DRAFT ENVIRONMENTAL ASSESSMENT

FOR

HYDROPOWER LICENSES

Piedmont Hydroelectric Project, P-2428-007

Upper Pelzer Hydroelectric Project, P-10254-026

Lower Pelzer Hydroelectric Project, P-10253-032

South Carolina

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
applicants	Aquenergy Systems, Pelzer Hydro, and Consolidated Hydro
Aquenergy	Aquenergy Systems, LLC
BOD	Biological Oxygen Demand
certification	water quality certification
cfs	cubic feet per second
co-applicants	Pelzer Hydro and Consolidated Hydro
Consolidated Hydro	Consolidated Hydro Southeast, LLC
Commission	Federal Energy Regulatory Commission
Corps	United States Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DHAC	Division of Hydropower Administration and Compliance
D2SI	Division of Dam Safety and Inspections
DO	dissolved oxygen
EA	environmental assessment
ESA	Endangered Species Act
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FERC Form-80	Licensed Hydropower Development Recreation Report
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
Interior	U.S. Department of the Interior
IPaC	Information for Planning and Conservation
kg	kilogram
kV	kilovolt
kW	kilowatt
Lower Pelzer	Lower Pelzer Hydroelectric Project
MADF	mean annual daily flow
mg/L	milligrams per liter
MGD	million gallons per day
m/hr	mussels per hour
msl	mean sea level
MW	megawatts
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Council
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System

NPS	National Park Service
NTU	Nephelometric Turbidity Units
Pelzer Hydro	Pelzer Hydro Company, LLC
Piedmont Project	Piedmont Hydroelectric Project
projects	Piedmont, Upper Pelzer, and Lower Pelzer Projects
RM	river mile
RMP	Recreation Management Plan
South Carolina DHEC	South Carolina Department of Health and Environmental Control
South Carolina DNR	South Carolina Department of Natural Resources
South Carolina SHPO	South Carolina State Historic Preservation Officer
Upper Pelzer	Upper Pelzer Hydroelectric Project
USGS	United States Geological Survey
V	volt
WWTP	Wastewater Treatment Plant

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1.0 INTRODUCTION

1.1 APPLICATIONS

On December 30, 2015, Aquenergy Systems, LLC (Aquenergy), a subsidiary of Enel Green Power North America, Inc., filed an application for a subsequent license with the Federal Energy Regulatory Commission (Commission or FERC) to continue to operate and maintain the existing Piedmont Hydroelectric Project (Piedmont Project) (FERC No. 2428).[1] The 1.0-megawatt (MW) project is located on the Saluda River in the town of Piedmont in Anderson and Greenville Counties, South Carolina (Figure 1). The project does not occupy federal land. The project generates an average of 5,369 megawatt-hours (MWh) of energy annually. Aquenergy proposes no new capacity and no new construction or major project modifications, with the exception of a new canoe portage facility.

On November 30, 2015, Pelzer Hydro Company, LLC (Pelzer Hydro) and Consolidated Hydro Southeast, LLC (Consolidated Hydro) (co-applicants), also subsidiaries of Enel Green Power North America, Inc., filed applications for new licenses with the Commission to continue to operate and maintain the existing Upper Pelzer Hydroelectric Project (Upper Pelzer Project) (FERC No. 10254)[2] and Lower Pelzer

[1] The current license for the Piedmont Hydroelectric Project was issued on September 9, 1986, for a term of 30 years, and expired on December 31, 2017. The licensee continues to operate and maintain the project under 18 C.F.R § 16.21.

[2] The current license for the Upper Pelzer Hydroelectric Project was issued on December 29, 1987, for a term of 30 years, and expired on November 30, 2017. The co-applicants continue to operate and maintain the project under an annual license.

Hydroelectric Project (Lower Pelzer Project) (FERC No. 10253).[3] The 1.95-MW Upper Pelzer Project is located in the town of Pelzer and the 3.3-MW Lower Pelzer Project is located in the town of Williamston. Both projects are located on the Saluda River in Anderson and Greenville Counties, South Carolina, downstream of the Piedmont Project (Figure 1). Neither project occupies federal land. The Upper Pelzer and Lower Pelzer Projects generate an average of 6,223 MWh and 8,784 MWh of energy annually, respectively. The co-applicants propose no new capacity and no new construction or major project modifications at either project, with the exception of new canoe portage facilities at both projects.

[3] The current license for the Lower Pelzer Hydroelectric Project was issued on December 24, 1987, for a term of 30 years, and expired on November 30, 2017. The co-applicants continue to operate and maintain the project under an annual license.

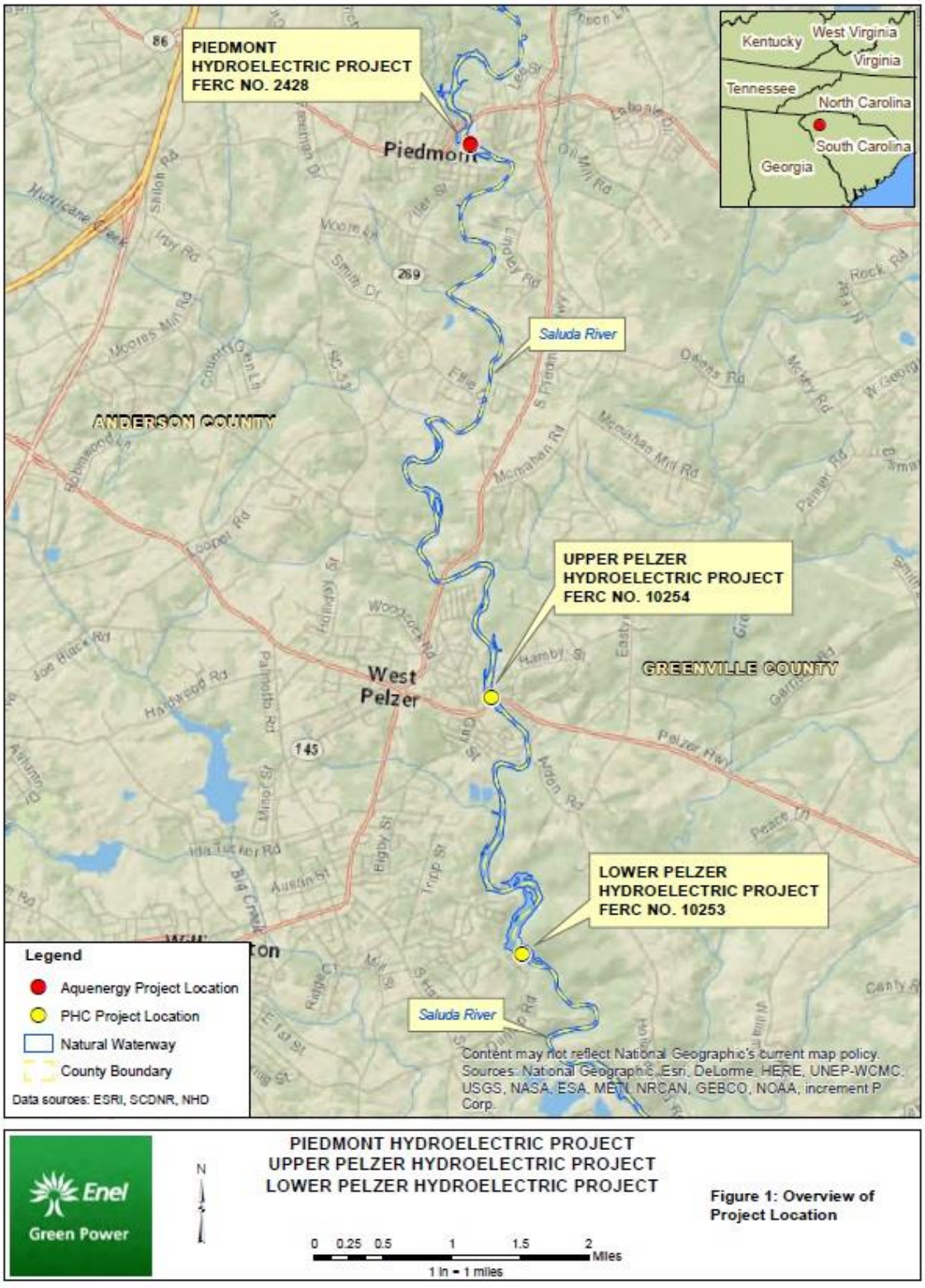

Figure 1. General location of the Piedmont, Upper Pelzer, and Lower Pelzer Projects, Anderson and Greenville Counties, South Carolina.
(Source: Enel Green Power North America, Inc., 2015, as modified by staff.)

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The Piedmont, Upper Pelzer, and Lower Pelzer Projects provide hydroelectric power to meet the region's power needs. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue licenses to Aquenergy for the Piedmont Project, and to the co-applicants for the Upper Pelzer and Lower Pelzer Projects, and what conditions should be placed on any licenses issued.

In deciding whether to issue a license for a hydroelectric project, the Commission must determine that 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 (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a subsequent license[4] for the Piedmont Project, and new licenses[5] for the Upper Pelzer and Lower Pelzer Projects, would allow the applicants to continue to generate electricity at the projects for the term of each license, making electric power from a renewable resource available to their customers. This multi-project draft environmental assessment (EA) has been prepared in compliance with the National Environmental Policy Act of 1969 to assess the environmental and economic effects associated with operation of the projects, and alternatives to the proposed projects. It includes recommendations to the Commission on whether to issue new and subsequent licenses, and if so, recommends terms and conditions to become parts of any issued licenses.

In this draft EA, we assess the environmental and economic effects of continuing to operate the projects: (1) as proposed by the applicants; and (2) with our recommended measures (staff alternative). We also consider the effects of the no-action alternative.

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[4] A subsequent license is issued after the expiration of a license for a minor water power project (1.5 MW or less) at an existing dam, and is not subject to the relicense provisions of sections 14 and 15 of the FPA. *See* 18 C.F.R. § 16(2)(d), and *Wisconsin Electric Power Co.*, 62 FERC ¶ 61,064 (1993).

[5] A new license is issued after the expiration of a license for a major water power project (5 MW or less) at an existing dam.

Important issues that are addressed include sediment management, water quality, water quantity, and fisheries.

1.2.2 Need for Power

The Piedmont, Upper Pelzer, and Lower Pelzer Projects provide hydroelectric generation to meet part of South Carolina's power requirements, resource diversity, and capacity needs. The Piedmont Project has an installed capacity of 1.0 MW and generates about 5,369 MWh per year (average 2003-2011). The Upper Pelzer Project has an installed capacity of 1.95 MW and generates about 6,223 MWh per year (average 2003-2011). The existing Lower Pelzer Project has an installed capacity of 3.3 MW and generates about 8,784 MWh per year (average 2003-2011).

The North American Electric Reliability Council (NERC) annually forecasts electricity supply and demand nationally and regionally for a 10-year period. The projects are located within the SERC-East subregion (SERC-E) of the NERC. According to NERC's most recent forecast (2018), the total internal demand projected for this region is expected to increase by 0.93 percent from 2018 to 2027 (NERC, 2018).

Here, the projects provide low-cost power that can displace generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating environmental benefits. We conclude that power from the projects would help meet a need for power in the SERC-E subregion in both the short- and long-term.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Licenses for the Piedmont, Upper Pelzer, and Lower Pelzer Projects are subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission shall require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the Department of Commerce or the Department of the Interior (Interior). No fishway prescriptions or requests for reservation of authority to prescribe fishways were filed under section 18 of the FPA.

1.3.1.2 Section 10(j) Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

On January 11, 2018, the South Carolina Department of Natural Resources (South Carolina DNR) filed timely 10(j) recommendations for the projects. These recommendations are summarized in table 22 and discussed in section 5.3, *Summary of 10(j) Recommendations*. In section 5.3, we also discuss how we address South Carolina DNR's recommendations, and whether they are within the scope of section 10(j).

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain water quality certification (certification) from the appropriate state pollution control agency verifying compliance with the CWA.

On December 31, 2015, Aquenergy applied to the South Carolina Department of Health and Environmental Control (South Carolina DHEC) for certification of the Piedmont Project. Aquenergy filed a copy of its request with the Commission on January 8, 2016. South Carolina DHEC received this request on January 8, 2016, and issued certification on January 4, 2017.[6]

On December 10, 2015, the co-applicants applied to South Carolina DHEC for certification of the Upper Pelzer and Lower Pelzer Projects and filed a copy of their requests with the Commission on December 11, 2015. The co-applicants concurrently withdrew their requests and reapplied for certification on November 7, 2016. South Carolina DHEC issued certification for the Upper Pelzer Project on October 13, 2017,[7] and issued certification for the Lower Pelzer Project on August 17, 2017.[8]

[6] *See* letter filed March 20, 2017.

[7] *See* letter filed January 12, 2018.

[8] ibid.

The conditions included with the certifications are described under section 2.2.5 *Modifications to Applicant's Proposal – Mandatory Conditions.*

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of such species. The United States Fish and Wildlife Service's (FWS) Information for Planning and Conservation (IPaC) system[9] indicates that eleven federally listed species and one proposed threatened species are likely to occur in Anderson and Greenville Counties, and have the potential to occur at the projects and/or be affected by the projects. The list includes the endangered bunched arrowhead, mountain sweet pitcher plant, smooth coneflower, white irisette, and rock gnome lichen; the threatened northern long-eared bat, bog turtle, dwarf-flowered heartleaf, small whorled pogonia, swamp pink, and white fringeless orchid; and the proposed threatened Eastern black rail. Our analysis of project effects on proposed, threatened, and endangered species is presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations are included in section 5.1, *Comprehensive Development and Recommended Alternative*.

Based on our analysis, we conclude that relicensing the projects, as proposed with the staff-recommended measures, would have no effect on the bog turtle, bunched arrowhead, dwarf-flowered heartleaf, mountain sweet pitcher plant, small whorled pogonia, smooth coneflower, swamp pink, white fringeless orchid, white irisette, and rock gnome lichen. None of these species were observed during the applicants' field surveys. In addition, the preferred or suitable habitat for bog turtles, dwarf-flowered heartleaf, mountain sweet pitcher-plant, smooth coneflower, swamp pink, white irisette, and rock gnome lichen were not found within the project boundaries. While the wetlands within the project boundaries may provide suitable habitat for bunched arrowhead, white fringeless orchid, and/or small whorled pogonia, these species would not be affected by continued run-of-river operation.

The northern long-eared bat has the potential to occur within the project boundaries and/or be affected by the projects. The proposed construction and maintenance of the canoe portages at each of the projects would require some initial tree removal and then periodic clearing of encroaching vegetation, which may include trees. Tree removal has the potential to disturb roosting northern long-eared bats. However, tree removal that may result as part of Aquenergy and the co-applicants' canoe portage construction and maintenance activities would not occur within 0.25 miles of a known

[9] Accessed on September 7, 2017, on February 19, 2019, and on July 9, 2019.

hibernacula, or within 150 feet of a known maternity roost. Therefore, we conclude that relicensing the projects may affect the northern long-eared bat, but any incidental take[10] that may result is not prohibited by the final 4(d) rule of the ESA.[11] In addition, the applicants' proposals to limit tree removal associated with the construction and maintenance of the proposed canoe portages to November 1 through March 31 would minimize adverse effects to northern long-eared bats during the pup season and the broader, active season.

The Eastern black rail, which FWS recently proposed for listing as a threatened species,[12] has the potential to occur at and/or be affected by the projects. FWS proposed a rule under section 4(d) with conservation measures to protect Eastern black rails and their habitat from impacts associated with activities, such as prescribed burns, grazing, mowing/haying, and mechanical treatment activities in emergent wetlands. If intentional sediment management methods such as flushing and dredging are used, sediment management could disturb or remove potentially suitable emergent wetland habitat for Eastern black rails. To avoid or minimize potential effects to Eastern black rail individuals and potentially suitable habitat, the applicants could document any effects to potentially suitable Eastern black rail habitat within observed emergent wetlands and floating aquatic beds during flushing and/or dredging events, consult with resource agencies if any adverse effects to wetland vegetation are observed, and avoid mechanical treatment activities within emergent wetlands that could result in the incidental take of Eastern black rails during the nesting, brooding, or post-breeding flightless molt period of mid-March through September.[13] We conclude that relicensing the projects, as proposed with staff-recommended measures, is not likely to jeopardize the continued existence of

[10] "The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Section 3(18) of the ESA. 'Incidental take' is take that results from, but is not the purpose of, carrying out an otherwise lawful activity (FWS, 2018).

[11] 81 Federal Register 1900-1922 (January 14, 2016).

[12] 83 Federal Register 50610-50629 (October 9, 2018).

[13] If FWS' proposed listing and 4(d) rule for this species become final, take of Eastern black rails associated with mowing, haying, and mechanical treatments during this period would be prohibited. FWS' proposed exception to this portion of the proposed 4(d) rule (i.e., mowing, haying, and mechanical activities in emergent wetlands) is for such activities that are maintenance requirements to ensure the safety and operational needs of existing infrastructure (i.e., existing fire breaks, roads, transmission corridor rights-of-way, and fence lines). It is not clear whether or not incidental take of Eastern black rails through sediment flushing or dredging within emergent wetlands at hydropower facilities would fall under this exception of the proposed 4(d) rule.

the Eastern black rail for the following reasons: 1) Eastern black rails have not been documented at the projects; 2) continued run-of-river operation and vegetation maintenance of the projects would maintain the existing emergent wetlands; 3) the majority of the emergent wetland habitats near the project dams that could be affected by active sediment management do not have this species' preferred nesting vegetation; and 4) the potential effects to this species and potentially suitable habitat could be avoided through a seasonal restriction of dredging and/or vegetation management within emergent wetlands in the project boundaries.

We are requesting FWS concurrence with our findings for the northern long-eared bat and Eastern black rail.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. §1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state's coastal zone management agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

In a letter filed June 20, 2017,[14] South Carolina DHEC stated that relicensing the Piedmont, Upper Pelzer, and Lower Pelzer Projects would not affect coastal resources because the projects are not within South Carolina's Coastal Zone, which consists of eight coastal counties. Therefore, CZMA consistency certification is not required.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

Pursuant to section 106 of the NHPA, Aquenergy and the co-applicants consulted with the South Carolina Historic Preservation Officer (South Carolina SHPO) and affected Indian tribes to identify historic properties, determine the National Register-eligibility of the projects, and assess potential adverse effects to historic properties within the projects' areas of potential effects (APEs). By letters dated October 8, 2015, and

[14] Letter dated May 16, 2017, which was sent in response to a May 4, 2017 letter from the applicants to South Carolina DHEC.

September 17, 2015 (filed with the respective final license applications (FLAs), the South Carolina SHPO states there are no historic properties that would be affected by relicensing the Piedmont, Upper Pelzer, or Lower Pelzer Projects.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 CFR, section 16.8) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, ESA, NHPA, and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. We distributed scoping document 1 to interested agencies and others on September 21, 2017. We distributed scoping document 2 on November 15, 2017. The following entities provided written comments:

Commenting Entity	Date Filed
South Carolina DNR	October 20, 2017
Applicants	October 23, 2017

1.4.2 Interventions

On September 21, 2017, the Commission issued notices accepting Aquenergy and the co-applicants' applications to relicense the Piedmont, Upper Pelzer, and Lower Pelzer Projects, and soliciting motions to intervene and protests. The notices set November 20, 2017, as the deadline for filing protests and motions to intervene. No entities filed motions to intervene in response to the notices.

1.4.3 Comments on the Application

On November 16, 2017, the Commission issued Ready for Environmental Analysis (REA) notices for the three projects and requested comments, recommendations, preliminary terms and conditions, and preliminary fishway prescriptions. The following entities filed comments:

Commenting Entity	Date Filed
Anderson County	December 11, 2017
Cherokee Nation	January 8, 2018
South Carolina DNR	January 11, 2018

The applicants filed reply comments on March 1, 2018.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the projects would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives and to judge the benefits and costs of any measures that might be required under a new license.

2.1.1 Current Project Facilities

The Piedmont, Upper Pelzer, and Lower Pelzer Projects are located on the Saluda River in northwestern South Carolina. The Piedmont Dam is located at river mile (RM) 120, about 6 miles upstream of the Upper Pelzer Dam, and about 9 miles upstream of the Lower Pelzer Dam. Descriptions of facilities at the three projects follow.

2.1.1.1 Piedmont Project

The Piedmont Project consists of an impoundment, dam, intake canal, powerhouse, tailrace, bypassed reach, transmission line, and appurtenant facilities.

Piedmont Dam creates a 53.4-acre impoundment at a normal pool elevation of 767.2-feet mean sea level[15] (msl), as measured at the top of the 24-inch flashboards. The impoundment extends about 1 mile upstream on the Saluda River. The gross storage capacity of the impoundment is 248 acre-feet, while the useable storage capacity is negligible.[16]

Piedmont Dam is a 600-foot-long, 25-foot-high stone masonry dam. The dam, from east to west, consists of: (1) a 200-foot-long non-overflow section; (2) a 200-foot-long central overflow spillway topped with 24-inch-high wooden flashboards;

[15] All elevation data are referenced to mean sea level datum, unless otherwise noted.

[16] Useable storage capacity is the volume of impounded water that is normally available for release from a reservoir's gross storage capacity.

and (3) a 200-foot-long non-overflow spillway housing the inoperable J.P. Stevens Canal intake.[17]

A 140-foot-long, 81-foot-wide intake canal is located at the east end of the project. The canal is bordered to the east by the river bank, and to the west by an 110-foot-long stone masonry wall equipped with 1.9-foot-high, 2-inch-thick wooden flashboards. The canal wall consists of a 5-foot-wide, 7.5-foot-high sluice gate and a 5.5-foot-wide, 7.5-foot-high sluice gate. Both sluice gates are currently operable.

Eight gates at the head of the canal, each measuring about 5.5-feet-wide by 9-feet-high, control flow to the 52-foot-long by 52-foot-wide brick masonry powerhouse. The powerhouse, located 120 feet downstream of the dam on the east riverbank, is protected by a 30-foot-wide, 25-foot-deep trash rack structure with 2-inch clear bar spacing. The powerhouse contains a single vertical Francis turbine-generator unit, with an authorized installed capacity of 1.0 MW.

Flow passes from the powerhouse into a 180-foot-long, 38-foot-wide tailrace section that empties into the Saluda River. A 180-foot-long, 475-foot-wide bypassed reach extends between the dam and the tailrace. The bypassed reach is watered by a continuous minimum flow release of 15 cfs, or inflow, whichever is less, passed through a weir in the spillway crest.

The project was originally designed with the ability to release flow and sediment from several low-level sluice gates in the non-overflow sections of the dam for the purpose of maintaining project operations. However, the two 5-foot-wide, 6.5-foot-high sluice gates in the west non-overflow section of the dam, and two 5-foot-wide, 6.5-foot-high sluice gates in the east non-overflow section of the dam are currently inoperable.[18] A third round gate opening, with a diameter of 4.75 feet, located within the east non-overflow section, is also inoperable.

The central overflow spillway crest includes a series of seven concrete piers of varying lengths, about 2 feet high, at a crest elevation of 767.2 feet. Wooden flashboards are installed between the seven piers, consisting of six, 4-inch by 4-inch timbers stacked to a total height of 24 inches, such that the top elevation is level with the crest elevation of the concrete piers.

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[17] The J.P. Stevens Canal is not currently used for any project purpose and is not necessary for project operation; however, it consists of a headgate structure which is integral with the dam's west abutment and a stone masonry canal wall.

[18] *See* AIR response filed June 20, 2017.

The project includes a 600-volt transmission line extending from the powerhouse to a non-project substation located 203 feet upstream of the project on the east bank. Power generated by the turbine passes through an applicant-owned transformer that is rated at 7.2/12.47-kilovolt (kV).

Figure 2. Project facilities for the Piedmont Project
(Source: Google Earth Pro, 2018, as modified by staff).

2.1.1.2 Upper Pelzer Project

The Upper Pelzer Project consists of an impoundment, dam, forebay canal, and headworks; two powerhouses; a penstock; two tailraces and bypassed reaches; a transmission line; and appurtenant facilities.

Upper Pelzer Dam creates a 56.4-acre impoundment at a normal pool elevation of 719.9 feet, as measured at the top of the 4-foot flashboards. The gross storage capacity is about 200 acre-feet at full pond elevation, while the usable storage capacity is negligible.

Upper Pelzer Dam is a 519-foot-long, 29.7-foot-high granite masonry dam. The dam, from east to west, consists of: (1) a 144-foot-long non-overflow section; (2) a 276-foot-long ungated overflow spillway topped with 4-foot wooden flashboards; and (3) a 75-foot-long gated intake section.

The project was originally designed with the ability to release flow and sediment from a single low-level sluice gate in the non-overflow section of the dam for the purpose of maintaining project operations. However, the 6-foot-wide by 6-foot-high sluice gate is currently inoperable.[19]

The gated intake section is protected by an about 49-foot-wide, 23-foot-deep trash rack structure. The intake consists of six, 10-foot-high by 6-foot-wide manually operated vertical lift gates, of which five are currently operable. The intake gates channel flow to the 50-foot-wide, 275-foot-long forebay canal, supplying the project's two powerhouses. The canal parallels the river along the west shoreline, and is formed by a rock-masonry wall on the east to the upper powerhouse, and an earth embankment between the upper and lower powerhouses. There is one 4-foot-high, 3-foot-wide operable sluice gate in the canal wall.

A 43-foot-long, 24-foot-wide concrete upper powerhouse, located about 70 feet downstream of the canal intake, contains two vertical Francis turbine-generator units rated at 750 kilowatts (kW) each. The powerhouse intake structure is protected by a three-sided trash rack structure with a total length of 65 feet along all sides, including a 45-foot-long face and 10-foot-long sides. The structure is 20 feet deep and consists of 5.5-inch clear bar spacing for 38 feet of length, and 2-inch clear bar spacing for 27 feet of length. Flows pass from the upper powerhouse into a 95-foot-long, 74-foot-wide tailrace.

A 70-foot-long, 55-foot-wide lower powerhouse is located within the basement of the old Pelzer Mill building and contains a single vertical Francis turbine-generator unit with a rated capacity of 450 kW. The intake is protected by a 23-foot-wide, 25-foot-deep

[19] In an AIR response filed June 20, 2017, the co-applicants stated that the low-level dam sluice gate has been inoperable since the late 1990s.

trash rack structure with 2-inch clear bar spacing. Flows pass from the lower powerhouse into a 67-foot-long, 10-foot-diameter ungated brick penstock which empties into a second, 132-foot-long, 24-foot-wide tailrace.

A 115-foot-long, 340-foot-wide bypassed reach extends from the base of the dam to the upper powerhouse. A secondary bypass is located between the upper and lower powerhouses. There is currently no required minimum flow to the bypassed reaches.

The project includes a 3,300-volt transmission line connecting the upper and lower powerhouses to a substation located 65 feet away on the right bank, downstream of the dam. Power generated by the turbines passes through a transformer rated at 7.2/12.47 kV.

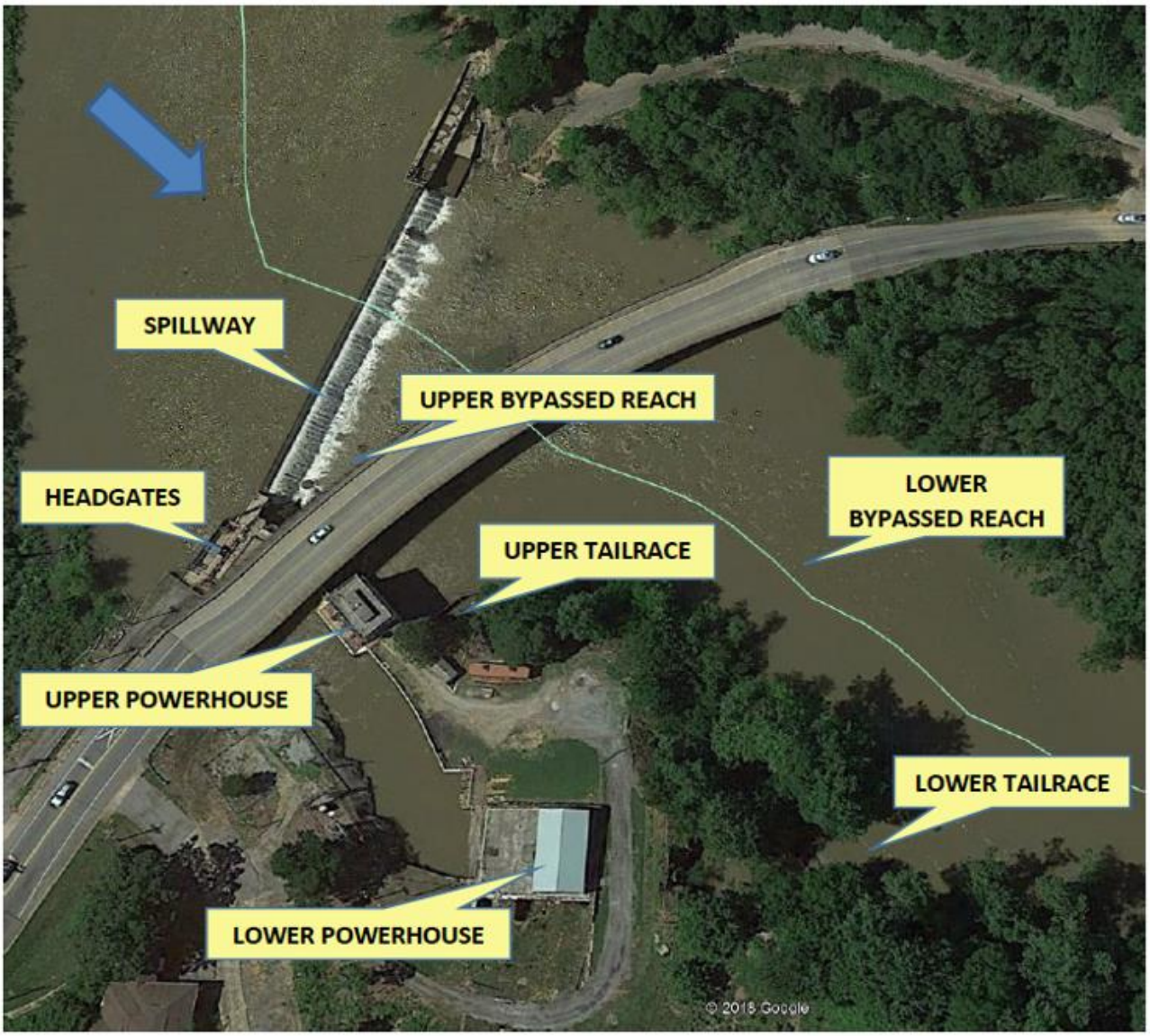

Figure 3. Project facilities for the Upper Pelzer Project.
(Source: Google Earth Pro, 2018, as modified by staff).

2.1.1.3 Lower Pelzer Project

The Lower Pelzer Project consists of an impoundment, dam, powerhouse, tailrace, bypassed reach, transmission line, and appurtenant facilities.

Lower Pelzer Dam creates a 99-acre impoundment at a normal pool elevation of 694 feet, as measured at the top of the 4-foot flashboards. The gross storage capacity of the impoundment is about 400 acre-feet at full pond elevation, while the usable storage capacity is negligible.

Lower Pelzer Dam is a 726-foot-long, 40-foot-high granite masonry dam. The dam, from east to west, consists of: (1) a 310-foot-long, 32-foot-high overflow spillway topped with 4-foot wooden flashboards; (2) a 40-foot-long, 40-foot-high non-overflow section; (3) an 110-foot-long integral powerhouse; and (4) a 266-foot-long non-overflow section.

A 110-foot-long, 68-foot-wide brick powerhouse forms the right central portion of the dam. A 110-foot-long, 14-foot-wide intake deck is located along the upstream side. The powerhouse contains five horizontal Francis turbine-generator units. Units 1, 2, 3, and 5 are rated at 750 kW each, while unit 4 is rated at 300 kW. The upstream face of the powerhouse is equipped with a 110-foot-wide, 29-foot-deep trash rack structure with 2-inch clear bar spacing. Flow to the turbine-generator units is controlled by five 10.5-foot square gates, which are operated manually.

Flows pass from the powerhouse into a 600-foot-long, 110-foot-wide tailrace channel, varying in width from about 350 feet at the toe of the dam, to 120 feet at the downstream end. The tailrace channel is separated from the adjacent 600-foot-long bypassed reach by a training wall and downstream island.

The project was designed with the ability to release flow and sediment from the dam for the purpose of maintaining project operations. Two 9-foot-wide by 6-foot-high, manually operable, low-level sluice gates are located in the east non-overflow section of the dam. The west non-overflow section varies in height from 30 feet near the powerhouse, to 0 feet at the west dam abutment. A 266-foot-long, 4-foot-high parapet wall sits atop the non-overflow section at a crest elevation of 699.8 feet to prevent overtopping by floodwaters and wave run-up into the powerhouse intake area.

A 600-foot-long bypassed reach extends from the toe of the dam to the confluence with the tailrace channel downstream. The bypassed reach varies in width from about 350 feet at the toe of the dam, to 120 feet at its downstream end. The bypassed reach is watered by a continuous minimum flow release of 140 cfs, or inflow, whichever is less.

The project includes a 165-foot-long, 3,300-volt transmission line extending from the powerhouse to a substation located 165 feet away on the west bank, downstream of

the dam. Power generated by the turbine passes through an applicant-owned transformer which is rated at 7.2/12.47 kV.

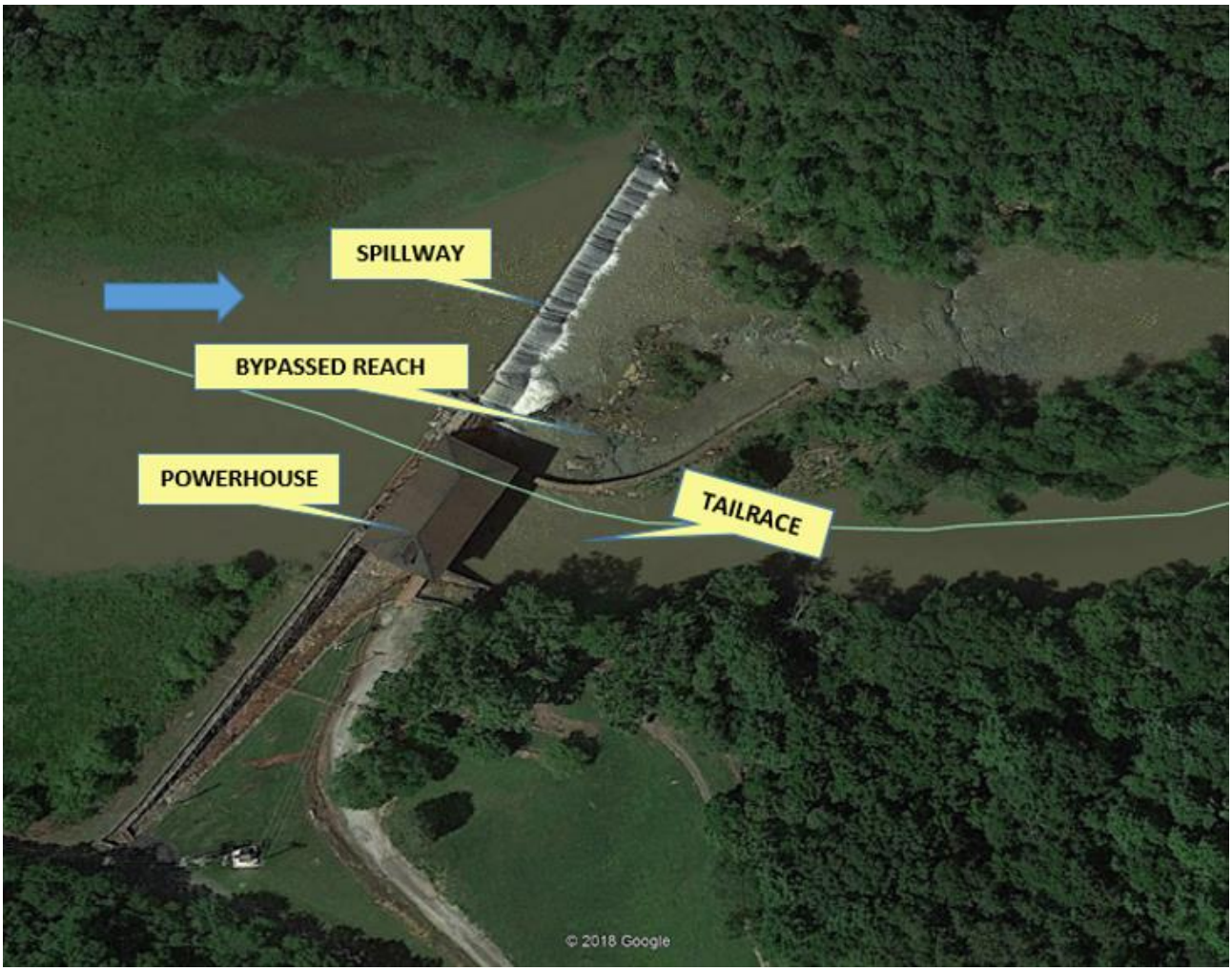

Figure 4. Project facilities for the Lower Pelzer Project.
(Source: Google Earth Pro, 2018, as modified by staff).

2.1.2 Project Safety

The Piedmont, Upper Pelzer, and Lower Pelzer Projects have each been operating for more than 32 years under the existing licenses, and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance.

As part of the relicensing process, Commission staff will evaluate the continued adequacy of the proposed project facilities under a new license. Special articles will be included in any license issued, as appropriate. Commission staff will continue to inspect the projects during any new license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.3 Current Project Operations

2.1.3.1 Piedmont Project

Aquenergy operates the Piedmont Project in a run-of-river mode[20] using automatic pond level control,[21] with no useable storage or flood control capacity. Aquenergy maintains the impoundment surface elevation at 767.2 feet with the 24-inch flashboards in place. The normal tailwater elevation is about 738.9 feet. Under the current license, Aquenergy releases a continuous minimum flow of 15 cfs, or inflow, whichever is less, into the bypassed reach.[22] The applicant releases the continuous minimum flow through an 8-foot-wide, 1-foot-deep weir located on the spillway crest.

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[20] Run-of-river mode is defined as the release of outflows from the project to approximate inflows. Because of the inherent lag times associated with the passive release of stream flows from an elevation-stabilized impoundment, precise instantaneous matching of outflows to inflows is not practical at the project.

[21] The automatic pond level control system uses sensors to maintain the impoundment level at the flashboard crest. During decreasing inflows, the control system automatically reduces the flow through the unit(s) until it reaches its minimum output and trips off-line.

[22] Article 401 of the existing license requires a continuous minimum flow from the project dam of 15 cfs, or inflow, whichever is less, for the protection of fish resources in the Saluda River between the project dam and tailrace. *See* 36 FERC ¶62,284 (1986).

The project operates with an estimated average head of 28 feet. The total installed capacity of the project is 1,000 kW from the single generating unit, while the dependable capacity is 500 kW. The average annual generation of the project is 5,369 MWh.

The project generates electricity when river flows are between 174 cfs (minimum hydraulic capacity of 159 cfs and 15 cfs minimum flow) and 550 cfs (maximum hydraulic capacity of 535 cfs and 15 cfs minimum flow). Water is discharged primarily through the turbine. Once the capacity of the generating unit is exceeded, flows in excess of 550 cfs pass over the flashboard-regulated spillway. Aquenergy replaces the 24-inch spillway flashboards, which are supported by steel I-beam supports fastened to the dam crest every 8 feet, as needed. According to Aquenergy, the spillway flashboards fail only under very high flow events, or if struck by riverine debris. Spillway flashboards generally require repair no more than once per year.

During the installation and repair of spillway flashboards, Aquenergy temporarily draws the impoundment down to the spillway crest by increasing generation flows above inflow rates, to allow its workers to access the crest by boat. When restoring the impoundment elevation, Aquenergy passes the majority of inflow through the turbine units to slowly raise water levels without dewatering the downstream reach.

For the installation and repair of the 1.9-foot-high canal flashboards, which are supported on the downstream side by wooden triangular strut frames, Aquenergy closes the canal head gates and temporarily draws down the canal elevation to a level just below that of the canal spillway cap, elevation 765.2 feet, using the canal wall sluice gates. Aquenergy restores the canal elevation in the same manner as the impoundment elevation following completion of repairs. The canal flashboards rarely require repair because they are less subject to debris impact than the main spillway flashboards. The canal flashboards experience only minimal overtopping because of the ability to control canal flows using the canal headgates.

The impoundment is monitored remotely on a continual basis using pond-level sensors.

2.1.3.2 Upper Pelzer Project

The co-applicants operate the Upper Pelzer Project in a run-of-river mode[23] using automatic pond-level control, with no useable storage or flood control capacity. They

[23] "Instantaneous run-of-river" operation is required by Article 402 of the existing license. *See* 41 FERC ¶62,310 (1987). However, because of the inherent lag times associated with the passive release of stream flows from an elevation-stabilized impoundment, precise instantaneous matching of outflows to inflows is not practicable at the project. Therefore, "run-of-river" is a more accurate description of existing project

maintain the impoundment surface elevation at 719.9 feet, including the 4-foot flashboards. The normal tailwater elevation is about 693.7 feet. Under the existing license, there are no minimum flow requirements downstream of the dam.

The co-applicants operate the project with an estimated average head of 26 feet. The total installed capacity of the project is 1,950 kW from the three turbine-generating units, while the dependable capacity is 450 kW. The average annual generation of the project is 6,223 MWh.

The project generates electricity when flows are between 150 cfs (minimum hydraulic capacity of Unit 1 in the lower powerhouse) and 1,200 cfs (maximum hydraulic capacity of the two powerhouses). The co-applicants typically operate Unit 1 as a first-on, first-off unit because of its lower hydraulic operating range (150 cfs to 300 cfs). They bring on-line Units 2 and 3, which have higher hydraulic operating ranges (350 cfs to 450 cfs, each), as needed, based on available flow.

Water is discharged primarily through the three turbine units. Once the capacity of the generating units is exceeded, flows in excess of 1,200 cfs pass over the flashboard-regulated spillway. The co-applicants replace the 4-foot spillway flashboards, which are held in place by wooden brackets and steel pins, as needed after high flow events. The flashboards are equipped with a wire and winch-activated tripping mechanism which allows the co-applicants to lower the flashboards manually when needed. For the installation and repair of the flashboards, the co-applicants temporarily draw down the impoundment to a level just below the spillway crest, elevation 715.9 feet, by increasing generation flows above inflow rates. When restoring the impoundment elevation, they pass the majority of inflow through the turbine units to slowly raise water levels without dewatering the downstream reach.

The project does not contain any discharge gates to pass flood flows. A single, low-level sluice gate, located in the unregulated spillway portion of the dam, originally used to drain the impoundment for maintenance of project structures and flush sediment, is inoperable.[24] During high flow conditions, the co-applicants close the forebay intake gates as necessary to maintain the water surface elevation in the forebay canal below the top of the forebay wall, which has a crest elevation of 720.7 feet. Project personnel are stationed at the project during high flow events to monitor and adjust the forebay intake gates. When the water surface elevation reaches 12 inches above the flashboards, the co-

operation, in which outflows from the project are released to approximate inflow, minus existing consumptive uses.

[24] In an AIR response filed June 20, 2017, the co-applicants stated that the low-level dam sluice gate has been inoperable since the late 1990s.

applicants close some of the forebay intake gates. When the water surface elevation reaches 12 inches over the intake deck, they close all forebay intake gates.

The impoundment is monitored remotely on a continual basis using pond-level sensors. In addition, personnel work on-site for about 2 hours each day.

2.1.3.3 Lower Pelzer Project

The co-applicants operate the Lower Pelzer Project in a run-of-river mode,[25] with automatic pond-level control of the turbine units, with the exception of unit 1, which is manually operated.[26] The project has no storage or flood control capacity. The co-applicants maintain the impoundment surface elevation at 694 feet, including the 4-foot flashboards. The normal tailwater elevation is at about 653 feet. Under the existing license, the co-applicants release a continuous minimum flow of 140 cfs, or inflow, whichever is less, into the 600-foot-long bypassed reach.[27] They provide the minimum flow primarily through a weir in the flashboard crest, which is sized to pass 140 cfs when the impoundment surface elevation is at the flashboard crest. If debris obstructs the weir, resulting in a weir flow less than 140 cfs, the co-applicants use the left sluice gate in the non-overflow section of the dam to provide a supplemental flow.

The co-applicants operate the project with an estimated average head of 41 feet. The total installed capacity of the project is 3,300 kW between the five generating units, while the dependable capacity is 550 kW. The average annual generation of the project is 8,784 MWh.

The primary discharge for the project is through the turbines. The project generates electricity when river flows are between 299 cfs (159 cfs minimum hydraulic capacity and 140 cfs minimum flow) and 1,548 cfs (1,408 cfs maximum hydraulic capacity and minimum flow). The co-applicants control flow to the generating units by

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[25] "Instantaneous run-of-river" operation is required by Article 402 of the existing license. *See* 41 FERC ¶62,298 (1987). However, because of the inherent lag times associated with the passive release of stream flows from an elevation-stabilized impoundment, precise instantaneous matching of outflows to inflows is not practicable at the project. Therefore, "run-of-river" is a more accurate description of existing project operation, in which outflows from the project are released to approximate inflow, minus existing consumptive uses.

[26] *See* email memorandum issued January 2, 2019.

[27] Article 403 of the Lower Pelzer Project license required a minimum flow of 168 cfs (*see* 36 FERC ¶ 62,284 [1986]), amended in 1996 to a continuous minimum flow of 140 cfs. *See* 75 FERC ¶ 62,209 (1996).

manually operating five, 10.5-foot square slide gates from the intake deck. They operate the turbine units in response to the natural inflow from the river, however the actual flow through the turbines is regulated to maintain the impoundment elevation. Discharge from the generating units enters a 600-foot-long tailrace channel separated from the east river bank by an 110-foot-long training wall and an island.

Once the capacity of the generating units is exceeded, flows in excess of 1,548 cfs pass over the flashboard-regulated spillway. The co-applicants replace the 4-foot spillway flashboards, which are supported by wooden trusses, as needed after high flow events. The flashboards are designed to fail when overtopped by 5 feet of water, and are equipped with a wire and winch-activated tripping mechanism to allow the co-applicants to lower the flashboards manually. For the installation and repair of the flashboards, the co-applicants temporarily draw down the impoundment to just below the spillway crest by increasing generation flows above inflow rates. When restoring the impoundment elevation, they pass the majority of inflow through the turbine units to slowly raise water levels without dewatering the downstream reach.

The co-applicants can use the two 9-foot-wide by 6-foot-high low-level sluice gates in the non-overflow section of the dam during scheduled maintenance and emergency events, as needed. The bottom elevation of each gate is at about 661.3 feet. The co-applicants are required to contact resource agencies and the Commission prior to raising any sluice gates during emergency situations.[28] If circumstances do not allow for contact prior to raising the sluice gates, then the co-applicants must make contact as soon as possible after emergencies.

The co-applicants remotely monitor the impoundment on a continual basis using pond-level sensors and a staff gage.[29] They also conduct regular visual inspections of the project.

