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Via Electronic Filing

November 6, 2019

Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, D.C. 20426

**Subject:      Niagara Hydroelectric Project (FERC No. 2466-034)  
                 Filing of Revised Study Plan for Relicensing Studies**

Dear Secretary Bose:

Appalachian Power Company (Appalachian or Applicant), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the run-of-river 2.4 megawatt (MW) Niagara Hydroelectric Project (Project No. 2466) (Project or Niagara Project), located on the Roanoke River in Roanoke County, Virginia. The Project is located at approximate river mile 355 on the Roanoke River, approximately 6 miles southeast of the City of Roanoke. The reservoir formed by the Project is approximately 2 miles long and includes the confluence with Tinker Creek.

The existing license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 30-year term, with an effective date of April 4, 1994 and expires February 29, 2024. Accordingly, Appalachian is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with 18 CFR §5.11 of the Commission's regulations, Appalachian is filing the Proposed Study Plan (PSP) describing the studies that the Licensee is proposing to conduct in support of relicensing the Project.

## **Background**

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 28, 2019, to initiate the ILP. The Commission issued Scoping Document 1 (SD1) for the Project on March 26, 2019. SD1 was intended to advise resource agencies, Indian tribes, non-governmental organizations, and other stakeholders as to the proposed scope of FERC's Environmental Assessment (EA) for the Project and to seek additional information pertinent to the Commission's analysis.

On April 24 and 25, 2019, the Commission held public scoping meetings in Vinton, Virginia. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and

analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on April 24, 2019.

Resource agencies, Indian tribes, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's March 26, 2019 notice and concluded on May 25, 2019. During the comment period, twelve stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests. FERC issued Scoping Document 2 (SD2) on July 9, 2019 to provide information on the proposed action and alternatives, the environmental analysis process FERC staff will follow to prepare the EA, and a revised list of issues to be addressed in the EA.

In accordance with 18 CFR §5.11, Appalachian developed a Proposed Study Plan (PSP) for the Project that was filed with the Commission and made available to stakeholders on July 9, 2019. The purpose of the PSP was to present the studies proposed by Appalachian and to address the comments and study requests submitted by resource agencies and other stakeholders. The PSP described Appalachian's proposed approaches for conducting studies and addressed agency and stakeholder study requests. Pursuant to 18 CFR §5.11(e), Appalachian held a PSP Meeting on August 1, 2019, for the purpose of clarifying the PSP, explaining any initial information gathering needs, and addressing any outstanding issues associated with the PSP. Appalachian distributed additional information requested during the meeting to FERC staff and agencies by email communications subsequent to the PSP meeting.

Resource agencies and stakeholders were afforded 90 days from the date of the PSP filing (i.e., until October 7, 2019) to provide comments on the PSP or to request additional studies. The Commission's regulations require that comments on the PSP include an explanation of any study plan concerns and any accommodations reached with Appalachian regarding those concerns (18 CFR §5.12). Any proposed modifications to the PSP are also required to address the Commission's criteria as presented in 18 CFR §5.9(b).

Appalachian received timely formal comments on the PSP from FERC, U.S Fish and Wildlife Service (USFWS), Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Polytechnic Institute and State University (Virginia Tech), Friends of the Rivers of Virginia (FORVA), Roanoke Valley Greenway Commission (RVGC), Environmental Protection Agency (EPA), Roanoke River Blueway Commission (RRBC), and Virginia Department of Environmental Quality (VDEQ) as described and included in the enclosed RSP. In developing the RSP, Appalachian has carefully evaluated and considered all agency and stakeholder comments and study requests received, as well as discussions during and communications following the PSP meeting.

### **Revised Study Plan**

In developing the RSP, Appalachian evaluated all the study requests and comments submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria for study requests as set forth at 18 CFR §5.9(b) of the Commission's ILP regulations. For the study requests

that did not address the seven study criteria, where appropriate, Appalachian considered the study in the context of providing the requested information in conjunction with one or more of Appalachian's proposed studies.

This RSP takes into account the Commission's July 9, 2019 SD2 as well as comments on the PSP filed by stakeholders. Based on Appalachian's review of the requested studies, the FERC criteria for study requests under the ILP, the discussions during the PSP meeting, and formal comments on the PSP, Appalachian is proposing to conduct the following studies as described in detail in the RSP:

1. Flow and Bypass Reach Aquatic Habitat Study;
2. Water Quality Study;
3. Fish Community Study;
4. Benthic Aquatic Resources Study;
5. Wetlands, Riparian, and Littoral Habitat Characterization Study;
6. Shoreline Stability Assessment Study;
7. Recreation Study; and
8. Cultural Resources Study.

Appalachian is filing the RSP with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Appalachian is distributing this letter via email; otherwise, Appalachian is distributing this letter via U.S. mail. All parties interested in the relicensing process may obtain a copy of the RSP electronically through FERC's eLibrary system at <https://elibrary.ferc.gov/idmws/search/fercgensearch.asp> under docket number P-2466-034, or on Appalachian's website at <http://www.aephydro.com/HydroPlant/Niagara>.

Comments on the RSP must be filed within 15 days of the filing date of this RSP which is no later than November 21, 2019. The Commission will issue a final Study Plan Determination by December 6, 2019.

If there are any questions regarding the RSP, please do not hesitate to contact me at (614) 716-2240 or by email [jmmagalski@aep.com](mailto:jmmagalski@aep.com).

Sincerely,



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# Revised Study Plan

Niagara Hydroelectric  
Project

FERC No. 2466

November 6, 2019

Prepared by:



Prepared for:

Appalachian Power Company



An **AEP** Company

BOUNDLESS ENERGY™

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## List of Acronyms

1-D	one-dimensional
2-D	two-dimensional
3-D	three-dimensional
ACHP	Advisory Council on Historic Preservation
AEP	American Electric Power
AIRs	Additional Information Requests
APE	Area of Potential Effects
Appalachian	Appalachian Power Company
BEHI	Bank Erosion Hazard Index
CFD	computational fluid dynamics
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeters
CPUE	catch per unit effort
DLA	Draft License Application
DTM	Digital Terrain Model
DO	Dissolved Oxygen
EA	Environmental Assessment
FERC	Federal Energy Regulatory Commission (FERC or Commission)
FLA	Final License Application
FORVA	Friends of the Rivers of Virginia
FR	Federal Register
GIS	Geographic Information Systems
GPS	Global Positioning System
HIS	Habitat Suitability Index
HPMP	Historic Properties Management Plan
ILP	Integrated Licensing Process
ISR	Initial Study Report
KOP	Key Observation Points
LiDAR	Light Detection and Ranging
WMP	Management Plan for Riparian Forest Wildlife Habitat
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act of 1969
NGOs	non-governmental organizations
NGVD	National Geodetic Vertical Datum
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
PAD	Pre-Application Document
PCBs	polychlorinated biphenyls
PM&E	protection, mitigation, and enhancement
PSP	Proposed Study Plan

RC	Roanoke County
RSP	Revised Study Plan
RRBC	Roanoke River Blueway Committee
RVGC	Roanoke Valley Greenway Commission
SD1	Scoping Document 1
SD2	Scoping Document 2
SHPO	State Historic Preservation Office
TMDL	total maximum daily load
TCP	Traditional Cultural Properties
TL	total length
TLAC	Tri-County Lakes Administrative Commission
TOV	Town of Vinton
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR	Updated Study Report
VAC	Virginia Administrative Code
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
Virginia Tech	Virginia Polytechnic Institute and State University
YOY	young-of-year

# 1 Introduction and Background

Appalachian Power Company (Appalachian or Licensee), a unit of American Electric Power (AEP), is the Licensee, owner, and operator of the run-of-river, 2.4-megawatt Niagara Hydroelectric Project (Project) (Project No. 2466), located on the Roanoke River in Roanoke County, Virginia.

The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission). The Project underwent relicensing in the early 1990s, and the current operating license for the Project expires on February 29, 2024. Accordingly, Appalachian is pursuing a subsequent license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. In accordance with 18 CFR §5.13 of the Commission's regulations, Appalachian is filing this Revised Study Plan (RSP) with the Commission in support of relicensing the Project.

## 1.1 Study Plan Overview

Appalachian filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on January 28, 2019, to initiate the ILP. The PAD provides a description of the Project and summarizes the existing, relevant, and reasonably available information to assist the Commission, resource agencies, Indian Tribes, non-governmental organizations (NGOs), and other stakeholders in identifying issues, determining information needs, and preparing study requests.

The National Environmental Policy Act of 1969, the Commission's regulations, and other applicable statutes require the Commission to independently evaluate the environmental effects of issuing a subsequent license for the Project and to consider reasonable alternatives to relicensing. At this time, the Commission has expressed its intent to prepare an Environmental Assessment (EA) that describes and evaluates the site-specific and cumulative potential effects (if any) of issuing a subsequent license, as well as potential alternatives to relicensing. The EA is supported by a scoping process to identify issues, concerns, and opportunities for resource enhancement associated with the proposed action. Accordingly, the Commission issued Scoping Document 1 (SD1) for the Project on March 26, 2019. SD1 was intended to advise resource agencies, Indian Tribes, NGOs, and other stakeholders as to the proposed scope of the EA and to seek additional information pertinent to the Commission's analysis. As provided in 18 CFR §5.8(a) and §5.18(b), the Commission issued a notice of commencement of the relicensing proceeding concomitant with SD1.

On April 24 and 25, 2019, the Commission held public scoping meetings in Vinton, Virginia. During these meetings, FERC staff presented information regarding the ILP and details regarding the study scoping process and how to request a relicensing study, including the Commission's study criteria. In addition, FERC staff solicited comments regarding the scope of issues and analyses for the EA. Pursuant to 18 CFR §5.8(d), a public site visit of the Project was conducted on April 24, 2019.

Resource agencies, Indian Tribes, NGOs, and other interested parties were afforded a 60-day period to request studies and provide comments on the PAD and SD1. The comment period was initiated with the Commission's March 26, 2019 notice and concluded on May 25, 2019.

During the comment period, 12 stakeholders filed letters with the Commission providing general comments, comments regarding the PAD, comments regarding SD1, and/or study requests. Sixteen formal study requests were received from FERC, U.S. Fish and Wildlife Service (USFWS), Virginia Department of Game and Inland Fisheries (VDGIF), and Virginia Polytechnic Institute and State University (Virginia Tech) during the comment period. Copies of the letters filed with the Commission are provided in Appendix A of this document.

FERC issued Scoping Document 2 (SD2) on July 9, 2019 to provide information on the proposed action and alternatives, the environmental analysis process FERC staff will follow to prepare the EA, and a revised list of issues to be addressed in the EA.

In accordance with 18 CFR §5.11, Appalachian developed a Proposed Study Plan (PSP) for the Project that was filed with the Commission and made available to stakeholders on July 9, 2019. The purpose of the PSP was to present the studies proposed by Appalachian and to address the comments and study requests submitted by resource agencies and other stakeholders. The PSP described Appalachian's proposed approaches for conducting studies and addressed agency and stakeholder study requests. Pursuant to 18 CFR §5.11(e), Appalachian held a PSP Meeting on August 1, 2019, for the purpose of clarifying the PSP, explaining any initial information gathering needs, and addressing any outstanding issues associated with the PSP. The meeting was held at the Jefferson Center in Roanoke, VA. Attendees included representatives from FERC, USFWS, VDGIF, Virginia Tech, Friends of the Rivers of Virginia (FORVA), Virginia Department of Environmental Quality (VDEQ), U.S. Environmental Protection Agency (USEPA), and Roanoke County Parks and Recreation. Resource agencies and stakeholders were afforded 90 days from the date of the PSP filing (i.e. until October 7, 2019) to provide comments on the PSP or request additional studies.

Appalachian received timely formal comments on the PSP from FERC, USFWS, VDGIF, Virginia Tech, FORVA, Roanoke Valley Greenway Commission (RVGC), USEPA, Roanoke River Blueway Commission (RRBC), and VDEQ, which are included in Appendix B. In developing this RSP, Appalachian has carefully evaluated and considered all agency and stakeholder comments and study requests received, as well as discussions during the PSP meeting.

Relicensing participants may file comments on the RSP within 15 days of this filing (i.e., on or before November 21, 2019). Appalachian notes that FERC's ILP regulations require that stakeholders who provide study requests include specific information in the request in order to allow the Licensee, as well as Commission staff, to determine a requested study's appropriateness and relevancy to the Project and proposed action. As described in 18 CFR §5.9(b) of the Commission's ILP regulations, and as presented by



FERC staff during the April 24 and 25, 2019 scoping meetings, the required information to be included in a study request is as follows:

*(1) Describe the goals and objectives of each study and the information to be obtained (§5.9(b) (1));*

This section describes why the study is being requested and what the study is intended to accomplish, including the goals, objectives, and specific information to be obtained. The goals of the study must clearly relate to the need to evaluate the effects of the Project on a particular resource. The objectives are the specific information that needs to be gathered to allow achievement of the study goals.

*(2) If applicable, explain the relevant resource management goals of the agencies or Indian Tribes with jurisdiction over the resource to be studied (§5.9(b) (2));*

This section must clearly establish the connection between the study request and management goals or resource of interest. A statement by an agency connecting its study request to a legal, regulatory, or policy mandate needs to be included that thoroughly explains how the mandate relates to the study request, as well as the Project's potential impacts.

*(3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study (§5.9(b) (3));*

This section is for non-agency or Indian Tribes to establish the relationship between the study request and the relevant public or tribal interest considerations.

*(4) Describe existing information concerning the subject of the study proposal and the need for additional information (§5.9(b) (4));*

This section must discuss any gaps in existing data by reviewing the available information presented in the PAD or information relative to the Project that is known from other sources. This section must explain the need for additional information and why the existing information is inadequate.

*(5) Explain any nexus between project operation and effects (direct, indirect, and/or cumulative) on the resource to be studied and how the study results would inform the development of license requirements (§5.9(b) (5));*

This section must clearly connect Project operations and Project effects on the applicable resource. This section can also explain how the study results would be used to develop protection, mitigation, and enhancement (PM&E) measures that could be implemented under a new FERC license. The PM&E measures can include

those related to any mandatory conditioning authority under Section 401 of the Clean Water Act<sup>1</sup> or Sections 4(e) and 18 of the Federal Power Act, as applicable.

*(6) Explain how any proposed study methodology is consistent with generally accepted practices in the scientific community or, as appropriate, considers relevant tribal values and knowledge. This includes any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration (§5.9(b) (6));*

This section must provide a detailed explanation of the study methodology. The methodology may be described by outlining specific methods to be implemented or by referencing an approved and established study protocol and methodology.

*(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs (§5.9(b) (7));*

This section must describe the expected level of cost and effort to conduct the study. If there are proposed alternative studies, this section can address why the alternatives would not meet the stated information needs.

## 1.2 Appalachian's Revised Study Plan

In developing the PSP, Appalachian evaluated the study requests submitted by the stakeholders, with a focus on the requests that specifically addressed the seven criteria set forth in §5.9(b) of the Commission's ILP regulations, as discussed above.

Appalachian considered the comments made on the proposed studies for possible incorporation into the study and in the development of the study plan. Regarding the comments made on Appalachian's proposed studies, where appropriate, Appalachian considered the comment in the context of providing the requested information or methods in conjunction with one of Appalachian's proposed studies.

This RSP takes into account comments and study requests considered in developing the PSP, the Commission's July 9, 2019 SD2 and comments on the PSP, as well as comments on the PSP filed by relicensing participants, including FERC, USFWS, VDGIF, Virginia Tech, FORVA, RVGC, USEPA, RRBC, and VDEQ.

Based on Appalachian's review of the requested studies, FERC criteria for study requests under the ILP, and available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), the discussion during the PSP meetings, and formal and informal comments on the PSP, Appalachian is proposing eight studies to be performed in support of issuing a new license for the Project.

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<sup>1</sup> 33 U.S.C. §1251 et seq.

Information regarding each of these studies is provided in Sections 4 through 11 of this RSP. For each of Appalachian's proposed studies, this RSP describes:

1. The goals and objectives of the study;
2. The defined study area;
3. A summary of background and existing information pertaining to the study;
4. The nexus between Project operations and potential effects on the resources to be studied;
5. The proposed study methodology; and
6. Level of effort, cost, and schedules for conducting the study.

## 1.3 Project Description, Location, and Study Area

The Project is located at approximate river mile 355 on the Roanoke River, approximately 6 miles southeast of the City of Roanoke, in Roanoke County, Virginia. The reservoir formed by the Project is approximately 2 miles long and includes the confluence with Tinker Creek. Figure 1-1 provides an overview of the Project location and setting as well as the FERC Project boundary, and Figure 1-2 provides an overview of the Project facilities.

The upper portion of the Project boundary and reservoir, including the mainstem of the Roanoke River as well as Tinker Creek immediately above its confluence with the Roanoke River, occupies a developed area within the Town of Vinton and along the outer limit of the City of Roanoke. Land use in this area and immediately upstream is predominantly low to medium-density development and forested. Development along the southern shoreline of the reservoir is generally limited by terrain, with development along the northern shoreline limited by the existing (active) CSX railroad. The study area included in this RSP encompasses the entire FERC Project boundary and also extends downstream to the Blue Ridge Parkway bridge (Figure 1-3). The study areas for individual studies have been slightly extended in the upstream or downstream direction where Appalachian believed it was appropriate to address study comments or requests.

Article 403 of the current license requires Appalachian to maintain a minimum flow release of 50 cubic feet per second (cfs) or inflow, whichever is less, downstream of the Niagara Project (consisting of the tailwater area below the powerhouse and the bypass reach below the spillway). Of the 50 cfs minimum flow requirement, at least 8 cfs must be released into the bypass reach.



Figure 1-1. Niagara Hydroelectric Project Location Map

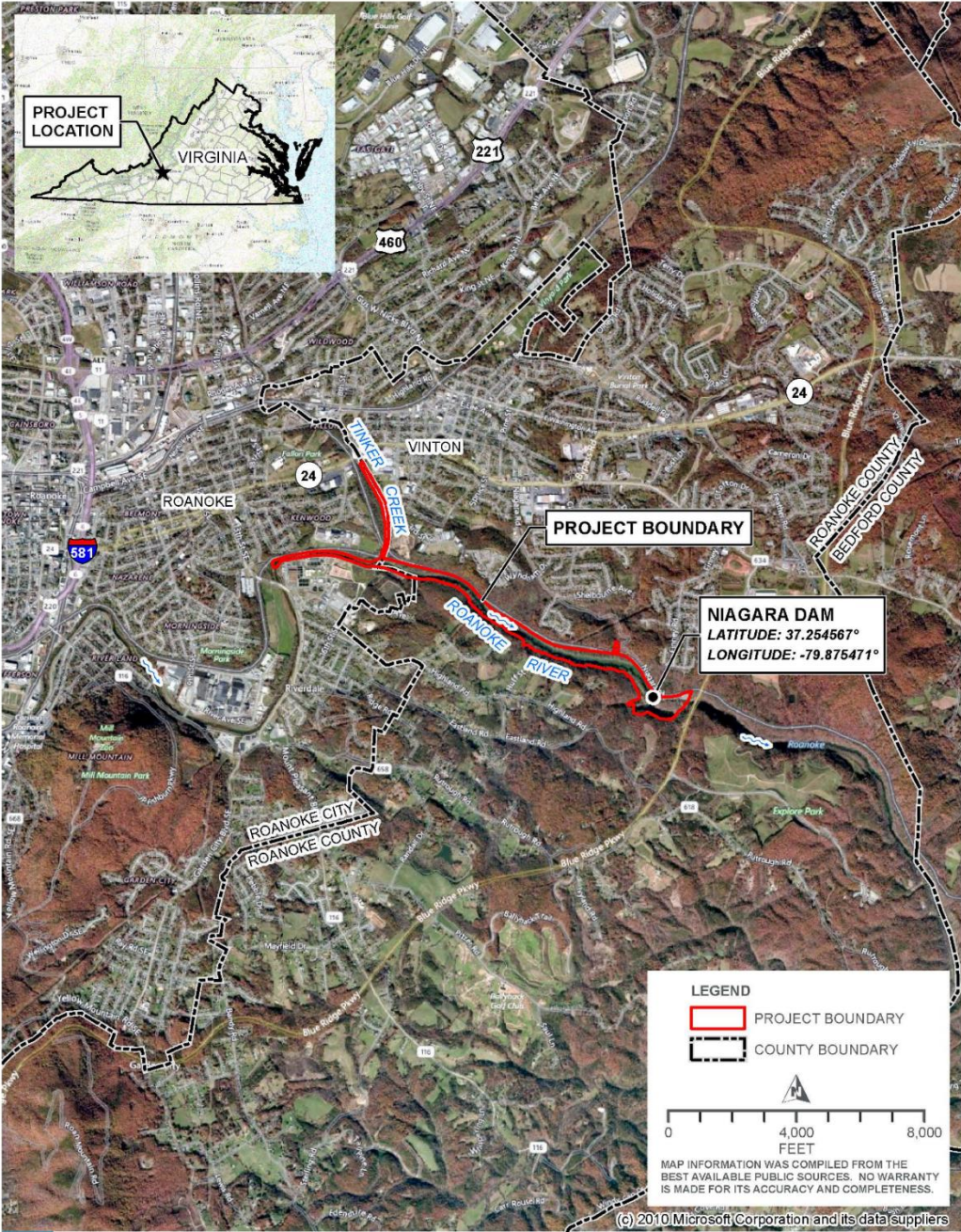


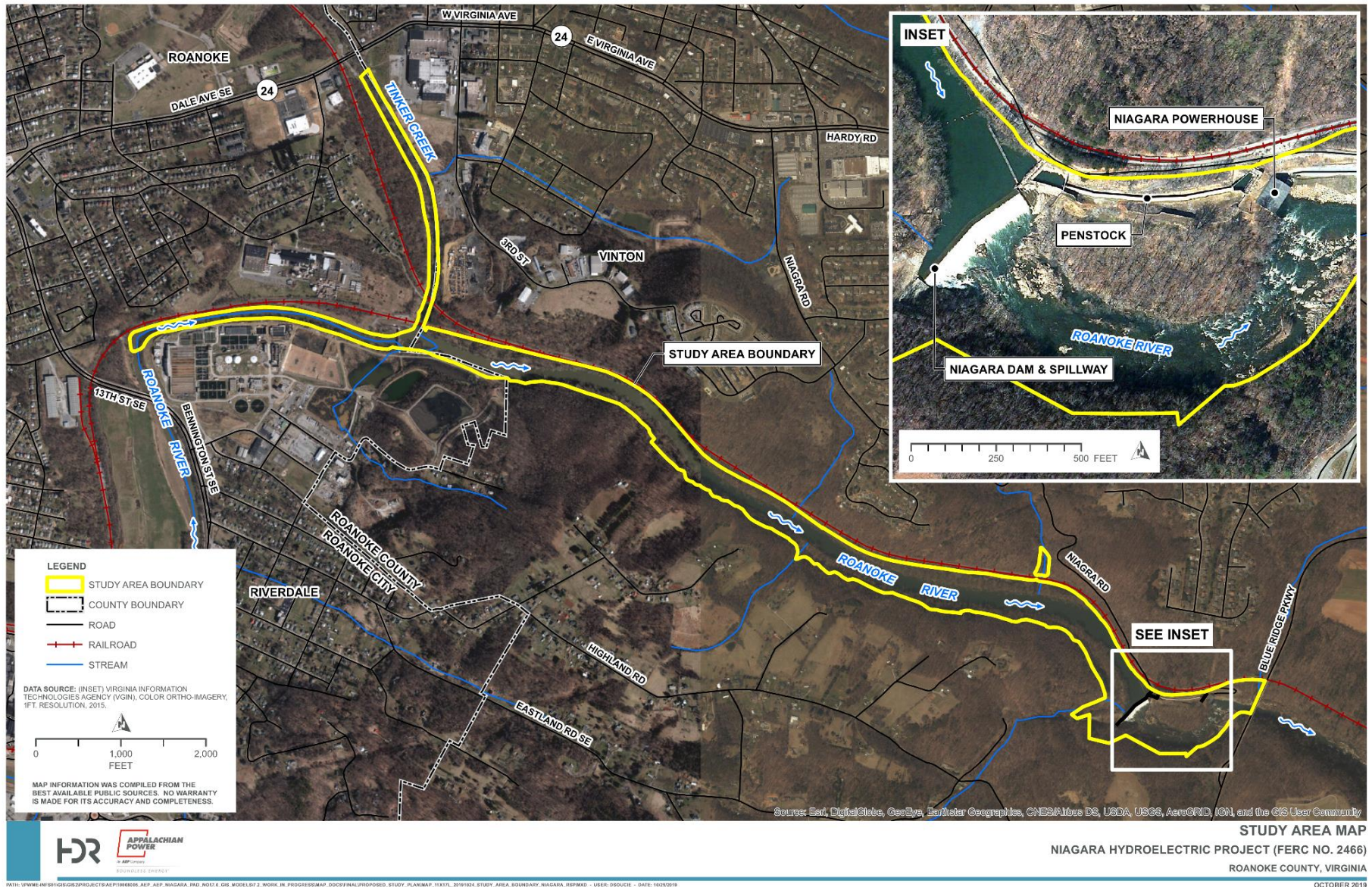


Figure 1-2. Niagara Project Facilities





Figure 1-3. Niagara Project Study Area





## 2 Execution of the Study Plan

As required by Section 5.15 of FERC's ILP regulations, Appalachian will prepare progress reports on a quarterly basis, file an Initial Study Report (ISR), hold an ISR Meeting with stakeholders and FERC staff to discuss the initial study results, prepare and file an Updated Study Report (USR), and convene an associated USR Meeting as appropriate. Appalachian will submit all study documents that must be filed with the Commission via FERC's eFiling system.

### 2.1 Process Plan and Schedule

The Process Plan and Schedule, as appended to FERC's SD1, is presented in Table 2-1. Gray shaded milestones are unnecessary if there are no study disputes. If the due date falls on a weekend or holiday, the due date is the following business day. Early filings or issuances will not result in changes to these deadlines.

**Table 2-1. Process Plan and Schedule**

Milestone	Responsible Party	Time Frame	Estimated Date
File NOI and PAD (18 CFR §5.5, 5.6)	Appalachian	As early as 5.5 years but no later than 5 years prior to license expiration	January 28, 2019
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days of filing NOI and PAD	February 27, 2019
Issue Notice of PAD/NOI and SD1 (18 CFR §5.8(a))	FERC	Within 60 days of filing NOI and PAD	March 26, 2019
Conduct Scoping Meetings and Site Visit (18 CFR §5.8(b) (viii))	FERC	Within 30 days of NOI/PAD notice and SD1 issuance	April 24-25, 2019
Comments on PAD, SD1, and Study Requests (18 CFR §5.9)	Stakeholders	Within 60 days of NOI/PAD notice and issuance of SD1	May 25, 2019
Issuance of Scoping Document 2 (SD2) (18 CFR §5.10) (if necessary)	FERC	Within 45 days of deadline for filing comments on SD1	July 9, 2019
File PSP (18 CFR §5.11(a))	Appalachian	Within 45 days of deadline for filing comments on PAD	July 9, 2019
Study Plan Meeting(s) (18 CFR §5.11(e))	Appalachian	Meeting to be held within 30 days of filing PSP	August 1, 2019 (actual) August 8, 2019 (deadline)
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days of filing PSP	October 7, 2019
File RSP (18 CFR §5.13(a))	Appalachian	Within 30 days of deadline for comments on PSP	November 6, 2019

Milestone	Responsible Party	Time Frame	Estimated Date
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following RSP	November 21, 2019
Issuance of Study Plan Determination (18 CFR §5.13(c))	FERC Director	Within 30 days of RSP	December 6, 2019
Formal Study Dispute Resolution Process (18 CFR §5.14(a)) (if necessary)	Agencies and Tribes with mandatory conditioning authority	Within 20 days of study plan determination	December 26, 2019
Third Dispute Resolution Panel Member Selection (18 CFR §5.14(d)) (if necessary)	Dispute Resolution Panel	Within 15 days of a notice of study dispute	January 10, 2020
Convene Dispute Resolution Panel (18 CFR §5.14(d)(3)) (if necessary)	Dispute Resolution Panel	Within 20 days of a notice of study dispute	January 15, 2020
Comments on Study Plan Disputes (18 CFR §5.14(i)) (if necessary)	Appalachian	Within 25 days of notice of study dispute	January 20, 2020
Dispute Resolution Panel Technical Conference (18 CFR §5.14(j)) (if necessary)	Dispute Resolution Panel, Appalachian, Stakeholders	Prior to engaging in deliberative meetings	January 25, 2020
Dispute Resolution Panel Findings and Recommendations (18 CFR §5.14(k)) (if necessary)	Dispute Resolution Panel	No later than 50 days after notice of dispute	February 14, 2020
Study Dispute Determination (18 CFR §5.14(l)) (if necessary)	FERC Director	No later than 70 days after notice of dispute	March 5, 2020
Conduct First Season of Studies (18 CFR §5.15(a))	Appalachian	NA	Spring-Fall 2020
Study Progress Report (18 CFR §5.15(b))	Appalachian	Appalachian will provide summary updates every three months	Quarterly, beginning in Quarter 2 of 2020 through filing of the USR
Initial Study Report (18 CFR §5.15(c)(1))	Appalachian	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	December 5, 2020
Initial Study Report Meeting (18 CFR §5.15(c)(2))	Appalachian and Stakeholders	Within 15 days of filing the initial study report	December 20, 2020
File Initial Study Report Meeting Summary (18 CFR §5.15(c)(3))	Appalachian	Within 15 days of initial study report meeting	January 4, 2021



Milestone	Responsible Party	Time Frame	Estimated Date
File Meeting Summary Disagreements (18 CFR §5.15(c)(4)) (if necessary)	Stakeholders	Within 30 days of study results meeting summary	February 4, 2021
File Responses to Meeting Summary Disagreements (18 CFR §5.15(c)(5)) (if necessary)	Appalachian	Within 30 days of filing meeting summary disagreements	March 5, 2021
Resolution of Disagreements (18 CFR §5.15(c)(6)) (if necessary)	FERC Director	Within 30 days of filing responses to disagreements	April 4, 2021
Conduct Second Season of Studies (18 CFR §5.15(a)) (if necessary)	Appalachian	NA	Spring-Fall 2021
File Preliminary Licensing Proposal or Draft License Application (DLA) (18 CFR §5.16(a))	Appalachian	No later than 150 days prior to the deadline for filing the Final License Application (FLA)	October 1, 2021
File Updated Study Report (18 CFR §5.15(f)) (if necessary)	Appalachian	Pursuant to the Commission approved study plan and schedule provided in §5.13 or no later than two years after Commission approval	December 5, 2021
Updated Study Report Meeting (18 CFR §5.15(f)) (if necessary)	Appalachian and Stakeholders	Within 15 days of updated study report	December 5, 2021
File Updated Study Report Meeting Summary (18 CFR §5.15(f)) (if necessary)	Appalachian	Within 15 days of study report meeting	January 4, 2022
Comments on Preliminary Licensing Proposal or DLA Due (18 CFR §5.16(e))	Stakeholders	Within 90 days of filing Preliminary Licensing Proposal or DLA	December 30, 2021
File Meeting Summary Disagreements (18 CFR §5.15(c)(4)) (if necessary)	Stakeholders	Within 30 days of study results meeting summary	January 4, 2021
File Responses to Meeting Summary Disagreements (18 CFR §5.15(f)(5)) (if necessary)	Appalachian	Within 30 days of filing meeting summary disagreements	March 5, 2022
File FLA (18 CFR §5.17)	Appalachian	No later than 24 months before the existing license expires	February 28, 2022
Issue Public Notice of FLA Filing (18 CFR §5.17(d)(2))	Appalachian	Within 14 days of filing FLA	March 14, 2022

Milestone	Responsible Party	Time Frame	Estimated Date
Resolution of Disagreements (18 CFR §5.15(f)) (if necessary)	FERC Director	Within 30 days of filing responses to disagreements	April 4, 2022

## 2.2 General Concepts and Procedures

The following general understandings, concepts, and practices will apply to the execution of all studies in this RSP:

- Personal safety is the most important consideration of each fieldwork team.
- Access to the Niagara Project bypass reach may be limited in some portions of the reach. The primary access is either in-channel or by descending banks with no defined trails, and fieldwork will require traversing uneven, wet, and often slick surfaces. As a result, field logistics will be an extremely important consideration in selecting study sites and calibration flow targets.
- Appalachian will make a good faith effort to obtain permission to access private property if and where needed well in advance of entering the property.
- Field crews may make minor variances to the FERC-approved study plan in the field to accommodate actual field conditions and unforeseen problems. When minor variances are made, the Project's field crew will follow the protocols in the FERC-approved study and the variances will be subsequently communicated to relicensing participants through the quarterly progress reports.
- Global Positioning System (GPS) data will be collected and exported into a Geographic Information Systems (GIS)-compatible file format in an appropriate coordinate system, using desktop software.

