ENVIRONMENTAL ASSESSMENT
FOR
HYDROPOWER LICENSE

Fries Hydroelectric Project
FERC Project No. 2883-009
Virginia

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

December 2020

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
Aquenergy	Aquenergy Systems, LLC
certification	water quality certification
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DO	Dissolved Oxygen
EA	environmental assessment
ESA	Endangered Species Act
ºF	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
Interior	U.S. Department of the Interior
IPaC	Information for Planning and Consultation
kW	kilowatt
MWh	megawatt-hours
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
PJM	Pennsylvania-New Jersey-Maryland
PM&E	protection, mitigation, and enhancement
POR	period of record
REA	Ready for Environmental Analysis
ROR	run-of-river
SD1	scoping document 1
USGS	United States Geological Survey
Virginia DCR	Virginia Department of Conservation and Recreation
Virginia DWR	Virginia Department of Wildlife Resources
Virginia DEQ	Virginia Department of Environmental Quality
Virginia SHPO	Virginia Department of Historic Resources

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1.0 INTRODUCTION

1.1 APPLICATION

On May 30, 2018, Aquenergy Systems, LLC (Aquenergy), filed an application for a new license with the Federal Energy Regulatory Commission (Commission to continue operating the Fries Hydroelectric Project (Fries Project or project) (FERC Project No. 2883).[1] The 5.1-megawatt (MW) Fries Project is located on the New River in the town of Fries in Grayson County, Virginia (figure 1).[2] The Fries Project generates an average of 26,150 megawatt-hours (MWh) of energy annually. The project does not occupy federal land. Aquenergy proposes no changes to the project's capacity.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Fries Project is to provide a source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to Aquenergy for the Fries Project and what

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[1] An original license for the project was issued on June 10, 1980, for a term of 40 years, with an effective date of June 1, 1980, and an expiration date of May 31, 2020. *See Fries Textile Company*, 11 FERC ¶ 62,297 (1980). The license was subsequently transferred to *Aquenergy Systems, Inc.*, 45 FERC ¶ 62,065 (1988) and *Aquenergy Systems, LLC* (the current licensee), 150 FERC ¶ 62,210 (2015).

[2] The Order Issuing License (Major) for Constructed Project and for Construction and Operation of Additional Project Works issued on June 10, 1980, authorized an installed capacity of 5.213 MW. However, as indicated in Exhibit A of the final license application, the current actual installed capacity of the project is 5.1 MW, which is the lesser of the sum of the generator capacities and the turbine capacities of the four turbine-generator units.

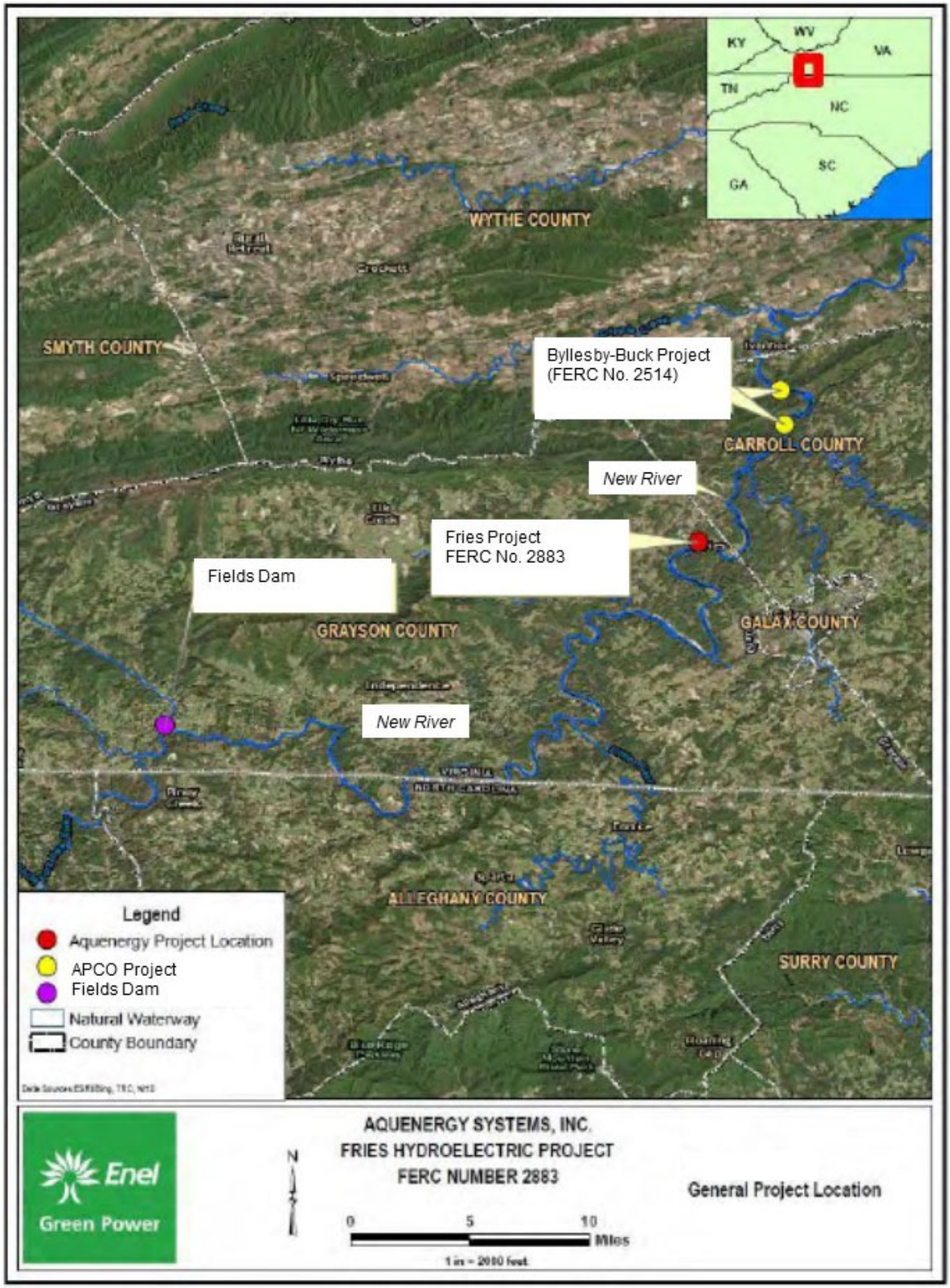

Figure 1. Location of the Fries Project (filled red circle) and nearby dams on the New River (Source: license application, as modified by staff).

conditions should be placed on any license 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 new license for the Fries Project would allow Aquenergy to generate electricity at the project for the term of a new license, making electric power from a renewable resource available to its customers.

In this environmental assessment (EA), we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by Aquenergy (proposed action); (2) the proposed action with additional or modified measures (staff alternative); (3) the staff alternative with mandatory conditions; and (4) the no-action alternative. The primary issues associated with relicensing the Fries Project are water quality, minimum flows, and aquatic habitat in the project's bypassed reach, as well as recreation enhancements at the project.

1.2.2 Need for Power

The Fries Project has an installed capacity of 5.1 MW and over the term of its license has generated 26,150 MWh per year. To assess the need for project power, we look at the needs in the operating region in which the project is located.

Power produced at the project would be used to meet demand in the Pennsylvania-New Jersey-Maryland (PJM) region of the North American Electric Reliability Corporation (NERC). NERC annually forecasts electrical supply and demand nationally and regionally for a 10-year period. According to NERC's 2019 forecast, the peak season (summer) demand for the PJM region is expected to grow at an annual rate of 0.4 percent from 2020 to 2029 (NERC, 2019). The project serves a role in the regional energy market by providing 5.1 MW of generation capacity. Project power is sold in an open, competitive market to respond to consumer demands. In addition, the 2019 Virginia State Energy Plan sets forth a goal for state utilities to source 30 percent of their electricity from renewable energy sources by 2030 and 100 percent of their electricity from carbon-free sources by 2050.

Power from the project would continue to help meet a need for power in the PJM region and the renewable energy goals of the state. The project would continue to provide low-cost power that displaces generation from non-renewable sources.

Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Any license for the Fries Project is subject to numerous requirements under the FPA and applicable statutes. The major regulatory and statutory requirements are described in Appendix A.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R. § 4.38) 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 for the Fries Project to determine what issues and alternatives should be addressed. A scoping document (SD1) was issued on November 1, 2018. It was noticed in the *Federal Register* on November 7, 2018.[3] Scoping meetings were held on December 5 and 6, 2018, to request comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
Virginia DEQ	November 8, 2018
Arlene F. Warren	December 21, 2018
Cherokee Nation Tribal Historic Preservation Office	January 2, 2019
Virginia DWR[4]	January 3, 2019
Aquenergy	January 7, 2019
Virginia Department of Conservation and Recreation	January 8, 2019
U.S. Department of the Interior's Bureau of Indian Affairs	February 12, 2019
FWS	February 25, 2019

[3] 83 Fed. Reg. 55,707 (Nov. 7, 2018).

[4] As of July 1, 2020, the Virginia Department of Game and Inland Fisheries (DGIF) has been renamed to the Virginia Department of Wildlife Resources (DWR).

Based on comments received during the December 5 and 6, 2018 scoping meetings and written comments received during the scoping process, a revised scoping document (SD2) was issued on August 15, 2019.

1.4.2 Interventions

On September 14, 2018, the Commission issued a notice accepting the license application. The notice set November 13, 2018, as the deadline for filing protests and motions to intervene. The following entity filed a notice of intervention (not in opposition to the project).

Entity	Date Filed
Interior	October 30, 2018

1.4.3 Comments on the License Application

On January 29, 2020, the Commission issued a Ready for Environmental Analysis (REA) notice setting March 30, 2020,[5] as the deadline for filing comments, recommendations, terms and conditions, and fishway prescriptions. The notice also established a deadline of May 13, 2020 for filing reply comments. The following entities commented:

Commenting Entity	Date Filed
Interior	March 27, 2020
Virginia DWR	March 27, 2020

Aquenergy filed reply comments on May 13, 2020.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the current license, and no new environmental protection,

[5] The Commission's Rules of Practice and Procedure provide that if a filing deadline falls on a Saturday, Sunday, holiday, or other day when the Commission is closed for business, the filing deadline does not end until the close of business on the next business day. 18 C.F.R. § 385.2007(a)(2). Because the 60-day filing deadline fell on a Sunday (i.e., March 29, 2020), the filing deadline was extended until the close of business on Monday, March 30, 2020.

mitigation, or enhancement (PM&E) measures would be implemented. This alternative is the baseline environmental condition for comparison with other alternatives.

2.1.1 Current Project Facilities

The project dam is a 41-foot-high, 610-foot-long rock masonry dam that has a 500-foot-long non-gated spillway with a crest elevation of 2,188.27 feet.[6] The project impoundment is 1.3 miles long and has a surface area of 85 acres and a gross storage capacity of 440 acre-feet at the normal pool elevation of 2,188.27 feet.[7] The northern end of the dam contains a 110-foot-wide, 750-foot-long headrace canal that is 24 feet deep (figure 2). Flow enters the headrace canal through four head gates, each of which are 6.5 feet wide and 15.5 feet high. A canal spillway is present along the upstream end of the canal wall and contains ten stoplog bays totaling 47 feet in length, including nine 4.83-foot-wide stoplog bays and one 3.5-foot-wide stoplog bay, each of which are fitted with stoplogs to an elevation of 2,188.27 feet. Two 5-foot-wide and 12.5-foot-high canal gates are present immediately downstream of the canal spillway's stoplog bays.

Two powerhouses are present at the project (figure 2). The mill powerhouse is a 35-foot-wide, 130-foot-long masonry structure that contains three turbine-generator units: (1) unit 1 is a 2,600-horsepower (hp) [or 1,950-kilowatt (kW)] S. Morgan Smith horizontal Francis double runner turbine with a 2,000-kW Westinghouse generator; (2) unit 2 is an 1,100-hp (825-kW) James Leffel vertical Francis turbine with an 800-kW Electric Machinery generator; and (3) unit 3 is a 359-hp (269-kW) S. Morgan Smith horizontal Francis turbine with a 250-kW Westinghouse generator. The unit 4 powerhouse is a steel over concrete structure that is 32 feet wide, 30 feet long, and contains a single 3,380-hp (2,535-kW) S. Morgan Smith vertical Kaplan turbine with a 2,100-kW Westinghouse generator (unit 4). A 10.5-square-foot, 28-foot-long concrete penstock supplies water to the unit 4 powerhouse. The trash racks covering the intakes of each powerhouse have a clear spacing of 2 inches.

The mill powerhouse and unit 4 powerhouse discharge into separate tailraces, each of which are 180 feet long and 12 feet deep, but the tailrace for the mill powerhouse is wider (120 feet wide) than that of the unit 4 powerhouse (75 feet wide). The normal tailrace elevation is 2,148.50 feet. A 450-foot-wide, 500-foot-long bypassed reach is present that extends from the toe of the dam to the tailraces (figure 2).

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[6] All elevation values reported herein reference the National Geodetic Vertical Datum of 1929 (NGVD 29).

[7] The surface area and gross storage capacity of the impoundment are based on the bathymetry survey conducted at the project in August 2016.

A 130-foot-long transmission line connects the mill powerhouse to a 5,000-kilovolt-amp step-up transformer; and a 323-foot-long, 13.2-kilovolt (kV) transmission line runs from the transformer to the interconnection point with the grid. A separate 567-foot-long, 13.2-kV transmission line runs from the unit 4 powerhouse, which operates at 13.2 kV, to the interconnection point with the grid (same interconnection point as the mill powerhouse).

Informal recreation facilities at the project consist of an impoundment access area that provides access to the project impoundment and a canoe portage trail around the dam.

2.1.2 Current Project Boundary

The current project boundary for the Fries Project encloses a total of 94.3 acres (of which 93.1 acres is water)[8] and includes the dam, impoundment (to an elevation of 2,188.27 feet), powerhouses, headrace canal, transmission lines, and appurtenant facilities. There are no recreation facilities required under the current license or included within the project boundary. However, Aquenergy does provide recreation access at the impoundment access area 450 feet upstream of the project, which includes an informal canoe launch and signage (a takeout sign, a private property sign, and a sign on the impoundment directing boaters to the left channel to access the portage takeout). A canoe portage starts at the launch site and goes through the impoundment access area, up the gravel access road to Route 94, along the shoulder of Route 94 into town, and ends in the Fries Town Park at the New River Trail Boat Launch, which is a distance of approximately 1 mile.

[8] Estimated by Commission staff based on aerial imagery.

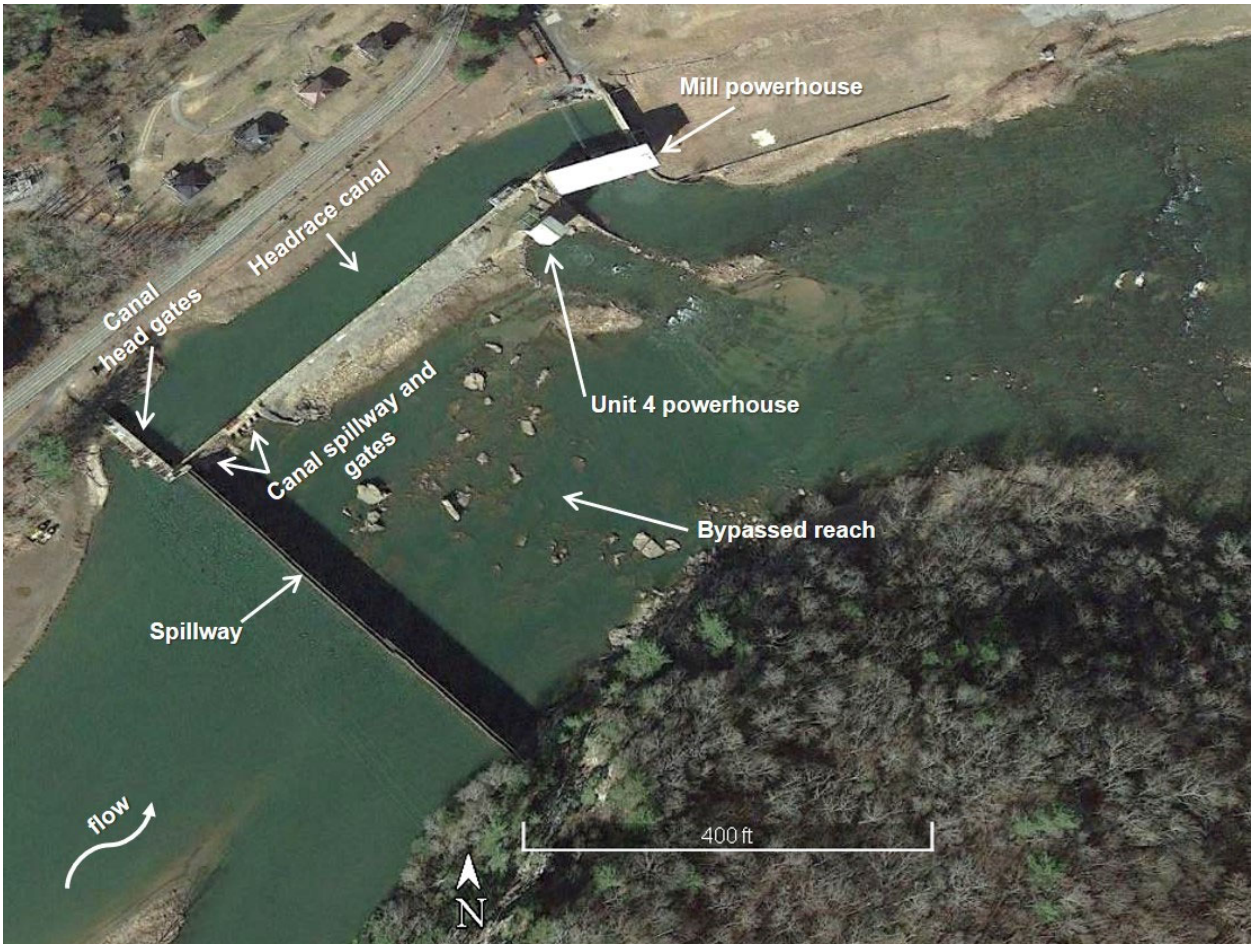

Figure 2. Project facilities at the Fries Project (Source: staff).

2.1.3 Project Safety

The Fries Project has been operating for more than 40 years under the current license issued in 1980. 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. In addition, the project has been inspected and evaluated every 5 years by an independent consultant, and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, Commission staff would evaluate the continued adequacy of the project's facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff would continue to inspect the project during the term of the new license 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.

2.1.4 Current Project Operation and Environmental Measures

The project is operated in a run-of-river (ROR) mode, with outflow from the project approximating inflow in order to maintain the impoundment within 0.2 foot of the top of the spillway crest, which has an elevation of 2,188.27 feet. The three turbine-generator units in the mill powerhouse (units 1, 2, and 3) have a combined hydraulic capacity of 1,250 cubic feet per second (cfs) and the single turbine-generator in the unit 4 powerhouse (unit 4) has a hydraulic capacity of 800 cfs; as such the total hydraulic capacity of the project is 2,050 cfs. The units in the mill powerhouse are operated first because they are equipped with an automatic pond level control system that helps maintain the impoundment at the target elevation (set point) of 2,188.27 feet. When the pond level dips below this set point (e.g., when flows are decreasing), the control system will sequentially back down unit operation or take units off-line to maintain the impoundment at the desired set point. When the pond level is rising (e.g., flows are increasing), the control system increases generation to maintain the impoundment level near the set point, until all available units are at maximum load.

Unlike the turbine-generator units in the mill powerhouse, unit 4 is manually controlled and operates as a block-loaded unit (i.e., with a fixed output) during higher river flows (greater than 1,250 cfs). When river flow exceeds the total hydraulic capacity of the project (2,050 cfs), spill occurs over the dam's spillway and into the project's bypassed reach, which occurs about 29 percent of the time on an annual basis and 11 percent of the time during the annual low-flow period, from July through September. However, even when there is no spill, the bypassed reach receives approximately 10 cfs of total leakage flow from the spillway and headrace canal combined. In addition, some of the outflow from the turbines backwaters into the bypassed reach due to the presence of a hydraulic control just downstream of the tailraces, as described below in section 3.3.1.1, *Affected Environment, Aquatic Habitat*.

The minimum hydraulic capacity of the project is 60 cfs, which corresponds to the minimum hydraulic capacity of the smallest turbine-generator (unit 3). The lowest flow recorded at the project site over a 91-year period of record (POR) from 1929 through 2019 is 253 cfs.[9] Therefore, when the units are available, the project is typically able to generate electricity because the lowest recorded inflow (253 cfs) is well above the project's minimum hydraulic capacity (60 cfs).

The project is capable of remote operation and monitoring via a Supervisory Control and Data Acquisition (SCADA) system. However, the project is normally

[9] All flow data presented herein are prorated based on the difference in drainage area between United States Geological Survey (USGS) Gage No. 03164000 at Galax, Virginia (1,141 square miles) and the drainage area at the project (1,154 square miles).

manned on a part-time basis, especially under high-flow conditions. When the impoundment elevation exceeds 2,189.50 feet, which generally occurs at flows greater than 5,000 cfs, the project is continuously manned so that operators can regulate flow into the headrace canal to ensure its walls are not overtopped. If there is a unit trip under high-flow conditions, operators can close the canal head gates or restart the units (if possible) to prevent overtopping of the canal wall.

The current license (article 30) includes measures for consulting with the Virginia SHPO to protect cultural resources discovered during any land-clearing or land-disturbing activities.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

Aquenergy proposes to expand the project boundary by including its existing property on the north bank of the New River out to the right-of-way for Route 94 and upstream to encompass the impoundment access area and portions of the canoe portage trail (figure 3). Aquenergy also proposes to include, in the project boundary, the powerhouse access road for which the licensee has a right-of-way across adjoining property. Aquenergy holds title or rights to all lands within the proposed project boundary including the impoundment access area. With these additions, which include about 5.5 acres of land,[10] the proposed project boundary would enclose 99.8 total acres.

[10] Aquenergy's license application indicates the land to be added to the project boundary totals 1.81 acres. However, staff estimates that, based on aerial imagery, the parcel to be added is about 5.5 acres.

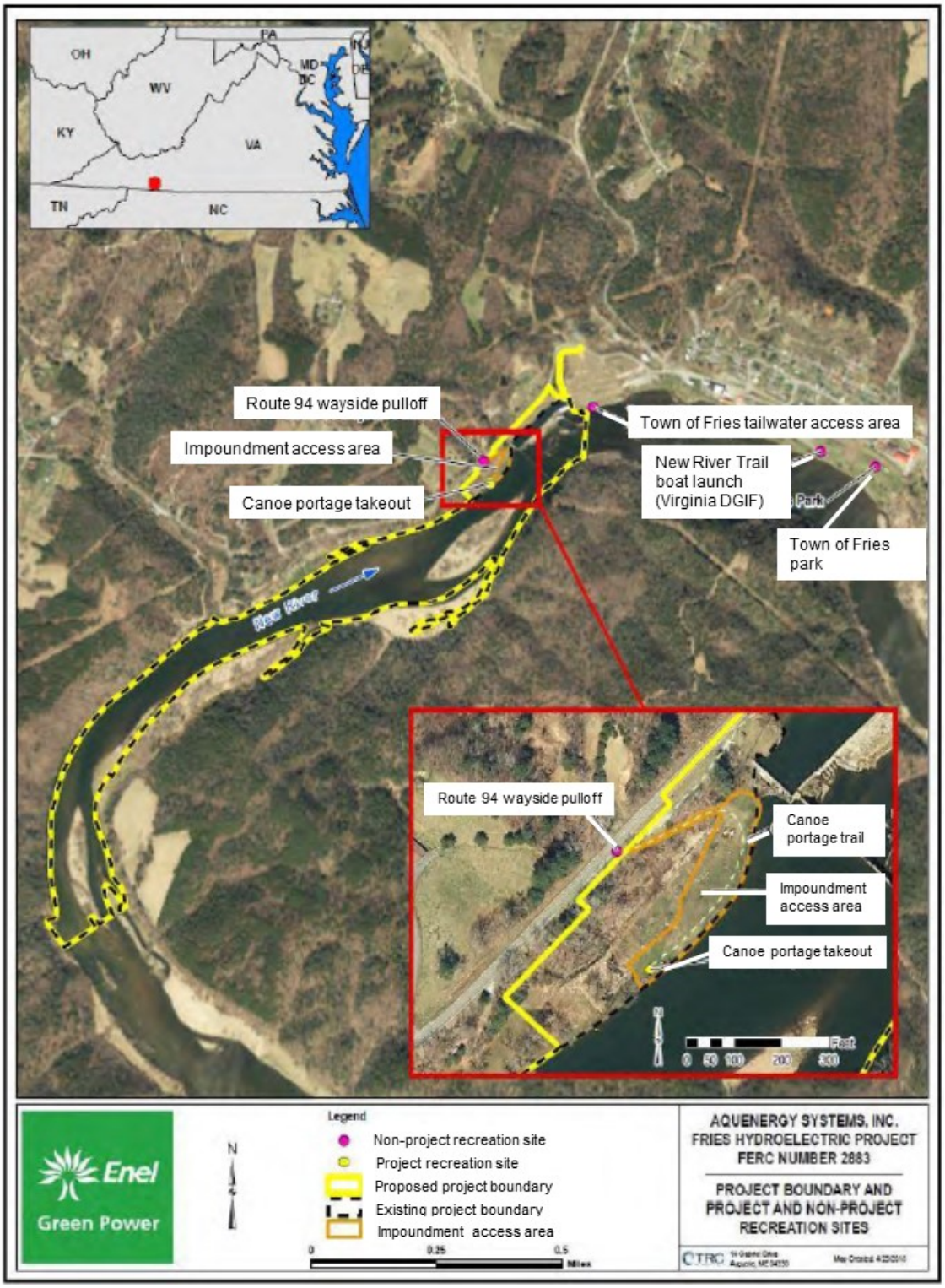

Figure 3. Project boundary map for the Fries Project. The black dashed line represents the current project boundary and the solid yellow line depicts Aquenergy's proposed project boundary, which includes an additional 5.5 acres of land, including the impoundment access area shown in the inset (Source: license application, as modified by staff).