[28] In an AIR response filed June 20, 2017, the co-applicants state that following the June 2015 fish kill incident at the Lower Pelzer Project, the co-applicants revised their standard operating procedure at the project to require contact with FWS, South Carolina DNR, South Carolina DHEC, and FERC prior to raising any sluice gates during emergency situations.

[29] In response to the June 2015 fish kill event at the Lower Pelzer Project, a staff gage was installed at one of the project sluice gates to help monitor the impoundment elevation when it is not at normal pool.

2.1.4 Current Environmental Measures

2.1.4.1 Piedmont Project

Run-of-River Operation

Aquenergy operates the Piedmont Project in a run-of-river mode by maintaining the impoundment surface elevation at or above 767.2 feet, which is designed to minimize fluctuations of the impoundment and ensure continuous release of the 15-cfs minimum flow. Release of the 15-cfs minimum flow, or inflow, whichever is less, from the Piedmont Dam into the 180-foot-long, 475-foot-wide bypassed reach, is meant to protect aquatic habitat and water quality conditions below the dam.

2.1.4.2 Upper Pelzer Project

Run-of-River Operation

The co-applicants operate the Upper Pelzer Project in a run-of-river mode by maintaining the impoundment surface elevation at or above 719.9 feet, which is designed to minimize fluctuations of the impoundment and downstream flows that may be caused by project operation.

Recreation

The co-applicants provide public access to one existing project recreation facility, the Upper Pelzer fishing area. The Upper Pelzer fishing area includes a gravel parking area, gravel walkway, and wheelchair-accessible ramp, and is maintained by the co-applicants.

Sediment Management

On May 30, 1990, the Commission approved a Sediment Flushing Plan for the Upper and Lower Pelzer Projects.[30] The Sediment Flushing Plan[31] requires the co-applicants to monitor sediment accumulation within the project impoundments and outlines standard operating procedures, the frequency of drawdowns and flushing events, dredging criteria, and notification procedures for all flushing events.

Specifically, the current plan requires the co-applicants to:

1) flush sediment from the impoundments during scheduled drawdowns for project maintenance and inspection once every 5 and 10 years at the Upper and Lower Pelzer Projects, respectively. Make appropriate adjustments to the frequency of sediment flushing based on monitoring of sediment accumulation rates and volumes released during the scheduled drawdowns;[32]
2) limit use of the projects' sluice gates to flush sediment to months of moderate to high flows, specifically during the months of November, December, January, and February;
3) avoid sediment flushing during fish spawning season or hot temperatures, except in the event of an emergency;

[30] On June 22, 1988, Soft Care Apparel, Inc., the former licensee for the Upper and Lower Pelzer Projects, filed a Sedimentation Release Plan for the Commission's approval. On March 19, 1990, Consolidated Hydro and Pelzer Hydro, the current co-applicants, filed a revised Sediment Flushing Plan to supplement the previous filing. The Commission's May 30, 1990, Order approved both filings. *See* 51 FERC ¶ 62,193 (1990).

[31] The final license applications for the Upper Pelzer and Lower Pelzer Projects interchangeably refer to the Sediment Flushing Plan as the "Sedimentation Plan." For consistency, we refer to the 1990 plan as the "Sediment Flushing Plan."

[32] The 1990 Sediment Flushing Plan states that the co-applicants were to flush the Upper and Lower Pelzer impoundments in 1989 for the installation of sediment accumulation gages throughout the impoundments to quantify the volume of sediment accumulated over time. The co-applicants were then to flush the impoundments in 1991 with records of accumulation obtained from the gages to determine an appropriate frequency for future drawdowns and flushing events at each project. Because installation of the sediment accumulation gages did not occur at either of the projects, we assume the co-applicants propose to continue implementing the original sediment release intervals approved in the 1988 Sedimentation Release Plan of once every 5 and 10 years at the Upper and Lower Pelzer Projects, respectively.

4) flush the impoundments when flows are equal to or greater than the MADF of 783 cfs, or establish a lower inflow guideline after a flushing event has taken place, if that flow exceeds the flow at which the impoundments can be flushed without major operational problems;
5) during impoundment refill after sediment flushing, maintain an instream flow of 20 percent of the MADF of 783 cfs in November, 30 percent for December, and 40 percent for January and February, or at a rate equal to inflow, if inflow is less than these monthly amounts, into the Saluda River downstream of the projects' tailraces;
6) work with resource agencies[33] to monitor dissolved oxygen (DO) downstream of the projects and maintain the DO level at a daily average of 5.0 mg/L during sediment flushing;
7) notify resource agencies at least 14 days prior to scheduled drawdowns or sediment flushing, and coordinate the events with the resource agencies and downstream residents that may be affected. All specified agencies would be given the opportunity to be present during the drawdown, flushing, or dredging operation, and may stop the process if they believe the quantity of sediment released poses a problem to the downstream environment;
8) immediately provide a written notice in the event of an emergency or unscheduled drawdown or sediment flushing, explaining the cause, the time it occurred, the duration of flushing, an estimate of the amount of sediment released, and any observed impact downstream; and
9) conduct other methods of sediment removal, such as hydraulic dredging, in the event that flushing cannot be accomplished without detrimental impacts on the downstream environment. In consultation with resource agencies, formulate a dredging plan, determine critical water quality conditions which would temporarily halt dredging, and monitor water quality to ensure DO concentrations and turbidity levels do not negatively impact fishery resources.

According to the co-applicants, sediment management activities at the Upper and Lower Pelzer Projects under the Sediment Flushing Plan have been infrequent over the last 30 years due to resource agency concerns regarding the impact of sediment releases on DO and turbidity downstream of the projects. Since 1991, there have only been two sediment flushing events at the Upper Pelzer Project; one in 1998, and the other in 2006. However, no data on the volume of sediment released, or water quality conditions, was

[33] Specified resource agencies include South Carolina DHEC, FWS, and South Carolina Wildlife and Marine Resources Department.

collected during either event. No alternative sediment management methods, such as dredging, have been employed at the project during the current license term.

2.1.4.3 Lower Pelzer Project

Run-of-River Operation

The co-applicants operate the Lower Pelzer Project in a run-of-river mode by maintaining the impoundment surface elevation at or above 694 feet, which is designed to minimize fluctuations of the impoundment and ensure continuous release of the 140-cfs minimum flow, or inflow, whichever is less, from the Lower Pelzer Dam. The co-applicants release the 140-cfs continuous minimum flow to protect and maintain the aquatic habitat and water quality conditions in the 600-foot long bypassed reach.

Recreation

The co-applicants provide public access to one existing project recreation facility, the Lower Pelzer fishing access station. The Lower Pelzer fishing access station includes a gravel parking area, barrier-free access, and fishing benches, and is maintained by the co-applicants.

Sediment Management

As noted above, a Sediment Flushing Plan is required under Article 401 of the current Lower Pelzer Project license, and is intended to minimize the effects of sediment releases associated with project maintenance and repair. The plan states that the co-applicants must monitor and manage sediment accumulation in the Lower Pelzer impoundment via sediment accumulation gages, and outlines standard operating procedures, the frequency of drawdowns and flushing events, dredging criteria, and notification procedures for all flushing events. However, since 1991 there have been no planned or non-emergency sediment flushing, or other forms of active sediment management, at the project. The rate and volume of sediment accumulation within the Lower Pelzer impoundment, both current and historic, is unknown.[34]

[34] In an additional information request issued March 22, 2017, staff requested a detailed description of the current Sediment Flushing Plan and how it has been implemented over the course of the current license at the Lower Pelzer Project, as well as more information on the volume and rate of sediment accumulation within the project impoundment. In their response filed June 20, 2017, the co-applicants stated that they have not conducted any non-emergency sediment flushing events, and no sediment accumulation measurements have been taken in the impoundment.

2.2 APPLICANTS' PROPOSALS

2.2.1 Proposed Project Facilities

Piedmont Project

As part of the development of a Sediment Management Plan, Aquenergy proposes to rehabilitate one of the two inoperable sluice gates in the east non-overflow section of the dam to pass sediment from the impoundment, if necessary. Aquenergy also proposes to develop new canoe portage facilities.

Upper Pelzer Project

The co-applicants propose to install a new weir on the spillway crest to release the proposed 15-cfs minimum flow into the bypassed reach.[35] As part of a proposed new Sediment Flushing Plan, the co-applicants propose to rehabilitate the inoperable sluice gate in the east non-overflow section of the dam to pass sediment from the impoundment, if necessary. The co-applicants also propose to develop new canoe portage facilities at the project.

Lower Pelzer Project

The co-applicants propose to remove a 3-mile-long, 3,300-volt overhead transmission line, which is no longer in use, from the project boundary. Instead, the project now uses a 165-foot-long, 3,300-volt transmission line that interconnects with the grid at an applicant-owned transformer. The co-applicants also propose to develop new canoe portage facilities at the project.

2.2.2 Proposed Project Operation

Piedmont Project

Aquenergy proposes no changes to project operation.

Upper Pelzer Project

The co-applicants propose no changes to project operation.

[35] In an AIR correspondence filed November 14, 2017, the co-applicants clarify that a new surface weir would be constructed on the spillway crest to provide the proposed 15-cfs minimum flow.

Lower Pelzer Project

The co-applicants propose no changes to project operation.

2.2.3 Proposed Environmental Measures

The applicants propose the following measures to protect or enhance environmental resources at each of the projects:

Piedmont Project

- Continue to release a continuous minimum flow of 15 cfs or inflow, whichever is less, from the dam to protect aquatic habitat and water quality conditions in the 180-foot-long, 475-foot-wide bypassed reach;

- Develop a Sediment Management Plan to flush sediment on a regular basis to reduce accumulation behind the dam, such that during unplanned or emergency releases there would be less of a sediment build-up subject to such unplanned releases. The proposed plan includes the following provisions:[36]

    1) conduct bathymetric surveys in the area immediately upstream of the dam before and after each sediment flushing event to document sediment flushing volumes, monitor accumulation, and estimate sediment movement;
    2) schedule planned sediment flushing events for a one-day duration during the November through February timeframe, annually, for 3 years;
    3) flush sediment when: (a) flows are greater than or equal to the mean annual daily flow (MADF) of 783 cfs, or establish a lower inflow guideline if that flow exceeds the flow at which the impoundment can be flushed without major operational problems, and (b) DO levels, as measured downstream, exceed 6.0 milligrams per liter (mg/L) on a daily average basis;
    4) minimize drawdown of the impoundment during sediment flushing operations;
    5) use one or both of the two operable low-level sluice gates located in the canal wall, or rehabilitate one of the two inoperable sluice gates in the east non-overflow section of the dam, to flush sediment. The sluice gate(s) would be fully opened to flush sediment, and all remaining inflow would be passed through the turbine-generator unit in automatic

[36] *See* AIR response filed June 20, 2017.

pond level control mode to avoid significant drawdown of the impoundment;

6) monitor DO and turbidity upstream and downstream of the project during the flushing event, as well as 24 hours before, and 24 hours after, the event. Collect water quality data using continuous monitoring equipment and submit the data to the resource agencies within 30 days of the conclusion of the flushing event. Visually survey the upstream and downstream areas for any environmental impacts, including stressed or dying fish, conditions permitting;
7) avoid sediment flushing during fish spawning season;
8) consult with South Carolina DNR, FWS, and South Carolina DHEC at least 3 days prior to each sediment flushing event, with a follow-up notice 24 hours prior to commencing sediment flushing;
9) in the event of an unscheduled impoundment drawdown or flushing event, contact resource agencies prior to raising any sluice gates if possible, or as soon as possible after raising the gate. File a written report detailing the time, duration, and cause of the emergency, as well as an estimate of the sediment released and any observed impacts on the downstream environment; and
10) following three annual releases during which flows, water quality conditions, and sediment movement is documented, consult with resource agencies to review the results and determine effectiveness of the releases, as well as a process for future implementation of the plan.

- Limit tree removal associated with the construction and maintenance of the proposed canoe portage at the project to November 1 through March 31, to minimize adverse effects to northern long-eared bats during the pup season and the broader active season;[37] and

- Develop a recreation management plan (RMP) with input from stakeholders to describe existing recreation use and facilities, plans, and costs for proposed facilities and maintenance protocols for the facilities.

Upper Pelzer Project

- Continue to implement the current Sediment Flushing Plan and, after a new license is issued, consult with resource agencies to review and update the plan, as necessary.

[37] *See* AIR response filed June 20, 2017.

- Release a continuous minimum flow of 15 cfs, or inflow, whichever is less, from the dam to maintain aquatic habitat and water quality conditions in the 115-foot-long, 340-foot-wide upper bypassed reach between the dam and the upper powerhouse tailrace. Provide the proposed minimum flow via a new weir to be constructed on the spillway crest adjacent to the left dam abutment;

- Limit tree removal associated with the construction and maintenance of the proposed canoe portage at the project to November 1 through March 31, to minimize adverse effects to northern long-eared bats during the pup season and the broader active season;[38]

- Develop a RMP with input from stakeholders to describe existing recreation use and facilities, plans, and costs for proposed facilities and maintenance protocols for the facilities; and

- Continue to provide public access and maintain existing recreation facilities, including the Upper Pelzer fishing area.

Lower Pelzer Project

- Continue to release a continuous minimum flow of 140 cfs, or inflow, whichever is less, from the dam to maintain aquatic habitat and water quality conditions in the 600-foot-long bypassed reach;

- Continue to implement the current Sediment Flushing Plan and, after a new license is issued, consult with resource agencies to review and update the plan, as necessary.

- Limit tree removal associated with the construction and maintenance of the proposed canoe portage at the project to November 1 through March 31, to minimize adverse effects to northern long-eared bats during the pup season and the broader active season;[39]

- Develop a RMP with input from stakeholders to describe existing recreation use and facilities, plans and costs for proposed facilities, and maintenance protocols for the facilities; and

[38] *See* AIR response filed June 20, 2017.

[39] *See* AIR response filed June 20, 2017.

- Continue to provide public access and maintain existing recreation facilities, including the Lower Pelzer fishing access station.

2.2.4 Proposed Modifications to Project Boundary

Piedmont Project

The current project boundary encloses a total of 55.5 acres, and follows an elevation of 767.2 feet. The project boundary includes 2.1 upland acres and 53.4 acres of water.[40] Aquenergy proposes to add 0.8 acre of land to the project boundary to fully enclose the location of the proposed recreation facilities, which include a new canoe portage route, and put-in and take-out locations.

Upper Pelzer Project

The current project boundary encloses about 62.2 acres and follows an elevation of 719.9 feet. The project boundary includes 5.7 upland acres and 56.4 acres of water.[41] The co-applicants propose to modify the existing boundary to enclose the new recreation facilities. About 2.5 acres would be removed from the project boundary to include only those lands necessary for operation and maintenance of the project. Specifically, land south of the Mill building near the tailrace area, which is not necessary for project operation, would be excluded.

Lower Pelzer Project

The current project boundary encloses about 109.4 acres and follows an elevation of 694 feet. The project boundary includes 10 upland acres and 99.4 acres of water.[42] The co-applicants propose to extend the boundary below the Lower Pelzer Dam by about 4 acres to enclose the project tailrace and bypass channel, and include the new recreation facilities. About 1.5 acres would be removed from the project boundary to include only those lands necessary for operation and maintenance of the project. Specifically, land containing the tailrace and bypassed reach of the Upper Pelzer Project would be excluded to avoid overlapping project boundaries.

In addition, the co-applicants propose to remove the existing 3-mile-long, 3,300-volt overhead transmission line, which is no longer in use, from the project boundary. Instead, the project uses a 165-foot-long, 3,300-volt transmission line which

[40] *See* email memorandum issued January 2, 2019.

[41] *See* email memorandum issued January 2, 2019.

[42] ibid.

interconnects with the grid at an applicant-owned transformer, and is enclosed by the current boundary.

2.3 MODIFICATIONS TO APPLICANTS' PROPOSALS – MANDATORY CONDITIONS

The following mandatory conditions have been provided for the project.

Water Quality Certification Conditions

Piedmont Project

South Carolina DHEC's certification for the Piedmont Project requires 4 conditions (*see* Appendix A) and includes the measures proposed by Aquenergy. Condition 1 is administrative in nature and not analyzed in this EA.

Upper Pelzer Project

South Carolina DHEC's certification for the Upper Pelzer Project requires 5 conditions (*see* Appendix B) and includes most of the measures proposed by the co-applicants. Certification condition 4 requires a bypassed flow monitoring plan, which is not part of the co-applicants' proposal. Condition 1 is administrative in nature and not analyzed in this EA.

Lower Pelzer Project

South Carolina DHEC's certification for the Lower Pelzer Project requires 4 conditions (*see* Appendix C) and includes the measures proposed by the co-applicants. Condition 1 is administrative in nature and not analyzed in this EA.

2.4 STAFF ALTERNATIVE

Under the staff alternative, the projects would be operated as proposed by the applicants, with the modifications and additional measures described below, as well as the 401 Certification conditions for the Piedmont, Upper Pelzer, and Lower Pelzer Projects.

The staff alternative for the projects includes modifications and additions to the applicants' proposed measures as follows. Unless otherwise noted, each measure applies to all three projects:

- Modify the proposed Sediment Management Plan for the Piedmont Project to:
    1) conduct baseline bathymetric mapping of the impoundment within 1 year of receiving a subsequent license to inform the development of the Sediment Management Plan. Include a report of the bathymetric mapping results with the Sediment Management Plan filed with the Commission for approval;
    2) conduct sediment contaminant testing and sediment composition and particle size sampling within 1 year of receiving a subsequent license to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment, and to characterize the composition of impounded sediment. Use the results from the contaminant testing and sediment sampling to guide the development of the Sediment Management Plan, and include a report of the results with the Sediment Management Plan filed with the Commission for approval;
    3) document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consult with resource agencies if any adverse effects to wetland vegetation are observed;
    4) if dredging occurs under the Sediment Management Plan, include general provisions in the Sediment Management Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period; and
    5) file an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results.

- Update the Sediment Flushing Plan for the Upper and Lower Pelzer Projects to:
    1) conduct baseline bathymetric mapping of the impoundments, and within 1 year of license issuance, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the current Sediment Flushing Plan;

2) conduct sediment contaminant testing and sediment composition and particle size sampling to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundments and to characterize the composition of impounded sediment, and within 1 year of license issuance, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the Sediment Flushing Plan;
3) document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consult with resource agencies if any adverse effects to wetland vegetation are observed;
4) if dredging occurs under the Sediment Flushing Plan, include general provisions in the Sediment Flushing Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period; and
5) file an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the projects during the preceding year, including dates and results.

- Develop an Operation Compliance Monitoring Plan to document compliance with the proposed operations described above (i.e., run-of-river mode, maintaining the normal pool elevations as specified, and minimum flows);

- Monitor bypassed reach minimum flows at the Upper Pelzer Project to evaluate the effects of the volume, placement, and delivery of the proposed minimum flow of 15 cfs on aquatic resources and water quality in the upper bypassed reach within the first 3 years after a new license is issued, in consultation with FWS, South Carolina DHEC, and South Carolina DNR; and

- Initiate standard hours for open-gate access to allow for reasonable public access leading into the Lower Pelzer fishing access station.

- Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered as a result of operation or

other project-related activities to avoid, lessen, or mitigate potential adverse effects to unknown historic properties.

Proposed and recommended measures are discussed further under the appropriate resource sections, and are summarized in section 5, *Conclusions and Recommendations*.

Section 10(j) Measures Not Recommended[43]

The staff alternative does not include South Carolina DNR's recommendations to:

- Operate the projects in an instantaneous run-of-river mode for protection of fish and wildlife resources in the Saluda River; and

- Implement practical measures to minimize fluctuations in downstream flows at the Lower Pelzer Project.

Section 10(a) Measures Not Recommended

The staff alternative does not include South Carolina DNR's recommendation to:

- Maintain a forested riparian buffer of at least 25 feet in width along the shorelines of the projects.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to the applicants' proposals, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing non-power licenses; (2) Federal Government takeover of the projects; and (3) retiring the projects.

2.5.1 Issuing a Non-power License

A non-power license is a temporary license that the Commission would terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities described in the non-power license.[44] At this

[43] See section 5.3, *Summary of Section 10(j) Recommendations* for additional details on the recommendations.

[44] Issuing a non-power license is not applicable where section 15 of the FPA has been waived. Because a subsequent license for a minor water power project is not subject to the relicense provisions of section 15 of the FPA, issuing a non-power license

point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license, and we have no basis for concluding that the projects should no longer be used to produce power.

2.5.2 Federal Government Takeover of the Projects

We do not consider federal takeover to be a reasonable alternative. Federal takeover and operation of the Upper Pelzer and Lower Pelzer Projects would require Congressional approval.[45] Although that fact alone would not preclude further consideration of this alternative, there is no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested federal takeover would be appropriate, and no federal agency has expressed an interest in operating the projects.

2.5.3 Retiring the Projects

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing a project in most cases, when appropriate protection, mitigation, and enhancement measures are available.[46] The Commission does not speculate about possible decommissioning measures at the time of relicensing, but rather waits until an applicant actually proposes to decommission a project, or there are serious resource concerns that cannot be addressed with appropriate measures, making decommissioning a reasonable alternative.[47] This is consistent with NEPA and the Commission's obligation

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is not an applicable alternative to Aquenergy's proposal for the Piedmont Project. *See* 18 C.F.R. § 16(2)(d), and *Wisconsin Electric Power Co*., 62 FERC ¶ 61,064 (1993).

[45] Federal takeover is not applicable where section 14 of the FPA has been waived. Because a subsequent license for a minor water power project is not subject to the relicense provisions of section 14 of the FPA, federal takeover is not an applicable alternative to Aquenergy's proposal for the Piedmont Project. *See* 18 C.F.R. § 16(2)(d), and *Wisconsin Electric Power Co*., 62 FERC ¶ 61,064 (1993).

[46] *See, e.g.*, *Eagle Crest Energy Co.*, 153 FERC ¶ 61,058, at P 67 (2015); *Public Utility District No. 1 of Pend Oreille County*, 112 FERC ¶ 61,055, at P 82 (2005); *Midwest Hydro, Inc.*, 111 FERC ¶ 61,327, at PP 35-38 (2005).

[47] *See generally Project Decommissioning at Relicensing; Policy Statement*, FERC Stats. & Regs., Regulations Preambles (1991-1996), ¶ 31,011 (1994); *see also City of Tacoma, Washington*, 110 FERC ¶ 61,140 (2005) (finding that unless and until the Commission has a specific decommissioning proposal, any further environmental analysis of the effects of project decommissioning would be both premature and speculative).

under section 10(a) of the FPA to issue licenses that balance developmental and environmental interests.

Project retirement could be accomplished with or without removal of the dams.[48] Either alternative would involve denial of the license applications and surrender or termination of the existing licenses with appropriate conditions.

No participant has recommended retirement of the projects, and we have no basis for recommending it. The projects are a source of clean, renewable energy. These sources of power would be lost if the projects were retired, and replacement power would need to be found. There also could be significant costs associated with retiring the projects' powerhouse and appurtenant facilities.

Project retirement without dam removal would involve retaining the dams and disabling or removing equipment used to generate power. Certain project works would remain in place and could be used for historic or other purposes. This approach would require the state of South Carolina to assume regulatory control and supervision of the remaining facilities. However, no participant has advocated this alternative, nor do we have any basis for recommending it. Removing the dams would be more costly than retiring them in place, and removal could have substantial, negative environmental effects.

[48] In the unlikely event that the Commission denies relicensing a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2 (2018). This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Our conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.[49]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Piedmont, Upper Pelzer, and Lower Pelzer Projects are located on the main stem of the Saluda River in the northwest portion of the state of South Carolina. The Saluda River originates in the Blue Ridge Mountains in northwestern South Carolina at the confluence of the North, Middle, and South Rivers, northwest of Greenville. The mainstem of the Saluda River flows in a south-easterly direction until it joins the Reedy River at Lake Greenwood. On exiting Lake Greenwood, the Saluda River flows in an easterly direction until converging with the Little Saluda and Bush Rivers at Lake Murray. The Saluda River exits Lake Murray and joins the Broad River at Columbia to form the Congaree River. The Congaree River is a tributary of the Santee River that empties into the Atlantic Ocean.

The Saluda River watershed is a long, narrow basin transecting the Blue Ridge and Piedmont physiographic regions. The drainage areas of the projects, as shown in figure 5, are 387 square miles, 410 square miles, and 411 square miles for the Piedmont, Upper Pelzer, and Lower Pelzer Projects, respectively. The watershed extends southeast to the Fall Line in the central part of South Carolina, covering about 2,505 square miles. With a northwest-southeast orientation, the watershed encompasses parts of 12 South Carolina counties, including most of Greenville, Greenwood, Laurens, Newberry, and Saluda Counties, and smaller parts of Abbeville, Aiken, Anderson, Edgefield, Lexington, Pickens, and Richland Counties (South Carolina DNR, 2009).

Major land use classifications within the watershed include forested land (45 percent), agricultural land (30 percent), and urban land (21 percent). Land use within

[49] Unless noted otherwise, the sources of our information are the license applications (Enel Green Power North America, Inc., 2015a, 2015b, 2015c), and additional information filed by the applicants.

the immediate vicinity of the projects includes forested lands to the east of the Saluda River, urban lands to the west of the river, and forested wetlands along the river banks both upstream and downstream of the projects (South Carolina DNR, 2012). The northern portion of the watershed consists primarily of rural, forested headwaters, while the southern portion includes the western outskirts of the City of Greenville (12 miles northwest of the Piedmont Project), the most heavily urbanized area within the larger Saluda-Reedy watershed.

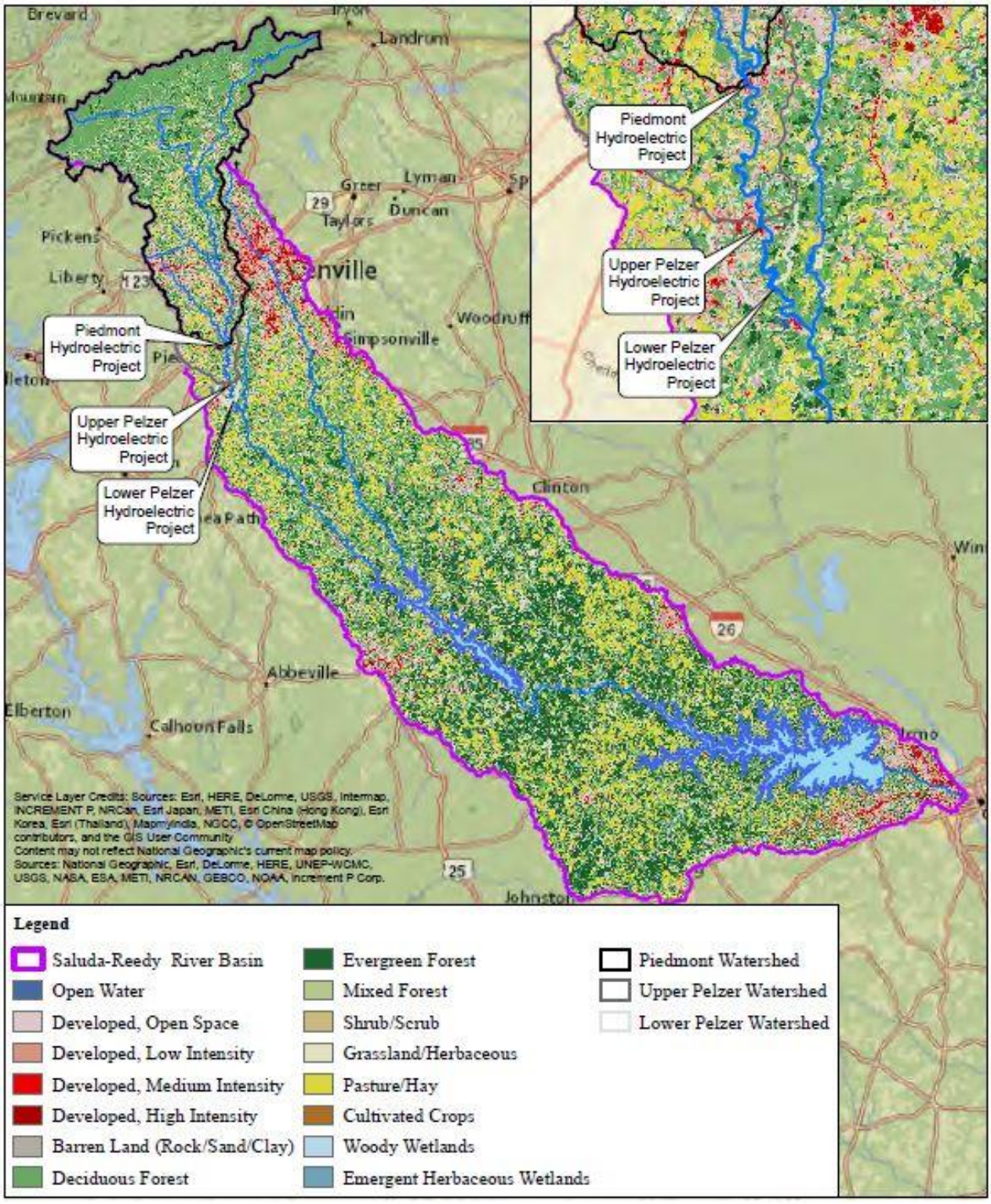

Figure 5. Location and land uses of the Piedmont, Upper Pelzer, and Lower Pelzer drainage areas within the Saluda River watershed, and larger Saluda-Reedy watershed.
(Source: Enel Green Power North America, Inc., 2017, as modified by staff).

The Greenville County regional economy has a significant history of textile manufacturing, and at one point, called itself the "textile capital of the world." However, since the turn of the 21st century, the region has become a corporate headquarters and manufacturing and warehousing center. High-technology and engineering industries also have a strong presence in the area.

The Piedmont, Upper Pelzer and Lower Pelzer Projects are located in Anderson and Greenville Counties, which have mild winters and hot summers. The area is classified as having a humid subtropical climate. The projects, located in the towns of Piedmont, Pelzer, and Williamston, respectively, receive an average of 52 inches of precipitation annually, which is slightly greater than the annual statewide average of 49 inches. The mean annual temperature is 61.9 degrees Fahrenheit (°F). The lowest mean monthly temperature occurs in January (42.1 °F), while the highest mean monthly temperature occurs in July (79.7 °F).

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 C.F.R., § 1508.7), a cumulative effect is the 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 (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license applications, and agency and public comments, we have identified sediment, water quality, water quantity, and fish as resources that could be cumulatively affected by relicensing the Piedmont, Upper Pelzer, and Lower Pelzer Projects.

3.2.1 Geographic Scope

The geographic scope of the cumulative analysis defines the physical limits or boundaries of the proposed action's effect on the resources. We have identified the geographic scope for sediment resources, water quality, water quantity, and fish to be the upper Saluda River sub-basin defined here as that portion of the sub-basin including and upstream of Duke Power Company's (Duke Power) Lee Steam Station, located about 1 river mile downstream of the Lower Pelzer Project.

We chose this geographic scope because the collective operation and maintenance of the projects, in combination with other developmental and non-developmental uses of the upper Saluda River sub-basin, has the potential to cumulatively affect sediment resources, aquatic habitat and water quality, and water quantity in the Saluda River.

3.2.2 Temporal Scope

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on water quality, water quantity, and sediment resources. Based on the potential new license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. We have determined that geology and soils, aquatic, terrestrial, threatened and endangered species, recreation, and cultural resources may be affected by the proposed action and action alternatives. We have not identified any substantive issues related to aesthetics and socioeconomics associated with the proposed action; therefore, we do not assess environmental effects on aesthetics and socioeconomics in the EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.1 Geological and Soil Resources

3.3.1.1 Affected Environment

Topography

The Piedmont, Upper Pelzer, and Lower Pelzer Projects are located in the Piedmont physiographic region, specifically within the Southern Outer Piedmont sub-region. Topography surrounding the projects is characterized by gently rolling to hilly terrain with narrow stream valleys (Griffith, 2008). Elevations range from 375 feet to 1,000 feet.

Geology

Bedrock in the Piedmont region of South Carolina is predominantly light gray to black biotite gneiss of moderate hardness. The biotite gneiss is highly eroded at the

surface and grade because of moderate weathering with depth of penetration (Pelzer Hydro Co., 2011).

Bedrock geology within the project areas is characterized by relatively shallow, metamorphosed gneiss and schists with some intrusions of magmatic formations. The Piedmont Project is primarily underlain by granitic gneiss, the Upper Pelzer Project by schist with small pockets of granitic gneiss in the northwest corner of the project boundary, and the Lower Pelzer Project by schist.

Soils

Surficial materials within the sub-basin consist of deep saprolite[50] underneath red, clayey subsoils. Predominant soils are of two groups. One group, derived from the metamorphic gneisses and schists, is composed of deep, red clay soils that drain well and are more acidic. The other group, derived from the igneous intrusions, is composed of dark, grayish-brown soils that are moderately well-drained and more alkaline in pH.

Soils in the vicinity of the projects range from sandy loams to fine, coarse loamy and complex soils, and vary from gently sloping to moderately sloping. The erodibility factor, or K-factor, for soils within the project boundaries range from 0.22 to 0.43, reflecting low to moderate erodibility.[51]

Sediment Quantity

Excess sedimentation is an ongoing concern for the Saluda River watershed due to rapid development of the surrounding lands. The river is turbid and carries a heavy sediment load from historic and current conversion of forested land to agricultural, industrial, commercial, and residential uses. As in other rivers of the southeast, a very large volume of sediment has accumulated in the valleys of the Saluda as a result of run-off from development (Trimble, 2008). The existing sediment load is regularly resuspended and redeposited by storms of various sizes and must pass through, or be trapped in, the impoundments.

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[50] A decomposed, porous rock formed by chemical weathering of igneous, metamorphic, or sedimentary rocks.

[51] The soil erodibility factor, or K-factor, represents the susceptibility of soil to erosion and the rate of runoff. Values of K range from the lowest erodibility, 0.02, to the highest, 0.69. A higher K value equates to a greater susceptibility of the soil to erosive forces.

Sediment Quality

Sediments that have accumulated within the impoundments for a significant length of time may contain contaminants from current and historic discharges upstream of the projects. While there is no quantitative data on the concentrations of contaminants within the impoundments, the range of potential contaminants within the sub-basin is well documented.[52] The applicants identified several facilities within the sub-basin that are currently permitted to discharge into the Saluda River, including several NPDES, Comprehensive Environmental Response, and Compensation and Liability Act (CERCLA or Superfund) facilities, and brownfield sites.[53]

Upstream of the Piedmont Project are two wastewater treatment plants (WWTP) that are permitted to discharge low concentrations of metal, including copper and copper compounds to the Brushy Creek tributary,[54] and copper, zinc, and associated compounds to the Saluda River. With respect to non-point source pollution, the Piedmont Project is located about 13 miles southwest of the city of Greenville, South Carolina, among the most urbanized areas in the region. Metropolitan areas introduce the potential for non-point source run-off from residential, commercial, and industrial uses. Portions of the Piedmont Project's drainage basin include the western outskirts of the city, and

[52] On February 5, 2016, FWS filed comments in response to the Upper Pelzer and Lower Pelzer license applications, requesting a study of contaminants in the impoundments. On January 29, 2016, and February 18, 2016, South Carolina DNR filed comments in response to the license application for Upper Pelzer and the Piedmont Project, respectively, requesting a sediment study for heavy metals and other contaminants prior to future sediment releases. On March 22, 2017, staff issued a letter requiring a qualitative assessment of the contaminants likely to be present in the impoundments. On June 20, 2017, the applicants filed a qualitative assessment of contaminants in the impoundments, including current and historic surface water dischargers near the Piedmont, Upper Pelzer, and Lower Pelzer Projects.

[53] A brownfield is a site with a history of hazardous waste contamination, which can be assessed for environmental impact, cleaned up, and remediated for sustainable redevelopment and reuse.

[54] The Big Brushy Creek tributary, backwatered by the Piedmont Project, is located about one-half mile upstream from the project. South Carolina DHEC developed, and EPA approved, a TMDL for Big Brushy Creek for fecal coliform bacteria, which reduced fecal coliform by 52 percent to meet the recreational use standard. Possible fecal coliform sources are leaking sanitary sewers, sanitary sewer overflows, urban runoff, agricultural activities, and wildlife (South Carolina DHEC, 2011).

commercial and residential development in Anderson and Greenville Counties. A reach of the river, extending from about 8 miles upstream of the Piedmont Project, to the confluence of the Saluda and Reedy Rivers at Lake Greenwood, is the focus of an annual grant from the EPA to reduce non-point source pollution (Enel Green North America, Inc., 2017). The presence of contaminants is directly linked to land conversion toward urbanization (Fitzpatrick *et al*., 2007).

Within 1 mile of the Upper Pelzer Project, the former Pelzer Mills Complex contains three brownfield sites, including: the Pelzer Mills Targeted Brownfield Assessment (TBA)[55] site; the Upper Pelzer Mill; and the Lower Pelzer Mill. The Pelzer Mills TBA site contained the Pelzer Mill Dump, an industrial dump site that stored industrial waste about 100 to 325 feet from the Saluda River. In 2015, a cleanup grant was awarded to the Pelzer Heritage Commission for cleaning up the eastern (16.8-acre) and western (11.8-acre) portions of the former Pelzer Mill Dump. Soil in the vicinity of Pelzer Mills TBA site exceeds EPA Region 4 screening residential soil levels for metals (arsenic, copper, iron, lead, and metallic debris), polycyclic aromatic hydrocarbons (PAHs),[56] and semi-volatile organic carbons.

The historic Lower Pelzer Mill is located immediately adjacent to, and below, the Upper Pelzer Project, about 2.5 miles upstream of the Lower Pelzer Project. Although not on the National Priority List, the site is considered both a superfund and a brownfield site, and the only potential source of sediment contamination situated between the Upper Pelzer and Lower Pelzer Projects. Potential soil contaminants associated within the Lower Pelzer Mill include metals such as arsenic and semi-volatile organic compounds.

Impounded sediment likely has been exposed to chemicals of concern, including trace metals, PAHs, poly-chlorinated biphenyls (PCBs),[57] and pesticides[58] from point and non-point sources. Some, if not all, of these pollutants may be detected in impounded

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[55] TBA is an EPA grant program that helps states, tribes, and municipalities with cleanup and redevelopment of brownfields. The Town of Pelzer was selected for a TBA grant in 2010.

[56] PAHs are a group of more than 100 chemicals that occur naturally in coal, crude oil, and gasoline and also are produced when coal, oil, gas, wood, garbage, and tobacco are burned. The effects of exposure to low levels of PAHs are unknown, but several PAHs and some mixtures of PAHs are considered to be carcinogens (CDC, 2009).

[57] Organic chlorinated compounds used in industrial and commercial processes, which are classified as persistent organic pollutants.

[58] *See* AIR response filed June 20, 2017.

sediment. However, sediment testing has not been conducted at the projects. Therefore, detailed estimates of the quantity and bioavailability of the contaminants do not exist.

3.3.1.2 Environmental Effects

Effects of Project Operation on Sediment Erosion and Transport

Operation of hydropower projects has the potential to affect erosion and sediment transport in a river system. The resulting sediment erosion and deposition can have adverse effects on aquatic habitat and organisms, hydropower operations, and other project uses. In some circumstances, erosion upstream and downstream of hydropower dams can be increased during impoundment drawdown and refill. Additionally, at hydropower projects the potential exists for high flows to mobilize sediment previously accumulated behind the dams, contributing to high turbidity and sediment deposition downstream.

Run-of-River Operation

The applicants propose to continue to operate the projects in a run-of-river mode, using automatic pond level control, where outflow from the projects would approximate inflow.

Water quality certification condition 2 for the Piedmont, Upper Pelzer, and Lower Pelzer Projects states that the projects must continue to operate as run-of-river facilities. In comments filed on January 11, 2018, in response to the REA notices issued November 16, 2017, South Carolina DNR recommends that the projects operate in an instantaneous run-of-river mode, such that outflow from the projects be released to match inflow, and thus avoid or minimize fluctuations of the impoundments and downstream flows that could be caused by project operation.

Our Analysis

Run-of-river operation[59] uses the river's natural flow regime and minimizes fluctuations of the impoundment elevation and alteration of downstream flows. Without frequent, significant drawdowns, the water level is generally close to the elevation of the vegetation, bare soil is rarely exposed, and flow released downstream is steady. These characteristics make run-of river operation unlikely to cause substantial erosion.

Additionally, the three projects are not particularly vulnerable to shoreline erosion by nature of the local soils and vegetation. The soil series found within the sub-basin are generally well-drained, and underlain by clayey subsoils. The K-factors, or measure of

[59] See section 3.3.2.2, *Environmental Effects, Run-of-river Operation.*

susceptibility of soil to erosion, are low to moderate across the soil series found within the project boundaries. Water depths in most areas of the impoundments range from 4 feet to 20 feet. The shallow areas of the impoundments have been colonized by emergent vegetation, including emergent wetlands. Emergent wetlands dissipate wave action, stabilize the shoreline, and prevent erosion.

Sediment Management

As sediment is transported through the Saluda River system as a function of the river's natural flow, dams may impede movement and allow accumulation of sediment behind project structures. At times, hydropower dam operators may remove or flush[60] sediment from behind project structures to maintain the utility of project facilities and operations. However, certain sediment management practices have the potential to affect aquatic species and habitat downstream of a hydropower project by increasing turbidity and siltation, and mobilizing buried contaminants. These effects can result in habitat degradation and death for aquatic organisms.

The current licenses for the Upper and Lower Pelzer Projects require the co-applicants to manage sediment at the projects pursuant to a Sediment Flushing Plan. The requirements of the plan are detailed in section 2.1.4, *Current Environmental Measures.* The co-applicants propose to continue to implement the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects. However, as noted above in section 2.1.4, sediment management activities at the Upper and Lower Pelzer Projects under the current Sediment Flushing Plan have been infrequent over the last 30 years due to resource agency concerns regarding the impact of sediment releases on DO concentrations and turbidity levels downstream of the projects. Therefore, the co-applicants also propose to consult with the resource agencies after new licenses are issued to determine whether or not revisions to the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects are necessary.

The current license for the Piedmont Project does not require implementation of a sediment management plan. However, as a condition of a subsequent license for the project, Aquenergy proposes to develop a Sediment Management Plan in consultation with resource agencies. The proposed provisions for the plan are detailed in section 2.2.3, *Proposed Environmental Measures.*[61]

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[60] Flushing is the discharge of deposited sediment from an impoundment through the use of low-level outlets, such as sluice gates, in the dam.

[61] The final license application filed on December 30, 2015, did not provide details for the proposed Sediment Management Plan. However, Aquenergy filed the noted draft provisions for the plan in an AIR response on June 20, 2017.

Condition 4 of the Piedmont Project's water quality certification states that Aquenergy must develop a Sediment Management Plan in consultation with the resource agencies after a subsequent license is issued. Consistent with the co-applicants' proposals for the Upper and Lower Pelzer Projects, certification condition 5 for the Upper Pelzer Project and certification condition 4 for the Lower Pelzer Project state that the projects must continue to implement the current Sediment Flushing Plan and, after any new licenses are issued, review and update the plan in consultation with resource agencies, if necessary.

South Carolina DNR states that it agrees[62] with the applicants' proposals and recommends that all of the plans for the projects include provisions to avoid or minimize the unintended release of sediments during scheduled maintenance activities or during emergency events where possible, and use dredging where needed to reduce the risk of a large downstream sediment release.

Our Analysis

Generally, the accumulation of sediment in the impoundments does not appear to be affecting the projects' operations or other uses of the impoundments, such as recreation. Also, the projects have passed all historical flood flows under existing operations, which require the applicants to pass the maximum hydraulic flow through the turbine units and pass the remaining inflow over the flashboard-regulated spillways. However, due in part to the large sediment load in the system, the risk of unintended sediment release particularly during emergencies, and the possibility of future impoundment capacity reductions due to sediment accumulation, there is a need for sedimentation plans for all three projects.

The proposed intentional flushing of sediment at all three projects could adversely affect aquatic resources if not carried out properly. Intentional flushing could fill the downstream habitat with sediment, exacerbate turbidity, or, possibly, introduce contaminants to the areas below the dams.

It would be prudent to establish a baseline of impounded sediment characteristics at each project prior to consulting with resource agencies on the need for any revisions to the Sediment Flushing Plan for the Upper and Lower Pelzer Projects, and developing the Sediment Management Plan for the Piedmont Project. A baseline bathymetric survey of each impoundment would be useful to identify the volume and distribution of sediment deposition upstream of each dam. Data from the surveys could be used to inform the applicants' approach to sediment management and an appropriate flushing interval, which Aquenergy assumes is once every year for three years at the Piedmont Project, and is currently once every 5 and 10 years at the Upper and Lower Pelzer Projects,

[62] Letters filed on January 11, 2018.

respectively. Additional bathymetric surveys before and after each sediment management event, as proposed by Aquenergy for the Piedmont Project, would help monitor and identify trends in sedimentation, the net change in the volume of sediment in each impoundment, and areas of accumulation.

Also, baseline sediment composition and particle-size sampling would allow the applicants to characterize the exact type and size of impounded substrates. Although substrates in the Saluda River typically consist of silt, sand, and clay, the exact composition and grain sizes of impounded sediments has not been identified. Sediment composition and particle size sampling would be helpful in understanding the flow volumes needed to transport sediment from the impoundments and into the downstream reaches.

Further, impounded sediments could potentially contain hazardous levels of heavy metals and other contaminants. As discussed above in section 3.3.1.1, *Sediment Quality,* the applicants' qualitative assessment identified a number of both current and historic point-and non-point sources of pollutant discharge upstream of the projects. It listed a range of potential contaminants, including heavy metals, arsenic, and PCBs that could be present. If the impounded sediments are contaminated, the volume of transport of those contaminants could be influenced by sediment management operations. Flushing the impoundments may re-suspend and transport sediment-bound contaminants downstream and adversely affect water quality and habitat. Testing the impoundments to assess the volume and toxicity of sediment-bound contaminants prior to revising the Sediment Flushing Plan for the Upper and Lower Pelzer Projects and developing the Sediment Management Plan for the Piedmont Project would help inform such determinations as the appropriate sediment load that could be discharged during each event without deleterious effects on the downstream environment, and the flush flow needed to transport the contaminants with an adequate level of dilution.

The current Sediment Flushing Plan for the Upper and Lower Pelzer Projects contemplates dredging to be used in place of sediment flushing under certain circumstances. The specifics of dredging options have not been defined. However if dredging operations are implemented under the revised Sediment Flushing Plan for the Upper and Lower Pelzer Projects and the Sediment Management Plan for the Piedmont Project, best management practices could be employed during dredging for the protection of aquatic resources, such as installing turbidity curtains to minimize increases in turbidity downstream. Dredging would remove sediment from the river system rather than transport it downstream, or to the next impoundment, which would prevent the formation of sediment slugs,[63] and minimize the potential of re-suspending contaminants

[63] A large sediment deposition generated by a disequilibrium in the fluvial sediment supply rate and transport capacity.

from the sediment into the environment downstream. There may also be efficiencies in combining both dredging and flushing for an optimal sediment management strategy.