## 3 Responses to Stakeholder Study Requests

In developing this RSP, Appalachian has carefully evaluated and considered agency and stakeholder comments and study requests filed in response to the PAD, SD1, PSP, and as discussed during the PSP meetings.

### 3.1 Response to Comments and Study Requests Received in Response to the PAD and SD1

Appalachian filed the PAD for the Project on January 28, 2019. FERC issued SD1 on March 26, 2019, and conducted public scoping meetings on April 24 and 25, 2019 in Vinton, Virginia. In accordance with ILP regulations, comments on the PAD and SD1 and study requests were due to FERC by May 25, 2019. Appalachian received study requests and or study-related comment letters from the following:

- Federal Energy Regulatory Commission (FERC)
- National Park Service (NPS)
- Roanoke County (RC)
- Roanoke River Blueway Committee (RRBC)
- Roanoke Valley Greenway Commission (RVGC)
- Town of Vinton (TOV)
- Tri-County Lakes Administrative Commission (TLAC)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Fish and Wildlife Service (USFWS)
- Virginia Department of Environmental Quality (VDEQ)
- Virginia Department of Game and Inland Fisheries (VDGIF)
- Virginia Polytechnic Institute and State University (Virginia Tech) College of Natural Resources and Environment Fish and Wildlife Conservation

In preparation of the PSP, Appalachian reviewed the stakeholder comments and requested studies included in the FERC record a summary of study requests and study-related comments in Table 3-1.

**Table 3-1. Summary of Study Requests and Study-Related Comments in Response the PAD and SD1**

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Study/Response
<b>Operations</b>					
Information request for flow data to the bypass channel	J. Smith, FERC	May 22, 2019	N/A	Y	Addressed in Section 5 of the PSP.
Request for Bypass Reach and Flow Assessment to determine minimum bypass flow required for suitable aquatic habitat	S. Jahrsdoerfer, USFWS S. Smith, VDGIF B. McGurk, VDEQ	May 28, 2019 May 24, 2019 May 24, 2019	Y	Y (alt)	Study proposed by Appalachian (Flow and Bypass Reach Aquatic Habitat Study).
Request for a Debris Management Plan due to unsightly and environmentally problematic accumulations below the dam and far down river into high use areas	K. Mendik, NPS B. Thompson, TOV R. Caywood, RC A. McGee, RRBC P. Shoffner, TLAC L. Belcher, RVGC	May 24, 2019 May 23, 2019 May 24, 2019 May 24, 2019 May 21, 2019 May 23, 2019	N	N	Comment does not relate to a study request; to be considered during development of preliminary licensing proposal and license application.
<b>Biology</b>					
Request for Fish Survey to develop updated information on the fish community in this reach of the Roanoke River	J. Smith, FERC B. Rudnick, USEPA S. Jahrsdoerfer, USFWS S. Smith, VDGIF	May 22, 2019 May 23, 2019 May 28, 2019 May 24, 2019	Y	Y	Study proposed by Appalachian (Fish Community Study).
Request for Hydrodynamics and Fish Behavior Study to characterize the hydrodynamics upstream and downstream of the dam to inform fish behavior and passage of the Roanoke Logperch	P. Angermeier, Virginia Tech	May 24, 2019	Y	N	Addressed in Section 3.1.1.
Request for Fish Protection and Passage Assessment to examine options for enhancing upstream and downstream fish passage for resident and migratory species	S. Jahrsdoerfer, USFWS S. Smith, VDGIF A. McGee, RRBC	May 28, 2019 May 24, 2019 May 24, 2019	Y	N	Addressed in Section 3.1.1.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Study/Response
Request for Entrainment and Impingement Study to update mortality rates based on newly developed turbine blade strike analyses	S. Jahrsdoerfer, USFWS	May 28, 2019	Y	Y (alt)	Study proposed by Appalachian (Fish Community Study). An entrainment and impingement study evaluating the risk to fish in the vicinity of the intake will be evaluated using recent intake velocity measurements and data from the fish community sampling.
Request for Benthic Habitat Quality Assessment in the Bypass Reach and Downstream Areas to evaluate the habitat that could be gained by increasing sediment downstream	S. Jahrsdoerfer, USFWS	May 28, 2019	Y	N	Addressed in Section 3.1.1.
Request for Aquatic Macroinvertebrate/Crayfish Surveys to compare the macroinvertebrate and crayfish communities with upstream and downstream reference locations	S. Jahrsdoerfer, USFWS	May 28, 2019	Y	Y (alt)	Incorporated in part in the Benthic Aquatic Resources Study. A survey of the study area will be performed to establish baseline data of the macroinvertebrate and crayfish community in the study area.
Request for Freshwater Mussel Assessment to assess the presence, distribution, and abundance of any freshwater mussels inhabiting Project-affected areas	S. Jahrsdoerfer, USFWS S. Smith, VDGIF	May 28, 2019 May 24, 2019	Y	Y	Study proposed by Appalachian (Benthic Aquatic Resources Study).
Comments on the proposed Bypass Reach Aquatic Habitat Study regarding the need for assessment over a range of flows to evaluate the availability of habitat under alternative flow releases	J. Smith, FERC S. Jahrsdoerfer, USFWS B. McGurk, VDEQ	May 22, 2019 May 28, 2019 May 24, 2019	N/A	Y	Data collections and 2-D model will evaluate, qualitatively, the availability of habitat under alternative flow releases.
Comment on study not proposed: an updated entrainment study is warranted to reflect the current fish community	S. Jahrsdoerfer, USFWS	May 28, 2019	N/A	Y	Study proposed by Appalachian (Fish Community Study). An entrainment evaluation will be performed with a comparison to the previous study).

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Study/Response
Comment on study not proposed: a benthic macroinvertebrate/crayfish, fish, and/or mussel survey is needed for a better understanding of the resources in the vicinity of the project, including Roanoke Logperch	S. Jahrsdoerfer, USFWS	May 28, 2019	N/A	Y	Study proposed by Appalachian (Benthic Aquatic Resources Study).
Comment on study not proposed: provided concurrence that a botanical study is not needed, however invasive plant monitoring and control (if necessary) should be incorporated as part of the Wildlife Management Plan	S. Jahrsdoerfer, USFWS	May 28, 2019	N/A	N	Comment does not relate to a study request; to be considered during development of preliminary licensing proposal and license application.
<b>Water Quality and Sediment</b>					
Comments on Water Quality Study requesting study design details	S. Jahrsdoerfer, USFWS B. McGurk, VDEQ	May 28, 2019 May 24, 2019	N/A	Y	Study proposed by Appalachian (Water Quality Study).
Comment on study not proposed: a sediment study is needed to understand how the dam may affect sediment transport and downstream areas, including the bypass reach	S. Jahrsdoerfer, USFWS	May 28, 2019	N/A	N	Addressed in Section 3.1.1.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Study/Response
Comment on study not proposed: PCB testing of sediment behind the dam due to concern of water quality and evaluation of methods for future remediation.	A. McGee, RRBC L. Caywood, RC	May 24, 2019 May 24, 2019	N/A	N	<p>No dredging of reservoir sediment is proposed at this time. Any future dredging and disposal, including testing of reservoir sediment, would be coordinated with USACE and VDEQ.</p> <p>Appalachian does not believe there is a nexus between Project operations and contamination of fish tissue and has not adopted this study recommendation on the basis of ILP Study Criteria No. 5.</p> <p>In the event that the Virginia Department of Health or cooperating agencies are interested in posting signage at the Project regarding fish consumption advisories, Appalachian will fully cooperate and accommodate reasonable requests.</p>
<b>Recreation</b>					
Request for Recreational Use and Enhancement Assessment to determine the need for enhanced recreational access in the Project area	S. Smith, VDGIF L. Caywood, RC	May 24, 2019 May 24, 2019	Y	Y (alt)	Request largely incorporated into Recreation Study.
Request for Aesthetic Flow Study to determine the extent to which flows can be modified or controlled to improve visitor's experience associated with spillage	K. Mendik, NPS L. Caywood, RC	May 24, 2019 May 24, 2019	Y	Y (alt)	Request largely incorporated into Recreation Study.
Comments on Recreational Needs Assessment supporting the need for a recreational use survey	B. McGurk, VDEQ R. Caywood, RC	May 24, 2019 May 24, 2019	N/A	Y	Study proposed by Appalachian (Recreation Study).

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Study/Response
Comment on Recreational Needs Assessment requesting the evaluation of the possibility of a controlled recreational release for whitewater boating downstream of the dam and in the bypass reach	R. Caywood, RC A. McGee, RRBC	May 24, 2019 May 24, 2019	N/A	Y (alt)	Addressed in Section 10.6.6.
Comment on Recreational Needs Assessment requesting consideration of developing boating access facility within the reservoir.	B. Thompson, TOV R. Caywood, RC A. McGee, RRBC L. Belcher, RVGC	May 23, 2019 May 24, 2019 May 24, 2019 May 23, 2019	N/A	Y (alt)	Request largely incorporated into the Recreation Study.
Comment on Recreational Needs Assessment requesting consideration to extend and complete the Roanoke River Greenway through the Project.	B. Thompson, TOV	May 23, 2019	N/A	Y (alt)	Request largely incorporated into the Recreation Study.
Comment on Recreational Needs Assessment to include an evaluation of improvements to the existing portage due to limited access, erosion control, and accessibility for those characterized under the Americans with Disabilities Act.	K. Mendik, NPS L. Belcher, RVGC	May 24, 2019 May 23, 2019	N/A	Y (alt)	Request largely incorporated into the Recreation Study.

<sup>1</sup>FERC: Federal Energy Regulatory Commission; USFWS: U.S. Fish and Wildlife Service; USEPA: Environmental Protection Agency; NPS: National Park Service; VDGIF: Virginia Department of Game and Inland Fisheries; VDEQ: Virginia Department of Environmental Quality; Virginia Tech; Virginia Polytechnic Institute and State University; TOV: Town of Vinton; RC: Roanoke County; RRBC: Roanoke River Blueway Committee; RVGC: Roanoke Valley Greenway Commission; TLAC: Tri-County Lakes Administrative Commission

<sup>2</sup>N/A: not applicable; Y: yes; N: No; Y (alt): the comment or request was incorporated with partial or alternative methodology from what was proposed.



### 3.1.1 Study Requests Deemed Not Appropriate for Study

Appalachian proposed eight studies in the PSP and the RSP to address study requests and comments by Project Stakeholders. Study requests received in response to filing the PAD that were not included in this RSP are discussed below.

#### Sediment Study

In their May 28, 2019 letter, USFWS stated that a sediment study is needed to understand how the dam may affect sediment transport and its potential impacts to areas downstream of the dam, including the bypass reach. (These comments were reiterated in comments filed on the PSP by USFWS and USEPA.) The Benthic Habitat Quality Assessment in the Bypass Reach and Downstream Areas study requested by USFWS included (among its goals and objectives) determining how much habitat could be gained by increasing the sediment released downstream. USFWS states that information about sediment and substrate in the bypass reach collected during this requested study could be compared to an upstream reference reach to determine the impacts of the Project on sediment transport and benthic habitats in the bypass reach and the affected reach of the main river channel downstream of the Project.

While Appalachian has integrated aspects of this study request into this RSP (i.e., Flow and Bypass Reach Aquatic Habitat Study, Fish Community Study, and Benthic Aquatic Resources Study), including characterization and quantification of existing benthic habitat (including substrates) in the bypass reach for species of interest, Appalachian has not adopted this larger study request for the following reasons:

The results of the requested study are not expected to inform reasonable and necessary PM&E measures for the new license (ILP Study Criteria No. 5), for the reasons described in the two bullet items that follow.

- The existing outlet structures at the Project do not provide a means to pass reservoir sediment beyond that which is passed through flows to the units or in spills at the dam during periods of high inflow.
- In comments filed in response to the PSP, USFWS noted that this reasoning ignores the use of other methods to augment sediment downstream, including mechanical placement. Appalachian does not believe that mechanical placement of sediment in the bypass reach is appropriate or feasible for the Project. Given the high cost of preparing and placing in-channel gravel, and to reduce the potential for gravel entrainment and prevent loss of the augmented gravel to erosion, coarse sediment augmentation projects tend to focus on streams with low gradients and wide channels. Gravel may also be placed in low-gradient areas with little upstream sediment supply and a relatively stable flow regime. As described in the PAD (Appalachian 2019), below the Niagara dam, the bypass reach extends approximately 1,500 feet to the powerhouse, with the riverbed sloping at an average rate of approximately 78 feet per mile. For the reach approximately 1 mile below the powerhouse, the river bed slopes at an average rate of approximately 15 feet per mile. The bypass reach is also subject to annual flood flows, due to natural

seasonal conditions and the run-of-river operation of the Project. Maintaining a supply of coarse sediment in the bypass reach is not feasible due to hydraulic conditions (i.e., turbulence, gradient, and velocity) that occur as a result of the natural streambed gradient and seasonal and periodic high flow events (USFS 2004).

Adding sediment in one time, large volume applications has potential to smother substrates that support mussels, macroinvertebrates, and provide spawning substrates for fish.

Optimizing benefits of this mitigation measure and minimizing potential damage such as that noted above would require a long-term adaptive management approach that would impose a high degree of uncertainty for the economic viability of the Projects (USFS 2004).

- Even if a managed quantity of sediment could be passed at the dam without unacceptable impacts or risks to sensitive aquatic species, it would likely travel through the bypass reach and ultimately settle downstream in Smith Mountain reservoir of the Smith Mountain Project (FERC Project No. 2210). As described in the PAD (Appalachian 2019), the river has an average gradient of approximately 78 feet per mile in the bypass reach, compared to an average river bed slope of 15 feet per mile for the reach of the river approximately 1 mile below the powerhouse. The bypass reach is also affected by annual scouring flood flows due to natural seasonal conditions, the run-of-river operation of the Project, and the uncontrolled spillway crest.
- Appalachian is not aware of any evidence that aquatic resources downstream are presently being significantly impacted by Project operations or that there is a clear connection between river bed substrate conditions in the bypass reach or immediately below the Project (both areas of high stream gradient) with impacts to aquatic species downstream of the Project (ILP Study Criteria No. 5).

## Hydrodynamics and Fish Behavior

On May 24, 2019, Virginia Tech submitted a study request entitled “Coupling Studies of Hydrodynamics and Fish Behavior to Improve Roanoke Logperch Passage at Niagara Dam.” The study request/proposal focused on characterization of the hydrodynamics of the flow fields upstream and downstream of Niagara dam and powerhouse to inform the understanding of what hydraulic features attract/repel Roanoke Logperch (*Percina rex*) and recommendations for design of hydraulic alterations to improve Roanoke Logperch passage. The methodology (two-year study) proposed by Virginia Tech includes, during the first proposed year of study, use of an acoustic Doppler current profiler to collect bathymetric and velocity data upstream and downstream of the dam and installation of velocity and stage sensors near the dam. The data collected would be used to conduct computational fluid dynamics (CFD) simulations to obtain “detailed information about the velocity field, streamlines, and turbulence levels of water flow upstream and downstream of Niagara Dam across a wide range of flow conditions.” Fish behavior studies (Roanoke Logperch and other species) are proposed as an additional task (spanning 22 months) in this study. Virginia Tech proposes to observe and quantify fish behavior using underwater cameras (including an infrared video system) and to then statistically model behavioral responses of Roanoke Logperch to diel cycle, season, and river flow.

Underwater observations collected from stationary cameras installed near the velocity sensors would be used to characterize Roanoke Logperch's spatial associations with the dam and associated structures or flow conditions over time. The CFD model-generated maps of flow-fields near the dam would be correlated with Roanoke Logperch behavior and abundance data from the fish surveys, with the goal of determining the specific hydrodynamic conditions that attract or repel Roanoke Logperch and informing a recommendation for where and how to alter the flow fields to promote Roanoke Logperch passage. Virginia Tech estimates the cost of this study to be \$380,000.

Appalachian does not propose to adopt this study request/proposal on the basis of methodology (ILP Study Criteria No. 6) and level of effort and cost (ILP Study Criteria No. 7). Appalachian is aware that CFD models alone or coupled with data about fish behavior, typically collected with telemetry/Passive Integrated Transponder tagging, have been developed and used for licensing studies and design of PM&E measures related to fish protection or passage but notes that past or ongoing studies have focused on migratory species (e.g., American Shad, river herring, American Eel) that are known to occur in the immediate vicinity of Project structures. The absence of a well-documented population of Roanoke Logperch in the study area, based on existing data summarized in the PAD (Appalachian 2019) and the lack of suitable habitat immediately upstream (reservoir pool), suggests it will likely be difficult to identify resident Roanoke Logperch in sufficient numbers to justify the cost of evaluating their potential occurrence and behavior near the intake. The potential incremental benefits (ecological data) of the proposed study that could be provided, beyond the data and benefits already anticipated from the studies presented in this document, do not justify the additional costs and effort required. Appalachian believes it is premature to study the need for Project modifications or other measures related to fish passage without justification that such measures are required or reasonable. The Commission's ILP regulations (18 C.F.R. §5.15(e)) provide a mechanism for modifying the approved study plan to accommodate changes in information material to study objectives. On this basis, Appalachian proposes to revisit whether additional study or protection measures are required for Roanoke Logperch in the ISR, based on the results of the Fish Community Study (inclusive of the Roanoke Logperch Study) proposed in this RSP.

## Fish Passage

By letters dated May 24, 2019 and May 28, 2019, VDGIF and USFWS, respectively, each requested that Appalachian conduct an assessment of options for enhancing upstream and downstream fish passage for resident and migratory species, including Roanoke Logperch. According to VDGIF, this requested study would build on data collected for the Fish Community Study and assess potential upstream and downstream fish passage options given the Project characteristics and fish species present. As stated by USFWS, the goals and objectives of this study are to provide information on potential fish passage and protection structures, or other measures that could be utilized at the Project, and to determine whether Roanoke Logperch are able to pass through the Project and whether the populations upstream and downstream of the Project are isolated from one another.

Appalachian does not propose to assess potential upstream fish passage options because the results of such a study would not be expected to inform reasonable and necessary PM&E measures for the new license (ILP Study Criteria No. 5). Agencies have not identified the need for passage of any migratory (diadromous) fish species. Fish passage facilities are not available at downstream facilities, and diadromous fish are not present at the Smith Mountain Project; therefore it is unlikely diadromous fish are present at the Project. The Striped Bass that occur downstream of the Project are a landlocked population and are maintained through stocking (Appalachian 2019). In the event that downstream barriers (dams) are equipped with upstream fish passage facilities in the future necessitating passage above the Project, Appalachian expects that the new license issued by FERC will include USFWS's reservation of authority to prescribe fishways under Section 18 of the Federal Power Act. With respect to Roanoke Logperch, Appalachian points out that this species is not typically found in reservoirs or other lentic environments, preferring riverine habitat types and silt-free, loosely embedded substrate, and that this species does not migrate or have significant temporal distribution (Appalachian 2019). Therefore Appalachian does not believe there is an appreciable population benefit for providing passage of this species upstream at Niagara Dam, even if such passage were found to be technically feasible and not cost prohibitive.

If the results of the Fish Community Survey proposed in this RSP indicate a need linked to a specific resource management goal to provide upstream fish passage, Appalachian would expect to evaluate alternatives to physical Project modifications in consultation with the agencies during preparation of the DLA or Preliminary Licensing Proposal. Additionally, and as stated above, Appalachian notes that the Commission's ILP regulations provide a mechanism to reevaluate the need for this study after the ISR (i.e., based on the results of the Fish Community Survey).

With respect to downstream passage, Appalachian expects that the results of the Fish Community Survey—including collection of an updated baseline of the existing fish community in the vicinity of the Project, confirmation of flow velocities at the intake, and assessment of entrainment and impingement potential at Niagara—will also inform the need for further study or design of PM&E measures targeted at resident and migratory fish species found to be present at the Project, including the forebay area and the bypass reach. In the event that additional measures are found to be potentially appropriate, after the ISR Appalachian will propose to modify the study plan to perform a desktop evaluation of downstream passage alternatives as an additional task under the Fish Community Survey, to evaluate the feasibility and cost of downstream fish passage alternatives for target species known to occur at the Project.

### 3.1.2 Study Requests Deemed Appropriate with Alteration

In some instances, the proposed methodology in the RSP deviates from the methodology submitted with, or does not incorporate all elements of, the study requests. In these cases, Appalachian has proposed an alternate methodology that can provide the requested or necessary information but may be more efficient or effective than the recommended methodology. Study requests received in response to the filing of the PAD

and issuance of FERC's SD1 deemed appropriate with alterations are identified in Table 3-1.

## 3.2 Response to Comments and Study Requests Received in Response to the PSP

Appalachian received timely formal comments on the PSP from nine stakeholders. In preparation of this RSP, Appalachian reviewed the stakeholder comments and requested studies included in the FERC record. A summary of study requests and study-related comments is provided in Table 3-2. Copies of comments received and other consultation correspondence since the filing of the PSP are provided in Appendix B.

**Table 3-2. Summary of Study Requests and Study-Related Comments in Response to the PSP**

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
<b>Flow and Bypass Reach Aquatic Habitat Study</b>					
Describe the methodology that will be used to evaluate the need for ramping rates for the bypass reach.	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	Appalachian notes that this statement was erroneously included in the PSP. Ramping rates are not applicable at this Project due to the ungated nature (except for the single sluice gate) of the spillway. References to ramping rates have been deleted in this RSP.
Explain how you will determine the target flows to be used to support the development of the 2-D hydraulic model calibration.	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	As explained in Section 4.6.3.2, the 2-D modeling range is anticipated to extend from 8 cfs (the existing minimum flow requirement) up to approximately 533 cfs (mean annual flow measured at the downstream USGS gage over the past 30 years). To support this simulation range, target flows (measured in the field) will need to be between 8 cfs and approximately 200 cfs.
The RSP should include a refined target species list developed in consultation with USFWS, VDGIF, and VDEQ to better understand the species of focus in this study.	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	As stated in Section 6.6.3.3, a targeted species list will be developed based on the fish community composition and abundance of the reservoir, as well as any other species of interest.
USFWS appreciates Appalachian's adoption of substrate characterization methods previously recommended, however after further review of available information for Roanoke River and Logperch, we recommend methods that follow habitat suitability index (HSI) recommendations, including the Wentworth scale approach to substrate characterization.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	The Wolman Pebble Count method will be used to document substrate particle size distribution along representative transects in the bypass reach. The pebble count data will then be assigned to particle size classes (i.e., sand, gravel, cobble, etc.) using the Wentworth scale (Wentworth 1922).

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Recommends representative bypass reach flow releases ranging up to a maximum flow release that will enable accurate hydraulic modeling of average annual flow from Jan 1, 1988 to Dec 31, 2017 (30 year period).	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	The mean annual flow for the period Jan 1, 1988 to Dec 31, 2017 is 533 cfs. Target bypass flow releases will be designed to support model calibration using 533 cfs as the upper modeling limit. As a result, the highest target flow release will need to be in the 200 cfs range.
Recommends hydraulic modeling also be performed with water spilling over the dam instead of only through the sluice gate to see how this changes the available habitat within the bypass reach.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	The 2-D model will be capable of simulating different bypass flow release points including sluice gate releases and a sheet flow release over the spillway crest.
Requests the use of a velocity meter to also record velocity measurements at different depths, under each target flow release, at the cross-section that will be established for calculating total flow. They request at least one cross section be established at a riffle, if possible. At a minimum, velocity measurements should be taken at 20% and 80% of depth, where total depth is greater than 1.5 feet, or 60% depth where total depth is less than 1.5 feet. We understand that the hydraulic model will produce modeled velocities under different flows, but it is not explicitly stated that in-field velocity measurements will also be taken and possibly used to verify modeled velocity.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	As noted in Section 4.6.3.2, an effort will be made to establish a cross-section in the bypass reach to manually measure velocities during each flow test if conditions permit. The purpose of this is to measure actual velocities under each flow regime incrementally across the bypass reach and these velocity measurements would be used to support model calibration efforts. Ideally, a cross-section comprised of mostly riffle-type habitat would be established. Velocity measurements would be conducted according to standard USGS methodology as described in the USFWS comment. Total flow, however, will be estimated by subtracting powerhouse flows from flows measured at the USGS 02056000 Roanoke River at Niagara, VA, stream flow gaging station, as suggested by the VDEQ.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Requests additional details regarding the spatial resolution of some of the model inputs, including the digital terrain model of the Manning's roughness coefficient input. For example, how will this coefficient be applied, spatially?	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A		The requested additional details have been added to Section 4.6.4.
Requests the evaluation of four habitat variables to be consistent with the HSI model for Roanoke Logperch: 1) depth, 2) velocity, 3) substrate particle size, and 4) percent silt cover. They recognize it may not be possible to model percent silt cover, but request that this variable is evaluated during the substrate characterization and mapping, which will include pebble count data.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y (alt)	These habitat characteristics will be evaluated in the Roanoke Logperch Study (see Section 6.6.2).
The study area needs to be better defined. In order to compare flow alternatives in the bypass, we will need to assess habitat conditions downstream of the project (below the confluence with the bypass reach). Given that the bypass reach is approx. 1500 feet in length, we suggest that a further 1500 feet of similar habitat (e.g., relatively shallow riffles, runs, shoals, etc.) downstream of the project be included in this study. Without this baseline for comparison, it will be difficult to assess the ecological impacts of various flow alternatives.	S. Smith, VDGIF	October 7, 2019	N	N	<p>Appalachian notes that it is not the intent of the relicensing process, given that decommissioning is not proposed, to restore the bypass reach to its pre-Project conditions (ILP Study Criteria No. 5; how the study results would inform the development of license requirements).</p> <p>Appalachian believes that, consistent with ILP Study Criteria No. 7, the tasks and activities within the proposed study area described in this RSP are sufficient to inform agency recommendations and FERC license conditions for the Project, and focusing the geographic scope of the proposed studies on this study area and the Project boundary is consistent with generally accepted practice in the scientific community and within FERC relicensing criteria (ILP Study Criteria No. 6).</p>



Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Flows through the bypass should be estimated by subtracting powerhouse outflow, from the gaged flow station 02056000. This should be included in the study. A time series of estimated flow in the bypass reach would provide critical information on the timing and frequency of various flow rates through the bypass reach and would inform and guide the decision regarding what representative flow rates should be used for the remainder of the study.	B. McGurk, VDEQ	October 7, 2019	N/A	Y	As noted in Section 4.6.3.2, flows in the bypass reach will be estimated by subtracting powerhouse flows from the USGS 02056000 Roanoke River at Niagara, VA streamflow gaging station.
Recommends a guild approach using the guild density histograms developed in relationship to four habitat variables in a study conducted by Vadas and Orth (2001) for the upper Roanoke River drainage.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	A guild approach (Vadas and Orth 2001) was used to develop a refined species list to be assessed during this study (see Section 4.6.1).

