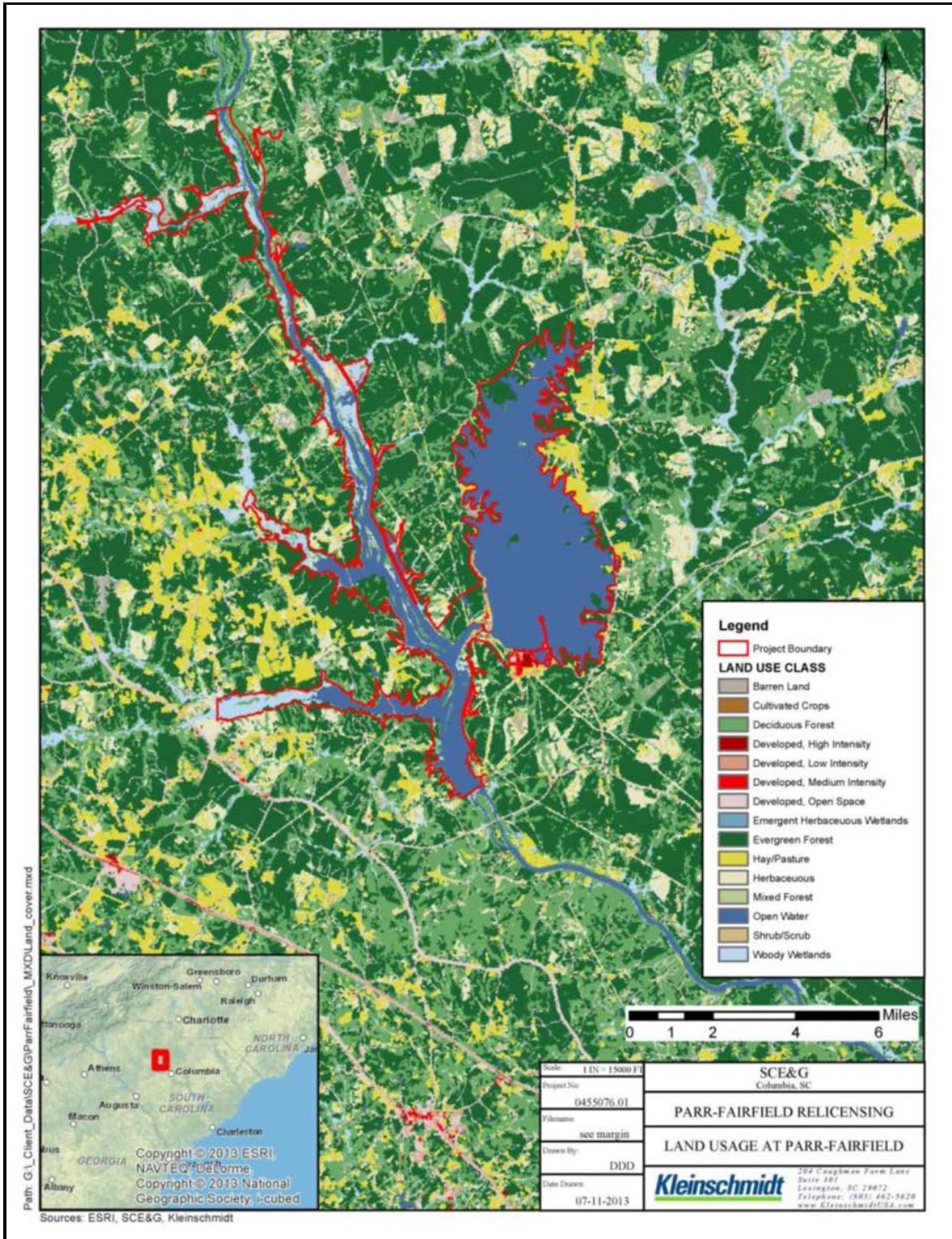


FIGURE 4-25 LAND USE MAP OF PROJECT

4.10.1.3 Existing Shoreline Management Plan

The project boundary encompasses a buffer zone of land around each reservoir between the high-water mark and the project boundary line. The 1974 FERC license required SCE&G to acquire this buffer zone for project operations, including land for recreational use and shoreline control. License Article 20 of the 1974 license requires that SCE&G allow public access to a reasonable extent to project waters and adjacent project lands (except for lands necessary for the protection of life, health and property) for navigation and outdoor recreational purposes. This Article allows SCE&G to grant permits for public access to the reservoirs subject to FERC approval (F.P.C. 1974).

After extensive stakeholder consultation, an amended SMP was developed. It was approved by FERC on June 4, 2001. The SMP was included as part of the Project's Exhibit R (FERC 2001). The SMP primarily covers activities associated with Monticello Reservoir. It deals with the following issues: (1) water quality; (2) forest management; (3) waterfowl management; (4) nuclear exclusion zone restrictions for the operation of SCE&G's V. C. Summer Nuclear Station; (5) fishing, boating, and hunting; (7) private boat docks and access; (8) vegetation removal; (9) water withdrawal; (10) erosion control; and (11) prohibited activities.

Currently, permits are not issued for private shoreline development activities, such as docks or erosion control measures on Parr Reservoir or on the Recreation Lake. The SMP allows adjacent property owners along 21 miles (42 percent) of the Monticello Reservoir's shoreline to have private access to the shoreline and to construct docks under certain conditions. Adjacent landowners may apply for a permit to maintain a 10-foot-wide, unpaved, meandering path for access to a permitted boat dock, subject to a prohibition on removal of trees 10 inches or greater in diameter at chest height. No vegetation will be removed from the buffer zone lands except within this permitted path (FERC 2001).