Though large-scale hydraulic dredging could be cost prohibitive, with limited information available on the methods, risks, and benefits of both dredging and flushing of sediment, it is possible that dredging, in some form, or in combination with flushing, could be a viable tool for addressing impoundment sedimentation.

To assist Commission staff with its compliance oversight responsibilities, any plan for sediment management at the projects should contain a detailed implementation schedule for all of the plans' monitoring and sediment management provisions along with a provision to file an annual report summarizing all of the sediment management activities that occurred under the plan during the year.

3.3.1.3 Cumulative Effects on Sediment Resources

Volume of Sediment

For the Piedmont, Upper Pelzer, and Lower Pelzer Projects, shoreline erosion in the impoundments is limited, therefore the volume of sediment added to the Saluda River system by the projects would not contribute to cumulative effects in the river.

The projects' normal operating conditions do not appear to directly contribute to sediment loading. The primary sources of sedimentation are identified as erosion and runoff from rapid, non-project development along the upstream reaches of the river. The river's heavy sediment load, from historic and ongoing upland conversion for agricultural, industrial, residential, and commercial uses, has the potential to cumulatively affect sedimentation within the impoundments over the term of a license.

Sediment Transport

The river is expected to continue carrying a high sediment load. Sediment within the river system consists primarily of fine-grained particles, and likely contains sediment-bound contaminants originating from point source discharges, discussed above in section 3.3.1.1, *Sediment Quality*. Sediment accumulation patterns, including the rate and volume of aggradation, have not been documented within the impoundments.

The applicants' proposals for sediment management would involve regular flushing of an unquantified volume of sediment from the project impoundments. Regular sediment flushing could reduce the volume of sediment stored within the impoundments, and minimize the volume of sediment transported downstream during routine and emergency drawdown events. However, sediment flushing could also contribute to a significant cumulative effect on the downstream aquatic environment. The release of a large volume of sediment can increase turbidity in riverine habitats, leading to reduced

light penetration and decreased primary productivity (i.e., plant and algae growth), which could adversely affect the rest of the food chain. Sedimentation can also modify the morphology of the stream channel, reducing habitat availability and smothering aquatic biota (Wood and Armitage, 1997).

The applicants propose to flush each impoundment on a different interval. In addition, while Aquenergy does not propose an alternative management approach to flushing under the Sediment Management Plan for the Piedmont Project, the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects requires the co-applicants to consider dredging as an alternative sediment removal method. The Piedmont Project is located about 6.5 miles upstream of the Upper Pelzer Project, and about 9 miles upstream of the Lower Pelzer Project. Because the projects are located downstream from one another at relatively short distances, any sediment management approach implemented at the upstream project may interact with project operations and sediment management activities at the downstream projects. Potential effects of sediment flushing, including the transport of sediment-bound contaminants and development of sand bars or sediment slugs below the dams, may be influenced by inconsistent sediment management approaches.

The cumulative effects of sediment removal from the impoundments could be minimized by developing plans that employ complementary methods and frequencies of sediment management at each project. While the plans are not entirely consistent at this time, they do include several common provisions that would minimize the potential for adverse environmental effects. The applicants propose to flush sediment from each impoundment during high flow conditions to avoid significant impoundment drawdowns, and when DO levels downstream exceed levels stipulated by state standards on a daily average basis. During high flows, sediment would be transported longer distances and under greater dilution than during low-flow or normal operating conditions. The plans also include provisions for water quality and sediment monitoring data to be collected during the events for the purpose of identifying any negative impacts associated with the sediment flushing activities. Building on this existing framework, the applicants could resolve any remaining discrepancies, particularly in terms of the management approach and interval, by updating the plans in consultation with resource agencies over time.

Therefore, although sediment flushing has the potential to cumulatively affect downstream habitats and developments, the magnitude and extent of those effects, as well as the most effective sediment management alternative, can be addressed by developing consistent plans informed by the additional information needs discussed above in section 3.3.1.2, *Environmental Effects, Our Analysis*.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity and Use

The impoundments of the Piedmont, Upper Pelzer, and Lower Pelzer Projects are long and narrow, or riverine, in shape. They have steep banks at the upstream ends of the impoundment with the banks becoming flatter and the channels wider at the lower ends of the impoundments. Depth in the impoundments generally range from 5 to 25 feet. The average residence time of water in the impoundments is 5, 4, and 8 hours[64] for the Piedmont, Upper Pelzer, and Lower Pelzer Projects, respectively.

The Piedmont impoundment has a surface area of about 53.4 acres with an estimated gross storage capacity of 248 acre-feet. The impoundment is about 1,500 feet long and extends upstream to the confluence of the Big Brushy River. The width of the impoundment is about 230 feet for most of its length, but widens to 400 feet near the dam.

The Upper Pelzer impoundment has a surface area of about 56.4 acres with a gross storage capacity of 200 acre-feet. The impoundment is about 2 miles long and extends upstream to Allen Shoals. The width of the impoundment is about 160 feet, but widens to 560 feet near the dam.

The Lower Pelzer impoundment has a surface area of about 99 acres with a gross storage capacity of 400 acre-feet. The impoundment is about 2.5 miles long and extends upstream to the Upper Pelzer tailrace. The width of the impoundment is about 270 feet, but widens to 430 feet near the dam.

Table 1 shows the drainage area and estimated mean and maximum annual flow for each project, prorated based on data from the U.S. Geological Survey (USGS) gage no. 02163001 Saluda River near Williamston, South Carolina. Monthly flow statistics prorated for each project are provided in tables 2 and 3. Monthly flows are generally highest from January through April, and lowest in October. Flows exceed the maximum hydraulic capacities for the Piedmont, Upper Pelzer, and Lower Pelzer Projects, (535, 1,200, and 1,408 cfs, respectively) about 46, 16, and 10 percent of the time,

[64] The hydraulic residence time measures the average length of time water is stored in an impoundment (Baxter, 1977; Petts, 1984; Kelly, 2001). At the Piedmont Project, the residence time is calculated as 4.9 hours using 248 acre-feet storage capacity divided by the 612 cfs mean annual flow. At Upper Pelzer and Lower Pelzer, the residence time is 3.7 and 7.5 hours, respectively, using 200 and 400 acre-feet storage capacity, respectively, divided by the 648 cfs mean annual flow.

respectively. Flows exceed the minimum flow required for generation for the Piedmont, Upper Pelzer, and Lower Pelzer Projects (174, 150, and 299 cfs, respectively) about 95, 96, and 83 percent of the time, respectively.

Table 1. Drainage areas and estimated mean and maximum annual flow at Piedmont, Upper Pelzer, and Lower Pelzer, prorated from gage data from October 1, 1996, through September 30, 2017.
(Source: Enel Green Power North America, Inc., 2015a, 2015b, 2015c).

	Piedmont	**Upper Pelzer**	**Lower Pelzer**
Drainage Area (square miles)	387	410	411
Impoundment Surface Elevation (msl)	767.2	719.9	694
Mean Annual Flow (cfs)	612	648	650
Maximum Annual Flow (cfs)	6,134	6,501	6,517
Number of Generating Units	1	3	5

Table 2. Monthly flow data (cfs) for the Piedmont Project from USGS gage no. 02163001 Saluda River near Williamston, SC (Period of Record [POR]: 1996-2017).
(Source: USGS, 2018, as modified by staff).

Month	Minimum	90 Percent Exceedance	75 Percent Exceedance	Mean	25 Percent Exceedance	10 Percent Exceedance	Maximum
January	112	324	413	814	913	1394	6927
February	137	327	408	770	917	1335	6113
March	138	385	472	849	955	1318	8039
April	258	382	471	776	935	1293	3253
May	102	291	355	646	736	1116	5020
June	50	297	317	514	238	875	3851
July	6	118	217	510	493	1083	8712
August	31	104	176	441	479	911	4580
September	45	120	154	425	449	775	10750
October	23	129	185	394	455	668	4908
November	103	144	257	465	553	846	4706
December	83	249	352	736	884	1424	6749

Note: The gage is located about 10.5 miles downstream of the project and has a drainage area of about 387 square miles. Flows were pro-rated to the project using the formula 387/414.

Table 3. Monthly flow data (cfs) for the Upper and Lower Pelzer Projects from USGS gage no. 02163001 Saluda River near Williamston, SC (POR: 1996-2017).
(Source: USGS, 2018, as modified by staff).

Month	Minimum	90 Percent Exceedance	75 Percent Exceedance	Mean	25 Percent Exceedance	10 Percent Exceedance	Maximum
January	119	343	437	863	967	1477	7338
February	146	347	432	816	971	1415	6477
March	147	408	501	900	1012	1396	8517
April	273	405	499	822	990	1369	3446
May	108	308	376	685	780	1182	5318
June	53	314	297	545	252	927	4080
July	6	125	230	541	522	1148	9230
August	33	110	187	467	507	965	4853
September	48	127	163	451	475	821	11389
October	24	136	196	417	482	708	5199
November	110	153	273	495	589	901	5011
December	88	263	373	779	936	1508	7150

Note: The gage is located about 4 miles downstream of Upper Pelzer, and 1 mile downstream from Lower Pelzer, with a drainage area of about 410 and 411 square miles, respectively. Flows were pro-rated to the project using the formula 410/414.

Water Withdrawals and Discharges

The city of Greenville and Duke Power's Lee Steam Station Project withdraw water in the vicinity of the projects. The city of Greenville began diverting water from the Saluda River through two intakes located about 20 miles upstream from the Piedmont Project in 1961, and, based on 2014 estimates, withdraws an average of 1,085 to 1,860 million gallons a month (South Carolina DHEC, 2014). The Lee Steam Station is about 1 mile downstream from the Lower Pelzer Project, and is the sole water withdrawal equal to, or greater than, 3 million gallons per month in the vicinity of the projects.

Currently, there are eight active and one inactive National Pollution Discharge Elimination System (NPDES) industrial discharge permits in the vicinity of the projects in the Saluda River (*see* table 4). There are no active NPDES permits within the Piedmont and Upper Pelzer Projects' boundaries. The Town of Pelzer maintains a NPDES permitted site that is located within the Lower Pelzer Project boundary.

Table 4. Active NPDES discharges on the Saluda River in the vicinity of the Piedmont, Upper Pelzer, and Lower Pelzer Projects.
(Source: Enel Green Power North America, Inc., 2015a, 2015b, 2015c, 2017, as modified by staff)

NPDES Nos.	Permittee	Type	County	Approximate Distance from Project on the Saluda River
SC0048470	Renewable Water Resources / Georges Creek WWTP	Municipal	Greenville	12 miles upstream of Piedmont
SC0039853	Middle Branch WWTP	Municipal	Pickens	7 miles upstream of Piedmont - Middle Branch of the Brushy Creek tributary
SCG73068	Thomas Sand / River Road	Industrial	Anderson	7 miles upstream of Piedmont
SCG0023906	ReWa/ Piedmont	Municipal	Anderson	4 miles upstream of Upper Pelzer
SC0024317	ReWa / Grove Creek WWTP	Municipal	Anderson	6 miles upstream of Upper Pelzer
SC0048470	WCRSA / Piedmont Regional WWTP	Municipal	Greenville	5.5 miles upstream of Upper Pelzer
SC0040797	Town of Pelzer	Municipal	Anderson	1.5 mile upstream Lower Pelzer
SC0002291	Duke Power Company / Lee Steam Station	Industrial	Anderson	1 miles downstream of Lower Pelzer

At the Piedmont Project, there is a continuous minimum flow of 15 cfs, or inflow to the project impoundment, whichever is less, into the bypassed reach. The minimum flow is achieved through an 8-foot wide, 1-foot deep weir on the spillway crest.

There are currently no minimum flow requirements for the Upper Pelzer Project. There is a leakage flow from the dam that is unquantified. The Lower Pelzer Project backs up to the Upper Pelzer Dam, resulting in a partial backwatered effect at the Lower Pelzer Project. Therefore, the reach immediately below the Upper Pelzer Dam is continuously watered.

At the Lower Pelzer Project, there is a continuous minimum flow of 140 cfs, or inflow to the project impoundment, whichever is less, into the bypassed reach. The minimum flow is achieved through a weir in the flashboards on the powerhouse side of the spillway crest, sized to pass 120 cfs, with the remaining flow of 20 cfs passed through a pre-set opening in a low-level sluice gate.

2015 Emergency Drawdown Event at the Lower Pelzer Project

On the evening of June 9, 2015, a flash flood resulted in high water conditions at the Lower Pelzer Project. On June 10, 2015, a utility trip caused all five turbine units to go offline. The co-applicants were unable to close the barrel gate[65] for one of the five units, causing it to go into a runaway condition, in which it could not be stopped or put back on-line. To relieve pressure on the unit and regain control, project personnel restarted the four working turbines and opened the project's low-level sluice gates to lower the impoundment about 5 feet below the flashboard crest, resulting in a partial impoundment drawdown.

Downstream releases from the Lower Pelzer Project during the emergency event, which started on the evening of June 9, 2015, were as high as 1,549 cfs. On June 10, 2015, the peak flow reached a high of 3,455 cfs. By June 11, 2015, the high and low daily flow was 747 cfs and 172 cfs, respectively. The mean inflow during the month of June is 545 cfs and the high flow for the month is about 4,080 cfs (see table 3).

Water Quality

The reach of the Saluda River, upstream- and downstream of the projects, is classified as "freshwaters." South Carolina DHEC defines freshwaters as suitable for primary and secondary contact recreation, and as a source for drinking water supply after conventional treatment (South Carolina DHEC Reg. 61-68, Water Classifications and

[65] The barrel gates control flow to the turbine units by sliding horizontally over an opening in the turbines' casings.

Standards, 2014). South Carolina DHEC considers freshwater classified waters as suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. These waters are also suitable for industrial and agricultural uses.

Table 5. Summary of water quality criteria for freshwaters. (Source: South Carolina DHEC Reg. 61-68, Water Classifications and Standards [June 27, 2014]).

Parameter	**South Carolina Water Quality Standard for Freshwaters**
Temperature	Not to exceed 2.8°C (5°F) above the natural water temperature conditions and not to exceed 32.2°C (90°F) for freshwaters.
Dissolved Oxygen (DO)	Daily average not less than 5.0 mg/L with an instantaneous minimum of 4.0 mg/L.
Turbidity[66]	Not to exceed 50 NTUs provided existing uses are maintained.
pH	Between 6.0 and 8.5.
Note: NTU – Nephelometric Turbidity Units. pH – hydrogen ion concentration	

Section 303(d) of the Clean Water Act requires states to develop a list of impaired waters, which includes those waters where current water quality does not meet numeric criteria in a water quality standard. According to South Carolina DHEC, the stretch of the Saluda River from South Carolina State Road 81, southwest of Greenville and about 9 miles upstream from the Piedmont Project, to state road 4-178, about 3 miles downstream from Lower Pelzer, is impaired by fecal coliform and E. coli bacteria (South Carolina DHEC, 2018). Other sections of the sub-basin are impaired by fecal coliform, alterations to biological (aquatic) communities, pH, DO, and total phosphorous. To address these pollutants, South Carolina DHEC has developed total maximum daily loads (TMDL)[67] for fecal coliform and phosphorus in the sub-basin (Natural Resources Conservation Service, 2010).

In 2002 and 2006, South Carolina DHEC monitored the Saluda River sub-basin in the vicinity of the projects at two locations: 9 miles upstream from the Piedmont Project,

[66] Turbidity is a measure of the collective optical properties of a water sample that cause light to be scattered and absorbed rather than transmitted in straight lines. The higher the concentration of suspended particles, the higher the scattering and absorbance of light, and, thus, the higher the turbidity value of the water sample.

[67] A TMDL is a regulatory term in the U.S. Clean Water Act describing a plan for restoring impaired waters that identifies the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. *See* 40 CFR §130.7; and section 303(d) of the Clean Water Act (33 U.S.C. §1251 *et seq*. (1972)).

and about 2.5 miles downstream from the Lower Pelzer Project. Based on the 2011 results, South Carolina DHEC categorized the upper portion of the sub-basin as fully supporting aquatic life and recreational uses. South Carolina DHEC noted a significant increasing trend in pH, and a significant decreasing trend in turbidity and fecal coliform, suggesting improved conditions for these parameters (South Carolina DHEC, 2011). At the downstream monitoring site, in 2011, South Carolina DHEC categorized the lower sub-basin as fully supporting aquatic life and noted that turbidity significantly decreased, suggesting improved conditions for this parameter. However, conditions had not improved enough to fully support recreational uses. Recreational uses were only partially supported as a result of the high fecal coliform bacteria counts (South Carolina DHEC, 2011).

Water Quality Monitoring

During the late spring through the early fall (June through October) of 2014, the applicants conducted continuous water quality monitoring at the projects for five water quality parameters, including DO, temperature, turbidity, pH, and specific conductance (Gomez and Sullivan, 2015b).

Dissolved Oxygen

DO concentrations up- and downstream from the Piedmont and Upper Pelzer Projects consistently exceeded a daily average of 5.0 mg/L and an instantaneous low of 4.0 mg/L, the minimum required DO levels for this segment of the Saluda River. The average DO concentrations downstream from the two projects ranged from 6.6 mg/L to 10.6 mg/L, and were lowest in early fall and highest in late fall.

The applicants reported that waters downstream from the Lower Pelzer Project failed to meet the required minimum instantaneous DO levels of 4.0 mg/L on three separate days. However, the daily average DO level remained above 5.0 mg/L on those days. The project generation data and the downstream USGS flow monitoring gage indicate that the DO data collected downstream from the Lower Pelzer Project may have been inaccurate on those days,[68] and it is likely that the DO concentrations below the Lower Pelzer Project are similar to those downstream of the Piedmont and Upper Pelzer Projects. Because the impoundments are shallow and the water residence times are short,

[68] The applicants report that the low DO concentration readings were accompanied by atypically identical air and water temperatures, recorded simultaneously, and indicate that the measurement probe was out of the water at the time. Additionally, there is little reason to think that DO would vary dramatically between the projects given the size, run-of-river operation, and relatively short distances between the projects, which would result in short residence times and a lack of stratification within the impoundments.

stratification of the water into temperature zones and the establishment of low oxygens zones is unlikely to occur.

Temperature

Water temperatures for the projects ranged from about 46°F to 81°F with up- and downstream monitoring results relatively consistent at each project. Temperatures during the 2014 study season were lowest in late fall (late October) and highest in late summer (mid-July through early August). The greatest change in temperature corresponded with high flow events, monitored by the upstream USGS gage.[69] These events occurred during the periods from July 19 through July 24, and October 14 through October 18.

Turbidity

Turbidity levels exceeded the maximum level for freshwaters classification of 50 NTU at all three projects, often coinciding with high flow events. Turbidity upstream of the three projects ranged broadly from undetectable to 263 NTU, with an average of about 18 NTU. Downstream turbidity ranged from undetectable to 283 NTU, averaging about 22 NTU.

pH

All pH measurements collected in the late spring and early fall of 2014 were within the range of South Carolina's water quality standard of 6.1 to 7.2.

Biotic Index for Water Quality

Duke Power conducted macroinvertebrate sampling, including an area about 0.3-mile downstream of the Lower Pelzer Project, in the late-fall to the early-summer of 2002 to 2009.[70] The number of taxa[71] collected at the location ranged from 19 to 67 over the course of the sampling period. South Carolina DHEC uses EPT taxa (insect orders

[69] USGS gage No. 02162500, near Greenville, South Carolina, located about 13 miles upstream of the Piedmont Project (USGS, 2019).

[70] Duke Power's 2010 Lee Steam Station 316(a) Demonstration Report analyzed the potential impacts of thermal releases from the Lee Steam Station on benthic macroinvertebrates. The sample location is described as a riffle area with a bedrock bottom and overhanging vegetation. Macroinvertebrate samples were collected along the left ascending bank of the Saluda River.

[71] Taxa is a biological classification or taxonomic group, such as a species, family, or class.

Ephemeroptera, Plecoptera, and Trichoptera) and the North Carolina Biotic indices for analyzing macroinvertebrate data, which take the average pollution tolerance of all organisms collected, based on assigned taxonomic tolerance values (South Carolina DHEC, 2011). The Duke Power study indicated that the number of EPT taxa was highest (22 taxa) in 2007 and lowest (2 taxa) in 2004. The macroinvertebrate community at the sampled site had a water quality rating of "good-fair" for six out of the eight sampling years.

Aquatic Biota

Freshwater Mussels

There are 29 known species of freshwater mussels in South Carolina, 24 of which are reported from the Santee-Cooper River basin that includes the Saluda River basin (Bogan and Alderman 2004, 2008). The Carolina heelsplitter, the one federally listed mussel species known to occur in South Carolina, and the Savannah Lilliput, a federal species of concern, are both present in the Saluda River basin. However, they are not known to occur in the counties where the projects are located (Anderson and Greenville).

In September of 2014, the applicants conducted a habitat assessment and qualitative mussel survey within the impoundments and downstream of the powerhouses at each of the three projects (Gomez and Sullivan, 2015c). A total of nine sites were surveyed. The majority of the habitat surveyed was characterized by impounded water, with depths of 5 to 25 feet, muck substrate, and little or no current. Mussels were generally found at moderate depths, ranging from 4 inches to 4 feet, in flowing water downstream of the projects.

All live mussels collected (118 total) at the nine sites were of a single, common species, Eastern elliptio. About 72 percent of the mussels were collected downstream of the Piedmont Dam (Site 2),[72] in a mixture of bedrock, boulder, cobble, gravel, and sand substrate. Only two mussels (fewer than 2 percent of the total) were found in the projects' impoundments. The non-native, invasive Asian clam, found throughout the study area, was especially abundant below the dams. The native pointed campeloma snail also was found at several locations.

The catch per unit effort (CPUE)[73] method was used to qualitatively assess mussel species' abundance in the vicinity of the projects. The overall CPUE for the study was

[72] Site 2 included the tailrace and areas directly adjacent to, but outside of, the downstream project boundary. No mussels were found in the tailrace.

[73] The number of individuals of a species encountered within a defined amount of time. Note: CPUE values were recalculated by staff from the data sheets provided in the

6.1 mussels per hour. The CPUE for the impounded areas was 0.5 mussels per hour, whereas CPUE for the areas downstream of the dams was 7.9 mussels per hour. The combined CPUE for each project, including both upstream and downstream sites, was: 16.0 mussels per hour at Piedmont; 4.5 mussels per hour at Upper Pelzer; and 0.4 mussels per hour at Lower Pelzer.

The applicants' mussel habitat and survey report also evaluated other mussel survey data collected on the mainstem of the Saluda River for comparison. Although survey data on the mainstem is limited, a study of the Saluda River basin collected 13 mussel species, including live Savannah lilliputs and Carolina heelsplitters. In this study, the closest site sampled included an area near the Ware Shoals Hydroelectric Project (FERC Project No. 2416), about 10 aerial miles downstream of the projects. The Eastern elliptio was the only mussel present at this location, with a CPUE of more than 400 mussels per hour. The closest sites surveyed upstream of the projects was on the middle branch of the Saluda River over 26 aerial miles away. Two Elliptio species, *Elliptio complanata* (eastern Elliptio) and *Elliptio icterina,* were collected in this area, with the CPUE ranging from 0.0 to 15.0 mussels per hour for the eastern Elliptio.

Fishery Resources and Habitat

The Saluda River mainstem supports a warm water fish assemblage typical of a small, low-gradient, Piedmont headwater river. The river is known to support at least 41 species of freshwater fish, including gamefish such as largemouth bass, redbreast sunfish, and spotted bass (table 6).

Table 6. Fish Assemblage of the Saluda River.
(Source: Gomez and Sullivan, 2015a, and Enel Green Power North America, Inc., 2015a, 2015b, 2015c, 2017.)

Gizzard Shad	Threadfin Shad	Greenfin Shiner
Thicklip Chub	Whitefin Shiner	Santee Chub
Common Carp	Eastern Silvery Minnow	Bluehead Chub
Golden Shiner	Greenhead Shiner	Spottail Shiner
Sandbar Shiner	Creek Chub	Notchlip Redhorse
V-Lip Redhorse	Striped Jumprock	Snail Bullhead
Flat Bullhead	Channel Catfish	Flathead Catfish
Chain Pickerel	Eastern Mosquitofish	White Bass

appendix of the mussel survey report. Updates were made to the CPUE for Lower Pelzer, impounded areas, downstream areas and the overall study; however, these changes did not affect the conclusion of the study, but did clarify that the CPUE for Piedmont was not identical to the overall CPUE for the study as indicated in the report summary.

Flier	Redbreast Sunfish	Green Sunfish
Pumpkinseed	Warmouth	Hybrid Sunfish
Bluegill	Dollar Sunfish	Redear Sunfish
Redeye Bass	Largemouth Bass	White Crappie
Black Crappie	Swamp Darter	Tessellated Darter
Yellow Perch	Piedmont Darter	

The three impoundments are dominated by shallow water habitat surrounded by wetland fringes, with limited deep-water habitat. They support a subset of fish from the larger Saluda River fish community that prefer large pools and slow water habitats, including largemouth bass, black crappie, and bluegill sunfish. At the Piedmont Project, a pool forms at the end of the retaining wall that is backwatered by the flow from the project tailrace. Downstream from the tailrace, the river progresses through many types of habitats, from riffle run to bedrock rapids, and long serpentine sections with an abundance of fallen woody snags. The Upper Pelzer Project does not have a substantial bypassed reach. The upper powerhouse discharges at an angle oriented slightly downstream, and the lower powerhouse discharges about 430 feet downstream from the dam, near where the backwater of the Lower Pelzer impoundment begins. The Lower Pelzer Project has a 350-foot-long bypassed reach with riffle run habitat that is bordered on the west side by a wingwall that curves towards the east bank, constricting the bypassed reach and concentrating the flow channel. Past the tailrace and bypassed reach of the dam, the habitat is comparable to areas located downstream of the Piedmont Project.

2015 Emergency Drawdown

As discussed in section 3.3.2.1, *Aquatic Resources, June 2015 Emergency Drawdown Event*, a high flow event required the emergency use of four turbines and two low-level sluice gates to regain control of the Lower Pelzer Project. South Carolina DNR's investigatory report on the event concluded that an estimated 7,455 fish were killed. The seven most abundant fish collected, and the estimated number killed, are listed in table 8.[74]

[74] A total of 1,234 fish were collected at nine randomly selected sites downstream of the Lower Pelzer Project. The number of fish killed was then expanded to include the entire 2.2-mile clean-up area; 1.6 miles of riverine habitat, and 0.6 miles of the Duke Steam Plant's impoundment.

Table 7. Dominant fish species collected during South Carolina DNR's Fish Kill Investigation below the Lower Pelzer Project on June 13, 2015. (Source: Gomez and Sullivan, 2015a; South Carolina DNR, n.d., as modified by staff).

Fish Species	Total in samples	Total Expanded Number	Total Composition (%)	Spawning Range (Centigrade)	Spawning Season Range
Bluegill	606	3967	53.21	24-27	Spring - Summer (May – August)
Suckers	128	688	9.23	--	Spring (March to May)
Common Carp	97	595	7.97	3-32	Late Spring - Late Summer (April – June)
Channel Catfish	102	576	7.73	> 21	Late Spring - Early Summer (May – July)
Redbreast sunfish	116	555	7.44	20-25	Spring – Summer (May – July)
Gizzard Shad	74	427	5.73	--	Spring - Early Summer (March – August)
Largemouth bass	49	272	3.65	20-21	Spring - Early Summer (April – June)

The dominant species of fish killed as a result of the emergency drawdown were those typically found in the impoundment. Some of these fish may have been drawn through the sluice gates under high flows and harmed. Any plans developed to manage sediment by flushing the impoundments should take into account the resident fish population.

3.3.2.2 Environmental Effects

Effects of Project Operation on Water Quantity

Run-of-river Operation

The applicants propose to continue to operate the projects in a run-of-river mode, using automatic pond level control sensors to minimize impoundment fluctuations. Under run-of-river operation, the applicants would maintain the impoundments at the existing water surface elevations at the height of the dams, including the spillway flashboards (i.e., 767.2 feet at Piedmont, 719.9 feet at Upper Pelzer, and 694 feet at Lower Pelzer). Additionally, during low-flow conditions at each project, a pond-level sensor would automatically reduce flow through the generating unit(s) until reaching the minimum hydraulic capacity, at which time the control unit would shut down the turbine(s) and release flows over the spillways.

Condition 2 of the Piedmont, Upper Pelzer, and Lower Pelzer Projects' respective water quality certifications states that the projects must continue run-of-river operation. South Carolina DNR concurs with the applicants' proposal to continue operating the projects in a run-of-river mode, and provide the proposed minimum flows.[75] However, South Carolina DNR recommends that all three projects operate in an "instantaneous run-of-river mode," as required by the current Upper and Lower Pelzer Project licenses,[76] for the protection of fish and wildlife resources in the Saluda River.

Our Analysis

The projects do not have the ability to store water given the small size of the project impoundments and relatively short residence times of 5, 4, and 8 hours, for the Piedmont, Upper Pelzer, and Lower Pelzer impoundments, respectively. Impoundments

[75] *See* letter filed January 11, 2018.

[76] Article 402 of the current licenses for Upper and Lower Pelzer Projects state, in part, that "[t]he licensee[s] shall operate the Pelzer Mills Upper [and Lower] Hydroelectric Project[s] in an instantaneous run-of-river mode for the protection of fish and wildlife resources in the Saluda River. The licensee[s], in operating the project[s] in an instantaneous run-of-river mode, shall at all times act to minimize the fluctuation of the Pelzer Mills Upper [and Lower] reservoir surface elevation[s], i.e., maintain discharge from the project[s] so that flow in the Saluda River, as measured immediately downstream from the project tailrace[s], approximates the instantaneous sum of inflow[s], minus existing consumptive uses, to the Pelzer Mills Upper [and Lower] reservoir[s]…" 41 FERC ¶ 62,310, at P 7 (1987); and 41 FERC ¶ 62,298, at P 7 (1987).

with short residence times tend to be riverine in their ecological structure and function (Soballe, D.M. *et al*., 1992).

Operating the projects in an instantaneous run-of-river mode per South Carolina DNR's recommendation, where instantaneous outflows match the instantaneous inflows, would be difficult to maintain because of variations in wind, flow, and other operational factors. This is especially the case for the Lower Pelzer Project, which, of the three projects, is nearest to the USGS gage.[77] During low flow conditions at the Lower Pelzer Project, turbine intake is automatically reduced as inflows fall below the maximum hydraulic capacity of 1,408 cfs.[78] The five turbine units automatically adjust in response to reduced inflow until flows reach below the minimum hydraulic capacity of 150 cfs, and generation stops. At this point, water is spilled over the spillway. As project operation changes, there would be an unavoidable, brief delay between the time the last unit shuts down and when an equivalent flow is spilled over the flashboards.

Conversely, when the project is not generating, all flow is released over the flashboard-regulated spillway. Once the project starts to generate, the first turbine is brought on-line, followed by the remaining four. Therefore, for a short period of time when the project initiates its start-up sequence, outflow from the project would include both discharge from the turbine units and flows passed over the spillway. This combined discharge would appear as a surge in flow during the lag time necessary for the impoundment elevation to fall to the flashboard crest.

Some flexibility regarding flow fluctuations downstream is needed to allow for brief delays between change in operation and attenuation of the flow. Because precise instantaneous matching of outflows to inflows is not practicable at the projects, run-of-river mode is a more accurate and realistic description of existing and proposed project operations.

Bypassed Reach Minimum Flows

Artificially low flows downstream of hydropower projects have the potential to affect the quality of habitat for fish and other aquatic organisms, and potentially create

[77] USGS gage No. 02163001; near Williamston, S.C. is about 1 mile downstream from the Lower Pelzer Project.

[78] The automatic control unit adjusts the single generating unit at the Piedmont Project and the three generating units at the Upper Pelzer Project in a similar manner to the Lower Pelzer Project's automatic control unit at low flows.

fish passage barriers by affecting the frequency, timing, and duration of flows released downstream of a project.

As previously discussed, Aquenergy proposes to continue to provide a continuous minimum flow release of 15 cfs, or inflow, whichever is less, from a weir in the spillway crest into the bypassed reach below the Piedmont Dam. Certification condition 3 states, and South Carolina DNR recommends, that the applicant continue to maintain this minimum bypassed reach flow.

At the Upper Pelzer Project, the co-applicants propose to provide a continuous minimum flow release of 15 cfs, or inflow, whichever is less, through a new weir, to be constructed on the spillway crest adjacent to the east dam abutment, and into the bypassed reach between the dam and upper powerhouse tailrace. Certification condition 3 states that the co-applicants must provide the proposed 15 cfs minimum flow, or inflow, whichever is less, and condition 4 states that the co-applicants must develop a minimum bypass flow monitoring plan within the first 3 years of license issuance. South Carolina DNR also recommends that the co-applicants provide the proposed minimum flow, and requests consultation in the placement and delivery of the flow to the bypassed reach.

At the Lower Pelzer Project, the co-applicants propose to continue to provide a continuous minimum flow release of 140 cfs, or inflow, whichever is less, into the bypassed reach below the dam. The 140-cfs minimum flow at the Lower Pelzer Project is released primarily through a weir in the flashboards on the powerhouse side of the spillway when the impoundment surface elevation is at the flashboard crest. A sluice gate in the non-overflow section of the dam is used to provide supplemental flow if debris obstructs the weir, resulting in releases less than 140 cfs. Certification condition 3 states, and South Carolina DNR recommends, that the co-applicants must continue to provide this minimum bypassed reach flow.

Our Analysis

As described in section 2.1.4, *Current Project Operations*, the Piedmont Project bypasses a 180-foot-long by 475-foot wide section of the Saluda River. As required under the current license, Aquenergy would continue to release a minimum flow of 15 cfs, or inflow, whichever is less, into the bypassed reach.

In comments on the May 30, 1986, environmental assessment, Interior recommended that the 7Q10 flow[79] of 165 cfs be released from the dam to maintain water

[79] The 7Q10 flow is derived from hydrologic records and is equivalent to the lowest flow occurring over seven consecutive days during a one-in-ten year drought.

quality, provide an aquatic habitat between the dam and tailrace, and restore shoal and riffle habitat. In contrast, South Carolina Wildlife and Marine Resources Department[80] stated that a 7Q10 flow of 165 cfs would not enhance spawning habitat, and that a continuous minimum flow of 15 to 20 cfs at the dam would continue to protect fishery resources in the bypassed reach. This determination was based on the observation that the reach consists primarily of flat bedrock which provides little habitat at higher flows. A minimum flow study plan was filed in 1993, with no resulting changes to the minimum flow requirement of 15 cfs.

Ecological conditions at the project have not changed substantially during the term of the existing license. The bypassed reach continues to consist of flat bedrock with no documented need for flows greater than 15 cfs. Additional flow data from 1996 to 2017 shows that flows at the Piedmont Project exceeded 15 cfs 90 percent of the time during low-flow months (July through October, *see* table 2). Aquenergy's proposed minimum flow of 15 cfs, which is verified every other year with an existing gage, would continue to protect fish resources in the bypassed reach of the Saluda River.

The Upper Pelzer Project, as described in section 2.1.4, *Current Project Operations*, operates with two powerhouses, and has two bypassed reaches (*see* figure 3). The upper bypassed reach is about 115 feet long and 340 feet wide, extending from the base of the Upper Pelzer Dam to the upper powerhouse. The lower bypassed reach is located between the upper and lower powerhouses. There is currently no minimum flow requirement for the bypassed reaches. The co-applicants' proposal to release a continuous minimum flow of 15 cfs, or inflow, whichever is less, from the Upper Pelzer impoundment into the upper bypassed reach was developed without habitat studies to aid in determining appropriate flow levels. The co-applicants' 2014 study of water quality in the lower bypassed reach indicated no water quality issues in the reach between the upper and lower powerhouses.

Given that there is no current minimum flow requirement for the Upper Pelzer Project, it is expected that a continuous minimum flow release to the upper bypassed reach, as proposed, would improve downstream aquatic habitat and water quality. However, the actual benefit of the proposed 15 cfs minimum flow is unknown. A bypass minimum flow monitoring plan would be helpful to confirm the effectiveness of the proposed 15 cfs minimum flow in maintaining (1) aquatic habitat in the bypassed reaches, (2) an adequate zone of passage for resident fish in the bypassed reaches, and (3) water quality downstream of the project. The plan should also include consultation on the placement and delivery of the proposed flow into the bypassed reach, as

[80] The South Carolina Wildlife and Marine Resources Department was reorganized into the South Carolina Department of Natural Resources on July 1, 1994.

recommended by South Carolina DNR, to ensure that the proposed minimum flow provides the intended benefits.

The Lower Pelzer Project, as described in section 2.1.4, *Current Project Operations*, bypasses a 600-foot-long section of the Saluda River that varies in width from about 350 feet at the toe of the dam, to 120 feet at its downstream end. The bypassed reach is watered by a continuous minimum flow release of 140 cfs, or inflow, whichever is less. The minimum flow requirement is based on a 1991 flow study conducted by one of the co-applicants, Consolidated Hydro, LLC (Normandeau Associates, 1994). The study found that a minimum flow of 140 cfs was appropriate to protect fish habitat in the bypassed reach and protect aquatic resources.[81] Because of this finding, South Carola DNR finds the minimum flow is protective of fish and wildlife habitat, water quality, and recreation, and is consistent with the South Carolina Water Plan (South Carolina DNR, 2004).[82]

Staff concludes that the co-applicants' proposed minimum flow of 140 cfs, verified using the existing bypassed staff gage, would continue to maintain the bypassed reach aquatic habitat and ensure an adequate zone of passage for resident fish (Normandeau Associates, 1994).

Sediment Management

As discussed in section 3.3.1, *Geological and Soil Resources,* sediment flushing methods need to correspond to the goals of sediment removal. In addition, it is important that the methods of sediment flushing fit the flow regime, and be designed with consideration of environmental consequences.

When flushing sediment, if the volume of the flow release for flushing, combined with any other releases, is greater than the impoundment inflow, the impoundment will be drawn down. Once an impoundment is drawn down, it will need to be refilled.

Piedmont Project

As outlined in section 2.2.3, *Proposed Environmental Measures,* Aquenergy proposes to develop a Sediment Management Plan for the Piedmont Project that would involve flushing sediment from the impoundment annually for a period of three years. To minimize any potential adverse effects on aquatic resources, Aquenergy would include provisions to flush the impoundment when incoming flows are greater than or

[81] 75 FERC ¶ 62,209 (1996).

[82] *See* South Carolina DNR's letter filed January 11, 2018.

equal to the mean annual daily flow (MADF) of 783 cfs during November through February, and avoid sediment flushing during fish spawning season (February[83] through May). Alternatively, Aquenergy proposes to establish a lower inflow guideline if a flow lower than the MADF can flush the impoundment without major operational problems. To avoid negative effects on aquatic resources in the impoundment, Aquenergy proposes to minimize impoundment drawdown at the Piedmont Project during sediment flushing by operating in automatic pond-level control mode. The impoundment surface elevation would not be lowered.

Condition 4 of the Piedmont Project's water quality certification states that Aquenergy must develop a Sediment Management Plan in consultation with resource agencies. South Carolina DNR also recommends the development of a Sediment Management Plan.

Upper and Lower Pelzer Projects

As outlined in section 2.2.3, *Proposed Environmental Measures,* the co-applicants propose to continue to implement the current Sediment Flushing Plan to flush sediment from the Upper Pelzer and Lower Pelzer impoundments during maintenance and inspection drawdowns once every 5 and 10 years, respectively. Similar to the Sediment Management Plan proposed for the Piedmont Project, the current plan would require the co-applicants to flush sediment during November through February, when incoming flows are greater than or equal to 783 cfs, with an option to establish a lower inflow guideline if the impoundments can be flushed without major operational problems. To further protect aquatic resources, the plan requires the co-applicants to avoid flushing during warm temperatures and fish spawning season (February[84] to May). The co-applicants also propose to continue to apply existing, seasonally-varying minimum flow requirements for South Carolina Rivers as minimum flow releases while refilling the Upper and Lower Pelzer impoundments (South Carolina DNR, 2009).

Certification condition 5 for the Upper Pelzer Project and certification condition 4 for the Lower Pelzer Project states that the projects must continue to implement the current Sediment Flushing Plan and, after new licenses are issued, review and update the plan in consultation with resource agencies, if necessary. South Carolina DNR also recommends the continued implementation of the current Sediment Flushing Plan.

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[83] Aquenergy characterizes February both as a month for flushing sediment based on high flows and as a month to avoid flushing based on potential spawning activity.

[84] ibid.

Our Analysis

Sediment flushing, as proposed by the applicants, would occur from November through February when incoming flows are greater than or equal to 783 cfs. The inflow threshold of 783 cfs was calculated as the MADF when the 1990 Sediment Flushing Plan[85] was developed for the Upper Pelzer and Lower Pelzer Projects.

Whether 783 cfs as the minimum impoundment inflow for flushing is too low, too high, or optimal depends on (1) the availability of the flow at the time of year proposed, (2) the effectiveness of the force provided by the volume of water to move sediment, and (3) the relationship of the impoundment inflow to impoundment drawdown and minimum flow releases during refill. The future availability of the minimum impoundment inflow can be estimated based on its availability in the recent past. The adequacy of the minimum inflow to support sediment flushing requires consideration of sediment transport details. The relationship of the minimum inflow to impoundment drawdown and refill is dependent on the volume of water passing through the river system at any time.

Flow data from 1996 to 2017 shows that the 783 cfs impoundment inflow has a low exceedance percentage for the month of November (12 percent exceedance at the Piedmont Project, and 13 percent exceedance at the Upper Pelzer and Lower Pelzer Projects, *see* table 7), a seasonally dry month (South Carolina, 2009). Table 7 shows that during the seasonally wetter months of January and February flows exceeded 783 cfs 34 percent of the time at the Piedmont Project, and 38 percent of the time at the Upper and Lower Pelzer Projects. Thus, 783 cfs is quite a high flow for November, and a somewhat high flow for December, January, and February.

Table 8. Percent exceedance of the MADF of 783 cfs during the proposed sediment flushing period (Source: USGS, 2018, as modified by staff).

Percent Exceedance of 783 cfs Inflow During Proposed Flushing Months (POR 1997-2017)			
Proposed Month	**Piedmont**	**Upper**	**Lower**
November	12%	13%	13%
December	29%	32%	32%
January	34%	38%	38%
February	34%	38%	38%

While the minimum impoundment inflow of 783 cfs describes the general hydrologic conditions needed to support sediment flushing, the sluice gate release flow would provide the force to flush sediment. These factors together would determine

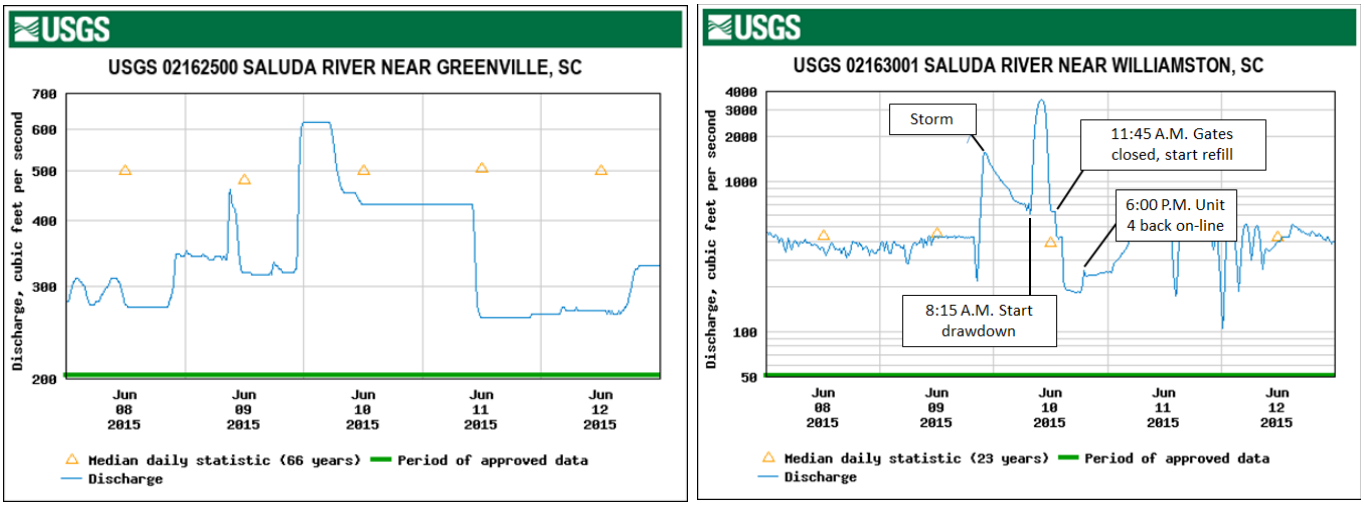
[85] 51 FERC ¶ 62,193 (1990).

whether the impoundments are drawn down during sediment flushing, and how much water is passed downstream through various dam structures, or over the dams. At each project, the sluice gate release flows would need to supply an adequate volume of water to generate the force necessary to scour sediment through the sluice gates while also diluting the sediment enough to avoid smothering organisms and habitat just below the gates. This issue is of particular importance at the Lower Pelzer Project, which has good quality river habitat immediately downstream, as discussed in *Biota*, below.

The risks of sediment flushing with very high flows was demonstrated during the June 2015 emergency drawdown at the Lower Pelzer Project. Based on the USGS gage data (figure 6), the rapid discharge of water through the sluice gates caused the flow downstream to escalate from 493 cfs (the average discharge on June 9, 2015, before the event) to 3,544 cfs (the highest discharge flow before the sluice gates were closed), in less than twelve hours. Flow continued at a rate greater than 1,000 cfs for about 6 hours before returning to a base flow of less than 250 cfs.[86] A combination of the rapidly changing flow conditions, including extremes in flow, velocity, and stage, and resulting turbidity and low DO concentrations, resulted in a fish kill. It appears that some fish were pulled through the sluice gates by the force of the water. Though not reported specifically in this case, such events could also cause streambank erosion or sloughing, and increased turbidity downstream of the release.

[86] https://waterdata.usgs.gov/nwisweb/get_ratings?file_type=exsa&site_no=02163001, accessed March 1, 2019.

Figure 6. Upstream and downstream USGS gages (POR June 9, 2015, to June 12, 2015). (Source: USGS, 2019).



Note: The upstream USGS gage, no. 02162500, is located about 22 miles upstream of Lower Pelzer. The downstream USGS gage, no. 02163001, is located about 1 mile downstream of Lower Pelzer.

The results of the emergency drawdown indicate that the applicants would need to be aware of sluice gate release flows that are both too high and too low. Additionally, it would be necessary to manage the rate at which the sluice gates are opened and closed to avoid sudden changes that could catch organisms off guard and wash them away from their home ranges or out of the main channel, or strand them in isolated pools or the floodplain.

As stated above, both the minimum impoundment inflows and the sluice gate release flows would influence drawdowns. However, the applicants have not specified sluice gate release flows. Aquenergy proposes to flush sediment from the Piedmont Project potentially using a sluice gate with a maximum release flow as low as 300 cfs, which would represent only about 38 percent of the 783 cfs minimum inflow. Because more water would be entering the impoundment as inflow than would be released as flushing flow, the impoundment would remain full, as proposed by Aquenergy.