<p>A separate habitat suitability analysis is needed for the Roanoke Logperch. The VA DOT Fish and Habitat Survey Protocol is recommended. A separate HSI is recommended for Age-0 Logperch due to pronounced habitat shifts by the species as it develops.</p>	<p>S. Jahrsdoerfer and R. McCorkle, USFWS</p>	<p>October 3, 2019</p>	<p>N/A</p>	<p>N</p>	<p>Out of recognition that Roanoke Logperch have not been previously detected in the bypass reach and HSI curves are not (to the best of Appalachian's knowledge and based on Appalachian's recent experiences with the ILP studies for the Smith Mountain Project, FERC Project No. 2210, relicensing) currently available for the species or its life stages, Appalachian has proposed to use a habitat guild approach for evaluations to be conducted as part of the Flow and Bypass Reach Aquatic Habitat Study (see Section 4.6.1). Appalachian believes this approach will have benefits for using the hydraulic modeling results to evaluate the habitat needs for fish assemblages that occur in the bypass reach. Appalachian believes this approach is consistent with generally accepted practices in the scientific community and the types of studies conducted for relicensings for comparable projects, including the downstream Smith Mountain Project (ILP Study Criteria No. 6).</p> <p>In the event that developed, peer-reviewed HSI curves for Roanoke Logperch are available and are provided by relicensing stakeholders, Appalachian is willing to further evaluate their potential applications to this study. In the absence of existing curves, Appalachian does not propose to develop HSI curves for Roanoke Logperch or its life stages as part of the relicensing study. Appalachian believes that doing so would result in a substantially increased level of effort and cost for the study, and the guild</p>
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Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
					<p>approach is an acceptable alternative (ILP Criteria No. 7).</p> <p>Appalachian understands the interest in this species by relicensing stakeholders given its federally endangered status. Appalachian believes that the studies and methods proposed in this RSP are consistent with the “best available scientific and commercial data” standard of the Endangered Species Act.</p>

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
<b>Water Quality Study</b>					
Specify the depths at which data loggers will be located in the forebay to determine the existence of stratification, and provide justification for why the depths were chosen.	J. Smith and A. Conner, FERC; S. Jahrsdoerfer and R. McCorkle, USFWS	October 7, 2019; October 3, 2019	N/A	Y(alt)	As described in Section 5.6.1, at this preliminary time, the exact location of the forebay monitoring location has not been determined. A reconnaissance of the forebay area will be made prior to selection of a suitable/representative monitoring location which will also need to take into consideration site access and safety considerations. Once a location has been selected, data sondes will be set at two discrete depths to determine the existence and extent, if any, of thermal and DO stratification. The upper and lower set points are anticipated to be approximately one-third and two-thirds depth below normal pond elevation, respectively. The depths of the forebay data sondes may be adjusted, if necessary, during the study period based on a comparison of the continuous temperature and DO results with the monthly depth profile measurements (described in Section 5.6.2).
Include monitoring of water quality in the free-flowing section of the Roanoke River upstream of the Project impoundment.	B. Rudnick, EPA; S. Jahrsdoerfer and R. McCorkle, USFWS	October 7, 2019; October 3, 2019	Y	Y	As shown in Figure 5-1, a water quality sampling location was added in a free-flowing section of the Roanoke River upstream of the confluence of the Roanoke River and Tinker Creek.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
If the water quality data show that a low temp or DO plume is present downstream of the powerhouse, an additional year of monitoring may be needed to define the vertical, lateral, and longitudinal extent of this plume, particularly if it extends downstream to where the Roanoke Logperch are known to occur. A second year of monitoring may be required if abnormally high flows are experienced during this period, or if data cannot be collected during an extended low flow period when water quality would be expected to be affected the most.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y (alt)	Appalachian acknowledges that if the proposed study period (May – September 2020) is deemed anomalous due to abnormally wet and/or cool weather conditions, a second field study season in 2021 may be necessary to capture water quality conditions representative of typical summer conditions. Appalachian expects to review this need in the ISR.
Recommends the analysis of water quality data include how water quality changes during different river flows and Project operations. Interested in a comparison of hourly operations to water quality.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	Y	Y	As described in Section 5, water temperature and DO data sondes will be deployed for a single season, from May 1, 2020 through September 30, 2020 and will collect data at 15 minute intervals. This will allow for a comparison of changes in temperature and DO associated with diurnal conditions, bypass flow release events, and powerhouse flow releases.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Stated that no study exists on the PCBs in the sediment behind the dam. A study of contaminants in the fish below the dam should be undertaken to determine if the fish are safe for consumption. If not, the river should be posted for whatever contaminants are found.	B. Tanger, FORVA	September 4 , 2019	N	N	<p>No dredging of reservoir sediment is proposed at this time. Any future dredging and disposal, including testing of reservoir sediment, would be coordinated with USACE and VDEQ.</p> <p>Appalachian does not believe there is a nexus between Project operations and contamination of fish tissue and has not adopted this study recommendation on the basis of ILP Study Criteria No. 5.</p> <p>In the event that the Virginia Department of Health or cooperating agencies are interested in posting signage at the Project regarding fish consumption advisories, Appalachian will fully cooperate and accommodate reasonable requests.</p>
<b>Fish Community Study</b>					
Additional information regarding methodology and level of effort in fish surveys should be included, including the number and locations of sampling sites.	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	Additional details of study methodology were incorporated based on discussion from the September 25, 2019 stakeholder coordination call.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Describe how Roanoke Logperch microhabitats will be identified, the minimum number of microhabitats that will be selected for sampling, and the minimum number of transect surveys that would be conducted within each survey location. If snorkel surveys are not approved by Appalachian, describe alternative techniques that would be used to conduct Roanoke Logperch surveys.	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	Study methodologies have been revised and are described in detail by life stage (see Section 6.6.2), including proposed sampling locations, and methodology for establishing sample transects and quadrats. The proposed survey method for adult and young-of-year (YOY) Roanoke Logperch Surveys include electrofishing (with bag seines). Visual shoreline surveys are also proposed for YOY Roanoke Logperch. Depending on stream velocity in the Niagara forebay, larval sampling sites L3 and L4 (Figure 6-1) may be difficult to collect with drift net sets. One potential alternative method for larval sampling includes the use of towed plankton nets. Snorkel surveys are not proposed as a primary sampling methodology, but may be used as a supplemental method for adult and YOY Logperch, upon approval by Appalachian.
The effects of the Project on the Roanoke Logperch (barriers to upstream and downstream movements, potential genetic isolation) result in 'incidental take' as defined under the Endangered Species Act. The Fish Community Study should include targeted surveys of the Roanoke Logperch for all life stages including larval, YOY, and adult, including occurrences within the impoundment or near the Project intake. This will also require survey efforts during multiple seasons in order to document all life stages.	B. Rudnick, EPA; S. Jahrsdoerfer and R. McCorkle, USFWS	October 7, 2019; October 3, 2019	Y	Y (alt)	A Roanoke Logperch Study is proposed in the Fish Community Study plan (Section 6.6.2, Task 1b). This study includes surveys for larval, YOY, and adult life stages by an approved surveyor. These surveys will provide information sufficient for a take determination by the USFWS.  See additional comments regarding Appalachian's position on the larval survey in Section 3.2.2 and Section 6.6.2.2

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Support the Hydrodynamics and Fish Behavior Study's goal of characterizing the Roanoke Logperch spatial associations with the dam and associated structures or flow conditions over a full range of temporal factors. Also support Appalachian's proposal to revisit whether additional study or protection measures are required for this species in the Initial Study Report based on the results of the Fish Community Study.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	Y (previously)	Y (alt)	While a Hydrodynamics and Fish Behavior Study is not proposed in this RSP, the study's goal of characterizing the Roanoke Logperch's spatial dynamics in the general vicinity of the dam will be addressed in the Roanoke Logperch Study (Section 6.6.2).
The USFWS previously requested the Fish Community Study to include methods to evaluate the presence of the American Eel, however it has been determined this species is highly unlikely to be present in the vicinity of the Project due to downstream impediments. Recommend appropriate monitoring efforts during the Ready for Environmental Analysis stage of this relicensing, contingent upon American Eel passage being provided at the Smith Mountain Project during the term of the new license.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	N	The necessity to monitor for American Eel presence and passage at Niagara dam will be reevaluated if downstream impediments are addressed during the term of the new license.
Virginia Tech, VDEQ, and the USEPA should be consulted during development of the final Fish Community Study plan.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y (alt)	A stakeholder coordination call was completed on September 25, 2019 with participation of USFWS, VDGIF, VDEQ, and Virginia Tech. Comments and recommendations from the call are incorporated to the Fish Community Study plan.



Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Requests extending the study area ~150 meters upstream beyond the currently proposed terminus in order to capture a large riffle feature that is just downstream of the 13th St /Bennington St Bridge. The Service supports Appalachian's proposed move of fish survey locations 1E and 2E further upstream to correspond with the most upstream Roanoke Logperch sampling locations (RLP1A and RLP1B).	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	As described and depicted in the figures included in Section 6, survey locations for the Fish Community Study, as well as the adult and YOY Roanoke Logperch studies are proposed for the referenced upstream riffle.
Requests that the downstream reach (below the dam) be extended further downstream. Prior studies encompassed a reach of river extending 1.25 miles downstream of the powerhouse, based on a determination that this river segment was predominantly riffle/run habitat where the Roanoke Logperch may be found. They support Appalachian's proposed additional sampling locations (RLP4A, RLP4B, 9E, 10E, and 11E).	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	As described and depicted in Section 6, several new Fish Community Study survey locations were added below Niagara dam in riffle/run areas, in addition to Roanoke Logperch Study survey locations.
PSP states that the 1991 sampling for Roanoke Logperch was conducted in a 0.25-mile riffle/run habitat reach located 0.5 miles downstream of the powerhouse, however the study report (APCO and AEPSC 1992) states the study encompassed a reach of river extending 1.25 mi downstream, and that suitable habitat exists in a 0.5-mi segment of river beginning 0.5 mi downstream of the powerhouse. Appalachian does not provide citations for the fisheries studies (APCO and AEPSC 1991, 1992), only the 1991 license application, which preceded the study required by FERC.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	Description of the survey area for the 1991 Roanoke Logperch Study was clarified in this RSP and the original report document is cited in this RSP (Section 6.4.1).

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Recommends Roanoke Logperch larval drift surveys be conducted starting in April within the project area. Because of time-of-year restrictions (Mar 15-Jun 30) to protect breeding RL, no electrofishing should occur in the river until after June 30. Fish surveys should be performed in summer (July-Aug) and fall (Oct-Nov).	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	Larval Roanoke Logperch surveys are proposed for the early April to early June 2020 period. The Fish Community Study (i.e., electrofishing surveys) are proposed from August to October 2020, outside of the time-of-year restriction window. (See Section 6.6.2.)  See additional comments regarding Appalachian's position on the larval survey in Section 3.2.2.
The proposed fish study will not include target effort for the Roanoke Logperch. This is not acceptable to the Service. The extent to which larvae of this species are present in the Project area will have a bearing on any recommended mitigation measures. Forgoing any effort to document and quantify this life stage in the Project area will result in the resource agencies and other stakeholders assuming that larvae are present. The Study Plan Criteria and methodology are provided for larval drift sampling by both, USFWS and Virginia Tech (Study Request 1). Methodology for YOY sampling is provided in the Study Plan Criteria provided by Virginia Tech (Study Request 2) Adult Roanoke Logperch sampling is recommended using transects and quadrats as established by Roberts et al. (2016).	S. Jahrsdoerfer and R. McCorkle, USFWS; P. Angermeier, Virginia Tech	October 3, 2019; October 3, 2019	Y	Y (alt)	A Roanoke Logperch Study is proposed in the Fish Community Study (Section 6.6.2, Task 1b), providing methodology for surveying larval, YOY, and adult life stages. Comments and recommendations from the September 25, 2019 stakeholder coordination call with USFWS, VDGIF, VDEQ, and Virginia Tech were incorporated to the development of the study plan.  See additional comments regarding Appalachian's position on the larval survey in Section 3.2.2.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Emphasize the need for larval/juvenile Roanoke Logperch sampling in order to assess the impacts of project operations on this listed species.	S. Smith, VDGIF	October 7, 2019	N	Y	<p>A Roanoke Logperch Study is proposed in the Fish Community Study (Section 6.6.2, Task 1b), providing methodology for surveying larval, YOY, and adult life stages. Comments and recommendations from the September 25, 2019 stakeholder coordination call with USFWS, VDGIF, VDEQ, and Virginia Tech were incorporated into the development of the study plan.</p> <p>See additional comments regarding Appalachian's position on the larval survey in Section 3.2.2.</p>
Sampling periods should be flexible and include: 1) sampling outside the two time periods (May-June, Aug-Sep); 2) sampling during extended periods of above-min flow in the bypass reach, rather than during brief (1-2 day) periods of such flow; 3) scheduled reductions in generation to increase bypass reach flow; and/or 4) consideration of a second year of fish data collection if flows remain at a minimum flow levels during the schedule sampling months or if reduced generation cannot be accomplished for a sufficient period.	B. McGurk, VDEQ	October 7, 2019	N	N	<p>Appalachian proposes to conduct the seasonal surveys in compliance with prevailing time-of-year restrictions (except where waiver to be sought to allow springtime survey for Roanoke Logperch in the bypass reach), under flows that are determined to be suitably safe for wading and the sampling methods proposed.</p> <p>Appalachian believes that the methods and schedule proposed for the tasks in the Fish Community Study are consistent with generally accepted practices in the scientific community and the types of studies conducted for relicensings for comparable projects (ILP Study Criteria No. 6).</p>

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Habitat assessments should be completed at all sites used to survey for adult, subadult, and YOY Roanoke logperch. Study Plan Criteria are provided. This includes determining water depth, velocity, substrate characterization (Wentworth scale), and percent silt cover.	P. Angermier, Virginia Tech	October 3, 2019	Y	Y	Water depth, velocity, substrate characterization, and percent cover by substrate type will be assessed at all Roanoke Logperch sampling locations for adult and YOY studies (Section 6.6.2, Task 1b).
In response to the conference call on September 25, 2019, two recommended modifications to the Roanoke Logperch sampling plan: 1) conduct field sampling in late summer (September) as YOY Roanoke Logperch are much more likely to be captured than earlier; 2) measure total length of all Roanoke Logperch to enable distinctions between YOY versus Age 1+.	P. Angermier, Virginia Tech	October 3, 2019	N/A	Y	Total length (TL) measurements will be taken on all captured adult and YOY Roanoke Logperch. Sampling for YOY Logperch will be conducted in the late summer (August to October 2020) time frame as suggested. (See section 6.6.2, Task 1b.)
The most recent scientific methods in the blade strike analysis is recommended for the Impingement and Entrainment Desktop Study - Franke et al. (1997). The Study Plan Criteria are provided by USFWS for using Frank et al. (1997).	B. Rudnick, EPA; S. Jahrsdoerfer and R. McCorkle, USFWS	October 7, 2019; October 3, 2019	Y	Y	As noted in Section 6.6.3.3, the USFWS Turbine Blade Strike Analysis Model based on Franke et al. (1997) will be used in the Impingement and Entrainment Desktop Study.
<b>Benthic Aquatic Resources Study</b>					
Provide the number and locations of proposed sampling sites to be included in the Macroinvertebrate and Crayfish Community Study.	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	A figure depicting the number and locations of sampling sites is provided in this RSP ( <b>Error! Reference source not found.</b> ).

It is not clear if the Benthic Habitat Assessment will address whether the benthic habitat below the dam is starved of sediment and therefore reducing quality and quantity of benthic habitat. It would be more appropriate to compare benthic habitat below to an upstream reference reach not impacted by a dam.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	<p>One of the goals of the study is to "quantify the amount of benthic habitat available for macroinvertebrates, crayfish, and mussels within the bypass reach." This will include a habitat assessment to gauge the quality of habitat in this area, as is standard in benthic sampling and is further detailed in Task 1 of Section 7.1. In addition to sampling in the bypass reach, sampling locations will be located in riffle/run areas above the impounded area, in the impoundment pool, and in riffle/run areas below the dam (<b>Error! Reference source not found.</b>). Analyses will allow for comparison among habitat types and locations.</p> <p>Appalachian does not believe it is necessary or appropriate to include such a comparison in this study, given that it is not the intent of the relicensing process, where decommissioning is not proposed as an alternative, to restore the bypass reach to its pre-Project conditions (ILP Study Criteria No. 5; how the study results would inform the development of license requirements).</p> <p>Appalachian believes that, consistent with ILP Study Criteria No. 7, the tasks and activities within the proposed study area described in this RSP are sufficient to inform agency recommendations and FERC license conditions for the Project, and focusing the geographic scope of the proposed studies on this study area and the Project boundary is consistent with generally accepted practice in the scientific community and within FERC</p>
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Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
					relicensing criteria (ILP Study Criteria No. 6).
Clarify the study area for the Mussel Habitat and Community Study, how the mussel habitat will be identified, and how mussel survey locations will be selected. Is the "Desktop Benthic Habitat Assessment" referencing Section 6.6.1 (bypass) or Section 9.6.3 (benthic)? Section 6.6.1 is limited geographically.	J. Smith and A. Conner, FERC; B. Rudnick, EPA	October 7, 2019;	N	Y	Mussel survey methodology is detailed in this RSP (Section 7.6.3), including locations and numbers of transects proposed for the reservoir and areas to be surveyed upstream and downstream of the impoundment, as well as the bypass reach.
Provide an alternative technique that may be used should approval for snorkeling not be granted for mussel surveys (by a qualified mussel surveyor).	J. Smith and A. Conner, FERC	October 7, 2019	N/A	Y	Currently proposed survey methods include snorkel, SCUBA, Surface Supply Air, or view-bottom buckets. In the event that these methods are not viable, Appalachian would expect to consult with agencies regarding a modification to the study plan and report it to FERC in a study progress report and the ISR.
The Atlantic pigtoe is shown as a state threatened species. It is also proposed for federal listing as a threatened species, and the table should be updated to reflect this current status.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	Table 7-1 has been updated to reflect the current status of the Atlantic pigtoe.
Mussel surveys also need to be conducted upstream of the impoundment in a free-flowing section of river to assess potential impacts to any mussels upstream that get washed downstream into the reservoir during high flow events. Surveys also need to be conducted further downstream than the tailrace in appropriate habitat since the downstream impacts of the project have not yet been determined.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	As described in Section 7.6.3, surveys of potential mussel habitat above the impoundment (in the free-flowing reach of river upstream of Tinker Creek) and below the tailrace are proposed in this RSP.



Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
The Mussel Community Study proposes 10 line-transects located throughout the study area based on the type and quantity of available habitats identified in the Desktop Benthic Habitat Assessment. It is unclear how it was determined that 10 transects was sufficient to assess the composition of mussel populations in the project area, or determine whether protected species are in the area with a high degree of certainty. The number of transects should be based on the amount of available habitat. Justification for the approach needs to be provided.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	Mussel survey locations are provided in the revised Mussel Habitat and Community Study (Section 7.6.3). Methodology was modified from the most recent Draft Freshwater Mussel Guidelines for Virginia (USFWS and VDGIF 2018). The methodology consists of a two-pronged approach: 1) quantitative time searches and 2) systematic transects. The combined methods provide sufficient coverage of the Project boundary to determine the presence and abundance of mussels in the Project boundary. In the event that agreeable and minor changes to the approved study plan are required, Appalachian would expect to consult with agencies regarding this modification and report it to FERC in a study progress report and the ISR.
The area to be surveyed for the Mussel Community Study is not provided. USFWS recommends a full survey be conducted according to the "Freshwater Mussel Guidelines for Virginia" (USFWS and VDGIF 2018). This would be 200 m upstream and 800 m downstream of the project, in addition to the first area with good mussel habitat upstream of the reservoir.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N/A	Y	

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
<b>Wetlands, Riparian, and Littoral Habitat Characterization Study</b>					
Please explain why a basic survey of wildlife within these habitats was not included as part of the Wetland, Riparian, and Littoral Habitat Characterization Study.	J. Smith and A. Conner, FERC	October 7, 2019	N	Y (alt)	This RSP (Section 8) includes provisions for documentation of general wildlife usage, including observations for bald eagles and any visible bald eagle nests, during the Wetland, Riparian, and Littoral Habitat Characterization Study. Appalachian notes that the study area does not include significant upland terrestrial habitat, and where limited upland habitat occurs Appalachian does not expect any impacts of Project operations, so no further botanical habitat or wildlife surveys are proposed.
The map depicting any invasive aquatic vegetation should also include invasive plant species in riparian and upland areas. This information will be useful for determining if any control of invasive plants is needed as part of the Wildlife Management Plan.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N	Y(alt)	This RSP (Section 8) includes provisions for documentation of visible invasive aquatic species in riparian areas during the Wetland, Riparian, and Littoral Habitat Characterization Study. Appalachian notes that the study area does not include significant upland terrestrial habitat, and where limited upland habitat occurs Appalachian does not expect any impacts of Project operations, so no further botanical surveys are proposed.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
The study area should be expanded both upstream to include free-flowing sections of the river, and to include areas downstream to Smith Mountain lake, to more fully assess impacts from the project.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N	N	Appalachian believes that, consistent with ILP Study Criteria No. 7, the tasks and activities within the proposed study areas described in this RSP are sufficient to inform agency recommendations and FERC license conditions for the Project, and focusing the geographic scope of the proposed studies on this study area and the Project boundary is consistent with generally accepted practice in the scientific community and within FERC relicensing criteria (ILP Study Criteria No. 6).
The goals and objectives only include characterization of vegetation and does not include assessment of wildlife use in the Project area. This should be added to the study, particularly river-dependent wildlife such as the Bald Eagle. A survey of eagle nests within the Project area is recommended.	S. Jahrsdoerfer and R. McCorkle, USFWS	October 3, 2019	N	Y(alt)	As noted above, this RSP (Section 8) includes provisions for documentation of general wildlife usage during the Wetland, Riparian, and Littoral Habitat Characterization Study. A bald eagle survey is not proposed at this time, for the reasons discussed in Section 3.2.2.
<b>Recreation Study</b>					
Stated that in the interest of assisting Appalachian to reach the maximum number of stakeholders in our community, the Committee would like to offer assistance with this task, including coordination with Appalachian and their consultants to ensure that several key stakeholders are involved in the meeting.	RRBC	October 7, 2019	N	Y	Appalachian appreciates this offer and support from RRBC and, as noted in Section 10.6.2 plans to coordinate with RRBC and other organizations, as appropriate, to convene this meeting and participate in the Recreation Study.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
<p>RRBC recommended distribution of the online survey through our contacts, webpage, and social media sites.</p> <p>RVGC stated that the survey needs to be more widely publicized. A notice should be sent to outfitters, shops that provide boating equipment, paddling and fishing groups, and other media and social media outlets such as Roanoke Outside.</p>	RRBC L. Belcher, RVGC	October 7, 2019 October 4, 2019	N/A	Y	Appalachian appreciates this offer and support from RRBC and, as noted in Section 10.6.3, plans to consult with RRBC and other organizations, as appropriate, to identify effective measures to promote the Recreation Visitor Use Online Survey.
<p>RVGC recommended that the study gather information on boating facilities upstream and downstream of the Project, and that the study area extend downstream to Back Creek, because of the impact of the Project on recreation use on that adjacent river section.</p> <p>VDGIF stated that the proposed study will not address the true need for recreation access enhancement. VDGIF previously suggested that Appalachian survey existing recreational use in areas not impacted by the project (e.g, upstream of the Project boundary). This will provide a realistic comparison of recreational demand and use between the project area and an area with reasonably good access.</p>	S. Smith, VDGIF L. Belcher, RVGC	October 7, 2019 October 4, 2019	N	Y (alt)	<p>Appalachian has expanded the study area for this Recreation Study to include observations and surveys at the upstream Tinker Creek and downstream Explore Park/Rutrough Point access areas. This, in combination with expanded notifications for the Recreation Visitor Use Online Survey as noted above, is expected to capture input from both existing and potential recreational visitors.</p> <p>Appalachian believes that, consistent with ILP Study Criteria No. 7, the tasks and activities within the proposed study area described in this RSP is sufficient to inform agency recommendations and FERC license conditions for the Project, and focusing the geographic scope of the proposed study on this study area and the Project boundary is consistent with generally accepted practice in the scientific community and within FERC relicensing criteria (ILP Study Criteria No. 6).</p>

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
The Proposed Study Plan summarizes comments into five bullets from five agencies, but it does not address other comments or clearly tell how the Recreation Study will address these requests. There is global assurance that the Commission will consider "all relevant studies and recommendations," but there is no step in the Recreation Study that documents this.	L. Belcher, RVGC	October 4, 2019	N/A	N	Appalachian has made a good faith effort in the PSP and RSP to concisely and accurately summarize comments received, and take these comments into consideration in development of the study plans. Appalachian is not obliged by FERC's ILP regulations to incorporate or respond directly to every study comment provided, particularly those that do not conform to the ILP study criteria. No further edits or revisions have been made to address this comment.
The Background and Existing Information section needs to include a review of all plans that are impacted by the Project and an analysis of how the Project might restrict or facilitate implementation of those plans (such as the 2018 Roanoke Valley Greenway Plan, or others submitted such as by Roanoke County).	L. Belcher, RVGC	October 4, 2019	N	Y	As noted in Section 10.7 of this RSP, Appalachian has clarified that the report for this study will include a review and analysis of applicable recreation-related plans that may be impacted by the Project.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
The inventory should consider other facilities in addition to the Niagara portage, such as the Tinker Creek boat launch and other access points upstream and downstream such as Bennington and Rutrough Roads and other recreation facilities in the study area.	L. Belcher, RVGC	October 4, 2019	N	Y (alt)	<p>As noted above and in the Recreation Study plan, Appalachian has expanded the study area for this Recreation Study, including the facility inventory and condition assessment, to include the Town of Vinton, Virginia boat launch located along Tinker Creek and the NPS Fishing Trail leading from the parking area along the Blue Ridge Parkway at Milepost 115 to the Roanoke River downstream of the powerhouse for the Niagara Project.</p> <p>Appalachian believes that, consistent with ILP Study Criteria No. 7, the tasks and activities within the proposed study area are sufficient to inform agency recommendations and FERC license conditions for the Project, and focusing the geographic scope of the proposed study on this study area and the Project boundary is consistent with generally accepted practice in the scientific community and within FERC relicensing criteria (ILP Study Criteria No. 6).</p>
One meeting is insufficient. A consultant should not be told to schedule 'a meeting' for a focused discussion with the expectation they will then know everything about existing and future recreational opportunities. The consultant should visit local offices of agencies, meeting with stakeholders, local governments, NGO's in the area.	L. Belcher, RVGC	October 4, 2019	N	N	<p>Appalachian notes that the study activities included in this RSP span the 2020 study season. Appalachian believes that conduct of an initial meeting, along with the other study activities proposed, is appropriate for this study period and expects to evaluate the need for additional meetings or outreach focused on this study in the ISR and at the ISR Meeting.</p>



Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
Expand Recreational Use Documentation to include cameras at the Tinker Creek and Rutrough Road boat launches.	L. Belcher, RVGC	October 4, 2019	N	Y	Based on additional site evaluations conducted by Appalachian and their consultants, and the comments provided on the PSP and at the PSP meeting, the use of trail cameras is no longer proposed. Refer to Section 10.6.4 for a description of the revised methodology for completing this task, which has been expanded to include the two recommended boat launches/ river access areas.
The Analysis and Reporting section should include 1) a research and review section documenting other plans and recreation programs that were reviewed and portions that were considered; 2) a list of potential cooperative recreation projects in the study area; 3) opportunities within the scope and beyond the scope of the project.	L. Belcher, RVGC	October 4, 2019	N/A	Y(alt)	With revisions made in this RSP, Appalachian has clarified that relevant recreation-related plans and potential cooperative projects will be addressed in the study report. Appalachian does not propose to address opportunities beyond the scope of the Project or with no clear nexus to the Project or Project operations in the study report (ILP Study Criteria No. 5).
We ask that Appalachian consider the following solutions to improve recreational opportunities in the Project area: 1) purchase property on the river-right near Niagara Dam to provide parking and boating access; 2) provide portage around Niagara Dam on the river-right; 3) work with the localities to provide debris removal at the dam and sponsor periodic clean ups of trash in the Project area; and 4) provide Roanoke County with right-of-way for Roanoke River Greenway on river-right on Appalachian land.	L. Belcher, RVGC	October 4, 2019	N/A	N	Appalachian appreciates the clear input from RVGC at this stage of the relicensing and plans to further evaluate these recommendations during and following completion of the Recreation Study, in support of preparation of the license application for the Project.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
<p>FORVA recommended that a portage study should include examining the idea of a portage on river-right that would allow for boaters to take out just above the dam and then to use a shuttle vehicle around to the Blue Ridge Parkway where they could re-enter the river using the Fishermen's Trail. Another option might be to put in a shorter hand-carry portage on river-right that would then allow boaters to enter the river just below the dam, accessing the bypass reach. A third option would be to maintain a working phone at the river-left takeout that would allow boaters to call for assistance from Appalachian for a shuttle to below the powerhouse.</p> <p>RRBC noted that the goals and objectives of the study do not explicitly state that recommendations for improvements to the facilities will be included as a product of the study, and that it is the hope of the Committee that the study would also result in specific recommendations to improve the portage facility, whether by Appalachian or by Appalachian in partnership with local governments and other entities.</p>	B. Tanger, FORVA RRBC	September 4 , 2019 October 7, 2019	N	Y(alt)	Appalachian understands modification of the existing portage trail to be a common interest of relicensing participants. Appalachian plans to further evaluate these recommendations in consultation with Project stakeholders, during and following completion of the Recreation Study, in support of preparation of the license application for the Project. Appalachian expects to reevaluate whether there is a need to conduct this evaluation as part of the formal Recreation Study in the ISR and at the ISR meeting.
Currently access is extremely difficult on river-right below the dam and excludes usage by the elderly, children, or the handicapped. A vastly improved trail down to the bypass reach is needed. A study should be done to determine the best way for the public to access the Niagara Dam bypass reach.	B. Tanger, FORVA	September 4 , 2019	N	N	Appalachian appreciates the clear input from RVGC at this stage of the relicensing and plans to further evaluate these recommendations during and following completion of the Recreation Study, in support of preparation of the license application for the Project.