4.10.1.4 Aesthetic Resources

VISUAL CHARACTER OF THE PROJECT VICINITY

The Project is located along the Broad River within a rural area of Fairfield and Newberry counties in the Piedmont physiographic region, which is characterized by rolling hills, forests, farms and orchards. The Project is located in an ecoregion of the Piedmont region called the Southern Outer Piedmont ecoregion, which has lower elevations and irregular plains rather

than plains with hills (EOE 2014; SCDNR 2014). Approximately 72 percent of Fairfield County and 63 percent of Newberry County is forested. Most forested lands are within close vicinity of the Project.

Roadways run parallel to the waterline and structures that support recreational and project-related activities. The shorelines surrounding project structures are armored with concrete embankments and rip-rap. Vegetation surrounding the project area varies, but forested shorelines are the most predominant landscape type. The eastern shoreline of Monticello Reservoir has less forested area and more residential development than the rest of the project vicinity.

NEARBY SCENIC ATTRACTIONS

Numerous scenic attractions of local and regional importance are in the project vicinity, and Fairfield and Newberry counties offer many municipal recreation areas as described in Section 4.8.1.1. Fairfield County is flanked by Lake Wateree to the east and the Monticello Reservoir to the west providing a combined total of 20,000 acres of pooled water in the project vicinity.

Fairfield County's rich history is evident in its numerous homes built before the revolutionary war (Fairfield County 2018). Newberry County is situated between the Broad and Saluda rivers. It has a rich history and was the site of several Revolutionary War battles. The City of Newberry features the Newberry Opera House, which was built in 1881 and serves as a performing arts facility with state-of-the-art technology (NewberryCounty.org 2014).

VISUAL CHARACTER OF PROJECT LANDS AND WATERS

Monticello Reservoir covers approximately 6,600 acres and has approximately 64 miles¹³ of shoreline. SCE&G owns and manages shoreline property extending above the 425-foot msl contour as a buffer zone. This buffer zone helps to maintain the environmental, aesthetic and recreational character of the reservoir shoreline. Approximately 6.4 miles of the Monticello Reservoir shoreline are within the nuclear exclusion zone (NEZ) of the V. C. Summer Nuclear Plant and, therefore, are not open to the public. The shoreline within the NEZ is marked with signs and buoys and is not available for public use (SCE&G 2002). The Recreation Lake, which was constructed by SCE&G solely for recreational use, is located adjacent to the

¹³ Includes the shoreline surrounding the Recreation Lake and all islands.

Monticello Reservoir and has a surface area of approximately 300 acres. The Recreation Lake is maintained at a stable water level and is not affected by the operation of the pumped storage facility (SCE&G 2002).

The Parr Reservoir covers approximately 4,250 acres and has 75 miles of shoreline. The reservoir was originally formed in 1914 as part of a conventional hydro project at Parr Shoals. The height of its dam was raised 9 feet in the 1970s during construction of the pumped storage development, nearly doubling the reservoir's surface area.

4.10.2 Environmental Effects

4.10.2.1 Completed Studies

Although no studies were completed regarding land use and aesthetics, SCE&G consulted with the Lake and Land Management TWC on the development of two new SMPs; one for Parr Reservoir and one for Monticello Reservoir. These documents are explained in greater detail in Section 4.10.2.2 Proposed Action and are included in Exhibit E-10.

4.10.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. The following PM&E measures have been proposed that may impact land use and aesthetic resources:

- Parr Reservoir Shoreline Management Plan
- Monticello Reservoir Shoreline Management Plan
- Erosion Monitoring Plan

Shoreline Management Plans

The current relicensing of the Project provided an opportunity for SCE&G to review the existing SMP in cooperation with relicensing stakeholders, including federal and state regulatory agencies, interested NGOs and individuals. Through discussions with these parties, it was decided that the existing FERC approved SMP should be divided into two distinct SMP's, one for each reservoir. SCE&G proposes to implement two SMPs for the Project; one for the Parr Reservoir and one for the Monticello Reservoir.

The implementation of the SMPs by SCE&G will help to maintain and conserve the area's natural and man-made resources. The SMPs will comply with the terms of the License, as well as the regulations and orders of FERC, and is intended to assist in providing a balance between recreational use and development, environmental protection and energy production.

The management guidelines set forth in these SMPs are applicable to all lands within the project boundary. Among other things, the current document includes the following components:

- Detailed descriptions, management prescriptions and mapping of land classifications;
- Summary information on the Permitting Handbook and fee policies;
- BMPs;
- Public education and outreach;
- Reservoir monitoring; and,
- A proposed review process.

Parr Reservoir SMP

An SMP was developed for the Parr Reservoir to identify existing and appropriate future uses and to provide plans and programs for responsible future use and management of project lands and waters as well as the flora and fauna encompassed within them.

Three distinct land management classifications have been developed for the shorelines surrounding the Parr Reservoir. These land management classifications are as follows: (1) Project Operations; (2) Public Recreation; and (3) Non-Development Areas. Although SCE&G intends to manage its lands according to these classification systems, the public generally will not be precluded from access to SCE&G land regardless of classification, with the exception of land reserved and used for project operations or other areas specifically protected from public access and posted as such. The sections below define the land management classifications. The acreages and parcels for each of the classifications are provided in Table 4-32. Figure 4-26 depicts their distribution around the Parr Reservoir.

- **Project Operations**-Areas classified as Project Operations lands include SCE&G-owned and managed lands required for operation of the Parr Development. Public access to these lands is restricted to ensure public safety or to assure security of the infrastructure system.

- **Public Recreation**-Areas classified as Public Recreation lands serve as recreational resources for the public and include areas managed expressly for recreation as well as those with recreation as a secondary usage. This classification includes SCDNR-managed waterfowl areas located on project lands. This classification also includes properties set aside for recreational development. Public Recreation lands include the following sub-classifications:
 - Public Access Areas
 - Islands and Shoals

- **Non-Development Areas**-Lands classified as Non-Developmental Areas are protected from private development. This is done for the protection of the environmental and aesthetic integrity of the shoreline.