2.2.2 Proposed Project Operation and Environmental Measures

Aquenergy proposes the following operational and environmental measures at the project:

- Continue operating the project in a ROR mode such that outflow from the project approximates inflow and the impoundment is maintained within 0.2 foot of the top of the spillway crest during normal project operation;

- Develop and implement a project operation plan to document how the licensee will monitor, record compliance with, and report any deviations from project operation conditions required by any license issued for the project; and

- Implement a recreation management plan to improve: (1) the impoundment access area, including access road improvements, a gravel turn-around area with parking spaces, a vehicle barrier, carry-in boat access, two picnic tables, two trash receptacles, a right-channel boat barrier, and directional signage; and (2) the canoe portage trail.

2.2.3 Modifications to Applicant's Proposal – Mandatory Conditions

Water Quality Certification Conditions

Virginia DEQ's certification for the Fries Project includes 70 conditions (*see* Appendix G). Seven of the conditions are consistent with the measures proposed by Aquenergy, including its proposals to operate the project in a ROR mode and maintain the impoundment within 0.2 foot of the spillway crest (conditions I.D.1 and I.D.2)[11] and develop and implement a project operation plan (conditions I.D.3, I.E.1, I.E.2, I.E.3, and I.E.4). A total of 62 conditions, including Conditions I.A.1 through I.C.11, I.E.5, and all of part II, are legal or administrative in nature, and are not analyzed in this EA. One condition (condition I.D.4) is not included in Aquenergy's proposal and requires the development of a water quality monitoring plan.

2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would be operated as proposed by Aquenergy and include all of its proposed measures described above in section 2.2.2, *Proposed Project Operation and Environmental Measures*, all eight of the non-legal and non-administrative certification conditions described in section 2.2.3, *Modifications to*

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[11] The intent of condition I.D.2 is unclear as this condition appears redundant with condition I.D.1, as both conditions specify the same allowable impoundment elevations (within 0.2 foot of the spillway crest).

Applicant's Proposal – Mandatory Conditions, and the following staff-recommended additions or modifications:

- Develop and implement an operation compliance monitoring plan that incorporates the provisions of Aquenergy's proposed project operation plan and the project operation, monitoring, and reporting plan specified by the certification (conditions I.D.3, I.E.1, I.E.2, I.E.3, and I.E.4); as well as provisions for the annual reporting of monitoring data (e.g., continuously recorded impoundment elevations) to the Commission for the purposes of determining compliance with the operational requirements of any new license issued for the project.

- Consult with FWS to avoid bald eagle disturbance associated with any project-related construction or maintenance and follow FWS's National Bald Eagle Management Guidelines to minimize effects to this species.

- Consult with the Virginia SHPO if previously unidentified cultural resources are encountered during the term of any new license issued for the project to ensure the proper treatment of these resources and discontinue all ground-disturbing activities until the proper treatment of the resources is established.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Certain alternatives to Aquenergy's proposal were considered but eliminated from further analysis because they are not reasonable in this case. These alternatives are presented in Appendix B.

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 recommended environmental measures. Sections are organized by resource area (aquatics, 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 PM&E measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommendations

are discussed in section 5.1, *Comprehensive Development and Recommended Alternative.*[12]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The New River originates in the Blue Ridge Mountains of North Carolina and flows 337 miles until it meets the Gauley River in West Virginia to form the Kanawha River, which flows into the Ohio River. The New River drains a total of 6,920 square miles across the states of North Carolina, Virginia, and West Virginia.

The Fries Project is located in southwestern Virginia approximately 28 river miles downstream of the North Carolina border. The New River flows in a northeast direction through the project area, and the drainage area at the project is 1,154 square miles. There are two named tributaries in the project vicinity, Stevens Creek and Bull Run, which enter the western side of the impoundment approximately 0.7 mile and 1.3 miles upstream of the project dam, respectively.

The project is located in the Blue Ridge physiographic province, where elevations generally range from 2,400 feet to 3,000 feet, with some higher peaks rising in the western and central parts of the province, including Mount Rogers. The topography in the project area is rugged and consists of narrow valleys and ravines.

The region has a moderate continental climate, characterized by moderately mild winters and warm summers. Average monthly high temperatures in the area range from 41 degrees Fahrenheit (°F) in January to 82°F in July. Average annual precipitation in the project area is 39 inches, with precipitation distributed fairly evenly throughout the year, ranging from 2.83 inches per month, on average, in October, to 4.24 inches in July.

The New River watershed primarily contains forested and agricultural lands, with urban areas composing just 3 percent of the watershed. Land use in the vicinity of the project is classified as rural farm and consists mainly of wooded and agricultural land with some residential structures.

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 impact is the impact on the environment that results from the incremental impact of the

[12] Unless otherwise noted, the sources of our information are the license application filed by Aquenergy on May 30, 2018, additional information filed by Aquenergy on December 2, 2019, and the reply comments to the REA notice filed on May 13, 2020.

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 application and agency and public comments, we have not identified any resources that would be cumulatively affected by continuing to operate the Fries Project.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect of the relicensing 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 site-specific environmental effects and any cumulative effects.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that aquatic resources, terrestrial resources, 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 land use or aesthetic resources associated with the proposed action, and therefore, these resources are not addressed in this EA.

During scoping, we identified geology and soils as resources that may be affected by the construction of the proposed recreation enhancements and maintenance dredging that occurs in the project impoundment. In its scoping comments filed on January 7, 2019, and additional information filed on December 2, 2019, Aquenergy clarified that dredging in the project impoundment occurs on an infrequent basis (such dredging has not occurred since 2003) and that while no dredging activities are planned or proposed, the licensee maintains the necessary permits[13] to conduct dredging on an as-needed basis (e.g., in the vicinity of the canal head gates to maintain generation efficiency and water flow into the headrace canal). The recreation enhancements would involve very little ground disturbance, mainly limited to laying gravel and erecting signage in the impoundment access area. Thus, due to the infrequent nature of dredging and limited scope of proposed construction, neither of these activities would be expected to affect geology and soils or other environmental (e.g., aquatic or terrestrial) resources. Moreover, we received no comments concerning geology and soil resources in response

[13] Dredging permit issued by the Virginia Department of Mines, Minerals and Energy (Permit No. 90430AB); Virginia Pollution Discharge Elimination System (Permit No. VAG840147) for Nonmetallic Mineral Mining issued by Virginia DEQ.

to our REA notice. Therefore, geology and soil resources are not discussed in this EA.

We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.1 Aquatic Resources

3.3.1.1 Affected Environment

Water Quantity

The mean annual flow of the New River at the Fries Project is 1,946 cfs (table 1). Flows at the project are generally highest in March and lowest in September (table 1, figure 4). The 95 percent monthly exceedance flows range from 455 cfs (October) to 1,133 cfs (April) (table 1). The minimum and maximum daily flows recorded over a 91-year POR, from 1929 through 2019, are 253 cfs and 87,182 cfs, respectively.

Table 1. Monthly inflow statistics for the Fries Project based on pro-rated flow data from the United States Geological Survey gage (No. 01364000) on the New River near Galax, Virginia across a 91-year period of record from 1929 through 2019 (Source: staff).

Month	Minimum (cfs)	Mean (cfs)	Maximum (cfs)	95 percent exceedance flow (cfs)
January	303	2,258	58,459	628
February	394	2,561	23,363	841
March	506	2,848	30,949	1,082
April	764	2,701	25,689	1,133
May	589	2,205	29,432	950
June	387	1,755	31,353	686
July	288	1,436	23,161	563
August	253	1,356	87,182	465
September	268	1,301	32,466	467
October	326	1,417	26,903	455
November	392	1,651	57,447	545
December	344	1,914	22,251	591
Annual	253	1,946	87,182	566

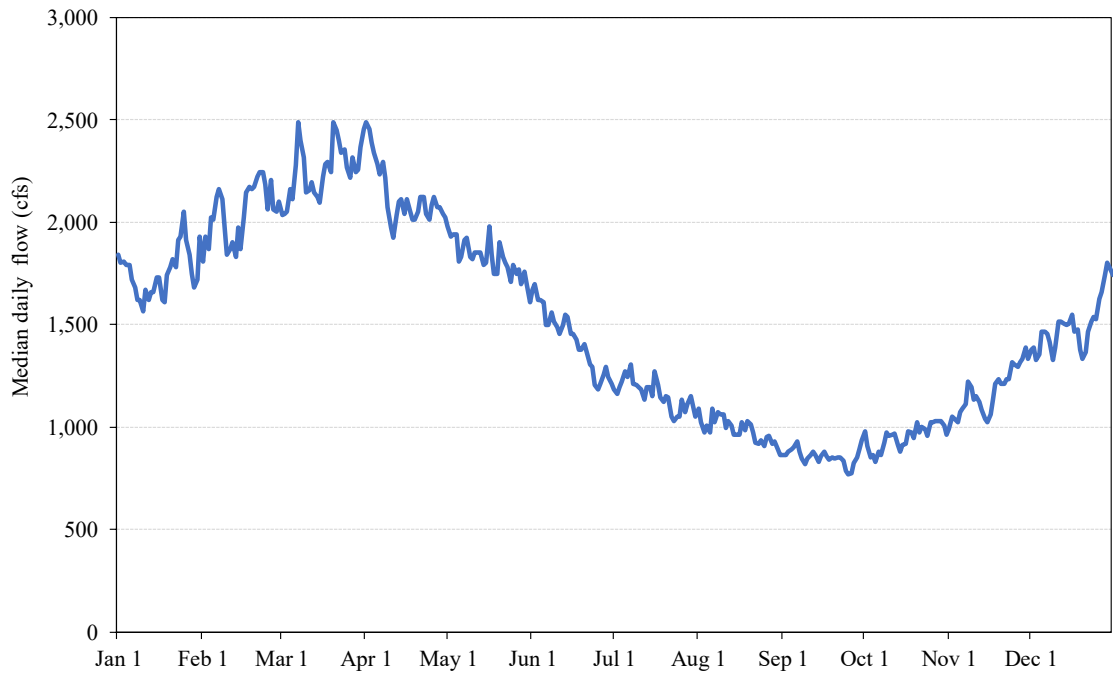

Figure 4. Annual hydrograph of median daily flows at the Fries Project based on pro-rated flow data from 1929 through 2019 (Source: staff).

Project waters are used for the purposes of hydroelectric generation and recreation. There are no consumptive uses or water withdrawals of project waters. There are two state-permitted discharges in the vicinity of the project, as (1) Aquenergy maintains a Virginia Pollution Discharge Elimination System (PDES) permit to release non-contact cooling water into the project's tailraces, and (2) the Fries Wastewater Treatment Plant is a PDES-permitted facility that discharges into the New River 0.9 mile downstream of the project dam.

Water Quality

The project is located in Virginia DEQ's Class IV Mountainous Zone. Water quality criteria for surface waters in this zone are: (1) daily average DO values of at least 5.0 milligrams per liter (mg/L), with instantaneous DO values above 4.0 mg/L; (2) pH values between 6.0 and 9.0; and (3) a maximum water temperature of 84°F. The maximum water temperature criterion (84°F) applies to the section of the New River where the project is located (upstream of the Montgomery-Giles County line to the Virginia-North Carolina border) and differs from the New River as a whole. In addition, these water quality criteria do not apply when flows are below the lowest 7-day average flow expected to occur once every 10 years (i.e., the 7Q10 flow, which is 401 cfs for the project). Lastly, in man-made impoundments in Virginia, such as the project impoundment, the water quality criteria for DO and pH apply only to surface waters (i.e., above any thermocline that may be present).

Water quality grab samples (of temperature, DO, and pH) were collected on an opportunistic basis as part of a flow demonstration study and biological surveys that were conducted to support project relicensing. Across years (2016 and 2017), there were one to four grab samples collected from each area of the project (i.e., impoundment, bypassed reach, etc.), as summarized in table 2. Dissolved oxygen levels ranged from 6.10 mg/L to 7.81 mg/L, pH from 7.6 to 8.6, and water temperatures from 73.0ºF to 87.1ºF (table 2).

To expand on the water quality data described above, Commission staff requested that additional water quality monitoring be conducted to better understand the variability and range of water quality conditions that occur at the project, particularly in the bypassed reach, over the course of an entire summer (July through September).[14] In response to this request, Aquenergy monitored water temperature and DO in the bypassed reach (and temperature in the project impoundment) on a continuous basis (at 15-minute intervals) from July 1, 2019 through September 30, 2019. However, less than 24 hours after deploying the monitoring equipment, at approximately 6:00 p.m. on July 1, 2019, an abandoned penstock plug failed, which caused the mill powerhouse to flood. This incident resulted in the project being shut down for most of the summer to complete repairs, as all four turbine-generator units were offline until September 23, 2019, at which time a single unit (unit 2 of the mill powerhouse) was brought online. Therefore, the water quality data collected as part of this monitoring effort are not representative of environmental conditions under normal project operation because most inflow was spilled into the bypassed reach, which likely increased re-aeration and elevated DO levels in the bypassed reach compared to normal project operation.[15]

Supplemental grab samples (of DO) were collected in the tailraces and bypassed reach on the afternoon of October 4, 2019, when the air temperature was approximately 92ºF. There was no spill into the bypassed reach (beyond leakage) on this date and when sampling occurred, 795 cfs was being passed through the powerhouses (265 cfs through unit 2 and 530 cfs through unit 4). Dissolved oxygen values ranged from 7.7 mg/L to 8.3 mg/L.

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[14] Additional information request issued by staff on January 25, 2019.

[15] Spill occurred every day of the 91-day monitoring period but would only be expected to occur 11 percent of the time during this same period under normal project operation (i.e., with all units available for operation). Dissolved oxygen levels in the bypassed reach during the 2019 water quality monitoring study ranged from 8.0 mg/L to 9.7 mg/L. Water temperatures in the impoundment and bypassed reach ranged from 65.7ºF to 85.7ºF (with a mean of 76.9ºF) and 65.9ºF to 85.7ºF (with a mean of 76.8ºF), respectively.

Table 2. Water quality data (grab samples) collected at the project as part of the biological surveys and flow demonstration study. When more than one sample was collected in a particular area on a given sampling date, the range of values for that parameter is provided; dashes denote parameters that were not measured on a particular sampling date (Source: staff).

Area/ Sampling Date(s)	Water temperature (°F)	Dissolved oxygen (mg/L)	pH
Impoundment			
8/31/2016	79.9	6.55	–
9/16/2016	75.2-77.0	–	–
7/20/2017	82.4-84.4	7.09-7.81	8.2-8.6
Headrace canal			
9/1/2016	80.4	6.25	–
8/2/2017	73.9-74.1	6.24-6.41	7.6-7.8
Bypassed reach			
7/28/2016	87.1	–	–
8/30/2016	77.1-79.8	6.12-6.95	–
9/1/2016	78.4-80.1	6.10-6.73	–
8/8/2017	73.0-73.2	7.43-7.63	7.8-7.9
Tailrace			
8/8/2017	73.8-73.9	6.74-7.53	7.6-7.9

Aquatic Habitat

The project impoundment is shallow, narrow, and riverine in nature. The impoundment is 400 feet wide, on average, and generally 2 to 7 feet deep (figure 5). Large sandbars are present around the islands that have formed within the project impoundment, and scour features are present near the outside bends of the impoundment where higher water velocities occur. The deepest portion of the impoundment is located near the entrance to the headrace canal, which is up to 12 feet deep when the impoundment is at an elevation of 2,188.27 feet (at the dam crest) (figure 5). Substrate in the impoundment is predominantly (90 percent) sand, with large boulders, bedrock, and woody debris also present.

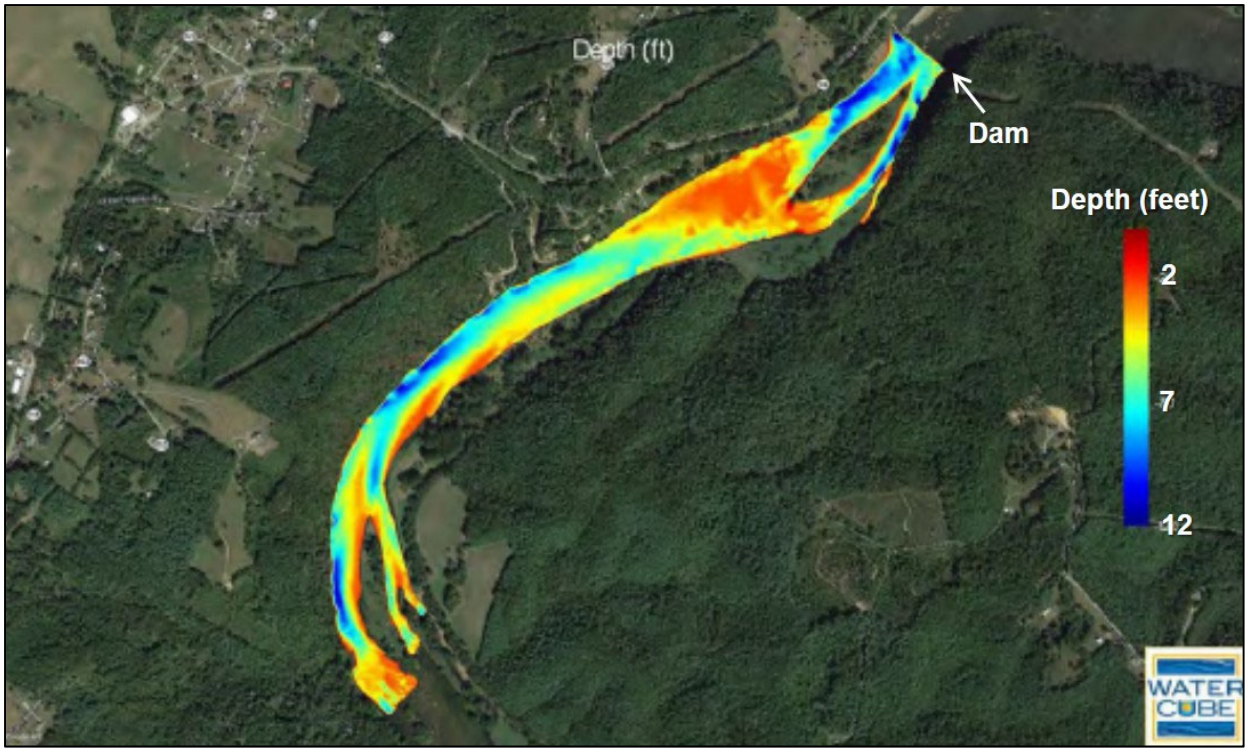

Figure 5. Bathymetry of the project impoundment based on a bathymetric survey conducted in August 2016, when the impoundment was at its normal elevation of approximately 2,188.27 feet NGVD 1929. Depths are color-coded, whereby warmer colors denote shallower locations and cooler colors represent deeper locations as indicated in the legend (Source: license application, as modified by staff).

A 500-foot-long and 300-foot-wide bypassed reach is present that extends from the dam downstream to its confluence with the tailraces (figure 2). Although a deep hole (11.5 feet deep) is present just downstream of the dam, most of the bypassed reach is 4 to 6 feet deep. Substrate in the bypassed reach is dominated by large boulders and slabs of bedrock, with some gravel and cobble present along the banks of the lower half of the reach. A prominent hydraulic control (figure 6) is present just downstream of the tailraces and causes a portion of the tailwater discharge to backwater into the bypassed reach, which keeps the bypassed reach watered even under no-spill (i.e., leakage-only) conditions. For example, the flow demonstration study conducted by Aquenergy indicated that under no-spill conditions, with 744 cfs being passed through the mill powerhouse, the bypassed reach remained watered, with an average depth of 4 feet, and had little to no measurable flow, as velocities were less than 0.04 feet per second (fps). In fact, negative flow (towards the dam) was noted in the bypassed reach during the biological surveys, likely due to the presence of the hydraulic control.

Figure 6. Location of the hydraulic control (orange-dashed line) just downstream of the confluence of the project's tailraces and bypassed reach. Photo date and associated flow are unknown (Source: license application).

Downstream of the hydraulic control, the river transitions into a shallower and faster riffle and run habitat with a mean depth of 1.4 feet. Substrates in this downstream area are composed primarily of a mixture of sand-gravel (64 percent) and bedrock (21 percent).

Fish Community

Fish sampling was conducted as part of the multi-taxa biological surveys performed in 2016 (July through October) and 2017 (May through July). Sampling occurred in the impoundment, bypassed reach, and a 0.5-mile-reach immediately downstream of the powerhouses, including the tailraces. Boat electrofishing, gill nets, and trot lines were the primary gear types used in the impoundment, and raft and boat electrofishing were used in the areas downstream of the dam, including the bypassed reach.

Based on these surveys, redbreast sunfish appears to be the most common species in the project impoundment. Other species found in the impoundment include centrarchids (largemouth bass, smallmouth bass, and bluegill), cyprinids (silver shiner and common carp), and catostomids (northern hog sucker and white sucker) (*see*

Appendix C).[16] The bypassed reach is dominated by centrarchids, which represented 84 percent of all fish collected in the reach, including redbreast sunfish, smallmouth bass, rock bass, and bluegill (Appendix C). Largemouth bass appear to be less common in the bypassed reach than the impoundment, with rock bass exhibiting the opposite pattern (more common in the bypassed reach than the impoundment) (Appendix C). A diverse fish assemblage is present downstream of the bypassed reach and includes numerous cyprinid species (whitetail shiner, bigmouth chub, central stoneroller, and mimic shiner) and several darter species (Appalachia darter, greenside darter, and fantail darter) (Appendix C). The downstream reach contains more of the shallower, faster-flowing habitats these lotic species prefer. Although centrarchids are also present in the downstream reach, they constitute a smaller percentage of the fish community there compared to the bypassed reach and impoundment, which is particularly the case for redbreast sunfish (Appendix C).

Popular game fish in this portion of the New River include smallmouth bass, walleye, and muskellunge. As indicated above, smallmouth bass are common throughout project waters, especially the bypassed reach. Walleye were only collected downstream of the project dam, in the bypassed reach and tailwaters, which is consistent with stocking practices; as walleye fingerlings are routinely stocked downstream of the project, including the reach of river between the Fries Project and the downstream Byllesby-Buck Project (FERC No. 2514), but are only occasionally stocked (just 3 years from 2001 through 2017) upstream of the Fries Project (to Fields Dam). Most muskellunge stocking in the New River has occurred outside of the project area, below Claytor Lake, as part of efforts to establish a naturally reproducing population in the lower New River. Nevertheless, two muskellunge were captured during the biological surveys, one in the impoundment and the other in the bypassed reach. No diadromous fish species occur in the project vicinity.[17]

The only mussel species found in the project area was purple wartyback (see below). Flathead catfish and channel catfish serve as hosts for purple wartyback (*Cyclonaias tuberculata*), and both of these host species are present both upstream and downstream of the project dam.