The co-applicants have not provided the sluice gate release characteristics for the Upper Pelzer Project. However, based on the sluice gate sizes, the Upper Pelzer gate release volume would fall in between those of the Piedmont and Lower Pelzer Projects in magnitude. The co-applicants have reported that the Lower Pelzer Project has two sluice gates, each with a capacity of 964 cfs, which could potentially be used to flush sediment. A 964 cfs sluice gate release flow for one gate at the Lower Pelzer Project would represent about 123 percent of the 783 cfs minimum impoundment inflow, which means that 181 cfs would be drawn from the impoundment. The Lower Pelzer impoundment holds 400 acre-feet, so at a rate of 181 cfs it would take just over one day (26.5 hours) to

draw it down completely. If both the gates were opened fully at the Lower Pelzer Project, 1,928 cfs could be released through the sluice gates, and 1,145 cfs would be withdrawn from the impoundment. The Lower Pelzer impoundment would be drawn down completely in about 4 hours. Thus, across the three impoundments, the applicants have the possibility of using sluice gate release flows that range between nearly zero and 1,928 cfs to flush sediment.

Drawing down the water level in the impoundments for sediment flushing could dewater littoral areas causing aquatic and wetland plants to be exposed and aquatic organisms to be stranded and isolated. Drawdowns could also lead to erosion of the exposed sediments and sloughing of the exposed slopes within the impoundment. Finally, fish could become concentrated in the reduced pools remaining in the impoundment after drawdown, where they could succumb to low DO concentrations or predation. Unlike Aquenergy, which proposes to prevent such conditions by avoiding significant drawdown of the Piedmont impoundment during sediment flushing, the co-applicants have not proposed a similar measure for the Upper and Lower Pelzer Projects.

Once drawn down, the impoundments would need to be refilled. The co-applicants propose to use South Carolina DNR's seasonally-varying minimum flow requirements for streams in South Carolina to set release flows for downstream habitat during impoundment refill. The South Carolina DNR flows are intended to sustain all relevant instream uses at an acceptable level (South Carolina DNR, 2009).

During refill of the Upper and Lower Pelzer impoundments, the co-applicants would release a minimum flow based on the seasonal percentage of the MADF to maintain habitat downstream. To prevent harm to water quality and aquatic resources, the current Sediment Flushing Plan requires the co-applicants to implement a refill regime based on seasonally-varying minimum flow requirements for South Carolina Rivers (South Carolina DNR, 2009). Therefore, depending on the month the plan is implemented, the co-applicants would release a minimum flow of 157 cfs in November, 235 cfs in December, and 313 cfs in January and February, or inflow, whichever is less, into the Saluda River, downstream of the tailraces. Based on the proposed flushing schedule, the co-applicants would release a minimum of 20 percent of the MADF in November, 30 percent for December, and 40 percent for January and February.

As discussed in section 3.3.1, *Geological and Soil Resources,* the emergency drawdown at the Lower Pelzer project in 2015 served as a significant example of fairly rapid refill while releasing water downstream. It is possible to estimate the amount of inflow held to refill the Lower Pelzer Project after the emergency event using information

from the USGS gages upstream, no. 02162500,[87] and downstream, no. 02163001[88], of the dam. On the days surrounding the emergency, inflow to the projects, as measured at the gage near Greenville, SC, upstream of the Piedmont Project, was at a baseflow of about 300 cfs. At the same time, outflow from the three projects, as measured at the gage near Williamston, SC, downstream of the Lower Pelzer Project, was at a baseflow of about 400 cfs.[89] After the emergency drawdown, operators refilled the Lower Pelzer impoundment. While flow at the gage near Greenville stayed near 300 cfs, the flow reaching the gage near Williamston dropped to just under 200 cfs, indicating that about 200 cfs refilled the impoundment over about 24 hours. During the months when intentional flushing would actually occur, November through February, more water would be available. Based on the experience with refill after the emergency event, applying the South Carolina minimum flows for releases during refill at the Upper and Lower Pelzer Projects would be very feasible, and would protect downstream resources during refill.[90]

In addition, the applicants propose to flush sediment from the impoundments in February because the MADF flow of 783 cfs is generally available. However, at the same time, they propose to avoid flushing in February, because of possible negative effects on fish spawning, which is active during that month. Flushing sediment in February would increase the number of higher flow opportunities to flush sediment, but also increase the risk of negative effects on spawning. In some years it may be logistically difficult to match staff availability with the limited periods, from November through January, when impoundment inflow is anticipated to be above 783 cfs, or anticipated high flows may not occur as predicted. Limiting sediment flushing in February to situations where flushing events from November through January have failed would minimize the risk of negative effects on spawning habitat, especially that

[87] USGS gage No. 02162500, near Greenville, South Carolina is located 22 miles upstream of the Lower Pelzer Project.

[88] USGS gage No. 02163001, near Williamston, South Carolina is located about 1 mile downstream from the Lower Pelzer Project.

[89] Flow at the downstream gage was about 100 cfs higher than that at the upstream gage, presumably because of flow accrual between the two gages.

[90] The co-applicants do not state whether the existing bypassed flow release at the Lower Pelzer Project, and proposed bypassed flow release at the Upper Pelzer Project, would be maintained during impoundment refill. If impoundment refill flows are released through the projects' powerhouses, then the bypassed flow releases should be maintained.

identified below the Lower Pelzer Project, without eliminating access to the high flow opportunities of the month to enable sediment flushing if needed.

Finally, flushing the impoundments when inflows are equal to or greater than 783 cfs would help ensure that drawdown and refill events occur when sufficient flows are available to protect aquatic resources. It would also help ensure that scheduled drawdowns do not occur during times of very low flow, or drought conditions, which are stressful periods for aquatic life. A minimum impoundment inflow of 783 cfs for sediment flushing would help guarantee that refill of the impoundments could be done relatively quickly, and with adequate minimum flow releases for the protection of downstream habitat.

Staff concludes that the applicants would need to identify starting minimum sluice gate release flows for sediment flushing at each impoundment based on: (a) the characteristics of the sediment deposits to be flushed; (b) sluice gate dimensions, locations, and other characteristics; (c) habitat conditions immediately downstream of the sluice gates; (d) acceptable levels and timing of impoundment drawdowns; (e) the force needed to transport the impounded sediments; and (f) avoidance of releases that are too low and would smother habitat immediately downstream of the sluice gates, and releases that are too high and could cause fish kills or downstream erosion. Establishing adequate sluice gate release flows for sediment flushing would help prevent sudden changes in downstream flows that could be harmful to aquatic organisms. Once preliminary sluice gate release flows are determined, they could be adjusted based on water and sediment quality monitoring conducted before, during, and after each sediment flushing event. Similarly, the minimum impoundment inflow for sediment flushing could be evaluated after the first few sediment management events, as proposed by the applicants. However, any reduction in the minimum impoundment inflow for sediment flushing would require additional consideration, information, planning, and follow-up to be confident that sediment flushing could be done safely and effectively with less inflow available.[91]

Dredging

As discussed in section 3.3.1, *Geological and Soil Resources*, over the last 30 years, sediment flushing events have not been carried out at the Piedmont Project and have been sporadic at the Upper Pelzer and Lower Pelzer Projects. The proposed

[91] The applicants do not state whether the existing bypassed flow release at the Piedmont and Lower Pelzer Projects, and proposed bypassed flow release at the Upper Pelzer Project, would be maintained during sediment flushing operations. If sediment releases occur in a manner that continues to dewater the projects' bypassed reaches, the bypassed flows should be maintained.

flushing flows may not be adequate to flush accumulated sediment or may result in fish kills.

In the event that the amount of water available for flushing, combined with the nature of the sediments within the impoundments, leads to a restriction on the amount of sediment that can be removed by flushing, dredging may be an appropriate sediment management alternative. If dredging is needed to reduce the risk of a large downstream sediment release or protect project operation, then the Sediment Management Plan for the Piedmont Project, and Sediment Flushing Plan for the Upper and Lower Pelzer Projects, should include general provisions to implement best management practices while dredging, such as a turbidity curtain, to avoid adverse effects on aquatic resources, as discussed in *Water Quality, Sediment Management*, below.

Operation Compliance Monitoring

Although compliance measures do not directly affect environmental resources, they do allow the Commission to ensure that a licensee complies with the environmental requirements of a license. The applicants propose no changes to normal project operation, with the exception of the proposed 15 cfs continuous minimum flow at the Upper Pelzer Project. South Carolina DNR recommends that the applicants operate the projects in a run-of-river mode, with minimal fluctuations, to provide a stable aquatic habitat in the Saluda River reach below the projects.

Our Analysis

The applicants currently operate the projects in a run-of-river mode, using remotely monitored, automatic pond level controllers to maintain stable impoundment elevations. However, formalizing the applicants' existing monitoring protocol in a project operation and monitoring plan would help the applicants document compliance with the operational provisions of any new or subsequent licenses, provide a mechanism for reporting operational data and deviations, and ensure the protection of resources that are sensitive to impoundment fluctuations. Therefore, developing an operation compliance monitoring plan would facilitate Commission administration of the licenses, and ensure that all operational requirements for the protection and enhancement of aquatic resources, namely run-of-river operation and minimum flow requirements, are being met.

Water Quality

Run-of-River Operation

Some forms of project operation can lead to fluctuations in impoundment levels, which may contribute to shoreline erosion, and result in increased turbidity and reduced water quality. Project operation may also reduce flows downstream of a project, which

can lead to increases in water temperature and decreases in DO levels, affecting aquatic biota. As discussed in section 3.3.2.2, *Aquatic Resources, Effects of Project Operation on Water Quantity,* the applicants proposed run-of-river operations include maintaining impoundment surface elevations and improving water quality in the downstream reaches.

The applicants' proposed run-of-river operations, as well as agency recommendations and conditions, were previously described in section 3.3.1, *Geological and Soil Resources.*

Our Analysis

As discussed in section 3.3.1, *Geological and Soil Resources,* run-of-river operation helps minimize increases in turbidity and sedimentation associated with erosion, which could be detrimental to aquatic organisms. Sedimentation associated with unnatural fluctuations of impoundment levels can negatively impact aquatic organisms by altering habitat suitability, reducing oxygen uptake, and reducing the density of nutritional value of food (Harrison *et al*., 2007).

Continuing run-of-river operations would maintain water temperature and DO conditions that exist at the projects and meet state standards by minimizing the amount of time water is retained behind the dams. As discussed in section 3.3.2.1, *Aquatic Resources, Affected Environment,* water temperature was maintained below the 90°F standard during continuous monitoring at the projects from June through October 2014, while DO consistently exceeded a daily average of 5.0 mg/L, and an instantaneous low of 4.0 mg/L, the minimum required DO levels for this segment of the Saluda River. Continuing run-of-river operations is likely to support good water quality conditions.

Sediment Management

Piedmont Project

As described previously, in section 2.2.3, *Proposed Environmental Measures,* Aquenergy proposes to develop a Sediment Management Plan for the Piedmont Project that would involve flushing sediment from the impoundment when DO concentrations, as measured downstream, exceed 6.0 mg/L on a daily average basis. DO and turbidity data would be continuously collected upstream and downstream of the project for 24 hours before, during, and after each flushing event. Aquenergy also proposes to survey the upstream and downstream areas for environmental impacts, including stressed or dying fish. Following the three annual releases, Aquenergy proposes to review the effectiveness of the flushing events with resource agencies by reviewing water quality, sediment, and flow data collected during the events.

Condition 4 of the Piedmont Project's water quality certification states that Aquenergy must develop a Sediment Management Plan in consultation with resource agencies. South Carolina DNR recommends the development of a Sediment Management Plan at the Piedmont Project and recommends dredging the impoundment if the low-level sluice gates cannot be operated, or other methods to safely and effectively release sediment from the impoundment are unavailable.

Upper and Lower Pelzer Projects

The co-applicants propose to continue to implement the current Sediment Flushing Plan to flush sediment from the Upper Pelzer and Lower Pelzer impoundments and, after new licenses are issued, review and update the plan in consultation with resource agencies. The plan requires the co-applicants to work with resource agencies[92] to monitor DO downstream of the project, and maintain DO levels at a daily average of 5.0 mg/L during sediment flushing. The plan also requires the co-applicants to use other methods of sediment removal, such as hydraulic dredging, in the event that flushing cannot be accomplished without detrimental impacts on the downstream environment. In such a case, the plan requires the development of a dredging plan, which must include DO and turbidity monitoring to determine critical water quality conditions that would temporarily stop dredging operations.

Certification condition 5 for the Upper Pelzer Project and certification condition 4 for the Lower Pelzer Project states that the projects must continue to implement the current Sediment Flushing Plan and, after new licenses are issued, review and update the plan in consultation with resource agencies, if necessary. South Carolina DNR agrees with the co-applicants' proposals.

Our Analysis

Turbidity

Turbidity is closely associated with sediment transport. Impoundment drawdown and refill during the proposed flushing events can have significant impacts on turbidity, affecting the aquatic community in the impoundment and downstream river reaches. However, flushing at the projects may be limited to localized areas in front of the sluice gates, which may cause relatively small and localized increases in turbidity.

High turbidity may reduce the availability of food for fish, thereby reducing growth and maturity that may result in an inability to reproduce. The optimum total suspended solid concentration for largemouth bass is 5 to 25 mg/L (Stuber *et al*., 1982a),

[92] Specified resource agencies include South Carolina DHEC, FWS, and South Carolina Wildlife and Marine Resources Department.

and the optimal growth and reproductive potential in bluegill occurs in waters of low to moderate turbidities of less than 50 mg/L of total suspended solids (Stuber *et al*., 1982b).

Continuous monitoring of turbidity upstream and downstream of the Piedmont Project, as proposed by Aquenergy before, during, and after sediment flushing, would help determine the effectiveness of the sluice gate release flow used for sediment flushing.

Dredging is also likely to affect turbidity levels. Although a dredging plan has not been developed by the applicants, dredging may only be necessary if sediment flushing cannot be performed without adverse effects on the downstream environment, as would be defined by the plans. As mentioned in section 3.3.2.1, *Aquatic Resources, Affected Environment,* turbidity levels sometimes exceed the maximum level for freshwater classification of 50 NTU at all three projects, often coinciding with high flow events. Because hydraulic dredging involves suctioning of the river bottom, special care should be taken when removing contaminated sediments, as the volume of suspended materials may increase during the process. Adverse effects on water quality conditions, such as increased turbidity and the transport of contaminants, could be minimized by incorporating general provisions in the Sediment Management Plan for the Piedmont Project, and Sediment Flushing Plan for the Upper and Lower Pelzer Projects, to implement best management practices, such as turbidity curtains, during dredging operations, and implement proper protocol for the handling, transport, treatment, and disposal of any dredged material.

DO

As discussed in section 3.3.2.1, *Aquatic Resources, Affected Environment,* dissolved oxygen concentrations are relatively good at the projects. Stratification is not likely because the impoundments are shallow, with short water-residence times. Though the water is not likely to be low in DO, sediment released from low-level sluice gates during flushing events may lower DO concentrations, as may have been the case during the 2015 emergency drawdown at the Lower Pelzer Project. This decrease in DO may be countered by reaeration from instream flows during refill (Morris and Fan, 1998).

Continuous monitoring of DO upstream and downstream of the Piedmont Project, as proposed by Aquenergy, before, during, and after flushing operations would help determine if DO concentrations are being affected by Aquenergy's sediment management process.

Dredging, alone or in combination with flushing, could be a viable method of sediment management in the impoundments, as discussed in section 3.3.1.2, *Environmental Effects, Effects of Project Operation on Sediment Erosion and Transport.* However, because hydraulic dredging involves suctioning of the river bottom, turbidity

may increase. Based on an Army Corps of Engineers study of the French Broad, Columbia, and Tennessee Rivers in Alabama and Tennessee, it was found that most suspended solids were redeposited within 950-3,000 feet from dredging sites during average and low flow periods (U.S. Army Corps of Engineers, 1984). Turbidity levels, as discussed above, may increase and DO levels may decrease during dredging, which could stress or suffocate aquatic life.

Aquatic Biota

Run-of-river Operation

Operating the projects in a run-of-river mode reduces water level fluctuations in the impoundments and downstream river reaches, and helps maintain downstream flow conditions for aquatic life, particularly during natural low-flow and drought periods.

The applicants propose to continue to operate the projects in a run-of-river mode, while maintaining the existing impoundment surface elevations, to improve and maintain aquatic habitat and water quality conditions in the downstream reaches. Condition 2 of the projects' respective water quality certifications states that the applicants must continue to operate the projects as run-of-river facilities.

Our Analysis

Continued run-of-river operation would minimize water level fluctuations and flow disruption to aquatic habitat present in the project impoundments and in the downstream reaches of the Saluda River. Maintaining relatively stable impoundment levels would benefit fish and other aquatic organisms that rely on near-shore littoral habitat for feeding, spawning, and cover. Changes to aquatic habitat in the impoundments and downstream reaches as a result of continued run-of-river operations are not expected. Effects on fish and benthic invertebrate communities in the vicinity of the projects are likely to be unchanged by continued run-of-river operation for both the fish communities in the projects' area which are fairly diverse and abundant,[93] and the mussel communities in the mainstem of the Saluda River that are limited to a few pollution tolerant species, with only one species, the Eastern Elliptio, identified in the project area during surveys.

Sediment Management

Excessive sediment can affect successful fish reproduction, sufficient food resources for growth, and physical habitat (Waters, 1995). Elevated turbidity levels can temporally result in adverse effects on resident fish by causing physiological stress

[93] South Carolina DNR letter filed January 11, 2018.

(Redding *et al*., 1987), lowering feeding success (Barrett *et al*., 1992), and diminishing habitat quality (Waters, 1995)

As previously described, the applicants propose to flush sediment from the impoundments on regular intervals to manage accumulation. The water quality certifications state that the applicants must develop plans to flush sediment, and South Carolina DNR also agrees with the applicants' proposals to reduce the volume of sediment accumulation by flushing sediment from behind the project dams.

Our Analysis

Heavy sedimentation of streams and reservoirs is ubiquitous in the southeastern U.S., and has significant effects on fish and other aquatic biota. As discussed in section 3.3.2.1, *Affected Environment, Water Quantity and Use*, the project impoundments generally range from 5 to 25 feet in depth, with muck substrate, and low flows. There is limited information on the existing volume, rate of accumulation, and transport of sediment in the projects' impoundments.

Flushing sediment may affect the slope, roughness, and particle size of substrates in the impoundments, and alter available habitat by decreasing fine sediment and increasing or exposing larger substrate, such as gravel or boulders. The impoundments may also deepen with flushing, potentially increasing volume capacity and the wetted surface area. Although the applicants' goal for flushing the impoundments is to protect habitat and water quality downstream during a drawdown, an evaluation of the effects of sediment flushing should consider the life history requirements of the aquatic biota found in the project area. The act of flushing sediment could unintentionally alter pool habitat and smother the biota it is meant to protect.

The release of accumulated sediments into the downstream aquatic habitat may cause a significant increase in sedimentation in these areas over multiple flushing events. A rapid increase in the flow released from a dam may cause downstream habitat erosion and sedimentation, further altering bottom habitat, aquatic vegetation, and the organisms that currently inhabit these areas. Further, mobilized sediments may also increase the amount of contaminants found in downstream habitat.

In 1991, the co-applicants conducted a fish habitat study in the 600-foot long bypassed reach located between the powerhouse and tailrace of the Lower Pelzer Project (Normandeau Associates, 1994).[94] During the study, the Lower Pelzer bypassed reach

[94] Studies were conducted in 1991 to determine the minimum flow necessary to optimize fish habitat in the bypassed reach of the Lower Pelzer Project. Transects, depth velocity, wetted perimeter, and fish passage were measured along each transect over a

was found to consist primarily of a rock shoal habitat supporting benthic communities and providing critical spawning and nursery habitat for resident fish including largemouth bass, bluegill, and redbreast sunfish, white crappie, warmouth, golden shiner, suckermouth redhorse, brown bullhead, and white catfish.

Because a sediment management regime was never developed for the Piedmont Project, and the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects was never fully implemented by the co-applicants, the potential yield of sediment flushed from the Piedmont to the Upper Pelzer Project, and through to the Lower Pelzer Project's tailrace, is unknown. Flushing the three impoundments could change the shoal gradient at the Lower Pelzer Project and affect the depth of sediment within the shoal habitat. In addition to preferring rock shoal habitat comprised of gravel or firm substrates, the species noted above are also sensitive to changes in stream gradient and prefer shallow nests (Stuber et al., 1982a, and Aho et al., 1986). Additionally, elevated turbidity levels may affect reproductive success in largemouth bass, which are considered intolerant of suspended solids and sedimentation. High turbidity may reduce available food, thereby reducing growth and maturity, which may result in an inability to reproduce. Optimum total suspended solid concentration for largemouth bass is 5 to 25 mg/L (Stuber et al., 1982a) and the optimal growth and reproductive potential in bluegill occurs in waters of low to moderate turbidities of less than 50 mg/L total suspended solids (Stuber et al., 1982b).

Despite a large sediment load in the Saluda River, the projects support a typical warmwater fishery for the region. Though low in diversity, there is a mussel population present in the project areas, and assessment of the benthic macroinvertebrate community downstream of the projects indicates fair to good conditions.

Additionally, the downstream reaches at each project provide more suitable habitat for mussels than the impoundments, as demonstrated by the Eastern elliptio CPUE of 0.5 mussels per hour in the impoundments versus 7.9 mussels per hour in the areas downstream of the dams. Mussel surveys show that impounded areas are generally unsuitable for most mussels with water depths of 5 to 25 feet, little or no flow, and muck substrates. Though better than the impoundments, the downstream reaches lack mussel diversity and are dominated by pollution tolerant species. Flushing sediment into these reaches could harm, at least temporarily, the already stressed mussel community.

Dredging may directly impact aquatic biota through habitat removal, physical damage, and the burial of benthic organisms. Indirectly, dredging may reduce water quality conditions, increase exposure to toxic materials in sediments, increase BOD from

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range of flows, resulting in a reduced minimum flow from 168 cfs, as stipulated in Article 403, to 140 cfs. *See* 75 FERC ¶ 62,209 (1996).

suspended sediments, and lower photosynthesis, which may affect aquatic plants and algae (Ebert, 1993). The projects would benefit from a provision in the Sediment Management Plan for the Piedmont Project, and Sediment Flushing Plan for the Upper and Lower Pelzer Projects, to avoid dredging in locations that could compromise shorelines or disturb existing wetlands, and in turn disrupt or destroy aquatic habitat. The current Sediment Flushing Plan for the Upper and Lower Pelzer Projects also requires the development of a dredging plan with provisions to monitor DO and turbidity levels during dredging operations in the event that flushing cannot be conducted without adverse effects on the downstream environment.

Impingement, Entrainment, and Turbine Mortality

Water intake structures at hydropower projects can injure or kill fish that come into contact with intake screens/trash racks or turbines. Fish that are wider than the clear spacing between the trash rack bars, and/or have burst swim speeds[95] lower than approach velocities[96] can become trapped against intake screens or bars of a trash rack. This process is known as impingement and can cause physical stress, suffocation, and death of some organisms (EPRI, 2003).

Entrainment into the intake structure occurs if fish are small enough to pass between trash rack bars, and they are unable to overcome the approach velocity, or if they choose to pass downstream through the trash rack. Even if fish are small enough to fit through trash rack bars, they are likely to behaviorally avoid entrainment if their burst swim speeds exceed the approach velocity in front of the trash racks (Knapp *et al.*, 1982). If entrainment occurs, fish injury or mortality can result from collisions with turbine blades, exposure to pressure changes, shear forces in turbulent flows,[97] or water velocity accelerations created by turbines (Rochester *et al*., 1984). The number of fish entrained and at risk of turbine mortality is dependent upon site-specific factors, including physical characteristics of the project (*e.g.*, head, approach velocity, turbine type, turbine speed, number of runner blades), as well as the size, age, and seasonal movement patterns of fish

[95] Burst swimming speed is the maximum swimming speed that can only be sustained for a few seconds. It is usually used to escape danger (Murray, 1974).

[96] Approach velocity is the calculated water flow velocity component perpendicular to the trash rack face.

[97] Shear stress occurs when force acts parallel to a surface (Gordon *et al*., 2004). Shear stress can be experienced by a fish passing between two water masses of different velocities, or when a fish slides along a solid structure such as a wall or turbine blade (commonly termed abrasion) (Neitzel *et al.*, 2000).

present within the impoundment (EPRI, 2003). Fish that are entrained and killed are removed from the river population and no longer available for recruitment to the fishery.

The applicants do not propose, and no agency recommended, additional measures to reduce mortality related to fish entrainment or impingement.

Our Analysis

To determine the risk of impingement and entrainment at each of the projects, we first calculated approach velocities and compared them to the burst swim speeds of representative fish. To calculate the approach velocities in front of the powerhouse trash racks at each project, we divided the maximum hydraulic capacity of the turbines by the open area between the trash rack bars (table 9). We also estimated the approach velocities in front of the canal gates at Piedmont and Upper Pelzer by dividing the maximum hydraulic capacity by the total open area with all canal gates open (table 9).[98] The estimated approach velocities in front of the trash racks at each of the projects, and the approach velocities in front of the canal gates at the Piedmont Project were lower than the burst swim speeds for all nine fish species chosen to represent the fish community in the Saluda River near the projects (table 10).[99] The estimated approach velocities in front of the canal gates at Upper Pelzer were lower than the burst swim speeds for notchlip redhorse, channel catfish, and yellow perch, but higher than the burst swim speeds for smaller bluegill, red breast sunfish, largemouth bass, gizzard shad, and blueback herring. Thus, all fish could avoid impingement and entrainment at Piedmont and Lower Pelzer, but some smaller individuals in the fish community are susceptible to entrainment into the intake canal at Upper Pelzer. Smaller individuals that enter the intake canal at Upper Pelzer would nevertheless be able to swim faster than the approach velocities in front of each powerhouses' intakes. Thus, based on the analysis above, fish species that occupy water near each project are able to avoid impingement on trash racks and entrainment

[98] Piedmont and Upper Pelzer have intake canals that are fully described in section 2.1.1, *Current Project Facilities*.

[99] For some species, burst speed data were not available in available literature. In such cases, we used related species as surrogates for the analysis.

into powerhouse intakes, although some fish could pass through the trash racks by choice.

Table 9. Estimated approach velocities.
(Source: Applicants).

Project	Maximum hydraulic capacity (cfs)	Approach velocity (fps)
Piedmont		
In front of the canal gates	535	1.35
In front of the trash racks	535	1.06
Upper Pelzer		
In front of the canal gates	1,200	3.33
In front of the upper powerhouse trash racks	900	0.77
In front of the lower powerhouse trash racks	300	0.50
Lower Pelzer		
In front of the trash racks	1,408	0.73

Table 10. Swim speeds of nine representative species found in the Saluda River. (Source: staff).

Species	Surrogate species	Habitat	Length (inches total length unless noted)	Burst swim speed (fps)	Reference
Bluegill	None	Littoral	2	1.8	Appalachian Power Company (2009)
			4-6	2.4	Appalachian Power Company (2009)
			6	4.3	Appalachian Power Company (2009)
Redbreast sunfish	Bluegill	Littoral	2	1.8	Appalachian Power Company (2009)
			4-6	2.4	Appalachian Power Company (2009)
			6	4.3	Appalachian Power Company (2009)
Largemouth bass	None	Littoral	2-4	3.2	Appalachian Power Company (2009)
			5.9-10.6	4.3	Appalachian Power Company (2009)
Whitefin shiner	Emerald shiner	Littoral	2.5	4	Bell (1991)
Notchlip redhorse	Longnose sucker	Benthic	4-16	4.0-8.0	HDR (2014)

Species	Surrogate species	Habitat	Length (inches total length unless noted)	Burst swim speed (fps)	Reference
Gizzard shad	Blueback herring	Littoral/ Pelagic	3.35 (FL)[a]	1.5	Richardson (2004)[b]
			3.50 (FL)	2.28	Castro-Santos (2002)
			8.07 (FL)	8.2	Castro-Santos (2002)
Threadfin shad	Blueback herring	Littoral/ Pelagic	3.35 (FL)	1.5	Richardson (2004)
			3.50 (FL)	2.28	Castro-Santos (2002)
			8.07 (FL)	8.2	Castro-Santos (2002)
Channel catfish	None	Benthic	9	3.9	Venn Beecham *et al*. (2007)
Yellow perch	Walleye	Littoral	7.1-26 (FL)	5.3-8.5	Peake *et al*. (2000)

[a] FL is the acronym for the fork length of a fish, which is the length of a fish from the tip of the snout to the middle, forked portion of the tail fin.

[b] For fish less than, or equal to, 3.50 inches (FL), burst swim speeds are based on Richardson's (2004) estimation that burst swim speeds of blueback herring are 2-2.6 times the prolonged swim speeds. Estimates in this table are based on 2 times the prolonged swim speeds.

To quantitatively evaluate the effects of the three projects on entrainment and turbine mortality, the applicants conducted a desktop study to estimate the number of fish that could be entrained and suffer mortality during project operation (Gomez and Sullivan Engineers, 2015a). The analysis indicated that the total fish entrainment at the three projects, based on the volume of water passed during an average year, to be just over 100,000 fish annually (Piedmont: 23,196; Upper Pelzer: 38,748; Lower Pelzer: 40,584), with less than 20,000 fish killed[100] annually (Piedmont: 4,326; Upper Pelzer: 7,226; Lower Pelzer: 7,569) as they pass through the projects. The analysis also indicated that bluegill, redbreast sunfish, largemouth bass, and whitefin shiner were the species most likely to suffer entrainment mortality, which together represented 96 percent of the total number of fish killed annually at each of the three projects. Other representative species such as notchlip redhorse, gizzard shad, threadfin shad, channel catfish, and yellow perch, each represented less than 1 percent of the total number of fish killed annually at each of the three projects.

Based on the qualitative and quantitative entrainment analyses above, there is no evidence to suggest that the estimated level of entrainment and turbine mortality would negatively affect the fish populations at the three projects. In part, this is because the burst swim speeds of the representative fish species exceed the approach velocities at the projects. Further, the species most likely to suffer entrainment mortality, as indicated by the desktop quantitative analysis (i.e., bluegill, redbreast sunfish, largemouth bass, whitefin shiner), exhibit relatively high reproductive rates because of their ability to spawn early and often throughout their lifespan. High reproductive rates give these species' populations a natural mechanism to buffer against any instance (natural or man-made) of high mortality, which makes these species resilient to population declines. In addition, South Carolina DNR has indicated that the fish community in the area of the projects is diverse and abundant and appears to be unaffected by project operations.[101] Thus, available information indicates that entrainment mortality at the projects is unlikely to negatively affect fish populations in the Saluda River.

3.3.2.3 Cumulative Effects on Aquatic Resources

Numerous dams on the Saluda River have the potential to cumulatively and adversely affect resident fishery resources as fish move within the river. However, most resident fish species maintain populations within the large pools or impoundments formed by the dams, and do not require moving within the river. Despite the presence of

[100] The mortality estimate is based on the number of fish killed within 48 hours of passing through the turbines.

[101] *See* letters filed by South Carolina DNR on January 11, 2018.

hydropower projects on the Saluda River and its tributaries, South Carolina DNR[102] states that resident fish populations in the river are healthy, diverse, and self-sustaining, and a good sport fishery exists throughout its length.

The Piedmont, Upper Pelzer, and Lower Pelzer Projects' operations could cumulatively affect water quality and downstream aquatic habitat in the Saluda River. Under current operations, water quality at the projects is consistent with South Carolina DHEC's state water quality standards for freshwater aquatic life criteria for DO and temperature, and demonstrates that the structure and function of the resident biological community is maintained. With the exception of a new, continuous minimum bypassed reach flow of 15 cfs at the Upper Pelzer Project, the applicants do not propose changes in operation, therefore there would be little change in the projects' contribution to the overall cumulative effect on water quality in the Saluda River.

Under normal conditions, run-of-river project operation results in relatively stable impoundment elevations and downstream flows, which would continue under any new or subsequent licenses. None of the projects effectively alter the flow of the Saluda River. Consequently, the projects' contribution to cumulative effects on aquatic habitat in the Saluda River would be minimal.

The cumulative effects of the applicants' proposals for sediment management on water quality in the Saluda River could be minimized by, as Aquenergy proposes, implementing such measures as flushing sediment during the existing high-flow regime of the river when flows are greater than or equal to 783 cfs. To protect against any negative effects that impoundment drawdowns may have on aquatic resources, Aquenergy proposes to minimize impoundment drawdowns during sediment flushing events. Conversely, the co-applicants' current Sediment Flushing Plan would allow impoundment drawdowns at the Upper Pelzer and Lower Pelzer impoundments during flushing operations, but includes provisions to limit flushing events to periods of high flows and outside of fish spawning season. Because the timing and magnitude of flows released from the impoundments during sediment management events could flush aquatic organisms from their respective habitats, affect fish spawning patterns, and degrade water quality downstream, Aquenergy and the co-applicants would flush during the winter wet season and release a seasonally-varying fraction of the Saluda River's MADF downstream of the projects' tailraces.

Cumulative effects on DO and turbidity would be monitored throughout sediment flushing operations to protect water quality and aquatic resources downstream of the impoundments. If detrimental effects cannot be avoided by flushing the projects' impoundments, alternative methods for sediment management, including dredging, could be evaluated. Overall, the projects' effects from flushing the impoundments has the

[102] South Carolina DNR letter dated January 11, 2018.

potential to cumulatively benefit aquatic habitat in the Saluda River by lessening the likelihood of a sudden, high magnitude sediment release, as occurred with adverse effects on aquatic resources in 2015.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

As described in section 3.3.1, *Geological and Soil Resources*, the Piedmont, Upper Pelzer, and Lower Pelzer Projects are located in the southern outer area of the Piedmont Ecoregion between the Southern Blue Ridge Escarpment and the Sandhills Ecoregion (South Carolina DNR, 2015a).[103] Trending in northeast-southwest direction, this region is a complex mosaic of irregular plains and some hills with patches of pine and mixed oak forests that form a transitional area between the mostly mountainous ecoregions of the Appalachians to the northwest and the relatively flat coastal plain to the southeast (Griffith, *et. al*., 2002). Currently dominated by agricultural areas and managed forests, this landscape generally does not provide suitable habitat for some species that prefer either early- or late-succession conditions (South Carolina DNR, 2005).

Botanical Resources

The vegetation in the Piedmont has been altered greatly by human activity. Historically the region was forested with dominant oak-hickory-pine species such as white oak, southern red oak, post oak, and hickory, with shortleaf pine, loblolly pine, and to the north and west, Virginia pine (Griffith, *et. al.*, 2002). After European settlement, much of the region's hardwood and shortleaf pine forests were cleared for cultivation of cotton and other crops. Subsequent severe erosion and insect outbreaks led to widespread farmland abandonment and much of the area was replanted in pine or reverted to successional pine and hardwood woodlands. Loblolly and shortleaf pine still dominate old field sites and pine plantations, while mixed oak forest is found in less heavily altered areas (South Carolina DNR, 2015a). An average of 1.2 meters of soil eroded during the 19th and early 20th centuries was deposited as sediments onto floodplains along most streams in the Piedmont. This soil is thought to have filled former Piedmont wetlands, likely including swamp tupelo and willow oak depressions that provide habitat for waterfowl and other wildlife (South Carolina DNR, 2005).

The projects are located within upland forest habitats of the Piedmont, with tree species varying with soil moisture and their position on slopes. While many of the areas adjacent to the Piedmont and Upper Pelzer Projects have been converted to residential, commercial, and industrial uses, the Lower Pelzer Project area is primarily forested with

[103] Ecoregions are areas related by similar climate, physiography, hydrology, vegetation, and wildlife potential.

trees ranging from 20 to 50 years old. Dominant tree species within the project areas include shortleaf pine, Virginia pine, yellow poplar, sweetgum, red oak, white oak, and hickory. Other tree species that may occur include red gum, tulip poplar, ash, winged elm, red maple, river birch, willow oak, musclewood, sycamore, shagbark hickory, water oak, beech, and mockernut hickory (Enel Green Power North America, Inc., 2015a, 2015b, 2015c). Understory layers consisting of woody and non-woody shrub and herbaceous layers are common within this forest community (South Carolina DNR, 2005). Typical shrubs which may be found are buttonbush, spicebush, boxelder, maple, papaw, bladdernut, deerberry, strawberry bush, maple leaved vibernum, and willow alder. In addition to the trees and shrubs listed, numerous vines are common to the area, including wild yam, greenbrier, trumpet vine, Virginia creeper, wild grape, poison ivy, honeysuckle, and virgin's bower (Enel Green Power North America, Inc., 2015a, 2015b, 2015c).

Wetlands, Riparian and Littoral Habitat

FWS' National Wetlands Inventory (NWI) identifies vegetated and non-vegetated wetlands along the Saluda River, and within the project boundaries. The wetland, riparian, and littoral habitats within the project boundaries are associated with the margin and near shore areas of the project impoundments. According to NWI, the wetland types occurring within, and adjacent to, the project boundaries include palustrine forested (PFO), palustrine scrub-shrub (PSS), palustrine emergent (PEM) wetlands (figures 8–13).

During the development of the license applications, South Carolina DNR, South Carolina DHEC, and FWS requested a survey of existing wetland and wildlife resources at the projects. On August 19-21, 2014, and November 5-6, 2014, the applicants conducted a reconnaissance level wetland survey to ground-truth FWS' NWI wetland data, collect geo-spatial location data for each observed wetland type, and document incidental wildlife use within, and adjacent to, the project boundaries.[104]

During the wetland survey, similarities in the project impoundments were observed, including little, to no, detectable current throughout most of the impoundments, water depths in most areas ranging from about 4 to 20 feet, and substrates were primarily soft muck and sand, which have been deposited as a result of the reduced velocities from the lacustrine[105] conditions created by the project dams. In shallow areas, these substrates have been colonized by extensive areas of emergent vegetation. While the upstream portion of the project impoundments are slightly narrower with steeper riverbanks and

[104] The survey area for the Piedmont Project was limited to the 22-acre area of the impoundment immediately upstream of the Piedmont Dam, and not the full extent of the area within the project boundary upstream of the dam.

[105] Lacustrine refers to lakes and impounded waters.

channel slopes, the areas closest to the dam are wider, with gradually sloped riverbanks. The downstream portions of the impoundments also tend to have the deepest unconsolidated substrate and the most aquatic vegetation.

Wetlands identified by NWI were field verified, and 10 additional wetlands were documented, for a total of 28 wetlands. The types of wetlands observed included palustrine forested (PFO), palustrine scrub-shrub (PSS), lacustrine emergent (LEM), and lacustrine aquatic bed (LAB) wetlands. Within the Piedmont, Upper Pelzer, and Lower Pelzer Project boundaries, 8.48, 27.60, and 40.28 acres of wetlands were documented, respectively. A total of 76.36 acres of wetlands were observed at the projects (including aquatic beds) (table 10).

Most of the observed wetlands occur within the project boundaries, but some extend beyond them. Wetlands occurring within the project boundaries are primarily lacustrine (i.e., aquatic beds and emergent wetlands) while nearly all the wetlands extending outside of the project boundaries are palustrine forested wetlands that are within the floodplains of tributaries entering the Saluda River. All of the observed emergent wetlands are located within the project boundaries, as are the majority of the scrub-shrub wetlands, with the exception of those created by beaver activity (figures 8-13; table 10). The forested and scrub-shrub wetlands are dominated by broad-leaved deciduous species such as red maple, river birch, box elder, sycamore, black gum, and black willow.

Large areas of emergent aquatic vegetation (EAV) dominated by floating primrose-willow, are present in the project impoundments. Swamp smartweed, pickerelweed, and broadleaf arrowhead were also common in the emergent wetlands. Younger plants that were below or almost entirely below the surface (submergent) were classified as aquatic beds under the Cowardin system (see table 10). A total of 7.5 acres of aquatic beds occur within the project boundaries.

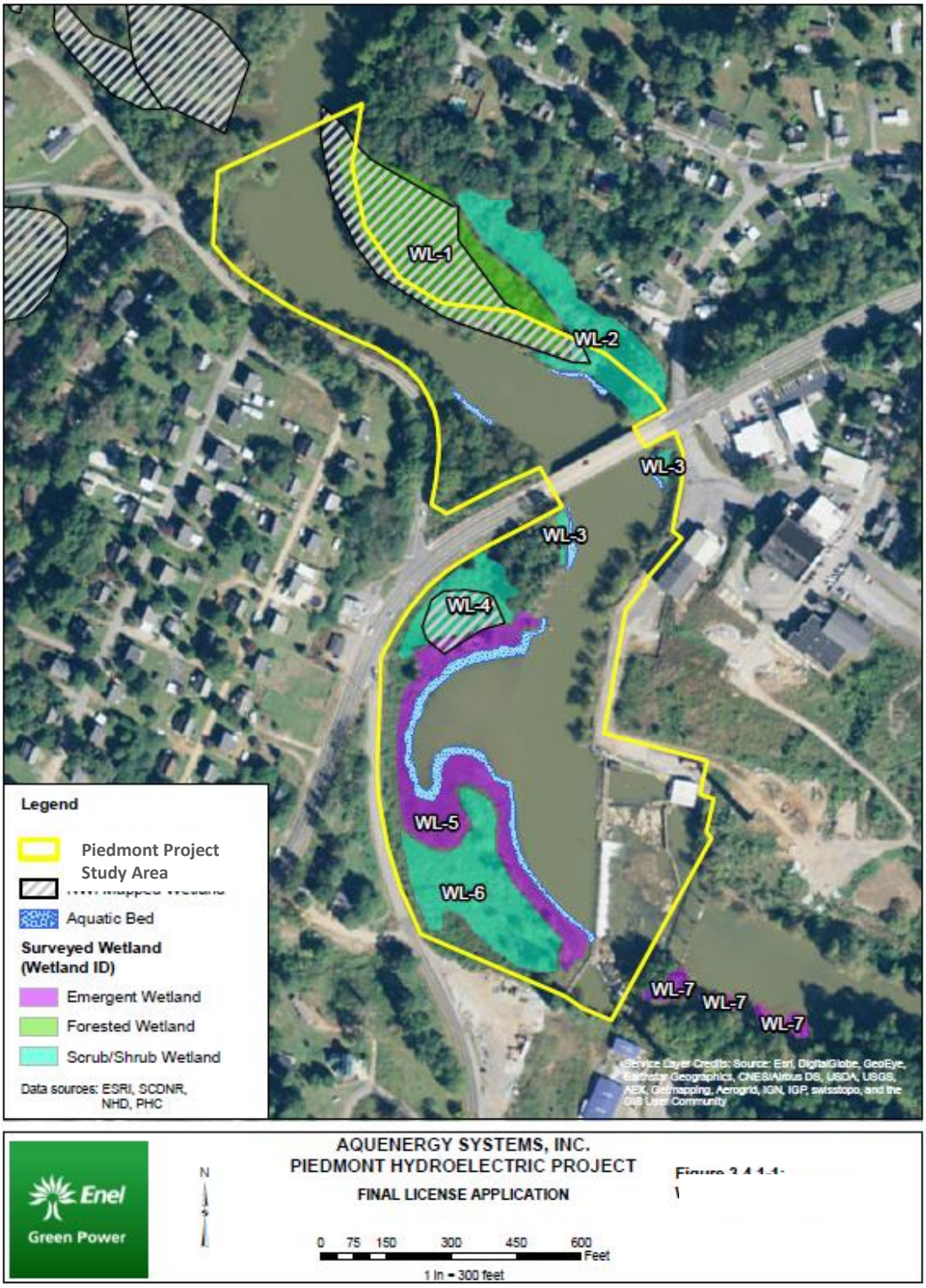

Figure 7. Wetlands identified by NWI and the 2014 Wetlands and Riparian Habitat Inventory within and adjacent to the applicant's study area at the Piedmont Project.
(Source: Aquenergy, as modified by staff).

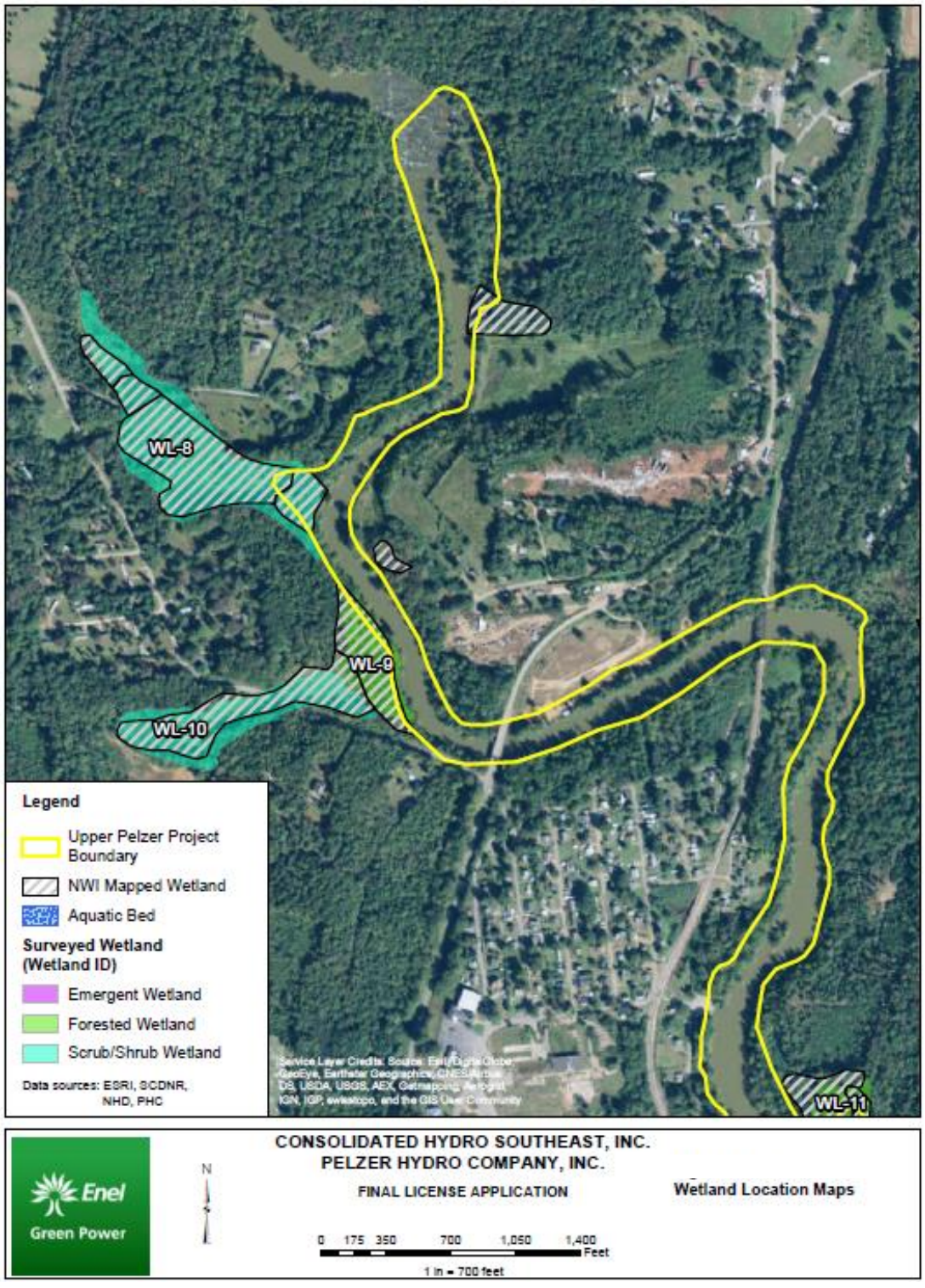

Figure 8. Wetlands identified by NWI and the 2014 Wetlands and Riparian Habitat Inventory within and adjacent to the upstream portion of the Upper Pelzer Project boundary.
(Source: Co-applicants, as modified by staff).