TABLE 4-32 PARR RESERVOIR SHORELINE MILES AND ACREAGES BY LAND USE CLASSIFICATION

CLASSIFICATION		SHORELINE MILES	ACRES
Project Operations*		0.90	10
Public Recreation*		6.97	857
Non-Development Areas*		67.05	2,131
TOTAL		74.91	2,998

*No docks allowed

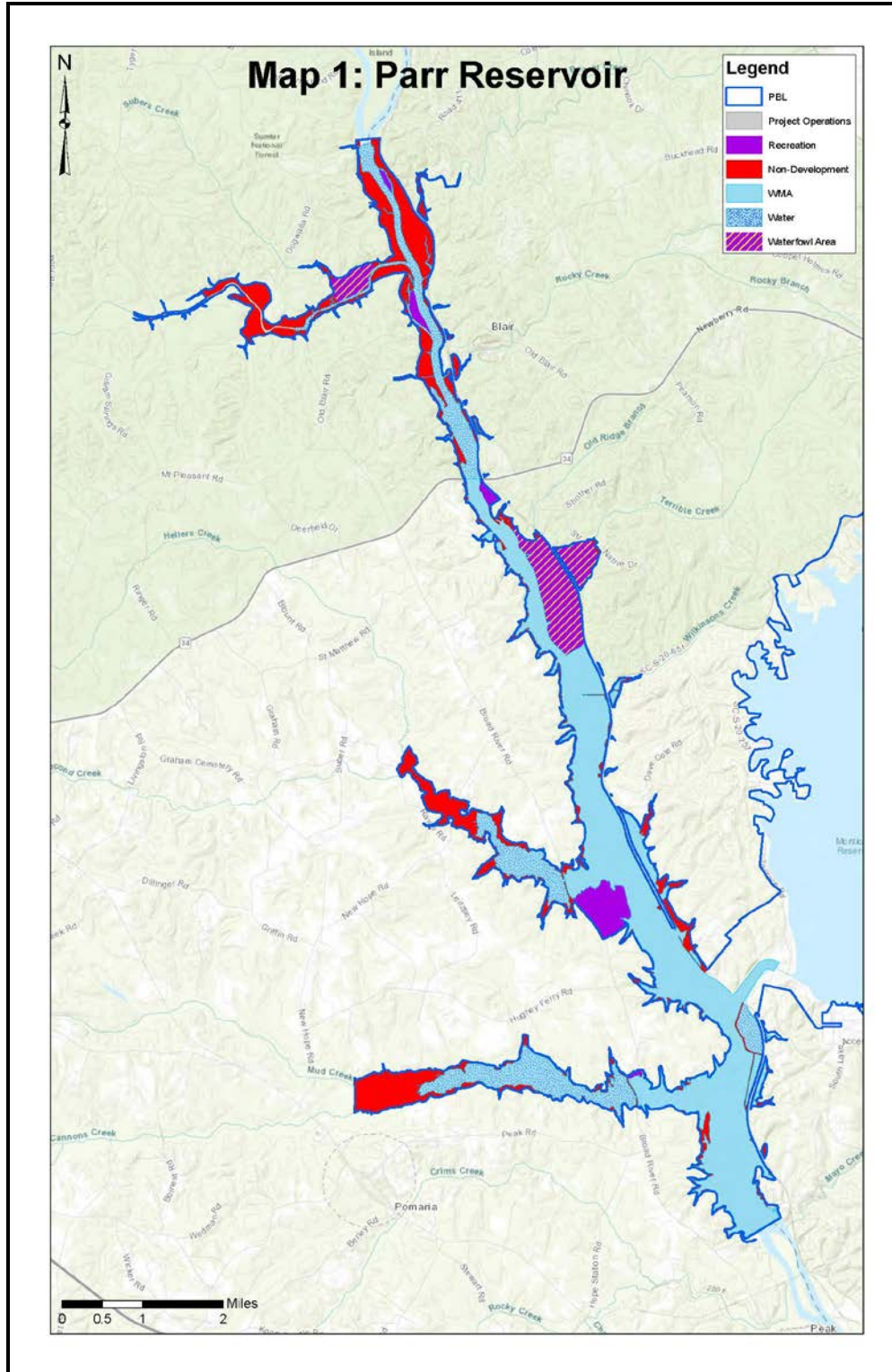


FIGURE 4-26 SHORELINE CLASSIFICATIONS MAP FOR PARR RESERVOIR

As development increases in areas surrounding the Project, so too do the development related stresses placed upon project reservoirs and the surrounding watershed. Thus, a

comprehensive SMP for the Parr Reservoir that recognizes and addresses sources of potential environmental impact is essential to managing the reservoir for the benefit of all interests and to ensure that non-project uses remain consistent with the License.

Monticello Reservoir SMP

An updated SMP was developed for the Monticello Reservoir to identify existing and appropriate future uses and to provide plans and programs for responsible future use and management of project lands and waters as well as the flora and fauna encompassed within them. This SMP specifically addresses shoreline uses surrounding the Monticello Reservoir.

Five distinct land management classifications have been developed for the shorelines surrounding Monticello Reservoir. These land management classifications are as follows: (1) Project Operations; (2) Nuclear Exclusion Zone; (3) Shoreline Permitting; (4) Public Recreation; and (5) Non-Development Areas. The Public Recreation classification includes designated public recreation areas, the Recreation Lake, and all islands on Monticello Reservoir. Although SCE&G intends to manage its lands according to this classification system, the public generally will not be precluded from access to SCE&G-owned lands regardless of classification, with the exception of lands reserved and used for project operations, lands/areas within the NEZ, or other areas specifically protected from public access and posted as such. The sections below define the land management classifications. The acreages and parcels for each of the classifications are provided in Table 4-33. Figure 4-27 depicts their distribution around Monticello Reservoir.