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[16] Centrarchids are fish in the Centrarchidae family (e.g., sunfish and black bass); cyprinids include minnow species within the Cyprinidae family; and catostomids are sucker-type fishes in the family Catostomidae.

[17] Diadromous fish migrate between freshwater and the ocean for the purposes of reproduction.

Freshwater Mussels

Qualitative mussel surveys (timed searches) were conducted as part of the 2016 and 2017 multi-taxa biological surveys. Sampling occurred during the summer and fall under low-flow conditions to maximize visibility, and searches were performed in putative mussel habitats via snorkeling, diving, hand-turning rocks, and using view scopes. Riverbanks and exposed areas were also searched for dead mussels and relic shells. The total search times in each area of the project (in person-hours) were as follows: 26 hours in the project impoundment, 8 hours in the bypassed reach, and 37 hours in the downstream reach, including the tailrace area.

No live mussels or shell materials were observed in the project impoundment or bypassed reach. In the downstream reach, purple wartyback (50 live individuals and 15 shells) were observed. However, there was no evidence of recent recruitment of purple wartyback as all mussels (both live and dead) had shell lengths greater than 2.9 inches, which corresponds to the typical size range of adults of this species (2 to 4 inches).[18] Combined with their relatively low abundance—2.1 mussels per search hour (via snorkeling or diving)—these data suggest an aging relict population of purple wartyback exists downstream of the bypassed reach. Although green floater (*Lasmigona subvirdis*) and spike (*Eurynia dilatata*) were found during the biological surveys, they occurred well upstream of, and outside the project's zone of influence, as green floater (10 live individuals and 2 shells) and spike (1 shell) were found in riffle habitats more than 1 mile upstream of the upper end of the project impoundment (i.e., more than 2.3 miles upstream of the project dam).

Eastern hellbender

The eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) is one of two recognized subspecies of hellbender—the largest salamander in North America, reaching up to 29 inches in length and weighing up to 5 pounds.[19] The eastern hellbender is found throughout parts of the eastern and central U.S. in the Susquehanna, Ohio, Mississippi, and Missouri River drainages and is a somewhat cryptic, stout-bodied, fully-aquatic salamander that prefers clear, fast-flowing, well-oxygenated streams and rivers and seeks refuge under large flat boulders, logs, and debris.[20] In Virginia, it is restricted to

[18] https://molluskconservation.org/Library/Maps/pdfs/Missouri-freshwater.pdf

[19] https://nationalzoo.si.edu/animals/hellbender

[20] https://dwr.virginia.gov/wildlife/information/eastern-hellbender/

southwestern portions of the state where it is only known from parts of the New and Tennessee River drainages (Mayasich et al., 2003).

The eastern hellbender has declined throughout most of its range due to habitat alteration, water pollution, and indiscriminate killing; as such, it was a recent candidate for federal listing. However, FWS determined that federal range-wide listing was not warranted for the eastern hellbender.[21] In Virginia, eastern hellbender is classified as a Tier I(a) species (of highest conservation concern) in the 2015 Virginia Wildlife Action Plan, as hellbender populations are at critically low levels, face immediate threat(s), and/or occur within an extremely limited range.[22]

The eastern hellbender was recently documented both upstream and downstream of the Fries Project dam in 2018.[23] These records come from incidental observations by anglers and, while noteworthy given the scarcity of local information and cryptic nature of hellbender, are not entirely unexpected as the species is poorly studied in the region (Jachowski et al., 2016) and is also known to occur elsewhere in Grayson County and the New River drainage (Carey et al., 2017).[24] The downstream record, from below the bypassed reach, was more typical of the preferred habitat of this species—faster flows and rocky substrate—compared to other parts of the project area and is in a location where eastern hellbender was documented historically[25] and where Carey et al. (2017) identified patches of suitable habitat. The upstream record, from the project impoundment, is somewhat less typical because that area experiences siltation and is more lentic in nature and was not identified by Carey et al. (2017) as suitable habitat.

3.3.1.2 Environmental Effects

Mode of Operation

The operation of hydropower projects can affect the downstream flow regime, with the magnitude and frequency of such effects depending largely on the mode of operation (e.g., ROR or peaking). For instance, following project outages, ROR projects generally spill more quickly than peaking projects because the impoundment level

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[21] https://www.govinfo.gov/content/pkg/FR-2019-04-04/pdf/2019-06536.pdf

[22] http://bewildvirginia.org/wildlife-action-plan/

[23] *See* letter filed by Interior on March 27, 2020.

[24] *See* letter filed by FWS on November 20, 2015.

[25] *See* letter filed by Virginia DCR on November 20, 2015.

fluctuates less and is more consistently maintained at a higher elevation (near the spillway crest).

Aquenergy proposes to continue operating the Fries Project in a ROR mode such that at any given time, outflow from the project approximates inflow and the impoundment is maintained within 0.2 foot of the top of the spillway crest to ensure that all inflow will be passed over the spillway shortly after any units trip off-line or are shut down.

The certification requires Aquenergy to maintain water levels in the project impoundment within 0.2 foot of the top of the spillway crest (elevation of 2,188.27 feet), at all times during normal project operation. The certification also specifies that when necessary, for either project maintenance or emergency purposes, Aquenergy shall be authorized to reduce the water level of the project impoundment to 0.2 foot below the spillway crest—to an elevation of 2,188.07 feet.

Virginia DWR recommends, under section 10(j), that Aquenergy examine additional PM&E measures, including the release of supplemental flow from the headrace canal and management of canal water levels, for their potential to protect downstream fish and wildlife resources during flow disruption events similar to an event documented on July 12, 2017 (described below), and that project operation should address the agency's concerns regarding such dewatering events. We discuss below, the effects of Aquenergy's proposed project operation on the continuity of downstream flows to address Virginia DWR's concerns regarding the effects of project outages on downstream aquatic resources.

In its reply comments, Aquenergy notes that an automatic pond level control system was installed at the project in September 2017 that allows the impoundment to be precisely maintained within 0.2 foot of the spillway crest. It states that if the impoundment had been within the proposed 0.2 foot of the spillway crest at the time of the July 2017 flow disruption event, water would have begun spilling within 15 minutes of the station outage.

Staff Analysis

During the July 2017 event of concern to Virginia DWR, all turbines were unexpectedly shut down during electrical testing associated with the installation of the pond level control system. The impoundment was 0.25 foot below the spillway crest when the turbines were taken offline and project inflows were 1,200 cfs; it took approximately 15 minutes for the project to begin spilling (possibly sooner because the SCADA system only records impoundment elevations at 15-minute intervals). During this event, sampling for the biological surveys was being conducted 0.6 mile downstream of the project dam. The biologists conducting the surveys noted that, during this event,

approximately one-third of the river along the left bank,[26] including a side channel, became dewatered.

The recent installation of an automatic pond level control system allows impoundment elevations to be more precisely controlled at levels closer to the spillway crest, which allows the impoundment to spill more quickly following project outages than was observed during the July 2017 event of concern. For example, leading up to the July 2017 event, impoundment levels were as much as 0.4 foot below the spillway crest. However, under Aquenergy's proposed mode of operation, impoundment levels would be maintained closer to the top of the spillway crest owing to the recent installation of the pond level control system. For example, staff estimates that under the median summer flow of 1,003 cfs (from July through September, across a 91-year POR from 1929 through 2019), the project would start spilling less than 12 minutes after a complete outage.[27] Disruptions of downstream flows for such short durations would not be expected to have significant effects on aquatic fauna. For example, mobile fauna such as fish, should be able to move to deeper waters of the main channel during any such events; immobile species such as freshwater mussels were not observed in the area that became dewatered, including the side channel. In addition, complete project outages would not be expected to occur on a regular basis and should be rather infrequent. Therefore, Aquenergy's proposed mode of operation is not expected to have adverse effects on downstream aquatic resources.

Effects of Project Operation on Water Quality

At hydropower projects with bypassed reaches, such as the Fries Project, most of the flow passes through the powerhouse(s) when the project is operating, as opposed to the bypassed reach, which receives less flow, generally in the form of leakage or a required minimum flow. As such, bypassed reaches are subject to potential water quality issues (high temperatures or low DO), particularly during summer, because this is when waters are warmest and hold the least amount of oxygen and spillage over the dam (and associated re-aeration) is less frequent.

Aquenergy proposes no changes to project operation. Under Aquenergy's proposal, the bypassed reach would continue receiving leakage flows of approximately 10 cfs and some backwatering of the turbine outflow due to the hydraulic control downstream of the tailraces.

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[26] Orientation as facing down-river.

[27] Estimates of spill time were based on the stage-volume relationship developed during the 2016 bathymetric survey and assume that the impoundment would be 0.2 foot below the spillway crest at the time of a potential station outage.

Certification condition I.D.4 would require Aquenergy to submit a water quality monitoring plan to Virginia DEQ for review and approval within one year of the effective date of any new license issued for the project. Virginia DEQ specifies the water quality monitoring plan must include the results from the water quality monitoring the applicant performed in the summer of 2019 in response to the AIR issued by Commission staff. The certification condition further specifies that if these water quality data indicate: (1) there are any periods when water temperature or DO levels in the bypassed reach did not meet applicable Virginia state water quality standards,[28] or (2) if the water quality monitoring data were not collected during periods of low flow or warm water, then the licensee shall include a description and schedule for additional water quality monitoring to be conducted in the bypassed reach, including the location, recording frequency, and duration of the data loggers that would be used to monitor water quality. The plan would also include an analysis of alternative approaches to remediate the water quality impacts to the New River, if needed, including a discussion of the feasibility and expected water quality improvements for each alternative, along with the steps and timelines necessary to implement any recommended alternatives.

Staff Analysis

Given the impoundment's shallow depth (generally 2 to 7 feet, with a maximum depth of 12 feet), stratification is unlikely to occur in the impoundment. As such, water exiting the turbines should have temperature and DO characteristics similar to the impoundment and headrace canal because the project does not draw water from a deep, cool stratified layer (with less oxygen). Therefore, water exiting the project's turbines would not be expected to significantly modify temperature or DO levels of the river downstream of the project's tailraces.

With regard to water quality in the bypassed reach—which is a pool-type habitat with limited water movement— grab samples collected by Aquenergy suggest that the project has little to no adverse effects on water temperature and DO levels relative to the parameters established by state water quality standards. As noted above, although Aquenergy made a good faith effort to more rigorously monitor water temperature and DO levels in the bypassed reach during the summer of 2019 to expand on the data collected in prior years, the powerhouse flooding incident that occurred shortly after the water quality loggers were installed resulted in data being collected under conditions that were not representative of normal project operation.

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[28] Because there were numerous instances (8 afternoons in the project impoundment and 9 afternoons in the bypassed reach) during the 2019 monitoring study that water temperatures (up to 85.7°F) exceeded the state temperature standard (84°F), additional water quality monitoring in the bypassed reach would be required under the water quality monitoring plan specified by certification condition I.D.4.

The development and implementation of a water quality monitoring plan, as specified by Virginia DEQ, would provide additional water quality data that can be used to identify any previously undocumented project-related adverse effects on water quality, particularly DO, in the bypassed reach during the summer under normal project operation. The data could be used to determine if any operational changes or additional enhancement measures (e.g., increasing spill into the bypassed reach) are needed to mitigate any project-related effects on water quality in the bypassed reach.

Minimum Flows in the Bypassed Reach

Minimum flows in the bypassed reaches of hydropower projects are implemented for various reasons, such as: providing suitable habitat for important fishery species or aquatic species of concern, enhancing water quality, ensuring habitat connectivity to prevent fish stranding during receding flows, and providing adequate swimming depths to allow migratory fish to reach upstream fish passage facilities installed at hydropower dams. Depending on their intended purpose, minimum flows can be constant year-round or vary on a seasonal basis.

Aquenery proposes no change in project operation; as such, the project would not provide a minimum flow to the bypassed reach, which currently receives approximately 10 cfs of leakage on a continual basis.

Interior recommends, under section 10(j), that the licensee provides, as a minimum flow into the bypassed reach, the monthly 95 percent exceedance flows, for the protection and enhancement of fish, mussels, and other aquatic resources, such as eastern hellbender. Interior also states that if gate configurations must be altered or automated to provide these minimum flows, such changes should be required as a condition in any new license issued for the project.

Virginia DWR recommends, under section 10(j), that the bypassed reach instream flow needs of aquatic biota, including water quality considerations, and the instream flow needs of recreational users, be examined to determine if leakage flow is adequate to protect beneficial instream uses as defined in section 62.1-44.3 of the Code of Virginia; as part of its recommendation, it supports Interior's recommendation to use the 95 percent monthly exceedance flow as a 'guideline' for providing flows into the bypassed reach to protect fish, wildlife, and recreation resources. Consistent with Virginia DWR's recommendation, we examine the adequacy of leakage flows in the bypassed reach below.

In its reply comments filed on May 13, 2020, Aquenergy indicates it strongly objects to Interior's recommended minimum flows for the bypassed reach. Aquenergy states that Interior does not present any site-specific information or data to support its minimum flow recommendation; nor is the licensee aware of any state or regional flow

policies that use the 95 percent monthly exceedance flow as a basis for a minimum flow recommendation. Aquenergy further states that its flow demonstration study clearly showed the pools in the bypassed reach remain well connected at leakage flows and that increasing spillage over the dam (up to 150 cfs) did little to change the overall depth and velocity characteristics of the bypassed reach. Aquenergy notes that due to the hydraulic control downstream of the tailraces, water surface elevation in the bypassed reach is determined by total river flow (i.e., spill and turbine outflow combined rather than from spill alone) and that shifting flow between the turbines and bypassed reach would not change the total flow over the hydraulic control and the associated water surface elevation and wetted widths in the bypassed reach.

Staff Analysis

As indicated above in section 3.3.1.1, *Affected Environment, Freshwater Mussels*, no live mussels or evidence of mussels (empty shells) were found in the bypassed reach. Regarding eastern hellbender, this species prefers riffles and runs (i.e., habitats with higher velocities), which are habitats that are not present in the bypassed reach. Rather, the bypassed reach consists of pools, which by their nature, have slow-moving waters. In addition, there is a low abundance of crayfish, which are the dominant prey item of hellbenders.[29] The two recent observations of hellbender from the project vicinity (both reported in 2018) were from areas outside the bypassed reach. Therefore, our analysis herein focuses on the effects of Interior's recommended minimum flow regime on fish species within the bypassed reach, rather than freshwater mussels or eastern hellbender.

Interior does not recommend a time period for calculating the monthly 95 percent exceedance flows. Therefore, we base our analysis on 95 percent monthly exceedance flows calculated from the 91-year POR described above in section 2.1.4, *Current Project Operation and Environmental Measures*.

As described in section 3.3.1.1, *Affected Environment, Aquatic Habitat*, and shown in figure 6, a hydraulic control is present just downstream of the project's tailraces. This feature controls the stage-discharge relationship in the bypassed reach. Because the hydraulic control is located downstream of the confluence of the bypassed reach and tailraces, water levels in the bypassed reach are a function of the total discharge from the project (i.e., turbine outflow and spill combined) rather than spill (or flow into the bypassed reach) alone. As such, increasing the amount of flow into the bypassed reach (e.g., by providing a minimum flow, as recommended by Interior, with monthly flows ranging from 455 cfs to 1,133 cfs; *see* table 1) would be expected to result in no change in water depths and habitat quantity (e.g., wetted width) in the bypassed reach. For example, the flow demonstration study indicated there was essentially no change in water

[29] Of the 800 spiny stream crayfish observed or captured in the project area during the multi-taxa biological surveys, only 1 individual was found in the bypassed reach.

depths in the bypassed reach when spill was increased from 10 cfs (leakage only) up to 150 cfs (table 3). This was likely due to the fact that while the proportion of total inflow allocated between spill and the powerhouse was altered during the study (i.e., there was less outflow from the powerhouse when spillage was increased), the total outflow from the project remained relatively constant during the study period (around 750 cfs). Consequently, water depths in the bypassed reach remained relatively stable across the three test flows (10 cfs, 75 cfs, and 150 cfs).

Although Interior's recommended minimum flows would likely result in little change in habitat quantity (i.e., water depth or wetted width) in the bypassed reach compared to existing conditions, Interior's recommended minimum flow regime would likely increase velocities in the bypassed reach. For example, the flow demonstration study indicated that average water velocities in the bypassed reach increased from 0.01 fps to 0.15 fps as spill was increased from 10 cfs (leakage only) to 150 cfs (table 3); assuming this linear flow-velocity relationship holds at the higher 95 percent monthly exceedance flows (455 cfs to 1,133 cfs), Interior's recommended minimum flow regime could increase velocities in the bypassed reach to 0.5 fps to 1.1 fps, and possibly higher.

This expected increase in velocity in the bypassed reach under Interior's recommended minimum flow regime could affect the habitat suitability of centrarchids, namely redbreast sunfish, smallmouth bass, and rock bass, which dominate the fish community in the bypassed reach under existing conditions, as described in section 3.3.1.1, *Affected Environment, Fish Community.* Available habitat suitability curves for these species indicate that optimal habitat for juvenile and adult smallmouth bass occurs at higher velocities (0.5 fps to 1.0 fps) than for redbreast sunfish and rock bass (figure 7). This is likely due to the preference of smallmouth bass to occupy areas (e.g., behind rocks, boulders, or other structure) located near the edge of higher currents, which they dart into to capture prey (Edwards et al., 1983); whereas rock bass, and redbreast sunfish in particular, tend to remain in lower velocity habitats during these life stages (Aho et al., 1986). However, for the spawning and fry stages of all three species, habitat suitability declines sharply at velocities greater than 0.5 fps and approaches zero (unsuitable conditions) as velocities near 1.0 fps (figure 7). This decline in habitat suitability (of spawning and fry stages) with increasing velocity is due to the fact that these species prefer to spawn and nest in lower velocity areas where it is easier for males to maintain their position while guarding nests and for emerging fry to maintain their position in the water column and avoid being swept downstream and possibly lost from the population. For example, it has been shown that redbreast sunfish and smallmouth bass fry cannot maintain their positions in the water column when velocities are higher than 0.33 fps and 0.66 fps, respectively (Edwards et al., 1983; Aho et al., 1986). The peak spawning period

for these species in Virginia is May and June,[30] and based on staff's velocity estimation methods described above, predicted velocities during these months would be 0.95 fps and 0.69 fps, respectively, which well exceeds the threshold velocities above which redbreast (0.33 fps) and smallmouth bass fry (0.66 fps) cannot maintain their position in the water column. As such, any potential benefits to centrarchids populations resulting from the increase in habitat suitability for the juvenile and adult stages of centrarchids (e.g., increased growth or fecundity of smallmouth bass due to increased foraging success) could be more than offset by reduced reproductive success due to the higher velocities expected during the spawning season under Interior's recommended minimum flows.[31] Therefore, there appears to be no benefit, and possibly negative effects (on the reproductive success of centrarchids), to releasing the monthly 95 percent exceedance flows into the bypassed reach, which currently supports abundant centrarchid populations, several of which, including smallmouth bass, are important game fish that provide recreational angling opportunities.

Table 3. Depths and velocities in the bypassed reach under three test (spill) flows examined during the flow demonstration study (August 30, 2016 through September 1, 2016). Depths and velocities (for each test flow) were measured along three cross-channel transects using a kayak-mounted Acoustic Doppler Current Profiler; the values in the table represent the average depths and velocities across the three transects for each test flow (Source: staff).

Spill (cfs)	**Average Depth (feet)**	**Average velocity (fps)**
Leakage (10)	3.88	0.01
75	4.00	0.08
150	3.84	0.15

[30] Information on peak spawning periods was obtained from the Final Environmental Impact Statement for the Smith Mountain Pumped Storage Project No. 2210, issued on August 7, 2009 and https://dwr.virginia.gov/wildlife/fish/rock-bass/.

[31] Although much of the bypassed reach contains bedrock or large boulder habitat that may be unsuitable for spawning, suitable spawning substrate (sand, gravel, and cobble) is present along the shorelines of the bypassed reach and likely supports local spawning given the dominance of centrarchids in the reach under existing conditions.

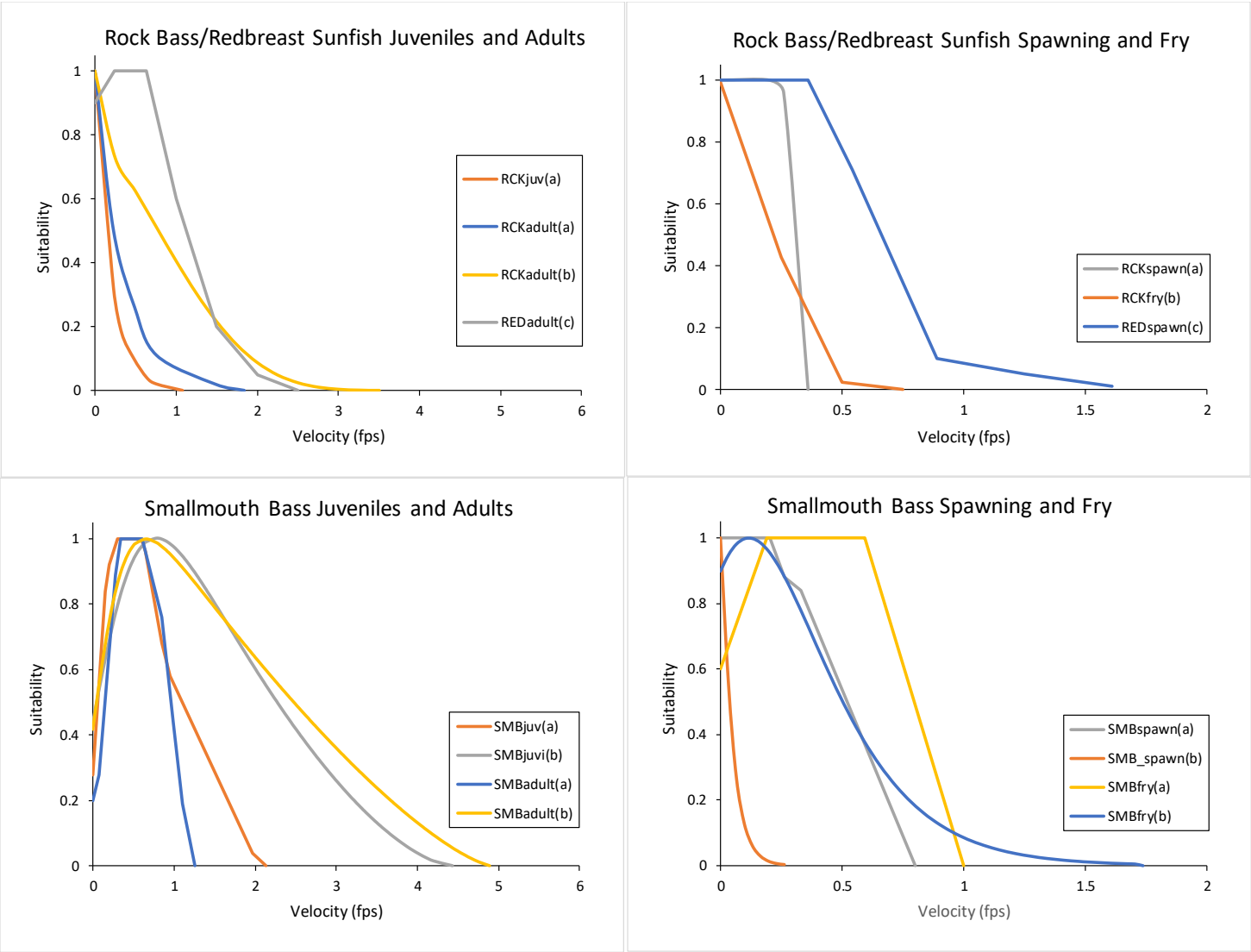

Figure 7. Available habitat suitability curves (velocity) for common centrarchid species found in Fries Project bypassed reach (Source: staff; (a) Leonard et al., 1986; (b) Aadland and Kuitunen, 2006; (c) HDR Engineering Inc., 2011).

Fish Impingement and Entrainment

The passage of large volumes of water through trash racks and turbines can result in fish impingement and entrainment mortality at hydropower projects. Blade strikes are thought to be the primary source of mortality for fish entrained through hydropower projects (Franke et al., 1997; Pracheil et al., 2016). Fish size is an important factor in entrainment susceptibility and turbine mortality, whereby smaller fish are more likely to be entrained, but experience lower turbine mortality, although the physical properties of turbine units also play a role in turbine mortality (Winchell et al., 2000; Cada et al., 1997; Pracheil et al., 2016).