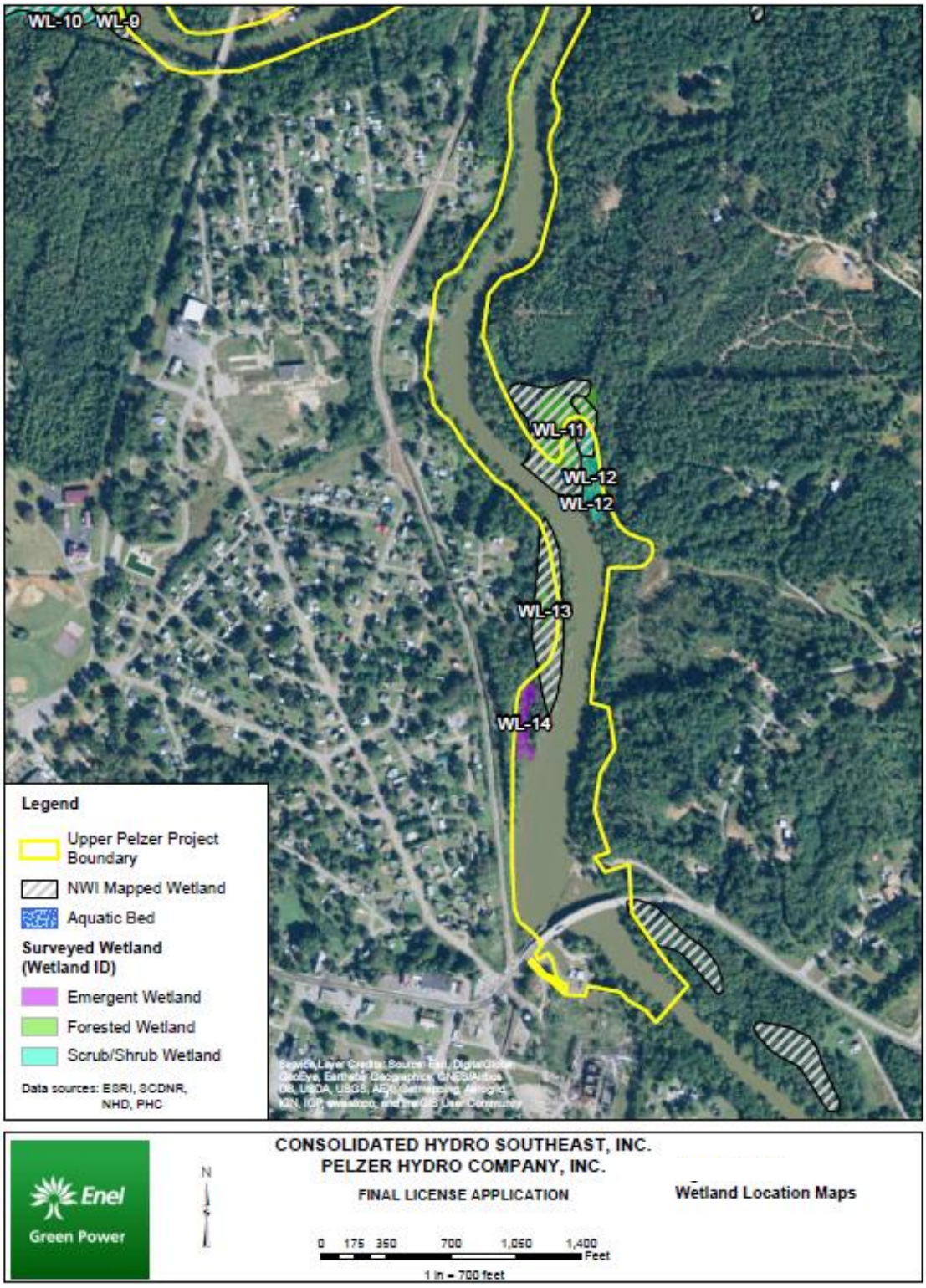

Figure 9. Wetlands identified by NWI and the 2014 Wetlands and Riparian Habitat Inventory within and adjacent to the downstream portion of the Upper Pelzer Project boundary.
(Source: Co-applicants, as modified by staff).

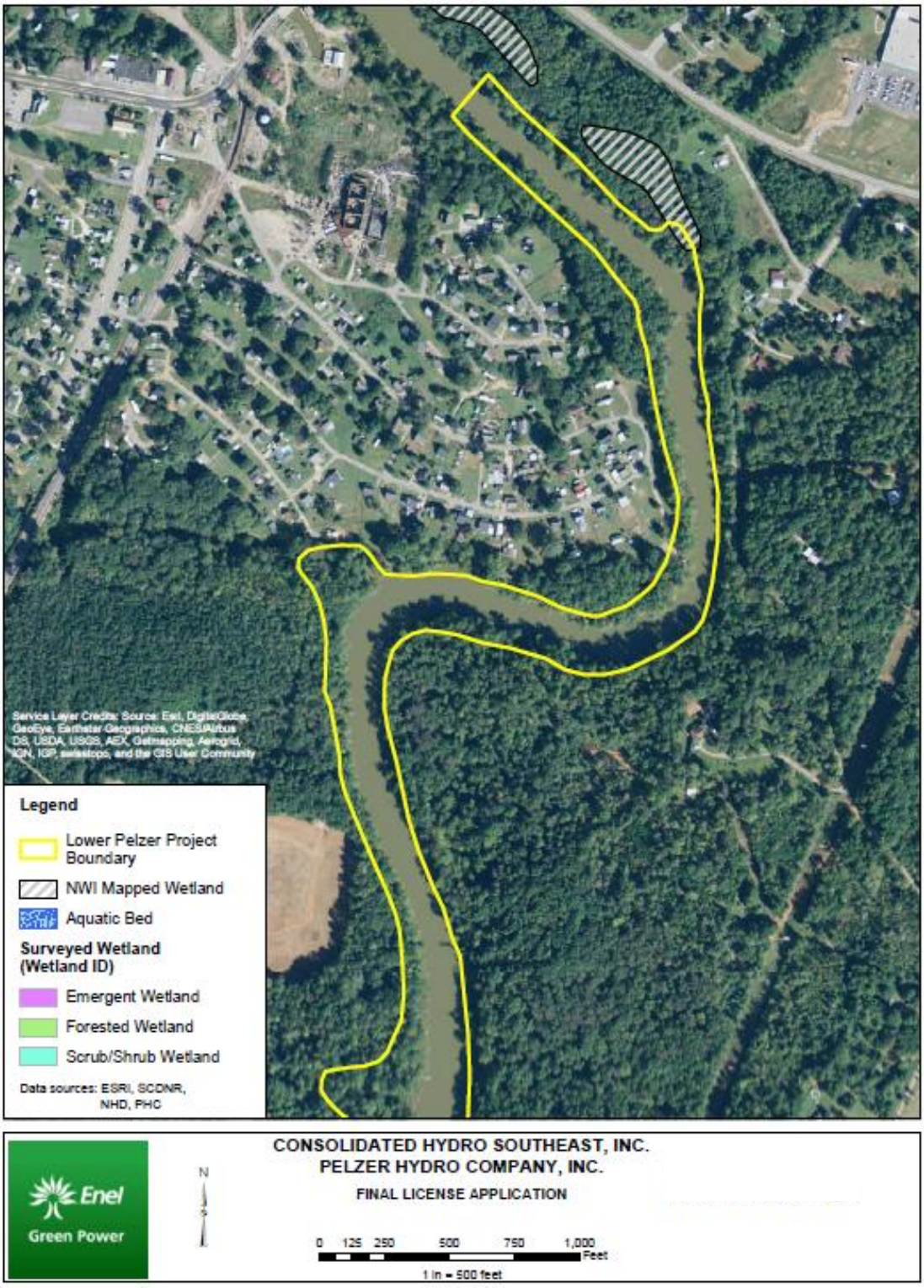

Figure 10. Wetlands identified by NWI and the 2014 Wetlands and Riparian Habitat Inventory within and adjacent to the upstream portion of the Lower Pelzer Project boundary.
(Source: Co-applicants, as modified by staff).

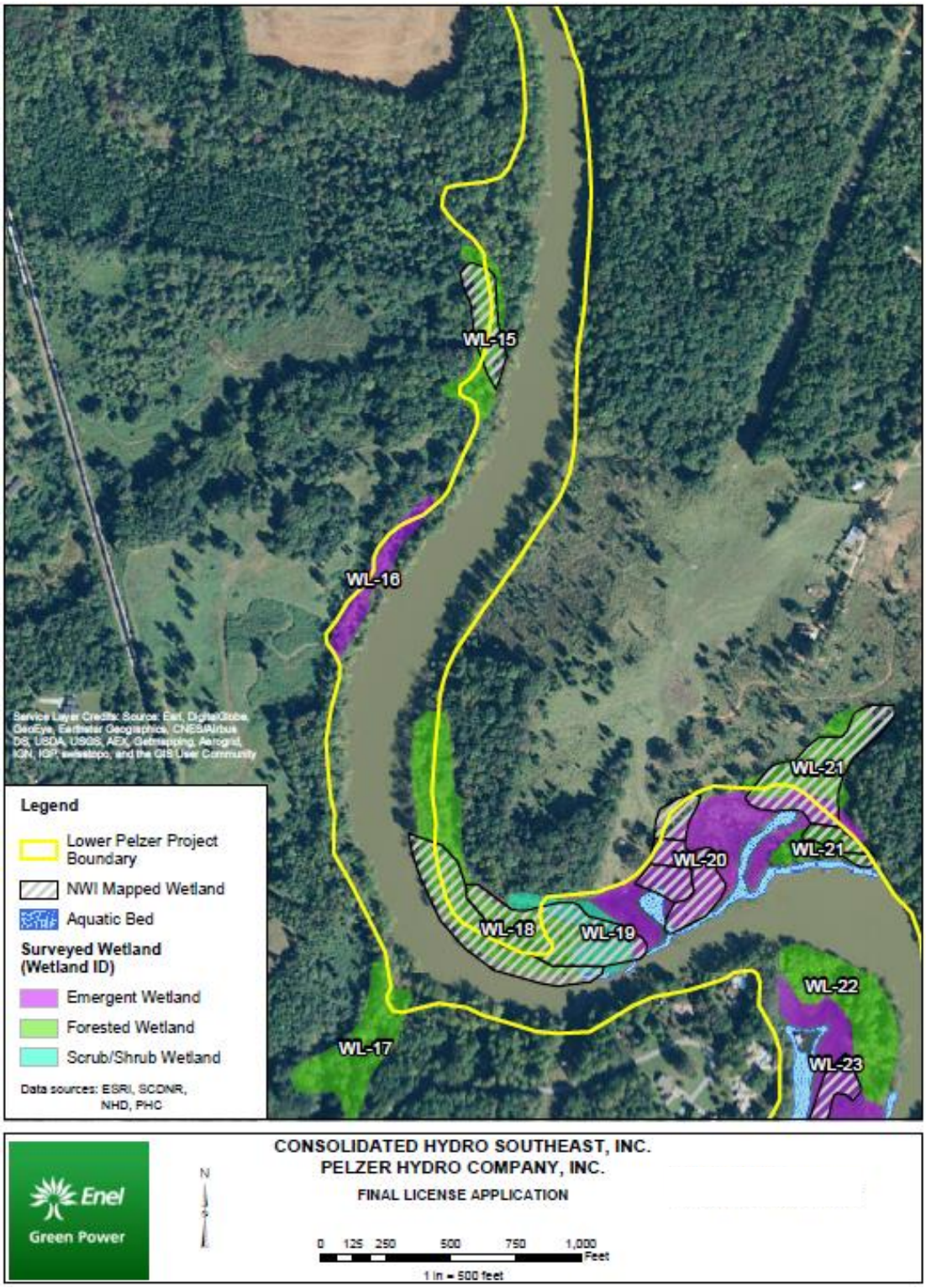

Figure 11. Wetlands identified by NWI and the 2014 Wetlands and Riparian Habitat Inventory within and adjacent to the upstream portion of the Lower Pelzer Project boundary.
(Source: Co-applicants, as modified by staff).

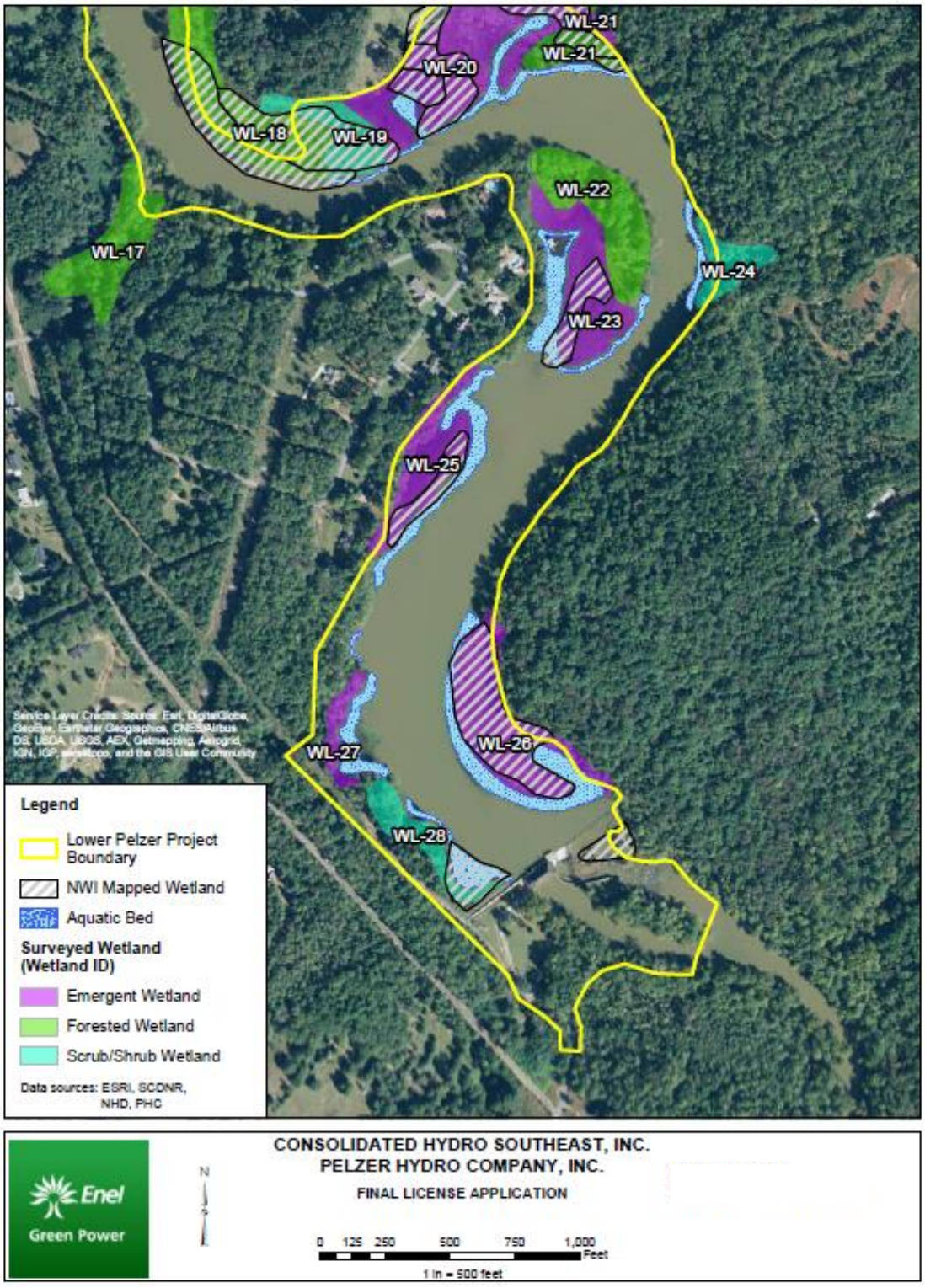

Figure 12. Wetlands identified by NWI and the 2014 Wetlands and Riparian Habitat Inventory within and adjacent to the downstream portion of the Lower Pelzer Project boundary.
(Source: Co-applicants, as modified by staff).

Table 11. Wetlands identified at the projects during the 2014 Wetlands and Riparian Habitat Inventory. (Source: Aquenergy and the co-applicants, as modified by staff).

Wetland Type		**Wetland Code**	Wetland Areas (acres) [Wetland site numbers][a]			**Total Acreage**
			Piedmont	**Upper Pelzer**	**Lower Pelzer**	
Palustrine forested, broad-leaved deciduous	Temporarily flooded, impounded	PFO1Ah	**2.3** [1]	**3.7** [9; 13]	**2.4** [21*]	**8.4**
	Semi-permanently flooded, impounded	PFO1Fh	**0**	**2.5** [11]	**2.4** [17^]	**4.9**
	Seasonally flooded	PFO1C	**0**	**0**	**1.7** [15]	**1.7**
	Seasonally flooded, impounded	PFO1Ch	**0**	**0**	**7.9** [18; 22^]	**7.9**
Palustrine scrub/shrub, broad-leaved deciduous	Semi-permanently flooded, impounded	PSS1Fh	**3.8** [2*^; 3*^; 4; 6^]	**1.1** [12]	**3.7** [19*; 24*^; 28*]	**8.6**
	Seasonally flooded, beaver	PSS1Cb	**0**	**19.7** [8; 10]	**0**	**19.7**
Lacustrine, littoral, emergent, non-persistent	Permanently flooded, impounded	L2EM2Hh	**1.5** [5*^]	**0**	**5.9** [25*; 26*]	**7.4**
	Semi-permanently flooded, impounded	L2EM2Fh	**0.26** [7^]	**0.6** [14^]	**9.4** [16^; 20*; 23*; 27*^]	**10.26**
Lacustrine, littoral, rooted/floating aquatic bed	Permanently flooded, impounded	L2AB(3/4)Hh	**0.62** [Aquatic Bed (EAV)]	**0**	**6.88** [Aquatic Bed (EAV)]	**7.5**
Totals			**8.48**	**27.6**	**40.28**	**76.36**

[a] The wetland site numbers in this table refer to wetlands documented during the 2014 Wetlands and Riparian Habitat Inventory. In figures X-1—X3c, the wetlands are labeled with the prefix "WL-," followed by these site numbers.

***** Wetland has associated Aquatic Bed (EAV) (L2AB3/4Hh) occurring along the fringe of low flow areas (usually in river bends and immediately upstream of impoundments); ranging from 2 to 30 feet wide.

^ Wetland not found on NWI mapping.

Invasive Species

The locations of non-native invasive plants in the project areas were documented as part of the applicants' 2014 Wetlands and Riparian Habitat Inventory (table 12). Kudzu, Chinese privet, and mimosa were observed primarily within scrub/shrub wetlands at the projects, including in 2.7, 2.0, and 3.9 acres[106] within the Piedmont, Upper Pelzer, and Lower Pelzer Project boundaries, respectively. In addition, Japanese honeysuckle occurs primarily in forested upland habitat within the Piedmont, Upper Pelzer, and Lower Pelzer Project boundaries, respectively.[107] As noted above, floating primrose-willow dominates large areas of EAV in the project impoundments.

The South Carolina Exotic Pest Plant Council (South Carolina EPPC) classifies Chinese privet, kudzu, and Japanese honeysuckle as non-native invasive species that pose a severe threat in South Carolina. These species are originally from Asia and have historically been planted widely throughout the southern U.S. as ornamentals or for erosion control, but their prolific seed production and/or the highly effective vegetative propagation of these species also facilitate their spread. Chinese privet is a deciduous or semi-evergreen shrub that readily invades shady forests, especially in stream floodplains, and birds feed on its berries, widely dispersing the seeds. Kudzu is a deciduous vine with up to 30 vines per tap root that grow up to 1 foot in a day, or over 100 feet each season, and can grow over, shade out, and eventually kill other vegetation, including trees. Japanese honeysuckle, a semi-evergreen vine, uses its climbing growth habit and the long growing season to invade a variety of habitats. Mimosa is a deciduous tree, also from Asia and commonly planted as an ornamental, that seeds prolifically, and also re-sprouts quickly when cut. South Carolina EPPC classifies mimosa as a significant threat in South Carolina. Floating primrose-willow often forms dense, floating colonies in shallow water near the riverbanks that extend into the open water. These non-native invasive plants can change the structure, composition, and function of wetland, riparian, and upland vegetation, which can also alter fish and/or wildlife habitats (Kaufman and Kaufman, 2007).

[106] These numbers are calculated before rounding individual wetland acreages.

[107] The estimated acreages of forested upland habitat at each project are unclear due to discrepancies in the AIR responses filed on June 20, 2017, and January 2, 2019.

Table 12. Non-native invasive botanical species observed during the 2014 Wetlands and Riparian Habitat Inventory, their associated habitats at the Piedmont, Upper Pelzer, and Lower Pelzer Hydroelectric Projects, and the South Carolina Exotic Pest Plant Council's threat categories.
(Sources: Aquenergy and the co-applicants, South Carolina DNR, 2010, and South Carolina EPPC, 2014, as modified by staff).

Common Name (Scientific name)	Forested Uplands	Forested Wetlands	Scrub/Shrub Wetlands	Emergent Wetlands	South Carolina EPPC threat category
trees and shrubs					
Chinese privet (*Ligustrum sinese*)			X		Severe threat
mimosa (*Aibisia julibrissin*)			X		Significant threat
Vines					
kudzu (*Pueravia lobata*)^	X		X		Severe threat
Japanese honeysuckle (*Lonicera japonica*)^	X				Severe threat
aquatic plants					
floating primrose-willow/ creeping water primrose (*Ludwigia peploides*)^+				X	N/A*

^ Species that are included on other state noxious weed lists. Kudzu is on the noxious weed lists in Connecticut, Florida, Illinois, Kansas, Kentucky, Massachusetts, Mississippi, Missouri, Oregon, Pennsylvania, Texas, Washington, and West Virginia. Japanese honeysuckle is on the noxious weed lists in Connecticut, Massachusetts, New Hampshire, and Vermont (South Carolina EPPC, 2014). Floating water-primrose is on the Washington state noxious weed list.

\+ Nativity status undetermined. The sub-species of *Ludwigia peploides*, which is required to determine whether this species is native or non-native to the project areas, was not identified and documented during the 2014 Wetlands and Riparian Habitat Inventory. *L. peploides* subspecies *peploides* and *glabrescens* are native to the U.S. The subspecies *montevidensis* is widely recognized as an introduced subspecies and is difficult to distinguish from other *Ludwigia* species, such as *Ludwigia hexapetala*, which is on South Carolina DNR's list of aquatic plant species that are "illegal to possess, import, or distribute in South Carolina."

* South Carolina EPPC list generally does not rank the relative threat of aquatic non-native invasive plants. It includes terrestrial non-native invasive plants and one aquatic non-native invasive plant because it is not included on South Carolina DNR's Aquatic Nuisance Species List (South Carolina DNR, 2010; South Carolina EPPC, 2014).

Wildlife

A variety of wildlife was observed during the applicants' Wetlands and Riparian Habitat Inventory surveys in 2014. Birds recorded in the project areas included red-shouldered hawk, red-tailed hawk, sharp-shinned hawk, osprey, king fisher, great blue heron, green heron, common egret, wood duck, mallard, American crow, bluejay, cardinal, robin, tufted titmouse, and ruby-throated hummingbird. Numerous unidentified song birds were also observed in the riparian forest, especially along the Lower Pelzer Project impoundment. Amphibians and reptiles in the project areas included northern cricket frog, green tree frog, bullfrog, pond slider, river cooter, common snapping turtle, and banded water snake. Mammals occurring in the project areas include muskrat and beaver. Observed insects include butterflies and damselflies. Many of these species, like common snapping turtle and bullfrog, are largely dependent upon water for much of their lifecycle, while other species, like banded water snake and great blue heron are dependent on water mainly for their food. Beavers appeared to be responsible for creating some of the wetland areas associated with the projects (e.g., wetlands adjacent to the upper end of the Upper Pelzer Project). Other species that may use the project areas include wild turkeys, quail, wood ducks, northern bobwhites, mourning doves, deer, foxes, raccoons, opossum, rabbits, and squirrels.

Special Status Species

FWS' Charleston Ecological Services Field Office requested that Incidental observations of federally listed and "at-risk" species known from Anderson and Greenville Counties be documented during the applicants' Wetlands and Riparian Habitat Inventory in 2014. Habitat within and adjacent to the project boundaries was also assessed for suitability and presence of any of the federally listed species and at risk species. Table 13 includes the terrestrial special status species that are known to occur in Anderson or Greenville Counties and that may occur at the projects. Federally listed species are discussed further in section 3.3.4 *Threatened and Endangered Species*.

Table 13. Terrestrial special status species known to occur in Anderson and/or Greenville Counties that may occur at the projects.
(Sources: Aquenergy and co-applicants, South Carolina DNR, and NatureServe, as modified by staff).

Common Name (*Scientific Name*)	**Federal Status**	**State Status/ Rank**	**Habitat/Distribution Notes**	**County**
Amphibians and Reptiles				
Green salamander (*Aneides aeneus*)	--	--/S1*	Occurs beneath loose bark of trees in hardwood forests, under logs, and on damp shaded cliff faces and in the crevices of large rock outcrops. The only arboreal salamander in South Carolina (South Carolina DNR, 2015b). Discontinuous range in Appalachian region, which includes western North and South Carolina (NatureServe, 2017).	Greenville
Bog turtle (*Clemmys muhlenbergi*)[108]	T (S/A)	ST/S1*	Open-canopy, wet meadows, streamside bogs, seeps, beaver ponds and other wetlands with flooded, dry, and saturated areas in upper piedmont and foothills (South Carolina DNR, 2015b). Spotty distribution in eastern U.S., including North and South Carolina; most viable populations in Maryland, New Jersey (NatureServe, 2017).	Greenville
Birds[109]				
American peregrine falcon	--	ST/SNR	Use cliffs, nest boxes, artificial structures like towers and buildings, and abandoned stick nests (e.g., osprey, red-tailed hawk, bald eagle,	Greenville

[108] An alternate scientific name (i.e., genus) for the bog turtle that is used by South Carolina DNR is "*Glyptemys muhlenbergi*."

[109] FWS' IPaC reports list the migratory birds of particular concern in the project areas. The bird species on these reports include brown-headed nuthatch, least bittern, rusty blackbird, wood thrush, worm eating warbler, Chuck-will's-widow, blue-winged warbler, Kentucky warbler, prairie warbler, prothonotary warbler, fox sparrow, red-headed

Common Name (*Scientific Name*)	Federal Status	State Status/ Rank	Habitat/Distribution Notes	County
(*Falco peregrinus anatum*)			and common raven) and open gulfs of air for foraging. During migration and winter, prefers wetlands with concentrations of waterfowl and shorebirds. Widespread world & U.S. distribution (South Carolina DNR, 2015b).	
Bald eagle (*Haliaeetus leucocephalus*)	BGEPA	ST/S2	Nests and perches in tall living trees, especially pines, in mature forests near large open water where foraging occurs. Widespread distribution in North America with large numbers of occurrences, many of high quality (NatureServe, 2017). South Carolina ranked 12th in the U.S. in total nesting pairs (i.e., 251) in 2009 (South Carolina DNR, 2015b).	Anderson
Eastern black rail (*Laterallus jamaicensis jamaicensis*)	P	--/SNR	Creates woven nests in emergent wetlands with dense sedges, rushes, and grasses. Historically widespread distribution in the U.S. east of the Rocky Mountains, and eastern Mexico, Central America, and the Caribbean. Severe population declines throughout its range with recent surveys estimating the population in South Carolina to be limited to two known occupied areas with 50 to 100 breeding pairs (NatureServe, 2018).	Anderson
Mammals				
Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)	--	SE/S2+	Roosts in large hollow cavity trees (e.g., tulip poplars), abandoned buildings, cave or cave-like structures (i.e., rock shelters and abandoned mines). Also uses mesic, cove, and dry hardwood forests, forested bottomlands, bottomland agricultural fields, pine woodlands, and forested riparian areas. Resident (non-migratory)	Greenville

woodpecker, bald eagle, loggerhead shrike, peregrine falcon, and short-eared owl. None of these species were observed during the applicants' 2014 surveys.

Common Name (*Scientific Name*)	Federal Status	State Status/ Rank	Habitat/Distribution Notes	County
			species; found in/near Appalachian Mountains including North and South Carolina, and Georgia (South Carolina DNR, 2015b).	
Eastern small-footed bat (*Myotis leibii*)	--	ST/S1*	Roosts in caves, mines, abandoned buildings, bridges, rock crevices and shelters in wooded areas; thought to forage near ponds/streams and use forested corridors between roosts and foraging areas. Only a few roosts found in South Carolina (South Carolina DNR, 2015b). Range spotty; Canada, eastern and Midwest U.S.; largest populations in New York, Pennsylvania, West Virginia, and western Virginia (NatureServe, 2017).	Greenville
Northern long-eared bat (*Myotis septentrionalis*)	T	--/S4*	Roosts in crevices and cavities in dead or live-damaged trees, and sometimes between loose bark and the bole of dead trees; forages in mature stands (South Carolina DNR, 2015b). Prefers interior forested habitats. Broad, patchy range in southern Canada and eastern and northcentral U.S. (NatureServe, 2017).	Greenville
Plants				
Smooth coneflower (*Echinacea laevigata*)	E	--/S3	Edaphically-limited (magnesium- and calcium-rich soils) and requires full or partial sun. Historically occurred in prairie-like habitats or oak-savannas maintained by fire. Currently occurs in woodland openings (e.g., cedar barrens, clear cuts, roadsides, and utility line rights-of-way) and dry limestone bluffs in Georgia, North and South Carolina, and Virginia (NatureServe, 2017).	Anderson
Swamp pink (*Helonias bullata*)	T	--/S1	Restricted to forested wetlands that are perennially-saturated but with low frequency of inundation. Occurs in coastal plain and/or higher elevations (primarily disjunct bog areas in the Southern Appalachians) in New Jersey, Delaware, Maryland, Virginia, North and South Carolina, and Georgia (NatureServe, 2017).	Greenville

Common Name (*Scientific Name*)	**Federal Status**	**State Status/ Rank**	**Habitat/Distribution Notes**	**County**
Dwarf-flowered heartleaf (*Hexastylis naniflora*)	T	--/S3	Generally occurs around tree/shrub bases in acidic soils, on moist to rather dry and relatively steep north-facing slopes of ravines in the Piedmont; usually found in the oak-hickory-pine community type. Endemic to the upper Piedmont of North and South Carolina (NatureServe, 2017).	Greenville
Small whorled pogonia (*Isotria medeoloides*)	T	--/S2	Occurs in acidic soils with light to moderate leaf litter, on flats or slope bases near canopy breaks, in dry to mesic mature and second-growth forests (deciduous or deciduous-coniferous) with an open herb layer; occasionally found among dense ferns and moderate to light shrub layer. Widely distributed from Maine south to Georgia with outlying occurrences in the Midwest U.S. and Ontario, Canada (NatureServe, 2017).	Greenville
White fringeless orchid (*Platanthera integrilabia*)	T	--/S1	Occurs in flat, boggy areas in acidic muck or sand, and in partially, but not fully shaded areas at the head of streams or seepage slopes; many occurrences in right-of-ways that are regularly cleared. Found Kentucky, Tennessee, Alabama, Mississippi, Georgia, and South Carolina (Piedmont) (NatureServe, 2017).	Greenville
Sun-facing coneflower (*Rudbeckia heliopsidis*)	--	--/S1S2	Grows in full sun to partial shade in moist to wet sites such as seeps, bogs, acidic swales, among grasses, sedges, and herbs, in pine-oak-hickory woodlands, peaty seeps in meadows, and sandy alluvium along streams. Occurs in the southeastern U.S. in coastal plain, piedmont, and Appalachian Plateau areas (NatureServe, 2017).	Greenville
Bunched arrowhead (*Sagittaria fasciculata*)	E	--/S2	Occurs at the base of bluffs on gently sloping areas near seeps with some standing water. Endemic to North Carolina and South Carolina with extremely limited distribution (extant in two counties) (NatureServe, 2017).	Greenville

Common Name (*Scientific Name*)	**Federal Status**	**State Status/ Rank**	**Habitat/Distribution Notes**	**County**
Mountain sweet pitcher-plant (*Sarracenia rubra ssp. jonesii*)	E	--/S1/S2	Prefers wettest parts of seepage-fed depression bogs with flat deep, poorly drained loam/sand/silt, acidic soils, on gentle slopes in valleys that do not flood. Also found in cataract bogs and along the edges or ledges of waterfalls. Endemic to a few sites in southwest North Carolina and northwest South Carolina (NatureServe, 2017).	Greenville
Purple pitcher plant (*Sarracenia purpurea* var. *montana*)	--	--/SNR^	Found in a few mountain and seepage bogs of the Blue Ridge Mountains and adjacent piedmont of southwestern North Carolina, northwestern South Carolina, and northeastern Georgia (NatureServe, 2017).	Greenville
White irisette[110] (*Sisyrinchium dichotomum*)	E	--/S1	Restricted to rich, basic soils, often with exposed humus or mineral soil layers. Occurs in clearings and near edges of upland woods with thin canopy cover (e.g., power line and road right-of-ways). Endemic to upper Piedmont; found in four counties in North and South Carolina (NatureServe, 2017).	Greenville
Georgia aster (*Symphyotrichum georgianum*)	--[111]	--/SNR	Found in dry, open woods, roadsides, and other openings; likely a relict of the post oak-savannas historically maintained by wildfire and large native grazers. Extant in 34 counties in the Carolinas, Alabama, and Georgia (NatureServe, 2017).	Anderson

[110] An alternate common name for white irisette used by South Carolina DNR and NatureServe is "reflexed blue-eyed grass."

[111] This species was not identified on FWS' IPaC lists for the projects and currently it has no federal status. 79 Fed. Reg. 56,041-56,047 (September 18, 2014).

Common Name (*Scientific Name*)	Federal Status	State Status/ Rank	Habitat/Distribution Notes	County
Carolina hemlock (*Tsuga caroliniana*)	--	--/SNR^	Limited to rocky stream beds and lower slopes of the southern Blue Ridge Mountains in Virginia, North and South Carolina, Georgia, and Tennessee (NatureServe, 2017).	Greenville
Lichen				
Rock gnome lichen (*Gymnoderma lineare*)	E	--/S1	Occurs in humid, high elevation areas on shady rock or shady moss-covered rocks/cliffs or in deep river gorges at lower elevations; primarily found on vertical rock faces with intermittent seepage, and large stream side boulders. Endemic to southern Appalachian Mountains (North and South Carolina, Tennessee, and Georgia (NatureServe, 2017).	Greenville

-- — Not listed
E — Federally Listed Endangered
T — Federally Listed Threatened
T(S/A) — Federally Listed Threatened, Similarity of Appearance
BGEPA — Protected by the Bald and Golden Eagle Protection Act
P — Proposed for Federal Listing
SE — State Listed Endangered (South Carolina)
ST — State Listed Threatened (South Carolina)
S1 — Critically imperiled in the nation or state/province because of extreme rarity (often five or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 — Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 — Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
SNR — Unranked: Nation or state/province conservation status not yet assessed.

***** — Species listed as highest priority on the 2015 South Carolina SWAP.
^ — Species no longer appears on the South Carolina state lists of rare, threatened, and endangered species for Anderson and Greenville Counties.
+ — Species currently on the South Carolina state lists of rare, threatened, and endangered species for Anderson and Greenville Counties, that were not on these lists at the time of applicants' surveys.

3.3.3.2 Environmental Effects

Effects of Project Operation and Maintenance and Project-Related Recreation on Wetlands, Riparian Habitat, and Associated Wildlife

The projects could affect wetlands, riparian habitat, and associated wildlife through proposed project operations (i.e., the mode of operation) and regular maintenance of project structures and equipment, sediment management, vegetation management, and project-related recreation.

Project Operation and Maintenance

As stated in section 2.2.2, *Proposed Project Operation*, and discussed in section 3.3.2 *Aquatic Resources*, the applicants propose to continue to operate the projects in a run-of-river mode to improve and maintain aquatic habitat and water quality downstream from the projects.[112] Under run-of-river operation, the applicants would maintain the existing water surface elevations of the impoundments (i.e., 767.2 feet at Piedmont, 719.9 feet at Upper Pelzer, and 694 feet at Lower Pelzer) and release minimum flows (i.e., 15 cfs at both Piedmont and Upper Pelzer [proposed], and 140 cfs at Lower Pelzer), or inflow, whichever is less, downstream from the projects. The proposed minimum flow at the Upper Pelzer would be released via a new weir to be constructed on the spillway crest adjacent to the east dam abutment. Regular maintenance of the projects typically includes infrequent flashboard repairs and associated drawdowns, as described in section 2.1.4, *Current Project Operations*.

Water quality certification condition 2 for the Piedmont, Upper Pelzer, and Lower Pelzer Projects states that the projects must continue to operate as run-of-river facilities. Certification condition 3 states that the applicants must continue to provide the 15-cfs and 140-cfs minimum flows at the Piedmont and Lower Pelzer Projects, respectively, and provide a new, 15-cfs minimum flow at the Upper Pelzer Project. In its January 11, 2018 letter, South Carolina DNR concurs with the applicants' proposed run-of-river operating regimes and the minimum flows.

[112] The current licenses for the Upper Pelzer and Lower Pelzer Projects require an "instantaneous run-of-river" operation mode, which was described as outflows approximating the instantaneous inflow[s], minus existing consumptive uses. However, precise instantaneous matching of outflows to inflows is not actually practicable at the projects, and so run-of-river is a more accurate description of existing project operations.

Our Analysis

Hydropower project operation and maintenance activities can affect wetlands, riparian habitat, and associated wildlife by modifying the natural flows through a river basin and converting segments of streams from riverine to regulated lacustrine environments. Wetlands at the projects developed under the hydroperiod[113] established by the existing run-of-river operating regime, which mimic the natural hydroperiod of the Saluda River. Vegetation in the project wetlands is adapted to the fluctuations associated with the natural inflows to the project impoundments and the run-of-river outflows from the projects, and would not be affected by continued run-of-river operation. Regular maintenance drawdowns have been infrequent (i.e., less than once per year)[114] at each of the projects, temporary in duration, and limited to 2 to 4 feet below the normal elevations of the impoundments (i.e., the height of the flashboards). Continued regular maintenance at such infrequent intervals would not affect existing wetlands during any new license terms for the projects.

The projects provide habitat for a variety of wildlife, as evidenced by the species observed during the applicants' 2014 Wetlands and Riparian Habitat surveys. Some of the existing wetlands within, and adjacent to, the Upper Pelzer Project impoundment are also influenced by beaver activity in the project area. Run-of-river operation with minimum downstream flows would not affect existing wetland habitat, including those influenced by beavers. Continued run-of-river operation would maintain the existing frequency and duration of flows at the projects, thereby preserving wetland habitats and benefitting great blue heron, green heron, common egret, wood duck, mallard, bullfrog, pond slider, river cooter, common snapping turtle, banded water snake, muskrats, damselflies, and other wildlife occurring in the project areas.

Sediment Management

As described in section 2.1.4, *Current Environmental Measures* and section 3.3.1, *Geological and Soil Resources*, there has not been intentional sediment management at the Piedmont Project, and sediment management activities at the Upper and Lower Pelzer Projects under the Sediment Flushing Plan have been sporadic over the last 30 years. Aquenergy proposes to develop a Sediment Management Plan for the Piedmont Project in consultation with resource agencies after license issuance. In addition, the co-applicants propose to continue to implement the current Sediment Flushing Plan at the Upper and Lower Pelzer Projects, and, after license issuance, consult with resource agencies to review and update the Sediment Flushing Plan, as necessary. All of the plans would include provisions to intentionally manage sediment. Sediment would be flushed

[113] A hydroperiod is the seasonal pattern of water levels within a wetland.

[114] *See* AIR response filed August 28, 2018.

downstream on a regular basis to reduce accumulation behind the dams and to minimize potential sediment discharges during unplanned releases or emergency conditions. The plans also include provisions for rehabilitating the dam sluice gates at the Piedmont and Upper Pelzer Projects, if the canal sluice gates cannot be used to flush sediment effectively, and then scheduling sediment flushing through the sluice gates at all three projects during the fall/winter. The applicants do not propose to draw down the impoundments during flushing events, or to dredge the impoundments, although dredging is identified as a possible alternative in the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects.

Condition 4 of the Piedmont Project's water quality certification states that Aquenergy must develop a Sediment Management Plan in consultation with resource agencies. Certification condition 5 for the Upper Pelzer Project and certification condition 4 for the Lower Pelzer Project state that the projects must continue to implement the current Sediment Flushing Plan, and upon receiving new licenses, revise the current plan in consultation with resource agencies, if necessary.

South Carolina DNR, in letters filed on January 11, 2018, recommends the development of a Sediment Management Plan for the Piedmont Project, as proposed by Aquenergy, and supports the co-applicants' proposal to implement the current Sediment Flushing Plan for the Upper Pelzer and Lower Pelzer Projects. South Carolina DNR recommends that all of the plans include provisions to avoid or minimize the unintended release of sediments during scheduled maintenance activities, as well as measures to address such releases during emergency events. For the Piedmont Project, South Carolina DNR comments that dredging may be the only practical method to remove sediments from the impoundment because the project currently lacks an operable gate mechanism to release sediment safely and effectively.

Our Analysis

Intentionally managing sediment at the projects could affect existing wetlands and/or riparian habitat by disturbing and mobilizing the substrates that have been deposited within the project impoundments and along the impoundment banks, and within which wetland vegetation grows. The applicants' 2014 Wetlands and Riparian Habitat Inventory Report indicates that the impoundment depths generally range from 4 to 20 feet with soft muck and sand substrates. Some substrates have been colonized by extensive areas of emergent wetlands that are bordered by floating aquatic beds dominated by floating primrose-willow. In the Piedmont and Lower Pelzer impoundments, these emergent wetlands and floating aquatic beds occur close to the project dams, but not near the project powerhouses. While a small area of emergent vegetation was also observed in the Upper Pelzer Project impoundment, it occurs along the west bank about 700 to 1000 feet upstream from the project dam. No other wetlands were observed closer to the Upper Pelzer Dam.

It is unclear whether or not the substrates beneath these beds would be mobilized during the proposed sediment flushing events. It is also undetermined whether or not the canal sluice gates at the Piedmont and Upper Pelzer Projects can effectively flush sediment from the impoundments, or if the dam sluice gates at those projects can be successfully rehabilitated to facilitate another method of sediment transport through the dams. Under existing conditions, wetland substrates appear to be stable, as sediment transport is largely passive, moving through the project powerhouses with high flows. Under intentional sediment management techniques (e.g., flushing, dredging, or a combination of methods), the potential mobilization of substrates beneath wetland vegetation would depend on many factors including the velocity and duration of inflows, how deeply rooted the emergent vegetation is, the locations of discharge through the project structures, and/or dredging, relative to the vegetation and substrates. Dredging would involve more intense disturbance of existing substrates in the project impoundments than flushing. At this time, it is not clear if dredging would be needed to reduce the risk of discharging large amounts of sediment through the project dams during unplanned releases or emergency conditions. If dredging were to occur close to the existing emergent wetlands and/or floating aquatic beds, it could uproot and/or fragment the vegetation and allow it to be transported downstream. As discussed herein, the sub-species of floating primrose-willow is unknown, and, therefore, it is unclear whether it is native or non-native (table 12). Spreading non-native vegetation downstream from the projects could adversely affect wetland structure and function, and wildlife habitats within and beyond the project boundaries.

The applicants' proposed plans contain provisions that could be used to identify and minimize potential effects of sediment management to project wetlands. Documenting the bathymetry of the impoundments, monitoring sediment accumulation, and estimating the volume of sediment released could help to predict which, if any, wetland vegetation could be affected by sediment management activities. To further identify and minimize potential effects to project wetlands, plans for the projects could include a provision to monitor emergent wetlands and floating aquatic beds during the proposed one-day annual flushing events and consult with resource agencies if wetland vegetation is dislodged or otherwise affected by sediment flushing methods. To minimize the potential effects of dredging on project wetlands, the plans could include provisions to select locations to dredge that would not compromise the stability of shorelines and the roots of existing wetland vegetation. As discussed in section 3.3.1.2, *Environmental Effects, Effects of Project Operation on Sediment Erosion and Transport*, appropriate methods for managing sediment at the projects could be evaluated, in consultation with resource agencies, once the existing bathymetry and sediment characteristic (e.g., type, particle size, composition) data are available. This data is also critical for developing effective measures to protect wetlands and other resources at the projects during sediment management activities. Reviewing the bathymetry and sediment data with resource agencies would allow the applicants to minimize the

potential adverse effects to wetlands in the project areas as appropriate sediment management methods are developed for the final plans.

Vegetation Management

Vegetation management activities in the project areas could affect the species composition and density, as well as the structure and function of the wetland and riparian areas in the project boundaries. The applicants propose to continue to implement their existing vegetation management activities, which include mowing and use of herbicides. The applicants do not currently operate or maintain any of the existing recreation facilities associated with the projects except for the Upper Pelzer fishing area, and the fishing access station at the Lower Pelzer Project. However, the applicants would maintain the proposed canoe portages by clearing grassy and woody vegetation, as needed; monitoring for erosion and implementing appropriate remedial actions, if needed; and cleaning up litter periodically during the summer.

In its January 11, 2018 letter, South Carolina DNR recommends that the applicants protect and conserve vegetation within the project boundaries by implementing the following measures: (1) avoid and minimize ground-disturbing activities and disturbance of riparian vegetation on project lands, whenever possible; (2) consult with state and federal resource agencies on the implementation of best management practices (BMPs) to be employed during construction or refurbishment activities at the projects; and (3) maintain forested riparian buffers that are at least 25 feet wide along the shorelines of each project, with exceptions for locations where a water-dependent structure or facility may require a different shoreline condition.

In their March 1, 2018, reply comments, the applicants state that they agree in principle, and in general concept, with South Carolina DNR's recommendations 1 and 2 (as numbered above). However, the applicants state that they would not be able to implement recommendation 3 above because the project boundaries are limited to a contour elevation around the impoundments that are generally within a few feet of the shoreline. The applicants state that they do not have control over land use practices outside of the project boundaries.