- **Project Operations**-Areas under this classification include SCE&G-owned and managed lands required for operations of the Fairfield Development. Public access to these lands is restricted to ensure public safety to assure the security of the infrastructure system.
- **Nuclear Exclusion Zone**-In addition to its use as part of the Fairfield Development, Monticello Reservoir provides cooling water for the V.C. Summer Nuclear Station located on its shore (authorized under 52 F.P.C. 537 [1974] and 137 FERC ¶ 62,033). The NEZ consists of the area surrounding the V.C. Summer Nuclear Station between the project boundary line and shoreline and a specified area within Monticello Reservoir where SCE&G as the reactor licensee has the authority to determine all activities, including exclusion or removal of personnel and property. This area is designated by

warning signs on the landward side and by buoys on the lakeward side. Admittance to this area is restricted to comply with licensing requirements administered by the Nuclear Regulatory Commission.

- **Shoreline Permitting**-It is the policy of SCE&G to authorize certain private uses of and/or acts on project property by permit when such uses or acts are consistent with the public interest and comply with the requirements of the project license. Areas within the Shoreline Permitting Classification may be eligible for certain private residential uses upon approval by SCE&G. This does not include commercial activities (other than commercial water withdrawals).
- **Public Recreation**-Project lands under this classification serve as recreational resources for the public and include areas managed expressly for recreation as well as those with recreation as a secondary usage. This classification includes properties set aside for recreational development. Public recreation lands include the following sub-classifications:
 - Recreation Lake
 - Public Access Areas
 - Islands on Monticello Reservoir
- **Non-Development Areas**-Lands under this classification warrant special protection because they may provide important habitat, aesthetic values, or other significant project characteristics.

TABLE 4-33 MONTICELLO RESERVOIR SHORELINE MILES AND ACREAGES BY LAND USE CLASSIFICATION

CLASSIFICATION	SHORELINE MILES	ACRES
Project Operations*	4.90	186
Nuclear Exclusion Zone *	6.43	203
Shoreline Permitting	22.36	235
Public Recreation*	19.49**	927**
Non-Development*	10.72	151
TOTAL	63.90	1,701

*No docks allowed

** Includes the shoreline surrounding the Recreation Lake and all islands

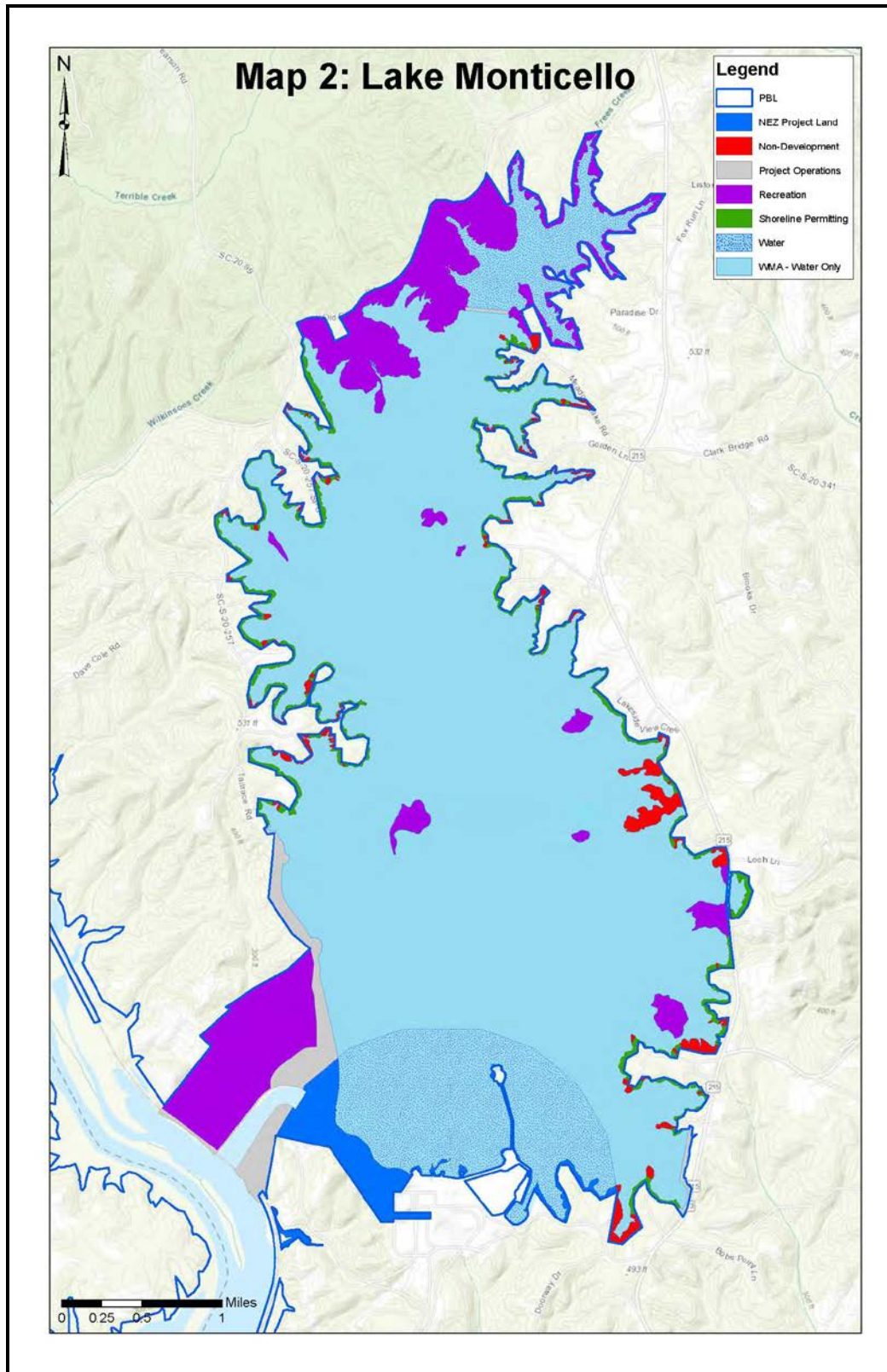


FIGURE 4-27 SHORELINE CLASSIFICATIONS MAP FOR MONTICELLO RESERVOIR

As development increases in areas surrounding the Project, so too do the development related stresses placed upon project reservoirs and the surrounding watershed. Thus, a comprehensive SMP for the Monticello Reservoir that recognizes and addresses sources of potential environmental impact is essential to managing the reservoir for the benefit of all interests and to ensure that non-project uses remain consistent with the License.