Summary of Study Request or Comment	Stakeholder <sup>1</sup>	Date	ILP Study Criteria Met? <sup>2</sup>	Addressed in RSP? (Y/N) <sup>2</sup>	Response
The public needs to know if schedule releases can be obtained, or, if not regularly scheduled, if commitments can be made by Appalachian to increase flows for special events planned by the community. Additionally, can there be releases from Spring Hollow Reservoir for special occasions? While Spring Hollow is not within the Project boundary, collaboration with Appalachian could provide greater opportunities for further recreation below the dam. A study should be done to determine potential releases from Spring Hollow to increase recreational flows.	B. Tanger, FORVA	September 4 , 2019	N	Y (alt)	Addressed in Sections 10.4 and 10.6.6.

### 3.2.1 Study Requests Deemed Appropriate for Study

As outlined in Table 3-2, PSP comments were received from FERC, USFWS, VDGIF, Virginia Tech, FORVA, RVGC, USEPA, RRBC, and VDEQ on the Flow and Bypass Reach Aquatic Habitat Study, Water Quality Study, Fish Community Study, Benthic Aquatic Resources Study, Wetlands, Riparian, and Littoral Habitat Characterization Study, and Recreational Study. Comments were not received on the Shoreline Stability Assessment Study or the Cultural Resources Study. Appalachian continues to propose eight studies, which are detailed in Sections 4 through 11 of this RSP, to address study requests and comments by Project Stakeholders:

- (1) Flow and Bypass Reach Aquatic Habitat Study
- (2) Water Quality Study
- (3) Fish Community Study
- (4) Benthic Aquatic Resources Study
- (5) Wetlands, Riparian, and Littoral Habitat Characterization Study
- (6) Shoreline Stability Assessment Study
- (7) Recreation Study
- (8) Cultural Resources Study

### 3.2.2 Study Requests Deemed Not Appropriate for Study

#### Bald Eagle Survey

In comments on the PSP dated October 3, 2019, USFWS recommended a survey of eagle nests within the study area, though the recommendation was not submitted in the form of a formal ILP study request. USFWS noted that river-dependent wildlife such as the bald eagle (*Haliaeetus leucocephalus*) may be impacted by the Project and that there is an existing record of an active (as of 2014) eagle nest located 1.25 miles downstream of the Project. Appalachian has not incorporated this recommendation into this RSP for the following reasons:

- Lack of nexus between Project operation and effects (direct, indirect, and/or cumulative) (ILP Study Criteria No. 5). Appalachian agrees in principle that in the event bald eagles are nesting within or proximate to the Project boundary, activities within the Project boundary resulting in potential disturbance of nesting habitat or to nesting eagles could impact bald eagles. However, it is also reasonable to assume that if bald eagles are nesting within or proximate to the Project boundary, Project operations are not adversely impacting this nesting activity. No modifications in Project operation or activities resulting in disturbance of potential bald eagle nesting habitat are presently proposed by Appalachian that would trigger the need for this

survey. In the event that bald eagle nest are discovered over the course of the relicensing process or the new license term and that the nest may be affected by Project operations, Appalachian would consult with USFWS and follow their guidance regarding nest disturbance.

- Appalachian understands that even if a baseline survey (of nests and on-or-off the nest bald eagles) were conducted as part of the relicensing studies, presumably following aerial methods outlined by USFWS's Post-delisting Monitoring Plan for the Bald Eagle (USFWS 2009), the results of this survey may no longer be valid by the time the new license is issued or during the new license term. Appalachian recognizes bald eagle populations are growing and prefers to assume that there may be potential for bald eagle nests to occur in the study area. In the event a future activity at the Project could affect nesting eagles, Appalachian will address potential impacts at that time.

## Roanoke Logperch Larval Study

In comments or study requests filed on the PSP, raised at the PSP meeting, or discussed during the September 25, 2019 Fish Community Study coordination call, USFWS, VDGIF, and Virginia Tech emphasized the need for a Roanoke Logperch Survey, including assessment of all life stages (larvae, YOY, adult). Virginia Tech provided study plan criteria.

Appalachian disagrees that this study request meets all of the ILP study criteria, in particular Study Criteria No. 6, consistency with generally accepted practices in the scientific community (including any preferred data collection and analysis techniques, or objectively quantified information), and No. 7, considerations of level of effort and cost. Appalachian's primary concern lies not with the (standard) methodology or level of effort associated with collecting larval drift, but in the feasibility of confidently and cost-effectively accurately identifying the collected specimens. The comments of both USFWS and Virginia Tech acknowledge that identifying larvae to the species level using DNA-barcoding would be a disproportionate cost for the relicensing study. Sorting of larvae using meristic and morphometric features is recommended as the alternative means of identifying larvae to the species level. As noted in Section 6.6 of this RSP, USFWS and Virginia Tech have stated that Roanoke Logperch can be confidently separated from other percids that may be collected during the larval study (comments on PSP from Dr. Paul Angermeier received on October 2, 2019). However, the reference provided to justify this assertion (Hallerman et al. 2017) concluded that the features on which identification was based may not be "useful for distinguishing among larval darter species occurring in the upper Roanoke River system." Additionally, the taxonomic keys used to separate the endangered Roanoke Logperch from other percids in the Roanoke River near the Project were only recently developed and have not been, to Appalachian's knowledge, validated by independent taxonomists or laboratories.

Based on the factors above, Appalachian remains deeply concerned that the results of this study could lead to an over-estimate of Roanoke Logperch drift into the Project reservoir. Appalachian also notes that no comments on this study have given any consideration to naturally occurring levels of larval (or juvenile) mortality. While Appalachian recognizes the gap in existing data that agencies are interested in addressing with the requested study, Appalachian does not believe that the results of this study will necessarily appropriately inform the development of license requirements, particularly with respect to analyses

triggered by Section 7 of the Endangered Species Act and any resulting actions or recommendations by the USFWS.

However, in the interest of efficiently advancing through this ILP and satisfying relicensing stakeholder requests, Appalachian has included methods and provisions to conduct the larval drift study in Section 6 of this RSP. In the event that this study is approved by the Commission and conducted by Appalachian, Appalachian assumes that relicensing stakeholders and Commission staff acknowledge the constraints that include state of the science (with respect to larval identification by the recommended methods) and limitations regarding interpretation and application of collected data, and support and cooperate with the quality control measures proposed by Appalachian for laboratory processing.

### 3.2.3 Response to FERC Requests for Additional Information

In addition to FERC's comments on the PSP, staff also included Additional Information Requests (AIRs) in Schedule B of their October 7, 2019 letter. The following summarizes FERC's Request for Additional Information and highlights Appalachian's response.

- (1) *The last paragraph of section 5.6.1 in the pre-application document (PAD) references the "2016 riparian forest wildlife habitat plan." We cannot find any other reference to such a plan in the PAD or any other recent document associated with this project. Please provide a copy of this plan or provide additional detail to clarify what the paragraph is referencing.*

**Appalachian's Response:**

Article 407 of the existing license requires Appalachian to implement the Management Plan for Riparian Forest Wildlife Habitat/Wildlife Management Plan (WMP) filed with the Commission on February 25, 1993. The most recent WMP report was submitted by Appalachian on November 5, 2015.

Under this Plan, Appalachian collects photographs of designated locations on an annual basis to monitor for changes in habitat compared to baseline data collected in 1995 and provides these photographs to VDGIF. The reference in Section 5.6.1 of the PAD was intended to reference the submittal of photographs taken in 2016 and transmitted to VDGIF on March 9, 2017.

- (2) *Section 10.4.2 of the PSP states that "many species likely to occur within the Project vicinity typically use wetland or riparian habitats at some point in their lives for permanent, temporary, or transient uses." However, section 5.6.2 of the PAD states that there is no available information on specific wildlife species within wetland and riparian habitats of the project vicinity. Please explain why a basic survey of wildlife within these habitats was not included as part of the Wetland, Riparian, and Littoral Habitat Characterization Study proposed in the PSP.*

**Appalachian's Response:**

As noted in Table 3-2, the Wetland, Riparian, and Littoral Habitat Characterization Study has been revised in this RSP to include observation and documentation of general wildlife usage during field verification activities to be conducted for this study. Refer to Section 5.5 of the PAD for a list of general wildlife species that have the potential to occur at or in the vicinity of the Project.

- (3) *In sub-section 6.2.4.1 of the PAD, you state that “ongoing operations may temporarily impact some generalist terrestrial wildlife species, however these species will likely move to adjacent habitat, returning once the activities are complete.” Please provide an explanation on how it was determined that only generalist species might be affected by operations, especially in habitats where existing information on wildlife is unavailable (as per section 5.6.2 of the PAD). Additionally, please provide information supporting your statements that (1) any such impacts would only be temporary and (2) that wildlife would move and then return to their original habitat.*

**Appalachian's Response:**

With the exception of federally listed bat species, Appalachian is not aware of any federally protected wildlife species that occur in the Project boundary. Appalachian believes it is reasonable to assume that in the limited areas of the Project boundary where routine maintenance activities occur (i.e., near the dam, access road, powerhouse, and appurtenant facilities), general wildlife species have acclimated to the presence of these structures and activities in these areas over the past 100+ years of Project operation. An example of the type of impact Appalachian intended with this statement in the PAD is disturbance to wildlife caused by vehicles or equipment accessing the dam or powerhouse is infrequent, short-lived, and would not cause permanent displacement of wildlife. No activities are presently proposed by Appalachian that would represent a departure from normal Project operations. Appalachian does not see a nexus between this AIR and the ILP studies proposed for this relicensing and thus is not including additional analyses or study activities to address this comment at this time. Potential impacts of activities or modifications proposed by Appalachian on a variety of resources will be addressed, as appropriate, in Exhibit E of the license application.

- (4) *As noted by the USFWS in its comment letter on May 28, 2019, Table 5.7-1 of the PAD lists the bog turtle as a species with historical records at or within the project vicinity. The species is currently listed as potentially occurring in Floyd County immediately south of Roanoke County. Thus, please explain why this species was included in Table 5.7-1 of the PAD and not considered for inclusion in the PSP.*

**Appalachian's Response:**

Appalachian has not included targeted survey activities for bog turtle (*Glyptemys muhlenbergii*) in the PSP or RSP. There are no known occurrences of this species within Roanoke County. True to the species name, bog turtles typically inhabit very



specific bog-type wetland habitats. Bog turtle habitat is characterized by an open canopy and may include slow, shallow, muck-bottomed rivulets of sphagnum bogs, calcareous fens, marshy/sedge-tussock meadows, wet cow pastures, spring seeps, and shrub swamps. Bog turtles require a mosaic of microhabitats for foraging, nesting, basking, hibernation, and shelter (often provided by an abundance of sedges or mossy cover). Unfragmented riparian systems subject to dynamic disturbances sufficient enough to allow natural creation of open habitat are necessary to compensate for ecological succession. Use by beaver, deer, and cattle are often instrumental in creating the disturbance needed to maintain the open-canopy conditions required for these types of wetlands (USFWS 2000). The limited wetland areas and types identified within the Project boundary do not provide the specific type of wetland habitat (i.e., bogs, fens, swamps) utilized by the bog turtle. Furthermore, USFWS has not requested any formal or informal assessments or surveys for the bog turtle; therefore, none are proposed.

## 4 Flow and Bypass Reach Aquatic Habitat Study

### 4.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing:

- Adequacy of the existing minimum flows for protecting aquatic habitat for resident fishes, including species of special concern (Orangefin Madtom [*Noturus gilberti*]), and other aquatic resources downstream of the powerhouse (50 cfs) and in the bypass reach (8 cfs).

Comments or study requests related to this study were received in response to the PAD and SD1 from FERC, USFWS, VDGIF, and VDEQ. Requests and comments included recommendations to identify the target biological community of the bypass reach, determine aquatic habitat availability, and evaluate the minimum amount of flow required for fully functional aquatic habitat in the bypass reach as compared to non-impacted reaches. These initial comments and study requests are summarized in greater detail below:

- USFWS and VDGIF requested an instream flow study (2-dimensional [2-D] hydraulic model coupled with Physical Habitat Simulation [PHABSIM] analysis) to (1) identify a bypass reach minimum flow, or range of monthly or seasonal minimum flows, that will support the aquatic species and life stages found in areas of the Roanoke River outside of the influence of hydropower projects, and (2) model water depth and velocity through the bypass reach under multiple flow scenarios for comparison with habitat suitability curves and quantify the degree of wetted perimeter and pool connectivity at each evaluated flow. Data from these efforts would be used to evaluate aquatic habitat availability over a range of flows for target species and life stages (to be determined in consultation with USFWS and VDGIF).
- USFWS also stated that this study should include a reassessment of the minimum flow requirements and evaluation of aquatic habitat in the bypass reach in order to prevent fish kill events.
- USFWS also requested as part of this study in situ monitoring of water quality parameters and pebble counts along established transects under a range of flows, as well as an evaluation of macroinvertebrate and crayfish communities in the bypass reach and determination of the appropriate flow that will support this community.
- VDGIF requested that this study include an evaluation of the feasibility of providing suitable habitat for all life stages of Roanoke Logperch at levels similar to areas of the Roanoke River outside of the influence of hydropower projects.

- VDEQ recommends quantifying the type and number of benthic and fish species that use the bypass reach and to assess whether the current 8 cfs minimum flow is adequately protective.

Additional comments or requests related to this study were received from USFWS, VDGIF, VDEQ and FERC in response to Appalachian's filing of the PSP. These comments are summarized as follows:

- FERC asked how Appalachian will determine target flows and requested a targeted species list developed in consultation with stakeholders to better understand the species of focus in this study.
- USFWS recommended an individual habitat suitability analysis be developed for the Roanoke Logperch and a guild approach be used to represent other species of interest. They also recommended collecting information on substrate particle sizes using the Wentworth (or similar) methodology/terminology. The USFWS is interested in better understanding how water spills over the dam if the sluice gate is closed. USFWS also provided recommendations for use of velocity meters and asked for additional details regarding the spatial resolution of some of the model inputs.
- VDGIF believes the study area should be redefined to compare downstream habitat conditions to a baseline or reference reach.
- VDEQ noted that flows through the bypass should be estimated by subtracting powerhouse outflow, from the USGS 02056000 Roanoke River at Niagara, VA streamflow gaging station.

In addition to the formal comments filed, the following points relevant to this study plan were discussed at the PSP meeting on August 1, 2019:

- Appalachian's consultant explained the benefits of the CHEOPS model to understand flow and simulate generation and spills. They explained the first target flow would likely be 8 cfs and that field crews would observe flow changes at staff gages in the bypass reach to confirm flows have stabilized.
- The group discussed HSI curves for guild and target species. USFWS noted they would want to see different life stages for target species (e.g., Roanoke Logperch) evaluated.
- Appalachian's consultant noted that the sluice gate is the only operational control of water level at the dam (other than powerhouse intake), so it may not be possible to provide a controlled flow release beyond the capacity of this outlet.
- Discussion with USFWS regarding pebble counts before and after each controlled release.
- Discussion of how connectivity will be evaluated. Includes quantitative assessment of wetted area as well as visual/qualitative description.

## 4.2 Goals and Objectives

The objectives of this study are to conduct a flow and habitat assessment for the Project's tailwater and bypass reach using a combination of desktop, field survey, and hydraulic modeling methodologies with the following goals:

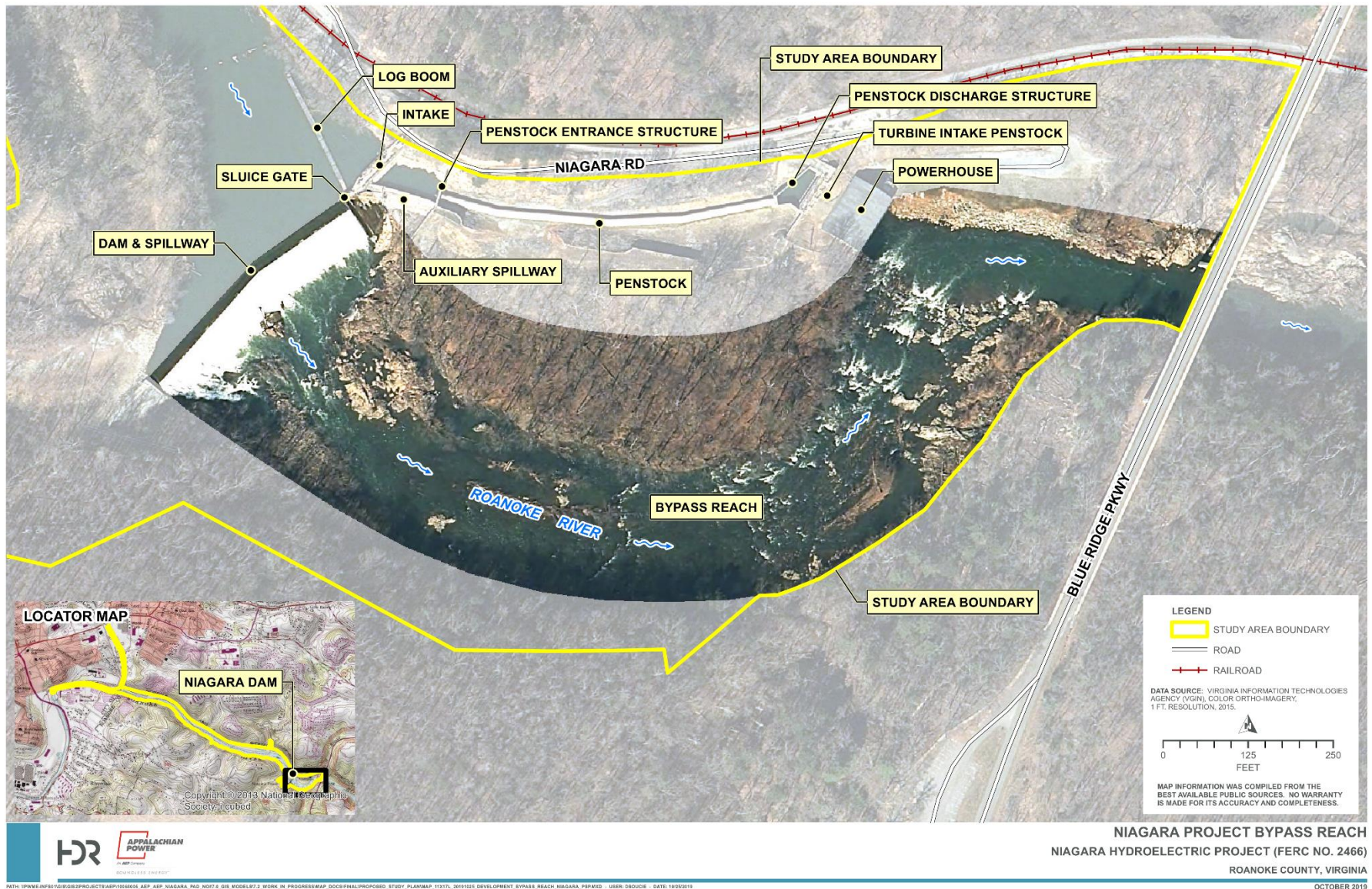
- Delineate and quantify aquatic habitats and substrate types in the bypass reach.
- Identify and characterize locations of habitat management interest located within the bypass reach.
- Develop an understanding of travel times and water surface elevation responses for different base flow and spillway release flow combinations in the tailwater and bypass reach study areas to:
  - Demonstrate the efficacy of the existing Project minimum flow requirement.
  - Evaluate the effects of providing higher seasonal minimum flows to the bypass reach.

## 4.3 Study Area

The study area for the Flow and Bypass Reach Aquatic Habitat Study includes the tailwater, bypass reach, and river reach downstream of the Niagara powerhouse to the Blue Ridge Parkway Bridge (Figure 4-1Figure 1-3).



Figure 4-1. Flow and Bypass Reach Aquatic Habitat Study Area



## 4.4 Background and Existing Information

The Niagara bypass reach is approximately 1,500 feet long, consisting primarily of exposed bedrock and rock outcroppings. License Article 403 established an 8 cfs minimum flow requirement for the bypass reach, but flows can be higher depending on spillway sluice gate operations and/or Project inflows. Under normal operating conditions, the development uses available flows for powerhouse generation, maintaining the elevation of the Niagara reservoir between elevations of 884.4 and 883.4 feet NGVD.

Under Article 403 of the current license, Appalachian is also required to maintain 50 cfs minimum flow release or inflow, whichever is less, downstream of the Project powerhouse. When inflow to the Project exceeds the powerhouse discharge capacity (684 cfs), the excess flows are passed over and through the spillway. Flow releases to the bypass reach can vary substantially depending on season and precipitation, as demonstrated in Table 4-1.

In preparation for this relicensing, an operations model of the Project was developed for Appalachian by HDR, using HDR's proprietary Computerized Hydro Electric Operations Planning Software (CHEOPS™) platform. While the primary purpose of this model is to evaluate the effects of operational changes and physical modifications at the developments on power generation, the model also provides useful data and tools to support evaluation of sluice gate operations and flows in the bypass reach. The model uses historical inflows to simulate likely future conditions. The model for these developments relied on flow data retrieved from the U. S. Geological Survey (USGS) streamflow gage USGS 02056000 Roanoke River at Niagara, VA. This gage is located immediately downstream of the Project and records daily average flow data; the period of record extends from October 1926 through present. The contiguous 30-year period from January 1, 1988 through December 31, 2017 was chosen for this modeling effort and contains a representative number of wet, normal, and dry precipitation periods. The USGS 02056000 streamflow gage records streamflow on the Roanoke River over a drainage area of 384 square miles. Based on annual streamflow gage data, the average flow for this 30-year hydrologic period is 533 cfs. The driest year was 2008 with an average flow of 222 cfs, and the wettest year was 2003 with an average flow of 996 cfs, based on gage data. Appalachian believes, therefore, that this historical hydrology dataset is sufficient to support the operations model as well as related flow evaluations for this study.

Additional physical data inputs to the operations model relevant to this study include reservoir storage volume, spillway capacity, and tailwater rating curves. The operations model simulates Project operations, including releases at the dam, under potential inflow conditions and operating requirements or constraints, including reservoir level restrictions and minimum or bypass flow requirements.



**Table 4-1. Niagara Development Bypass Reach Flows, as Licensed**

Month	Niagara Bypass Reach Flows (cfs) <sup>1</sup>								
	1988-2017 (Full Period)			2008 (Dry Year)			2003 (Wet Year)		
	Average Monthly Min	Average Monthly Max	Monthly Average	Min	Max	Average	Min	Max	Average
Jan	8	3,106	151	8	8	8	8	188	8
Feb	9	1,885	249	8	8	8	8	11,616	935
Mar	8	2,588	287	8	8	8	8	2,296	255
Apr	8	2,527	185	8	2,386	8	8	8,946	882
May	8	1,477	140	8	110	8	8	5,346	916
Jun	8	1,537	107	8	8	8	8	4,836	1,175
Jul	8	1,065	67	8	8	8	8	5,096	413
Aug	8	384	10	8	656	8	8	1,806	77
Sep	8	1,733	83	8	8	8	8	1,226	8
Oct	8	901	40	8	8	8	8	8	8
Nov	8	1,347	34	8	8	8	8	1,946	8
Dec	8	1,412	103	8	8	8	8	2,176	128
<b>Annual Average</b>	<b>8</b>	<b>1,663</b>	<b>121</b>	<b>8</b>	<b>269</b>	<b>8</b>	<b>8</b>	<b>3,791</b>	<b>401</b>

<sup>1</sup>Based on flows calculated by subtracting estimated maximum powerhouse discharge from flows recorded at USGS 02056000 Roanoke River at Niagara, VA. Actual flows provided to the bypass reach over this period may have been higher based on availability of turbine-generator units or other operating or inflow conditions.

## 4.5 Project Nexus

Diversion of water to the powerhouse for generation and operation of the existing sluice gate at the dam alters the timing, rate, and spatial distribution of Project inflows. Such alterations may negatively impact aquatic species and habitat in the bypass reach and tailwater area, particularly during periods of low flow or periodic or intermittent release of flows via the spillway.

## 4.6 Methodology

The USFWS and VDGIF requested an instream flow study with the goal of determining the minimum flow, or range of flows to the bypass required to support habitat for a suite of species inhabiting the Roanoke River, including the Roanoke Logperch.



Appalachian's goal in selecting a process for evaluating flows at the Project is to develop a technical basis for systematically evaluating and balancing the needs and priorities of the various flow-related resources. The goal of the study will be to characterize changes in habitat quantity over a range of flows and operational scenarios. There are several types or combinations of methodologies that could be used to meet the study objectives, ranging from quantitative to relatively qualitative. Appalachian believes that the approach proposed will provide the requested information at an appropriate level of effort. This approach will allow for an assessment of potential project PM&E measures for the benefit of the range of resources in the Project's tailwater area and bypass reach.

## 4.6.1 Task 1 – Literature Review and Desktop Assessment

A literature review of available information will be performed to support the study goals, methodologies, and planning of field portions of the study. This task will include a review of the hydrologic record for the Project reach, existing sluice gate operating procedures maintained by Appalachian, existing topographic and geologic maps, and available recent and historical aerial imagery.

Several pieces of information will be considered in the field study planning process. First, a visual assessment and habitat characterization of mesohabitat types within the bypass reach will be performed. High resolution aerial imagery at low and high flows and fine-scale topographic data will be used to delineate the reach into pool, riffle, run, and shoal habitats. Dominant substrate types and any obvious instream habitat (such as littoral zones, hard structure, woody debris, and vegetative cover) will be characterized and mapped based on the mesohabitat type and aerial imagery. Figures created in GIS will delineate mesohabitat types and proposed field study locations will be developed.

Second, consideration of select species of interest will be incorporated for project planning. Several resources were reviewed to develop a list of species to be evaluated in this analysis. Using a guild approach as recommended by USFWS (Vadas and Orth 2001), species of interest for this study include those collected in the prior fish survey (Appalachian and AEP 1991), protected species, or those of management concern. Species selected for this study are summarized in Table 4-2. Appalachian's justification for following the habitat guild approach is provided in Table 3-2.

**Table 4-2. Species of Interest to be Evaluated in the Flow and Bypass Reach Aquatic Habitat Study**

Super Guild	Guild	Species Type	Common Name	Scientific Name
Rheophiles	Fast Riffle	Sucker	Shorthead Redhorse <sup>1</sup>	<i>Moxostoma macrolepidotum</i>
		Sucker	Roanoke Hog Sucker <sup>2</sup>	<i>Hypentelium roanokense</i>
	Riffle-Run	Minnow	Central Stoneroller <sup>3</sup>	<i>Campostoma anomalum</i>
		Catfish	Orange-fin Madtom <sup>2</sup>	<i>Noturus gilberti</i>
		Darter	Common Logperch	<i>Percina caprodes</i>

Super Guild	Guild	Species Type	Common Name	Scientific Name
	Fast Generalist	Darter	Roanoke Logperch <sup>4</sup>	<i>Percina rex</i>
		Sucker	Bigeye Jumprock <sup>2</sup>	<i>Moxostoma ariommum</i>
		Sucker	Golden Redhorse <sup>1</sup>	<i>Moxostoma erythrurum</i>
	Shallow Rheophile	Catfish	Channel Catfish <sup>1</sup>	<i>Ictalurus punctatus</i>
		Minnow	Redbelly Dace <sup>3</sup>	<i>Chrosomus eos</i>
		Minnow	Blacknose Dace <sup>3</sup>	<i>Rhinichthys atratulus</i>
Limnophiles	Pool-run	Minnow	Bluntnose Minnow <sup>1, 3</sup>	<i>Pimephales notatus</i>
		Sucker	White Sucker <sup>1, 3</sup>	<i>Catostomus commersonii</i>
		Minnow	Spottail Shiner <sup>1, 3</sup>	<i>Notropis hudsonius</i>
	Open Pool	Shad	Gizzard Shad <sup>1</sup>	<i>Dorosoma cepedianum</i>
	Pool Cover	Sunfish	Roanoke Bass <sup>2</sup>	<i>Ambloplites cavifrons</i>
		Sunfish	Redbreast Sunfish <sup>1</sup>	<i>Lepomis auritus</i>
		Sunfish	Smallmouth Bass <sup>1</sup>	<i>Micropterus dolomieu</i>
		Minnow	Common Carp <sup>1</sup>	<i>Cyprinus carpio</i>
		Sucker	Northern Hog Sucker <sup>1, 3</sup>	<i>Hypentelium nigricans</i>

<sup>1</sup>Appalachian and AEP 1991; <sup>2</sup>VDGIF 2019a; <sup>3</sup>Vadas and Orth 2001; <sup>4</sup>Vadas and Orth 1997

## 4.6.2 Task 2 – Topography Mapping and Photogrammetry Data Collection

Light detection and ranging (LiDAR) or similar technology and photogrammetry data, if not already available and achievable, will be collected during a period of minimal water levels in the bypass reach to support development of comprehensive three-dimensional (3-D) elevation and visual surface layers of the bypass reach. Field survey data may also need to be collected in areas that are underwater during the topographic mapping flyover. This data will be used to produce a topographic map of the bypass reach which in turn will be used as a base layer or foundation for subsequent field data collection and hydraulic modeling efforts.

### 4.6.3 Task 3 – Field Data Collection

#### 4.6.3.1 Mesohabitat Mapping Verification

A representative selection of mesohabitats identified during the desktop habitat assessment will be selected for field verification, in proportion to their availability (frequency of occurrence and total area). This habitat mapping may potentially be performed concurrently with field activities for other studies. Examples of mesohabitat types will be documented via photographs and GIS mapping. Specific habitat types of interest, such as suitable spawning habitat for species of interest or mussel habitat, will be documented.