Our Analysis

The applicants' proposals to continue to implement existing vegetation management practices would maintain vegetation in the immediate vicinity of project facilities in a manicured, or early succession state. Mowing occurs weekly from April through September (no mowing is done from October through March) in the areas adjacent to each of the project powerhouses and dams. Herbicides (i.e., Roundup®) are typically applied monthly from April through September along fence lines, access roads, and areas that are not easily accessible for mowing adjacent to the project powerhouses and dams. In addition, the applicants apply herbicides year-round on buildings and other

project structures (e.g., dam training walls), as needed to keep them clear of vines and other climbing vegetation. These types of vegetation maintenance activities are limited to the vegetation growing around the perimeters of the project facilities, which are all relatively small footprints in mostly upland habitats.

South Carolina DNR's recommendations regarding vegetation management at the projects were very general in nature and it appears that the applicants already implement, or are amenable to, some of them. The applicants concur that avoiding and minimizing ground-disturbing activities and disturbance of riparian vegetation on project lands, whenever possible, would protect the project shorelines/banks by minimizing erosion and thereby also minimizing sedimentation of the impoundment. The applicants also agree that consulting with state and federal resource agencies on the implementation of BMPs to be employed during construction or refurbishment activities at the projects would be beneficial. During the current license terms, prior to conducting construction activities in or near the water, the applicants state that they typically notify and consult with the resource agencies concerning any permit requirements or required operational modifications.

Construction of the proposed canoe portages would require removal of some vegetation at each of the projects. The applicant states that the proposed canoe portage routes are located on developed and/or disturbed land. Several prolific non-native invasive plants (e.g., kudzu, Japanese honeysuckle, and Chinese privet) occur within the project boundaries, and are likely present along the proposed canoe route for the Lower Pelzer Project. Given that non-native invasive plant species occur in the project areas and thrive in disturbed habitats, it would likely be necessary for the applicants to periodically monitor the canoe portages and cut back, or use herbicides on any encroaching vegetation, to maintain clear paths for recreationists. Managing non-native invasive vegetation along the proposed canoe portages would help to minimize the potential for recreationists to inadvertently spread these species to new areas within or adjacent to the project boundaries, thereby benefitting native vegetation and wildlife.

Other measures may be necessary to minimize the potential effects of proposed project repairs, sediment management activities, and/or construction or maintenance of the canoe portages on terrestrial resources. More specific BMPs could be developed in consultation with resource agencies as part of the development of the proposed Sediment Management Plan for the Piedmont Project, updated Sediment Flushing Plan for the Upper and Lower Pelzer Projects, and RMPs for all three projects.

It is widely recognized that riparian buffer zones provide numerous environmental benefits, such as slowing and filtering stormwater runoff, protecting water quality, conserving and enhancing species diversity, maintaining wildlife corridors, and protecting aesthetic/scenic values. South Carolina DNR encourages all landowners to establish, protect, and/or expand riparian buffers on all streams. Specifically, South

Carolina DNR recommends that landowners retain and/or establish 40- to 300-foot-wide riparian buffers on both sides of streams depending on the stream size, slopes of the streambanks, presence of wetlands, floodplain, and/or critical habitats, and the natural resource management goals such as improving water quality and conserving or enhancing wildlife habitat (South Carolina DNR, 2008). South Carolina DNR also implements a Scenic River Program in which it promotes the use of riparian buffers of various widths and other BMPs based on the management goal(s) and existing land uses (South Carolina DNR, 2015c). The recommended riparian buffer widths and BMPs under this program are designed to serve as guidelines for conserving or enhancing water quality, wildlife habitats, and the scenic character of state-designated scenic river corridors. While segments of the Saluda River upstream and downstream of the projects are South Carolina designated Scenic Rivers, none of the designated segments are near to, or influenced by, the projects. Therefore, the riparian buffers and other BMPs recommended under the South Carolina Scenic River Program are not applicable to the riparian corridors within, and adjacent to, the Piedmont, Upper Pelzer, and Lower Pelzer Project boundaries.

The extent of the existing riparian habitat at the projects varies greatly, as private lands adjacent to the project boundaries have historically developed unevenly and landowners are not currently required to retain or establish riparian buffers on their property. Rather, South Carolina DNR's riparian buffers are optional recommendations for landowners, including the applicants. On large segments of the shorelines at the projects, the vegetated riparian buffers are already 25-feet-wide or greater, which would provide the ecological benefits described above. In addition, as the applicants noted, the project boundaries are limited to a contour elevation around the impoundments that are generally within a few feet of the shoreline and they cannot control land uses on adjacent private lands. In order to implement South Carolina DNR's recommendation, the applicants would have to acquire sufficient rights to lands adjacent to the project boundaries to allow them to increase the riparian buffer widths in locations where it is less than 25 feet. However, it has not been demonstrated that additional riparian lands would be needed.

Continuing run-of-river operation and the existing vegetation management practices at the projects would preserve the existing hydroperiod, water quality and quantity, and riparian vegetation. Establishing and maintaining relatively short canoe portages around the projects' dams, as discussed below, would not have a significant impact on the existing riparian vegetation. Therefore, relicensing the projects would maintain quality and character of the existing riparian buffers within the project boundaries.

Project-Related Recreation

As described in section 3.3.5, *Recreation and Land Use*, the applicants propose to construct and maintain canoe take-outs, portages, and put-ins at each of the projects. The applicants would also develop RMPs for each of the projects, in consultation with stakeholders.

In its January 11, 2018 letters, South Carolina DNR states that it agrees with, and recommends, the applicants' recreation proposals (i.e., the canoe portages, recreation plans, and continued public access to the projects for recreation) be implemented.

Our Analysis

The proposed canoe portages at the Piedmont, Upper Pelzer, and Lower Pelzer Projects, would be about 1,230-, 560-, and 1,375-feet-long, respectively, and would be located along the banks of the Saluda River, as described further in section 3.3.5.2, *Environmental Effects, Recreation Use and Access*. These portage routes would be constructed mostly on lands that have been developed and/or experience regular disturbances associated with adjacent private and commercial land uses. Recreation activities such as canoeing and hiking can affect terrestrial resource through trampling or otherwise damaging native vegetation and inadvertently fragmenting and spreading non-native vegetation in waterbodies or on shoes and recreation gear. As discussed above, the applicants are amenable to avoiding and minimizing ground-disturbing activities and disturbance of riparian vegetation on project lands, whenever possible, and consulting with stakeholders to develop other BMPs to avoid or minimize potential impacts of construction or refurbishment activities at the projects. Once the routes for the proposed canoe portages are finalized, the applicants could work with resource agencies and other stakeholders to develop site-specific BMPs to avoid or minimize erosion, impacts to native vegetation and wildlife, and the spread of non-native invasive vegetation during and after construction.

Effects of the Projects on Special Status Species

The applicants do not propose any measures related to the protection of state-listed rare, threatened, or endangered species. In addition, no stakeholders recommended specific measures to protect these special status species.

Our Analysis

None of the state- or federally-protected species identified by FWS were observed during the project surveys. Federally listed species are discussed in more detail in section 3.3.4, *Threatened and Endangered Species*. Suitable habitat for many of these special status species does not occur within the project boundaries. However, several of these species may be present within the project boundaries for brief periods of time while

foraging (e.g., bald eagle). While some suitable habitat is present within the project boundaries, none of the state-protected species were observed during the applicants' 2014 surveys. Therefore, relicensing the projects is not expected to affect any state-listed rare, threatened, or endangered species.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

On September 7, 2017, FWS' IPaC system indicated that eleven federally-listed threatened and endangered species may occur within the project boundaries, or be affected by one or more of the projects, including: the northern long-eared bat, bog turtle, rock gnome lichen, and eight plants including bunched arrowhead, dwarf-flowered heartleaf, mountain sweet pitcher-plant, small whorled pogonia, smooth coneflower, swamp pink, white fringeless orchid, and white irisette (FWS, 2017). A review of FWS' IPaC system on July 9, 2019, indicates that the proposed threatened Eastern black rail may also be present in the project areas (FWS, 2019a). No critical habitat for any federally listed threatened and endangered, or proposed species occurs within project-affected lands.

Animals

Northern Long-Eared Bat

Northern long-eared bat is a medium-sized migratory bat species with longer ears (average 17 millimeters mm, or 0.7 inches) than other *Myotis* species. This species uses high frequency echolocation to forage on moths, beetles, spiders, flies, and leafhoppers, primarily between the understory and canopy in forested areas, but also in more open areas such as forest clearings, over water bodies, and along roads starting at dusk. During the winter, small groups of northern long-eared bats typically hibernate in cracks and crevices in the walls or ceilings of caves or abandoned mines with high humidity, cool temperatures, and no air currents, but this species has also been observed hibernating in buildings, railroad tunnels, and other man-made structures. Every 2 to 3 days during the summer, individuals or colonies switch roosts which can include a wide variety of live and dead tree species and sizes,[115] as well as the nooks and crannies of man-made structures. Northern long-eared bats breed from late July to October, but females store sperm during hibernation, delaying fertilization (i.e., of a single egg) until ovulation during the spring. Typically born between late May and July, pups are raised in

[115] Trees 3 inches in diameter or greater at breast height can provide suitable habitat for northern long-eared bats.

maternity colonies of 30 to 60 individuals[116] and are most vulnerable to disturbances at maternal roosts before they learn to fly,[117] from 18 to 21 days after birth.[118] While northern long-eared bats' range includes much of the eastern and north central U.S., and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia, its distribution is patchy and historically it has been observed more frequently in the northeastern U.S. and in Quebec and Ontario, Canada. No critical habitat has been designated for northern long-eared bats (FWS, 2018a).

Bog Turtle

With a carapace length of about 4 to 4.5 inches, bog turtles are one of the smallest North American turtles. This species usually occurs in small, discrete populations in wetlands that have several micro-habitats, including flooded areas, dry areas, and saturated areas that provide foraging, breeding, hibernating, basking, and shelter areas. Wetlands are variable by type, but are often small, open-canopy, herbaceous sedge meadows or fens with thickly vegetated or wooded borders. Denser vegetation provides shelter and hibernation habitat. Cattle pastures can also provide habitat for bog turtles because light grazing maintains some open areas/early succession vegetation in wetlands. Bog turtles feed primarily on insects, slugs, and earthworms, and, on occasion, crayfish, frogs, and vegetation. They lay eggs in the spring in cavities that they dig and then backfill, or on raised mounds of grass or sedges devoid of woody shrubs and generally sparsely vegetated. Females may lay their eggs on grass mounds in close proximity, clustering their nests within small nursery areas. Populations of bog turtles have declined due to loss, fragmentation, and degradation of habitat, incidental mortality (crossing roads), as well as loss of adults from wild populations to illegal wildlife trade (FWS, 2001). FWS has not designated critical habitat for bog turtles (FWS, 2018b).

Eastern Black Rail

The Eastern black rail is a small, wetland-dependent bird with red eyes, a dark gray head, lighter gray neck and breast, and a black and white mottled pattern on its back (FWS, 2014). This species can be found in a wide variety of salt, brackish, and freshwater marshes across the U.S. east of the Rocky Mountains, east of the Sierra Madre Oriental in Mexico, and throughout Central America and the Caribbean. While this species' total range is broad, the extant population appears to be concentrated on the

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[116] 78 Federal Register 61051, 61054-61058 (October 2, 2013).

[117] 80 Federal Register 2374 (January 16, 2015).

[118] 78 Federal Register 61057 (October 2, 2013).

Atlantic and Gulf coasts, with sparse distribution in inland areas.[119] In South Carolina, breeding pairs are known to occur mostly throughout the Outer Coastal Plain (FWS, 2014), but there are also historical occurrences of breeding pairs documented in inland locations. Eastern black rails require dense emergent wetland vegetation, preferably with fine stems (i.e., rushes, grasses, and sedges), for foraging, shelter, and nesting sites.[120] Constructed within a few centimeters above moist soil or very shallow water (i.e., ranging from 1 to 6 centimeters deep), nests are woven within dense wetland vegetation with live and dead stems, are often covered with a grass dome, and may have a grass ramp leading to the ground (NatureServe, 2018). Juvenile and adult Eastern black rails can fly; however, they prefer to remain close to the ground, running or walking under vegetation cover and using ramps to access the nest. Breeding, brood rearing, and the flightless molt periods occur from mid-March through September 30.[121] The primary threats to this species include wetland habitat fragmentation and conversion, sea level rise and tidal flooding, incompatible land management practices such as prescribed burns, grazing, and haying/mowing, and environmental disturbances such as hurricanes and extreme flooding.[122]

On October 9, 2018, FWS proposed the Eastern black rail for listing as a threatened species (FWS, 2019b). FWS also proposed a rule under section 4(d) of the ESA that would provide for conservation measures to protect Eastern black rails and their habitat from impacts associated with activities such as prescribed burns, grazing, mowing/haying, and mechanical treatment activities in emergent wetlands. In addition, FWS determined that designating critical habitat for this species would not be prudent at this time.[123]

Plants

Bunched Arrowhead

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[119] 83 Federal Register 50610-50629 (October 9, 2018).

[120] 83 Federal Register 50610-50629 (October 9, 2018).

[121] Egg laying and incubation primarily occur from May to August, but there is some early nesting in March and April. The brood rearing stage occurs from May through September. The spring after the hatch year, Eastern black rails reach the adult life stage. After breeding, they undergo a complete molt each year between July and September and are unable to fly for about 3 weeks.

[122] 83 Federal Register 50610-50629 (October 9, 2018).

[123] ibid.

Bunched arrowhead is a perennial aquatic herb that is endemic to North and South Carolina. This species' extremely limited distribution includes Henderson County, North Carolina and Greenville County, South Carolina. It also occurred historically in Henderson and Buncombe Counties, North Carolina. It has emergent leaves and whorls of white flowers on one to a few stems that bloom in May and June (female flowers on the lowest whorls and males on the upper ones). It is thought to reproduce primarily vegetatively. This species typically grows in gently sloping areas near slow, continuous cool, clear water seeps such as bogs, fens, and transition zones between the base of bluffs and edges of floodplains. Continuous flow of water appears to be the critical element in the ecology of the species. Threats to bunched arrowhead include land-use conversion, habitat fragmentation and disturbance (including both increases and decreases in seepage flows), forest management practices, non-native invasive plant encroachment, sedimentation and succession, grazing and trampling by cattle, and scouring from flash flooding (NatureServe, 2017). FWS has not designated critical habitat for bunched arrowhead (FWS, 2018c).

Dwarf-Flowered Heartleaf

Dwarf-flowered heartleaf is a low-growing, perennial herbaceous species that is endemic to the western upper Piedmont of North and South Carolina. This species often grows in association with laurel or paw at the base of trees in dry to mesic oak-hickory-pine forests. Potentially suitable habitat includes acidic, sandy loam soils on north-facing slopes of ravines, bluffs, and hillsides in boggy areas adjacent to creeks and streams. Dwarf-flowered heartleaf flowers in April and May. Flies and other insects pollinate the small, jug-shaped flowers which are inconspicuous under the leathery, evergreen leaves and/or forest leaf litter. Ants are thought to be this species' primary seed dispersal mechanism; however, existing plants also spread vegetatively via rhizomes below the soil surface. Ongoing threats to this species include habitat degradation and fragmentation, including that caused by forest management practices (NatureServe, 2017). FWS has not designated critical habitat for dwarf-flowered heartleaf (FWS, 2018d).

Mountain Sweet Pitcher Plant

Mountain sweet pitcher plant is an insectivorous perennial herb that is endemic to a few mountain bogs near seeps or waterfalls on both sides of the Blue Ridge in southwest North Carolina and northwest South Carolina. This species has green waxy leaves with maroon/purple veins and a single maroon and yellow nodding flower above a vase-shaped pitcher. Flowers bloom in spring and attract insects, some of which may feed on, live inside of, or fall into the pitchers and decay. This species may use the decaying insects as a source of micronutrients. Pollinator(s) are unknown but may include bumblebees. Seeds are dispersed via water. Mountain sweet pitcher plant can also reproduce vegetatively via rhizome fragments. Ongoing threats to this species include habitat disturbances associated with impoundments, agriculture, development,

collection, and ecological succession that could be a result of fire suppression, elimination of natural grazers, or absence of beaver activity (NatureServe, 2017). FWS has not designated critical habitat for mountain sweet pitcher plant (FWS, 2018e).

Small Whorled Pogonia

Small whorled pogonia is an herb in the orchid family that grows in acidic, humus-rich soils, among mature beech, birch, maple, oak, hickory and sometimes hemlock and other softwood trees. It prefers forests with an open understory and is often found on slopes close to small streams. This species is named for the five- to six-leaf whorl topping the stem just below its greenish yellow flower(s) which bloom between mid-May to mid-June and last a few days to a week. While individuals of small whorled pogonia may not flower every year, when flowering, it appears to self-pollinate. Pollinated flowers form capsules with several thousand to over 9,000 tiny dust-like seeds per plant. However, this seed production is considered to be low to moderate, and known populations are composed of less than 20 plants. Threats to the species include habitat loss and/or degradation due to urbanization and recreational activities and collection for commercial horticulture, research, or personal use (FWS, 2014; Center for Plant Conservation, 2010). Although it is widely distributed among 86 sites spread across 15 states and Ontario, Canada, it is rare throughout its range and has been extirpated from 13 to 15 sites and about 40 other sites are considered historical occurrences (FWS, 1992). FWS has not designated critical habitat for small whorled pogonia (FWS, 2018f).

Smooth Coneflower

Smooth coneflower is a rhizomatous perennial herb that grows to a height of about 4.5 feet with smooth stems, few leaves, and pink to purplish flowers. This species flowers from May to mid-July, and fruits from late-June to September. Preferred habitats include openings in woods, such as cedar barrens and clear cuts, along roadsides and utility line rights-of-way, and on dry limestone bluffs. There are about 20 populations of smooth coneflower in a narrow band from Georgia, through North Carolina and South Carolina to Virginia. Ongoing threats include habitat loss and degradation from agriculture, silviculture, residential and industrial development, highway construction and maintenance, and collection for medicinal purposes (NatureServe, 2017). FWS has not designated critical habitat for smooth coneflower (FWS, 2018g).

Swamp Pink

Swamp pink is a perennial herb that grows in various high elevation, groundwater-influenced swamps, bogs, and/or stream headwaters with a stable water table at or near ground level and dominated by Atlantic white cedar, red maple, and mixed hardwood-evergreen trees. This species has evergreen leaves and showy clusters of pink flowers that bloom April through June, and are prolific seed producers, but usually only a few plants in a population flower and seeds are only viable for about 2 weeks. Seed dispersal

may occur by gravity, wind, water, and/or ants. Swamp pink can also reproduce vegetatively via rhizomes. It tolerates some shade and may require some canopy to limit growth and competition with other plants. The majority of the extant populations occur in the Appalachian Mountains in New Jersey, with others in Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia. The primary ongoing threat is direct or indirect habitat degradation from development and subsequent changes to the hydrological regime. Other threats include reduced water quality, trash, non-native invasive species, all-terrain vehicles, deer herbivory, trampling, collection, and potential for increased droughts (NatureServe, 2017). FWS has not designated critical habitat for swamp pink (FWS, 2018h).

White Fringeless Orchid

White fringeless orchid is a mycotrophic,[124] perennial orchid. This obligate wetland species grows in colonies in flat, boggy areas in acidic muck or sand, and in partially shaded areas at the head of streams or seepage slopes. White fringeless orchids have fleshy tuber roots, 2 to 3 elliptical to lanceolate leaves, and clusters of 6 to up to 20 white fragrant flowers on each inflorescence which, depending on the area of its range, are in bloom from June or July to early September. Its ellipsoid fruits mature in October and the wind disperses seeds after the fruits dry and break open. The reproductive success of this species is affected by the limited number of flowering individuals in each population, herbivory (e.g., wasps), inbreeding depression, and possibly a lack of effective pollinators. In addition, despite copious seed production of pollenated flowers, only a small fraction of white fringeless orchid seeds germinate. Research on the mycorrhizal fungal relationships of white fringeless orchid suggests that the symbiont's (i.e., *Epulorhiza inquiline)* presence may play a key role in the rate of seed germination (NatureServe, 2017).

While known from over 60 occurrences, with populations ranging from less than 100 to more than 1,000 individuals, white fringeless orchid is rare throughout its range which includes Kentucky, Tennessee, Alabama, Mississippi, Georgia, South Carolina, and North Carolina (now extirpated/historical in North Carolina). Threats to this species include draining of habitats for land use conversion, deer browse, feral hogs that uproot plants, disease, use of herbicides, illegal collection for nursery sale, ecological succession leading to competition and canopy closure, encroachment of non-native invasive plants such as kudzu, forest management/timber harvest practices, use of ATVs, horseback riding, and other off-road activities that damage the plants and/or disrupt and alter hydrological regimes. Many sites occur in right-of-ways and may benefit from the

[124] Mycotrophic species are plants that tap into, and extract organic carbon through, mycorrhizal fungi that are attached to the roots of a host plant (Forest Service, Nd).

manual or mechanical clearing of vegetation (NatureServe, 2017). FWS has not designated critical habitat for white fringeless orchid (FWS, 2018i).

White Irisette

White irisette is a perennial herb endemic to hardwood forests in four counties in North Carolina (i.e., Henderson, Polk, and Rutherford) and South Carolina (i.e., Greenville). This species has winged, branching stems and clumps of blue-green, grass-like leaves. In late May through July, its small (7.5 mm long) white flowers bloom at the ends of the dichotomous branching stems. White irisette occurs in clearings and areas of limited canopy cover near the edges of upland woods with rich, basic soils with exposed humus or mineral soil layers. Historically, wildfires and native grazers were the source of disturbance maintaining this species' preferred habitat conditions. Most remaining populations occur in power line and road rights-of-way, and other areas where early succession species are maintained. Primary threats to white irisette include residential development, road and trail construction, habitat fragmentation, and forest management practices. This species is also threatened by lack of disturbance (e.g., grazing and fire suppression) resulting in succession and encroachment of non-native invasive plants such as kudzu, Japanese honeysuckle, and Japanese stiltgrass (NatureServe, 2017). FWS has not designated critical habitat for white irisette (FWS, 2018j).

Lichen[125]

Rock Gnome Lichen

Rock gnome lichen is an endemic of the southern Appalachian Mountains and occurs only in areas of high humidity, such as on high-elevation vertical rock faces frequently shrouded in fog or in deep river gorges. It grows in dense colonies with typically small, overlapping scale-shaped lobes called squamules and appears to prefer areas with some canopy cover or other protection from direct sunlight if growing on south- or west- facing rocks. Colonies of rock gnome lichen appear to spread clonally. Much about this composite organism's life history is still unknown, including growth rates, means of dispersal, what constitutes a genetic individual, as well as the cause(s) of population declines and extirpations. However, some known threats include collection, logging, and habitat disturbance associated with hikers and climbers. Other threats may

[125] Lichens are symbiotic associations between a fungus and an algae or cyanobacteria, and together they form a composite organism. The algae produces food for the fungus through photosynthesis and the fungus gathers moisture and nutrients from the environment and provides the algae protected space (i.e., within the filaments of the fungus).

include indirect effects of exotic insects and air pollution (FWS, 1997). FWS has not designated critical habitat for rock gnome lichen (FWS, 2018k).

3.3.4.2 Environmental Effects

The applicants do not propose any changes to existing run-of-river project operation. As described in section 3.3.5, *Recreation and Land Use*, the applicants propose to construct new canoe portages at each project dam, and to repair the dam sluice gates at the Piedmont and Upper Pelzer Projects to facilitate sediment management activities, if necessary. Maintenance of the 1,230-, 560-, and 1,375-feet-long canoe portages at the Piedmont, Upper Pelzer, and Lower Pelzer Projects, respectively, would require the periodic removal of fallen trees and other encroaching vegetation. To minimize the potential effects of tree removal on northern long-eared bats, the applicants propose, whenever possible, to limit any tree removal associated with operation, maintenance, and construction activities at the projects to November 1 through March 31, which is outside of the maternity roosting season, as well as this species' active season (i.e., April 1 to October 31).

Resource agencies and other stakeholders did not file recommendations regarding protection of federally listed species in response to the Commission's REA Notice.

Our Analysis

None of the federally-protected species identified by FWS were observed during the 2014 surveys at the projects. Preferred or suitable habitat for many of these special status species, such as dwarf-flowered heartleaf, mountain sweet pitcher-plant, smooth coneflower, swamp pink, white irisette, and rock gnome lichen does not occur within the project boundaries. Some of these species may be present within the project boundaries for brief periods of time while foraging (e.g., northern long-eared bat). Other species, such as the Eastern black rail, bog turtle, bunched arrowhead, white fringeless orchid, and small whorled pogonia require wet conditions or wetland habitat that is present within the project boundaries.

Northern Long-Eared Bat

The projects occur within the range of northern long-eared bats, and within the White Nose Syndrome (WNS) Zone.[126] The applicants consulted with FWS who

[126] White-nose syndrome is the main threat to the northern long-eared bat species, and has caused a precipitous decline in bat numbers (in many cases, 90 – 100 percent) where the disease occurs. FWS identifies the WNS Zone as the set of counties within the

checked the South Carolina Natural Heritage Database and it was determined that there are no known occupied hibernacula,[127] or maternity roost trees near the projects. However, undocumented maternity roosts may occur in the forested areas within the project boundaries. The applicants' proposals to construct and maintain the 1,230-, 560-, and 1,375-feet-long canoe portages around the Piedmont, Upper Pelzer, and Lower Pelzer Project Dams, respectively, would require some initial tree removal,[128] and then periodic vegetation trimming or clearing, and may require the removal of potential summer roosting habitat for northern long-eared bats. While the final canoe portage routes have not been determined, the spatial extent of the vegetation that would be cleared for construction is anticipated to be less than 0.1 acres at each of the projects. Tree removal that may result as part of the applicants' construction and maintenance activities does not occur within 0.25 miles of hibernacula, or within 150 feet of a known maternity roost. Therefore, we conclude that continued operation and maintenance of the projects may affect the northern long-eared bat, but any incidental take that may result is not prohibited by the final 4(d) rule.

As stated above, potential summer roosting habitat for the northern long-eared bat occurs in the vicinity of the canoe portages. Avoiding removing trees with equal or greater than 3 inches in diameter at breast height from April 1 to October 31 would reduce the likelihood of disturbing northern long-eared bats and their newly born pups in undocumented maternity roosts within 150 feet of the canoe portages. Tree removal in the cooler winter months, specifically November 1 through March 31, would coincide with the period of time when northern long-eared bats are likely hibernating in caves. Implementing a seasonal tree removal restriction would minimize potential adverse effects to northern long-eared bats residing in undocumented roosts within 150 feet of the proposed canoe portages.

Eastern Black Rail

Eastern black rails may have historically occurred within the wetlands in the project areas. However, currently available survey data suggests that the majority of the

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range of the northern long-eared bat within 150 miles of the boundaries of U.S. counties or Canadian districts where the white-nose syndrome had been detected.

[127] Hibernacula provide bats shelter during the colder winter months, and are typically found in cool, humid caves or abandoned mines in temperate climate zones.

[128] FWS defines "tree removal" as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats (81 Federal Register 1902 (January 14, 2016)).

viable populations of this species are concentrated in Florida and Texas, with only a few remaining occupied coastal sites in North and South Carolina.[129] While there is likely some limited suitable wetland habitat for Eastern black rails within the project boundaries (e.g., areas with native grasses, sedges, and rushes), it is unknown if the dominant emergent vegetation (i.e., floating primrose-willow) would provide the cover and suitable nesting material for this species. Floating primrose-willow provides fairly dense cover, but it is lower-growing and has stems that are not as straight or fine (i.e., thin and flexible) as that of grasses, sedges, and rushes. As a result, this vegetation is likely less suitable for Eastern black rails to weave into nests. If Eastern black rails were to use the project areas, continued run-of-river operation and vegetation management activities would maintain the existing wetlands. Establishing and maintaining the proposed canoe portages is not expected to have any effect on wetlands at the projects, because the proposed portage routes, as shown in figures 15, 16, and 17, would avoid wetland habitat.

Sediment management techniques that disturb existing wetland vegetation, such as flushing and dredging, could affect potentially suitable habitat for Eastern black rails within the project boundaries. Given that the very limited amount of emergent wetland vegetation near the project dams consists mostly of floating primrose-willow, the applicants' proposals to flush sediments through the projects impoundments is unlikely to disturb emergent wetlands with Eastern black rails' preferred nesting and cover vegetation. Dredging the projects' impoundments could still be identified as a reasonable method for sediment management as part of a plan. As discussed in section 3.3.1, *Geological and Soil Resources*, the specific methods of intentional sediment management, if needed, could be determined in consultation with resource agencies, with consideration of the potential effects to Eastern black rails and their preferred habitat.

To avoid potential effects to Eastern black rail individuals and potentially suitable habitat, the applicants could include the following provisions in their plans:
(1) document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events and consult with resource agencies if any adverse effects to wetland vegetation are observed; and
(2) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation, including within emergent wetlands, that could result in the incidental take of Eastern black rails during this species' nesting, brooding, or post-breeding flightless molt period of mid-March through September.[130] If FWS' proposed listing and 4(d) rule for this species becomes final, incidental take of Eastern black rails

[129] 83 Federal Register 50610-50629 (October 9, 2018).

[130] FWS acknowledges that there is variability in the breeding/nesting/flightless molt period across this species' range, and, therefore, the wetland vegetation maintenance prohibition would coincide with the time that Eastern black rails are using the habitat for these purposes. 83 Federal Register 50610-50629 (October 9, 2018).

associated with mowing, haying, and mechanical treatments during this period would be prohibited. An exception to this portion of the proposed 4(d) rule (i.e., mowing, haying, and mechanical activities in emergent wetlands) is for such activities that are maintenance requirements to ensure the safety and operational needs of existing infrastructure (i.e., existing fire breaks, roads, transmission corridor rights-of-way, and fence lines). It is not clear whether or not incidental take of Eastern black rails through maintenance dredging within emergent wetlands at hydropower facilities would fall under this exception of the proposed 4(d) rule. Given that Eastern black rails are not known to occur at the projects, the majority of the emergent wetland habitat is lacking the Eastern black rails' preferred nesting vegetation, and potential effects to this species could be avoided through a seasonal restriction on dredging and/or vegetation management within emergent wetlands, we find that relicensing the projects is not likely to jeopardize the continued existence of the Eastern black rail.

Bog Turtle

Bog turtles occur in various types of wetlands, usually with sedges and mosses, including sphagnum bogs, calcareous fens, marshy meadows, spring seeps, cow pastures, or shrub swamps. The emergent and scrub/shrub wetlands of the project areas were not dominated by plant species associated with bog turtle habitat, so these areas were not considered potential habitat for bog turtle. In addition, no evidence of bog turtles was observed in the project areas. Therefore, we conclude that relicensing the projects would have no effect on bog turtles.

Bunched Arrowhead, White Fringeless Orchid, and Small Whorled Pogonia

Bunched arrowhead occurs in deciduous wetlands, near continuous seeps. White fringeless orchid is also found in wet, flat, boggy areas and in partially, shaded areas at the head of streams or seepage slopes. The preferred habitat for small-whorled pogonia is forested wetlands. There are 0.5 acres and 7.3 acres of forested wetlands at the Piedmont and Lower Pelzer Projects, respectively. These wetlands may provide suitable habitat for bunched arrowhead, white fringeless orchid, and/or small whorled pogonia. However, these species were not observed during the applicants' 2014 field surveys. In addition, continued run-of-river operation at the projects is not anticipated to disturb these wetlands. Intentional sediment management could affect potentially suitable habitat for these species within the project areas, but the staff-recommended provisions for managing sediment, as described in sections 3.3.1.2 and 3.3.3.2, *Environmental Effects*, would allow the applicants to identify and minimize potential effects to this habitat. Therefore, we conclude that relicensing the projects would have no effect on bunched arrowhead, white fringeless orchid, and/or small whorled pogonia.

Dwarf-Flowered Heartleaf, Mountain Sweet Pitcher-Plant, Smooth Coneflower, Swamp pink, White Irisette, and Rock Gnome Lichen

Dwarf-flowered heartleaf, mountain sweet pitcher-plant, smooth coneflower, swamp pink, white irisette, and rock gnome lichen were not observed during the applicants' 2014 field surveys, and these species' preferred habitats do not occur within the project boundaries. Therefore, we conclude that relicensing the projects would have no effect on dwarf-flowered heartleaf, mountain sweet pitcher-plant, smooth coneflower, swamp pink, white irisette, and rock gnome lichen.

3.3.5 Recreation and Land Use

3.3.5.1 Affected Environment

Recreation Overview

Regional Water-Based Recreation Opportunities

Recreational opportunities in the region include powered and non-powered boating, recreational fishing, swimming, picnicking, camping, playground equipment and ballparks, hiking, and viewing wildlife. Greenville County contains 55 parks, 2 state parks, and a zoo. Anderson County offers 37 parks, 1 state park, and a sports and entertainment center. Federal lands in the region include Sumter National Forest, about 40 miles from the projects, and Nantahala National Forest in North Carolina, also about 40 miles from the projects.

The Saluda River offers 200 river miles of fishing and paddling opportunities. The reach of the river running between Anderson and Greenville Counties has extensive largemouth and hybrid bass, sunfish, catfish, crappie, and walleye fishing. Plans are underway to develop a blue (paddling) trail, known as the Saluda River Blue Trail, on the river from the Saluda Lake dam (FERC Project No. 516) in Greenville County to Ware Shoals Dam in Laurens County. The trail would stretch 127 miles and connect 6 counties and several smaller municipalities. Partners for the blue trail include the National Park Service (NPS) and South Carolina DNR, among others. The NPS has provided guidance in developing a steering committee for the Saluda River Blue Trail, a wayfinding design manual, and access point identification and evaluation.

Recreation Access at the Projects

Piedmont

The Piedmont Project offers no project recreation facilities. Recreation access facilities closest to the project include the non-project Timmerman boat launch and picnic

area located at the Upper Pelzer Project about 3 miles downstream, and the Lyman Street boat launch (a non-project facility)about 4.5 miles downstream (figure 13).

Upper Pelzer

The Upper Pelzer Project offers one project recreation facility, the Upper Pelzer fishing area. The Upper Pelzer fishing area consists of a gravel parking area for 2-3 vehicles, a 150-foot-long gravel walkway from the parking area to the fishing area, and a barrier-free ramp. The fishing area also functions as an informal canoe launch point.

Two non-project recreation facilities also provide public access to the project: the Timmerman boat launch and picnic area and the Lyman Street boat launch. The Timmerman boat launch and picnic area, which is located on the impoundment, is owned and maintained by Anderson County, and consists of a paved parking area for 11 vehicles, a boat ramp, barrier-free fishing dock, floating kayak launch, and picnic tables (figure 13). The Town of Pelzer operates the Lyman Street boat launch, which is located one-half mile downstream of the project. This facility provides access to the Upper Pelzer tailwater area.

Lower Pelzer

The Lower Pelzer Project offers one project recreation facility, the Lower Pelzer fishing access station. This facility has a gravel parking area for 2-3 vehicles, barrier-free access, and fishing benches. The facility is located at the end of the access road on the western bank of the Saluda River. The facility is fenced and gated, and access is granted only between the hours of 8:00 a.m. and 4:00 p.m., Monday through Friday, and 8:00 a.m. to 12:00 noon on weekend days, when an operator is nearby and available (figure 13).

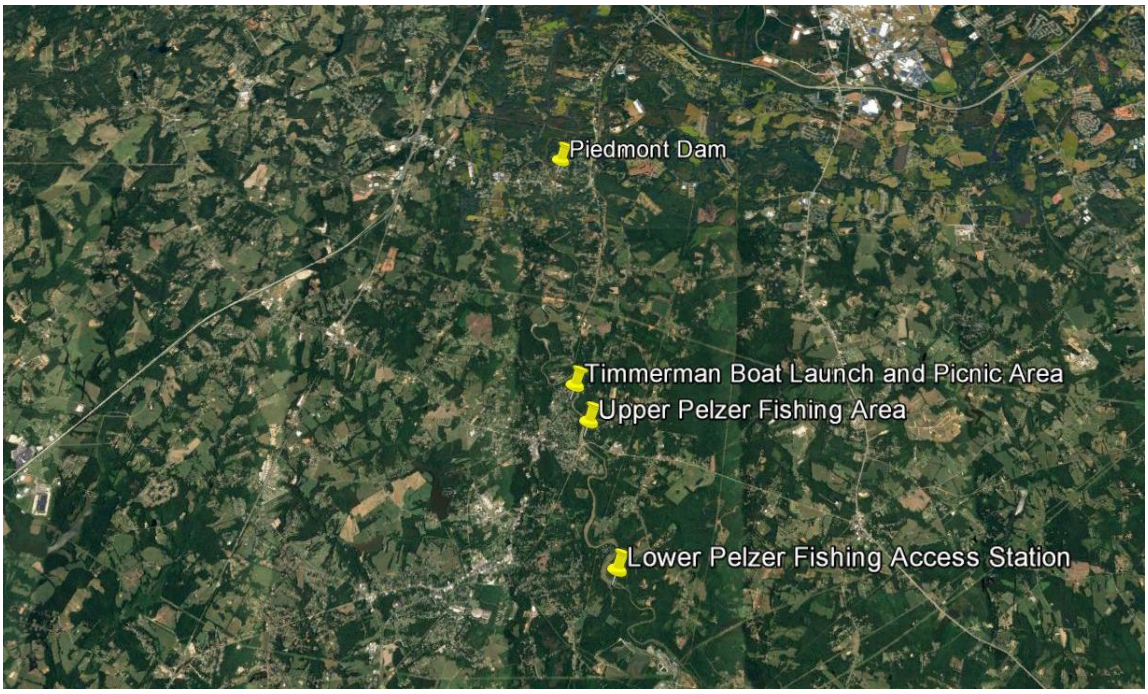

Figure 13. Recreation Facilities at the Projects.
(Source: Google Earth Pro, 2018, as modified by staff).

Recreation Use

There are no records of recreation use for the Piedmont Project. In a letter filed October 9, 1997,[131] Consolidated Hydro Southeast requested exemption from filing the 1996 Licensed Hydropower Development Recreation Reports (Form 80) and future Form 80 reports for the Piedmont Project. On October 30, 1997,[132] the Commission exempted Consolidated Hydro Southeast from filing the 1996 and future Form 80 reports because there was no potential for recreation use at the project.

Based on the FERC Form 80 from 2008 and 2014, the Upper Pelzer Project received 150 daytime recreation visits in 2008, and 351 visits in 2014. On peak weekends, average daytime visits totaled 10 in 2008 and 14 in 2014. The boat launch area was used at 20 percent capacity in 2014, while the fishing area was used at 35 percent capacity.

[131] Letter dated September 29, 1997.

[132] Letter dated October 30, 1997.

The Lower Pelzer Project received 361 daytime recreation visits in 2014, and 100 visits in 2008. On peak weekends, average daytime visits totaled 10 in 2008 and 20 in 2014. The fishing access area was used at 30 percent capacity in 2014.

Land Use

Major land use/land cover classifications within the Saluda River Basin include forested land (44.6%), agricultural land (29.9%), urban land (21.4%), forest wetlands (2.0%), water (1.1%), and barren land (1.0%) (South Carolina DHEC, 2011). Project lands are in rural or suburban settings. There are some private residential developments on the waterfront, interspersed with tracts of undeveloped land.

There are no lands in the immediate vicinity of the project that are included in the national trails system, or designated as wilderness. No portion of the Saluda River within the vicinity of the projects is included on the list of wild and scenic rivers. A stretch of the river in Richland and Lexington Counties, near the city of Columbia, is included on the Nationwide Rivers Inventory.[133]

3.3.5.2 Environmental Effects

Recreation Use and Access

The applicants propose to operate and maintain the existing recreation facilities. Aquenergy proposes to construct a canoe portage facility, including a put-in, take-out, and portage path, on the eastern side of the Piedmont Dam in Greenville County (figure 14). The length of the proposed path is about 1,230 feet. The co-applicants propose to construct a canoe portage facility, including a put-in, take-out, and portage path, on the eastern side of the Upper Pelzer Dam in Greenville County (figure 15). The length of the proposed path is about 560 feet. The co-applicants also propose to construct a canoe portage facility, including a put-in, take-out, and portage path, on the western side of the Lower Pelzer Dam in Anderson County (figure 16). The length of the proposed path is about 1,375 feet. Signs would be installed along the portage routes to provide clear direction. The applicants propose to finalize the portage path routes with stakeholders as

[133] The NRI, which was created in 1982 and amended in 1993, identifies river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance (NPS, 2011).

part of the development of the Saluda River Blue Trail, after receiving new or subsequent licenses.[134]

The applicants also propose to develop a RMP for each project, after new or subsequent licenses are issued, to describe recreational use, project facilities, and plans to construct and maintain the proposed and existing facilities.

South Carolina DNR agrees with the applicants' proposals (portage facilities, development of RMPs, and continued public access to project lands and recreation facilities), and recommends these as measures to be implemented at the projects.[135] South Carolina DNR also comments that a locked gate at the Lower Pelzer Project limits public access to project lands and waters by blocking vehicle access to the fishing access area when operators are not onsite. South Carolina DNR recommends that the co-applicants establish standard hours for reasonable public access to the Lower Pelzer Project area, and install signage to communicate the hours of operation, open-gate access, and/or when public access is allowed. South Carolina DNR also comments that while the FLA for the Lower Pelzer Project mistakenly specifies that the portage trail will be on the eastern side of the dam, Figure 5.1.2.1 of the FLA shows the most appropriate location for the trail, which is on the west side of the dam.

Anderson County acknowledges that the active participation of the applicants has helped in developing the Saluda River Blue Trail under the current license and requests continued participation.[136]

[134] AIR Response filed June 20, 2017.

[135] *See* letter filed January 11, 2018.

[136] *See* letter filed December 11, 2017.

Figure 14. Piedmont Recreation Facilities.
(Source: Enel Green Power North America, Inc., 2015, as modified by staff).

Figure 15. Upper Pelzer Recreation Facilities.
(Source: Enel Green Power North America, Inc., 2015, as modified by staff).

Figure 16. Lower Pelzer Recreation Facilities.
(Source: Enel Green Power North America, Inc., 2015, as modified by staff).

Our Analysis

The applicants propose to construct, operate, and maintain a canoe portage facility, including put-in and take-out amenities, and a portage path, at each project. Creating a canoe portage facility at each project would enhance recreational use at the Upper Pelzer and Lower Pelzer Projects, and establish formal recreation use at the Piedmont Project. The portage facilities would also further the development of the Saluda River Blue Trail initiative, as discussed above. The applicants propose to consult with stakeholders on the development of the canoe portage facilities upon receiving new or subsequent licenses. Such consultation would result in portage facilities that are likely to be used by more recreationists once constructed, and would allow more input on developing the construction and maintenance schedules in the RMP.

The co-applicants also propose to continue to operate and maintain the existing Upper Pelzer fishing area and Lower Pelzer fishing access station. Continuing to operate and maintain these facilities would allow for continued recreational use at the projects. In addition, requiring standard open-gate hours at the Lower Pelzer fishing access station would inform recreationists of visiting times in advance, and potentially result in increased use of the station. A schedule of the open-gate hours could be posted at the gate so that recreationists could plan their visits accordingly.

Effects of Project Operation and Maintenance on Recreation

Run-of-River Operation

The applicants propose to continue to operate the projects in a run-of-river mode, with minimum flows proposed to the bypassed reaches. They propose periodic impoundment drawdowns for maintenance and repair operations. Currently, as discussed in section 3.3.1.2, *Environmental Effects, Geological and Soil Resources*, sediment is managed sporadically at the Upper and Lower Pelzer Projects. No sediment management has occurred at the Piedmont Project under the existing license. Sediment management is proposed for any new or subsequent licenses.

Our Analysis

Because the projects would continue to operate in a run-of-river mode, there would be no change in the effect on recreation. With flows from the projects approximating natural flows, operation of the project would likely cause no effect on recreation, including canoe and kayak navigation, upstream or downstream from the projects. There have been no observed or reported impacts to recreation access, use, or satisfaction from sedimentation. However, future sedimentation or changes in sedimentation trends could result in negative impacts to recreation. Comparing changes in bathymetry with recreation uses would help to predict whether or not sediment is accumulating in a way that would affect recreation and require action.

Sediment Management

As discussed in section 3.3.1.2, *Sediment Management,* the applicants propose to manage sediment by flushing the impoundments on a regular interval. Aquenergy proposes to develop a Sediment Management Plan for the Piedmont Project which would involve flushing sediment from the impoundment once every year for three years, and include provisions to collect water quality and sediment monitoring data during the events. The co-applicants propose to continue implementing the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects and, after receiving new licenses, review and update the plan in consultation with resource agencies, as necessary. The current plan requires the co-applicants to flush sediment from the impoundments every 5 and 10 years, respectively, and includes provisions to monitor water quality during the events, and evaluate sediment management alternatives.

Our Analysis

Though flushing has been proposed, the effects of flushing on recreation have not been evaluated. There could be both positive (e.g., increased open water in the impoundments) and negative (e.g., filling in of downstream fishing holes in the river) effects. Dredging, another form of intentional sediment management, similarly could have positive and negative effects. Conducting bathymetric mapping and evaluating the number, location, and type of sluice gate(s) to use for sediment evacuation would be helpful in minimizing potential adverse effects on recreation at the projects. Estimating and accounting for the effects of any sediment management measures on recreation would help to ensure a positive, or at least neutral, result for recreation at the projects.

Effects of Construction and Project Repairs on Recreation

Aquenergy and the co-applicants propose to develop canoe portage facilities, including put-in and take-out amenities, and portage paths, at each of the three projects, and maintain the existing and proposed project facilities to provide safe and effective recreation opportunities. Also, the project works may require repairs, specifically, potential sluice gate repairs at the Piedmont and Upper Pelzer Projects, to facilitate the applicants' proposed sediment management activities.

Our Analysis

Construction of the proposed project facilities may have temporary effects on anglers, canoeists, and kayakers that recreate at the projects, including loss of recreation access, noise, and dust. Anglers could be displaced from the fishing access areas on an intermittent basis during construction of the canoe portage facilities. Boaters may also temporarily be affected during the construction activities due to access issues. For example, construction equipment may temporarily block sections of portage paths. Also, there may be times during construction that the put-in and take-out areas are inaccessible.

However, the proposed construction activities at the projects are small in scope, and any closures should be brief.

Also, recreation is prohibited on the dam and other project works (with the exception of the previously discussed project recreation facilities), and refurbishment of the project works would not affect recreation.

RMP Review

The applicants propose to consult with interested stakeholders during the development of the RMPs, and provide drafts of the plans to stakeholders for review and comment. South Carolina DNR agrees with this proposal, as discussed above.

Our Analysis

As part of the proposed RMP for each project, the applicants would provide a plan to implement necessary recreation enhancements. Recreation use and needs may continue to evolve over the period of any new or subsequent licenses issued for the projects. Allowing stakeholders to review drafts of the plans and submit comments would help ensure that recreation facilities would be managed effectively for the term of any license.

Project Effects on Land Use and Modification of Project Boundaries

The applicants propose to develop and/or modify canoe portages at the projects, with input from stakeholders. They also propose adjustments to the project boundaries to reflect changes in facilities needed to operate the project and to eliminate an overlap in project boundaries.