The implementation of the Parr Reservoir SMP, Monticello Reservoir SMP, Erosion Monitoring Plan (discussed in more detail in Section 4.3, and included in Exhibit E-3), implementation of shoreline BMPs, and public education associated with the SMP and BMPs by SCE&G will help to maintain and conserve the project shorelines. While SCE&G cannot control land use practices on privately owned property outside the project boundary, the revised SMPs should have a positive effect on project shorelines by providing a balance between recreational use and development, environmental protection and energy production.

4.10.3 Environmental Effects – No Action Alternative

Under the no action alternative SCE&G would continue to operate the Project in the manner it is currently operated. The Monticello Reservoir SMP would be updated as required by the FERC. However without a Parr Reservoir SMP, improvements to the management of Parr Reservoir shoreline and education of adjacent owners would not occur.

4.10.4 Unavoidable Adverse Effects

Development of private lands outside of the Project, but adjacent to project shorelines will continue into the foreseeable future. Regardless of the implementation of SMPs for the Parr and Monticello reservoirs, private development use will continue to affect land use practices surrounding the developments.

4.10.5 References

City of Newberry. 2010. Comprehensive Plan 2010-2020. Planning and Development Services Department. City of Newberry, South Carolina.

Fairfield County. 2018. Welcome to Fairfield County, South Carolina. [Online] URL: <http://www.fairfieldsc.com/>. Accessed March 12, 2018.

Section 4

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Federal Energy Regulatory Commission (FERC). 2001. Order Approving Land use and Shoreline Management Plan. June 4, 2001. 95 FERC ¶ 61,351.

NewberryCounty.org. 2014. Newberry County Chamber of Commerce and Visitors' Center. [Online] URL: <http://www.newberrycounty.org/>. Accessed March 27, 2014.

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South Carolina Energy & Gas Company (SCE&G). 2002. Land Use and Shoreline Management Plan – Monticello and Parr Reservoirs. Effective April 1, 2002. SCE&G Lake Management.

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4.11 SOCIOECONOMIC RESOURCES

The Parr Hydroelectric Project consists of two developments, the Parr Development and the Fairfield Development. The developments, including the hydroelectric stations and associated facilities, are located in Fairfield and Newberry counties, South Carolina. The following sections provide a general description of the socioeconomic conditions in Fairfield and Newberry counties. The town of Jenkinsville is the nearest populated town to the Project.

4.11.1 Affected Environment

4.11.1.1 Population Patterns

In 2016, an estimated 22,653 people lived in Fairfield County, South Carolina (Table 4-34). From 2010 to 2016, the county population decreased by 5.4%. This population decline opposed the overall statewide population growth (7.3%) in South Carolina during the same period. Population densities are significantly lower in Fairfield County compared to the statewide densities. Fairfield County had 34.9 people per square mile compared to the state average of 153.9 people per square mile (U.S. Census 2016).

In 2016, an estimated 38,079 people lived in Newberry County, South Carolina (Table 4-34). From 2010 to 2016, the county population increased by 1.5%. This population change was less than the overall statewide population growth (7.3%) in South Carolina during the same period. Population densities are significantly lower in Newberry County at 59.5 people per square mile compared to the state average of 153.9 people per square mile (U.S. Census 2016).

TABLE 4-34 POPULATION PATTERNS

	FAIRFIELD COUNTY	NEWBERRY COUNTY	SOUTH CAROLINA
Population			
Population (2016)	22,653	38,079	4,961,119
Population (2010)	23,956	37,508	4,625,364
Population Change (2010-2016)	-5.4%	1.5%	7.3%
Geography (2010)			
Land area in square miles (sq mi)	686.28	630.04	30,060.7
Population Density (people/ sq mi)	34.9	59.5	153.9
Gender (2016)			
Female	52.2%	51.1%	51.5%
Male	47.8%	48.9%	48.5%
Age (2016)			
Persons under 5 years old	4.8%	6.0%	5.9%
Persons under 18 years old	19.7%	22.0%	22.1%
Persons over 65 years old	19.7%	18.9%	16.7%
Race (2016)			
Caucasian	39.4%	65.3%	68.5%
Black	58.0%	31.3%	27.5%
American Indian and Alaska Native	0.3%	0.8%	0.5%
Asian	0.5%	0.8%	1.6%
Native Hawaiian/Other Pacific Islander	<0.1%	0.3%	0.1%
Hispanic or Latino	2.1%	7.4%	5.5%
Two or More Races	1.8%	1.5%	1.8%

Source: U.S. Census 2016

4.11.1.2 Household/Family Distribution of Income

Between 2012 and 2016, Fairfield County had 8,878 households with 2.55 people in each household. The median household income was \$33,798, which was significantly lower than the state median (\$46,898). Approximately 21.2 percent of the population of Fairfield County live below the poverty level (U.S. Census 2016).

Between 2012 and 2016, Newberry County had 14,504 households with 2.52 people in each household. The median household income was \$39,841, which was slightly lower than the state median (\$46,898). Approximately 18.9 percent of the population of Newberry County live below the poverty level (U.S. Census 2016).