Interior recommends, under section 10(j), that Aquenergy develop and implement, in consultation with FWS, impingement/entrainment and turbine operation protocols that minimize fish mortality, which may be likely to occur based on the licensee's blade strike analysis, and to mitigate for such impacts with flow and water quality enhancements of tailwater and downstream habitat areas. Interior's recommendation provides no specific measures to be analyzed, nor does it provide any justification as to why it believes there is a need to reduce entrainment mortality at the project. For instance, Interior notes that mortality may occur, but it provides no estimate of the current levels of entrainment mortality under existing project operation. Therefore, to provide information on the expected magnitude of entrainment mortality at the project under current project operation to inform the need for potential measures to mitigate entrainment mortality, we summarize below the results of Aquenergy's desktop impingement and entrainment study, which focused on the ten most abundant species in the project impoundment based on data collected during the multi-taxa biological surveys.

Staff Analysis

The adults of several species including common carp, channel catfish, and largemouth bass, as well as smallmouth bass approaching the species' maximum size reported in Virginia, would be excluded from the trash racks (2-inch clear spacing) based on their body size alone (table 4). However, the adults of these species have burst swimming speeds (ranging from 3.5 fps to 14 fps; table 5) that well exceed the maximum measured approach velocity (across turbine units) of 1.5 fps, which occurred at unit 4.[32] Therefore, because excluded fish can easily escape the intakes, the potential for impingement mortality at the project is very low.

[32] Approach velocities were measured with an Acoustic Doppler Current Profiler (ADCP) in front of the trash racks of each unit when respective turbine units were operating at their maximum hydraulic capacity.

Table 4. Minimum sizes (total length, in inches) of fish species physically excluded by the project's trash racks (2-inch clear spacing). Fish exclusion sizes were based on body scaling factors relating body width to fish length as reported in Smith (1985). (Source: Fries Fish Entrainment and Turbine Mortality Study filed December 2, 2019, as modified by staff).

Species	Reported maximum total length in Virginia (inches)	Minimum exclusion size (total length, inches)
Redbreast sunfish	7.28	NE[a]
Silver shiner	3.74	NE
Northern hog sucker	11.81	NE
Largemouth bass	25.59	14.96
Common carp	27.56	12.34
Bluegill	8.66	NE
Smallmouth bass	16.93	15.65
Whitetail shiner	3.94	NE
Channel catfish	27.56	12.78
Gizzard shad	13.78	NE

[a] 'NE' indicates the species is not excluded by the trash racks because the minimum exclusion size is greater than the species maximum length in Virginia as reported by Jenkins and Burkhead (1993).

Although most fish present in the project impoundment, especially juveniles, could theoretically fit through the trash racks based on their body size alone, entrainment risk is low because the approach velocities at the project are low in relation to fish swimming speeds. The maximum approach velocities at units 2, 4, and 1/3 (combined), are 0.7 fps, 1.3 fps, and 1.5 fps, respectively.[33] The only fish species susceptible to entrainment are juvenile shiners (silver and whitetail shiners) and juvenile gizzard shad, as all other species and life stages should be able to avoid entrainment because their burst swimming speeds (table 5) exceed the maximum approach velocity of 1.5 fps across units. Because their burst swimming speeds are greater than 0.7 fps (the maximum approach velocity of unit 2), juvenile shiners and juvenile gizzard shad would only be susceptible to entrainment though units 1, 3, and 4. Based on the Franke et al. (1997) blade strike model, entrained juvenile shiners (less than 2 inches) would experience high

[33] Units 1 and 3 share the same penstock and can operate simultaneously, which results in the higher approach velocities (1.5 fps) than when the units are operating alone (i.e., independent of each other), in which case velocities are 1.2 fps for unit 1 and 0.3 fps for unit 3.

survival through units 1/3 (97.5 percent) and unit 4 (99 percent). The predicted turbine survival of juvenile gizzard shad (4 inches) is slightly lower, but still ranges from 89.5 percent (units 1/3) to 98 percent (unit 4). Therefore, under existing project operation, entrainment mortality at the project appears to be minimal and would not be expected to adversely affect fish populations that reside in the project impoundment.

Table 5. Burst swimming speeds of the juvenile and adult stages of fish species present in the project impoundment (Source: staff).

Species	Burst swimming speed of juveniles (fps)	Burst swimming speed of adults (fps)
Redbreast sunfish	2.4[b,g]	4.3[i]
Silver shiner	1.3-1.4[h,j]	4.5 [h,j]
Northern hog sucker	1.9[n]	2.6[n]
Largemouth bass	2.0-3.2[b,c,d]	3.5-5.6[e]
Common carp	2.6[n]	4.6[n]
Bluegill	2.6[b,g]	4.3[h]
Smallmouth bass	2.0-3.2[f]	3.5-5.6[a]
Whitetail shiner	1.3-1.4[m]	4.5[m]
Channel catfish	3.6[b,k,l]	7.9[b,k,l]
Gizzard shad	1.4[p]	4.1[o]

[a] Peake and Farrell, 2004.
[b] Estimated using the relationship in Bell, 1991 that the ratio of sustained to burst swim speeds is 0.5.
[c] Kolok, 1992.
[d] Katopodis and Gervais, 1991.
[e] Using smallmouth bass as surrogate species.
[f] Using largemouth bass as a surrogate species.
[g] Leavy and Bonner, 2009.
[h] Webb, 1978.
[i] Using bluegill as a surrogate species.
[j] Using common shiner as a surrogate species.
[k] Beecham et al., 2009.
[l] Using blue catfish as a surrogate species.
[m] Using silver shiner as a surrogate species.
[n] Katopodis and Gervais, 2016.
[o] https://www.fws.gov/northeast/fisheries/pdf/fishpassage/NLF-Passage-Design-Guidelines.pdf.
[p] Patrick et al., 2015.

Operation Compliance Monitoring

As part of its project operation plan, Aquenergy proposes to continuously monitor and record, at 15-minute intervals via the project's SCADA system, the following parameters: impoundment water levels, canal water levels, generation output (in kW) from each unit, and tailrace water levels. Project outflow would be calculated from the generation readings using a conversion factor based on kW/cfs passed through the units. Aquenergy proposes to provide copies of this monitoring data (e.g., flow and impoundment elevation data) to the Commission, and/or state and federal resource agencies, upon written request. Aquenergy also proposes to notify Virginia DEQ, Virginia DWR, and FWS within 24 hours of any deviations from ROR operation, and to notify the Commission, in writing, within 10 days of such events.

Certification condition I.D.3 would require Aquenergy to submit a project operation, monitoring, and reporting plan to Virginia DEQ that follows the monitoring, recording, and reporting procedures in conditions I.E.1, I.E.2, I.E.3, and I.E.4, and would be submitted to Virginia DEQ, for review and approval, within one year of the effective date of any new license issued for the project. The plan required by the certification is generally consistent with Aquenergy's proposed plan, but also includes provisions for monitoring and estimating project inflow as well as the annual reporting of monitoring data to Virginia DEQ.

Staff Analysis

An operation compliance monitoring plan describes the methodology, instrumentation, and reporting procedures a licensee intends to use to verify a project is being operated in accordance with the operational requirements of its license. While the project operation plans proposed by Aquenergy and specified by the certification include provisions for monitoring certain parameters such as impoundment elevation to confirm ROR operation, the plans do not contain procedures for reporting such monitoring data to the Commission, which is necessary so that the Commission can ensure compliance with the operating requirements of any license it issues for the project. Therefore, developing an operation compliance monitoring plan that includes the monitoring provisions from Aquenergy's and Virginia DEQ's plans, as well as procedures for reporting this monitoring data to the Commission and establishing a schedule for reporting any operational deviations, would ensure that all operation requirements for the protection and enhancement of aquatic resources are being met.

Access to Project Site for Environmental Inspection

On March 27, 2020, Interior filed a recommendation pursuant to section 10(a) of the FPA that the Fries Project shall at all times be subject to inspection by representatives of FWS in order to ensure compliance with any fish and wildlife protection, mitigation,

and enhancement measures that may be contained in any new license issued for the project.

Staff Analysis

Ensuring compliance with the terms and conditions of any license issued for the project is the Commission's responsibility, and a standard article in the Commission's hydropower licenses already requires the licensee to provide employees of the U.S. Government access to project lands and works in performance of their official duties. This standard article would apply to site access for FWS employees and designated representatives for the purposes of inspecting project facilities. Accordingly, Interior's recommended measure is redundant with the standard articles contained in any license issued for the project and would therefore be minimally beneficial because it would not provide for additional opportunities to access and inspect the project site and facilities for compliance purposes.

Freshwater Mussels

Virginia DWR and Interior recommend that ensuring green floater populations can disperse to enhanced habitats below the project dam should be a protection, mitigation, and enhancement goal of the project. Virginia DWR further states that if dispersal cannot be achieved, additional PM&E measures should be considered that directly benefit green floater.

Staff Analysis

Virginia DWR and Interior's recommendation lacks specificity as to how green floater dispersal could be enhanced; nor does Virginia DWR identify or recommend specific measures that would benefit green floater. Due to this lack of details, staff are unable to analyze the potential effects of these recommendations.

As described above in section 3.3.1.1, *Affected Environment, Freshwater Mussels*, the only freshwater mussel species found in the immediate project vicinity was purple wartyback, which were observed downstream of the bypassed reach. Under Aquenergy's proposal to continue operating the project in a ROR mode, there would continue to be minimal modification of the downstream hydrologic regime, as outflow from the project would continue to approximate project inflow. As such, continuing to operate the project in this manner would not be expected to result in any adverse effects on mussel populations downstream of the project, including purple wartyback.

Eastern Hellbender

Although eastern hellbender are not federally listed, they remain a species of interest to both Virginia DWR and FWS because of their status as a special concern and Tier I(a) (highest conservation concern) species in Virginia, and their recent federal candidacy for listing under the ESA that led FWS to propose at least one distinct population segment as federally endangered (in Missouri). The eastern hellbender was found at two locations in the project area; one upstream of the project dam, in the impoundment, and one downstream of the project dam, below the bypassed reach.

Interior recommends, under section 10(j) of the FPA, continued consultation with FWS regarding eastern hellbender should this species' status change.

Staff Analysis

Because Aquenergy proposes to continue operating the project in a ROR mode, with minimal fluctuation of water levels in the impoundment and minimal disruption to the downstream hydrologic regime, conditions in the impoundment and downstream of the bypassed reach are not expected to change. During complete station outages, which should be infrequent in nature, Aquenergy's proposal to maintain the impoundment within 0.2 foot of the dam crest would ensure the continuity of downstream flow during such events because spill would occur quickly (within 12 minutes of a complete outage), thereby limiting the possibility of de-watering of downstream habitats in which eastern hellbender may occur (i.e., downstream of the bypassed reach). Moreover, eastern hellbender was not found in the bypassed reach, nor did Carey et al. (2017) identify the bypassed reach as an area containing suitable habitat based on its substrate composition. Therefore, continuing to operate the Fries Project, as proposed by Aquenergy and specified by Virginia DEQ, would not be expected to negatively affect any eastern hellbenders present in the project area. However, future consultation under the ESA could be required if any proposed license amendments would affect federally listed species (i.e., should eastern hellbender become federally listed).

3.3.2 Terrestrial Resources

3.3.2.1 Affected Environment

The Fries Project is located within the southern part of the Blue Ridge Mountains ecoregion and is characterized by a narrow strip of forested and well-dissected mountain ridges (Woods et al., 1999). The Blue Ridge Mountains ecoregion is underlain by metavolcanic, igneous, sedimentary, and metasedimentary rock and is dominated by a mix of Appalachian Oak Forest, Oak-Hickory-Pine Forest, and Northern Hardwood Forest in higher areas. The lands within the vicinity of the project are further described by Woods et al. (1999) as Interior Plateau, a subregion of the Blue Ridge Mountains

ecoregion, characterized as a high hilly plateau with scattered isolated knobs and historical predominance of Appalachian Oak Forest and Oak-Hickory-Pine Forest. Presently, upland habitat within the project area includes forests on steeper slopes and low-lying areas, interspersed with pastures and agricultural land that include dairy and livestock farms and apple orchards (Woods et al., 1999). The region supports a variety of wildlife associated with both northern and southern climate regimes.

Upland habitat within the project boundary includes: (1) limited vegetation along the project impoundment above an elevation of 2,188.27 feet, (2) two islands within the project impoundment totaling about 11 acres,[34] and (3) about 5 acres of open and forested land associated with the impoundment access area and project tailraces along the north bank of the river. Upland habitat in the project boundary is bounded by open water, roads and residential developed land, and scattered undeveloped habitats. Major habitat types include riparian shrub, early successional forest, mature forest, and maintained lawns near the project dam, powerhouse, proposed impoundment access area and access road, and within the project's transmission line right-of-way.

Wetlands

According to the FWS National Wetlands Inventory (NWI), open water and riverine habitats of the New River are the primary wetland resources within the project boundary. The majority of wetland habitat within the project boundary is classified as riverine, unknown perennial, unconsolidated bottom, and permanently flooded (R5UBH). A 2.69-acre area near the island upstream of the dam is classified as riverine, unknown perennial, unconsolidated shore, and seasonally flooded (R5USC). Lastly, a 1.84-acre freshwater pond is present south of the midpoint of the impoundment, and is classified as impounded, permanently flooded, palustrine habitat with an unconsolidated bottom (PUBHh).

Wildlife

Wildlife species expected within the project area include those tolerant of human development and activity (e.g., raccoon, Virginia opossum, eastern cottontail rabbit, gray fox, red fox, gray squirrel, and various passerine bird species), game species such as white-tailed deer, species associated with forest habitat (i.e., black bear, wild turkey, ruffed grouse, ground squirrel, fox squirrel, bobcat, and wood thrush), species associated with open habitat (i.e., quail, mourning dove, and American woodcock), and species that would use aquatic habitat within the New River (i.e., American beaver, common muskrat, and common mink).

[34] Acreage estimated by staff from aerial imagery.

Rare and State-listed Species

Bald eagle

The bald eagle (*Haliaeetus leucocephalus*) is protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, which prohibit the "take" of eagle eggs, nests, and offspring, as well as activities that substantially disturb normal breeding and feeding behaviors, except as permitted by regulation.

Bald eagles typically forage over water and other open habitats and nest in mature trees and snags and on cliffs, rocks, and artificial structures, generally within 1 mile of water. Nesting activity generally occurs from December through July in Virginia.[35]

Bald eagles have been observed foraging in the project's tailwaters.[36] Interior's March 27, 2020, letter states that bald eagle nests have been observed in the project area, and that bald eagles likely forage and roost within the project boundary. According to the Cornell Lab of Ornithology's eBird database, individual adult bald eagles have been observed in the Town of Fries about 0.4 mile east of the project dam during the breeding season (from December through July) across years 2012 to 2020.

3.3.2.2 Environmental Effects

In SD2, Commission staff identified, as potential terrestrial resource issues, the effects of: (1) vegetation maintenance and management on wildlife and botanical resources; and (2) the construction of proposed recreation enhancements on wildlife and botanical resources.

The Commission did not receive substantive comments regarding the effects on terrestrial resources from vegetation management or construction related to the proposed recreation enhancements. However, because Interior recommends measures to minimize project effects on bald eagle activity in the project area, we analyze below, the effects of project maintenance and the proposed recreation enhancements on bald eagles.

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[35] https://dwr.virginia.gov/wp-content/uploads/virginia-bald-eagle-guidelines-for-landowners.pdf

[36] *See* Table E5-16 of the license application.

Effects of project maintenance and proposed recreation enhancements on bald eagles

Aquenergy's proposed recreation enhancements include upgrades to the access road, installation of signage, construction of a gravel parking area, a vehicle turn-around, boat launch, and canoe-portage path. Also, Aquenergy proposes to continue maintaining the project, primarily by mowing open areas, removing fallen trees, and other routine maintenance practices.[37]

Under section 10(j), Interior recommends that Aquenergy consult with FWS to avoid bald eagle disturbance associated with project-related construction and maintenance in the event that bald eagles are documented at the project. Interior recommends that Aquenergy follow FWS's National Bald Eagle Management Guidelines.[38] These guidelines provide general recommendations on avoiding or minimizing project-related disturbance of bald eagle nesting, roosting, and foraging.

Staff Analysis

Bald eagles are known to forage in the project's tailwaters, have been observed about 0.4 mile downstream of the project during the breeding season, and their nests have been observed in the project area. If bald eagles establish nests or roosts within the project boundary, ground disturbance associated with the proposed recreation enhancements and routine maintenance of the project (primarily mowing) may disturb bald eagle nests or roosts. Consulting with FWS to avoid disturbance or other impacts to bald eagles associated with the project and implementing actions consistent with those specified in FWS's National Bald Eagle Management Guidelines, would minimize project effects on bald eagles.

3.3.3 Threatened and Endangered Species

3.3.3.1 Affected Environment

According to FWS's IPaC system, there are five federally listed terrestrial species that are known or have the potential to occur in Grayson County, Virginia, where the Fries Project is located, including the: (1) endangered Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), (2) endangered Indiana bat (*Myotis sodalis*), (3)

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[37] *See* draft Recreation Management Plan filed as Appendix E-5 of the license application.

[38] http://www.fws.gov/northeast/EcologicalServices/eagle.html

threatened northern long-eared bat (*Myotis septentrionalis*), (4) endangered spruce-fir moss spider (*Microhexura montivaga*), and (5) endangered Roan Mountain bluet (*Hedyotis purpurea var. montana*). No critical habitat for any federally listed threatened and endangered species occurs within project-affected lands.[39]

Carolina Northern Flying Squirrel

The Carolina northern flying squirrel, a subspecies of the northern flying squirrel, was listed as endangered by FWS on July 1, 1985 (FWS, 2020a). A recovery plan was issued for the subspecies on September 24, 1990, and FWS determined that designating critical habitat was not prudent (FWS, 2019a). Carolina flying squirrel is a small nocturnal gliding species that is approximately 10 to 12 inches in total length and 3 to 5 ounces in weight (FWS, 2020a).

The Carolina northern flying squirrel has a patchy distribution in the southern U.S. as it is restricted to rugged, high elevation forests. Preferred habitats include conifer and mixed conifer-hardwood forests with boreal characteristics, but deciduous and riparian woods may also be utilized. Optimal conditions include cool, moist, mature forest, especially areas with older red spruce and abundant standing and down snags. They are active throughout the year and occupy tree cavities, leaf nests, and underground burrows (NatureServe, 2020a). The limited and discontinuous range of this subspecies in the Southern Appalachians makes it vulnerable to a number of threats (FWS, 2019a) including the loss of cool, wet mountaintop habitats due to climate change, destruction and fragmentation of habitats, and impacts to forest trees from insect infestations such as the balsam woolly adelgid (*Adelges piceae*), a nonnative insect pest (FWS, 1998; NatureServe, 2020a).

Indiana Bat

The Indiana bat was listed as endangered by FWS on March 11, 1967 (FWS, 2020b). Critical habitat for the Indiana bat was designated on September 24, 1976 and consists of eleven caves and two mines in six states. The original recovery plan for the species was published in 1983 and a revised version was released in 2007.

The Indiana bat is a temperate, insectivorous, migratory species that hibernates colonially in limestone and sandstone caves, cliff lines, and abandoned mine shafts from October through April. The non-hibernation season (April 1 through November 15) includes spring emergence and migration, summer reproduction in maternity roosts, and fall migration, swarming, and mating. In summer, most reproductive Indiana bat females occupy roost sites under the exfoliating bark of large, often dead, trees (typically greater than 5 inches diameter at breast height) that retain large, thick slabs of peeling bark. Primary roosts usually receive direct sunlight for more than half the day. Roost trees are

[39] Commission staff's August 15, 2019 SD2 and July 16, 2020 memorandum.

typically within canopy gaps in a forest, in a fence line, or along a wooded edge. Habitats in which maternity roosts occur include riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities. Indiana bats typically forage for flying insects along river and lake shorelines, in the crowns of trees in floodplains, and in upland forests (FWS, 2018). Indiana bats typically forage in semi-open to closed (open understory) forested habitats, forest edges, and riparian areas (FWS, 2007). Most populations hibernate in a relatively small number of caves, making the species particularly vulnerable to disturbances within those systems (NatureServe, 2020b). Ongoing threats to this species include human disturbance during hibernation, loss of mature trees for roosting due to deforestation, and mortality from white-nose syndrome, a fungal infection currently affecting many bat species.

Northern Long-eared Bat

The northern long-eared bat was listed as threatened by FWS on May 4, 2015 (FWS, 2015a). A recovery plan was not issued for this species and FWS determined on April 27, 2016, that it was not prudent to designate critical habitat (FWS, 2020c). The northern long-eared bat is a medium-sized bat species with a body length of 3 to 3.7 inches, wingspan of 9 to 10 inches, and longer ears than other species in the *Myotis* genus (FWS, 2015a).

The northern long-eared bat ranges across 37 states, including most of the central and eastern United States as well as the southern and central provinces of Canada, coinciding with the greatest abundance of forested areas. The species is insectivorous and found in a variety of forested habitats in the summer season. During this time, bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. In the fall season, northern long-eared bats leave their forest habitats to hibernate in caves, mines, and similar habitat. Bats arrive at hibernacula between August and September, enter hibernation during October and November, and emerge during March and April. During the winter, small groups 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, although hibernation has also been observed in buildings, railroad tunnels, and other man-made structures. Hibernacula and surrounding forest habitats play important roles in the life cycle of the species beyond the time when bats are overwintering, including for fall-swarming[40] and spring-staging[41] activities.

[40] Fall-swarming occurs between summer and winter hibernation and provides opportunities for: introduction of juveniles to potential hibernacula, copulation, and gathering at stop-over sites on migratory pathways between summer and winter regions.

Reproduction is limited to one pup per year in late spring and, as such, populations can be slow to rebound from mortality events. The primary threat to this species is white-nose syndrome[42] which was first observed in New York state in 2006 and has since spread beyond the Northeast and into the Midwest and Southeast (FWS, 2015b). Other threats include impacts to hibernacula and loss or degradation of summer habitat.

On January 14, 2016, FWS issued a final 4(d) rule that prohibits the following activities in areas of the country impacted by white-nose syndrome: incidental take within a hibernation site; tree removal within 0.25 mile of a known, occupied hibernaculum; and cutting or destroying known occupied maternity roost trees, or any other trees within 150 feet of that maternity roost tree, during the pup-rearing season (June 1 through July 31) (FWS, 2016a). On January 5, 2016, FWS developed an optional streamlined consultation framework that allows federal agencies to rely on a programmatic biological opinion on FWS's final 4(d) rule to fulfill section 7(a)(2) consultation requirements for northern long-eared bat (FWS, 2016b).[43]

Spruce-fir Moss Spider

The spruce-fir moss spider was listed as endangered by FWS on February 6, 1995 (FWS, 2020d). A recovery plan was issued for the species on September 11, 1998, and critical habitat was designated in North Carolina and Tennessee on July 6, 2001.

This small spider species occurs across several southern Appalachian states and is limited to a small number of high-mountain peaks in southwest Virginia (FWS, 2019b). It is largely found in fir and spruce-fir forests over 5,400 feet in elevation and on slopes

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[41] Spring-staging occurs between winter hibernation and migration to summer habitat and allows bats to gradually emerge from hibernation to feed and then re-enter the same or alternative hibernacula to resume daily bouts of torpor (short-term hibernation).

[42] White-nose syndrome is the main threat to the northern long-eared bat and has caused precipitous declines (in many cases, 90 to 100 percent) where the disease occurs.

[43] FWS developed a key to help federal agencies determine if they can rely on the streamlined section 7 consultation in the 4(d) rule or if their actions may cause prohibited incidental take requiring separate section 7 consultation (FWS, 2016c). It considers whether the federal action: (1) may affect northern long-eared bats; (2) involves the purposeful take of northern long-eared bats; (3) is located inside the white-nose syndrome zone; (4) will occur within a hibernaculum or alter the entrance/environment of a hibernaculum; (5) involves tree removal; (6) involves the removal of hazardous trees; and (7) includes (a) the removal of an occupied maternity roost tree or any trees within 150 feet of a known occupied roost tree from June 1 through July 31, or (b) the removal of any trees within 0.25 mile of a hibernaculum at any time of year.

with northern aspects and is restricted to small areas of damp but well-drained moss mats growing on rocks and boulders in well-shaded areas within forests. Little is known about the diet of this species, but it is known to be very sensitive to desiccation and, as such, needs moist moss-mat microhabitat. Primary threats include damage or destruction of moss mats and surrounding vegetation, which can cause losses of entire populations, as well as loss of suitable moss habitat due to the decline of the Fraser Fir (*Abies fraseri*) by the infestation of the balsam woolly adelgid (FWS, 1998; NatureServe, 2020c).