#### 4.6.3.2 Flow and Water Level Assessment

In this task, field data will be collected to support development of a two-dimensional (2-D) hydraulic model (described in Task 4) of the Project's tailwater and bypass reach. Calibration flows will be released into the tailwater and bypass reach for purposes of collecting depth and wetted area data under various powerhouse and spillway flow regimes and spillway flow release points (i.e., either through the existing sluice gate or across the crest of the spillway). As a result, the model will enable a comparison between powerhouse operations and dam operations. Appalachian or their consultant will develop a proposed framework for model scenarios and provide interested relicensing participants the opportunity to review and comment on the framework prior to collecting field data under the calibration flows. The framework is expected to include provisions for the following:

- Water level data loggers (pressure transducers that measure water stage changes) will be strategically deployed in the tailwater and bypass study reach in March or April to begin collecting depth information under a variety of flow regimes (i.e., powerhouse operations and spillway operations). Based on monthly average bypass flow estimates provided in Table 4-1, higher flows typically occur during this time of year, and collecting depth information under these conditions will help calibrate the higher 2-D model flow regimes.
- Level loggers will be placed approximately equidistant from the base of the spillway in pairs on each side of the bypass reach from top to bottom. This will help to evaluate changes in depth, flow patterns, and wetted area under a range of flow conditions and bypass flow release points.
- Level loggers will also be placed in the immediate tailwater area and at the downstream end of the study area (i.e., at or near the Blue Ridge Parkway bridge) to capture changes in water surface elevations and travel time associated with flow releases from both the tailwater and bypass reach study areas.
- The level loggers will be programmed to collect data in 15-minute increments to help evaluate travel time and document steady-state conditions.

- Documentation of powerhouse and spillway operations will be collected and analyzed to inform flow tests that will be conducted to further support the 2-D model calibration needs. Flows in the bypass reach will be estimated by subtracting powerhouse flows from the USGS 02056000 Roanoke River at Niagara, VA streamflow gaging station. A time series of estimated flows in the bypass reach will provide critical information on the timing and frequency of various flow rates in the bypass reach and will inform the decision regarding what representative flow rates should be used to support the study. Development of flow test scenarios will be done in consultation with interested relicensing participants.
- It is anticipated that the 2-D model will be capable of simulating flows in the bypass reach from the existing 8 cfs minimum flow requirement up to approximately 533 cfs. This is equivalent to the annual average flow measured at the USGS 02056000 Roanoke River At Niagara, VA streamflow gaging station from 1988 through 2017 (i.e., 30-yr period of record used for CHEOPS modeling).
- The flow tests will be designed and conducted to a) support model calibration needs and b) evaluate flow patterns and wetted area associated with releasing flows into the bypass reach via the existing sluice gate and, alternatively, across the top of the spillway. The objective of the flow tests in the bypass reach will be to obtain data under a variety of lower flow conditions starting at the existing 8 cfs minimum flow requirements up to approximately 200 cfs. It is anticipated that flows in this range may be more challenging to model given the complex terrain (i.e., geometry). As flows increase to the upper target modeling range (i.e., 533 cfs), the model parameters are easier to adjust; so capturing higher flow events are not as critical from a modeling perspective.
- Sluice gate openings and changes will comply with any existing operating procedures maintained by Appalachian.
- The flow tests will be designed to collect data under steady-state conditions, with the time interval of each flow test designed to provide ample travel time to reach constant flow conditions and to allow time for observation and any required discharge measurements at designated locations.
- Per request from the USFWS, an effort will be made to establish a cross-section in the bypass reach to manually measure velocities across the stream profile during each flow test if conditions (e.g., weather, flows, safety) allow. The purpose of this is to measure actual velocities under each flow regime incrementally across the bypass reach and use these velocity measurements to support model calibration efforts. Ideally, a cross-section comprised of mostly riffle-type habitat would be established. Velocity measurements would be conducted according to standard USGS methodology (i.e., velocity measurements should be taken at 20 percent and 80 percent of depth where total depth is greater than 1.5 feet, or 60 percent depth where total depth is less than 1.5 feet). Total flow, however, during each flow test scenario would be estimated by subtracting powerhouse flows from flows measured at the USGS 02056000 Roanoke River at Niagara, VA streamflow gaging station.

- It is anticipated that the tailwater and bypass flow tests will be conducted within one normal four-day work week (i.e., Monday – Thursday), or equivalent if flows are not sufficient over a consecutive four-day period.
- During the defined flow testing period, date- and time-stamped photographs or time-lapse video will be collected in the study areas.
- The level loggers will remain in place through fall 2020 to further characterize the hydraulics of the bypass reach under additional flow regimes that may occur during this period.

#### 4.6.3.3 Particle Size Distribution

In addition to substrate mapping conducted as part of Task 1, a Wolman pebble count (Wolman 1954) will be performed along one to two transects before and after each controlled flow release scenario described in Section 4.6.3.2. This data will be used to characterize the existing surface substrate grain size distribution in the bypass reach and determine if the test flows evaluated have sufficient velocity to mobilize substrate particles in the bypass reach. The Wentworth grain size classification scale (Wentworth 1922) will be used to assign size classes to the substrate as recommended by USFWS. Substrate data will be plotted by mesohabitat type to determine particle size distributions (e.g.,  $D_{50}$ ).

#### 4.6.4 Task 4 – Hydraulic Model Development

Development of a 2-D hydraulic model is proposed as part of this Flow and Bypass Reach Aquatic Habitat Study. A 2-D model incorporates detailed characterization of terrain obtained by topographic mapping technologies, and provides options for building both one-dimensional (1-D) and 2-D geometries. A 2-D model incorporates detailed characterization of terrain obtained by topographic mapping technology, and using a combined 1-D/2-D model development approach optimizes the simulation of observed hydraulic behavior for specific project requirements. Models such as the USACE's HEC-RAS software (version 5.0.3), or the Innovyze ICM software (version 7.0) (or similar computational models) are capable of simulating depth and velocities in a 2-D grid pattern over a wide range of flow conditions.

The approximately 1,500-foot-long Niagara bypass reach extending from the dam to the vicinity of the powerhouse tailwater is characterized by significant channel morphology variability, including deep and shallow pools, runs, shoals, steep cascades, and side channels with large boulders. This variability impacts travel times differently at various flows and is most accurately represented by a 2-D model. A 2-D model often provides more stable results over a wider range of flows than a 1-D model, thus reducing troubleshooting during model development; however, simulation speed is generally slower. The model software performs 2-D unsteady flow hydraulic calculations to dynamically route the spillway release flood wave downstream. The 2-D model uses a finite-volume solution algorithm to allow for 2-D cells to be wet or dry and handle a sudden rush of water, subcritical, supercritical, and mixed-flow regimes.

The 2-D unsteady flow calculations are based on conservation of mass and momentum. As a spillway release is a highly dynamic flood wave that will rise and fall quickly, the 2-D unsteady flow calculation will use the full momentum form of the St. Venant equations. The full momentum equation accounts for the change in velocity both spatially and temporally.

The 2-D model geometry is defined by the following inputs:

- A digital terrain model (DTM) - LiDAR data will be processed into a DTM with 1-foot by 1-foot resolution;
- User inputs based on Project drawings and survey information; and
- Manning's roughness coefficient inputs defined spatially by the 2016 National Land Cover Database, numerically by Chow (1959) and adjusted using high-resolution aerial photography proposed for collection in the fall of 2019.

The 2-D model calculates the flood wave hydrograph resulting from a spillway release based on input gate operation/spillway release parameters.

Flow and water depth data collected in Task 3 will be used to calibrate and validate the hydraulic model to allow simulation of flow conditions other than those that were explicitly sampled during data collection. Recorded sluice gate openings (provided by Appalachian), flow, and level-logger data from the tailwater and bypass reach study area will be processed to provide operation sequences and flow and elevation hydrographs used for the calibration of bypass reach model hydraulic parameters.

The calibrated model will be applied in coordination with interested relicensing stakeholders to simulate a variety of tailwater and bypass flow scenarios. Simulations will be used to establish matrices of travel time, rise in water surface elevation, and velocities at locations of interest under the different flow regimes.

It is noted that any model is a representation of actual physical processes and has inherent uncertainty, especially when used to simulate conditions that were not explicitly observed and recorded. The level of model accuracy is influenced by the quality of data used to build the model, such as channel geometry, geometry and hydraulic parameters of controlling structures (i.e., gates and spillways), the quality of data used to calibrate the model, and choice of model (e.g., uncertainty inherent in numerical methods, flow calculation equations).

#### 4.6.5 Task 5 – Aquatic Habitat Evaluation

Activities described in Tasks 1 – 4 (i.e., literature review and desktop assessment, topographic mapping and photogrammetry, field data collection, and hydraulic model development) will be used to develop a flow and aquatic habitat assessment of the tailwater and bypass reach. Specifically, for each flow scenario evaluated, incremental changes in depth and wetted area will be determined. The water level logger data in combination with the 2-D model results will be used to determine rate of rise and fall of water elevation (i.e., water depth) in the tailwater and bypass reach and evaluate flow patterns and hydraulic connectivity under each flow regime evaluated. In addition,

substrate and mesohabitat mapping, along with the 2-D model depth and velocity simulation results will be used in combination with aquatic species habitat suitability indices based on a guild approach (as described in Section 4.6.1) to evaluate potential available habitat under each modeled flow scenario in the study reach.

## 4.7 Analysis and Reporting

Appalachian anticipates that the Flow and Bypass Reach Aquatic Habitat Study report will include Project information and background, a description of each study area, study methodologies, analyses and results, discussion, and references. Study results will include:

1. Literature review and desktop mesohabitat mapping results illustrating the types and size (acres) of available mesohabitats.
2. A summary of the topographic and photogrammetry results.
3. The relationship between flow and water level/wetted area for each target flow evaluated.
4. Development of a sluice gate opening spreadsheet for computation of discharge under a range of headwater elevations and gate opening combinations, if necessary.
5. Substrate characterization and mapping of the bypass reach (including Wolman pebble count data).
6. Development of a 2-D model for the tailwater and bypass reach (including a description of model development and calibration). The 2-D model runs will evaluate the relationship between minimum flow releases to the tailwater area versus bypass reach. Within the bypass reach, simulations will be performed to evaluate flow releases from the spillway sluice gate to determine flow patterns, hydraulic connectivity, travel time and the timing of flow releases on rise and rates of rise at downstream locations of interest.
7. An evaluation of potential available aquatic habitat based on a guild approach using substrate, depth, and velocity parameters developed in Tasks 1 – 4.
8. Documentation of agency correspondence and/or consultation completed in support of the study.

## 4.8 Schedule and Level of Effort

The preliminary schedule for this study is outlined in Table 4-3. The estimated level of effort for this study is approximately 1,000 hours, and Appalachian estimates that this study will cost approximately \$150,000 to complete.



**Table 4-3. Proposed Flow and Bypass Reach Aquatic Habitat Study Schedule**

Task	Proposed Timeframe for Completion
Topographic Mapping and Photogrammetry Data Collection	Fall 2019
Desktop Habitat Assessment	Spring 2020
Distribute Proposed Flow Test Scenario Framework to Interested Parties for Review	June/July 2020
Mesohabitat Mapping and Substrate Characterization Field Data Collection	Summer 2020
Conduct Flow and Water Level Assessment and Hydraulic Model Development	June - October 2020
Distribute Draft Study Report with the ISR	December 2020

## 5 Water Quality Study

### 5.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing.

- Effects of continued Project operation and maintenance on water quality, including dissolved oxygen (DO) and water temperature, upstream and downstream of the impoundment, including the bypass reach.
- Adequacy of the existing minimum flows for protecting aquatic habitat for resident fishes, including species of special concern, and other aquatic resources downstream of the powerhouse (minimum flow of 50 cfs) and in the bypass reach (minimum flow of 8 cfs).

In Section 6.2.2 of the PAD, Appalachian proposed to conduct a Water Quality Study within the study area including seasonal temperature and DO parameters. No formal study requests were received regarding water quality, however comments in response to the PAD and SD1 were received from USFWS and VDEQ which are summarized as follows:

- The USFWS supports the water quality study proposed in the PAD and would like to work with Appalachian on the development of the study plan.
- The VDEQ requests study details regarding locations, timing, and frequency of water quality sampling in order to assess the adequacy of the proposed study for performing its stated purpose of confirming compliance with water quality standards.

Additional comments or requests related to this study were received from USFWS, USEPA, and FERC in response to Appalachian's filing of the PSP. These comments are summarized as follows:

- FERC and the USFWS requested depths at which the water quality data sondes will be located in the forebay and provide justification.
- The USEPA and USFWS requested a water quality location upstream of the confluence of Tinker Creek in a free-flowing section of the river.
- The USFWS also noted that if the water quality data show that a low temp or DO plume or a high flow is present downstream of the powerhouse, an additional year of monitoring may be needed. USFWS is also interested in a comparison of hourly operations to water quality.

In addition to the formal comments filed, the following points relevant to this study plan were discussed at the PSP meeting on August 1, 2019:

- General discussion of recent past fish kill (thousands) on Tinker Creek, was well upstream of Project (above Mason's Mill) and effects did not extend downstream to the Project.

- FORVA inquired about potential erosion/turbulence and PCB movement. VDEQ noted they do not expect PCB in water, instead it would be bound to fine-grained sediment.
- Discussion of challenges regarding placing DO sondes in the bypass reach (risk of disturbance or vandalism due to public access).
- USFWS noted the importance of water quality sampling in the early morning and recommended that the study plan note potential for water quality data collection in 2021 if conditions are anomalous in 2020. (Appalachian notes that this study includes provisions for continuous monitoring, which will encompass early morning hours for 2020 only, unless additional sampling is required based on anomalous conditions. It is not feasible to collect all monthly measurements during early morning hours given the number and spatial distribution of monitoring locations.)

## 5.2 Goals and Objectives

Appalachian's proposed Water Quality Study employs standard methodologies that are consistent with the scope and level of effort of water quality monitoring conducted at hydropower projects in the region. Appalachian believes that this study will provide sufficient information to support an analysis of the potential Project-related effects on water quality. The goals and objectives of this study are to:

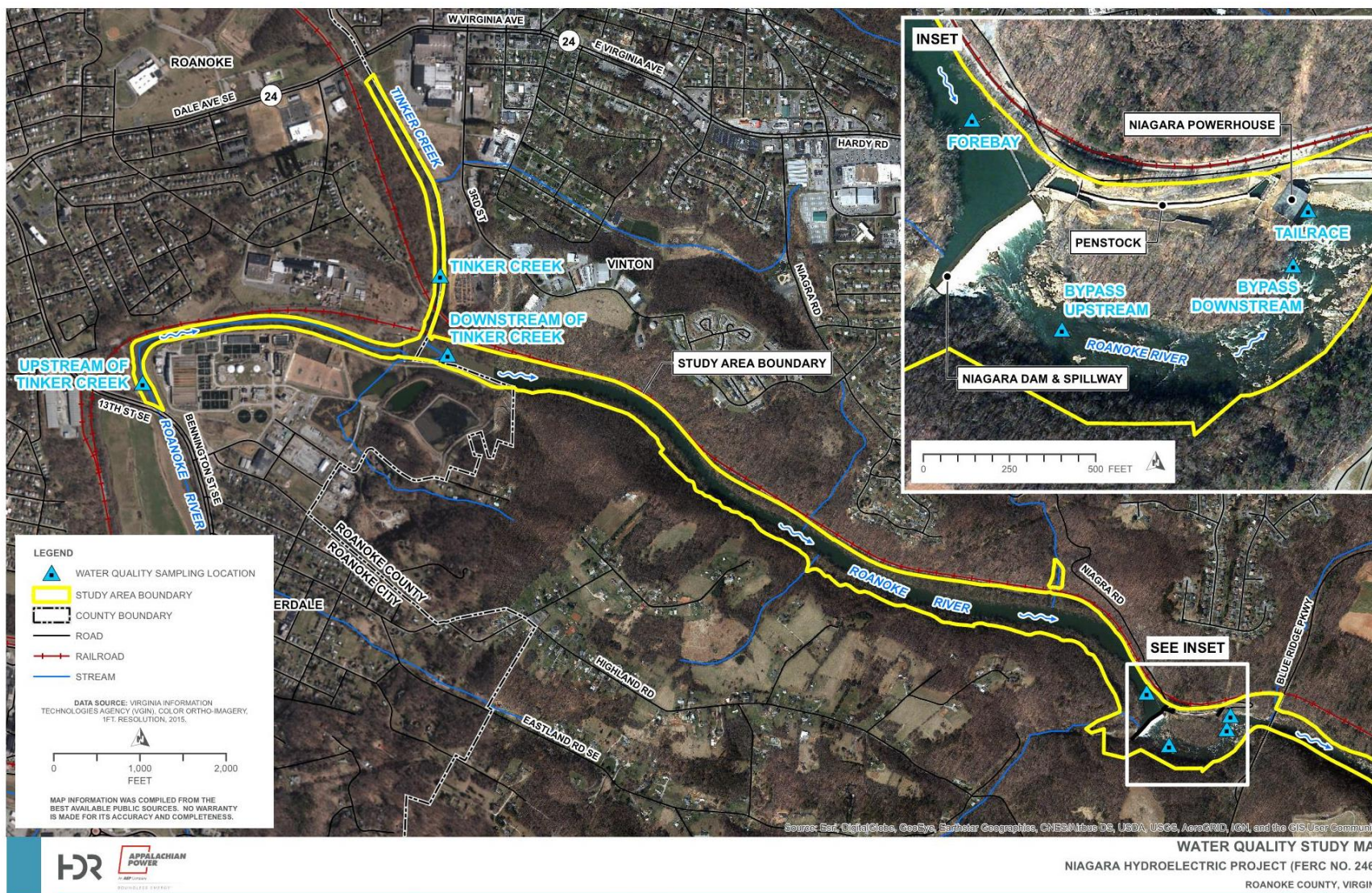
- Gather baseline water quality data sufficient to determine consistency of existing Project operations with applicable Virginia state water quality standards and designated uses (Virginia Administrative Code [VAC] Chapter 260).
- Provide data (temperature and DO concentration) to determine the presence and extent, if any, of temperature or DO stratification in the Niagara impoundment.
- Provide data to support a Virginia Water Protection Permit application (Clean Water Act Section 401 Certification).
- Provide information to support evaluation of whether additional or modified PM&E measures may be appropriate for the protection of water quality at the Project.

## 5.3 Study Area

The study area for the Water Quality Study includes the Roanoke River within and immediately upstream and downstream of the Niagara Project boundary as shown on Figure 5-1.



Figure 5-1. Proposed Water Quality Study Locations





## 5.4 Background and Existing Information

Existing relevant and reasonably available information regarding water quality in the Project vicinity was presented in Section 5.3 of the PAD (Appalachian 2019). The PAD included historical water quality data collected by USGS and VDEQ upstream and downstream of the study area. Temperature, DO, pH, and specific conductivity data indicate that inflows to and outflows from the Project meet numeric water quality standards (9VAC25-260-50) required to support designated uses identified at 9VAC25-260-10. No water quality data specifically for the Project reservoir or bypass reach are available.

Due to a range of factors not related to Project operations, multiple reaches within the Project boundary were listed as impaired in the 2018 §305(b)/303(d) Water Quality Assessment Integrated Report, including fish consumption advisories (VDEQ 2019a). However, the source of impairment is not associated with the Project and it is expected that continued operation of the facility will have no effect on whether or not these reaches continue to be listed as impaired. Potential sources for water quality impairment include discharges from municipal separate storm sewer systems, industrial point source discharge, landfills, municipal areas, on-site treatment systems, sanitary sewer outflows, and wildlife (VDEQ 2019a), all of which are notably not attributed to Project operations.

Total maximum daily loads (TMDLs) for aquatic life (benthic) use, polychlorinated biphenyls (PCBs), and bacteria have been developed for the Roanoke River (The Louis Berger Group, Inc. 2006; Tetra Tech, Inc. 2009; George Mason University and The Louis Berger Group, Inc. 2006).

According to the benthic TMDL prepared for the upper Roanoke River (The Louis Berger Group, Inc. 2006), sediment has been identified as the most probable stressor impacting benthic macroinvertebrates in the biologically impaired segments of the Roanoke River. Excessive sediment loading can negatively impact benthic macroinvertebrates through siltation of habitat, water quality degradation (e.g., decreased light, temperature, and DO concentrations) due to excess sediment in the water column, and bringing invertebrates into contact with other pollutants that enter surface water via adhesion to sediment particles. Potential sources of sediment loading in the watershed include urban stormwater runoff, streambank erosion, and sediment loss from habitat degradation associated with urbanization.

In late July 2017, approximately 165 gallons of Termix 5301, a type of surfactant that is added to herbicide and pesticide products before application, was spilled into Tinker Creek in Cloverdale, Virginia, upstream of the Project. The resulting fish kill was estimated at tens of thousands of fish in Tinker Creek. The fish kill occurred outside of the Project boundary, and no effects have been identified in the mainstem of the Roanoke River. The VDEQ continues to work with USFWS and VDGIF on monitoring the recovery of Tinker Creek (VDEQ 2017).

## 5.5 Project Nexus

Due to the existing and proposed run-of-river operations and the short hydraulic retention time of the reservoir, the Project likely has little to no effect on water quality in the upper Roanoke River. However, Project operation has the potential to locally alter water quality in the bypass reach during periods of minimum flow and high ambient air temperatures.

Meteorological and hydrological conditions (flow) and operation of the Project, including diversion of flows to the powerhouse for generation and the resultant reduction of flows to the bypass reach, may combine to impact water quality parameters such as temperature and DO in the Project reservoir, powerhouse tailrace, and bypass reach.

## 5.6 Methodology

### 5.6.1 Task 1 – Continuous Water Temperature and DO Monitoring

Appalachian proposes to monitor temperature and DO using multiparameter water quality instrumentation (i.e. sondes) at the following locations:

- One location in the free-flowing section of river upstream of the reservoir and confluence with Tinker Creek;
- One location in Tinker Creek;
- One location in the reservoir downstream of the confluence with Tinker Creek;
- One location in the forebay area, as feasible given site conditions and access/safety considerations;
- One location in the tailrace below the powerhouse; and
- Two locations in the bypass reach (upstream location and downstream location).

The approximate locations are depicted on Figure 5-1. Appalachian expects to verify these locations during the initial field deployment and will timely communicate any substantive changes to the VDEQ and other interested relicensing participants.

All water quality monitoring locations will be geo-referenced using GPS. These GPS locations will be included in a GIS database layer to support the documentation and reporting of collected data and to facilitate comparisons with future monitoring efforts.

Water temperature and DO data sondes are proposed to be deployed for a single season, from May 1, 2020 through September 30, 2020 and will collect data at 15 minute intervals. Each of the data sondes will be cleaned and calibrated prior to deployment and checked each month during data retrieval. As necessary, protective measures may be employed, such as weighting the data sondes or attaching them to permanent structures (where feasible) to maintain position during high flow events. Note the data sondes deployed in the tailwater and bypass reach locations will also collect temperature and DO data during the flow test events described in the Flow and Bypass Reach Aquatic

Habitat Study (Section 4). If a data sonde is lost due to vandalism or a high flow event, Appalachian will replace the instrumentation one time only.

At this time, the exact location of the forebay monitoring location has not been determined. A reconnaissance of the forebay area will be made prior to selection of a suitable/representative monitoring location which will also need to take into consideration site access and safety considerations. Once a location has been selected, data sondes will be set at two discrete depths to determine the existence and extent, if any, of thermal and DO stratification. The upper and lower set points are anticipated to be approximately one-third and two-thirds depth below normal pond elevation, respectively. The depths of the forebay data sondes may be adjusted, if necessary, during the study period based on a comparison of the continuous temperature and DO results with the monthly depth profile measurements (described in Section 5.6.2).

### 5.6.2 Task 2 – Monthly Water Quality Monitoring

In addition to continuous monitoring, once per calendar month (May through September), in situ water quality measurements of temperature, DO, pH, and specific conductance will be collected at each of the locations described above with a Hydrolab® or similar data sonde. At the forebay monitoring location, a depth profile will be collected each month.

Individual water quality measurements (temperature, DO, pH, conductivity) will also be collected during fisheries and macroinvertebrate field sampling events.

## 5.7 Analysis and Reporting

Results of this study will be summarized in a final study report. Appalachian anticipates that the Water Quality Study report will include Project information and background, a depiction and descriptive narrative of the study area, methodology, results, analysis, and discussion. In addition, stakeholder correspondence and/or consultation will be included, as well as any literature cited. Raw data will be provided in appendices to the study report. Appalachian notes that USFWS has recommended analysis for this study report address different river flows and Project operations (e.g., allocation of flows through the powerhouse, through the spillway sluice gate, and/or over the spillway crest) and also include a comparison of hourly operations to water quality. Appalachian expects to address this request through inclusion of hourly generation and calculated powerhouse and spillway releases, as feasible from Project operation records, for the study period in the reported and analyzed data in this study report.

## 5.8 Schedule and Level of Effort

The preliminary schedule for this study is outlined in Table 5-1. The estimated level of effort for this study is approximately 450 hours. Appalachian estimates that this study will cost approximately \$95,000 to complete. If the proposed study period is deemed anomalous due to abnormally wet and/or cool weather conditions, a second study year may be necessary to capture water quality conditions representative of worse case



conditions (i.e., peak summer temperature and low flow conditions). Additionally, if the water quality data collected during the proposed study period does not meet the goals and objectives described in Section 5.2, a second year of data collection may be necessary. Appalachian expects to assess the need for any additional data collection in the ISR and at the ISR meeting.

**Table 5-1. Proposed Water Quality Study Schedule**

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	February – April 2020
Continuous and Monthly Water Quality Monitoring (DO and temperature)	May – September 2020
Distribute Draft Study Report with the ISR	December 2020

## 6 Fish Community Study

### 6.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing.

- Effects of continued Project operation and maintenance on aquatic resources, including entrainment and impingement mortality of resident fishes.
- Adequacy of the existing minimum flows downstream of the powerhouse (50 cfs) and in the bypass reach (8 cfs) for protecting aquatic habitat for resident fishes, including species of special concern like the Orangefin Madtom, and other aquatic resources.
- Effects (including cumulative effects) of continued Project operation and maintenance on the state and federally listed Roanoke Logperch.

No aquatic species surveys were proposed by Appalachian in Section 6.2.3 of the PAD. During the scoping process and in response to the PAD and SD1, formal study requests were received from FERC, VDGIF, and USFWS, including requests for an assessment of fish species diversity, abundance, and distribution in the study area, including the endangered Roanoke Logperch, and an evaluation of entrainment and impingement at the Project. Additional comments and informal study requests were also received from VDEQ, Virginia Tech, RRBC, and USEPA related to aquatic resources. These requests and comments are further summarized as follows:

- FERC, VDGIF, and USFWS requested a Fish Survey to document the diversity, relative abundance, and condition (i.e., length frequency and weight) of the fish community in the impoundment, bypass reach, and tailwaters of the Project. USFWS also requested that the Fish Survey include appropriate methods to demonstrate presence and status of American Eel in the study area.
- VDGIF, USFWS, and RRBC requested a desktop Fish Passage Assessment and preliminary engineering assessment to identify options (if any) for enhancing upstream and downstream fish passage for resident and migratory species, including Roanoke Logperch, with the goal of restoring connectivity.
- USFWS requested an Entrainment and Impingement Study to provide an assessment of annual and latent mortality rates for all species and life stages susceptible to entrainment and impingement at the Project, including the endangered Roanoke Logperch, using recent literature and fish community data.
- Virginia Tech requested a multi-year Hydrodynamics Study incorporating hydrodynamic modeling and analyses of fish behavior with the goal of improving passage of Roanoke Logperch at Niagara dam.
- USFWS requested that the cumulative effects assessment for the Project include an assessment for cumulative effects to the Roanoke Logperch and to fish species

potentially impacted by impediments to fish migration (e.g., American Eel, sturgeon, herrings, etc.) and from potential stranding in the bypass reach.

- USFWS stated that they may recommend revised or additional PM&E measures depending on the outcome of the requested studies.

Additional comments or requests related to this study were received from FERC, USEPA, USFWS, VDGIF, VDEQ, and Virginia Tech in response to Appalachian's filing of the PSP. These comments are summarized as follows:

- FERC requested additional information regarding the methodology and level of effort for the Fish Community Study surveys, including number and locations of sampling sites.
- The USFWS originally requested that the Fish Community Study include methods to evaluate the presence of American Eel, but later determined it is highly unlikely to be in the vicinity of the Project due to downstream impediments.
- The USFWS recommended that Virginia Tech, VDEQ, and USEPA also be consulted in the development of the Fish Community Study plan.
- The USFWS recommended relocating the most upstream electrofishing sites further upstream to capture a large riffle, which will also be sampled during the Roanoke Logperch survey. The USFWS also recommended extended the downstream extent of the Fish Community Study area further downstream to capture additional riffle/run habitat.
- The USFWS noted a discrepancy in the description of prior Roanoke Logperch Survey areas as compared to what is included in the original report.
- The USFWS, VDGIF, and Virginia Tech emphasized the need for a Roanoke Logperch Surveys, including assessment of all life stages (larvae, YOY, adult). Virginia Tech provided study plan criteria.
- The USFWS provided recommended survey windows for Roanoke Logperch larval drift surveys and the Fish Community Survey, taking into consideration time-of-year restrictions. The VDEQ suggested more flexible survey windows in order to capture periods of flow in the bypass reach.
- Following the September 25, 2019 stakeholder coordination call regarding the Fish Community and Roanoke Logperch studies, Virginia Tech recommended alternative sampling windows for YOY Roanoke Logperch surveys, and including length measurements to distinguish between age classes.
- FERC requested details on the methodology to be used in identifying Roanoke Logperch microhabitats, number and locations of transect surveys to be evaluated. They also requested alternative survey techniques that may be used if snorkel surveys are not approved by Appalachian.
- The USEPA and USFWS recommend application of the USFWS blade strike analysis model for the Impingement and Entrainment Desktop Study.
- The USFWS supports the previously proposed Hydrodynamics and Fish Behavior Study's goal of characterizing the Roanoke Logperch's spatial associations with the dam and associated structures or flow conditions over a range of temporal factors.