4.11.1.3 Project Vicinity Employment Sources

In 2015, the largest source of employment in Fairfield County was manufacturing. The second largest employment sector was retail trade. The third largest employment sector was health care and social assistance. The smallest source of employment was management of companies and enterprises (South Carolina Department of Commerce 2016a).

In 2015, the largest source of employment in Newberry County was manufacturing. The second largest employment sector was retail trade. The third largest employment sector was administrative and waste services. The smallest source of employment was information services (South Carolina Department of Commerce 2016b).

4.11.1.4 The Regional Economy

As in Fairfield and Newberry counties, the primary employer within South Carolina is manufacturing. The state relies heavily on government, real estate, retail trade, and health care and social assistance to provide employment.

In 2014, South Carolina's gross domestic product was \$190 billion; 16.2 percent of that came from the public sector. The main contributors to the gross domestic product were manufacturing (\$30.9 billion), government (\$30.8 billion), real estate (\$24 billion), retail trade (\$14.1 billion) and healthcare and social assistance (\$12.7 billion). South Carolina's gross domestic product ranks 27th nationwide (South Carolina Department of Commerce 2015).

4.11.1.5 Regional Benefits of the Project

The Project offers significant benefits to the region in terms of providing (a) low-cost renewable energy for the region; (b) economic activity related to the operation and maintenance of the project facilities; and (c) recreational benefits in the project vicinity.

Renewable Energy

The Project offers efficient, reliable and cost-effective hydroelectric power. The Project has an installed capacity of 526.08 MW. The Project's average annual generation of 716,475 MWh is enough electricity to power approximately 68,120 households, assuming an average annual household use of 10,766 kilowatts per hour (kWh) (U.S. Energy Information Administration 2017).

Economic Activity

While continued project operation may not significantly impact the local economy in creating jobs, SCE&G and its employees positively affect the local and regional economy by consuming goods and services and paying taxes. In addition, the Licensee pays approximately \$5.85 million dollars annually in property taxes for project property and assets, which has a significant direct impact on the surrounding communities.

Recreational Benefits

Project lands and waters provide a variety of public recreational opportunities and are served by formal and informal recreation sites. FERC-approved project recreation facilities include a multiple-use recreation area, park areas, public boat landings, informal fishing access areas, and waterfowl management areas. Section 4.8 provides an overview of the recreational resources provided by the Parr Hydroelectric Project.

4.11.2 Environmental Effects

4.11.2.1 Completed Studies

SCE&G did not conduct any studies regarding socioeconomic resources.

4.11.2.2 Proposed Action

A complete description of SCE&G's proposed PM&E measures is provided in Section 3.2.1. SCE&G has proposed several PM&E measures that would increase recreational opportunities in the project area. Increased recreational opportunities may lead to an increase of tourism in the area and benefit socioeconomic resources. The following PM&E measures have been proposed that may impact socioeconomic resources:

- Parr Recreation Management Plan (Exhibit E-8)
- Monticello Fisheries Habitat Enhancement Plan (Exhibit E-5)
- Minimum Flows Downstream of Parr Shoals Dam AMP (Exhibit E-5)

Recreation Management Plan

SCE&G consulted with the Recreation TWC throughout the relicensing process. During this time, the TWC requested a number of recreational studies and proposed enhancements that

was later compiled into a RMP for the Project. The RMP details all proposed recreation enhancements and management practices for the Project, as well as schedules for further stakeholder consultation after the project license is issued. The proposed recreation enhancements and management practices will likely enrich recreational experiences available at the Project, thus drawing more people into the area.

Monticello Fisheries Habitat Enhancement Plan

In response to a SCDNR request for habitat enhancements to mitigate the effects of Monticello Reservoir water fluctuations, SCE&G is proposing to install a variety of habitat enhancements at the reservoir. SCE&G proposes installing habitat improvement structures to benefit deep-water, nursery and spawning habitat. The structures would provide enhanced fish production within the reservoir and may also concentrate fish as an enhancement for recreational fishermen, increasing fishing opportunities at the reservoir.

Minimum Flows Downstream of Parr Shoals Dam AMP

The Downstream Navigation Flow Assessment evaluated concerns regarding minimum flows in the Broad River downstream of Parr Shoals Dam. The results suggested that a flow of 1,000 cfs is necessary in the Broad River downstream of Parr Shoals Dam to meet state criteria for one-way navigation. The Navigation Assessment results were considered when SCE&G developed their proposed minimum flows. Providing the proposed minimum navigation flows will increase boating opportunities downstream of the Project.

4.11.3 Environmental Effects – No Action Alternative

Under the no action alternative, SCE&G would continue to operate the Project in the manner it is presently operated. The Project would not likely experience the incremental socioeconomic and recreational benefits that would be associated with implementation of SCE&G's proposals. Also, the PME measures described above, and their associated benefits, would not occur. Nevertheless, it is clear from the information provided above that the project area already benefits significantly socioeconomically from the Project as it exists and is operated.

4.11.4 Unavoidable Adverse Effects

No unavoidable adverse effects have been identified for socioeconomic resources.

4.11.5 References

South Carolina Department of Commerce (SCDC). 2015. South Carolina's Gross Domestic Product. [Online] URL:

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U.S. Census, 2016. Quickfacts, South Carolina. [Online] URL: <http://www.census.gov/quickfacts/table/PST045215/45039,45071,45,00>. Accessed February 16, 2018.

U.S. Energy Information Administration. 2017. Frequently Asked Questions. [Online] URL <http://www.eia.gov/tools/fags/fag.cfm?id=97&t=3>. Accessed February 16, 2018.