Roan Mountain Bluet

The Roan Mountain bluet was listed as endangered by FWS on April 5, 1990 (FWS, 2020e). A recovery plan was issued on May 13, 1996, although no critical habitat has been designated for the species since its listing. It is a short clumped perennial herbaceous plant in the bedstraw family that is easily distinguished from other bluets by its relatively large reddish-purple funnel-shaped flowers, small oval leaves, and compact growth form that reaches approximately 8 inches in height (Weakley, 2012; FWS, 2017). Roan Mountain bluet occurs at high elevation rocky summits and grassy balds (between 4,600 and 6,200 feet) with thin, gravelly soils or embedded rocks (Weakley, 2012). Threats include commercial, residential, and recreational development at privately owned sites and trampling of populations at accessible cliff or trail-side locations on public lands (FWS, 2017).

3.3.3.2 Environmental Effects

Aquenergy proposes to expand the project boundary on the north bank of the New River that staff estimates would add about 5.5 acres of land in the northern end of the project boundary. This proposed expansion includes the impoundment access area for proposed recreation enhancements (e.g., upgrades to the access road, installation of signage, construction of a gravel parking area, vehicle turn-around, boat launch, and canoe-portage path).

Aquenergy does not propose any protective measures associated with threatened and endangered species. By letter filed on March 27, 2020, Interior states that no species listed under the ESA are known to occur within the Fries Project area.

Staff Analysis

Although FWS's IPaC system identifies five federally listed species as potentially occurring in Grayson County, Virginia where the Fries Project is located,[44] Interior states that no species listed under the ESA are known to occur within the Fries Project area.

[44] *See* Commission staff's August 15, 2019, SD2 and July 16, 2020 memorandum.

Three of the species (Carolina northern flying squirrel, spruce-fir moss spider, and Roan Mountain bluet) are typically found in habitats (i.e., high-altitude peaks with spruce-fir forests or rocky-outcrops) that are not present at the project; as such, these species would not be expected to occur at the Fries Project.

Regarding listed bats, the Fries Project is located within the range of the Indiana bat and northern long-eared bat. Limited forested habitat[45] is present at the project that could provide suitable summer roosting and feeding habitat for listed bats. However, there are no maternity roost trees or hibernacula documented at the project. Further, Aquenergy indicated to staff on the December 5, 2018 site visit during project scoping that no tree clearing is expected during construction of Aquenergy's proposed recreation enhancements. Lastly, routine project maintenance would not be expected to affect forested habitat, as the project transmission line corridor is sited in open land.

For these reasons, we conclude that relicensing the Fries Project would have no effect on the Carolina northern flying squirrel, spruce-fir moss spider, Roan Mountain bluet, Indiana bat, and northern long-eared bat. Therefore, no further consultation under the ESA is required regarding these five species.

3.3.4 Recreation Resources

3.3.4.1 Affected Environment

Local and Regional Recreation Opportunities

Recreation opportunities in Grayson County include golf, hiking, hunting, biking, cross country skiing, fishing, bird watching, boating, swimming, horseback riding, ziplines, and agritourism experiences. Grayson County offers multiple trails, state parks, nature preserves, and a national forest within 50 miles of the project (figure 8).

[45] Staff estimates, based on aerial imagery, that forested habitat within the project boundary includes: an approximately 3-acre forested corridor along Route 94 in Aquenergy's proposed project boundary; two islands (approximately 5 and 6 acres, respectively) within the project impoundment that have some forested habitat; and some individual trees within open areas in the project boundary.

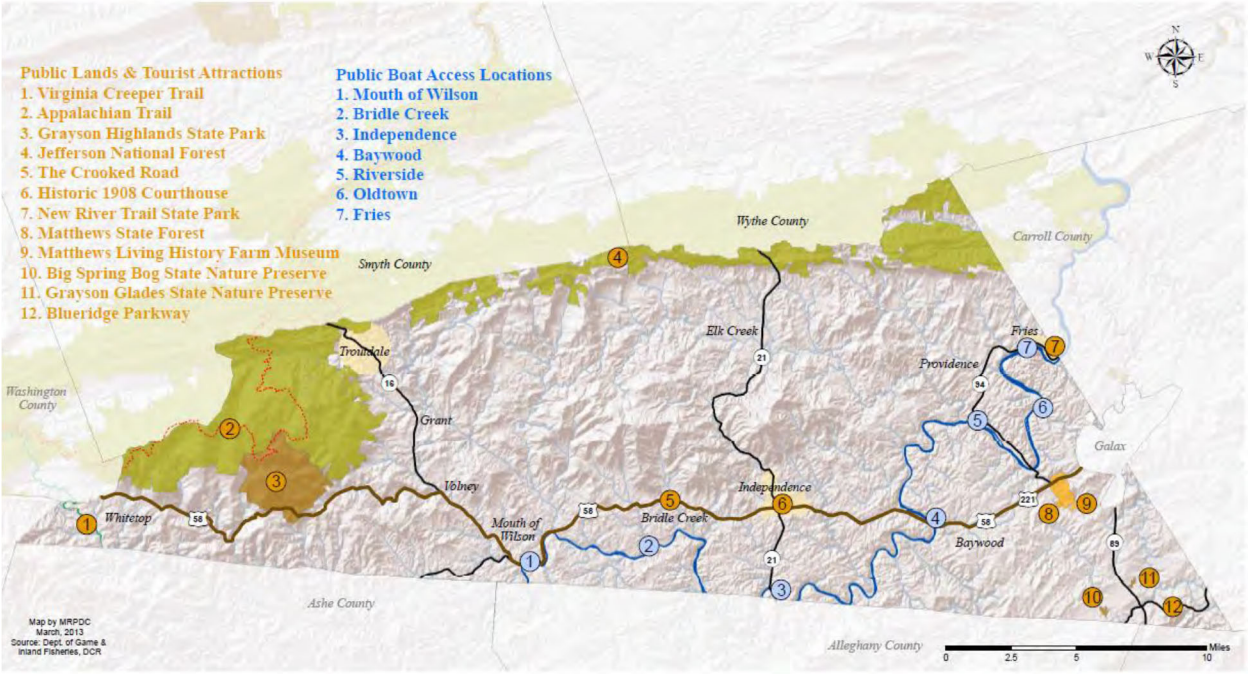

Figure 8. Public lands, tourist attractions, and public boat access locations in Grayson County, Virginia (Source: license application).

Grayson County is home to the New River Trail State Park, Grayson Highlands State Park, and the Matthews State Forest. The New River Trail State Park is a 57-mile linear park that starts in the Town of Fries, just below Fries Dam and follows an abandoned railroad right-of-way. The park parallels the New River for 39 miles and passes through four counties and the city of Galax. Grayson Highlands State Park, near Mount Rogers and Whitetop Mountain (Virginia's two highest mountains), offers scenic views from alpine-like peaks more than 5,000 feet high. Facilities at the park include a visitor center, campgrounds, and hiking trails leading to waterfalls and overlooks. Scenic horse trails and a horse camping area with electric and water hookups, stables, and parking for trailers are available. The park provides year-round access to the Appalachian Trail and the Virginia Highlands Horse Trail. Matthews State Forest, which includes approximately 1 mile of nature trails, takes visitors through a labeled section of forest that introduces common resident trees such as white pine, white oak, black birch, and American beech.

Recreation access sites in the immediate vicinity of the project include the Fries New River Trail Boat Launch, the Fries Town Park, and the Town of Fries Tailwater Access Area (figure 9). The Fries New River Trail Boat Launch is a non-project recreation site that is owned and maintained by Virginia DWR. The boat ramp is located approximately 0.5 mile downstream of the Fries Dam on river left off Route 94 at Fries Town Park. Fries Town Park is a non-project recreation site that is owned and maintained by the Town of Fries; it is located on the northern banks (river left) of the New River. In addition to the Virginia DWR boat ramp, park facilities include

playground equipment, a stage, and plentiful views of the river. Various events are held at the park during the year, including the Festival by the River every September.

A portion of Fries Town Park extends upstream towards the project powerhouses to where town property abuts the old mill property, which is privately owned by Fries Investments, LLC. The Town of Fries maintains ownership of a narrow strip of property along the river shoreline immediately downstream of the powerhouses (figure 9). This strip of property lies between the river and the old mill property retaining wall and is available for public recreation, which includes the Town of Fries Tailwater Access Area. This area provides recreation access to the project tailwaters for anglers and for launching canoes and kayaks.

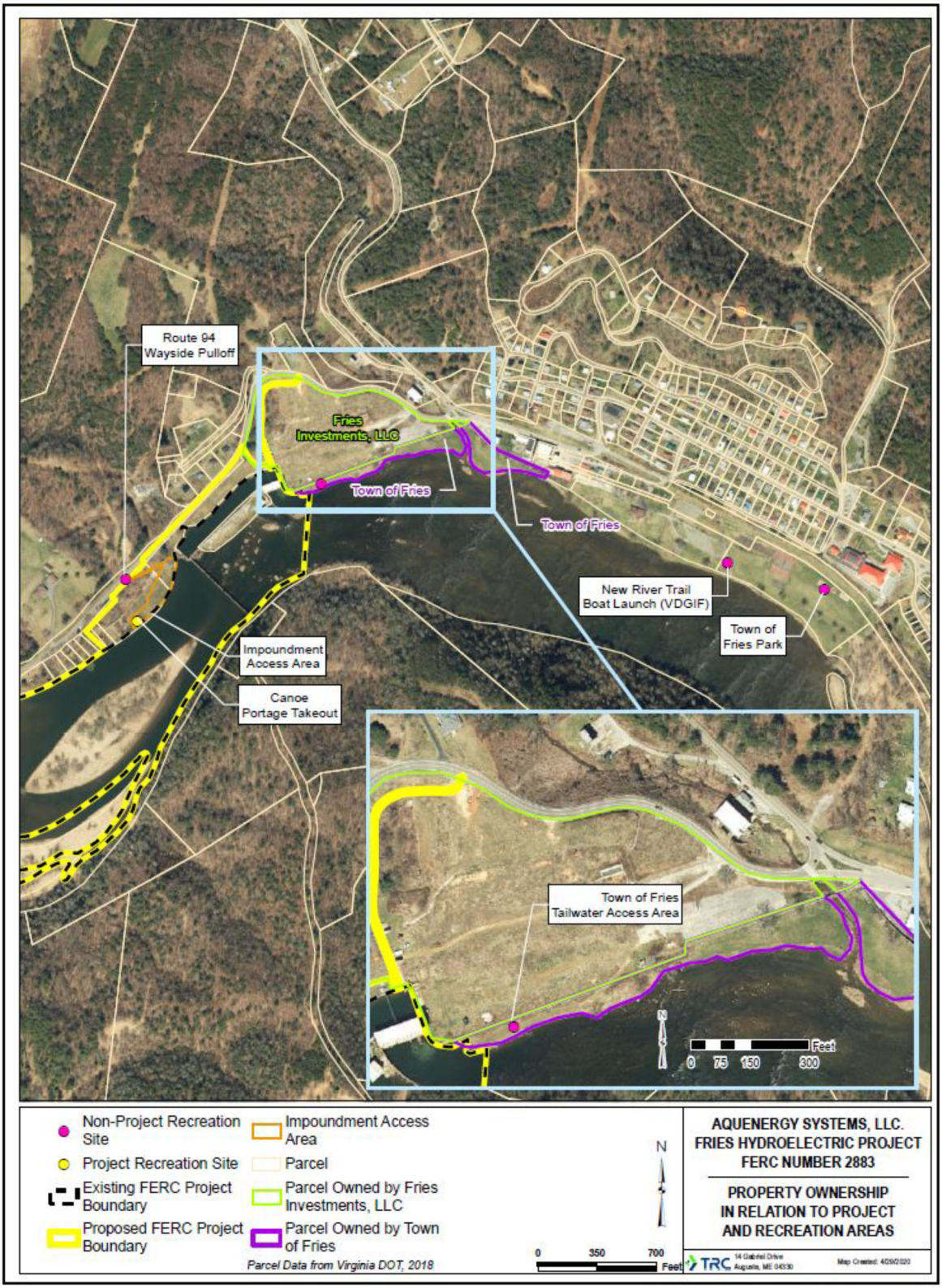

Figure 9. Project and non-project recreation sites (Source: REA reply comments)

Project Recreation

The impoundment access area is a project recreation site that provides access to the impoundment for anglers and carry-in boats and serves as the take-out location for the canoe portage trail. The impoundment access area is located approximately 450 feet upstream of the dam, on the northern shoreline (river left). Parking is provided near the road at the Route 94 wayside parking area. Pedestrian access to the site is open via a gated gravel access road that descends into the impoundment access area and ends near the shoreline. At the upstream-most end of the impoundment access area, a small, informal take-out site is provided for hand-carried boats. Other than signage, there are no formal facilities or amenities at this site.

Aquenergy installs a seasonal boat barrier just downstream of the canoe portage trail across the left channel to the island. The existing canoe portage trail begins at the upstream end of the impoundment access area, leads up the gravel access road, follows along the shoulder of Route 94 into the Fries Town Park, and ends at the New River Trail Boat Launch. Users travel approximately one mile either by foot or vehicle along the canoe portage trail in order to re-enter the river below the project and continue downstream (figure 9).

Recreation Use

Aquenergy conducted a recreation study to determine recreation use and evaluate recreation facilities near the project. Aquenergy staff recorded observations of recreational use between April 27, 2017 and September 30, 2017 at the impoundment access area, the bypassed reach, and the tailwater area downstream to the Fries Town Park. Spot counts taken at varying times of day and night included the number of people recreating and the activities observed (fishing, kayaking, etc.). During the observation period, a total of 1,209 people was observed recreating at the project; of those, 834 people were counted on weekdays and 375 people on weekend days. Of the total number observed recreating, 228 people were in the impoundment access area (19 percent of total use), and 981 people were downstream of the dam in the tailwater or bypassed reach (81 percent of total use).

The most frequently observed activity at the project was fishing (from a boat and from shore) accounting for 175 people or 77 percent of use at the impoundment access area and 877 people or 89 percent of use at the tailwater area. The remaining 23 percent of use at the impoundment access area included camping (12 percent), sightseeing (2 percent), watching fireworks (8 percent), and taking pictures (1 percent). The remaining 11 percent of use at the tailwater area included camping (5 percent), sightseeing (2 percent), wading (2 percent), watching fireworks (2 percent), and kayaking (1 percent).

There were no observations of use along the canoe portage trail during the study. The observations conducted for the study indicated that most recreation use occurs downstream of the dam in the tailwater or bypassed reach.

The second component of the recreation study evaluated the condition of the impoundment access area and sites that provide access to the project. The recreation site evaluation was conducted as a working group with interested stakeholders including Virginia DWR, the Town of Fries and Grayson County representatives, commercial recreation outfitters, adjacent residents, and members of the public. The collaborative effort included three meetings (two in-person meetings and one teleconference). The first meeting was held at the Fries Project on June 21, 2017; participants toured the recreation sites and then reconvened at the Fries Community Center to discuss their observations.

Multiple issues regarding the impoundment access area were discussed. The access road from the Route 94 wayside parking area to the impoundment was described to be in poor condition and in need of improvement. Concern was raised that the lower end of the access road puts people and vehicles at the edge of the impoundment and very close to the project's intakes. The discussion centered on the need for a barrier or fencing to prevent people and vehicles from entering the impoundment too close to the intakes. The grassy area that the access road leads to was thought to be sufficiently level and large enough to create a parking area and turnaround for vehicles near the impoundment. Discussions about the left channel barrier highlighted the need for a barrier on the upstream end of the right channel of the impoundment, as well as signage directing boaters to the left channel. Additional recommendations for improving the impoundment access area included enhancing the informal canoe launch with a gravel-based launch site and adding picnic tables and trash receptacles.

Alternatives to the existing canoe portage route were also discussed at the meeting. Currently, more than half of the approximately one-mile-long canoe portage trail is along the shoulder of Route 94 and close to fast-moving traffic. Two options could potentially reduce the length of the roadside portion from around 2,500 feet to 650 feet. One option would bring the trail between the Route 94 guardrail and the project fence (off of the shoulder); a second option would bring the portage inside the existing project fence and would require the installation of a new fence to safeguard and enclose the project facilities. Both options would require slope modification and/or land contouring to create a level portage surface. This would be necessary due to the presence of a ravine and the steeply sloped hillsides between the shoulder of the road and the project. At the end of this section, the portage trail would lead to the old mill steps above the powerhouse down to the powerhouse parking lot. The group concluded that from the parking lot, the best options to reach the river would need to cross private property and acknowledged that both options would require permission from the private landowner, Fries Investments, LLC. One option would include bringing the trail immediately to the river just downstream of the powerhouses to the Town of Fries Tailrace Access Area.

This option would reduce the length of the canoe portage trail by more than half. The second option would cross a larger swath of Fries Investments, LLC property that parallels the river until reaching the upstream edge of Fries Town Park (figure 10). This option would create a canoe portage trail that was 0.5 mile long. Aquenergy stated that it would contact the private landowner to discuss allowing public access across its property.

The second meeting was held via teleconference on July 19, 2017 and was used to discuss initial concepts for enhancing the impoundment access area and canoe portage trail. Aquenergy explained that contact was initiated with Gus Hill of Fries Investments, LLC regarding the potential for canoe portage trail access across his property. Mr. Hill mentioned plans to develop the property into a campground and expressed interest in accommodating public access. The final meeting was held on September 6, 2017 at the Fries Community Center; Aquenergy shared its conceptual plans for improvements to the impoundment access area and noted that continued efforts to contact Mr. Hill about potential canoe portage trail enhancements utilizing his land had been unsuccessful.

3.3.4.2 Environmental Effects

Aquenergy proposes to improve the impoundment access area by: (1) upgrading the condition of the existing gravel access road by creating a smooth surface void of existing ruts and patches of grass; (2) adding a new gravel turnaround and parking area for five cars at the base of the access road that can accommodate truck/trailer combinations and provides direct access to the impoundment; (3) installing a boulder vehicle barrier around the parking area to prevent any vehicles from entering the impoundment; (4) adding picnic tables and trash receptacles; (5) improving the carry-in boat launch area by creating a graded, gravel entrance to the impoundment; (6) adding a boat barrier across the upper end of the right channel of the impoundment to direct boaters to paddle towards the take-out provided in the left channel; and (7) adding signage (a) at the picnic area, (b) on the island to direct boaters to the left channel and take-out area, and (c) near the take-out area to discourage trespassing on the adjacent upstream property.

For the canoe portage enhancements, Aquenergy proposes to move a portion of the roadside canoe portage trail onto Aquenergy property inside the existing guardrail along Route 94. Aquenergy also proposes to continue working with the Town of Fries and the adjacent property owner to further pursue a route modification around the dam to minimize the need for roadside portage on the shoulder of Route 94 and to shorten the distance users must travel to re-enter the river (figure 10).

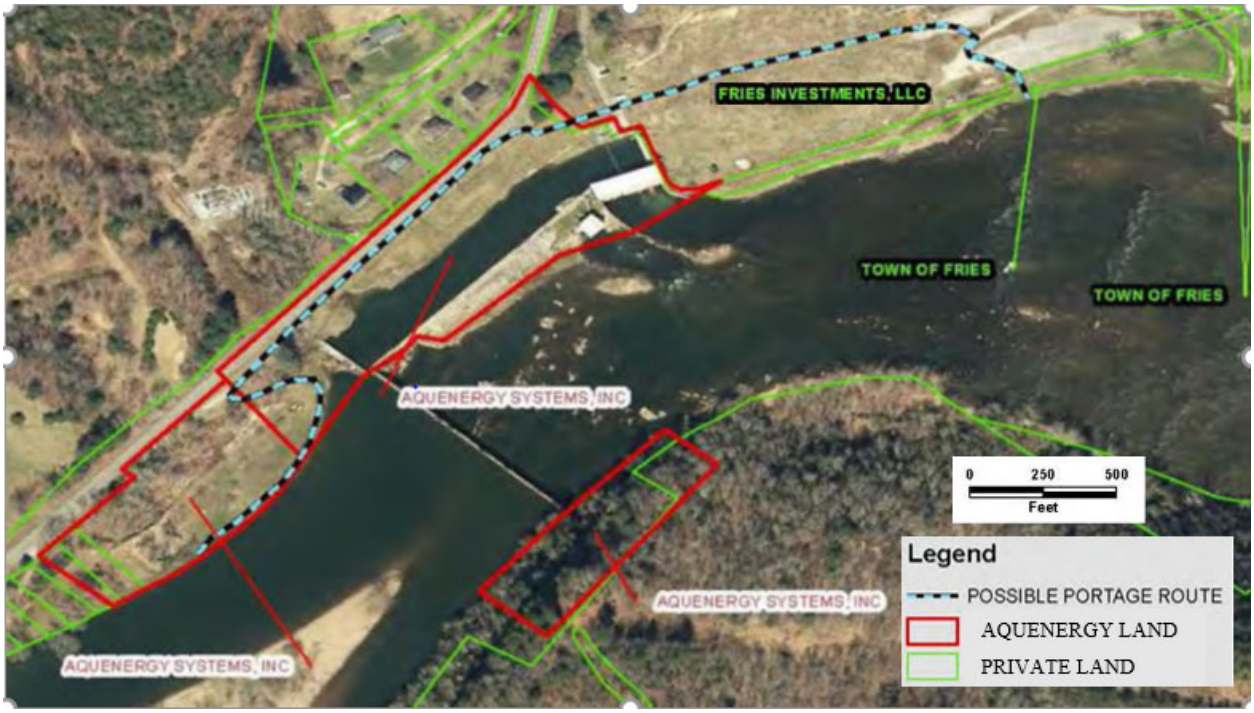

Figure 10. Proposed canoe portage route (Source: license application, as modified by staff).

Interior recommends that Aquenergy implement recreational improvements to facilitate downstream recreational access in the tailwater and bypassed reach, improve the existing canoe portage trail around Fries Dam, and develop a recreation management plan. Interior also states that with the known importance of recreation use in the tailwater, collaboration between the licensee, the private landowner, and the Town of Fries could improve tailwater and bypassed reach recreational access.

Virginia DWR recommends, under section 10(j) of the FPA, recreation enhancement measures to improve the canoe portage trail, enhance downstream recreational access to the tailwater and bypassed reach, and develop a recreation management plan. Virginia DWR also states that collaboration between the licensee, the private landowner, and the Town of Fries could improve tailwater and bypassed reach recreational access.

In its REA reply comments, Aquenergy states that communication with the private landowner adjacent to the tailwater area, where a canoe portage trail would improve access, has been intermittent during the relicensing process. Aquenergy states that until the landowner is willing to work with them to create a canoe portage trail, there are no other feasible alternatives to the licensee's proposed modifications to the existing portage trail. Aquenergy plans to continue its efforts to work with the private landowner to improve the existing portage trail and would update the recreation management plan if its efforts succeed.

Aquenergy acknowledges that fishing in the tailwater and bypassed reach is the most popular recreation activity at the project; however, it states there is no direct access to the project tailwater from the powerhouse area, or from elsewhere within the project boundary. Accessing the tailwater area downstream of the powerhouse requires crossing private property or walking upstream from West Main Street along a narrow riverside strip of land owned by the Town of Fries (figure 10). Aquenergy states that it does not own the existing tailrace access area but is willing to work with the Town of Fries to implement possible improvements to the tailwater fishing area and participate in joint management of the area going forward.

Aquenergy also notes in its reply comments that one reason it disagrees with Interior's minimum flow recommendation (discussed in section 3.3.1) is that a significant increase in flows to the bypassed reach (e.g., in excess of 1,000 cfs during the spring, *see* table 1) could limit tailwater recreation use and make conditions more dangerous for wading and boating anglers compared to current use supported by leakage flows and backwatering due to the downstream hydraulic control.