In addition to the formal comments filed, the following points relevant to this study plan were discussed at the PSP meeting on August 1, 2019:

- Virginia Tech noted that the historical Roanoke Logperch studies did not employ the appropriate survey techniques. The USFWS and Virginia Tech noted interest in the different life stages of the Roanoke Logperch and recommended nets to survey for juveniles. Virginia Tech noted that larvae may enter the Project by drifting downstream and recommended extending the study period to begin in April. Appalachian's consultants clarified that an additional survey location would be added on Tinker Creek. Appalachian and stakeholders decided to have a follow-up call before the filing of the RSP to further discuss the survey techniques and methods for the Roanoke Logperch.
- On September 25, 2019, Appalachian and their consultants conducted a conference call with VDGIF, USFWS, Virginia Tech, VDEQ to discuss the Fish Community and Roanoke Logperch Study Plan (summarized in Appendix B) Outcomes and decisions made on this phone call have been incorporated into the Fish Community Study, as appropriate.
- Appalachian confirmed that the USFWS blade strike analysis method will be used.

## 6.2 Goals and Objectives

The goal of the Fish Community Study is to obtain current information on the fish community in the Roanoke River in the vicinity of the Project to support an analysis of project effects. The study will also include a comparison of newly collected fish community data with historical fish community data collected in the study area. A desktop assessment of entrainment and impingement at Niagara will also be completed.

To achieve these goals, the Fish Community Study objectives are to:

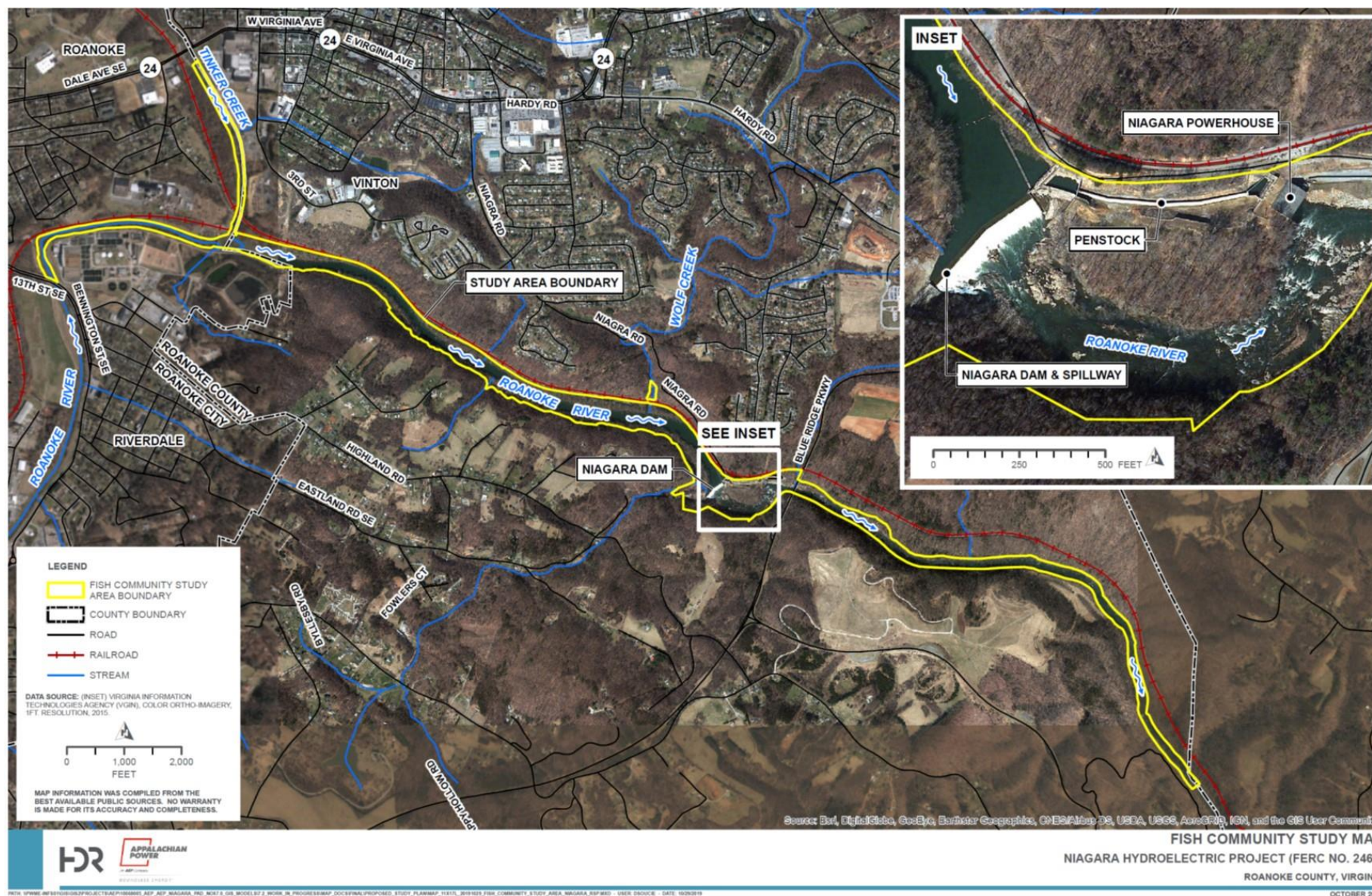
- Collect a comprehensive baseline of the existing fish community in the Project vicinity.
- Compare current fish community data to historical data to determine any significant changes to species composition, abundance, or distribution.
- Collect information regarding the current status (abundance and distribution) of the Roanoke Logperch (including larval, YOY, and adults) in the vicinity of the Project for the purpose of establishing a baseline and to potentially support the Commission's cumulative effects analyses.
- Confirm flow velocities at the intake to facilitate a desktop assessment of entrainment and impingement potential at Niagara.

## 6.3 Study Area

The study area for the Fish Community Study includes the Roanoke River and lower reaches of tributary streams within the study area shown on Figure 6-1. The study area for the impingement and entrainment analysis will include the area of influence created by the intake structure at the Niagara Project.



Figure 6-1. Fish Community Study Area



## 6.4 Background and Existing Information

### 6.4.1 Fish Community

Existing relevant and reasonably available information regarding the aquatic species community in the Project vicinity was summarized in Section 5.4 of the PAD (Appalachian 2019). The Roanoke River is characterized as a warmwater stream with designated uses that include recreation, aquatic life, production of commercial natural resources, and hydroelectric generation (Virginia Code 9VAC25-260-10). Based on studies conducted for the previous licensing, the study area supports a variety of warmwater game and forage species, and species diversity and abundance above and below the dam are comparable.

In 1990, a fish survey was conducted in the study area as part of the previous relicensing of the Project (Appalachian and AEP 1991). Adult and juvenile fish were sampled in the Niagara reservoir by electrofishing, hoop netting, and gill netting techniques. Upper, middle, and lower portions of the reservoir were sampled. In addition, riffle/run habitat was sampled upstream and downstream of the Project by electrofishing. Each station was sampled six times, twice in June and September and once in July and October.

A total of 1,936 fish representing 36 species were collected during this study (Appalachian and AEP 1991). Redbreast Sunfish (*Lepomis auritus*) and Silver Redhorse (*Moxostoma anisurum*) were the dominant fish collected, but Common Carp (*Cyprinus carpio*), White Sucker (*Catostomus commersonii*), Spottail Shiner (*Notropis hudsonius*), and Golden Redhorse (*Moxostoma erythrurum*) were also abundant. Common Carp and Silver Redhorse (*Moxostoma anisurum*) comprised the majority of the sample biomass. White Sucker, Golden Redhorse, Redbreast Sunfish, and Channel Catfish (*Ictalurus punctatus*) also comprised a substantial portion of the sample biomass. Four Roanoke Logperch, a federally and state listed endangered species, were collected during this survey in an upstream riffle/run electrofishing site.

Catch rates of most species within reservoir sites were statistically equivalent or greater than catch rates at the upstream riffle/run site (Appalachian and AEP 1991). Gizzard Shad (*Dorosoma cepedianum*), Satfin Shiner (*Notropis analostanus*), Northern Hogsucker (*Hypentelium nigricans*), Shorthead Redhorse (*Moxostoma macrolepidotum*), V-lip Redhorse (*Moxostoma pappillosum*), Bluegill (*Lepomis macrochirus*), and Largemouth Bass (*Micropterus salmoides*) catch rates at the site downstream of the Project were the highest among all sites. The length frequency distributions of the dominant fish species at the riffle/run sites were very similar. Species richness and diversity were fairly similar among all pool and riffle/run sites except for the downstream riffle/run site, which exhibited higher species richness and diversity.

In 1991, a survey for Roanoke Logperch and suitable habitat was conducted in a two-mile free-flowing reach of the Roanoke River downstream of the Project (Appalachian and AEP 1992). The upper 1.25 miles of the reach were conserved to contain potential habitat and were assessed by systematic snorkel surveys of all riffle/run areas with



gravel or cobble substrates. Follow-up electrofishing by VDGIF was also performed for confirmed species identification. Fish sampling yielded three Roanoke Logperch, each measuring approximately 110 millimeters in length. Overall, suitable Roanoke Logperch habitat was found in a 2,500-foot segment of the river beginning approximately 0.5 mile downstream of the powerhouse, totaling approximately 21,500 square feet.

To the best of Appalachian's knowledge, there are presently no stocking programs or locations in the study area. In 2014, approximately 300,000, 1.25-inch-long, Roanoke strain Striped Bass were stocked in Smith Mountain Lake downstream of the project (VDGIF 2019b), the nearest known fish stocking location. Historically, Walleye (*Sander vitreus*), Muskellunge (*Esox masquinongy*), and Tiger Musky (*Esox masquinongy* x *Esox lucius*) have been stocked in Smith Mountain Lake (Appalachian 2004). No additional data on these stocking efforts was identified. However, 2014 stocking records indicated that, aside from Striped Bass, no other fish were stocked in Smith Mountain Lake or the study area in 2014 (VDGIF 2019b).

No specific information was available on diadromous fish in the study area. Upstream fish passage facilities are not available at the three dams downstream of Niagara (Appalachian 2008; USACE 2015); therefore, it is unlikely diadromous fish are present at the Project. In comments filed in response to the PSP, USFWS stated that American Eel is highly unlikely to be present in the vicinity of the Project because upstream passage measures for eels have not been implemented at the Smith Mountain Project, which includes two dams downstream of the Project. Striped Bass are a landlocked population and are maintained through stocking.

The Roanoke River Diadromous Fish Restoration Plan outlines the mechanisms for restoring historic fish migration reaches on the Roanoke River (Appalachian 2008). The plan indicates that the greatest gains in mainstem river habitat would be obtained by passing fish above Kerr Dam, the next project downstream of the Smith Mountain Project (Appalachian 2008).

## 6.4.2 Impingement and Entrainment

The potential for fish to become entrained or impinged at a hydroelectric facility is dependent on a variety of factors such as fish life history, size, and swimming ability, water quality, operating regimes, inflow, and intake/turbine configurations (Cada et al. 1997). Impingement occurs when a fish aquatic organism is held or impinged on the exterior intake structure screen (trashracks) due to forces created by the intake velocities. Entrainment occurs when the fish passes through the exterior intake screen (trashracks) and is withdrawn into the intake structure. A gradient of fish entrainment potential exists both temporally and spatially at intake structures. Smaller-sized fish may be more abundant during certain portions of the year, thus increasing their potential for entrainment. In addition, diurnal and seasonal movements of both small and large fish may bring them in close proximity to intake structures. Physical and operational characteristics of a given project, including trash rack bar spacing, intake velocities, intake depth, waterbody stratification, and intake proximity to feeding and rearing habitats also affect the potential for a fish to become entrained. These factors and



several others are used to make general assessments of entrainment and impingement potential at hydroelectric projects using a desktop study approach.

In support of the original licensing in the early 1990's, Appalachian conducted a fish entrainment study in which it was determined that the amount of entrainment and mortality at the Project was negligible and would not have a measurable effect on the fish community (Appalachian 1991).

## 6.5 Project Nexus

Project effects on aquatic resources may include insufficient flows within downstream reaches, habitat impacts due to water quality or sedimentation, fluctuations in reservoir elevations, and possible effects from impingement and entrainment. Information on the species diversity, abundance, and distribution of the existing fisheries community will help identify the aquatic species potentially affected by Project operations.

## 6.6 Methodology

To meet the goals and objectives of the overall Fish Community Study, two separate studies will be performed: a holistic fish community study (Task 1a), as well as a targeted Roanoke Logperch Study (Task 1b).

### 6.6.1 Task 1a – Fish Community Study

#### 6.6.1.1 Collector's Permits

Appalachian's consultant will coordinate with the USFWS and VDGIF regarding potential for encountering federal or state-protected fish species and to identify/obtain specific permits that may be required prior to initiating fisheries field sampling work. A Recovery and Interstate Commerce Permit (Section 10(a)(1)(A)) and selection of field biologists from a list of surveyors approved to handle the Roanoke Logperch may be required from the USFWS prior to initiating fish sampling.

#### 6.6.1.2 Field Sampling

Appalachian proposes to conduct one year of fish data collection using methods employed during previous Niagara Project-relicensing studies and supplemental methods derived from the National Rivers and Streams Assessment protocol (USEPA 2019), per recommendation by VDEQ. The study is intended to facilitate temporal comparisons and document contemporary fish communities in the study area. Field sampling will be performed during daylight hours in the late summer/early fall (August – October) of 2020, which is outside of the VDGIF time-of-year restrictions on in-stream work (VDGIF 2018a). Specific sampling dates within these timeframes will be based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the general public.

Appalachian proposes to conduct fish sampling in the reservoirs, tailraces, and wetted portions of the bypass reach of the Niagara development using boat and backpack electrofishing (into seines where appropriate) methods. Sampling locations were selected to overlap with historical sampling locations and includes both near-shore and mid-channel habitats to characterize fish communities and life stages that use these different habitat types.

The historical fish community study (conducted for the previous relicensing) also employed gillnet and hoop net samples. However, the study showed that electrofishing overall collected a greater number of species per site than did either gill or hoop nets (Appalachian and AEP 1991), and since electrofishing will be performed in both near-shore and mid-channel habitats, all species susceptible to gill and hoop nets are also expected to be vulnerable to electrofishing. The previous study also included both day and nighttime boat electrofishing samples, however results were not reported separately for the diel periods. Electrofishing samples will be collected during daylight hours to minimize safety concerns associated with nighttime boat work on the Roanoke River.

Based on input received to date on the PSP, additional sites were added to provide fish community information: one location in Tinker Creek, one location in the bypass reach, and three additional sites downstream of the Project. The proposed sampling locations at Niagara are presented in Figure 6-2. The proposed study will include six 100-m boat electrofishing transects in the reservoir (2 each in the upper, middle, and lower impoundment) and seven 100-m backpack electrofishing transects in riffle/run or wadeable portions of the development (1 site (transect) upstream of the Tinker Creek confluence with the Roanoke River, 1 each in the tailrace and bypass reaches, and 3 additional sites between the tailrace and the study area boundary located approximately 2 miles downstream of the dam.

Supporting data will be collected at each sampling site including location via GPS, sampling gear type(s), habitat characterization, representative photographs, time and date of sampling, weather, general descriptions of depth, flows, and substrate, and cover type including submerged and emergent aquatic vegetation and estimated percent cover.

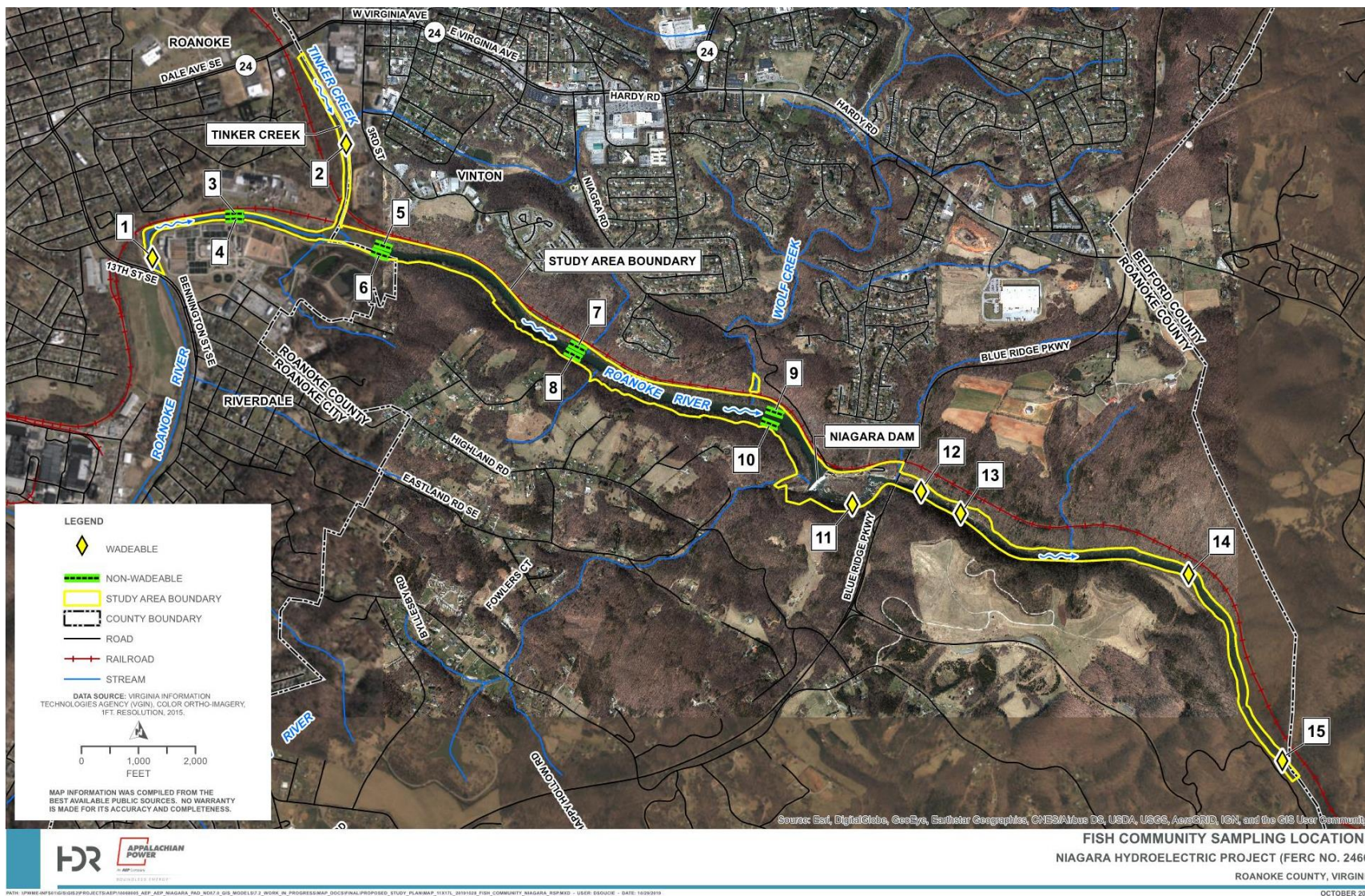
### **Sampling Locations**

Fish community sampling is proposed at 13 sites across the study area that encompasses the Project reservoir, tailrace, and wetted portions of the Niagara bypass reach (Figure 6-2). Sampling locations (Sites 1 through 5, 9, and 10) will be placed to overlap historical sampling locations (Appalachian and AEP 1991) to facilitate temporal comparisons and to obtain contemporary fish community data. Supplemental sampling locations will be placed at 3 sites (i.e., Sites 6 through 8) in riffle/run habitats to characterize fish assemblages occupying these habitats and augment potential collections of RLP. Sites will be classified as wadeable or non-wadeable (USEPA 2019) and sampled using appropriate equipment and methods. Wadeable sites (Sites 1, 2, and 11 through 15) will be sampled with backpack electrofishing units and seines.

The non-wadeable impoundment was divided into 3 reaches (upper, middle, and lower). Two parallel 100-m transects will be established along the shoreline (one on each side of the channel) (Sites 3 through 10) for a total of eight, 100-m transects, as illustrated in Figure 6-2. Collecting samples along the shoreline on each side of the impounded reach of the Roanoke River increases the likelihood of sampling a greater diversity of habitat.



### Figure 6-2. Locations of Proposed Fish Community Sampling at Niagara





## Sampling Methods

Prior to initiating sample collection, electrofishing equipment will be calibrated based on the conductivity of the water at each sample site. Each 100-meter transect will be sampled for at least five minutes in the downstream direction and all available habitat types (i.e., shallow shoreline, deep shoreline, emergent vegetation, submerged wood, etc.) will be sampled. Transects will be placed parallel to stream flow. Boat electrofishing becomes less effective in deeper water (i.e., greater than three meters), especially during daylight hours; therefore, sampling will occur within 30 meters of shore. During sampling, a boat driver will maneuver the boat along each transect while two field personnel or netters collect stunned fish in nets.

At each of the wadeable sampling sites, backpack electrofishing will be performed by moving in an upstream direction along a 100-meter transect during base flow conditions. All major habitat types identified within the transect will be sampled, and particular care will be taken to thoroughly sample complex habitat and instream structures while a netter actively captures stunned fish. In areas of elevated stream velocities (e.g., riffles, runs), a stationary seine (minimum of eight feet in width) will be positioned (secured on each end) perpendicular to stream flow and the operator of the backpack electrofishing unit will simultaneously perform kicks/sweeps in a downstream manner toward the seine. Stunned fishes are driven into the net with the aid of stream currents and the seine is then swept ashore and fish retrieved for processing. All field personnel will wear polarized sunglasses to minimize surface glare and increase their ability to see and collect stunned fish.

For non-wadeable and wadeable sites, a four-person field crew will be responsible for collecting, identifying, weighing, and measuring fish. Each fish will be identified to the lowest taxonomic level practicable, enumerated, and examined for signs of external parasites, disease, or physical abnormalities. In addition, the total length (TL) and weight will be recorded for the first 30 individuals of a species collected per sampling site. In the event that more than 30 individuals of a single species are collected at a given sample site, the additional fish will be counted and length measurements will be recorded for specimens that exceed the upper or lower maximum recorded lengths from the first 30 individuals.

Photo vouchers will be taken in the field for a representative specimen of each fish taxon collected during the study, and for those fish that cannot be identified to species (e.g., minnows, juvenile *Moxostoma* sp.), representative specimens will be preserved and identified in a laboratory setting based on sampling permit specifications. All fish collected at a sample site will be held in an aerated container until processed and then returned as near as possible to the place of capture.

National Rivers and Streams Assessment (USEPA 2019) habitat sampling protocol and datasheets will be used for non-wadeable and wadeable sites. The location of each sampling site will be documented via GPS coordinates and field conditions will be recorded (i.e., time, date, temperature, precipitation, cloudy/overcast, etc.). Additionally,

general descriptions of water depth, flow, substrates, and estimated percent cover by type (including submerged and emergent aquatic vegetation).

Water quality parameters (e.g., DO, pH, water temperature, conductivity) will be measured at mid-depth using a calibrated multi-parameter water quality meter (i.e., data sonde). A Secchi disk reading will be taken at each reservoir sample site at the time of sampling. These water quality samples are specific to the fish sampling efforts and are in addition to efforts identified in the Water Quality Study presented in Section 5.

#### 6.6.1.3 Data Analysis and Comparison of Study Results

Catch per unit effort (CPUE), species richness, relative abundance, spatial distribution, and various life history attributes (e.g., feeding guilds, spawning guilds, etc.) will be determined for each site. CPUE will be used to compare data from the historical fish community surveys (Appalachian and AEP 1991) performed in the study area to identify trends or changes in species composition, abundance, or distribution over time.

### 6.6.2 Task 1b – Roanoke Logperch Study

To address comments from stakeholders on the PSP, Appalachian proposes to perform a targeted Roanoke Logperch Study, which is presented in the following sections. The Study would consist of season and life stage-specific sampling efforts designed to sample the most appropriate habitats during the times when targeted life stages would be anticipated to be present.

The results of the study would be used to:

- Establish a baseline characterization of presence, abundance, and distribution.
- Potentially support the Commission's cumulative effects analyses.
- Support and inform the Section 7 consultation process.

The proposed Study includes a larval drift assessment at the request of stakeholders. However, given the potential implications of the data resulting from this Study, Appalachian has concerns regarding the existence of a definitive taxonomic key (see Section 6.6.2.2) that can be used to distinguish Roanoke Logperch from other percids collected in the Study. In the absence of a definitive, independently validated, and cost effective method of processing and separating Roanoke Logperch larvae from other similar *Percina* larvae collected in the study, Appalachian believes that the use of the resulting larval fish data to satisfy the objectives listed above would set an undesirable precedent and may not reflect the “best available scientific information.”

The collection and use of these data may be helpful in supporting continued development of taxonomic methods to confidently and accurately separate Roanoke Logperch from other larvae. However, until these methods have been finalized and validated by independent taxonomists and researchers, the results of the study should

be cautiously interpreted and used, and not be used in defining PM&E measures specific to the Roanoke Logperch.

#### 6.6.2.1 Collector's Permits

Appalachian's consultant will coordinate with the USFWS and VDGIF regarding the collection of federal or state-protected fish species and to identify/obtain specific permits that may be required prior to initiating fisheries field sampling work. A Recovery and Interstate Commerce Permit (Section 10(a)(1)(A)) and selection of field biologists from a list of surveyors approved to handle the Roanoke Logperch may be required from the USFWS prior to initiating fish sampling.

#### 6.6.2.2 Field Sampling

Life stage-specific sampling approaches are proposed for evaluating the Roanoke Logperch population in the Project vicinity. The proposed sample locations, methodology, and timing of data collection were developed for the larval, YOY, and adult life stages of the Roanoke Logperch. The sampling locations and methodologies are presented in the following sections.

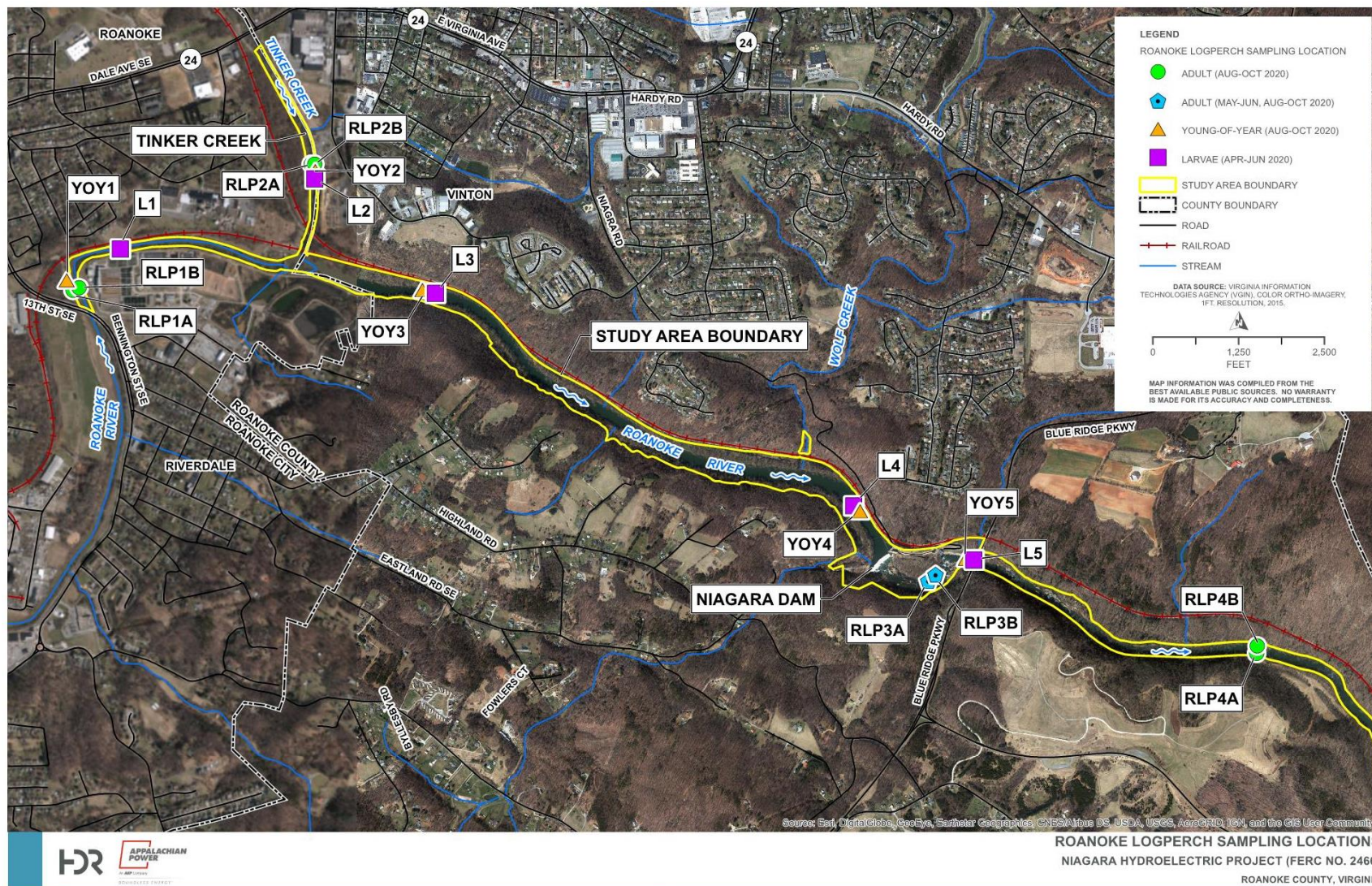
##### **Roanoke Logperch Adults**

##### ***Sampling Locations***

Adult Roanoke Logperch sample collection will be performed at four locations within the Study boundary. Each of the locations will be sampled using paired sites (e.g., RLP1A, RLP1B) targeting potentially occupied habitats. The proposed sampling locations for adult Roanoke Logperch were selected based on records of prior collections within the Project boundary or where prior studies documented potentially suitable Roanoke Logperch habitats (Figure 6-3). Sample locations include the first riffle upstream of the Niagara impoundment in the Roanoke River (i.e., RLP1A, RLP1B), lower reaches of Tinker Creek (i.e., RLP2A, RLP2B - proximal the riverine and reservoir interface), Niagara dam bypass reach (i.e., RLP 3A, RLP3B), and select riffle habitats downstream of the tailrace (i.e., RLP 4A, RLP4B). Establishing two sites above and two sites below the impoundment will provide insight regarding adult densities on both sides of the impoundment.