At the Piedmont Project, Aquenergy proposes to add 0.8 acres of land to the existing Piedmont Project boundary to fully enclose the location of the proposed portage route and put-in and take-out sites. At the Upper Pelzer Project the co-applicants propose to extend the project boundary below the dam to enclose the proposed portage route and put-in and take-out sites. The co-applicants also propose to remove a total of 2.5 acres of vacant land once used for the former Upper Pelzer Mill from the project boundary. At the Lower Pelzer Project, the co-applicants propose to extend the project boundary downstream of the dam to include the proposed portage route and put-in and take-out sites. The co-applicants also propose to remove the area of a 3-mile-long transmission line, which is no longer in use by the project, from the project boundary.[137] Finally, the co-applicants propose to remove 1.5 acres of land from the Lower Pelzer Project

[137] *See* November 14, 2017 Memo.

boundary upstream of the Lower Pelzer Dam to eliminate overlap with the Upper Pelzer Project boundary.

Our Analysis

The lands that the applicants propose to remove from the existing project boundaries are not needed for project operations. Their removal would not result in a change in the projects' effects on environmental, recreational, or cultural resources. Adding 0.8 acre of land to the Piedmont Project boundary would allow the proposed portage facilities to be enclosed within the project boundary.

Removing 2.5 acres of land from the Upper Pelzer Project boundary will ensure that only lands necessary for operation and maintenance of the project are included in the project boundary. Removing the 1.5 acres of land from the Lower Pelzer Project boundary will establish an accurate project boundary by eliminating the current overlap with the tailrace and bypassed reach of the Upper Pelzer Project. Extending the Lower Pelzer Project boundary to contain the proposed portage route would ensure that the portage trail could be constructed.

The proposed addition and/or removal of lands would establish new project boundaries at each of the three projects to include only those areas needed for project operations and maintenance, and remove those lands that do not serve a project purpose. The extent of development that would be undertaken if licenses were granted would be minimal, as no major construction is proposed. However, measures may be necessary to minimize the potential effects of construction or maintenance of the canoe portages on terrestrial resources. More specific BMPs could be developed in consultation with resource agencies, as part of the development of the RMPs for the projects. As discussed in section 3.3.5.1, *Affected Environment*, the proposed improvements would be consistent with recreational use of the Saluda River.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Section 106 of the NHPA requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register prior to an undertaking. In this case, the undertaking is the issuance of a subsequent license for the Piedmont Project and new licenses for the Upper Pelzer and Lower Pelzer Projects. Project-related effects associated with this undertaking include those effects associated with the day-to-day operation and maintenance of the projects after issuance of licenses. Section 106 also requires that the Commission seek concurrence with the South Carolina SHPO on any finding involving effects or no effects on historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment on any finding of effects on historic properties. If Native American properties have been

identified, section 106 requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

In a notice issued December 19, 2012, the Commission designated Aquenergy (Piedmont) and Consolidated Hydro and Pelzer Hydro (Upper Pelzer, Lower Pelzer) as the non-federal representatives for the purpose of informal consultation with the South Carolina SHPO. However, the Commission remains responsible for all findings and determinations regarding the effects of the proposed project on any historic property, pursuant to section 106.

Area of Potential Effects

Under section 106 of the NHPA of 1966, as amended, the Commission must take into account whether any historic property within the proposed project's area of potential effects (APE) could be affected by the issuance of a license for the project. The Advisory Council on Historic Preservation defines an APE as the geographic area or areas in which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. We define the APE for each individual project as: (1) lands enclosed by the project boundary; and (2) lands or properties adjoining the project boundary, where authorized project uses may cause changes in the character or use of historic properties, if historic properties exist.

Regional History

Anderson County is named for Revolutionary War leader Robert Anderson. In the mid-1700s, General Anderson, with General Andrew Pickens, travelled the Cherokee land that was to become Anderson County. Scots-Irish and English farmers occupied the area and established an agrarian economy that was not based on slavery. Anderson County contributed to industrialization of the South with the first long distance transmission of hydroelectric power. It was dubbed the Electric City.

The origins of the name Greenville County are uncertain; however, the county was probably named for Revolutionary War general Nathanael Greene or for an early resident, Isaac Green. This part of South Carolina was the territory of the Cherokee Indians until 1777. As with Anderson County, Scots-Irish and English settlers began moving into the area soon after it was ceded to the state. Greenville District was created in 1786, but from 1791 to 1800 it was part of the larger Washington District. Because of its location in the foothills of the Blue Ridge Mountains, Greenville County became a popular summer retreat for low-country planters. Using power from the local streams and rivers, textile manufacturers began operating in the area as early as the 1820s. Following the Civil War, Greenville County became a textile center.

Piedmont

The Town of Piedmont, located in both Anderson and Greenville Counties, is about 12 miles south of the City of Greenville. In the mid-1780s, following the American Revolution, David Garrison settled in the South Carolina Indian Territory known as Big Shoals of the Saluda. Native Americans used this area as a river crossing because of its rock formations which jutted into the Saluda River. Following his arrival, Garrison renamed this area Garrison Shoals which it would be known as until eventually being renamed Piedmont. Henry Pinckney Hammett purchased this land from David Garrison and established a cotton mill which would eventually become the Piedmont Manufacturing Company. The Piedmont Manufacturing Company was organized in 1873, and began operation in 1876. The textile mill was one of the first large-scale cotton manufacturers in upstate South Carolina. As early as the 1880s, hydroelectric power was used to run the machinery of the textile mills in this area.

Upper Pelzer

The Town of Pelzer, located in Anderson County, is about 17 miles south of the City of Greenville. The Town of Pelzer's history is linked with that of the Pelzer Manufacturing Company. Pelzer, and neighboring West Pelzer, were named for Francis Joseph Pelzer who was one of the founders of the Pelzer Manufacturing Company. The Pelzer Manufacturing Company began textile production in the late 1880s, and bought the first generation of generators made by the General Electric Company. The Pelzer Manufacturing Company was the first factory in the country to have incandescent lights. During the 1880s the Pelzer Manufacturing Company owned all the land in the area.

Lower Pelzer

The Town of Williamston, located in Anderson County, is about 18 miles south of the City of Greenville. Williamston was named for West Allen Williams, who discovered a natural mineral spring on his property. The Town of Williamston developed around this spring, the water from which was believed to have healing properties. This belief made the town a popular health resort in the early 1880s. The site of the mineral spring has been renamed Williamston Park, and is the location of an annual Spring Water Festival and Christmas Park.

Historic Properties

Piedmont

The Piedmont Mill was designated as a National Historic Landmark in 1979. Extensive renovations in 1982 by Aquenergy had no effect on the structures' historic status. However, a massive fire in 1983 destroyed the old mill and power plant. Following the fire, the remnants of the old mill were cleared from the site and the

Piedmont Hydroelectric Facility was rebuilt. As a result of the damage caused by the fire, the Piedmont Mill was removed from the National Register in 1986 (NPS, 2018a). Today, the Piedmont Project area contains no properties known to be listed, or eligible for listing on, the National Register.

Upper Pelzer

Construction of the Upper Pelzer Project began in the late 1870s and early 1880s with construction of the Upper Pelzer Mills Dam. Dam construction was completed in 1881, while construction of the powerhouses was completed in 1920. The project has been in operation for over 130 years, and, as such, the project dam and powerhouse were determined eligible for listing on the National Register on October 6, 1986. On October 10, 2017, the Pelzer Manufacturing Company and Mill Village Historic District was added to the National Register (NPS, 2018b).

Lower Pelzer

Construction of the Lower Pelzer Hydroelectric Project began in the 1893 when the Lower Pelzer Dam was built. The powerhouse is situated on the right central portion of the dam, and was built in 1895. The project has been in operation for over 119 years, and, as such, the project powerhouse and dam are considered eligible for listing on the National Register.

Traditional Cultural Properties

On December 19, 2012, staff established a consultation list to discuss project effects on cultural resources. The list was distributed to the Eastern Band of Cherokee Indians, Catawba Indian Nation, Cherokee Nation of Oklahoma, and United Keetoowah Band of Cherokee Indians. The tribes have not reported any known traditional cultural properties within any of the projects' APEs to date. The Cherokee Nation filed a letter on December 27, 2017, stating that the Upper Pelzer Project lies within their ancestral homelands (discussed further below, in section 3.3.6.2, *Effects on Historic Properties*).

3.3.6.2 Environmental Effects

Effects on Historic Properties

The applicants propose no changes to project facilities or operations that would affect historic properties. By letter dated October 8, 2015,[138] the South Carolina SHPO states that even though there are no known historic properties at the Piedmont Project,

[138] Filed as part of Piedmont Final License Application.

they should be contacted prior to any significant construction and/or modifications that may affect historic properties. By letter dated September 17, 2015,[139] the South Carolina SHPO states that they should be contacted prior to any significant construction and/or modifications that may affect eligible properties at the Upper and Lower Pelzer Projects.

In a letter filed December 27, 2017, the Cherokee Nation expresses its interest in acting as a consulting party for the Upper Pelzer Project. The Cherokee Nation recommends a cultural resources survey at the project, and requests a copy of the survey. If items of cultural significance are found, the Cherokee Nation requests that that FERC halt all project activities and contact the Cherokee Nation. The Cherokee Nation also requests that FERC conduct appropriate inquiries with other pertinent tribal and historic preservation offices regarding historic and prehistoric resources not included in the Cherokee Nation databases or records.

Our Analysis

Continued operation of the Upper Pelzer and Lower Pelzer Projects would ensure that the historic facilities at these projects would be used for the purpose for which they were originally designed and constructed. However, operating the projects under the protection afforded by section 106 does not ensure that there would be no adverse effects. Adverse effects may occur to historic project features as a result of repairs and modifications that, while necessary for the continued safe and efficient operation, are not in keeping with the project's historic character. Further, future maintenance or emergency situations may adversely affect the historic resources at the Upper Pelzer and Lower Pelzer Projects.

There may be unknown archaeological resources that could be adversely affected by future operation and maintenance of the projects, including the Piedmont Project. To ensure that any unanticipated discoveries are adequately addressed, the applicants would contact the South Carolina SHPO and relevant tribes upon proposal of any ground-disturbing activity that may have the potential to affect lands that have historic or cultural significance. As described in the license applications, the project proposals do not contain significant construction and/or modifications to project facilities, as well as no proposed changes to project operations. Therefore, the SHPO states that the proposals are unlikely to affect historic properties. The SHPO notes that if the project proposals change, consultation with the SHPO should take place under Section 106.

As stated by the South Carolina SHPO, relicensing the projects as proposed should cause no effects to historic properties at the projects. There would be minimal ground disturbance resulting from the construction of the portage trails.

[139] Filed as part of Upper Pelzer and Lower Pelzer Final License Applications.

3.4 NO-ACTION ALTERNATIVE

Under the no action alternative, the Piedmont, Upper Pelzer, and Lower Pelzer Projects would continue to operate in their current manner. There would be no changes to the physical, biological, or cultural resources of the areas.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Piedmont, Upper Pelzer, and Lower Pelzer Projects' use of the Saluda River for hydropower purposes to see what effects various environmental measures would have on the projects' costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[140] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower projects' power benefits.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation, and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost for construction, operation, maintenance, and environmental measures; and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND ECONOMIC BENEFITS OF THE PIEDMONT PROJECT

Table 14 summarizes the assumptions and economic information we use in our analysis of the Piedmont Project. The applicant provided this information in their license applications and subsequent submittals. We find that the values provided by the applicant are reasonable for the purposes of our analysis. Cost items common to all alternatives include: (1) taxes and insurance costs; (2) net investment; (3) relicensing costs; and (4) normal operation and maintenance cost. Values provided by the applicant in their license application and subsequent submittals were indexed to 2019 dollars using rates obtained from http://www.usbr.gov/tsc/techreferences/mands/cct.html.

[140] *See Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

Table 14. Parameters for the economic analysis of the Piedmont Project (Source: Enel Green Power North America, Inc., 2015a, as modified by staff).

Economic Parameter	Value (2019$)[a]	Source
Installed capacity	1.0 MW	Applicant
Dependable capacity	0.5 MW[b]	Applicant
Average annual generation	5,369 MWh	Applicant
Annual O&M cost	$92,900	Applicant
Cost to prepare license application	$118,400	Applicant
Net investment	$464,900	Applicant
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Interest Rate	8.0 percent[c]	Applicant
Energy rate	$36.00/MWh[d]	Staff
Capacity rate	$195.00 kilowatt-year[d]	Staff

a Values provided by Aquenergy in 2015 dollars were converted to 2019 dollars.

b Value provided by Aquenergy in an email correspondence issued July 10, 2018.

c Staff assumed Aquenergy's interest rate was the same as the interest rate used by the co-applicants in developing the costs for the Upper Pelzer and Lower Pelzer Hydroelectric Projects.

d Source: Energy Information Administration using rates obtained from Annual Energy Outlook 2018 at http://www.eia.gov/outlooks/aeo/index.cfm.

4.1.1 Comparison of Alternatives

Table 15 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this draft EA for the Piedmont Project: the no-action alternative, Aquenergy's proposal, and the staff alternative.

Table 15. Summary of the annual cost of alternative power and annual project cost for alternatives for the Piedmont Project (Source: Staff).

	No-Action Alternative	Aquenergy's Proposal	Staff Alternative
Installed capacity	1.0 MW	1.0 MW	1.0 MW
Annual generation	5,369 MWh	5,369 MWh	5,369 MWh
Annual cost of alternative power	$290,785 $54.16/MWh	$290,785 $54.16/MWh	$290,785 $54.16/MWh
Annual project cost	$205,740 $38.32/MWh	$241,390 $44.96/MWh	$245,095 $45.65/MWh
Difference between cost of alternative power and project power	$85,045 $15.84/MWh	$49,395 $9.20/MWh	$45,690 $8.51/MWh

4.1.2 No Action Alternative

Under the no-action alternative, Aquenergy would continue to operate the Piedmont Project as it does now. With an installed capacity of 1.0 MW, the project generates an average of 5,369 MWh of electricity annually. The average annual cost of alternative power would be $290,785, or $54.16/MWh. The average annual project cost would be about $205,740, or $38.32/MWh. Overall, the project would produce power at a cost that is $85,045, or $15.84/MWh, less than the cost of alternative power.

4.1.3 Aquenergy's Proposal

Under Aquenergy's proposal, the project would continue to operate in its current mode with an installed capacity of 1.0 MW, and generate an average of 5,369 MWh of electricity annually. The average annual cost of alternative power would be $290,785, or $54.16/MWh. The average annual project cost would be $241,390, or $44.96/MWh. Overall, the project would produce power at a cost which is $49,395, or $9.20/MWh, less than the cost of alternative power.

4.1.4 Staff Alternative

Under the staff alternative, the project would continue to operate in its current mode with an installed capacity of 1.0 MW, and generate an average of 5,369 MWh of electricity annually. Table 16 shows the staff-recommended additions and modifications

to Aquenergy's proposed environmental protection, mitigation and enhancement measures, and the estimated costs of each.

The average annual cost of alternative power would be $290,785, or $54.16/MWh. The average annual project cost would be $245,095, or $45.65/MWh. Overall, the project would produce power at a cost which is $45,690, or $8.51/MWh, less than the cost of alternative power.

4.1.5 Cost of Environmental Measures

Table 16 gives the cost of each of the environmental enhancement measures considered in our analysis. All dollars in table 16 are year 2019. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 16. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the Piedmont Project.
(Source: Staff).

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
General				
Continue to operate in a run-of-river mode, such that outflow approximates inflow.	Aquenergy, South Carolina DHEC, Staff	$0	$0	$0
Operate the project in an instantaneous run-of-river mode.	South Carolina DNR	$0	$0	$0
Develop an Operation Compliance Monitoring Plan that specifies the methods that will be used at the project to monitor project operation.	Staff	$5,000[d]	$0	$390
Aquatic Resources				
Continue to provide a year-round continuous minimum flow of 15 cfs, or inflow, whichever is less, into the bypassed reach.	Aquenergy, South Carolina DHEC, South Carolina DNR, Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Geology and Soil Resources				
Develop a Sediment Management Plan in consultation with resource agencies to prevent the unintentional release of sediment from the impoundment during unplanned or emergency drawdowns.	Aquenergy, South Carolina DNR,[141] South Carolina DHEC,[142] Staff	$318,000[e]	$2,500	$26,480
Conduct baseline bathymetric mapping of the impoundment within 1 year of license issuance to inform the development of the Sediment Management Plan. Include a report of the baseline bathymetric mapping results with the Sediment Management Plan filed with the Commission for approval.	Staff	$23,000[f]	$0[g]	$1,800

[141] In comments filed in response to the Commission's REA notice, South Carolina DNR recommends the development of a Sediment Management Plan, as proposed by the applicant. Because no additional provisions or costs were provided by South Carolina DNR, staff assumes the capital and annual costs of South Carolina DNR's recommendation to be equivalent to the applicant's proposal.

[142] As a water quality certification condition, South Carolina DHEC states that the licensee must develop and implement a Sediment Management Plan in consultation with resource agencies. However, South Carolina DHEC does not provide specific provisions or costs for the required plan. Therefore, we assume the capital and annual costs of South Carolina DHEC's plan to be equivalent to the applicant's proposal and South Carolina DNR's recommendation.

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Conduct sediment contaminant testing and sediment composition and particle size sampling within 1 year of receiving a subsequent license to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment, and to characterize the composition of impounded sediment. Use the results from the contaminant testing and sediment sampling to guide the development of the Sediment Management Plan, and include a report of the results with the Sediment Management Plan filed with the Commission for approval.	Staff	$20,000[h]	$0[g]	$1,560
Document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consult with resource agencies if any adverse effects to wetland vegetation are observed.	Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
If dredging occurs under the Sediment Management Plan, include general provisions in the Sediment Management Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period.	Staff	$0	$0	$0
File an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results.	Staff	$0	$0	$0
Terrestrial Resources				
Avoid and minimize ground-disturbing activities and disturbance of riparian vegetation on project lands.	South Carolina DNR, staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Consult with state and federal resource agencies on the implementation of best management practices to be employed during construction or refurbishment activities at the project.	South Carolina DNR, staff	$0	$0	$0
Maintain a forested riparian buffer of at least 25 feet in width along the shorelines of the project.	South Carolina DNR	Undefined.	Undefined.	Undefined.
Threatened and Endangered Species				
Limit tree removal associated with the construction and maintenance of the proposed canoe portages to periods outside of the northern long-eared bat pup season and broader active season.	Aquenergy, Staff	$0	$0	$0
Recreation and Land Use				
Continue to allow public use of project lands.	Aquenergy, South Carolina DNR, Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Develop a Recreation Management Plan with input from stakeholders on plans for proposed facilities, and maintenance protocols for the facilities.	Aquenergy, South Carolina DNR, Anderson County Parks and Recreation Department, Staff	$15,000	$2,000	$2,490
Develop a canoe portage facility, including a put-in, take-out, and trail at the Piedmont Project.	Aquenergy, South Carolina DNR, Staff	$60,000	$3,000	$6,670
Cultural				
Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered during project operation or other project-related activities.	Staff	$0	$0	$0

[a] Costs provided by the applicant, unless otherwise noted.
[b] Annual costs typically include operational and maintenance costs, and any other costs which occur on a yearly basis.
[c] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.
[d] Staff estimated the cost for the development of a plan.
[e] In a teleconference between staff and the applicant on November 11, 2018, (*see* memo issued January 12, 2019), the applicant clarified that the $150,000 cost presented in the FLA includes the cost for development of a plan in consultation with resource agencies, and construction costs associated with rehabilitating the inoperable dam sluice

gate(s) at the project. Staff has modified the cost to also include an estimate of the proposed bathymetry (before and after each sediment flushing event) and water quality monitoring measures (continuous DO and turbidity monitoring, during, as well as 24 hours before, and 24 hours after, each flushing event) described for the three annual sediment flushing events in the AIR response filed by the applicant on June 20, 2017.

[f] Staff estimated the cost to conduct baseline bathymetric monitoring within 1 year of license issuance to inform the development of the Sediment Management Plan.

[g] Staff assumes that any annual O&M costs for staff recommended provisions will be captured by the applicant's estimated annual operating cost ($2,500) for the Sediment Management Plan.

[h] Staff estimated the cost to conduct sediment contaminant testing and sediment composition and particle size sampling within 1 year of license issuance to inform the development of the Sediment Management Plan.

4.2 POWER AND ECONOMIC BENEFITS OF THE UPPER PELZER PROJECT

Table 17 summarizes the assumptions and economic information we use in our analysis of the Upper Pelzer Project. The co-applicants provided this information in their license applications and subsequent submittals. We find that the values provided by the co-applicants are reasonable for the purposes of our analysis. Cost items common to all alternatives include: (1) taxes and insurance costs; (2) net investment; (3) relicensing costs; and (4) normal operation and maintenance cost. Values provided by the co-applicants in their license application and subsequent submittals were indexed to 2019 dollars using rates obtained from http://www.usbr.gov/tsc/techreferences/mands/cct.html.

Table 17. Parameters for the economic analysis of the Upper Pelzer Project. (Source: Enel Green Power North America, Inc., 2015b, as modified by staff).

Economic Parameter	Value (2019$)[a]	Source
Installed capacity	1.95 MW	Co-applicants
Dependable capacity	0.45 MW[b]	Co-applicants
Average annual generation	6,223 MWh	Co-applicants
Annual O&M cost	$114,300	Co-applicants
Cost to prepare license application	$118,400	Co-applicants
Net investment	$733,600	Co-applicants
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Interest Rate	8.0 percent	Co-applicants
Energy rate	$36.00/MWh[c]	Staff
Capacity rate	$195.00 kilowatt-year[c]	Staff

a Values provided by the co-applicants in 2015 dollars were converted to 2019 dollars.

b Value provided by the co-applicants in an email correspondence issued July 10, 2018.

c Source: Energy Information Administration using rates obtained from Annual Energy Outlook 2018 at http://www.eia.gov/outlooks/aeo/index.cfm.

4.2.1 Comparison of Alternatives

Table 18 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this draft EA for the Upper Pelzer Project: the no-action alternative, the co-applicants' proposal, and the staff alternative.

Table 18. Summary of the annual cost of alternative power and annual project cost for alternatives for the Upper Pelzer Project (Source: Staff).

	No-Action Alternative	**Co-applicants' Proposal**	**Staff Alternative**
Installed capacity	1.95 MW	1.95 MW	1.95 MW
Annual generation	6,223 MWh	6,091[a] MWh	6,091[a] MWh
Annual cost of alternative power	$305,159 $50.10/MWh	$307,047 $50.41/MWh	$307,047 $50.41/MWh
Annual project cost	$246,259 $40.43/MWh	$276,227 $45.35/MWh	$280,003 $45.97/MWh
Difference between cost of alternative power and project power	$58,900 $9.67/MWh	$30,820 $5.06/MWh	$27,044 $4.44/MWh

[a] The co-applicants' proposed 15 cfs minimum flow release would result in an average annual generation loss of about 132 MWh.

4.2.2 No Action Alternative

Under the no action alternative, the project would continue to operate in its current mode with an installed capacity of 1.95 MW, and generate an average of 6,223 MWh of electricity annually. The average annual cost of alternative power would be $305,159, or $50.10/MWh. The average annual project cost would be $246,259, or $40.43/MWh. Overall, the project would produce power at a cost which is $58,900, or $9.67/MWh, less than the cost of alternative power.

4.2.3 Co-applicants' Proposal

Under the co-applicants' proposal, the project would operate with an installed capacity of 1.95 MW, and generate an average of 6,091 MWh of electricity annually. The average annual cost of alternative power would be

$307,047, or $50.41/MWh. The average annual project cost would be $276,227, or $45.35/MWh. Overall, the project would produce power at a cost which is $30,820, or $5.06/MWh, less than the cost of alternative power.

4.2.4 Staff Alternative

Under the staff alternative, the project would operate with an installed capacity of 1.95 MW, and generate an average of 6,033 MWh of electricity annually. Table 18 shows the staff-recommended additions and modifications to the co-applicants' proposed environmental protection, mitigation and enhancement measures, and the estimated costs of each.

The average annual cost of alternative power would be $307,047, or $50.41/MWh. The average annual project cost would be $280,003, or $45.97/MWh. Overall, the project would produce power at a cost which is $27,044, or $4.44/MWh, less than the cost of alternative power.

4.2.5 Cost of Environmental Measures

Table 19 gives the cost of each of the environmental enhancement measures considered in our analysis. All dollars in table 19 are year 2019. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 19. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the Upper Pelzer Project.
(Source: Staff).

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
General				
Continue to operate in a run-of-river mode, such that outflow approximates inflow.	Co-applicants, South Carolina DHEC, Staff	$0	$0	$0
Operate the project in an instantaneous run-of-river mode.	South Carolina DNR	$0	$0	$0
Develop an Operation Compliance Monitoring Plan that specifies the methods that will be used at the project to monitor project operation.	Staff	$5,000[d]	$0	$390
Aquatic Resources				
Provide a continuous minimum flow release of 15 cfs, or inflow, whichever is less, into the bypassed reach between the dam and upper powerhouse tailrace.	Co-applicants, South Carolina DHEC	$0	$0	$0
Provide a continuous minimum flow release of 15 cfs, or inflow, whichever is less, to the bypassed reach, and consult with South Carolina DNR on the placement and delivery of the minimum flow.	South Carolina DNR, Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Develop a bypassed reach minimum flow monitoring plan, in consultation with FWS, South Carolina DNR, and South Carolina DHEC, within the first 3 years after issuance of a new license, and file the monitoring plan and results with the Commission upon completion.[143]	South Carolina DHEC, Staff	$15,000[d]	$0	$1,170
Geology and Soil Resources				
Continue implementing the current Sediment Flushing Plan, and, after a new license is issued, consult with resource agencies to review and update the plan.	Co-applicants, South Carolina DNR,[144] South Carolina DHEC,[145] Staff	$135,000[e]	$2,500	$12,190

[143] Staff expanded South Carolina DHEC's water quality certification condition to require filing of the bypassed reach flow monitoring plan and results with the Commission upon completion.

[144] In comments filed in response to the Commission's REA notice, South Carolina DNR concurs with the co-applicants proposal to review and update the current Sediment Flushing Plan. Because no additional provisions or costs were provided by South Carolina DNR, we assume the capital and annual costs of South Carolina DNR's recommendation to be equivalent to the co-applicants' proposal.

[145] As a water quality certification condition, South Carolina DHEC states that the co-applicants must continue implementing the current Sediment Flushing Plan, and, after a new license is issued, consult with resource agencies to review and update the plan as necessary. However, South Carolina DHEC does not provide specific provisions or costs for

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Conduct baseline bathymetric mapping of the impoundment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the current Sediment Flushing Plan.	Staff	$23,000[f]	$0[g]	$1,800
Conduct sediment contaminant testing and sediment composition and particle size sampling to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment and to characterize the composition of impounded sediment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the Sediment Flushing Plan.	Staff	$20,000[h]	$0[g]	$1,560

the updated plan. Therefore, staff assumes the capital and annual costs of South Carolina DHEC's plan to be equivalent to the co-applicants' proposal and South Carolina DNR's recommendation.

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consult with resource agencies if any adverse effects to wetland vegetation are observed.	Staff	$0	$0	$0
If dredging occurs under the Sediment Flushing Plan, include general provisions in the Sediment Flushing Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period.	Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
File an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results.	Staff	$0	$0	$0
Terrestrial Resources				
Avoid and minimize ground-disturbing activities and disturbance of riparian vegetation on project lands.	South Carolina DNR, staff	$0	$0	$0
Consult with state and federal resource agencies on the implementation of best management practices to be employed during construction or refurbishment activities at the project.	South Carolina DNR, staff	$0	$0	$0
Maintain a forested riparian buffer of at least 25 feet in width along the shorelines of the project.	South Carolina DNR	Undefined.	Undefined.	Undefined.
Threatened and Endangered Species				
Limit tree removal associated with the construction and maintenance of the proposed canoe portages to periods outside of the northern long-eared bat pup season and broader active season.	Co-applicants, Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Recreation and Land Use				
Develop a Recreation Management Plan with input from stakeholders on plans for proposed facilities, and maintenance protocols for the facilities.	Co-applicants, South Carolina DNR, Anderson County Parks and Recreation Department, Staff	$15,000	$1,000	$1,830
Develop a canoe portage facility, including a put-in, take-out, and trail at the Upper Pelzer Project.	Co-applicants, South Carolina DNR, Staff	$112,000	$3,000	$10,730
Continue to operate and maintain recreation facilities, and allow public use of project lands.	Co-applicants, South Carolina DNR, Staff	$0	$500[i]	$330
Cultural				
Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered during project operation or other project-related activities	Staff	$0	$0	$0

[a] Costs provided by the co-applicants, unless otherwise noted.
[b] Annual costs typically include operational and maintenance costs, and any other costs which occur on a yearly basis.
[c] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.
[d] Staff estimated cost for the development of the plan.

[e] In a teleconference between staff and the co-applicants on November 11, 2018, (*see* memo issued January 12, 2019), the co-applicants clarified that the $75,000 cost presented in the FLA includes the cost for updating the plan in consultation with resource agencies, and construction costs associated with rehabilitating the inoperable dam sluice gate. Staff has modified the cost to also include an estimate of the water quality monitoring measure described for each sediment flushing event (once every 5 years) in the current Sediment Flushing Plan.

[f] Staff estimated the cost to conduct baseline bathymetric monitoring within 1 year of license issuance to inform the need to update the current Sediment Flushing Plan.

[g] Staff assumes that any annual O&M costs for staff recommended provisions will be captured by the co-applicants' estimated annual operating cost ($2,500) for the Sediment Flushing Plan.

[h] Staff estimated the cost to conduct sediment contaminant testing and sediment composition and particle size sampling within 1 year of license issuance to inform the need to update the current Sediment Flushing Plan.

[i] Staff estimated the annual cost for the co-applicants to continue to operate and maintain recreation facilities and allow public use of project lands.

4.3 POWER AND ECONOMIC BENEFITS OF THE LOWER PELZER PROJECT

Table 20 summarizes the assumptions and economic information we use in our analysis of the Lower Pelzer Project. The co-applicants provided this information in their license applications and subsequent submittals. We find that the values provided by the co-applicants are reasonable for the purposes of our analysis. Cost items common to all alternatives include: (1) taxes and insurance costs; (2) net investment; (3) relicensing costs; and (4) normal operation and maintenance cost. Values provided by the co-applicants in their license application and subsequent submittals were indexed to 2019 dollars using rates obtained from http://www.usbr.gov/tsc/techreferences/mands/cct.html.

Table 20. Parameters for the economic analysis of the Lower Pelzer Project. (Source: Enel Green Power North America, Inc., 2015c, as modified by staff).

Economic Parameter	Value (2019$)[a]	Source
Installed capacity	3.0 MW	Co-applicants
Dependable capacity	0.55 MW[b]	Co-applicants
Average annual generation	8,784 MWh	Co-applicants
Annual O&M cost	$171,500	Co-applicants
Cost to prepare license application	$118,400	Co-applicants
Net investment	$838,200	Co-applicants
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Interest Rate	8.0 percent	Co-applicants
Energy rate	$36.00/MWh[c]	Staff
Capacity rate	$195.00 kilowatt-year[c]	Staff

a Values provided by the co-applicants in 2015 dollars were converted to 2019 dollars.

b Value provided by the co-applicants in an email correspondence issued July 10, 2018.

c Source: Energy Information Administration using rates obtained from Annual Energy Outlook 2018 at http://www.eia.gov/outlooks/aeo/index.cfm.

4.3.1 Comparison of Alternatives

Table 21 summarizes the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this EA for the Lower Pelzer Project: the no-action alternative, the co-applicants' proposal, and the staff alternative.

Table 21. Summary of the annual cost of alternative power and annual project cost for alternatives for the Lower Pelzer Project. (Source: Staff).

	No-Action Alternative	**Co-applicants' Proposal**	**Staff Alternative**
Installed capacity	3.0 MW	3.0 MW	3.0 MW
Annual generation	8,784 MWh	8,784 MWh	8,784 MWh
Annual cost of alternative power	$423,477 $48.21/MWh	$423,477 $48.21/MWh	$423,477 $48.21/MWh
Annual project cost	$337,920 $38.47/MWh	$355,576 $40.48/MWh	$359,968 $40.98/MWh
Difference between cost of alternative power and project power	$85,557 $9.74/MWh	$67,901 $7.73/MWh	$63,509 $7.23/MWh

4.3.2 No Action Alternative

Under the no action alternative, the project would continue to operate in its current mode with an installed capacity of 3.0 MW, and generate an average of 8,784 MWh of electricity annually. The average annual cost of alternative power would be $423,477, or $48.21/MWh. The average annual project cost would be $337,920, or $38.47/MWh. Overall, the project would produce power at a cost which is $85,557, or $9.74/MWh, less than the cost of alternative power.

4.3.3 Co-applicants' Proposal

Under the co-applicants' proposal, the project would continue to operate in its current mode with an installed capacity of 3.0 MW, and generate an average of

8,784 MWh of electricity annually. The average annual cost of alternative power would be $423,477, or $48.21/MWh. The average annual project cost would be $355,576, or $40.48/MWh. Overall, the project would produce power at a cost which is $67,901, or $7.73/MWh, less than the cost of alternative power.

4.3.4 Staff Alternative

Under the staff alternative, the project would operate with an installed capacity of 3.0 MW, and generate an average of 8,784 MWh of electricity annually. Table 21 shows the staff-recommended additions and modifications to the co-applicants' proposed environmental protection, mitigation and enhancement measures, and the estimated costs of each.

The average annual cost of alternative power would be $423,477, or $48.21/MWh. The average annual project cost would be $359,968, or $40.98/MWh. Overall, the project would produce power at a cost which is $63,509, or $7.23/MWh, less than the cost of alternative power.

4.3.5 Cost of Environmental Measures

Table 22 gives the cost of each of the environmental enhancement measures considered in our analysis. All dollars in table 22 are year 2019. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 22. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the Lower Pelzer Project.
(Source: Staff).

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
General				
Continue to operate in a run-of-river mode, such that outflow approximates inflow.	Co-applicants, South Carolina DHEC, Staff	$0	$0	$0
Operate the project in an instantaneous run-of-river mode.	South Carolina DNR	$0	$0	$0
Develop an Operation Compliance Monitoring Plan that specifies the methods that will be used at the project to monitor project operation.	Staff	$5,000[d]	$0	$390
Aquatic Resources				
Continue to provide a year-round continuous minimum flow release of 140 cfs, or inflow, whichever is less, into the bypassed reach.	Co-applicants, South Carolina DHEC, South Carolina DNR, Staff	$0	$0	$0
Employ practical measures to minimize fluctuations in downstream flows to provide more stable aquatic habitat conditions in the Saluda River reach below the project, if and/or when such practical measures are available.	South Carolina DNR	Undefined.	Undefined.	Undefined.

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Geology and Soil Resources				
Continue implementing the current Sediment Flushing Plan, and, after a new license is issued, consult with resource agencies to review and update the plan.	Co-applicants, South Carolina DNR,[146] South Carolina DHEC,[147] Staff	$40,000[e]	$2,500	$4,770
Conduct baseline bathymetric mapping of the impoundment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the current Sediment Flushing Plan;	Staff	$23,000[f]	$0[g]	$1,800

[146] In comments filed in response to the Commission's REA notice, South Carolina DNR agrees with the co-applicants proposal to review and update the current Sediment Flushing Plan. Because no additional provisions or costs were provided by South Carolina DNR, we assume the capital and annual costs of South Carolina DNR's recommendation to be equivalent to the co-applicants' proposal.

[147] As a water quality certification condition, South Carolina DHEC states that the co-applicants must continue implementing the current Sediment Flushing Plan, and, after a new license is issued, consult with resource agencies to review and update the plan as necessary. However, South Carolina DHEC does not provide specific provisions or costs for the updated plan. Therefore, we assume the capital and annual costs of South Carolina DHEC's plan to be equivalent to the co-applicants' proposal and South Carolina DNR's recommendation.

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Conduct sediment contaminant testing and sediment composition and particle size sampling to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment and to characterize the composition of impounded sediment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the Sediment Flushing Plan.	Staff	$20,000[h]	$0[g]	$1,560
Document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consult with resource agencies if any adverse effects to wetland vegetation are observed.	Staff	$0	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
If dredging occurs under the Sediment Flushing Plan, include general provisions in the Sediment Flushing Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period.	Staff	$0	$0	$0
File an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results.	Staff	$0	$0	$0
Terrestrial Resources				
Avoid and minimize ground-disturbing activities and disturbance of riparian vegetation on project lands.	South Carolina DNR, staff	$0	$0	$0
Consult with state and federal resource agencies on the implementation of best management practices to be employed during construction or refurbishment activities at the project.	South Carolina DNR, staff	$0	$0	$0
Maintain a forested riparian buffer of at least 25 feet in width along the shorelines of the project.	South Carolina DNR	Undefined.	Undefined.	Undefined.

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Threatened and Endangered Species				
Limit tree removal associated with the construction and maintenance of the proposed canoe portages to periods outside of the northern long-eared bat pup season and broader active season.	Co-applicants, Staff	$0	$0	$0
Recreation and Land Use				
Develop a Recreation Management Plan with input from stakeholders on plans for proposed facilities, and maintenance protocols for the facilities.	Co-applicants, South Carolina DNR, Anderson County Parks and Recreation Department, Staff	$15,000	$1,000	$1,830
Develop a canoe portage facility, including a put-in, take-out, and trail at the Lower Pelzer Project.	Co-applicants, South Carolina DNR, Staff	$112,000	$3,000	$10,730
Continue to operate and maintain recreation facilities, and allow public use of project lands.	Co-applicants, South Carolina DNR, Staff	$0	$500[i]	$330
Initiate standard hours for open-gate access to allow for reasonable public access leading into the Lower Pelzer fishing access station.	South Carolina DNR, Staff	$0	$1,000[j]	$660

Enhancement/Mitigation Measures	Entity	Capital cost [a]	Annual cost [a, b]	Levelized annual cost [c]
Cultural				
Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered during project operation or other project-related activities	Staff	$0	$0	$0

[a] Costs provided by the co-applicants unless otherwise noted.

[b] Annual costs typically include operational and maintenance costs, and any other costs which occur on a yearly basis.

[c] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.

[d] Staff estimated cost for the development of the plan.

[e] Staff has modified the $10,000 capital cost provided by the co-applicants to include an estimate of the water quality monitoring measure described for each sediment flushing event (once every 10 years) in the current Sediment Flushing Plan.

[f] Staff estimated the cost to conduct baseline bathymetric monitoring within 1 year of license issuance to inform the need to update the current Sediment Flushing Plan.

[g] Staff assumes that any annual O&M costs for staff recommended provisions will be captured by the co-applicants' estimated annual operating cost ($2,500) for the Sediment Flushing Plan.

[h] Staff estimated the cost to conduct sediment contaminant testing and sediment composition and particle size sampling within 1 year of license issuance to inform the need to update the current Sediment Flushing Plan.

[i] Staff estimated the cost to initiate standard hours for open-gate access to the Lower Pelzer fishing access station.

[j] Staff estimated the annual cost for the co-applicants to continue to operate and maintain recreation facilities and allow public use of project lands based on the estimated minimal level of maintenance.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a hydropower project, we consider water quality, fish and wildlife, recreation, cultural, and other non-developmental values of the involved waterway equally with its electric energy and other developmental values. In deciding whether, and under what conditions, a hydropower project should be licensed, the Commission must determine that the project would be best adapted to a comprehensive plan for improving or developing the waterway. We weigh the costs and benefits of our recommended alternative against other proposed measures. This section contains the basis for, and a summary of, our recommendations for relicensing the Piedmont, Upper Pelzer, and Lower Pelzer Projects.

Based on our independent review and evaluation of the environmental and economic effects of the proposed action and its alternatives, we selected the staff alternative as the preferred alternative for the Piedmont, Upper Pelzer, and Lower Pelzer Projects. We recommend this alternative because: (1) issuing new and subsequent licenses would allow the applicants to continue operating the projects as beneficial and dependable sources of electrical energy; (2) the 1.0 MW, 1.95 MW, and 3.0 MW of electric capacity of the Piedmont, Upper Pelzer, and Lower Pelzer Projects, respectively, comes from renewable resources that do not contribute to atmospheric pollution; and (3) the recommended environmental measures would protect and enhance environmental resources affected by the projects.

In the following section, we make recommendations as to which environmental measures proposed by the applicants, or recommended by agencies or other entities, should be included in any license issued for the project. In addition to the applicants' proposed environmental measures listed below, we recommend additional staff-recommended environmental measures to be included in any license issued to for the project.

5.1.1 Piedmont Project

5.1.1.1 Measures Proposed by Aquenergy

Based on our environmental analysis of Aquenergy's proposal, as discussed in section 3, *Environmental Analysis*, and the costs presented in section 4, *Developmental Analysis*, we conclude that the following environmental measures proposed by the applicant would protect and enhance environmental resources, and would be worth the cost. Therefore, we recommend the following proposed measures:

- Continue to operate the project in a run-of-river mode, maintaining the normal pool elevation at 767.2 feet;

- Continue to release a continuous minimum flow of 15 cfs, or inflow, whichever is less, into the bypassed reach;

- Develop a Sediment Management Plan for the impoundment;

- Provide canoe portage facilities at the project; and

- Limit tree removal associated with the construction and maintenance of the proposed canoe portage to November 1 through March 31 to minimize adverse effects to northern long-eared bats during the pup season, and the broader active season.

5.1.1.2 Additional Measures Recommended by Staff

In addition to the applicant's proposed measures noted above, we recommend including the following additional or modified measures in any license issued for the Piedmont Project:

- An Operation Compliance Monitoring Plan to document compliance with the proposed operations described above (i.e., run-of-river mode, maintaining the normal pool elevation as specified, and minimum flows);

- Conduct baseline bathymetric mapping of the impoundment within 1 year of receiving a subsequent license to inform the development of the Sediment Management Plan. Include a report of the bathymetric mapping results with the Sediment Management Plan filed with the Commission for approval;

- Conduct sediment contaminant testing and sediment composition and particle size sampling within 1 year of receiving a subsequent license to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment, and to characterize the composition of impounded sediment. Use the results from the contaminant testing and sediment sampling to guide the development of the Sediment Management Plan, and include a report of the results with the Sediment Management Plan filed with the Commission for approval;

- During flushing and/or dredging events, document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds, and consult with resource agencies if any adverse effects to wetland vegetation are observed;

- If dredging occurs under the Sediment Management Plan, include general provisions in the Sediment Management Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period;

- File an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results; and

- Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered during project operation or other project-related activities.

Below, we discuss the rationale for modifying Aquenergy's proposals, and the basis for our additional staff-recommended measures.

Operation Compliance Monitoring

Aquenergy uses a remotely-monitored, automatic pond level controller to maintain a stable impoundment elevation of 767.2 feet. South Carolina DNR recommends that the applicant operate the project in a run-of-river mode, with minimal fluctuations in downstream flow to provide a stable aquatic habitat in the Saluda River reach below the project. Additionally, Aquenergy proposes to continue to supply a continuous minimum flow of 15 cfs, or inflow, whichever is less, to the bypassed reach below the dam. In the water quality certification South Carolina DHEC states, and South Carolina DNR recommends, that the applicant must continue to operate in a run-of-river mode and maintain the current minimum flow.

As discussed in section 3.3.2.2, *Operation Compliance Monitoring,* developing a formal project operation and monitoring plan would provide a mechanism for reporting operational data and deviations, facilitate administration of the license, and ensure the protection of resources sensitive to fluctuations in impoundment surface elevation. Additionally, developing such a plan would ensure that the minimum flows required in any license issued for the Piedmont Project are met and monitored effectively. Therefore, we recommend that Aquenergy develop an operation compliance monitoring plan with measures to monitor minimum flows and impoundment elevations using the existing automatic pond level controller at the Piedmont Project.

We estimate that the annual levelized cost of developing a monitoring plan would be $390, and conclude that the benefits of the plan outweigh the cost.

Sediment Management

Aquenergy proposes to develop a Sediment Management Plan to minimize the unintentional release of sediments from the project impoundment during unplanned or emergency drawdowns. In the plan, Aquenergy proposes to flush sediment from the impoundment over one full day, annually, for 3 years. Aquenergy proposes to minimize impoundment drawdown during sediment flushing, and to conduct bathymetric surveys of the impoundment before and after each sediment flushing event to determine sediment flushing volumes, monitor accumulation, and estimate sediment movement. Following the first 3 annual releases, Aquenergy proposes to consult with resource agencies on the results of water quality and sediment monitoring data taken during the flushing events to determine the effectiveness of the releases and the need for any changes in methodology or frequency for future implementation of the plan.

Condition 4 of the water quality certification states that Aquenergy must develop a Sediment Management Plan in consultation with the resource agencies. South Carolina DNR supports the development a Sediment Management Plan, and recommends that the plan include provisions to avoid or minimize the unintended release of sediment prior to, and during, scheduled maintenance events, and measures to address releases during emergencies. South Carolina DNR also states that dredging may be the most practical method of sediment removal at the project.

As discussed in section 3.3.1, *Geological and Soil Resources*, the Saluda River carries a heavy sediment load and unregulated sediment accumulation could become a problem for project operation and other uses in the future. The potential for uncontrolled sediment releases during emergency drawdowns is also an issue. Intentional sediment flushing could protect power generation and proactively reduce sediment releases during emergency drawdowns. Development of a Sediment Management Plan as proposed by Aquenergy and recommended by South Carolina DHEC and South Carolina DNR would be beneficial for establishing a procedure for periodically removing sediment from the impoundment in a controlled manner to prevent sudden, uncontrolled high-magnitude sediment release events from occurring and adversely affecting downstream environmental resources. The levelized annual cost for developing the Sediment Management Plan would be about $26,480. The aforementioned benefits would be worth this cost, and therefore, we recommend that Aquenergy develop a Sediment Management Plan for the project.

As discussed in section 3.3.1, *Geological and Soil Resources*, in order to better inform the development of the Sediment Management Plan for the project, including determining what amount of dredging, if any, is needed to adequately protect

environmental resources at and adjacent to the river reach downstream of the project, baseline bathymetric mapping, sediment contaminant testing, and sediment composition and particle size sampling results for the project impoundment are needed. The levelized annual cost of conducting the bathymetric mapping would be about $1,800 and the levelized annual cost of conducting the contaminant testing and sediment sampling would be about $1,560. The benefits of obtaining this data to inform the development of the Sediment Management Plan to thereby protect downstream aquatic and other environmental resources would be worth this cost. Therefore, we recommend baseline bathymetric mapping, sediment contaminant testing, and sediment composition and particle size sampling at the project impoundment.

As discussed in Section 3.3.2, *Aquatic Resources,* sediment dredging, if necessary, could affect water quality conditions and aquatic biota by increasing turbidity, decreasing DO, and both resuspending and transporting sediment-bound contaminants. To avoid adverse effects on aquatic resources from sediment dredging, Aquenergy could include a provision in its Sediment Management Plan to implement best management practices during dredging operations, such as the use of turbidity curtains and proper protocol for handling, transporting, and disposing of any dredged material. Including this measure in the Sediment Management Plan would minimize adverse effects to water quality conditions and negative impacts on aquatic life, such as suffocation and loss of habitat. Implementing this measure would come at no additional cost to Aquenergy. Therefore, we recommend implementing best management practices during dredging operations to protect aquatic resources in the impoundment and below the dam.