Staff Analysis

Aquenergy's proposed enhancements at the impoundment access area would provide a more formal recreation area than currently exists. The improvements should create an appealing place for the public to recreate and potentially increase recreation use at the impoundment access area. The new gravel turnaround and parking area would provide safe, designated spots away from the road and closer to the impoundment, which would lessen the need for roadside parking along Route 94. The vehicle barrier around the parking area would prevent people and their automobiles from accidentally ending up in the impoundment. Providing picnic tables and trash bins would offer an opportunity for the public to relax and enjoy nature while having a meal and may entice the public to spend more time at the impoundment access area. Gravel and grade improvements to the carry-in boat launch area could reduce the steepness of the riverbank and provide improved footing/traction in order to create a manageable entry and exit area to the impoundment. Installing a boat barrier across the river-right channel, from the upstream end of the island to the river right shoreline, would direct boaters to the left channel and the canoe portage trail. The boat barrier would prevent boaters from paddling down the right channel towards the dam and missing the canoe portage trail on the river left channel. Installing additional signage and project information would educate the public about the area's recreational value and provide direction to and from the canoe portage trail.

Tailrace access below the project is provided by the Town of Fries via a long, narrow strip of land between the old mill foundation wall and the river. There are no formal facilities provided at the tailrace access area. Interior and Virginia DWR

expressed the need for enhancing downstream recreational access to the tailwater and bypassed reach but they did not provide specific measures. Without specific measures, staff cannot analyze Interior or Virginia DWR's recommendation. Aquenergy has stated its willingness to work with the Town of Fries to improve access at this site; however, no tailrace enhancement measures are proposed by the licensee. Collaboration among Aquenergy, the Town of Fries, Interior, and Virginia DWR could result in additional recreation facilities that would improve existing conditions at the tailrace access area.

The canoe portage trail improvements proposed by Aquenergy would bring the roadside portion that bypasses the dam and headrace canal onto Aquenergy-owned land, inside the Route 94 guardrail. Interior and Virginia DWR support the licensee's efforts to improve the canoe portage trail. By bringing the canoe portage trail inside the Route 94 guardrail onto Aquenergy property, the licensee is providing an improvement in safety for recreational boaters who walk along the canoe portage trail. If the adjacent property owner agrees to grant Aquenergy access for the canoe portage trail across its property, the trail could be shortened by nearly half a mile. However, discussions with the private landowner have not resulted in an agreement to allow crossing the adjacent property. If Aquenergy's continued attempts to improve the canoe portage trail are successful, the results could be a significantly shorter, improved (non-roadside) trail for users wishing to continue down river.

An increase in bypassed reach flows as recommended by Interior could reduce angler use due to swift currents and less than ideal conditions for angling whether from shore, wading, or in a boat. It is also possible that such an increase in bypassed reach flows could reduce angling success and angler safety in the tailrace. Over 80 percent of recreation use has been observed in the tailrace and bypassed reach, which suggests that angling success is quite good there under current conditions. Furthermore, as described in section 3.3.1.2, there didn't appear to be any overall benefit of increased flows to centrarchid populations, which include important game fish such as smallmouth bass.

3.3.5 Cultural Resources

3.3.5.1 Affected Environment

Section 106 of the NHPA requires that the Commission take into account the effects of its actions on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking.[46] Historic

[46] An undertaking means "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license, or approval." 36 CFR §

properties are those that are listed or eligible for listing in the National Register. The regulations implementing section 106 of the NHPA also require that the Commission seek concurrence with the SHPO on any finding involving effects or no effects on historic properties and consult with interested Indian tribes or Native Hawaiian organizations that attach religious or cultural significance to historic properties that may be affected by an undertaking. In this document, we also use the term "cultural resources" for properties that have not been determined eligible for listing in the National Register. Cultural resources represent things, structures, places, or archaeological sites that can be either prehistoric or historic in origin. In most cases, cultural resources less than 50 years old are not considered historic.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed license within a project's APE. The APE is determined in consultation with the SHPO and is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.[47] The APE for the project is defined as all lands within the project boundary and any lands outside the project boundary where cultural resources may be affected by project-related activities that are conducted in accordance with the license. On April 17, 2018, Aquenergy requested a section 106 review of the project from the Virginia SHPO. To date, no response has been received by Aquenergy.

Tribal Consultation

By letter issued December 30, 2013, the Commission initiated tribal consultation with the Cherokee Nation, Eastern Band of Cherokee Indians, United Keetowah Band of Cherokee Indians in Oklahoma, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Shawnee Tribe, and Tuscarora Nation of New York. Additional letters initiating tribal consultation were issued on December 14, 2017 to the Delaware Nation and on June 25, 2019 to the Pamunkey Indian Tribe and the Monacan Indian Nation. Responses were received from the Eastern Shawnee Tribe of Oklahoma, Tuscarora Nation of New York, and Delaware Nation indicating they should be notified of any unanticipated archaeological discoveries. In a letter filed January 2, 2019, the Cherokee Nation expressed its interest in acting as a consulting party to the relicensing process. The Cherokee Nation recommended that a cultural resources survey be conducted and requested a copy of the final report.

800.16(y). Here, the undertaking is the potential issuance of a new license for the Fries Project.

[47] 36 CFR § 800.16(d).

Additional tribes consulted during relicensing by Aquenergy include the Catawba Indian Nation, United Keetowah Band of Cherokee Indians in Oklahoma, Tuscarora Nation of North Carolina, Oneida Indian Nation, and Delaware Tribe of Indians. No tribes identified any traditional cultural properties during consultation.

History of the Region

The Town of Fries was named for Colonel Francis Fries of Salem, North Carolina. He realized that even though the area was remote, it had great possibilities as a mill location because of its location on the New River. After Colonel Fries purchased the land, a dam was built at Bartlett Falls on the New River. Construction began in April of 1901, and by the end of 1902, a 41-foot-high dam, powerhouse, houses, a company commissary, post office, and other necessary business structures brought the Town of Fries to life. The layout of the town followed the basic design tenets for mill villages, with streets laid out in a rough grid accommodating 300 original worker houses on the steep northeastern bank of the New River. In February 1903, a textile mill began operation. Power generated by the new dam and powerhouse were used to operate the mill, which provided hydro-mechanical power to run the mill machinery.

The mill building structure, which has been demolished, was located near the Fries Dam at the north end of town. Overlooking the dam and mill were a handful of larger dwellings, originally inhabited by the mill management. Main Street, the primary commercial thoroughfare and home of the former Washington Hotel, and Railroad Avenue ran south from the mill, roughly paralleling the river, and are nearest to the river. Near the center of town, adjacent to both Main Street and the residential area, is the Lyceum, built in 1910, which is now the town hall. Further uphill to the east, located roughly in the center of town, are two company-built boarding houses with broad lawns that face the Lyceum.

The Town of Fries grew through much of the 20th century, but like many other mill towns, production declined after World War II, and the textile mill ceased operation in 1989. A new penstock, tailrace channel, and powerhouse (unit 4 powerhouse), which enclosed a new hydroelectric generator, were constructed at the Fries Dam following the issuance of the original license in 1980. During construction of the powerhouse, approximately 0.18 acre of land was cleared of vegetation and replaced with fill. In addition, nearly 885 cubic yards of bedrock and river rock were excavated to provide a foundation for the unit 4 powerhouse. After construction, a riprap rock wall was constructed between the unit 4 powerhouse and the streambed.

3.3.5.2 Environmental Effects

Project-related effects on cultural resources within the APE can result from modifications to project facilities or project operation; project-related ground-disturbing activities; construction, modification, or maintenance of project recreation facilities and use of such facilities by visitors; project-induced shoreline erosion;[48] and vandalism. Current project operation is not affecting cultural resources within the APE. Aquenergy is not proposing to modify project operation or conduct any project-related land-clearing or land-disturbing activities within the APE that would impact any archaeological site, historic cemetery, or architectural resource, or area that has been identified as having moderate to high potential for containing archaeological sites. However, continued operation and maintenance of the project, including ground-disturbing activities that may be needed in the future, have the potential to affect undiscovered historic and archaeological resources during the term of any new license issued for the project. Any adverse effects must be resolved in consultation with the Virginia SHPO.

Aquenergy determined that four historic sites listed on the National Register were within approximately 33 feet of the APE. One historic site includes former railways (now trails) and is part of the New River Trail Park Historic District; the other three sites are houses and buildings that are part of the Fries Historic District. Aquenergy states that no archaeological sites listed or eligible for listing in the National Register were identified in the vicinity of the project.

Staff Analysis

Neither the Virginia SHPO nor any Native American tribes identified any concerns with relicensing the project. On June 8, 2018 the Commission issued a notice that set July 29, 2018 as the deadline for filing study requests. On December 27, 2018, the Cherokee Nation requested a cultural resources study, but did not provide a justification of the need for a cultural resources study. Despite missing the deadline for filing study requests, the Cherokee Nation did not explain why Aquenergy needed to conduct a study, nor did the tribe identify the potential for culturally significant items to be present in the project area. In addition, the Virginia SHPO did not express a need for a cultural resources study, nor did staff identify any information gaps or substantial reasons for the study to be completed. Current operation does not affect cultural resources and no archaeological resources were discovered in the APE; therefore, relicensing the project would have no effect on known cultural or archaeological resources.

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[48] Project-induced shoreline erosion does not include shoreline erosion attributable to flood flows or natural phenomena, such as wind-driven wave action, erodible soils, and loss of vegetation due to natural causes.

The possibility remains that during the term of any license issued, archaeological or cultural resources could be discovered during project-related activities that require ground disturbance. To ensure the proper treatment of any potential archaeological or cultural resources that may be encountered during the term of the license, it would be reasonable for Aquenergy to notify the Commission and the Virginia SHPO and discontinue all ground-disturbing activities until it can be determined whether any measures are needed.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate as it has in the past. None of the licensee's proposed measures or the resource agencies' recommendations would be required. Recreation access would not be enhanced at the project, nor would the licensee be required to develop a water quality monitoring plan to further evaluate water quality in the bypassed reach.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Fries Project's use of environmental resources for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[49] 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 project's 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 (i.e., for 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 PROJECT

Table 6 summarizes the assumptions and economic information we use in our analysis based on information, except as noted, provided by Aquenergy in its license application 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: taxes costs, net investment (the total investment in power plant facilities remaining to be depreciated), relicensing cost, and normal operation and maintenance cost.

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[49] *See Mead Corp.*, *Publ'g Paper Div.,* 72 FERC ¶ 61,027 (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 6. Parameters for the economic analysis of the Fries Project (Source: Staff and Aquenergy).

Economic Parameter	Value
Period of economic analysis (years)[a]	30
Term of financing (years)[a]	20
Federal tax rate (percent)[a]	21
Local tax rate (percent)[a]	3
Interest rate (percent)[a]	8
Discount rate (percent)[b]	8
Net investment ($)[c]	904,200
Annual operation & maintenance cost ($)[c]	484,010
Relicensing cost ($)[c]	348,840
Dependable capacity (MW)[b]	2.34
Energy rate ($/MWh)[d]	23.33
Capacity rate ($/kW-year)[d]	159.7

[a] Assumed by staff.

[b] Provided by Aquenergy.

[c] Values provided by Aquenergy in 2018 dollars were converted to 2020 dollars using the United States Department of Labor Consumer Price Index.

[d] Source: Energy Information Administration's Annual Energy Outlook 2020 at http://www.eia.gov/outlooks/aeo/index.cfm. The energy rate includes ancillary services values.

4.2 COMPARISON OF ALTERNATIVES

The expected authorized installed capacity of the project is 5.1 MW.[50] Table 7 summarizes the installed capacity, annual generation, annual cost of alternative power, annual estimated total project cost, and difference between the annual cost of alternative power and annual project cost for each of the alternatives considered in this EA: no action, Aquenergy's proposal, and the staff alternative.

[50] Pursuant to the section 11.1(i) of the Commission's regulations, the authorized installed capacity differs from the capacity authorized in the current license (5.213 MW) because the latter value was based on the generator ratings alone.

Table 7. Summary of the annual cost of alternative power and annual project cost for four alternatives for the Fries Project (Source: Staff).

	No-Action Alternative	Aquenergy's Proposal	Staff Alternative
Installed capacity (MW)	5.1	5.1	5.1
Annual generation (MWh)	26,150	26,150	26,150
Dependable capacity (MW)	2.34	2.34	2.34
Annual cost of alternative power ($) ($/MWh)	983,760 37.62	983,760 37.62	983,760 37.62
Annual project cost ($) ($/MWh)	672,840 25.73	726,190 27.77	726,970 27.80
Difference between cost of alternative power and project cost ($) ($/MWh)	310,920 11.89	257,570 9.85	256,790 9.82

4.2.1 No-action Alternative

Under the no-action alternative, the Fries Project would continue to operate as it does now. The project would have an installed capacity of 5.1 MW and generate an average of 26,150 MWh of electricity annually. The average annual cost of alternative power would be $983,760, or about $37.62/MWh. The average annual project cost of producing this power, including operation and maintenance costs and taxes, would be $672,840, or about $25.73/MWh. Overall, the project would produce power at a cost that is $310,920 or $11.89/MWh, less than the cost of alternative power.

4.2.2 Aquenergy's Proposal

Under Aquenergy's proposal, the project would continue to operate with an installed capacity of 5.1 MW and would have an average annual generation of 26,150 MWh. The average annual cost of alternative power would be $983,760, or about $37.62/MWh. The average annual project cost would be $726,190, or about $27.77/MWh. Overall, the project would produce power at a cost that is $257,570, or $9.85/MWh, less than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative has the same capacity and energy attributes as Aquenergy's proposal. Appendix D shows the staff-recommended additions, deletions, and modifications to Aquenergy's proposed environmental protection and enhancement measures and the estimated cost of each.

Based on a total installed capacity of 5.1 MW and an average annual generation of 26,150 MWh, the cost of alternative power would be $983,760, or about $37.62/MWh. The average annual project cost would be $726,970, or about $27.80/MWh. Overall, the project would produce power at a cost that is $256,790, or $9.82/MWh, less than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Appendix D presents the cost of each of the environmental enhancement measures considered in our analysis. All costs are in 2020 dollars. 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.

5.0 CONCLUSIONS 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 the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the Fries Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our evaluation of the environmental and economic effects of the proposed action and its alternatives, the staff alternative is the preferred alternative for the Fries Project. We recommend this alternative because: (1) issuing a new license for the project would allow Aquenergy to continue to operate the project and provide a beneficial and dependable source of electric energy; (2) generation from the Fries Project, with an installed capacity of 5.1 MW of electric capacity, comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance aquatic, terrestrial, and recreation resources at the project.

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

5.1.1 Measures Proposed by the Applicant

Based on our environmental analysis of Aquenergy's proposal in section 3.0, and the costs discussed in section 4.0, we conclude the following operation and environmental measures proposed by Aquenergy would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend including the following measures in any new license issued for the Fries Project:

- Continue operating the project in a ROR mode such that outflow from the project approximates inflow and the project impoundment is maintained within 0.2 foot of the top of the spillway crest during normal project operation; and

- Implement a recreation management plan that includes measures to improve: (1) the impoundment access area including access road improvements, a gravel turn-around area with parking spaces, vehicle barrier, carry-in boat access, two picnic tables, two trash receptacles, a right-channel boat barrier, and directional signage; and (2) the canoe portage trail.

5.1.2 Additional Staff-Recommended Measures

Under the staff alternative, the project would be operated with Aquenergy's proposed measures identified above, all certification conditions described in section 2.2.3, *Modifications to Applicant's Proposal – Mandatory Conditions*, and the following staff-recommended additions or modifications:

- Develop and implement an operation compliance monitoring plan that incorporates the provisions of Aquenergy's proposed project operation plan and the project operation, monitoring, and reporting plan required by the certification (conditions I.D.3, I.E.1, I.E.2, I.E.3, and I.E.4); and also contains procedures for the annual reporting of monitoring data (e.g., continuously recorded impoundment elevations) to the Commission for the purposes of determining compliance with the operational requirements of any new license issued for the project.

- If bald eagles establish nests or roosts at the project, consult with FWS prior to any project-related disturbance (e.g., trimming or removal of trees) in proximity to active nests or roosts to determine appropriate measures (if any) to implement from FWS's National Bald Eagle Management Guidelines.

- Consult with the Virginia SHPO if previously unidentified cultural resources are encountered during the term of any new license issued for the project to ensure the proper treatment of these resources and discontinue all ground-disturbing activities until the proper treatment of the resources is established.

Below we discuss the basis for our staff-recommended measures and the rationale for modifying Aquenergy's proposal.

Project Operation and Impoundment Levels

Aquenergy proposes to continue operating the project as it currently does, in a ROR mode, with outflow from the project approximating inflow, and the impoundment maintained within 0.2 foot of the top of the spillway crest. In addition to ensuring a stable impoundment elevation, operating the project in a ROR mode and maintaining the impoundment within 0.2 foot of the spillway crest, as proposed by Aquenergy, would allow the project to start spilling shortly after any project outages. Based on staff's analysis in section 3.3.1.2, if the impoundment is 0.2 foot below the spillway crest at the time of a complete station outage (i.e., with no flow through the turbines), spillage into the bypassed reach would occur in less than 12 minutes. In section 3.3.1.2, staff concluded that because complete station outages should be infrequent, the impacts of such events would be short-lived, and because no immobile species of concern (e.g., freshwater mussels) were found in the side channel where partial dewatering was observed during the July 12, 2017 flow disruption event, project outages are unlikely to adversely affect downstream aquatic resources. Therefore, we recommend Aquenergy's proposed ROR mode of operation and impoundment levels. There are no incremental costs associated with this measure because it reflects Aquenergy's current mode of project operation.

Water Quality Monitoring Plan

Certification condition I.D.4 would require Aquenergy to develop a water quality monitoring plan, in consultation with Virginia DEQ, for the collection of additional water quality data (water temperature and DO) in the project's bypassed reach. Because of Aquenergy's inability to conduct water quality monitoring under normal project operations in the summer of 2019 when the project was inoperable, developing a water quality monitoring plan in consultation with Virginia DEQ would have the benefit of supplementing the existing water quality information gathered in 2016 and 2017 with more rigorous data collected in the bypassed reach during normal project operation to identify any project-related adverse effects on water temperature and DO relative to levels specified by current state standards. The Commission could use the results from these additional monitoring efforts to identify the need for additional measures to mitigate any adverse water quality effects in the bypassed reach caused by project operation. We estimate that the levelized annual cost to develop and implement a water quality monitoring plan would be $705 and conclude that the benefits of the plan would outweigh the costs.

Operation Compliance Monitoring Plan

As discussed in section 3.3.1.2, Aquenergy's proposed project operation plan and the project operation, monitoring, and reporting plan required by the certification (conditions I.D.3, I.E.1, I.E.2, I.E.3, and I.E.4) contain provisions for monitoring

parameters (e.g., impoundment elevation) necessary to determine compliance with the operational requirements (e.g., ROR operation and impoundment levels) of any new license issued for the project. However, the plans do not contain provisions for reporting this monitoring data to the Commission on a routine basis, which is necessary for compliance purposes. Therefore, developing and implementing an operation compliance monitoring plan that includes the monitoring provisions from Aquenergy's proposed project operation plan and the project operation, monitoring, and reporting plan required by the certification, as well as procedures for reporting monitoring data to the Commission (e.g., on an annual basis), would ensure that all operation requirements for the protection and enhancement of aquatic resources are being met. We estimate that the levelized annual cost to develop and implement an operation compliance monitoring plan would be $470 and conclude that the benefits of the plan would outweigh the costs.

Bald Eagle protection

Interior recommends, under section 10(j), that if bald eagles establish nests or roosts at the project, Aquenergy consult with FWS to avoid disturbance or other impacts to bald eagles or determine whether an incidental take permit is necessary, and follow FWS's National Bald Eagle Management Guidelines to minimize effects to this species. Bald eagles are present during the breeding season within 0.4 mile of the project, are known to forage at the project, nest in the project area, and could establish nests or roosts at the project in the future. Interior's recommendation would help minimize project-related effects on bald eagles, such as disturbance from trimming or removing trees, or noise from maintenance or construction activities, through consultation during the term of any new license issued for the Fries Project. Therefore, we recommend Interior's measures for consulting with FWS on measures consistent with those stipulated in the National Bald Eagle Management Guidelines for protecting bald eagles, in the event that bald eagles establish and occupy nests and/or roosts at the project. Such measures, including keeping distance between maintenance and construction activities and any nests or roosts, avoiding noise or visual disturbances during the breeding season, and avoiding cutting or removal of overstory trees in proximity to a nest, constitute standard routine operation and maintenance actions, and therefore, would require minimal to no incremental effort or cost to implement..

Recreation Enhancements

Aquenergy proposes the following recreation enhancements at the impoundment access area: (1) upgrades to the existing gravel access road; (2) a new gravel turnaround and parking area for five cars; (3) a boulder vehicle barrier around the parking area; (4) two picnic tables and trash receptacles; (5) an improved gravel-based carry-in boat launch area; (6) the addition of a boat barrier across the upper end of the right channel of the impoundment; and (7) signage at (a) the picnic area, (b) on the island, to direct boaters to the left channel and take-out area, and (c) to discourage trespassing on the

adjacent upstream property. Aquenergy also proposes to improve the canoe portage trail across its existing property. Each of these measures would enhance recreation opportunities that currently exist at the project. Improving the gravel access road and creating a parking area and turnaround would allow recreation users to safely access the impoundment rather than parking on Route 94 and walking down an uneven gravel road. Providing picnic tables and trash receptacles invites the public to stay longer by enjoying a meal outdoors while taking in the views. Improving access at the boat launch/portage trail take-out area benefits all users wishing to access the impoundment. An information kiosk and signage can help educate the public on local river and recreation issues as well as safety concerns, all of which can benefit the user and the recreation provider. Improvements to the portage trail would provide a clearly marked path with a wider, more even surface for the public to safely portage with their canoe or kayak around the dam. We estimate that the annual levelized cost of a recreation management plan implementing these measures would be $21,065 and conclude that the benefits of these measures outweigh the costs.

Cultural Resources Protection

Archaeological or historic sites could be discovered during land-disturbing activities associated with project operation and maintenance over the term of a license. Therefore, we recommend that Aquenergy notify the Commission and the Virginia SHPO if previously unidentified archaeological or historic resources are discovered during the term of any new license issued for the project. In the event of any such discovery, Aquenergy should discontinue any ground-disturbing activities until the need for treatment of the archaeological or historic resource is established.

5.1.3 Measures Not Recommended by Staff

Minimum Flows in the Bypassed Reach

Aquenergy proposes to continue operating the project as it currently does, with no minimum flow in the bypassed reach, which currently receives 10 cfs of leakage and remains watered (with an average depth of 4 feet) even when there is no spill, due to the presence of a downstream hydraulic control, as described in sections 3.3.1.1 and 3.3.1.2. Interior recommends, under section 10(j), that Aquenergy releases into the bypassed reach the monthly 95 percent exceedance flows for the protection and enhancement of fish, mussels, and other aquatic resources, such as eastern hellbender. As discussed in section 3.3.1.2, no freshwater mussels were observed in the bypassed reach during mussel surveys, and eastern hellbender have not been documented from the bypassed reach, which contains suboptimal habitat for this species (slow-moving pool habitats with a minimal prey base). Thus, Interior's recommended minimum flow regime would be expected to have minimal benefits, if any, for freshwater mussels or eastern hellbender. As described in section 3.3.1.1, the fish community in the bypassed reach is dominated

by centrarchids, including redbreast sunfish, rock bass, and smallmouth bass, which is a popular game species that provides recreational angling opportunities in the bypassed reach under current project operation (no minimum flows beyond leakage). There would be little change in water depths in the bypassed reach under Interior's minimum flow regime compared to existing conditions, but water velocities would increase. This increase in velocity could enhance the feeding success of smallmouth bass, but potentially reduce the spawning and reproductive success of all three species analyzed (smallmouth bass, redbreast sunfish, and rock bass). Therefore, the minimal benefits of Interior's recommended minimum flow regime to mussels, eastern hellbender, and feeding success of smallmouth bass would not outweigh the levelized annual cost of $185,350 and the adverse effects on the spawning and reproduction of smallmouth bass, redbreast sunfish, and rock bass.

Impingement/entrainment

Interior recommends, under section 10(j), that Aquenergy develop and implement, in consultation with FWS, impingement/entrainment and turbine operation protocols that minimize fish mortality and mitigate for such impacts with flow and water quality enhancements of tailwater and downstream habitat areas. Based on staff's analysis in section 3.3.1.2, there is little risk of impingement at the project and turbine survival of the few species that are susceptible to entrainment (juvenile shiners and juvenile gizzard shad) would be high and exceed 90 percent. Therefore, we have no justification for recommending any impingement or entrainment mitigation measures.

Access to Project Site for Environmental Inspection

Interior recommended that the Fries Project shall at all times be subject to inspection by representatives of FWS in order to ensure compliance with any fish and wildlife PM&E measures that may be contained in any new license issued for the project.