Figure 6-3. Proposed Sampling Locations for Larval, YOY, and Adult Roanoke Logperch at Niagara



### ***Sampling Methods***

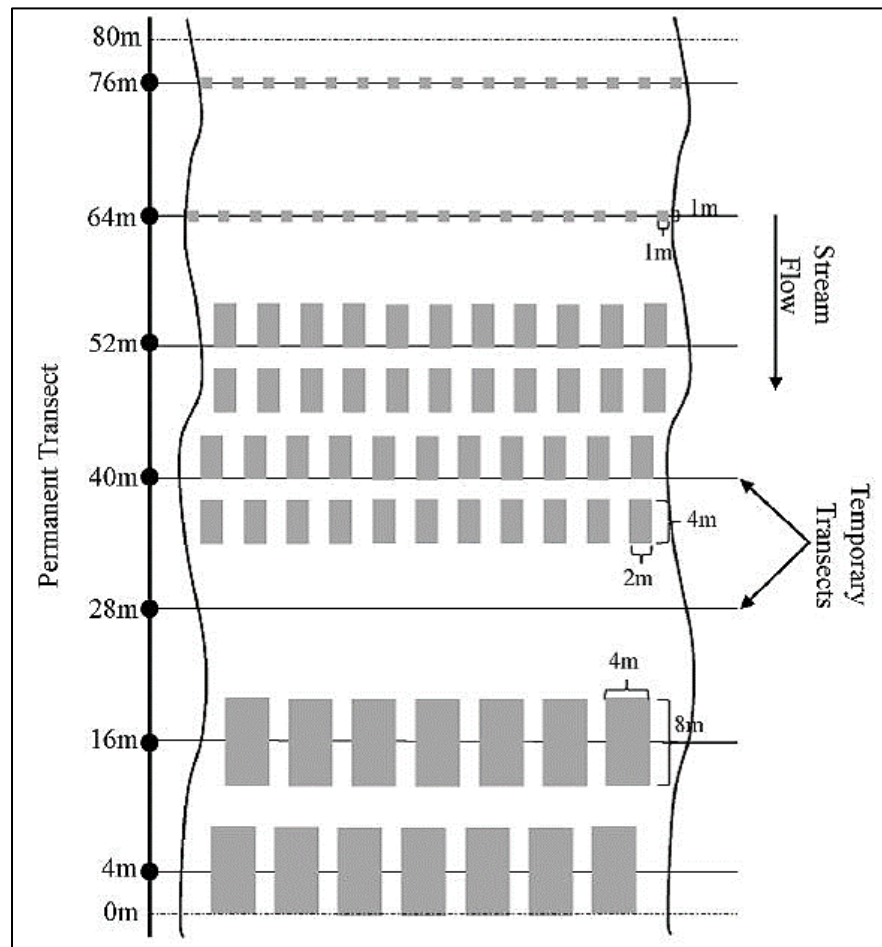
Adult Roanoke Logperch sampling events will occur at each of the four locations between August-October 2020 during suitable stream flow conditions that align with previous studies done within the study area. Subject to approval by VDGIF and USFWS as noted below, one additional sampling event will occur in the bypass reach (i.e., RLP3A/RLP3B) between May-June 2020 because it is hypothesized that more-suitable habitat will be available to Roanoke Logperch during the spring (elevated river flows) rather than the fall (reduced river flows). The spring sampling event may allow for determination of differences in habitat availability and occupation during discrepant flow regimes. It is important to note that the spring sampling event will require a Roanoke Logperch time-of-year restriction waiver from VDGIF and USFWS and safe flow conditions to conduct the surveys within the bypass reach, if waived.

Sampling will be performed using fixed-area quadrat methods, as described by Anderson (2016) and illustrated in Figure 6-4. At each site, a linear transect will be established parallel to shore and marked in 12-meter intervals. Temporary transects will be established perpendicular to the permanent transect and extend across the width of the river at each interval. Fixed-area quadrats (eight meters long by four meters wide) will be delineated along each temporary transect and sampled in an upstream direction. The number of quadrats will be based on the width of the stream at a given transect. RLP1A/RLP1B is approximately 26 meters wide by 60 meters long, RLP2A/RLP2B is 16 meters wide by 60 meters long, RLP3A/RLP3B is 45 meters wide by 180 meters long, and RLP4A/RLP4B is 36 meters wide by 60 meters long. These sites will result in roughly 25, 15, 100, and 35 quadrats, respectively.

During collections, a bag seine will be placed at the downstream end of the quadrat and two backpack electrofishers will concurrently make a rapid pass from the top of the quadrat downstream into the seine. The seine will then be quickly pulled up from the water to capture fish. Fish collected in the seine will be placed in instream live wells during sample processing. Fish will then be identified, measured for TL, and checked for signs of disease, deformities, or other anomalies. The total number of quadrats sampled is based on the total area of adult Roanoke Logperch habitat identified at each site. If a site yields zero Roanoke Logperch, snorkel surveys may be implemented to augment detectability and minimize false-negative survey efforts.



**Figure 6-4. Graphical Depiction of Fixed-Quadrat Sampling Design**  
(Source: Anderson 2016)



Source: Anderson 2016

A widely used quantitative assessment of Roanoke Logperch habitat suitability is described by Ensign et al. (2000) and Anderson and Angermeier (2015). Briefly, this approach samples a series of one-square meter cells centered on (and occurring every three meters along) a series of transects throughout the site. Within each cell, depth (centimeters [cm]) and water velocity (cm/second) will be measured at 0.6 times depth at the center of the cell. Qualitative estimations of silt coverage will be assessed visually using a five-point scale (i.e., 1= 100%, 2= 75-99%, 3= 25-74%, 4= 1-24%, and 5= no silt). Additionally, a pebble-count will be used to describe the substrate size at five locations equally-spaced across the width of a cell. Ordinal particle sizes will be assigned using the modified Wentworth scale. The five substrate measurements are then averaged to obtain a mean substrate size for future analysis. These four variables will then be used to evaluate the suitability of each cell for adult Roanoke Logperch based on the habitat suitability index (HSI) developed by Ensign and Angermeier (1994) and Ensign et al. (2000). The HSI for each cell is calculated, then placed into a suitability category (e.g., HSI score of 50-75 is 'Good').

## Roanoke Logperch YOY

### *Sampling Locations*

According to Rosenberger and Angermeier (2003), YOY Roanoke Logperch are typically found in “nearly stagnant areas such as backwater habitats, secondary channels, and the shallow edges of pools, riffles and runs. These small individuals were consistently found in water around 20 cm deep with small, slightly embedded substrate. A thick layer of silt covered these areas; however, small Logperch foraged in small patches of silt-free, loosely embedded gravel”. Surveys targeting YOY Roanoke Logperch will be performed at five locations in the Roanoke River portion of the study boundary including the most upstream riffle (i.e., YOY1), the lower reach of Tinker Creek (i.e., YOY2 - proximal the riverine and reservoir interface), an impounded section downstream of the confluence of Tinker Creek with the Roanoke River (i.e., YOY3), the lower reach of the impoundment just upstream of the Project (i.e., YOY4), and in the tailrace portion of the Project (i.e., YOY5), as illustrated in Figure 6-3. Establishing sites above and below the reservoir will provide insight regarding YOY densities on either side of the impoundment and determine potential YOY distribution from adult ‘source’ populations (i.e., mainstem Roanoke River, Tinker Creek).

### *Sampling Methods*

Sampling for YOY Roanoke Logperch will be conducted from August-October 2020. Each site will be sampled with similar effort targeting habitat patches favorable for Roanoke Logperch YOY including (but not limited to) sandy, backwater, and emergent vegetation patches and shallow, slow-velocity patches with gravel and cobble substrates. These habitat patches typically occur along river margins.

Sampling methods will follow Argentina and Roberts (2014) and are summarized below. At each site, a six-foot by eight-foot seine (1/16 inch mesh) will be used to sample fishes in 20 habitat patches along a 200- to 300-meter stream reach. Commencing at the downstream end of the site and moving upstream, single seine hauls will be made at 10-meter intervals throughout the stream reach. Within each 10-meter segment, each haul will begin approximately 2 meters from the bank and move perpendicular to shore. Each patch will be sampled with a single seine haul. Habitat patches will not be sampled if water velocity is too fast or if bed sediments create an area that cannot be sampled efficiently with a seine (e.g., root wads or rip rap). The number of actual habitat patches sampled will depend on available habitat. Patches of sandy and rocky margins, backwaters, and water willow (*Justicia americana*) beds will be targeted. Roanoke Logperch YOY collected in the seines will be measured for TL and kept in live wells during site sampling and released after sampling is completed.

Seining methods will be supplemented with visual surveys performed along systematic transects located on the shoreline adjacent to low-velocity pool-margin habitats to augment detectability and minimize false-negative survey efforts, as described in Roberts et al. (2016). Sampling will be performed at base-flow conditions by two to four investigators slowly walking upstream while scanning shallow areas for YOY Roanoke

Loggerhead. Surveyors will wear polarized sunglasses while performing evaluations to minimize surface glare.

Microhabitats within each habitat patch (i.e., 10-meter segment) will be assessed measuring depth, stream velocity, substrate size (on a modified Wentworth scale), and percent cover by substrate type at each corner of a one-square meter sampling frame placed in the center of each habitat patch. These values will be averaged to create a mean value for each variable for each sampled patch. A qualitative, visual estimate of embeddedness is assessed for the entire sampled patch.

## **Roanoke Loggerhead Larvae**

### ***Sampling Locations***

In addition to adult and YOY Roanoke Loggerhead surveys, efforts will also target larval Roanoke Loggerhead with weekly samples expected to be collected between early April and early June 2020. Surveys targeting larval Roanoke Loggerhead will be performed at five locations in the Roanoke River portion of the Study boundary and coinciding with the YOY sampling locations (Figure 6-3). Establishing sites above and below the impoundment will provide insight regarding larval drift from adult 'source' populations (i.e., Roanoke River mainstem, Tinker Creek), both into and through the Niagara impoundment.

Site L1 is located at the most upstream riffle in the Study boundary and is intended to capture drifting larvae from potential source Roanoke Loggerhead populations in the mainstem Roanoke River. Site L2 is located at the first riffle upstream of the Niagara impoundment in Tinker Creek and is intended to capture drifting larvae from source Roanoke Loggerhead populations in Tinker Creek. Site L3 is located in the Niagara impoundment, just downstream of the Tinker Creek confluence with the Roanoke River, and is intended to capture drifting larvae that may enter the impoundment. Site L4 is located in the lower reach of the impoundment just upstream of the Project and is intended to capture drifting larvae that from upstream source populations in the mainstem Roanoke River. In the event that drift nets cannot be used at L3 or L4 due to limited accessibility, safety concerns, and/or low-velocities, then the sites will be shifted upstream closer to the Tinker Creek confluence. Site L5 is located downstream of the tailrace and is intended to capture drifting larvae from the impoundment and/or a reproducing population presumably occurring in the bypass reach.

### ***Sampling Methods***

Sampling methods for larval Roanoke Loggerhead will follow analogous larval studies (Hallerman et al. 2017; Buckwalter et al. 2019). Drift nets will be used to sample larval fishes during the Roanoke Loggerhead spawning period (i.e., early April – early June [10-11 weeks]). Each site (L1-L5) will be sampled nocturnally once every 7 days. Sampling will begin shortly after sunset and completed by 2 am. Each night, two teams will sample two sites each. Sampling at each site will include two, 20-minute drift-net sets (early and late) using a single net. Drift nets will be staked into the substrate in a riffle or run

mesohabitat. All solid material (i.e., fish larvae, debris) from each sample will be placed in labeled glass jars containing 95 percent ethanol and stored for laboratory processing. Water velocity will be measured at the mouth of each net to determine water volume. Samples will be picked and sorted. Larval darters will be extracted from samples for further identification and processing. The remaining sample will be retained for storage.

### 6.6.2.3 Laboratory Processing of Larval Study Samples

The most critical components of the methodology for the larval drift study for Roanoke Logperch are the procedures and quality assurance steps implemented in the laboratory to produce results that will meet predefined data quality objectives and that can be repeated by independent taxonomists. As such, additional information is provided below detailing procedures for sample processing, preservation, storage, and quality control that should be implemented at a minimum to support the accuracy and quality of the results from the study.

#### **Sample Processing**

Samples from the larval study will be transported to the qualified biological laboratory where they will be processed following procedures identified in Hallerman 2017. Larval fish will be sorted from debris and then percid larvae will be separated from larvae from other fish families based on distinguishing characters, including vent location, yolk sac and oil globule characters, pectoral fin development, myomere count, and pigmentation patterns. Each larvae will be photographed under magnification and stored in 95 percent ethanol in a 1- or 2-dram glass vial with Titeseal™ cap (Fisher Scientific) or comparable container and labeled with a unique identification number.

Numerous metrics will be collected on each specimen and used for taxonomic identification to lowest practical taxonomic level. Pre-anal myomeres will be counted and TL will be measured along with seven other body measurements, which are then expressed relative to (i.e., ratio of) TL, including: preanal length (RPREL, tip of snout to posterior margin of vent), head height (RHEADH, apex of optic lobe to ventral margin of head), head length (RHEADL, tip of snout to pectoral fin insertion), snout length (RSNOUTL, tip of snout to anterior margin of eye iris), eye diameter (REYED, longitudinal iris diameter), pectoral fin length (RPECL, from foremost visible point of insertion to distal tip of the membranous edge), and caudal peduncle height (RPEDH, least peduncle height excluding finfold). All preanal myomeres will be counted between the anterior-most myoseptum and an imaginary vertical line drawn at the posterior margin of the vent, including any bisected by the line.

#### **Quality Assurance**

Given the potential for these data to be used to inform resource management goals for the endangered Roanoke Logperch and their potential use in the evaluation of potential effects from the Niagara Project, it is paramount that the results presented by the laboratory can be viewed with an acceptable level of confidence. To that end, laboratory processing and taxonomic identification of larval samples will be completed under a



Quality Assurance Plan to be developed by the biological laboratory. The Quality Assurance Plan should include standard operating procedures and data quality objectives that clearly define and document all sample handling and processing procedures, in addition to data entry, data processing, and quality control checks performed for each phase of the laboratory process.

Appalachian has been assured that Roanoke Logperch can be confidently separated (using preanal myomere counts) from other percids that may be collected during the larval study (comments on Project PSP from Dr. Paul Angermeier received on October 2, 2019). However, the 2017 study by Hallerman et al., concluded that “there was considerable overlap of pre-anal myomere counts among species..., leading us to conclude that such counts are not useful for distinguishing among larval darter species occurring in the upper Roanoke River system.” Additionally, the taxonomic keys used to separate the endangered Roanoke Logperch from other percids in the Roanoke River near the Project were only recently developed and have not been, to Appalachian’s knowledge, validated by independent taxonomists or independent laboratories. As such, Appalachian proposes to submit 20 percent of the samples to an independent biological laboratory specializing in fish taxonomy, including larval fish, to be verified taxonomically using the dichotomous key developed by Virginia Tech (Hallerman et al. 2017; Buckwalter et al. 2019).

Results of the taxonomic verification (percent agreement between taxonomists) will be used to adjust the raw laboratory totals so that the numbers of Roanoke Logperch, and subsequent calculations, presented in the final report can be viewed with confidence.

#### 6.6.2.4 Data Analysis and Comparison of Study Results

##### **Adults**

Adult Roanoke Logperch body condition, numbers collected, density, and relative abundance will be calculated and summarized in the study report. Temporal habitat availability/occupancy will also be evaluated at RLP3 (i.e., bypass reach). Data from the Roanoke Logperch Study will be compiled, converted to catch per unit effort, and compared to data from the historical Roanoke Logperch assessment (Appalachian and AEP 1992), as applicable. This comparison will include identifying trends or changes in species abundance or distribution over time.

##### **YOY**

Roanoke Logperch YOY abundance will be converted to an estimated population density by dividing the number of individuals observed by the length of river surveyed. Additionally, CPUE, body condition, relative abundance and spatial distribution will be calculated or determined.

## Larvae

The total number of Roanoke Logperch will be used to calculate volumetric density and CPUE. These data will be used to identify the temporal and spatial distribution of Roanoke Logperch and temporal and spatial distribution of larvae will be calculated.

### 6.6.3 Task 2 – Impingement and Entrainment Desktop Study

#### 6.6.3.1 Develop Characterization of Existing Intake

Appalachian will document the intake dimensions and provide information on operational parameters as they are related to assessing the risk for impingement and entrainment at the Project's intake structure.

#### 6.6.3.2 Perform Verification of Intake Velocities

Appalachian will measure the average approach velocity at a distance of one foot in front of the existing trash rack structures, as feasible based on field conditions. Measurements will be collected using an acoustic Doppler current profiler or similar technology to measure 3-D velocity vectors. At least one parallel transverse transect for the velocity measurements will be positioned immediately upstream of the intake, as close to the trash rack surface as the instrumentation will allow. Measurements will be collected at the Project's maximum and efficient generation rates. Results of this task will be compared to approach velocities measured during the previous desktop fish entrainment study (Appalachian 1991) to verify that velocities have not changed significantly since the 1990s study.

#### 6.6.3.3 Perform Assessment of Entrainment and Impingement Potential at the Intake

Results of the Fish Community Study will be used to describe the fish community that may be susceptible to impingement and entrainment. A targeted species list will be developed based on the fish community composition and abundance of the reservoir, as well as any other species of interest. Selected species will be evaluated for potential of entrainment and impingement based on swim speed, behavior, habitat preferences, life stages, and other life history characteristics. Risk assessment of impingement and entrainment will also consider seasonal, diel, or temperature behavior changes in fish species. The evaluation will include a blade strike evaluation using the USFWS Turbine Blade Strike Analysis Model (USFWS 2018b). This model is a probabilistic Excel-based Visual Basic for Applications implementation of the methods outlined by Franke et al. (1997) for evaluating fish mortalities due to turbine entrainment.

#### 6.6.3.4 Comparative Analysis of the Historical Study and Current Study Results

Velocities measured at the intake will be compared with results from the previous entrainment study to evaluate any changes in fish community risk.

## 6.7 Analysis and Reporting

Results of this study will be summarized in a final study report. Appalachian anticipates that the Fish Community Study report will include Project information and background, a depiction and descriptive narrative of the study area, methodology, results, analysis, and discussion for each subsection. In addition, stakeholder correspondence and/or consultation will be included, as well as any literature cited.

## 6.8 Schedule and Level of Effort

The preliminary schedule for this study is provided in Table 6-1. The estimated level of combined effort for this study is approximately 500 hours. Appalachian estimates that this study will cost approximately \$200,000 to complete.

**Table 6-1. Proposed Fish Community Study Schedule**

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	September 2019 – April 2020
Fish Community Study	August – October 2020
Roanoke Logperch Adult Surveys	May – June <sup>1</sup> , August – October 2020
Roanoke Logperch Young-of-Year Surveys	August – October 2020
Roanoke Logperch Larval Surveys	April – June 2020
Desktop Impingement and Entrainment Evaluation	December 2019 – November 2020
Distribute Draft Study Report with the ISR	December 2020

<sup>1</sup>Spring sampling will only be performed in the bypass reach, assuming a waiver is granted from the USFWS and VDGIF for sampling within the time-of-year restriction period.

## 7 Benthic Aquatic Resources Study

### 7.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing.

- Adequacy of the existing minimum flows for protecting aquatic habitat for resident species, including species of special concern, downstream of the powerhouse (minimum flow of 50 cfs) and in the bypass reach (minimum flow of 8 cfs).

In Section 6.2.3 of the PAD, no aquatic species surveys were proposed by Appalachian. Formal study requests were received from VDGIF and USFWS during the scoping process and in response to the PAD and SD1, including requests for assessments of freshwater mussels, aquatic macroinvertebrates and crayfish, and benthic habitat in the study area, including the bypass reach. Additional comments and informal study requests were also received from FERC, USFWS, and VDEQ related to aquatic resources. These requests and comments are further summarized as follows:

- USFWS requested a benthic habitat quality assessment in the bypass reach and downstream areas in order to evaluate the amount of benthic habitat in these areas and quantify the habitat that could be gained by increasing sediment release downstream. FERC recommends the assessment be evaluated over a range of flows, and that consultation with USFWS and VDGIF be completed for target species.
- USFWS requested an aquatic macroinvertebrate/crayfish survey to compare the occurrence and abundance of crayfish and other macroinvertebrates with up- and downstream reference areas.
- VDGIF and USFWS requested a freshwater mussel assessment to evaluate the presence, distribution, and abundance of any freshwater mussels inhabiting the area affected by the Project, including the pool, bypass, and powerhouse tailrace.

Additional comments or requests related to this study were received from FERC, EPA, and USFWS in response to Appalachian's filing of the PSP. These comments are summarized as follows:

- FERC and USFWS requested that the number and locations of sampling sites for the Macroinvertebrate and Crayfish Community Study be specified, with justification.
- FERC and EPA requested clarification of the extent of the Mussel Community Study area, how mussel habitat will be identified, and how many survey locations will be selected.
- FERC requested alternative sampling techniques should approval for snorkeling surveys not be granted for the Mussel Community Study.
- USFWS requested that the Mussel Community Study area be expanded further upstream and downstream.

- USFWS requests clarification if the Benthic Aquatic Resources Study will address whether habitat below the dam is starved of sediment and therefore reducing quality and quantity of benthic habitat.

In addition to the formal comments filed, the following points relevant to this study plan were discussed at the PSP meeting on August 1, 2019:

- VDIGF noted there is a lack of mussel data on the Roanoke River.
- VDGIF noted there is no need to do a targeted crayfish survey.
- Appalachian's consultant noted that sampling in an upstream reference reach is not proposed.

## 7.2 Goals and Objectives

The goals and objectives of the Benthic Aquatic Resources Study are to:

- Quantify the amount of benthic habitat available for macroinvertebrates, crayfish, and mussels within the bypass reach.
- Collect a baseline of existing macroinvertebrate and crayfish communities in the vicinity of the Project.
- Confirm the presence or absence of mussels within the study area.
- Characterize the mussel community composition (if present), abundance, and distribution within the study area.
- Determine presence/probable absence of federally or state-listed species within the study area.

## 7.3 Study Area

The study area for the Benthic Aquatic Resources Study includes the Roanoke River and lower reaches of tributary streams within the study area shown on **Error! Reference source not found.** and Figure 7-2 .

## 7.4 Background and Existing Information

### 7.4.1 Macroinvertebrate and Crayfish Community

Benthic macroinvertebrates and crustaceans such as crayfish are an important component of riverine systems where they serve as a food resource for fish and as useful indicators of water quality and environmental stressors. Often, the presence of pollution-intolerant macroinvertebrates, or EPT taxa (Ephemeroptera [mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]) can be indicative of a healthy stream.

Existing relevant and reasonably available information regarding the macroinvertebrate community in the Project vicinity was summarized in Section 5.4.6 of the PAD (Appalachian 2019). Macroinvertebrate sampling has been conducted by the VDEQ along the mainstem of the Roanoke River downstream of the Project. A 3.2-mile reach of the Roanoke River from Niagara dam downstream to the mouth of Back Creek (Assessment Unit ID: VAW-L04R\_ROA01A00) is listed for benthic community impairment (i.e., Clean Water Act Section 303(d)). An assessment of the benthic community by VDEQ (2019) in this reach indicated the community was dominated by net-spinning caddisfly larvae and midges. There was low taxa richness and diversity, and low numbers of pollution-sensitive taxa (i.e., mayflies and stoneflies). Although instream habitat, riparian zone vegetation, and bank stability were considered optimal and provide conditions favorable for a healthy benthic community, filamentous algae and periphyton growth was prevalent on stream substrates, indicating excessive nutrient inputs in this reach of the river (VDEQ 2019a). No additional data on the macroinvertebrate community were available.

There are up to 33 species of crayfish found in Virginia, including several non-indigenous and/or invasive species such as the red swamp crayfish (*Procambarus clarkii*), rusty crayfish (*Faxonius rusticus*), marbled crayfish (*P. fallax f. virginialis*) and virile crayfish (*F. virilis*) (VDGIF 2018b; VISAC 2018). No information regarding crayfish species in the vicinity of the Project is available.

## 7.4.2 Mussel Community

Existing relevant and reasonably available information regarding the mussel community in the Project vicinity was summarized in Section 5.4.7 of the PAD (Appalachian 2019). No recent mussel surveys have been completed in the study area. Based on a geographic search on the VDGIF's Fish and Wildlife Information Service, seven mussel species have the potential to occur within a three-mile radius of the Project (VDGIF 2017) (Table 7-1). No additional mussel data is available for the study area.



**Table 7-1. Mussel Species Known to Occur within Three Miles of the Project (VDGIF 2017)**

Common Name	Scientific Name
Atlantic pigtoe <sup>1</sup>	<i>Fusconaia masoni</i>
Carolina slabshell mussel	<i>Elliptio congraea</i>
Creeper	<i>Strophitus undulatus</i>
Eastern elliptio	<i>Elliptio complanata</i>
Notched rainbow	<i>Villosa constricta</i>
Triangle floater mussel	<i>Alasmodonta undulata</i>
Yellow lance	<i>Elliptio lanceolata</i>

<sup>1</sup>Currently listed as state threatened, and also proposed for federal listing as a threatened species.

In comments filed on the PAD and SD1, USFWS stated that additional state and federally listed mussel species have the potential to occur in the study area, including (in addition to the Atlantic pigtoe), green floater (*Lasmigona subviridis*, state threatened) and James spiny mussel (*Pleurobema collina*, federally and state endangered).

In addition to native species, the invasive Asiatic clam (*Corbicula fluminea*) has been identified in the Roanoke River, however it has not been identified within the study area. The Asiatic clam is a small bivalve, which can be found at the sediment surface or slightly buried. It is a filter feeder and removes particles from the water column. It reproduces rapidly and is intolerant to cold temperatures, which can produce fluctuations in annual population sizes. The invasive clam substantially alters benthic substrate and competes with native species for limited resources. There have also been problems associated with biofouling on power plant and industrial water systems (USGS 2017).

## 7.5 Project Nexus

Potential Project effects on benthic aquatic resources may include impacts to benthic habitat due to flow fluctuations, sediment deposition in the impoundment and diminished sedimentation downstream of the dam, and reduced transport of particulate matter, nutrients, and plant propagules. These effects may result in a reduction of suitable habitat for benthic organisms potentially leading to a reduction in organism density, species richness, and evenness. Adequate benthic habitat is important to support a healthy macroinvertebrate community, as well as to provide spawning fish habitat. Furthermore, the presence of adequate benthic habitat and its associated fish community are necessary for a healthy mussel population. Information on the macroinvertebrate and mussel species diversity, abundance, and distribution will help identify the benthic aquatic resources and habitat potentially affected by Project operations.

## 7.6 Methodology

### 7.6.1 Task 1 – Benthic Habitat Assessment

#### 7.6.1.1 Field Sampling

A Benthic Habitat Assessment will be performed following VDEQ's protocol at all macroinvertebrate survey areas including (VDEQ 2008). Habitat characteristics such as substrate and cover availability, substrate embeddedness, flow velocity and depth, sedimentation, frequency of riffles, and bank stability, vegetative protection, and riparian zone will be scored on a scale of 0-10 in order to evaluate the quality of benthic habitat in the survey areas.

Characterization of substrates and mesohabitats within the bypass reach will also be evaluated in the Flow and Bypass Reach Aquatic Habitat Study.

#### 7.6.1.2 Comparison of Study Results

Results from the Benthic Habitat Assessment surveys will be reviewed to evaluate trends in species composition, abundance, or distribution throughout the study area. Additionally, the bypass reach Benthic Habitat Assessment will be reviewed along with the results of the Flow and Bypass Reach Aquatic Habitat Study in order to evaluate how habitat may be increased under various flow scenarios.

### 7.6.2 Task 2 – Macroinvertebrate and Crayfish Community Study

#### 7.6.2.1 Collector's Permits

Appalachian's consultant will obtain any necessary collector/survey permits that may be required prior to initiating field sampling for benthic Macroinvertebrates and Crayfish Community Study.

#### 7.6.2.2 Field Sampling

Appalachian proposes to conduct two macroinvertebrate and crayfish sampling events. Sampling will be performed during the sample index periods defined by VDEQ in the spring (March 1 – May 31) and fall (September 1 – November 30) of 2020 (VDEQ 2008). Specific sampling dates within these timeframes will be determined based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the general public. A variety of sampling techniques will be used during this study such as kick netting, dip netting, Hester-Dendy samplers, and rock picking. To assess the crayfish community in the Project boundary, crayfish will be targeted by sampling in appropriate habitats using kicknetting, seine hauling, and dipnetting techniques. Additionally, crayfish are often collected during backpack electrofishing efforts. Crayfish collected during fish community sampling will be

processed and added to the macroinvertebrate data for inclusion as a qualitative data point.

Appalachian's consultant will conduct benthic macroinvertebrate and crayfish sampling in the reservoir, tailrace, and bypass reach (**Error! Reference source not found.**). Appalachian's consultant will also perform sampling in the lower reaches of streams entering the reservoir that fall within the Project boundary. Qualitative (multi-habitat) and quantitative (riffles/runs) sampling will be completed following VDEQ's (2008) standard operating procedures. Appalachian's consultant will also complete habitat assessment evaluations during macroinvertebrate sampling following VDEQ's "Methods for Habitat Assessment for Streams" protocol. Supporting data will be collected at each sampling site including upstream and downstream reach limits recorded via GPS, sampling gear type, habitat characterization, representative photographs, time and date of sampling, weather conditions, general descriptions of depth, flow, and substrate, cover type and estimated percentage of cover.