5.0 DEVELOPMENTAL ANALYSIS

The objective of a developmental analysis is to explain the electric power benefits of a project, as well as to describe the cost, power value, and net benefit for the proposed action and the no-action alternative. The developmental analysis also summarizes, and provides the estimated cost for each proposed environmental measure for the PM&E. For the purposes of this application, relevant information for the Developmental Analysis is provided in the Exhibit D of this FLA. General information regarding the power and economic benefits of the Project is nevertheless provided in the following sections.

5.1 POWER AND ECONOMIC BENEFITS

The Parr Development has an authorized installed generation capacity of 14.88 MW. The Fairfield Development has an authorized installed generation capacity of 511.2 MW. The average annual generation figures for the Parr and Fairfield developments are 55,893 and 660,582 MWh, respectively. Under the proposed action, the Project would continue to operate as currently authorized under the existing license, subject to operational adjustments for the enhancement of downstream environmental resources, as project inflows allow. Generally, Parr Development would continue to operate in a modified run-of-river mode, and the Fairfield Development would continue to operate as a peaking and reserve generation resource.

Information regarding the power and economic benefits of the Project is included in Exhibits D and H of the FLA.

5.2 COMPARISON OF ALTERNATIVES

A comparison of the economics of the proposed action is included in Exhibits D and H of the FLA.

5.2.1 Proposed Action

Under the proposed action, SCE&G would continue to operate the Project as currently authorized under the existing license, with the Parr Development operating in a modified run-of-river mode, and the Fairfield Development operating as a peaking and reserve generation resource. Licensee-implemented operational adjustments would be made for the protection of downstream environmental resources, as inflows allow. SCE&G is proposing a

number of additional PM&E measures through this application. The cost of each measure is estimated in the Exhibit D of the FLA.

5.2.2 No Action Alternative

Under the no action alternative, the Project would continue to operate as currently licensed. Average annual generation would be assumed to remain consistent with historical MWhs. Additional information regarding an average annual value of power is included in Exhibit D of the FLA.

5.3 COST OF ENVIRONMENTAL MEASURES

The cost of environmental measures is included in Exhibit D of the FLA.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 COMPARISON OF ALTERNATIVES

The purpose of this section is to compare the effects of the proposed action and the no action alternatives.

TABLE 6-1: COMPARISON OF EFFECTS OF PROPOSED ACTION AND NO ACTION ALTERNATIVES

RESOURCE	PROPOSED ACTION	NO ACTION ALTERNATIVE
Generation	Parr – To be determined based on final PM&E measures Fairfield - To be determined based on final PM&E measures	Parr - 55,893 MWh/year Fairfield – 660,582 MWh/year
Geology and Soils	<ul style="list-style-type: none"> • No change. • SCE&G would continue to monitor and implement erosion control measures at the Project. 	<ul style="list-style-type: none"> • No change.
Water Resources	<ul style="list-style-type: none"> • SCE&G would implement operational measures that would likely enhance DO levels in the Parr Development tailrace according to the Turbine Venting Plan and Minimum Flow AMP and in the west channel according to the West Channel AMP. 	<ul style="list-style-type: none"> • No change. • Periodic incidences of DO levels less than 4 mg/L in the tailrace during the summer months would likely continue to occur. • Moreover, the west channel would likely continue to experience low DO during periods of low inflow.
Fishery Resources	<ul style="list-style-type: none"> • Aquatic resources would likely be improved through the implementation of revised downstream flows through the implementation of the Minimum Flow AMP. • Downstream fishery enhancements would potentially occur through the reduction of downstream flow fluctuations according to the Downstream Flow Fluctuation AMP. • Fish spawning habitat in Monticello Reservoir would be enhanced through habitat improvement measures. • Mussels and American eel will be monitored for abundance and distribution. • Fish entrainment will likely be reduced by adjusting lighting in the Fairfield discharge area. • Areas of aquatic habitat within the project area and portions of the Broad, Saluda, and Congaree River watersheds will be restored, enhanced and protected through the HEP. 	<ul style="list-style-type: none"> • No change. • Fish entrainment will continue at its current rate.

RESOURCE	PROPOSED ACTION	NO ACTION ALTERNATIVE
Terrestrial Resources	<ul style="list-style-type: none"> • No change 	<ul style="list-style-type: none"> • No change.
RT&E Species	<ul style="list-style-type: none"> • Aquatic resources for RT&E species would likely be improved through the implementation of revised downstream flows with the implementation of the Minimum Flow AMP. • Potential downstream RT&E fishery enhancements would occur through the reduction of downstream flow fluctuations. • Fish spawning habitat in Monticello Reservoir would be enhanced through habitat improvement measures, which may benefit RT&E species. • Mussel species and American eel would be monitored for abundance and distribution. 	<ul style="list-style-type: none"> • No change.
Recreation	<ul style="list-style-type: none"> • Recreation at the Project would be enhanced through the recreation site improvements, the addition of barrier free access at certain facilities, and through the formal opening and operation of the canoe portage. • Higher minimum flows would improve recreation opportunities downstream of the Project through the implementation of the Minimum Flow AMP. • Flows for downstream navigation would be provided through revised downstream flows with the implementation of the Minimum Flow AMP. 	<ul style="list-style-type: none"> • No change.
Cultural	<ul style="list-style-type: none"> • Cultural resources would be preserved and mitigated through implementation of the HPMP, Lyle's Ford mitigation, and other measures. 	<ul style="list-style-type: none"> • No change.
Land Use and Aesthetics	<ul style="list-style-type: none"> • Project shoreline would be preserved and public access to the project lands would be enhanced with the implementation of the Parr and Monticello SMPs. 	<ul style="list-style-type: none"> • No change.
Socioeconomic	<ul style="list-style-type: none"> • Recreation site enhancements would likely improve socioeconomic conditions in the surrounding region. 	<ul style="list-style-type: none"> • No change.