The Commission's standard terms and conditions for a hydropower license require the licensee to provide employees of the U.S. Government access to project lands and works in performance of their official duties. This standard article would apply to site access for FWS employees and its designated representatives for inspection purposes. Therefore, there is no need for a separate article incorporating Interior's recommendation.

Green Floater Dispersal

Virginia DWR recommends that if green floater dispersal downstream of the project dam cannot be enhanced, that additional PM&E measures should be considered that directly benefit green floater. As discussed in sections 3.3.1.1 and 3.3.1.2, green floater was only observed well upstream of the project impoundment and not within any areas or waters affected by the operation of the project, such as the impoundment,

bypassed reach, or tailrace. Therefore, because project operation is not expected to affect the green floater, we have no basis for recommending any PM&E measures for this species.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Although adult fish can generally avoid involuntary entrainment or impingement due to their swimming ability, some entrainment mortality is likely unavoidable for juveniles, particularly weaker swimming species such as juvenile shiners and gizzard shad that have burst swimming speeds less than the project's maximum approach velocity of 1.5 fps. However, any entrained juveniles should experience relatively high turbine survival exceeding 90 percent. Therefore, we expect the long-term impact of entrainment would continue to have minimal consequences for the resident fish communities in the project area.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, a hydroelectric license issued by the Commission should include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or 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 January 29, 2020, notice soliciting comments, recommendations, terms and conditions, and prescriptions, Virginia DWR and Interior timely filed three and four 10(j) recommendations, respectively, for the project on March 27, 2020. Table 8 lists the recommendations filed subject to section 10(j) and indicates whether the recommendations are included under the staff 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 8. Analysis of fish and wildlife agency recommendations for the Fries Project (Source: staff).

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Recommend Adopting?
Release, as a minimum flow into the bypassed reach, the monthly 95 percent exceedance flows, to protect and enhance fish, mussels, and other aquatic resources, such as eastern hellbender. If gate configurations must be altered and automated to allow these minimum flows, such changes should be included as conditions in any new license issued for the project.	Interior	Yes	$185,350	No. See discussion below.
Develop and implement, in consultation with FWS, impingement/entrainment and turbine operation protocols that minimize fish mortality, which may be likely to occur based upon the licensee's turbine blade strike analysis. The impacts of such fish mortality shall be mitigated for through flow and water quality enhancements of tailwater and downstream habitats.	Interior	No. Measure lacks specificity with regard to what specific actions would meet the intent of the recommendation.	$0[a]	No
Continue to consult with FWS regarding eastern hellbender should this species' status change.	Interior	No. Consultation is an administrative matter, not a fish and wildlife measure.	$0[b]	Adopted to the extent that future consultation under the ESA could be required if any proposed license

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Recommend Adopting?
				amendments would affect federally listed species.
In the event that bald eagles are documented at or in the vicinity of the project, the licensee should consult with FWS in order to avoid disturbance or other impacts to this species or determine whether an incidental take permit is necessary.	Interior	No. Consultation is an administrative matter, not a fish and wildlife measure.	$0[b]	Yes
Examine the bypassed reach instream flow needs of biota, including water quality considerations and the needs of recreational users, to determine if leakage flow is adequate to protect beneficial instream uses as defined in section 62.1-44.3 of the Code of Virginia. As part of this recommendation, we support Interior's recommendation to use the 95 percent monthly exceedance flow from the long-term hydrologic record as a guideline for providing flows to protect fish and wildlife resources and recreational uses in the bypassed reach and downstream river.	Virginia DWR	No. This is a recommendation for a pre-licensing study that could have physically been done prior to license issuance; as such, it does not constitute a valid section 10(j) recommendation.	$0[a]	No. An analysis of bypassed reach flow needs has been provided in this EA.

Recommendation	Agency	Within the Scope of Section 10(j)	Levelized Annual Cost	Recommend Adopting?
Examine protection, mitigation, and enhancement measures (in addition to the proposed maintenance of impoundment levels within 0.2 foot of the spillway crest) for their potential to protect downstream fish and wildlife resources during potential dewatering events, including an examination of releasing supplemental flow from the headrace canal's side gates and managing canal water levels.	Virginia DWR	No. This is a recommendation for a pre-licensing study that could have physically been done prior to license issuance; as such, it does not constitute a valid section 10(j) recommendation.	$0[a]	No. An analysis of the need for fish and wildlife measures has been conducted in this EA.
Project recreation improvements should expand beyond the proposed focus on impoundment recreation improvements to include an improved canoe portage path and enhanced downstream recreational access in the vicinity of the tailwater and bypassed reach.	Virginia DWR	No. This is a recommendation to enhance recreation resources. Section 10(j) only applies to recommendations for fish and wildlife resources.	$0[a]	No

[a] Cost for this measure was not provided by the recommending agencies and a cost cannot be estimated by staff due to a lack of details.

[b] Staff did not assign a cost for this measure because it is a suggestion for consultation rather than a specific fish and wildlife protection measure.

Minimum Flows in the Bypassed Reach

We are making a preliminary determination that Interior's section 10(j) minimum flow recommendation (see table 8 above) is inconsistent with the comprehensive development and public interest standards of sections 10(a) and 4(e) of the FPA.

As discussed in section 3.3.1.2, releasing the 95 percent monthly exceedance flows into the bypassed reach, as recommended by Interior, would not be expected to benefit freshwater mussels or eastern hellbender, neither of which have been documented to occur in the bypassed reach. Moreover, staff's analysis indicates that releasing Interior's recommended minimum flows into the bypassed reach could reduce the reproductive success of centrarchids, which dominate this reach under existing project operation and include popular game species such as smallmouth bass that support recreational angling opportunities.

We concluded, in section 5.1.3 above, that the benefits associated with Interior's minimum flow would be minimal and not outweigh the levelized annual cost of the measure, which is $185,350, and the adverse effects on smallmouth bass, redbreast sunfish, and rock bass spawning and reproduction.

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 federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 10 qualifying comprehensive plans that are applicable to the Fries Project. No inconsistencies were found.

National Park Service. 1993. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.

Ohio River Basin Commission. 1977. Kanawha River Basin comprehensive coordinated joint plan. Cincinnati, Ohio. July 1977.

Ohio River Basin Fish Habitat Partnership. 2009. Ohio River Basin Fish Habitat Partnership Strategic Plan. Dublin, Ohio. December 2013.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C

Virginia Department of Conservation and Recreation. The 2007 Virginia outdoors plan (SCORP). Richmond, Virginia.

Virginia Department of Conservation and Historic Resources. n.d. Virginia's scenic rivers. Richmond, Virginia.

Virginia Department of Environmental Quality. 2015. Commonwealth of Virginia State Water Resources Plan. Richmond, Virginia. October 2015.

Virginia Department of Game and Inland Fisheries. 2017. Upper New River Walleye Management Plan 2017-2022. Blacksburg, VA.

Virginia State Water Control Board. 1986. Minimum instream flow study - final report. Annandale, Virginia. February 1986.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Fries Project is relicensed as proposed with the additional staff-recommended measures, the project would operate while providing enhancements and protective measures for aquatic, terrestrial, recreation, and cultural resources in the project area.

Based on our independent analysis, issuance of a license for the project, as proposed with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

7.0 LITERATURE CITED

The literature cited in this EA is presented as Appendix E.

8.0 LIST OF PREPARERS

The list of preparers of this EA is presented as Appendix F.

APPENDIX A

STATUTORY AND REGULATORY REQUIREMENTS

Federal Power Act

Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require the construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the U.S. Department of the Interior (Interior). Interior, by letter filed March 27, 2020, requests that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or 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 laws. 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 March 27, 2020, the Virginia Department of Wildlife Resources (Virginia DWR, formerly the Virginia Department of Game and Inland Fisheries) and Interior timely filed recommendations under section 10(j), as summarized in table 8, in section 5.3, *Fish and Wildlife Agency Recommendations*. In section 5.3, we also discuss how we address the agency recommendations and comply with section 10(j). Recommendations that were not filed pursuant to section 10(j) of the FPA are considered under section 10(a) of the FPA. We discuss these recommendations by resource area in sections 3 and 5 of this EA.

Section 10(a) Recommendations

Under section 10(a) of the FPA, each hydroelectric license issued by the Commission must be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes.

In addition to the recommendations Virginia DWR made under section 10(j), the agency also recommended that ensuring green floater[51] populations can disperse to enhanced habitats below the project dam should be a protection, mitigation, and enhancement goal of the project; that if dispersal cannot be achieved, additional measures should be considered that directly benefit green floater. Because this recommendation was not filed pursuant to section 10(j), we consider it herein under section 10(a) of the FPA. Interior filed two recommendations pursuant to section 10(a) including: (1) allowing employees from Interior's Fish and Wildlife Service (FWS) access to the project site for the purposes of environmental inspection; and (2) implementing several recreation enhancements at the project including improved tailwater access, canoe portage, and the development of a recreation management plan. We discuss section 10(a) recommendations by resource area in section 3 and provide our recommendations in section 5 of this EA.

Clean Water Act

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain either a water quality certification (certification) from the appropriate state pollution control agency verifying that any discharge from a project would comply with applicable provisions of the CWA or a waiver of certification by the appropriate state agency. The failure to act on a request for certification within a reasonable period of time, not to exceed one year, after receipt of such request constitutes a waiver.

On June 21, 2018, Aquenergy submitted an application to the Virginia Department of Environmental Quality (Virginia DEQ) for a section 401 certification for the Fries Project. Virginia DEQ confirmed it received the application on June 21, 2018.[52] Virginia DEQ issued the certification on June 19, 2019. The conditions of the certification are described in section 2.2.3, *Modifications to Applicant's Proposal – Mandatory Conditions*.

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[51] Green floater, *Lasmigona subviridis*, is a freshwater mussel species native to the New River Basin that is generally found in small to medium-sized streams with sand and gravel bottoms and low current. Most mussel species have a larval life stage (glochidia) that requires specific fish host species upon which the larvae attach (to the fish's gills) and develop (later dropping off the gills and settling to the bottom as juvenile mussels). However, the host species for green floater are unknown, and it is possible this species does not require a host fish.

[52] On September 25, 2019, Aquenergy filed a copy of the certification request and an email confirmation of receipt from Virginia DEQ.

Endangered Species Act

Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, 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. On July 15, 2020, Commission staff requested a species list for the project through FWS's Information for Planning and Consultation (IPaC) system, which indicated that five federally listed species: the endangered Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*), endangered Indiana bat (*Myotis sodalis*), threatened northern long-eared bat (*Myotis septentrionalis*), endangered spruce-fir moss spider (*Microhexura montivaga*), and endangered Roan Mountain bluet (*Hedyotis purpurea var. montana*), have the potential to occur within the project boundary.[53] However, in its letter filed on March 27, 2020, Interior states that no federally listed species are known to occur within the project area. There are no proposed or candidate species, or any proposed or designated critical habitats in the project area.

Our analysis of project effects on federally threatened and endangered species is presented in section 3.3.3, *Threatened and Endangered Species*, and our recommendations are included in section 5.1, *Comprehensive Development and Recommended Alternative*. Based on the available information, we conclude that relicensing the project would have no effect on: (1) the Carolina northern flying squirrel, spruce-fir moss spider, or Roan Mountain bluet, because no suitable habitat for these species is located at the project; and (2) Indiana and northern long-eared bats, because the proposed recreation enhancements and routine project maintenance would not be expected to result in the removal of forested habitat used by these species for summer roosting. Therefore, no further consultation under the ESA is required regarding these five species.

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 CZMA 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 6 months of its receipt of the applicant's certification.

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[53] The same five species contained in the IPaC list, *see* Commission staff's July 16, 2020 memorandum, were also referenced in Scoping Document 2 issued on August 15, 2019.

On December 2, 2019, Aquenergy filed Virginia DEQ's response to its inquiry of CZMA consistency. Virginia DEQ agreed that the project is not located within Virginia's designated coastal zone and stated that the proposed licensing activity would have no effect on the enforceable policies of the Virginia Coastal Zone Management (CZM) program. Therefore, the project is not subject to Virginia CZM program review and no consistency certification is needed.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA), 54 U.S.C. § 306108, 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).

Commission staff designated Aquenergy as its non-federal representative for the purposes of conducting section 106 consultation under the NHPA on August 6, 2015. Aquenergy consulted with the Virginia Department of Historic Resources, which serves as the State Historic Preservation Office (Virginia SHPO), to identify historic properties, determine National Register eligibility, and assess potential adverse effects on historic properties within the project's area of potential effects (APE). Four historic properties occur in the vicinity of the project (outside of the APE) and are listed on the National Register, including: the New River Trail State Park Historic District and three separate historic properties located in the Fries Historic District. The Virginia SHPO has not commented on the potential effects of project operation on cultural resources identified within the APE.

In Commission staff's review of the information related to section 106 that Aquenergy submitted to the Virginia SHPO, we find that continued operation of the project would not affect any cultural resources located near the project. However, any future discoveries of cultural or historic resources made by Aquenergy would require consultation with the Virginia SHPO to ensure appropriate protection measures are put in place.

APPENDIX B

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

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 covered by the non-power license. At this time, no agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and we have no basis for concluding that the Fries Project should no longer be used to produce power.

Federal Government Takeover

Federal takeover and operation of the Fries Project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

Project Decommissioning

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing in most cases.[54] Decommissioning can be accomplished in different ways depending on the project, its environment, and the particular resource needs.[55] For these reasons, 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 a participant in a relicensing proceeding

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[54] *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).

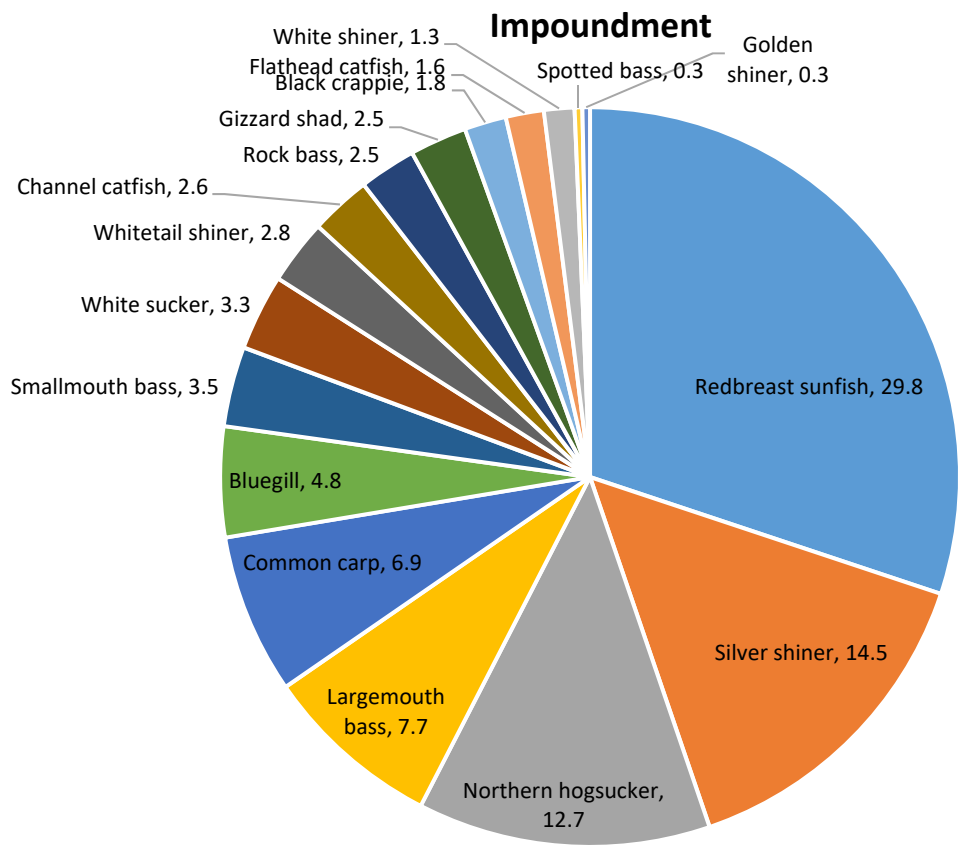
[55] In the unlikely event that the Commission denies relicensing a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R § 6.2 (2019). 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.

demonstrates that there are serious resource concerns that cannot be addressed with appropriate license measures and that make decommissioning a reasonable alternative.[56] Aquenergy does not propose decommissioning, nor does the record to date demonstrate there are serious resource concerns that cannot be mitigated if the project is relicensed; as such, there is no reason, at this time, to include decommissioning as a reasonable alternative to be evaluated and studied as part of staff's NEPA analysis.

[56] *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).

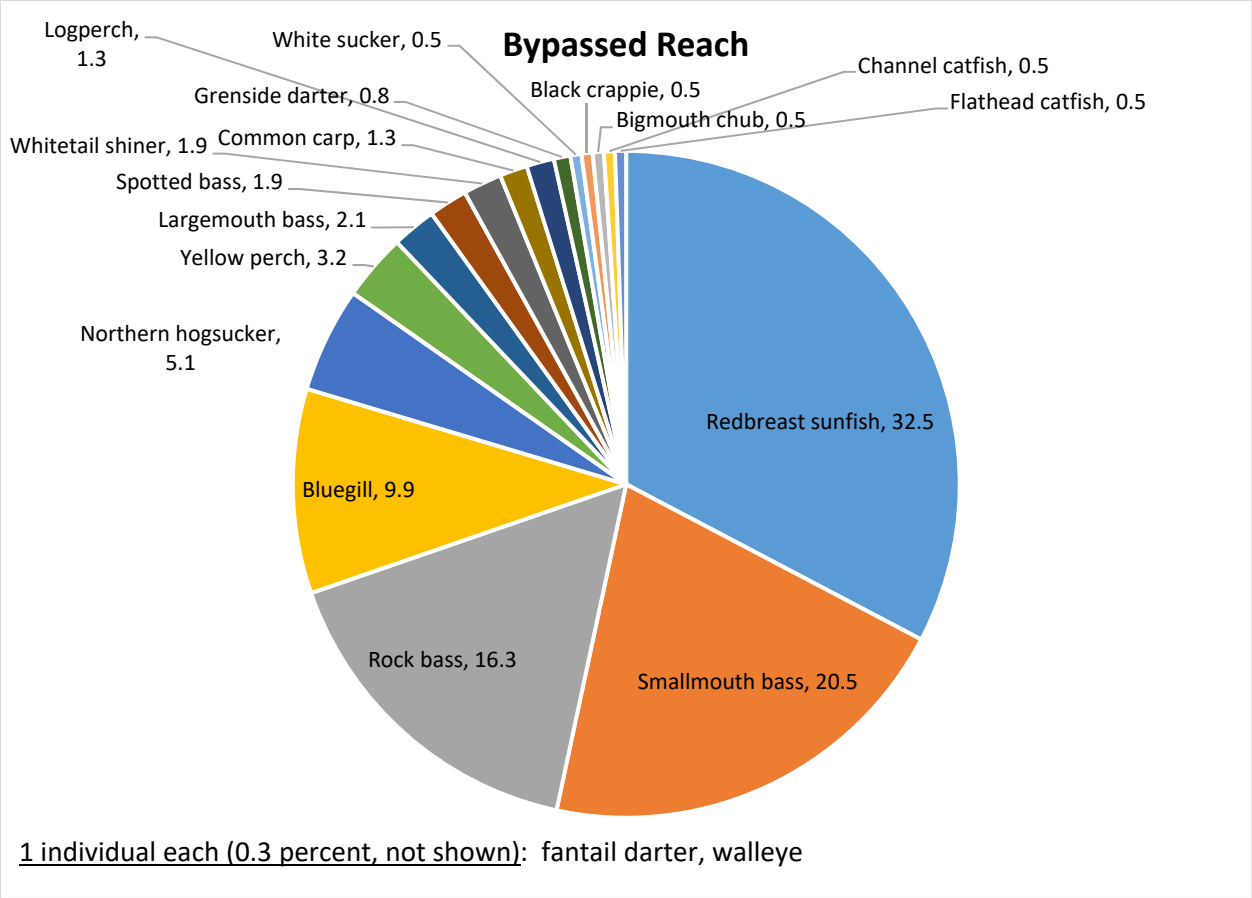
APPENDIX C

FISH COMMUNITY COMPOSITION

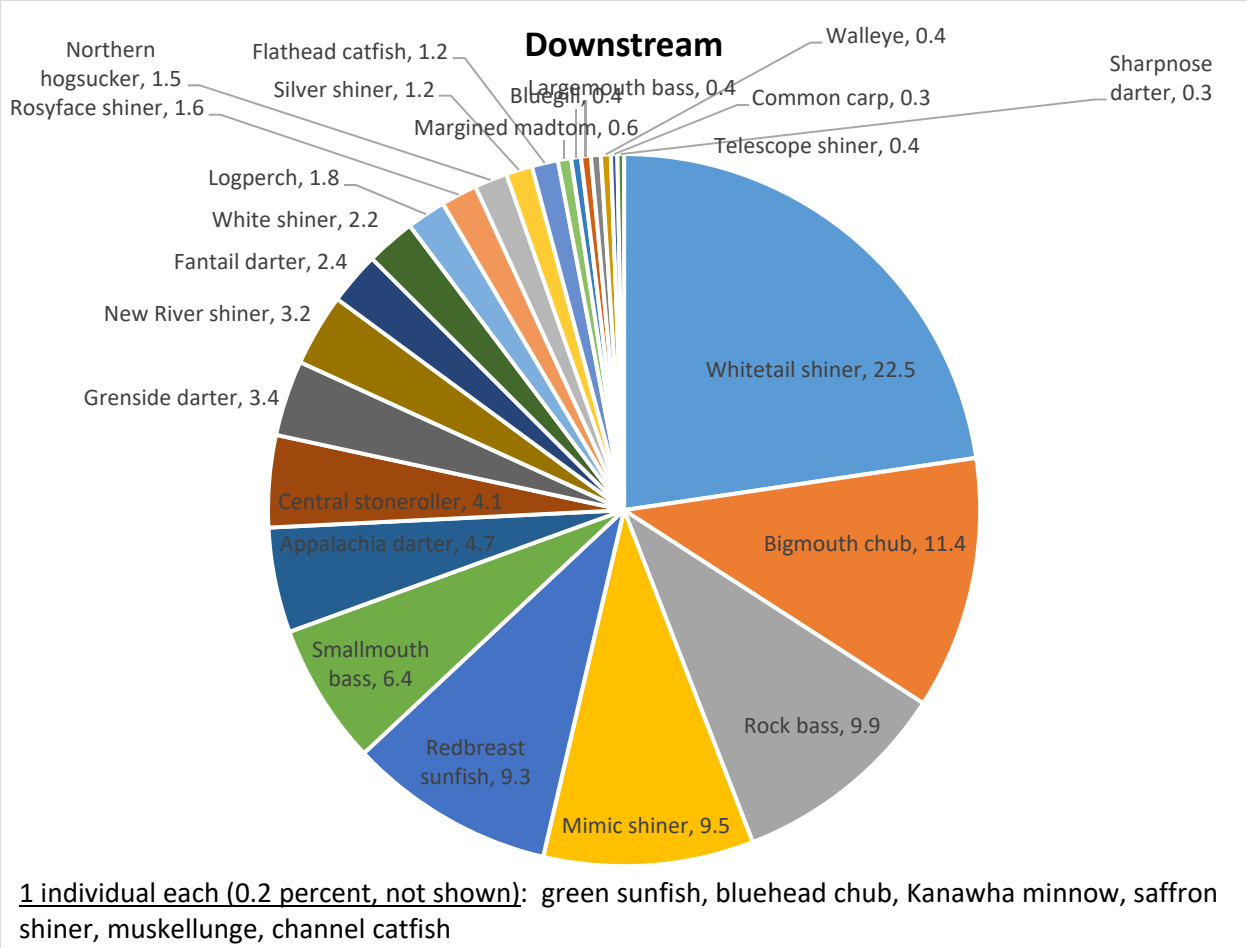


1 individual each (0.2 percent, not shown): pumpkinseed, bigmouth chub, rosyface shiner, swallowtail shiner, muskellunge, greenside darter

Fish species composition in the project impoundment. The values in the chart represent the number of each species captured as a percentage of all fish collected (a total of 607 individuals) across species, gear types (boat electrofishing, gill nets, and trotlines), and years (July through October 2016 and May through July 2017) in the project impoundment (Source: staff).



Fish species composition in the bypassed reach. The values in the chart represent the number of each species captured as a percentage of all fish collected (a total of 375 individuals) across species, gear types (raft and backpack electrofishing), and years (July through October 2016 and May through July 2017) in the bypassed reach (Source: staff).