As discussed in section 3.3.4, *Threatened and Endangered Species*, sediment flushing and dredging could affect potentially suitable wetland habitat for Eastern black rails within the project boundary. Documenting any effects on potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consulting with resource agencies regarding any observed adverse effects to wetland vegetation, would allow Aquenergy to develop appropriate measures, if necessary, to avoid or minimize potential effects to Eastern black rails. In addition, if dredging would occur at the project, Aquenergy could include a provision in its Sediment Management Plan to avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation, including within emergent wetlands, from mid-March through September. Including such measures in the Sediment Management Plan for the project would avoid the potential for prohibited incidental take of Eastern black rails during this species' nesting, brooding, or post-breeding flightless molt period. Implementing these measures would come at no additional cost to Aquenergy.

As discussed in Section 3.3.1, *Geological and Soil Resources,* development of a Sediment Management Plan for the project is necessary due to the large sediment load in the system, the risk of an unintended sediment release particularly during emergencies,

and the possibility of future impoundment capacity reductions from sediment accumulation. Regular sediment flushing or dredging could reduce the volume of sediment stored within the impoundment, and minimize the volume of sediment transported downstream during routine and emergency drawdown events. To ensure that sediment management activities occur in accordance with the methodology and frequency determined in consultation with resource agencies for the Sediment Management Plan, Aquenergy could include a detailed implementation schedule for all of the plan's monitoring and sediment management provisions and file an annual report summarizing all of the sediment management activities that occurred under the plan during the year. Including this measure in the Sediment Management Plan would assist staff with their compliance oversight responsibilities, ensure sediment management activities occur on the agreed upon interval, and minimize adverse effects on downstream aquatic resources from sudden, high-magnitude sediment release events.

Cultural Resources

There is a possibility that unknown archaeological or historic resources may be discovered due to project operation or other project-related activities. To ensure proper treatment of any unknown cultural resources that may be discovered at the project, we recommend that, in the case of any such discovery, Aquenergy notify and consult with the South Carolina SHPO and: (1) cease project-related activities and determine if the discovered archaeological or historic resource is eligible for the National Register; (2) determine if continued operation of the project would adversely affect the resource; and (3) if the resource would be adversely affected, obtain guidance from the South Carolina SHPO on how to avoid, lessen, or mitigate for any adverse effects. Also, we recommend that Aquenergy inform the Commission of any discovery of unknown cultural resource, and any measures proposed if the resource is eligible for the National Register and is adversely affected by project construction or operation.

Implementing the proposed measure would come at no additional cost to Aquenergy.

5.1.1.3 Measures Not Recommended

Instantaneous Run-of-River Operation

South Carolina DNR recommends that Aquenergy operate the project in an instantaneous run-of-river mode. South Carolina DNR argues that under this type of operation, inflows match outflows and, thus, minimize or avoid fluctuations of the project impoundment and downstream flows that could be caused by project operation.

As discussed in section 3.3.2.2, *Water Quantity*, precise instantaneous matching of outflows to inflows is not practicable at the project because of variations in wind, flow, and other operational factors. Based on the small size of the impoundment and relatively

short residence time, the project is not able to store water. Therefore, we recommend that Aquenergy continue to operate the project in a run-of-river mode in which outflows from the project are released to approximate inflow, minus existing consumptive uses and maintain the current minimum flow, rather than instantaneous run-of-river mode. Run-of-river operation helps minimize water level fluctuations and flow disruption to aquatic and riparian habitats present in the project impoundments and in the downstream reaches of the Saluda River. Continuing to operate would result in no change in the effect on recreation, water quality and quality, and wetland resources.

South Carolina DNR's Recommended Riparian Buffers

South Carolina DNR recommends that the applicant protect and conserve vegetation within the project boundary, in part, by maintaining forested riparian buffers that are at least 25 feet wide along the shorelines of the project, with exceptions for locations where a water-dependent structure or facility may require a different shoreline condition. In its reply comments, the applicant states that it cannot implement the recommended riparian buffers because the project boundary is limited to a contour elevation around the impoundment that is generally within a few feet of the shoreline, and it does not have control over land use practices outside of the project boundary.

As noted in section 3.3.3.2, *Terrestrial Resources*, riparian buffers provide numerous environmental benefits, including managing stormwater runoff, protecting water quality, conserving and enhancing species diversity, maintaining wildlife corridors, and protecting aesthetic/scenic values. The extent of the existing riparian habitat at the project varies greatly, as private lands adjacent to the project boundary have historically developed unevenly, and retaining or establishing riparian buffers is currently optional for landowners, including the applicant. On large segments of the shorelines at the project, the vegetated riparian buffers are already 25-feet-wide or greater, and would provide the ecological benefits described above. As the applicant states, the project boundary is limited to contour elevations around the impoundment that are generally within a few feet of the shoreline and they cannot control land uses on adjacent private lands. To implement South Carolina DNR's recommendation, the applicant would have to acquire sufficient rights to lands adjacent to the project boundary to allow them to increase the riparian buffer widths in locations where it is less than 25 feet. However, it has not been demonstrated that additional riparian lands are needed.

Continuing the run-of-river operation at the project would preserve the existing hydroperiod, water quality and quantity, and riparian vegetation. Establishing and maintaining a relatively short canoe portage around the project dam would not have a significant impact on the existing riparian vegetation. Therefore, relicensing the project would maintain the quality and character of the existing riparian buffers within the project boundary. Based on the reasons outlined above, we do not recommend that the

applicant acquire rights to lands adjacent to the project boundary solely to establish a 25-foot-wide buffer where it does not currently exist.

5.1.2 Upper Pelzer Project

5.1.2.1 Measures Proposed by the Co-applicants

Based on our environmental analysis of the co-applicants' proposal, as discussed in section 3, *Environmental Analysis*, and the costs presented in section 4, *Developmental Analysis*, we conclude that the following environmental measures proposed by the co-applicants would protect and enhance environmental resources, and would be worth the cost. Therefore, we recommend the following proposed measures:

- Continue to operate the project in a run-of-river mode, maintaining the normal pool elevation at 719.9 feet;

- Release a continuous minimum flow of 15 cfs, or inflow, whichever is less, into the bypassed reach between the dam and upper powerhouse tailrace;

- Continue to provide public access and maintain existing recreation facilities at the project;

- Continue to implement the current Sediment Flushing Plan, and, after a new license is issued, consult with the resource agencies to review and update the plan, as necessary;

- Provide canoe portage facilities at the project; and

- Limit tree removal associated with the construction and maintenance of the proposed canoe portages at the projects to November 1 through March 31, to minimize adverse effects to northern long-eared bats during the pup season and the broader active season.

5.1.2.2 Additional Measures Recommended by Staff

In addition to the co-applicants' proposed measures noted above, we recommend including the following additional or modified measures in any license issued for the Upper Pelzer Project:

- Monitor bypassed reach minimum flows to evaluate the effects of the volume, placement, and delivery of the proposed minimum flow of 15 cfs on aquatic resources and water quality in the upper bypassed reach within the first 3 years after a new license is issued, in consultation with FWS, South Carolina DHEC, and South Carolina DNR;

- An Operation Compliance Monitoring Plan to document compliance with the proposed operations described above (i.e., run-of-river mode, maintaining the normal pool elevation as specified, and minimum flows);

- Conduct baseline bathymetric mapping of the impoundment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the current Sediment Flushing Plan;

- Conduct sediment contaminant testing and sediment composition and particle size sampling of the impoundment to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment and characterize the composition of impounded sediment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the Sediment Flushing Plan;

- During flushing and/or dredging events, document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds, and consult with resource agencies if any adverse effects to wetland vegetation are observed;

- If dredging occurs under the Sediment Flushing Plan, include general provisions in the Sediment Flushing Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period;

- File an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results; and

- Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered during project operation or other project-related activities.

Below, we discuss the rationale for modifying the co-applicants' proposals and the basis for our additional staff-recommended measures.

Minimum Flow Monitoring Plan in the Bypassed Reach

The co-applicants propose to release a continuous minimum flow of 15 cfs, or inflow, whichever is less, through a new weir to be constructed on the spillway crest adjacent to the east dam abutment and into the upper bypassed reach between the dam and upper powerhouse tailrace.

South Carolina DNR recommends that the co-applicants provide the proposed minimum flow, and requests consultation in the placement and delivery of the flow to the bypassed reach. A minimum bypassed flow monitoring plan, as required by South Carolina DHEC in condition 4 of the water quality certification, would be developed within the first 3 years after a new license is issued, in consultation with FWS, South Carolina DNR, and South Carolina DHEC.

As discussed in 3.3.2.2, *Environmental Effects, Water Quantity,* the proposed minimum flow of 15 cfs was developed without habitat studies to aid in determining appropriate flow levels. Developing a minimum bypassed flow monitoring plan to measure the effectiveness of the proposed minimum flow, would help the co-applicants determine if their proposed minimum flow supports a stable habitat that is capable of supporting a balanced resident aquatic community in the upper bypassed reach, as recommended in the South Carolina Water Plan.

We estimate that the annual levelized cost of developing a minimum flow monitoring plan would be $1,170, and conclude that the benefits of the plan outweigh the cost.

Operation Monitoring Compliance

The co-applicants use a remotely-monitored, automatic pond level controller to maintain a stable impoundment elevation of 719.9 feet. South Carolina DNR recommends that the co-applicants operate the project in a run-of-river mode, with minimal fluctuations in downstream flow to provide a stable aquatic habitat in the Saluda River reach below the project. Additionally, the co-applicants propose to supply a continuous minimum flow of 15 cfs, or inflow, whichever is less, to the bypassed reach below the dam. South Carolina DHEC states, and South Carolina DNR recommends, that the co-applicants must continue to operate the project in a run-of-river mode, and provide a 15 cfs minimum flow to the bypassed reach.

As discussed in section 3.3.2.2, *Operation Compliance Monitoring,* developing a formal project operation and monitoring plan would provide a mechanism for reporting

operational data and deviations, facilitate administration of the license, and ensure the protection of resources sensitive to fluctuations in impoundment surface elevation. Additionally, developing such a plan would ensure that the minimum flows required in any license issued for the Upper Pelzer Project are met and monitored efficiently. Therefore, we recommend that the co-applicants develop an operation compliance monitoring plan with measures to monitor minimum flows and impoundment elevation levels using the existing automatic pond level controller at the Upper Pelzer Project.

We estimate that the annual levelized cost of developing a monitoring plan would be $390, and conclude that the benefits of the plan outweigh the cost.

Sediment Management

The co-applicants propose to continue to implement the current Sediment Flushing Plan to minimize the unintentional release of sediments from the project impoundment during unplanned or emergency drawdowns and, after a new license is issued, consult with resource agencies to review and update the plan. The current plan requires the co-applicants to flush sediment from the Upper Pelzer impoundment every 5 years during winter months with moderate to high flows. The plan also includes provisions to notify and coordinate with resource agencies prior to scheduled drawdowns or sediment flushing events, and monitor DO levels downstream of the projects during each event. If sediment flushing cannot be accomplished without detrimental effects on the downstream environment, the plan requires the co-applicants to consult with resource agencies on other methods of sediment removal, such as hydraulic dredging, and formulate an appropriate dredging plan.

Condition 5 of the water quality certification states that the co-applicants must continue implementing the current Sediment Flushing Plan. Upon receiving a new license, South Carolina DHEC states that the co-applicants must revise the current plan, if necessary, in consultation with FWS, South Carolina DNR, and South Carolina DHEC. South Carolina DNR supports the co-applicants' proposal and recommends that the updated plan include provisions to avoid or minimize the unintended release of sediments during scheduled maintenance activities, and measures to address such releases during emergency events.

As discussed in section 3.3.1, *Geological and Soil Resources*¸ due in part to the large sediment load in the system, the risk of unintended sediment release particularly during emergencies, and the possibility of future impoundment capacity reductions due to sediment accumulation, there is a need to continue implementing the current Sediment Flushing Plan as proposed by the co-applicants and recommended by South Carolina DHEC and South Carolina DNR. More specifically, continued implementation of the Sediment Flushing Plan would be beneficial because it includes a procedure for periodically removing sediment from the impoundment in a controlled manner to prevent

sudden, uncontrolled high-magnitude sediment release events from occurring and adversely affecting downstream environmental resources. Sediment management activities at the Upper Pelzer Project under the current Sediment Flushing Plan have been infrequent over the last 30 years due to resource agency concerns regarding the impact of sediment releases under the plan on DO concentrations and turbidity levels downstream of the project. Therefore, the co-applicants propose to, and certain of the resource agencies recommend, that the co-applicants consult with the resource agencies after a new license is issued to determine whether or not any revisions to the current Sediment Flushing Plan, as it pertains to the Upper Pelzer Project, are necessary. This action would be beneficial for protecting aquatic resources located downstream of the Upper Pelzer Project. The levelized annual cost to continue implementing the Sediment Flushing Plan, and consult with resource agencies on the need for revisions to the plan, would be about $12,190. The benefits would be worth this cost, and therefore, we recommend that co-applicants continue implementing the Sediment Flushing Plan for the project, and consult with the resource agencies after a new license is issued to determine whether any revisions to the current Sediment Flushing Plan are necessary. .

As discussed in section 3.3.1, *Geological and Soil Resources*, it would be prudent to establish a baseline of impounded sediment characteristics at the project prior to consulting with resource agencies on the need for any revisions to the Sediment Flushing Plan as it pertains to the Upper Pelzer Project. Baseline bathymetric mapping, sediment contaminant testing, and sediment composition and particle size sampling results for the project impoundment are needed to identify the volume and distribution of sediment deposition upstream of the dam, and determine what amount of dredging, if any, is needed to adequately protect environmental resources at and adjacent to the river reach downstream of the project. This information could in turn be used to determine if any changes are needed to the Sediment Flushing Plan, including whether or not the flushing interval of once every 5 years is an appropriate flushing interval for the Upper Pelzer Project. The levelized annual cost of conducting the bathymetric mapping would be about $1,800, and the levelized annual cost of conducting the contaminant testing and sediment sampling would be about $1,560. The benefits of obtaining this data to inform the need for revisions to the current plan for the Upper Pelzer Project would be worth the cost. Therefore, we recommend that the co-applicants conduct baseline bathymetric mapping, sediment contaminant testing, and sediment composition and particle size sampling at the impoundment.

As discussed in Section 3.3.2, *Aquatic Resources*, sediment dredging, if necessary, could affect water quality conditions and aquatic biota by increasing turbidity, decreasing DO, and both resuspending and transporting sediment-bound contaminants. To avoid adverse effects on aquatic resources from sediment dredging, the co-applicants could include a provision in the Sediment Flushing Plan to implement best management practices during dredging operations, such as the use of turbidity curtains and proper protocol for handling, transporting, and disposing of any dredged material. Including this

measure in the Sediment Flushing Plan would minimize adverse effects to water quality conditions and negative impacts on aquatic life, such as suffocation and loss of habitat. Implementing this measure would come at no additional cost to the co-applicants. Therefore, we recommend implementing best management practices during dredging operations to protect aquatic resources in the impoundment and below the dam.

As discussed in section 3.3.4, *Threatened and Endangered Species*, sediment flushing and dredging could affect potentially suitable wetland habitat for Eastern black rails within the project boundary. Documenting any effects on potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consulting with resource agencies regarding any observed adverse effects to wetland vegetation, would allow the applicant to develop appropriate measures, if necessary, to avoid or minimize potential effects to Eastern black rails. In addition, if dredging would occur at the project, the co-applicants could minimize potential effects to Eastern black rail individuals and potentially suitable habitat by avoiding dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation, including within emergent wetlands, from mid-March through September. Including such measures in any revised Sediment Flushing Plan for the project would avoid the potential for prohibited incidental take of Eastern black rails during this species' nesting, brooding, or post-breeding flightless molt period. Implementing these measures would come at no additional cost to the co-applicants.

As discussed in Section 3.3.1, *Geological and Soil Resources,* continued implementation of the Sediment Flushing Plan, and potential revisions to the plan in consultation with resource agencies, is necessary at the project due to the large sediment load in the system, the risk of an unintended sediment release particularly during emergencies, and the possibility of future impoundment capacity reductions from sediment accumulation. Regular sediment flushing or dredging could reduce the volume of sediment stored within the impoundment, and minimize the volume of sediment transported downstream during routine and emergency drawdown events. However, sediment management activities at the project under the current Sediment Flushing Plan have been infrequent over the last 30 years. To ensure that sediment management activities occur in accordance with the current plan and any revisions made in consultation with resource agencies, the co-applicants could include a detailed implementation schedule for all of the plan's monitoring and sediment management provisions, and file an annual report summarizing all of the sediment management activities that occurred under the plan during the year. Including this measure in the Sediment Flushing Plan would assist staff with their compliance oversight responsibilities, ensure sediment management activities occur on the interval dictated in the plan, and minimize adverse effects on downstream aquatic resources from sudden, high-magnitude sediment release events.

Cultural Resources

There is a possibility that unknown archaeological or historic resources may be discovered due to project operation or other project-related activities. To ensure proper treatment of any unknown cultural resources that may be discovered at the project, we recommend that, in the case of any such discovery, the co-applicants notify and consult with the South Carolina SHPO and: (1) cease project-related activities and determine if the discovered archaeological or historic resource is eligible for the National Register; (2) determine if continued operation of the project would adversely affect the resource; and (3) if the resource would be adversely affected, obtain guidance from the South Carolina SHPO on how to avoid, lessen, or mitigate for any adverse effects. Also, we recommend that the co-applicants inform the Commission of any discovery of unknown cultural resource, and any measures proposed if the resource is eligible for the National Register and is adversely affected by project construction or operation.

Implementing the proposed measure would come at no additional cost to the co-applicants.

5.1.2.3 Measures Not Recommended

Instantaneous Run-of-River Operation

South Carolina DNR recommends that the co-applicants operate the Upper Pelzer Project in an instantaneous run-of-river mode, as stated in the current project license. South Carolina DNR argues that under this type of operation, inflows match outflows, and, thus, minimize or avoid fluctuations of the project impoundment and downstream flows that could be caused by project operation.

As discussed in section 3.3.2.2, *Water Quantity*, precise instantaneous matching of outflows to inflows is not actually practicable at the project. Operating the project in an instantaneous run-of-river mode would be difficult to maintain because of variations in wind, flow, and other operational factors. Based on the small size of the impoundment and relatively short residence time, the project is not able to store water. Therefore, we do not recommend that the project operate in instantaneous run-of-river mode but recommend continuing to operate the project in a run-of-river mode in which outflows from the project are released to approximate inflow, minus existing consumptive uses and maintain the current minimum flow. Run-of-river operation helps minimize water level fluctuations and flow disruption to aquatic and riparian habitats present in the project impoundments and in the downstream reaches of the Saluda River. Continuing to operate would result in no change in the effect on recreation, water quality and quality, and wetland resources.

South Carolina DNR's Recommended Riparian Buffers

South Carolina DNR recommends that the co-applicants protect and conserve vegetation within the project boundary, in part, by maintaining forested riparian buffers that are at least 25 feet wide along the shorelines of the project, with exceptions for locations where a water-dependent structure or facility may require a different shoreline condition. In its reply comments, the co-applicants state that they cannot implement the recommended riparian buffers because the project boundary is limited to a contour elevation around the impoundment that is generally within a few feet of the shoreline, and they do not have control over land use practices outside of the project boundary.

As noted in section 3.3.3.2, *Terrestrial Resources*, riparian buffers provide numerous environmental benefits, including managing stormwater runoff, protecting water quality, conserving and enhancing species diversity, maintaining wildlife corridors, and protecting aesthetic/scenic values. The extent of the existing riparian habitat at the project varies greatly, as private lands adjacent to the project boundary have historically developed unevenly and retaining or establishing riparian buffers is currently optional for landowners, including the co-applicants. On large segments of the shorelines at the project, the vegetated riparian buffers are already 25-feet-wide or greater, and would provide the ecological benefits described above. As the co-applicants state, the project boundary is limited to contour elevations around the impoundment that are generally within a few feet of the shoreline, and they cannot control land uses on adjacent private lands. To implement South Carolina DNR's recommendation, the co-applicants would have to acquire sufficient rights to lands adjacent to the project boundary to allow them to increase the riparian buffer widths in locations where it is less than 25 feet. However, it has not been demonstrated that additional riparian lands are needed.

Continuing the run-of-river operation at the project would preserve the existing hydroperiod, water quality and quantity, and riparian vegetation. Establishing and maintaining a relatively short canoe portage around the project dam would not have a significant impact on the existing riparian vegetation. Therefore, relicensing the project would maintain the quality and character of the existing riparian buffers within the project boundary. Based on the reasons outlined above, we do not recommend that the co-applicants acquire rights to lands adjacent to the project boundary solely to establish a 25-foot-wide buffer where it does not currently exist.

5.1.3 Lower Pelzer Project

5.1.3.1 Measures Proposed by the Co-applicants

Based on our environmental analysis of the co-applicants' proposal, as discussed in section 3, *Environmental Analysis*, and the costs presented in section 4, *Developmental Analysis*, we conclude that the following environmental measures proposed by the co-

applicants would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend the following proposed measures:

- Continue to operate the project in a run-of-river mode, maintaining the normal pool elevation at 694.0 feet;

- Continue to release a continuous minimum flow of 140 cfs, or inflow, whichever is less, into the bypassed reach;

- Continue to implement the current Sediment Flushing Plan, and, after a new license is issued, consult with the resource agencies to review and update the plan, as necessary;

- Continue to provide public access and maintain existing recreation facilities at the project;

- Provide canoe portage facilities at the project; and

- Limit tree removal associated with the construction and maintenance of the proposed canoe portages at the projects to November 1 through March 31, to minimize adverse effects to northern long-eared bats during the pup season and the broader active season.

5.1.3.2 Additional Measures Recommended by Staff

In addition to the co-applicants' proposed measures noted above, we recommend including the following additional or modified measures in any license issued for the Lower Pelzer Project:

- An Operation Compliance Monitoring Plan to document compliance with the proposed operations described above (i.e., run-of-river mode, maintain the normal pool elevations as specified, and minimum flows);

- Conduct baseline bathymetric mapping of the impoundment, and within 1 year of receiving a new license, file a report of the results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the current Sediment Flushing Plan;

- Conduct sediment contaminant testing and sediment composition and particle size sampling to quantify the volume and toxicity of heavy metals and other potential contaminants identified by the applicants' 2017 qualitative survey of the project impoundment and characterize the composition of impounded sediment, and within 1 year of receiving a new license, file a report of the

results with the Commission with copies provided to the agencies prior to consulting with the agencies on the need to update the Sediment Flushing Plan;

- During flushing and/or dredging events, document any effects to potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds, and consult with resource agencies if any adverse effects to wetland vegetation are observed;

- If dredging occurs under the Sediment Flushing Plan, include general provisions in the Sediment Flushing Plan to: (a) implement best management practices while dredging to avoid adverse effects to aquatic resources in the impoundment and downstream of the project, including specifying proper protocol for handling, transporting, and disposing of any dredged material, and (b) avoid dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation to avoid adverse effects to the federally proposed threatened Eastern black rail and effects on potentially suitable habitat during this species' nesting, brooding, or post-breeding flightless molt period;

- File an annual status report with the Commission detailing any sediment monitoring and management activities that occurred at the project during the preceding year, including dates and results;
- Initiate standard hours for open-gate access to allow for reasonable public access leading into the Lower Pelzer fishing access station; and
- Cease project activities and notify the South Carolina SHPO if any unknown archaeological or historic resources are discovered during project operation or other project-related activities.

Below, we discuss the rationale for modifying the co-applicants' proposals and the basis for our additional staff-recommended measures.

Operation Monitoring Compliance

The co-applicants use a remotely-monitored, automatic pond level controller to maintain a stable impoundment elevation of 694 feet. South Carolina DNR recommends that the co-applicants operate the project in a run-of-river mode, with minimal fluctuations in downstream flow to provide a stable aquatic habitat in the Saluda River reach below the project. Additionally, the co-applicants propose to supply a continuous minimum flow of 140 cfs, or inflow, whichever is less to the Saluda River. South Carolina DHEC states, and South Carolina DNR recommends, that the co-applicants must continue to operate in a run-of-river mode and maintain the current minimum flow.

As discussed in section 3.3.2.2, *Operation Compliance Monitoring,* developing a formal project operation and monitoring plan would provide a mechanism for reporting operational data and deviations, facilitate administration of the license, and ensure the protection of resources sensitive to fluctuations in impoundment surface elevation. Additionally, developing such a plan would ensure that the minimum flows required in any license issued for the Lower Pelzer Project are met and monitored efficiently. Therefore, we recommend that the co-applicants develop an operation compliance monitoring plan with measures to monitor impoundment elevations and minimum flows, using the existing automatic pond level controller and staff gage at the project.

We estimate that the annual levelized cost of developing a monitoring plan would be $390, and conclude that the benefits of the plan outweigh the cost.

Sediment Management

The co-applicants propose to continue to implement the current Sediment Flushing Plan to minimize the unintentional release of sediments from the project impoundment during unplanned or emergency drawdowns and, after a new license is issued, consult with resource agencies to review and update the plan. The current plan requires the co-applicants to flush sediment from the Lower Pelzer impoundment every 10 years during winter months with moderate to high flows. The plan also includes provisions to notify and coordinate with resource agencies prior to scheduled drawdowns or sediment flushing events, and monitor DO levels downstream of the projects during each event. If sediment flushing cannot be accomplished without detrimental effects on the downstream environment, the plan requires the co-applicants to consult with resource agencies on other methods of sediment removal, such as hydraulic dredging, and formulate an appropriate dredging plan.

Condition 4 of the water quality certification states that the co-applicants must continue implementing the current Sediment Flushing Plan for the Lower Pelzer Project. Upon receiving a new license, South Carolina DHEC states that the co-applicants must revise the current plan, if necessary, in consultation with FWS, South Carolina DNR, and South Carolina DHEC. South Carolina DNR supports the co-applicants' proposal and recommends that the plan include provisions to avoid or minimize the unintended release of sediments during scheduled maintenance activities, and measures to address such releases during emergency events.

As discussed in section 3.3.1, *Geological and Soil Resources*¸ due in part to the large sediment load in the system, the risk of unintended sediment release particularly during emergencies, and the possibility of future impoundment capacity reductions due to sediment accumulation, there is a need to continue implementing the current Sediment Flushing Plan as proposed by the co-applicants and recommended by certain of the resource agencies. More specifically, continued implementation of the Sediment

Flushing Plan would be beneficial, because it includes a procedure for periodically removing sediment from the impoundment in a controlled manner to prevent sudden, uncontrolled high magnitude sediment release events from occurring and adversely affecting downstream environmental resources. Sediment management activities at the Upper Pelzer Project under the current Sediment Flushing Plan have been infrequent over the last 30 years due to resource agency concerns regarding the impact of sediment releases under the plan on DO concentrations and turbidity levels downstream of the project. Therefore, the co-applicants propose to, and certain of the resource agencies recommend, that the co-applicants consult with the resource agencies after a new license is issued to determine whether or not any revisions to the current Sediment Flushing Plan, as it pertains to the Upper Pelzer Project, are necessary. This action would be beneficial for protecting aquatic resources located downstream of the Upper Pelzer Project. The levelized annual cost to continue implementing the Sediment Flushing Plan, and consult with resource agencies on the need for revisions to the plan, would be about $4,770. The benefits would be worth this cost, and therefore, we recommend that co-applicants continue implementing the Sediment Flushing Plan for the project, and consult with the resource agencies after a new license is issued to determine whether any revisions to the current Sediment Flushing Plan are necessary.

As discussed in section 3.3.1, *Geological and Soil Resources*, it would be prudent to establish a baseline of impounded sediment characteristics at the project prior to consulting with resource agencies on the need for any revisions to the Sediment Flushing Plan as it pertains to the Lower Pelzer Project. Baseline bathymetric mapping, sediment contaminant testing, and sediment composition and particle size sampling results for the project impoundment are needed to identify the volume and distribution of sediment deposition upstream of the dam, and determine what amount of dredging, if any, is needed to adequately protect environmental resources at and adjacent to the river reach downstream of the project. This information could in turn be used to determine if any changes are needed to the Sediment Flushing Plan, including whether or not the flushing interval of once every 10 years is an appropriate flushing interval for the Lower Pelzer Project. The levelized annual cost of conducting the bathymetric mapping would be about $1,800, and the levelized annual cost of conducting the contaminant testing and sediment sampling would be about $1,560. The benefits of obtaining this data to inform the need for revisions to the current plan for the Lower Pelzer Project would be worth the cost. Therefore, we recommend that the co-applicants conduct baseline bathymetric mapping, sediment contaminant testing, and sediment composition and particle size sampling at the impoundment.

As discussed in Section 3.3.2, *Aquatic Resources*, sediment dredging, if necessary, could affect water quality conditions and aquatic biota by increasing turbidity, decreasing DO, and both resuspending and transporting sediment-bound contaminants. To avoid adverse effects on aquatic resources from sediment dredging, the co-applicants could include a provision in the Sediment Flushing Plan to implement best management

practices during dredging operations, such as the use of turbidity curtains and proper protocol for handling, transporting, and disposing of any dredged material. Including this measure in the Sediment Flushing Plan would minimize adverse effects to water quality conditions and negative impacts on aquatic life, such as suffocation and loss of habitat. Implementing this measure would come at no additional cost to the co-applicants. Therefore, we recommend implementing best management practices during dredging operations to protect aquatic resources in the impoundment and below the dam.

As discussed in section 3.3.4, *Threatened and Endangered Species*, sediment flushing and dredging could affect potentially suitable wetland habitat for Eastern black rails within the project boundary. Documenting any effects on potentially suitable Eastern black rail habitat within emergent wetlands and floating aquatic beds during flushing and/or dredging events, and consulting with resource agencies regarding any observed adverse effects to wetland vegetation, would allow the applicant to develop appropriate measures, if necessary, to avoid or minimize potential effects to Eastern black rails. In addition, if dredging would occur at the project, the co-applicants could minimize potential effects to Eastern black rail individuals and potentially suitable habitat by avoiding dredging in locations that could compromise shoreline stability or disturb existing wetland vegetation, including within emergent wetlands, from mid-March through September. Including such measures in any revised Sediment Flushing Plan for the project would avoid the potential for prohibited incidental take of Eastern black rails during this species' nesting, brooding, or post-breeding flightless molt period. Implementing these measures would come at no additional cost to the co-applicants.

As discussed in Section 3.3.1, *Geological and Soil Resources,* continued implementation of the Sediment Flushing Plan, and potential revisions to the plan in consultation with resource agencies, is necessary at the project due to the large sediment load in the system, the risk of an unintended sediment release particularly during emergencies, and the possibility of future impoundment capacity reductions from sediment accumulation. Regular sediment flushing or dredging could reduce the volume of sediment stored within the impoundment, and minimize the volume of sediment transported downstream during routine and emergency drawdown events. However, sediment management activities at the project under the current Sediment Flushing Plan have been infrequent over the last 30 years. To ensure that sediment management activities occur in accordance with the current plan and any revisions made in consultation with resource agencies, the co-applicants could include a detailed implementation schedule for all of the plan's monitoring and sediment management provisions and file an annual report summarizing all of the sediment management activities that occurred under the plan during the year. Including this measure in the Sediment Flushing Plan would assist staff with their compliance oversight responsibilities, ensure sediment management activities occur on the interval dictated in

the plan, and minimize adverse effects on downstream aquatic resources from sudden, high-magnitude sediment release events.

Fishing Station Open-Gate Hours

As discussed in section 3.3.4, *Recreation and Land Use*, access to the Lower Pelzer Project is currently limited by a locked gate. Recreationists are unable to access the Lower Pelzer Fishing Station unless a project operator is on site and has unlocked the gate to the facility. Initiating standard open-gate hours, and installing a sign to communicate this to the public, would allow for reasonable public access to the Lower Pelzer Project lands.

Initiating standard open-gate hours at the Lower Pelzer Project, and installing a sign to communicate this to the public, would be worth the levelized annual cost of $660 to the co-applicants.

Cultural Resources

There is a possibility that unknown archaeological or historic resources may be discovered due to project operation or other project-related activities. To ensure proper treatment of any unknown cultural resources that may be discovered at the project, we recommend that, in the case of any such discovery, the co-applicants notify and consult with the South Carolina SHPO and: (1) cease project-related activities and determine if the discovered archaeological or historic resource is eligible for the National Register; (2) determine if continued operation of the project would adversely affect the resource; and (3) if the resource would be adversely affected, obtain guidance from the South Carolina SHPO on how to avoid, lessen, or mitigate for any adverse effects. Also, we recommend that the co-applicants inform the Commission of any discovery of unknown cultural resource, and any measures proposed if the resource is eligible for the National Register and is adversely affected by project construction or operation.

Implementing the proposed measure would come at no additional cost to the co-applicants.

5.1.3.3 Measures Not Recommended

Instantaneous Run-of-River Operation

South Carolina DNR recommends that the co-applicants operate the Lower Pelzer Project in an instantaneous run-of-river mode, as stated in the current project license. South Carolina DNR argues that under this type of operation, inflows match outflows and thus minimize or avoid fluctuations of the project impoundment and downstream flows that could be caused by project operation.

As discussed in section 3.3.2.2, *Water Quantity*, operating the project in an instantaneous run-of-river mode, per South Carolina DNR's recommendation, where instantaneous outflows match the instantaneous inflows, would be difficult to maintain because of variations in wind, flow, and other operational factors. The Lower Pelzer Project operates with five turbines that automatically adjust in response to reduced and increased inflow through the five turbine units. Some flexibility regarding fluctuations downstream is needed to allow for the delay between the time the last unit shuts down at the project and the spillage of an equivalent inflow over the flashboards, as well as the time for flow to travel down the bypassed reach to the downstream USGS gage located about 1 mile downstream of the Lower Pelzer Project. Conversely, a surge in flow is recorded at the downstream gage for a short period of time, when the project initiates its start-up sequence. The flow from the project would include both flows through the turbines and flows over the flashboards. This combined discharge would appear as a surge in flow during the lag time as the impoundment elevation falls to the crest of the flashboards. Based on the small size of the impoundment and relatively short residence time, the project is not able to store water. Therefore, we do not recommend that the project operate in instantaneous run-of-river mode but recommend continuing to operate the project in a run-of-river mode in which outflows from the project are released to approximate inflow, minus existing consumptive uses and maintain the current minimum flow. Run-of-river operation helps minimize water level fluctuations and flow disruption to aquatic and riparian habitats present in the project impoundments and in the downstream reaches of the Saluda River. Continuing to operate would result in no change in the effect on recreation, water quality and quality, and wetland resources.

South Carolina DNR's Recommended Riparian Buffers

South Carolina DNR recommends that the co-applicants protect and conserve vegetation within the project boundary, in part, by maintaining forested riparian buffers that are at least 25 feet wide along the shoreline of the project, with exceptions for locations where a water-dependent structure or facility may require a different shoreline condition. In its reply comments, the co-applicants state that they cannot implement the recommended riparian buffer because the project boundary is limited to a contour elevation around the impoundment that is generally within a few feet of the shoreline and they do not have control over land use practices outside of the project boundary.

As noted in section 3.3.3.2, *Terrestrial Resources*, riparian buffers provide numerous environmental benefits, including managing stormwater runoff, protecting water quality, conserving and enhancing species diversity, maintaining wildlife corridors, and protecting aesthetic/scenic values. The extent of the existing riparian habitat at the project varies greatly, as private lands adjacent to the project boundary have historically developed unevenly and retaining or establishing riparian buffers is currently optional for landowners, including the co-applicants. On large segments of the shorelines at the project, the vegetated riparian buffers are already 25-feet-wide or greater, and would

provide the ecological benefits described above. As the co-applicants state, the project boundary is limited to contour elevations around the impoundment that are generally within a few feet of the shoreline, and they cannot control land uses on adjacent private lands. To implement South Carolina DNR's recommendation, the co-applicants would have to acquire sufficient rights to lands adjacent to the project boundary to allow them to increase the riparian buffer widths in locations where it is less than 25 feet. However, it has not been demonstrated that additional riparian lands are needed.

Continuing run-of-river operation at the project would preserve the existing hydroperiod, water quality and quantity, and riparian vegetation. Establishing and maintaining a relatively short canoe portage around the project dam would not have a significant impact on the existing riparian vegetation. Therefore, relicensing the project would maintain the quality and character of the existing riparian buffers within the project boundary. Based on the reasons outlined above, we do not recommend that the co-applicants acquire rights to lands adjacent to the project boundary solely to establish a 25-foot-wide buffer where it does not currently exist.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Natural, high-flow events would continue to mobilize impounded substrate and transport suspended solids downstream. Similarly, maintenance drawdowns carried out through the projects' powerhouses would release minor volumes of suspended sediment. The primary effect would be temporary increases in sediment and turbidity levels downstream that would cause short-term effects on aquatic biota. While it is also possible that the downstream aquatic environment could be exposed to nutrients and sediment-bound contaminants, the exact concentrations of contaminants within impounded sediments is unknown. Emergency drawdowns involving the sluice gates would potentially release a greater volume of sediment, should sediment continue to accumulate within the impoundments. However, under the staff alternative the applicants would develop a Sediment Management Plan for the Piedmont Project, and continue to implement the current Sediment Flushing Plan for the Upper and Lower Pelzer Projects, guided by baseline bathymetric and sediment contaminant surveys of the impoundments. Regular sediment management would reduce the volume of sediment accumulation within the impoundments and minimize the potential for unintended releases during both maintenance and emergency drawdown events.

Continued operation of the projects would result in some unavoidable fish impingement or entrainment mortality. Nonetheless, our analysis indicates that the level of impingement and entrainment mortality would have minimal effects on fish populations in the Saluda River. In part, this is because the burst swim speeds of the representative fish species exceed the approach velocities in front of each projects' trash racks. Further, the species most likely to suffer entrainment mortality (i.e., bluegill, redbreast sunfish, largemouth bass, and whitefin shiner), exhibit life-histories that are

resilient to population declines. Thus, available information indicates that entrainment mortality at the projects is unlikely to negatively affect fish populations in the Saluda River.

The proposed portage facilities at each of the projects would result in unavoidable, but minor, loss and/or temporary disturbance of vegetation and wildlife habitat within and immediately adjacent to the proposed portage routes. The canoe portage routes, as currently proposed, coincide partially with existing roads and trails and are adjacent to some developed areas. Using existing roads and trails and traversing developed areas would avoid disturbances and losses to existing vegetation and wildlife habitat. In addition, the applicants' proposals to limit tree removal associated with the construction and maintenance of the proposed canoe portages at the projects to November 1 through March 31, would minimize adverse effects to northern long-eared bats during the pup season and the broader active season. Relicensing the projects, as proposed with staff recommendations, would minimize disturbances and losses of vegetation and wildlife habitat within the project boundaries to the extent possible.

5.3 SUMMARY OF SECTION 10(j) RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency. In response to our Ready for Environmental Analysis notices, South Carolina DNR filed recommendations for the projects on January 11, 2018.

Table 23 lists the recommendations filed subject to section 10(j), and indicates whether the recommendations are included under our alternative, as well as the basis for our preliminary determinations concerning measures that we consider inconsistent with section 10(j). Environmental recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA, and are addressed in the specific resource sections of this document.

Table 23. Analysis of fish and wildlife agency recommendations for the Piedmont, Upper Pelzer, and Lower Pelzer Projects.
(Source: Staff).

Recommendation	Agency	Project(s)	Within the Scope of Section 10(j)	Annualized Cost	Recommend Adopting?
1. Operate the projects in an instantaneous run-of-river mode.	South Carolina DNR	Piedmont, Upper Pelzer, and Lower Pelzer	Yes.	$0	No. Instead, we recommend the projects continue to operate in a run-of-river mode, in which outflows from the projects approximate inflow, minus existing consumptive uses.
2. Implement practical measures to minimize fluctuations in downstream flows.	South Carolina DNR	Lower Pelzer	No.	Undefined.	No.
3. Develop a Sediment Management Plan for the Piedmont Project.	South Carolina DNR	Piedmont	Yes.	$26,480[a]	Yes.
4. Continue to implement the current Sediment Flushing Plan for the Upper Pelzer Project, and, after a new license is issued, consult with resource agencies to review and update the plan, if necessary.	South Carolina DNR	Upper Pelzer	Yes.	$12,190[a]	Yes.

5. Continue to implement the current Sediment Flushing Plan for the Lower Pelzer Project, and, after a new license is issued, consult with resource agencies to review and update the plan, if necessary.	South Carolina DNR	Lower Pelzer	Yes	$4,770[a]	Yes.
6. Continue to provide a continuous minimum flow of 15 cfs, or inflow, whichever is less, to the bypassed reach at the Piedmont Project.	South Carolina DNR	Piedmont	Yes.	$0	Yes.
7. Provide a continuous minimum flow of 15 cfs, or inflow, whichever is less, to the bypassed reach at the Upper Pelzer Project, and consult with South Carolina DNR on the placement and delivery of that flow.	South Carolina DNR	Upper Pelzer	Yes.	$0	Yes.
8. Continue to provide a continuous minimum flow of 140 cfs, or inflow, whichever is less, to the bypassed reach at the Lower Pelzer Project.	South Carolina DNR	Lower Pelzer	Yes.	$0	Yes.

[a] The staff recommendation for the proposed Sediment Management Plan for the Piedmont Project, and updated Sediment Flushing Plan for the Upper and Lower Pelzer Projects, includes measures that are separate, or modified, from what was included in the applicants' proposals, and recommended by South Carolina DNR. Therefore, the costs of the agency recommendations, presented here, differ from the costs of the staff alternatives.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C. §803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 16 comprehensive plans that are applicable to the project.[148] No inconsistencies were found.

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[148] (1) Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). (Report No. 36). April 2000; (2) National Marine Fisheries Service, U.S. Fish and Wildlife Service, North Carolina Wildlife Resources Commission, and South Carolina Department of Natural Resources. 2017. Santee Basin Diadromous Fish Restoration Plan; (3) National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993; (4) 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; (5) 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; (6) South Carolina Department of Natural Resources. 2000. Lower Saluda Scenic River Corridor Plan update. Columbia, South Carolina. December 2000; (7) South Carolina Department of Natural Resources. 2004. South Carolina Water Plan-Second Edition. Columbia, South Carolina. January 2004; (8) South Carolina Department of Natural Resources. 2015. South Carolina's State Wildlife Action Plan (SWAP): 2015. Columbia, South Carolina. September 2005; (9) South Carolina Department of Parks, Recreation, & Tourism. 2002. The South Carolina State Trails Plan. Columbia, South Carolina. 2002; (10) South Carolina Department of Parks, Recreation, & Tourism. 2008. South Carolina State Comprehensive Outdoor Recreation Plan (SCORP). Columbia, South Carolina. April 2008; (11) 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; (12) 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; (13) South Carolina Water Resources Commission. National Park Service. 1988. South Carolina rivers assessment. Columbia, South Carolina. September 1988; (14) South Carolina Wildlife and Marine Resources Department. 1989. South Carolina instream flow studies: a status report. Columbia, South Carolina. June 1, 1989; (15) U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North

6.0 FINDING OF NO SIGNIFICANT IMPACT

Continuing to operate the Piedmont, Upper Pelzer, and Lower Pelzer Projects, with our recommended measures, involves minimal land-disturbing or land-clearing activities. Our recommended measures would ensure the projects would continue to operate, while providing enhancements to fish and wildlife resources, improvements to recreation facilities, and protection of cultural and historic resources in the project areas.

Based on our independent analysis, issuance of subsequent and new licenses for the Piedmont, Upper Pelzer, and Lower Pelzer Projects, as proposed and with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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Appendix A

Summaries of the Water Quality Certification Conditions for the Piedmont Project Issued by the South Carolina Department of Health and Environmental Control on January 4, 2017

1. The applicant shall take all necessary measures to prevent oil, tar, trash, debris and other pollutants from entering waters of the State within the project boundary, as well as adjacent waters, wetlands, or offsite areas.

2. The applicant to shall continue to operate the project as a run-of-river facility.

3. The applicant shall maintain the current level of minimum flows (15 cfs, or inflow, whichever is less) released to the bypassed reach of the project for the protection of aquatic resources in the Saluda River, unless temporarily modified by operating emergencies beyond the control of the applicant, or for short periods planned in consultation with FWS, South Carolina DNR, and South Carolina DHEC.

4. The applicant must develop and implement a Sediment Management Plan in consultation with FWS, South Carolina DNR, and South Carolina DHEC. Any future revisions of the plan must also be made in consultation with the aforementioned agencies.

Appendix B

Summaries of the Water Quality Certification Conditions for the Upper Pelzer Project Issued by the South Carolina Department of Health and Environmental Control on October 13, 2017

1. The co-applicants shall take all necessary measures to prevent oil, tar, trash, debris and other pollutants from entering waters of the State within the project boundary, as well as adjacent waters, wetlands, or offsite areas.

2. The co-applicants shall continue to operate the project as a run-of-river facility.

3. The co-applicants shall provide a minimum flow of 15 cfs, or inflow, whichever is less, to the bypassed reach of the project for the protection of aquatic resources in the Saluda River, unless temporarily modified by operating emergencies beyond the control of the co-applicants, or for short periods planned in consultation with FWS, South Carolina DNR, and South Carolina DHEC.

4. The co-applicants must develop a follow-up bypass minimum flow monitoring plan within the first 3 years after a new license is issued in consultation with FWS, South Carolina DNR, and South Carolina DHEC. The co-applicants must complete the study, and provide the study results to the agencies within the first 5 years after relicensing.

5. The co-applicants shall continue to implement the current Sedimentation Plan for the project. After a new license is issued, the co-applicants must consult with FWS, South Carolina DNR, and South Carolina DHEC to review the current plan. If it is determined that revisions are necessary, the plan must be updated in consultation with the agencies.

Appendix C

Summaries of the Water Quality Certification Conditions for the Lower Pelzer Project Issued by the South Carolina Department of Health and Environmental Control on August 17, 2017

1. The co-applicants shall take all necessary measures to prevent oil, tar, trash, debris and other pollutants from entering waters of the State within the project boundary, as well as adjacent waters, wetlands, or offsite areas.

2. The co-applicants shall continue to operate the project as a run-of-river facility.

3. The co-applicants shall maintain the current level of minimum flows (140 cfs, or inflow, whichever is less) released to the bypassed reach of the project for the protection of aquatic resources in the Saluda River, unless temporarily modified by operating emergencies beyond the control of the co-applicants, or for short periods planned in consultation with FWS, South Carolina DNR, and South Carolina DHEC.

4. The co-applicants shall continue to implement the current Sedimentation Plan for the project. After a new license is issued, the co-applicants must consult with FWS, South Carolina DNR, and South Carolina DHEC to review the current plan. If it is determined that revisions are necessary, the plan must be updated in consultation with the agencies.