6.2 UNAVOIDABLE ADVERSE EFFECTS

The following unavoidable adverse effects have been identified for the Project, regardless of what alternative is undertaken:

Geology and Soils - Reservoir fluctuations, wave and wind action will continue to have adverse impacts on erodible soils around the shoreline and hence, siltation will continue to occur within the reservoirs. Continued mitigation and armoring of these areas by SCE&G would likely reduce the extent of these continuing adverse impacts.

Fishery Resources - Parr Reservoir experiences fluctuations associated with pumped storage operations. These fluctuations may dewater potential spawning habitat, and may thus reduce the potential for spawning success or recruitment of juvenile fish to adult lifestages. It is not anticipated that habitat enhancements would materially benefit spawning success in Parr Reservoir given these conditions. Additionally, fish entrainment and turbine mortality would continue to occur at the Project regardless of what alternative is undertaken.

Terrestrial Resources - Fluctuations in reservoir levels due to operation of the Project may impact littoral and riparian areas within the project boundary.

RT&E Species – Project operations, in addition to high inflows to the Project, have the potential to create downstream flow fluctuations. These may interfere with the spawning of various RT&E species.

Land Use and Aesthetics - Development of private lands outside of the Project, but adjacent to project shorelines will continue into the foreseeable future and may affect land use practices surrounding the project developments.

Unavoidable adverse effects were not identified for the following resources: Water Resources and Water Quality, Recreation, Cultural Resources, and Socioeconomic Resources.

6.3 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a) of the FPA, 16 U.S.C. § 803(a)(2)(A), requires FERC to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the Project. On April 27, 1988, FERC issued Order No. 481—A revising Order No. 481, issued October 26, 1987, establishing

that FERC will accord FPA Section 10(a)(2)(A) comprehensive plan status to any Federal or state plan that:

- Is a comprehensive study of one or more of the beneficial uses of a waterway or waterways;
- Specifies the standards, the data, and the methodology used; and
- Is filed with the Secretary of the Commission.

FERC currently lists comprehensive plans for the State of South Carolina and the United States resources. Of the 30 plans listed, 24 are potentially relevant to the Project, as detailed below in Table 6-2.

TABLE 6-2 LIST OF QUALIFYING FEDERAL AND STATE COMPREHENSIVE WATERWAY PLANS POTENTIALLY RELEVANT TO THE PROJECT AND PROJECT CONSISTENCY

RESOURCE	COMPREHENSIVE PLAN TITLE	PROJECT CONSISTENCY (YES/NO)
Botanical Resources	Forest Service. 2001. Sumter National Forest revised land and resource management plan. Department of Agriculture, Columbia, South Carolina. January 2004.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 1998. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (<i>Acipenser oxyrhynchus oxyrhynchus</i>). (Report No. 31). July 1998.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring. Arlington, Virginia. May 2009.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring. Arlington, Virginia. February 2010.	Yes
Fisheries Resources	Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (<i>Anguilla rostrata</i>). (Report No. 36). April 2000.	Yes
Fisheries Resources	National Marine Fisheries Service. 1998. Final Recovery Plan for the shortnose sturgeon (<i>Acipenser brevirostrum</i>). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service. Silver Spring, Maryland. December 1998.	Yes
Fisheries Resources	South Carolina Water Resources Commission. 1985. Instream flow study – Phase I: identification and priority listing of streams in South Carolina for which minimum flow levels need to be established. Report No. 149. Columbia, South Carolina. June 1985.	Yes

RESOURCE	COMPREHENSIVE PLAN TITLE	PROJECT CONSISTENCY (YES/NO)
Fisheries Resources	U.S. Fish and Wildlife Service, National Marine Fisheries Service, and South Carolina Department of Natural Resources. 2001. Santee-Cooper Basin diadromous fish passage restoration plan. Charleston, South Carolina. August 28, 2001.	Yes
Fisheries Resources	U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.	Yes
Fisheries Resources	South Carolina Wildlife and Marine Resources Department. 1989. South Carolina instream flow studies: a status report. Columbia, South Carolina. June 1989.	Yes
Fisheries Resources	South Carolina Water Resources Commission. 1988. Instream flow study – Phase II: determination of minimum flow standards to protect instream uses in priority stream segments. Report No. 163. Columbia, South Carolina. May 1988.	Yes
Water Resources	South Carolina Department of Health and Environmental Control. 1989. Non-point source management program for the State of South Carolina. Columbia, South Carolina. April 1989.	Yes
Water Resources	South Carolina Department of Health and Environmental Control. 1989. Assessment of non-point source pollution for the State of South Carolina. Columbia, South Carolina. April 1989.	Yes
Water Resources, Fisheries Resources, Wildlife Resources, Recreation	South Carolina Department of Natural Resources. 2004. South Carolina Water Plan-Second Edition. Columbia, South Carolina. January, 2004.	Yes
Water Resources	South Carolina Department of Health and Environmental Control. 1985. Water classifications and standards, and classified waters. Columbia, South Carolina. June 1985.	Yes
Water Resources	South Carolina Water Resources Commission. National Park Service. 1988. South Carolina Rivers Assessment. Columbia, South Carolina. September 1988.	Yes

RESOURCE	COMPREHENSIVE PLAN TITLE	PROJECT CONSISTENCY (YES/NO)
Recreation	South Carolina Department of Parks, Recreation, & Tourism. 2008. South Carolina State Comprehensive Outdoor Recreation Plan (SCORP). Columbia, South Carolina. April 2008.	Yes
Recreation	National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.	Yes
Recreation	South Carolina Department of Parks, Recreation, & Tourism. 2002. The South Carolina State Trails Plan. Columbia, South Carolina. 2002.	Yes
Wildlife Resources	South Carolina Department of Natural Resources. 2005. South Carolina comprehensive wildlife conservation strategy: 2005-2010. Columbia, South Carolina. September 2005.	Yes
Wildlife Resources	U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.	Yes

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