Fish species composition downstream of the bypassed reach, including the tailrace area. The values in the chart represent the number of each species captured as a percentage of all fish collected (a total of 677 individuals) across species, gear types (raft and backpack electrofishing), and years (July through October 2016 and May through July 2017) (Source: staff).

APPENDIX D

COST OF ENVIRONMENTAL MEASURES

Enhancement / Mitigation Measure	Entity	Capital Cost[a]	Annual Cost[a]	Levelized Annual Cost[b]
Aquatic Resources				
Continue operating the project in a ROR mode such that outflow from the project approximates inflow and the project impoundment is maintained within 0.2 foot of the top of the spillway crest during normal project operation.	Aquenergy, Virginia DEQ, Staff	$0	$0	$0[c]
When necessary for either emergency or project maintenance purposes, the water level in the project impoundment may be lowered to 0.2 foot below the spillway crest.	Virginia DEQ, Staff	$0	$0	$0
Release a monthly minimum flow into the bypassed reach that corresponds to the 95 percent monthly exceedance flow.	Interior	$0	$234,620	$185,350[d]
Examine the bypassed reach instream flow needs of biota, including water quality considerations, and bypassed reach instream flow needs of recreational users, to determine if	Virginia DWR	$0	$0	$0[e]

Enhancement / Mitigation Measure	Entity	Capital Cost[a]	Annual Cost[a]	Levelized Annual Cost[b]
leakage flow is adequate to protect beneficial instream uses as defined in section 62.1-44.3 of the Code of Virginia.				
Develop and implement, in consultation with FWS, impingement/entrainment and turbine operation protocols that minimize fish mortality. The impacts of such mortality shall be mitigated for through flow and water quality enhancements of tailwater and downstream habitats.	Interior	$0	$0	$0[e]
Ensure that green floater populations can disperse to enhanced habitats downstream of the project dam. If dispersal cannot be achieved, additional measures should be considered that directly benefit green floater.	Virginia DWR, Interior	$0	$0	$0[e]
Develop and submit a water quality monitoring plan to Virginia DEQ for approval within one year of the effective date of any new license issued for the project (certification condition I.D.4).	Virginia DEQ, Staff	$7,650	$0	$705[d]
Develop and implement a project operation plan.	Aquenergy	$5,100	$0	$470

Enhancement / Mitigation Measure	Entity	Capital Cost[a]	Annual Cost[a]	Levelized Annual Cost[b]
Examine protection, mitigation, and enhancement measures (in addition to the proposed maintenance of impoundment levels within 0.2 foot of the spillway crest) for their potential to protect downstream fish and wildlife resources, including an examination of releasing supplemental flow from the headrace canal's side gates and managing canal water levels.	Virginia DWR	$0	$0	$0[e]
Develop and implement a project operation, monitoring, and reporting plan within one year of the effective date of any new license issued for the project (certification conditions I.D.3, I.E.1, I.E.2, I.E.3, and I.E.4).	Virginia DEQ	$5,100	$0	$470
Develop and implement an operation compliance monitoring plan that includes the provisions of Aquenergy's proposed project operation plan and certification conditions I.D.3, I.E.1, I.E.2, I.E.3, and I.E.4, as well as provisions for reporting monitoring data to the Commission to ensure compliance	Staff	$5,100	$0	$470[d]

Enhancement / Mitigation Measure	Entity	Capital Cost[a]	Annual Cost[a]	Levelized Annual Cost[b]
with project operation requirements of any new license issued for the project.				
The project shall at all times be subject to inspection by representatives of FWS in order to ensure compliance with any fish and wildlife PM&Es that may be contained in any license issued for the project.	Interior	$0	$0	$0[f]
Terrestrial Resources				
If bald eagles establish nests or roosts at the project, consult with FWS prior to conducting any project-related disturbance (e.g., trimming or removal of trees) in proximity to active nests or roosts to determine appropriate measures (if any) to implement from FWS's National Bald Eagle Management Guidelines.	Interior, Staff	$0	$0	$0
Recreation Resources				
Improvements to the impoundment access area: access road improvements, a gravel turn-around and 5-car parking	Aquenergy, Interior, Virginia DWR, Staff	$102,000	$10,200	$17,445

Enhancement / Mitigation Measure	Entity	Capital Cost[a]	Annual Cost[a]	Levelized Annual Cost[b]
area, carry-in boat access, picnic tables, trash receptacles, and signage.				
Improving the existing portage trail.	Aquenergy, Interior, Virginia DWR, Staff	$25,500	$1,020	$3,150
Prepare and implement a Recreation Management Plan.	Aquenergy, Interior, Virginia DWR, Staff	$5,100	$0	$470

[a] Unless otherwise noted, all cost estimates are from Aquenergy, converted to 2020 dollars.

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

[c] Staff assumes no additional cost to implement this measure.

[d] Cost estimated by staff.

[e] Cost for this measure was not provided by the recommending agencies, and a cost cannot be estimated by staff due to a lack of details.

[f] Staff did not assign a cost to this measure because it is a suggestion for consultation rather than a specific fish and wildlife protection measure.

APPENDIX E

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APPENDIX F

LIST OF PREPARERS

Jody Callihan – Project Coordinator; Geology and Soils; Aquatic Resources (Water Quality and Fisheries) (Fish Biologist; Ph.D., Oceanography and Coastal Sciences; M.S., Marine, Estuarine, and Environmental Science; B.S., Marine Science and Biology).

Woohee Choi – Need for Power, Developmental Resources (Environmental Engineer; Ph.D., M.S., and B.S., Civil and Environmental Engineering).

Allyson Conner – Recreation, Land Use, Aesthetic and Cultural Resources (Outdoor Recreation Planner; M.S., Recreation Management; B.S., Recreation).

Jeremy Feinberg – Aquatic Resources (eastern hellbender), Terrestrial Resources, and Threatened and Endangered Species (Wildlife Biologist; Ph.D., Ecology and Evolution; M.S., and B.A., Biology).

APPENDIX G

Virginia Department of Environmental Quality's Water Quality Certification Issued for the Fries Project

Part I - Special Conditions

A. Authorized Activities

1. This permit authorizes the operation of a surface water diversion to support the operation of an existing electric power generation station and impoundment (the Project) on the New River in Grayson County as described in Part I.D.
2. Authorized activities shall be conducted as described in the Joint Permit Application dated June 21, 2018, and received June 21, 2018, and supplemental materials, revisions and clarifications received through May 10, 2019.
3. The permittee shall notify the DEQ of any additional impacts to surface waters, including wetlands, of any modifications of the intake structure, and of any change to the type of surface water impacts associated with this Project. Any additional impacts, modifications, or changes shall be subject to individual permit review and/or modification of this permit.

B. Permit Term

1. This permit is valid for fifteen (15) years from the date of issuance.
2. The permittee shall submit a new permit application at least 270 days before the expiration date of this permit, if the surface water diversion activities are to be continued, unless the Department has approved a request for a later submittal date.
3. This permit may be modified, or alternatively revoked and reissued, if the Federal Energy Regulatory Commission (FERC) issues, reissues, or modifies its license granted to Aquenergy Systems, LLC for the Fries Hydroelectric Project, and where such issuance, reissuance, or modification results in a change to surface water release operations.

C. Standard Project Conditions

1. The activities authorized by this permit shall be executed in such a manner that any impacts to beneficial uses are minimized. As defined in § 62.1-44.3 of the Code of Virginia, "beneficial use" means both instream and off stream uses. Instream beneficial uses include, but are not limited to, the protection of fish and wildlife resources and habitat, maintenance of waste assimilation, recreation, navigation, and cultural and aesthetic values. The preservation of instream flows for purposes of the protection of navigation, maintenance of waste assimilation capacity, the protection of fish and wildlife resources and habitat, recreation,

cultural and aesthetic values is an instream beneficial use of Virginia's waters. Off stream beneficial uses include, but are not limited to, domestic (including public water supply), agricultural uses, electric power generation, commercial, and industrial uses.

2. No activity shall substantially disrupt the movement of aquatic life indigenous to the water body, including those species that normally migrate through the area, unless the primary purpose of the activity is to impound water.
3. Flows downstream of the Project area shall be maintained to protect all uses.
4. The activity shall not impede the passage of normal or expected high flows, and any associated structure shall withstand expected high flows.
5. Measures shall be employed at all times to prevent and contain spills of fuels, lubricants, or other pollutants into surface waters.
6. Virginia Water Quality Standards shall not be violated in any surface waters as a result of the Project activities.
7. All required notifications and submittals shall include project name and permit number and be submitted electronically to Withdrawal.permitting@deq.virginia.gov or mailed to the DEQ office stated below, unless otherwise directed in writing by DEQ subsequent to the issuance of this permit: Department of Environmental Quality, Attn: Water Withdrawal Permitting &Compliance Manager, Office of Water Supply, P.O. Box 1105, Richmond VA 23218.
8. All reports required by this permit and other information requested by DEQ shall be signed by the permittee or a person acting in the permittee's behalf, with the authority to bind the permittee. A person is a duly authorized representative only if both criteria below are met. If a representative authorization is no longer valid because of a change in responsibility for the overall operation of the facility, a new authorization shall be immediately submitted to DEQ.
   a. The authorization is made in writing by the permittee.
   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, superintendent, or position of equivalent responsibility. A duly authorized representative may thus be either a named individual or any individual occupying a named position.
9. All submittals shall contain the following signed certification statement:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the

information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

10. Any fish kills or spills of fuels or oils shall be reported to DEQ immediately upon discovery at 540-562-6700. If DEQ cannot be reached, the spill shall be reported to the Virginia Department of Emergency Management (VDEM) at 1-800-468-8892 or the National Response Center (NRC) at 1-800-424-8802. Any spill of oil as defined in§ 62.1-44.34:14 of the Code of Virginia that is less than 25 gallons and that reaches, or that is expected to reach, land only is not reportable, if recorded per§ 62.1-44.34:19.2 of the Code of Virginia and if properly cleaned up.
11. DEQ shall be notified in writing within 24 hours or as soon as possible on the next business day when potential environmentally threatening conditions are encountered which require debris removal or involve potentially toxic substances. Measures to remove the obstruction, material, or toxic substance or to change the location of any structure are prohibited until approved by DEQ.

D. Instream Flow and Water Quality Conditions

1. The facility shall maintain water levels in the Fries Project Impoundment within 0.2 feet below the spillway crest elevation (2,188.27 feet National Geodetic Vertical Elevation (NGVD)) at all times during normal Project operations.
2. When necessary for either emergency or Project maintenance purposes, the permittee shall be authorized to reduce the Fries Project impoundment elevation to 0.2 feet below spillway crest elevation 2,188.27 feet (NGVD). The permittee shall notify DEQ, the Virginia Department of Game and Inland Fisheries (DGIF), and interested stakeholders in accordance with Project Operations, Monitoring and Reporting Plan required under Part I.D.3.
3. The permittee shall submit a Project Operation, Monitoring and Reporting Plan for DEQ review and approval within one year of the effective date of the reissuance of the current FERC license for the Project. Once approved, the plan shall be incorporated by reference and become an enforceable part of this permit. Any revisions to the approved plan shall be submitted to DEQ for review and approval prior to implementing the change. The plan shall include, at a minimum, the following:
    a. A detailed description of the methodology to be used for monitoring and recording inflow to the Project in compliance with Part 1.E.3;

b. A procedure for estimating the previous day's flow at the intake location in the event that station 03164000 (New River near Galax, Virginia) is damaged, disabled, or discontinued;

c. The proposed design and location of headwater, tailwater and outflow monitoring equipment;

d. The procedure to be used to measure and record impoundment elevations on an hourly basis, at a minimum, in the project impoundment near the dam;

e. The procedure to be used to measure and record tailwater elevations and outflows in the tailrace (below the dam) on an hourly basis, at a minimum, and recorded daily using water level transducers, staff gages, and/or other equipment located downstream that are calibrated with the instrumentation used to monitor the headwater levels; and

f. A schedule for implementation of the Project Operation, Monitoring and Reporting Plan within one year of the effective date of the reissuance of the current FERC license for the Project.

4. The permittee shall submit a Water Quality Monitoring Plan for DEQ review and approval within one year of the effective date of the reissuance of the current FERC license for the Project. Once approved, the plan shall be incorporated by reference and become an enforceable part of this permit. Any revisions to the approved plan shall be submitted to DEQ for review and approval prior to implementing the change. The plan shall include, at a minimum, the following:

   a. The results of water quality monitoring or data collected in the Fries Project bypass reach submitted in support of the Project's current FERC re-license application, including an assessment of whether dissolved oxygen (DO) and temperature standards were met during periods of warm water temperature (greater than 25 degrees centigrade) and low flow. Low flow is defined as inflow estimated in accordance with Part I.E.3 based upon measured flow at gaging station 0316400 that is less than that station's 25th percentile for return flow frequencies),

   b. A description and schedule for additional water quality monitoring to be conducted in the bypass reach if the water quality data described in Part I.D.4a indicate either of the following:

      i. any periods when water temperature or DO conditions in the bypass reach fall below applicable Virginia Water Quality Standards, or

      ii. the previous water quality monitoring conducted in support of the Project's current FERC re-license application was not conducted during periods of low flow or warm water;

   c. A detailed description of the methodology to be used for monitoring and recording water quality, including dissolved oxygen and temperature, within

the bypass reach of the New River between the Project dam and powerhouse outfalls during periods of lower than normal inflow to the project;

d. A detailed description of the frequency and duration of water quality monitoring;

e. The proposed design and location of water quality monitoring sites; and

f. A schedule for implementation of the Water Quality Monitoring Plan within one year of the effective date of the reissuance of the current FERC license for the Project.

g. An analysis of alternative approaches to remediate the water quality impacts to the New River, if needed, including a discussion of the feasibility and expected water quality improvements for each alternative; and

h. Steps and timeline required to implement the recommended alternatives.

E. Monitoring, Recordation and Reporting Conditions

1. Elevations in the Fries Project Impoundment shall be measured and recorded on an hourly basis, at a minimum, in the forebay (reservoir) in accordance with the Water Management Plan approved by FERC.
2. Elevations and outflows in the tailrace (below the dam) shall be monitored on an hourly basis, at a minimum, and recorded daily using water level transducers, staff gages, and/or other equipment located downstream that are calibrated with the instrumentation used to monitor the headwater levels.
3. The permittee shall estimate inflow to the Project on a daily basis using the following equation:

   $Q_{in} = Q_{03164000} * 1.0114$, where:

   Q_{in} = estimated inflow to the Project;

   $Q_{03164000}$ = the previous day's provisional mean daily flow recorded for gaging station 03164000 (Galax, VA); and

   1.0114 = the ratio of the drainage area of the Project (1,160 mi^2) to the drainage area of station 03164000 (1,144 mi^2).

4. The permittee shall submit an annual monitoring report to DEQ to demonstrate compliance with Parts I.D and I.E of the permit Special Conditions. The annual monitoring period shall be from January through December. The daily records shall be tabulated by month. The report shall be submitted within thirty (30 days) following each annual monitoring period. Submittal of the report may take the form of electronic reporting or another form determined to be acceptable by DEQ. In the event the electronic reporting system is not available, the permittee may submit the

report by electronic mail. The report shall include the following information:

a. The permittee's name and address;
b. The permit number;
c. The calendar date;
d. The mean daily inflow to the Project (cfs) as measured or estimated in accordance with Part I.E.3;
e. The mean daily water levels in the Fries Project headpond and tailrace as measured in accordance with Parts I.E. I and I.E.2;
f. The mean daily outflow from the Project (cfs) measured in accordance with Part I.E.2; and,
g. A list of any periods when the Project operated under a DEQ- or FERC-issued variance or when the Project operated in an emergency drawdown.

5. Monitoring and reporting activities shall comply with this section, Parts I.C and I.D, and Part II. All records and information that result from the monitoring and reporting activities required by this permit, including any records of maintenance activities to the withdrawal system, shall be retained for the life of the permit. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or as requested by the State Water Control Board.

Part II - General Conditions

A. Duty to Comply

The permittee shall comply with all conditions of the VWP permit. Nothing in the VWP permit regulations shall be construed to relieve the permittee of the duty to comply with all applicable federal and state statutes, regulations and prohibitions. Any VWP permit violation is a violation of the law, and is grounds for enforcement action, VWP permit termination, revocation, modification, or denial of an application for a VWP permit extension or reissuance.

B. Next Duty to Cease or Confine Activity

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the activity for which a VWP permit has been granted in order to maintain compliance with the conditions of the VWP permit.

C. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any impacts in violation of the permit which may have a reasonable likelihood of adversely affecting human health or the environment.

D. VWP Permit Action

1. A VWP permit may be modified, revoked and reissued, or terminated as set forth in 9 VAC 25- 210 et seq.

2. If a permittee files a request for VWP permit modification, revocation, or termination, or files a notification of planned changes, or anticipated noncompliance, the VWP permit terms and conditions shall remain effective until the request is acted upon by the board. This provision shall not be used to extend the expiration date of the effective VWP permit. If the permittee wishes to continue an activity regulated by the VWP permit after the expiration date of the VWP permit, the permittee must apply for and obtain a new VWP permit or comply with the provisions of9 VAC 25-210-185 (VWP Permit Extension).

VWP permits may be modified, revoked and reissued or terminated upon the request of the permittee or other person at the board's discretion, or upon board initiative to reflect the requirements of any changes in the statutes or regulations, or as a result of VWP permit noncompliance as indicated in the Duty to Comply subsection above, or for other reasons listed in 9 VAC 25-210-180 (Rules for Modification, Revocation and Reissuance, and Termination of VWP permits).

E. Inspection and Entry

Upon presentation of credentials, any duly authorized agent of the board may, at reasonable times and under reasonable circumstances:

1. Enter upon any permittee's property, public or private, and have access to, inspect and copy any records that must be kept as part of the VWP permit conditions;

2. Inspect any facilities, operations or practices (including monitoring and control equipment) regulated or required under the VWP permit; and

3. Sample or monitor any substance, parameter or activity for the purpose of ensuring compliance with the conditions of the VWP permit or as otherwise authorized by law.

F. Duty to Provide Information

1. The permittee shall furnish to the board any information which the board may request to determine whether cause exists for modifying, revoking, reissuing or terminating the VWP permit, or to determine compliance with the VWP permit. The permittee shall also furnish to the board, upon request, copies of records required to be kept by the permittee.

2. Plans, specifications, maps, conceptual reports and other relevant information shall be submitted as required by the board prior to commencing construction.

G. Monitoring and Records Requirements

1. Monitoring of parameters, other than pollutants, shall be conducted according to approved analytical methods as specified in the VWP permit. Analysis of pollutants will be conducted according to 40 CPR Part 136 (2000), Guidelines Establishing Test Procedures for the Analysis of Pollutants.

2. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

3. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart or electronic recordings for continuous monitoring instrumentation, copies of all reports required by the VWP permit, and records of all data used to complete the application for the VWP permit, for a period of at least three years from the date of the expiration of a granted VWP permit. This period may be extended by request of the board at any time.

4. Records of monitoring information shall include:

    a. The date, exact place and time of sampling or measurements;

    b. The name of the individuals who performed the sampling or measurements;

    c. The date and time the analyses were performed;

    d. The name of the individuals who performed the analyses;

    e. The analytical techniques or methods supporting the information such as observations, readings, calculations and bench data used;

    f. The results of such analyses; and

g. Chain of custody documentation.

H. Transferability

This VWP permit may be transferred to a new permittee only by modification to reflect the transfer, by revoking and reissuing the permit, or by automatic transfer. Automatic transfer to a new permittee shall occur if:

1. The current permittee notifies the board within 30 days of the proposed transfer of the title to the facility or property;

2. The notice to the board includes a written agreement between the existing and proposed permittee containing a specific date of transfer of VWP permit responsibility, coverage and liability to the new permittee, or that the existing permittee will retain such responsibility, coverage, or liability, including liability for compliance with the requirements of any enforcement activities related to the permitted activity; and

3. The board does not within the 30-day time period notify the existing permittee and the new permittee of its intent to modify or revoke and reissue the VWP permit.

I. Property rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize injury to private property or any invasion of personal rights or any infringement of federal, state or local law or regulation.

J. Reopener

Each VWP permit shall have a condition allowing the reopening of the VWP permit for the purpose of modifying the conditions of the VWP permit to meet new regulatory standards duly adopted by the board. Cause for reopening VWP permits includes, but is not limited to when the circumstances on which the previous VWP permit was based have materially and substantially changed, or special studies conducted by the board or the permittee show material and substantial change, since the time the VWP permit was issued and thereby constitute cause for VWP permit modification or revocation and reissuance.

K. Compliance with State and Federal Law

Compliance with this VWP permit constitutes compliance with the VWP permit requirements of the State Water Control Law. Nothing in this VWP permit shall be

construed to preclude the institution of any legal action under or relieve the permittee from any responsibilities, liabilities, or other penalties established pursuant to any other state law or regulation or under the authority preserved by § 510 of the Clean Water Act.

L. Severability

The provisions of this VWP permit are severable.

M. Permit Modification

A VWP permit may be modified, but not revoked and reissued except when the permittee agrees or requests, when any of the following developments occur:

1. When additions or alterations have been made to the affected facility or activity which require the application of VWP permit conditions that differ from those of the existing VWP permit or are absent from it;

2. When new information becomes available about the operation or activity covered by the VWP permit which was not available at VWP permit issuance and would have justified the application of different VWP permit conditions at the time of VWP permit issuance;

3. When a change is made in the promulgated standards or regulations on which the VWP permit was based;

4. When it becomes necessary to change final dates in schedules due to circumstances over which the permittee has little or no control such as acts of God, materials shortages, etc. However, in no case may a compliance schedule be modified to extend beyond any applicable statutory deadline of the Act;

5. When changes occur which are subject to "reopener clauses" in the VWP permit; or

6. When the board determines that minimum instream flow levels resulting from the permittee's withdrawal of water are detrimental to the instream beneficial use and the withdrawal of water should be subject to further net limitations or when an area is declared a Surface Water Management Area pursuant to §§ 62.1-242 through 62.1-253 of the Code of Virginia, during the term of the VWP permit.

N. Permit Termination

After notice and opportunity for a formal hearing pursuant to Procedural Rule No. 1 (9 VAC 25-230- 100) a VWP permit can be terminated for cause. Causes for termination are as follows:

1. Noncompliance by the permittee with any condition of the VWP permit;

2. The permittee's failure in the application or during the VWP permit issuance process to disclose fully all relevant facts or the permittee's misrepresentation of any relevant facts at any time;

3. The permittee's violation of a special or judicial order;

4. A determination by the board that the permitted activity endangers human health or the environment and can be regulated to acceptable levels by VWP permit modification or termination;

5. A change in any condition that requires either a temporary or permanent reduction or elimination of any activity controlled by the VWP permit; and

6. A determination that the permitted activity has ceased and that the compensatory mitigation for unavoidable adverse impacts has been successfully completed.

O. Civil and Criminal Liability

Nothing in this VWP permit shall be construed to relieve the permittee from civil and criminal penalties for noncompliance.

P. Oil and Hazardous Substance Liability

Nothing in this VWP permit shall be construed to preclude the institution of legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under§ 311 of the Clean Water Act or §§ 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law.

Q. Unauthorized Discharge of Pollutants

Except in compliance with this VWP permit, it shall be unlawful for the permittee to:

1. Discharge into state waters sewage, industrial wastes, other wastes, or any noxious or deleterious substances;

2. Excavate in a wetland;

3. Otherwise alter the physical, chemical, or biological properties of state waters and make them detrimental to the public health, to animal or aquatic life, to the uses of such waters for domestic or industrial consumption, for recreation, or for other uses;

4. On or after October 1, 2001 conduct the following activities in a wetland:

    a. New activities to cause draining that significantly alters or degrades existing wetland acreage or functions;

    b. Filling or dumping;

    c. Permanent flooding or impounding;

    d. New activities that cause significant alteration or degradation of existing wetland acreage or functions.

R. Permit Extension

Any permittee with an effective VWP permit for an activity that is expected to continue after the expiration date of the VWP permit, without any change in the activity authorized by the VWP permit, shall submit written notification requesting an extension. The permittee must file the request prior to the expiration date of the VWP permit. Under no circumstances will the extension be granted for more than 15 years beyond the original effective date of the VWP permit. If the request for extension is denied, the VWP permit will still expire on its original date and, therefore, care should be taken to allow for sufficient time for the board to evaluate the extension request and to process a full VWP permit modification, if required.