In addition to this supporting data, Appalachian's consultant will collect discrete water quality measurements of temperature, DO, pH, and specific conductance at each sampling location using an appropriate instrument calibrated per the manufacturer's instructions. These water quality samples are specific to the macroinvertebrate and crayfish sampling efforts and are in addition to efforts identified in the Water Quality Study presented in Section 5.

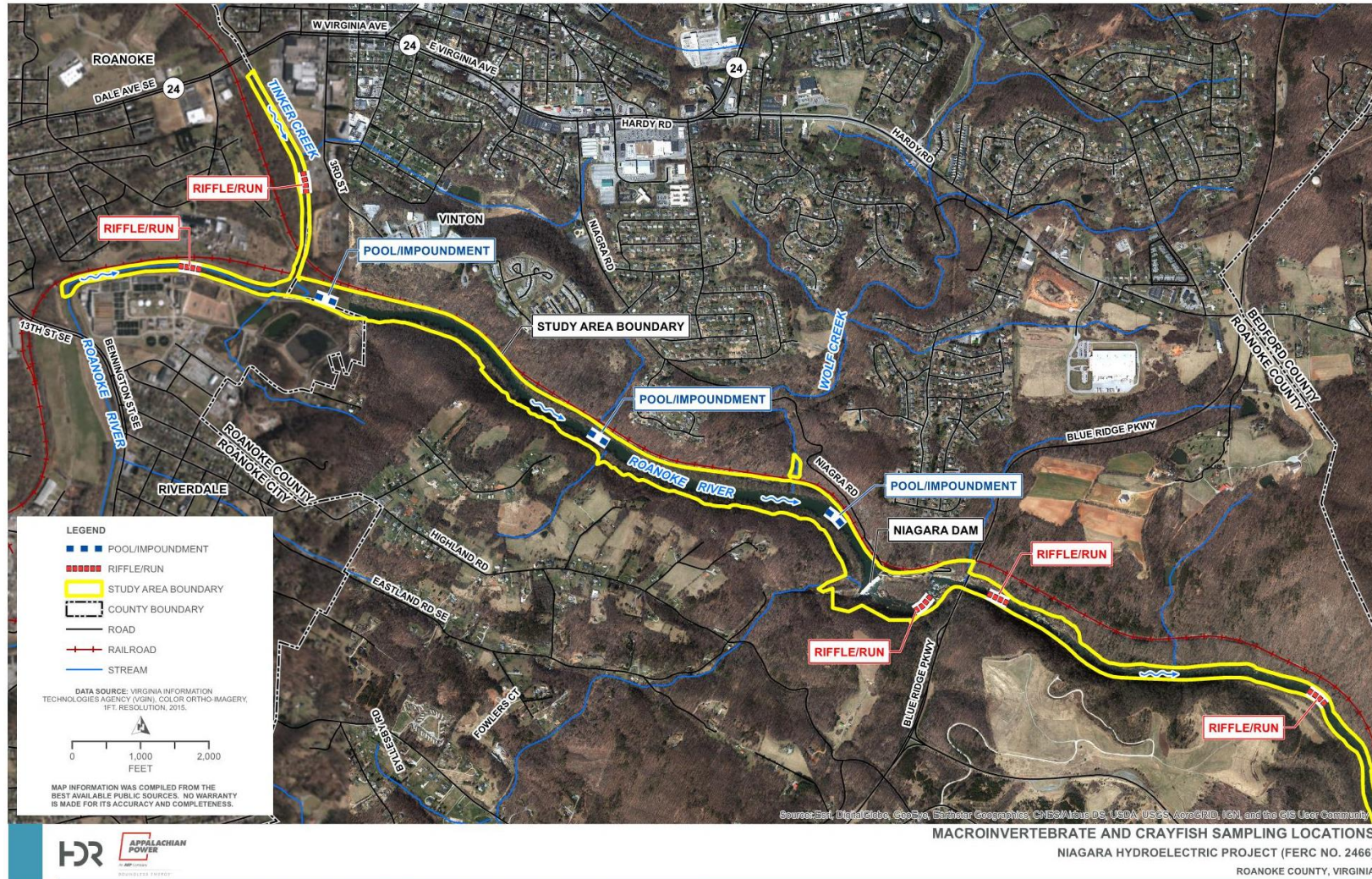
All samples collected, except crayfish which will be processed in the field, will be preserved and placed in labeled jars and sent to a laboratory for taxonomic identification to the lowest practicable taxonomic level. Laboratory processing will be performed in accordance with the VDEQ standard operating procedures "Methods for Laboratory Sorting and Subsampling of Benthic Macroinvertebrate Samples" (VDEQ 2008). Photo vouchers will be taken of all unique or rare species collected. A summary of species and numbers collected will be provided to VDGIF in compliance with permit specifications.

### 7.6.2.3 Comparison of Study Results

Data from the Macroinvertebrate and Crayfish Community Study will be processed following the Virginia Stream Condition Index protocol to develop common metrics and indices used to evaluate benthic macroinvertebrate community health and similarity (e.g., percent EPT, percent intolerant species, Hilsenhoff Biotic Index, etc.) (VDEQ 2008). A comprehensive list of crayfish species identified in the study area will be provided.



Figure 7-1. Locations of Proposed Macroinvertebrate and Crayfish Community Sampling at Niagara



## 7.6.3 Task 3 – Mussel Habitat and Community Study

### 7.6.3.1 Collector's Permits

Appalachian's consultant will obtain any necessary collector/survey permits that may be required prior to initiating field sampling for mussels.

### 7.6.3.2 Field Sampling

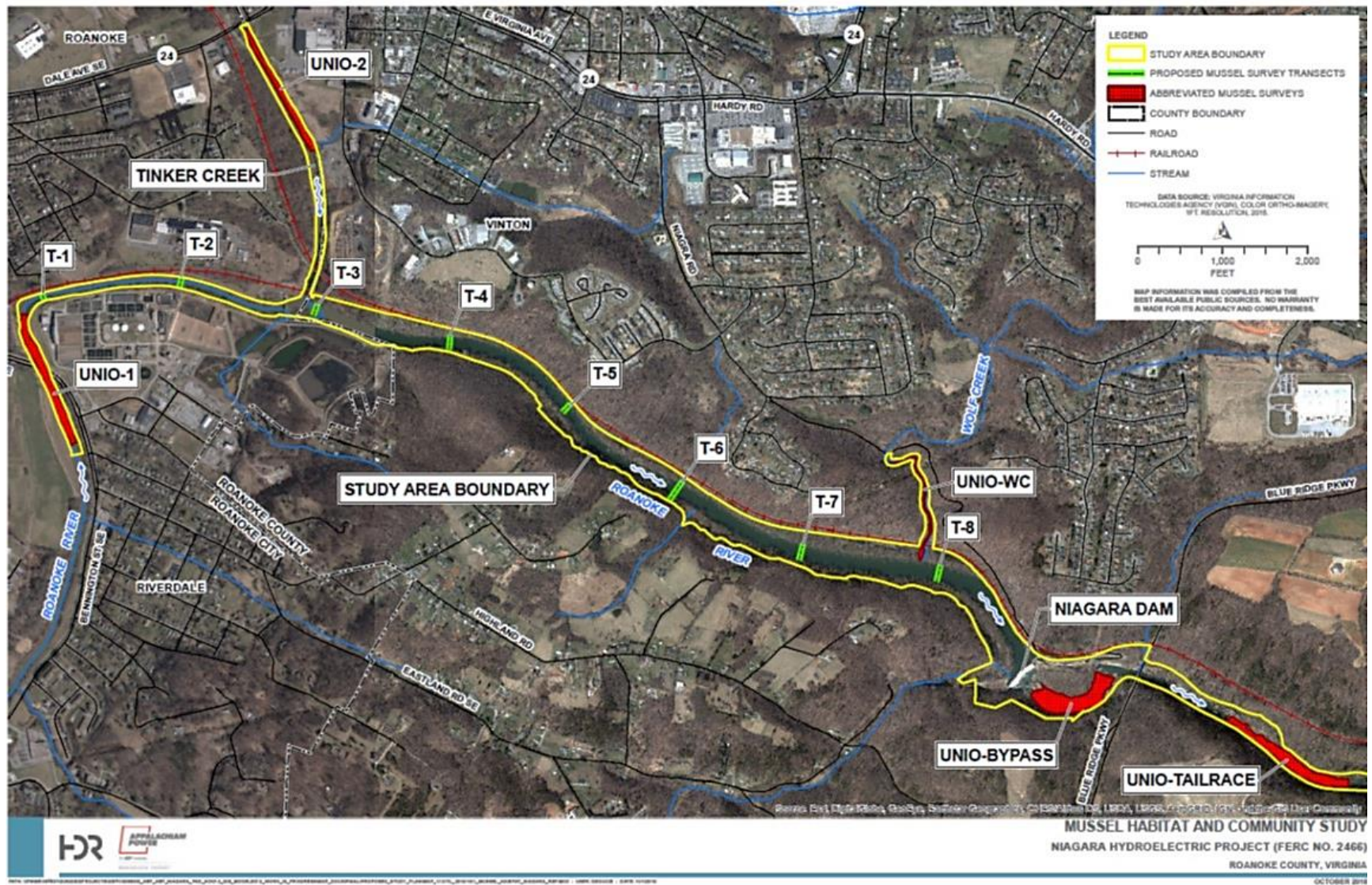
Appalachian proposes to conduct one season of mussel survey data collection following project-specific methods modified from the Draft Freshwater Mussel Guidelines for Virginia (USFWS and VDGIF 2018). Sampling will be performed during daylight hours within the approved mussel survey season in Virginia: April 1 to October 31. Specific sampling dates are determined based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff.

#### **Sampling Locations**

Mussel sampling is proposed to encompass the Project reservoir, tailrace, and wetted portions of the bypass reach (Figure 7-2). Survey methods will incorporate a combination of qualitative timed searches (i.e., abbreviated surveys) and systematic transect searches. Abbreviated mussel surveys (where possible) are anticipated at five (5) locations including: lower reaches of Roanoke River (Unio1 - proximal the riverine and reservoir interface), lower reaches of Tinker Creek (Unio2 - proximal the riverine and reservoir interface), bypass reach below the dam (i.e., Unio\_Bypass), 0.5-kilometer downstream of the tailrace (i.e., Unio\_Tailrace), and lower portions of Wolf Creek (i.e., Unio\_WC – empties directly into the Project reservoir). Sites are sampled using the appropriate mussel survey gear (e.g., snorkeling, view scopes, or SCUBA/Surface Supply Air) and dependent on water depth and velocities.



Figure 7-2. Locations of Proposed Mussel Community Sampling at Niagara





## Sampling Methods

### *Qualitative Timed Search Surveys*

Abbreviated mussel surveys extend 100 meters upstream and 400 meters downstream of the study area. Although the application of aforementioned buffers is not relevant to a specific “instream footprint”, select survey sites will encompass 500-meter stream reaches in congruence with the Draft Freshwater Mussel Guidelines for Virginia. Four of the five proposed sites are 500 meters in length and the bypass reach is approximately 315 meters in stream length (Table 7-2). Abbreviated mussel surveys are completed throughout the assigned survey reach using view-bottom buckets, snorkeling, Surface Supply Air and/or SCUBA. Surveyors target habitats suitable for the occurrence of freshwater mussels. Location, species counts, survey methods, and search efforts are recorded.

**Table 7-2. Site-specific Abbreviated Survey Reach Lengths**

SiteID	Survey Reach length (m)
Unio1	500
Unio2	500
Unio_WC	500
Unio_Tailrace	500
Unio_Bypass	315

### *Transect Surveys*

The reservoir is approximately 4.1 kilometers in length. To determine the presence and distribution of freshwater mussels, sampling in the reservoir is proposed using systematic placement of linear transects that extend bank to bank. Due to safety concerns, transects are not placed nor searched within 500 meters upstream of the Niagara dam. The survey will consist of 8 linear transects placed every 500 meters in the reservoir above Niagara dam and the upstream/free-flowing reach near the upstream extent of the Survey area. Transects will be subdivided into 10-meter intervals and data (i.e., substrate composition, mussel occurrence) recorded per interval. The use of linear transects, with subdivided intervals, enables surveyors to delineate and geo-reference mussel occurrences and/or suitable mussel habitats. Divers will search transects using Surface Supply Air and/or SCUBA at an approximate rate of one minute per square meter in heterogeneous substrates. All efforts will be made to locate mussels including wafting substrates, searching through aquatic vegetation, and turning cobble, boulder, and woody debris. Additionally, divers will waft sediment and rake substrates with their fingertips to uncover buried mussels. Location, species counts, survey methods, and search efforts will be recorded.

Mussels will be placed in mesh bags and retained in the water for subsequent processing that includes species identifications, enumerations, and length

measurements (millimeters - for at least 50 individuals per species). Photographs of representative taxa will be taken. No live mussels are retained or injured during survey-related activities. Fresh dead (empty valves) and weathered shells may be retained as voucher specimens and deposited at malacological museums at Marshall University, Huntington, West Virginia, Ohio State University, Columbus, Ohio, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, or provided to the USFWS, VDGIF and/or appropriate state agency upon request.

In the event a federally listed species (i.e., live or fresh-dead shell) is encountered within the survey extent, USFWS (Virginia Field Office) and VDGIF would be contacted within 24 hours (or by the next business day). GPS coordinates would be recorded at the capture location. At the time of capture, the specimen would be photographed and measured before being returned to the water at the capture location.

7.6.3.3 Comparison of Study Results

Data will be compiled and used to calculate CPUE, qualitative density, species richness, and relative abundance, and used to evaluate patterns in distribution (e.g., lateral to shore and longitudinal throughout project). Data from the mussel community survey will be compared to other mussel surveys performed in the Project vicinity to identify spatial or temporal trends or changes in species composition, abundance, or distribution.

7.7 Analysis and Reporting

Results of this study will be summarized in a final study report. Appalachian anticipates that the Benthic Aquatic Resources Study report will include Project information and background, a depiction and descriptive narrative of the study area, methodology, results, analysis, and discussion for each subsection. In addition, stakeholder correspondence and/or consultation will be included, as well as any literature cited.

7.8 Schedule and Level of Effort

The preliminary schedule for this study is provided in Table 7-3. The estimated level of combined effort for this study is approximately 475 hours. Appalachian estimates that this study will cost approximately \$125,000 to complete.

Table 7-3. Proposed Benthic Aquatic Resources Study Schedule

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	November 2019 – February 2020
Benthic Habitat Assessment	March – October 2020
Macroinvertebrate and Crayfish Community Study	March – October 2020

Task	Proposed Timeframe for Completion
Mussel Habitat and Community Survey	April – October 2020
Distribute Draft Study Report with the ISR	December 2020

## 8 Wetlands, Riparian, and Littoral Habitat Characterization Study

### 8.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing.

- Effects of continued Project operation and maintenance on riparian, wetland, and upland habitat and associated wildlife such as bald eagles.

In Section 6.2.5 of the PAD, Appalachian proposed to conduct a Wetland and Riparian Habitat Characterization of the study area. No formal study requests were received in response to the PAD or SD1 regarding wetland and riparian habitat resources. Regarding the study proposed by Appalachian in the PAD, the USEPA recommends the EA identify the location of any submerged aquatic vegetation beds within the study area, as well as provide a description of the terrestrial habitat resources in the study area, including species lists and plants present, a summary of composition and characteristics of each community type and the functions and total acreages.

Additional comments or requests related to this study were received from USFWS and FERC in response to Appalachian's filing of the PSP. These comments are summarized as follows:

- FERC staff questioned why a basic survey of wildlife within wetland or riparian habitats was not included as part of the study.
- USFWS also requested assessment of wildlife use and characterization of vegetation in the study area.
- USFWS noted that the invasive aquatic vegetation map should also include invasive plant species in riparian and upland areas which can be adapted into the WMP.

No comments on this study were received at the PSP meeting on August 1, 2019.

### 8.2 Goals and Objectives

The goal of the Wetlands, Riparian, and Littoral Habitat Characterization Study is to identify and characterize the existing wetlands, waterbodies, and riparian and littoral vegetative habitats (including emergent and submerged aquatic vegetation beds) in the study area. Specific study goals and objectives are to:

- Perform a desktop characterization using the USFWS (2019) National Wetlands Inventory (NWI), the Wetland Condition Assessment Tool (WetCAT) (VDEQ 2019b), and other resources such as GIS-based topographic maps, hydrography, aerial imagery, and soil surveys to identify and describe, approximate, and classify wetlands

and waterbodies (i.e., streams, creeks, rivers) within the study area (including upland, littoral, and riparian zones of the study area).

- Perform a field verification survey to confirm the location, dominant vegetative community and vegetation classification identified in the desktop survey and resulting maps.
- The field verification will include identification of littoral and instream vegetation in the study area to characterize the availability of littoral, submerged, and emergent vegetative habitat.
- Wildlife utilizing or present within observed areas will also be documented during the field verification.
- Using the results of the desktop characterization and field verification, develop a GIS-based map identifying wetlands, waterbodies, and riparian, littoral, and instream vegetative community composition according to the Cowardin Classification System (Cowardin et al. 1979). The map will also identify the location and species of any invasive aquatic vegetation identified in the literature review or during the field verification effort.
- Using the results of the desktop and field verification efforts, evaluate the potential for Project effects on wetlands, riparian, and littoral habitat in the study area, and wildlife species that utilize these habitats.

## 8.3 Study Area

The study area for this Wetland and Riparian Habitat Characterization Study includes the terrestrial and appropriate aquatic habitats within the study area shown on Figure 1-3, including the reservoir, terrestrial areas adjacent to the Project boundary at the normal full pond elevation of the Project reservoir, the bypass reach, and the riverine section of the Roanoke River and its tributary streams within the Project boundary.

## 8.4 Background and Existing Information

Existing relevant and reasonably available information regarding wetlands in the Project vicinity is presented in Section 5.6 of the PAD (Appalachian 2019). Wetland, riparian, and littoral habitats within the Project boundary are associated with the margin and near-shore areas of the impoundments. Wetlands are defined as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support... vegetation typically adapted for life in saturate soil conditions” (USACE 1987). The USACE and VDEQ have jurisdiction over wetlands in Virginia. The littoral zone, in the context of a large river system, is the habitat between approximately a half-meter of depth and the depth of light penetration (Wetzel 1975). Riparian habitats are areas found along waterways such as lakes, reservoirs, rivers, and streams (NRCS 1996).

## 8.4.1 Wetlands and Waterbodies

Due to the relatively steep terrain along much of the Project's shorelines of the Roanoke River and Tinker Creek, there are limited areas in which wetlands may occur within the study area and would likely be confined to floodplain areas. Two wetland and deepwater types are currently mapped by the NWI within the Project boundary: palustrine wetlands and riverine systems as defined by Cowardin et al. (1979). Palustrine wetlands are non-tidal wetlands dominated by trees, shrubs, and/or persistent plants/mosses, generally representing marsh, swamp, and small ponds. According to the NWI, the Roanoke River extending approximately one mile upstream of Niagara Dam is currently classified as a palustrine wetland with an unconsolidated bottom, with "permanently flooded" and "diked/impounded" modifiers (PUBHh). In addition to this area, three emergent wetlands (PEM1) in the floodplain, and one forested wetland (PFO1) associated with a shallow area of the main channel of the Roanoke River may also occur within the Project boundary.

The main channel of the Roanoke River upstream of the one-mile stretch above Niagara Dam and downstream of the dam is classified as lower perennial riverine system with an unconsolidated bottom. There are also several intermittent tributary streams and one perennial tributary stream within the study area. Riverine systems include all wetlands and deepwater habitats contained in natural or artificial channels periodically or continuously containing flowing water or which forms a connecting link between the two bodies of standing water (Cowardin et al. 1979). Upland islands or palustrine wetlands may occur in the channel, but they are not part of the riverine system. There are no other NWI-mapped wetlands associated with the Project.

## 8.4.2 Wetland, Riparian, and Littoral Vegetation and Wildlife

The shoreline and lands surrounding the Project reservoir are mostly forested and undeveloped, except for the CSX Railroad tracks and right-of-way along the north shore. Around the Project reservoir, the valley walls are covered with a mixture of deciduous hardwoods and conifers. Forest cover is generally oak-chestnut with many bare rock exposures. There is also a noteworthy percentage of pine and other types of cover, such as maple, hickory, hemlock, locust, dogwood, and basswood (Appalachian 1991).

A survey of the Project wetland, riparian, and littoral vegetation was performed in 1990 for the previous relicensing. This survey indicated the presence of several low, forested areas, which, based on their location several feet above the reservoir level on well-drained soil, appeared to be bottomland or riparian forest rather than forested wetland. These riparian forests were found to cover a total of approximately 20 acres (Appalachian 1991).

The majority of riparian habitat within the Project boundary is located within the Deciduous Forest, Mixed Forest, and Developed, Low Intensity cover types (USGS 2016). In the study area, discernible riparian vegetation is located along the Roanoke River and Tinker Creek. These areas typically support forests dominated by silver maple



(*Acer saccharinum*), sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra*), hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), and boxelder (*Acer negundo* var. *negundo*). Herb layers in mixed floodplains/riparian areas are usually very lush with nutrient-demanding, early-season species such as Virginia bluebells (*Mertensia virginica*), Canada waterleaf (*Hydrophyllum canadense*), wild ginger (*Asarum canadense* var. *canadense*), yellow trout-lily (*Erythronium americanum* ssp. *americanum*), large solomon's-seal (*Polygonatum biflorum* var. *commutatum*), and many others (VDCR 2017a).

Littoral vegetation (submerged aquatic or emergent) in the Project waters has historically been limited to a few and rooted plant species tolerant of urban contamination from upstream (Appalachian 1991). Based on the NWI maps and a review of aerial photography of the study area, some potential littoral habitats for wildlife were identified in two locations: the upstream extent of the Project boundary where the Roanoke River decreases in depth at the furthest upstream meander within the Project boundary and near the confluence of the Roanoke River and Tinker Creek.

The study area also supports a number of small mammals, avifauna, reptiles, and amphibians. Over 623 species were identified as potentially occurring within a three-mile radius of the Project per a geographic search on the VDGIF's Fish and Wildlife Information Service (VDGIF 2017). Section 5.5 of the PAD includes specific species known to occur in the general project vicinity. Under Article 407 of the existing license Appalachian implements a WMP, in part, protect riparian forest habitat at the Project.

The Virginia Department of Conservation and Recreation (VDCR) maintains a list of invasive plant species found within the State (VDCR 2017b). The list includes those species that pose a threat to Virginia's forests, marshes, wetlands, and waterways. They are ranked based on the level of threat they present to natural communities and species. There are close to 100 invasive plant species in Virginia (VDCR 2017b).

## 8.5 Project Nexus

Project operations may affect water levels and velocities. These factors can affect aquatic vegetation and wetlands, which are important habitats for fish and wildlife. This study will be used to assist in the evaluation of potential Project effects on wetlands.

## 8.6 Methodology

Appalachian is proposing this study as a desktop analysis followed by field verification of streams and wetland areas within the study area. The desktop study will use several data resources and GIS databases to identify areas likely to contain wetlands, riparian, and littoral habitat. The desktop study will estimate the areas of riparian and littoral zones. Wetland areas identified in the desktop study will be field-verified, but not formally delineated. The study methods proposed by Appalachian will provide adequate information to assess potential Project operations-related effects to wetlands, riparian, and littoral habitats in the study area.

## 8.6.1 Task 1 – Desktop Characterization of Wetland, and Riparian, and Littoral Habitats

A desktop characterization of existing and potential wetlands and waterbodies, and existing riparian and littoral vegetation will be performed. For the purposes of this study, the riparian zone will be defined as terrestrial areas 100 feet from the shoreline (VDCR 2006) or to the Project boundary, whichever is closer. The littoral zone, for this study, will be defined as the shallow shoreline area of the Roanoke River from the stream bank down to the maximum depth of light penetration (typically less than 20 feet) in the water column (Armantrout 1998), and will also include instream emergent and/or submerged aquatic vegetation beds.

Information sources may include the USFWS NWI, the VDEQ Wetland Condition Assessment Tool or WetCAT (VDEQ 2019b), USGS topographic quadrangles, topographic maps and elevation data, high-resolution orthoimagery, NRCS soil surveys, USGS National Hydrography Dataset, the National Land Cover Database, or other resources referenced in the PAD (Appalachian 2019).

These data will be used to create a preliminary habitat characterization map that will be used to perform the field verification efforts identified below in Task 2.

## 8.6.2 Task 2 – Field Verification

### 8.6.2.1 Wetlands and Waterbodies

Known wetlands identified through Task 1 will be assessed in the field by a qualified wetland scientist. Potential streams and wetland areas not confirmed previously (e.g., by the USACE, through prior licensing, other sources) identified in Task 1 will be field-sketched and geo-referenced with GPS by qualified wetland scientists and included in final maps. A visual assessment of potential wetlands and waterbodies (intermittent, ephemeral, or persistent streams) will be performed to assess the presence of wetland hydrology, hydrophytic vegetation, and hydric soil characteristics. During the evaluation, the dominant vegetation, invasive species, and general wildlife use observed, including any observations of bald eagles or their nests, will be documented. Wetlands and waterbodies will not be formally delineated.

### 8.6.2.2 Littoral Zone

A visual assessment will be performed to characterize the availability of littoral zone aquatic habitats including emergent and submerged aquatic vegetation beds occurring within the study area. Vegetation beds that cannot be safely evaluated from the shoreline or wadeable sections of the study area may be sampled with a throw rake to facilitate species identification. The general location and species composition will also be sketched on a field map during the survey. The species and general location of invasive aquatic vegetation observed during the field assessment will also be noted, as will any evident wildlife usage.

### 8.6.2.3 Riparian Zone

The vegetative communities identified and land cover maps created for Task 1 will be used to perform the riparian habitat field verification. To facilitate the field verification of the preliminary vegetative cover maps, the riparian habitat within each vegetative community type will be characterized by recording the dominant species of vegetation at three strata (tree, sapling/shrub, and herb). Invasive species identified during the assessment will also be noted on the field data sheets. This data will be compared to the general vegetative community types identified in the preliminary map to verify their accuracy. Documented differences in the vegetation will be field sketched and used to revise the map of riparian vegetative communities. The list of vegetation by strata will be provided in the final report. Any general wildlife usage of the riparian zone, including any observations of bald eagles or their nests, will be noted in the final report as well.

Vegetative communities documented in wetlands, streams, littoral, or riparian zones will be categorized using Cowardin Classification (Cowardin et al. 1979). Data collected during the field verification efforts will be used to revise preliminary vegetation cover type maps, which will be provided in the study report.

## 8.7 Analysis and Reporting

Wetland, riparian, and littoral habitats and emergent and submerged vegetation beds within the study area will be used to create vegetation and habitat availability maps and will include a GIS-based estimate of total area. Appalachian or their consultant will prepare a report that includes Project wetland and habitat cover-type maps based on results of the desktop study and field verification results. Appalachian anticipates that the Wetlands, Riparian, and Littoral Habitat Characterization Study report will include Project information and background, a depiction and descriptive narrative of the study area, methodology, results, analysis, and discussion. In addition, stakeholder correspondence and/or consultation will also be included, as well as any literature cited.

## 8.8 Schedule and Level of Effort

The preliminary schedule for this study is outlined in Table 8-1. The estimated level of effort for this study is approximately 180 hours. Appalachian estimates that the Wetlands, Riparian, and Littoral Habitat Characterization Study will cost approximately \$30,000 to complete.

**Table 8-1. Proposed Wetland, Riparian, and Littoral Habitat Characterization Study Schedule**

Task	Anticipated Schedule
Desktop Mapping of Wetland, and Riparian, and Littoral Habitats	September 2019 – March 2020

Field Verification of Preliminary Maps and Wetland Delineations  
and Riparian and Littoral Habitat Characterizations

April – July 2020

Distribute Draft Study Report with the ISR

December 2020

## 9 Shoreline Stability Assessment Study

### 9.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for the Project relicensing.

- Effects of continued Project operation and maintenance on shoreline stability of the impoundment.

In Section 6.2.1 of the PAD, Appalachian proposed to conduct a Shoreline Stability Assessment at the Project to identify sites of erosion or shoreline instability. No formal study requests or comments were received in response to the PAD and SD1 regarding shoreline erosion and stability.

No comments or requests related to this study were received from Project Stakeholders in response to Appalachian's filing of the PSP. FORVA noted at the PSP meeting on August 1, 2019 that the canoe take-out steps seem to have an erosion problem.

### 9.2 Goals and Objectives

The goals and objectives of the Shoreline Stability Assessment Study are to:

- Survey the Project's reservoir, bypass reach, and tailrace area to characterize the shoreline, with the focus on erosion or shoreline instability using the Bank Erosion Hazard Index (BEHI; WVDEP 2015);
- Inventory, map, and document any areas of erosion or shoreline instability; and
- Prioritize any areas where remedial action or further assessment may be needed.

### 9.3 Study Area

The study area for the Shoreline Stability Assessment Study includes the study area shown on Figure 1-3, including the reservoir shoreline, bypass reach, and tailrace area downstream of the Niagara powerhouse.

### 9.4 Background and Existing Information

The majority of the Project reservoir consists of undeveloped river banks with steep slopes and tree cover. There is limited upland area within the study area. Additionally, there are no private docks in the Project reservoir. The topography bordering the reservoir is relatively steep in areas, especially along the southern bank. The steeper slopes transition to lower gradients near the shoreline.

Existing relevant and reasonably available information regarding geology and soils in the Project vicinity was presented in Section 5.2 of the PAD (Appalachian 2019). The soils in the Project boundary downstream from the confluence of Tinker Creek, along the shoreline of the Roanoke River, are generally very stony Hayesville channery fine sandy loam with 25 to 50 percent slopes. The Hayesville series consists of very deep, well-drained soils on gently sloping to very steep ridges and side slopes of the Southern Appalachian Mountains. They most commonly formed in residuum weathered from igneous and high-grade metamorphic rocks such as granite, granodiorite, gneiss, and schist, but in some places formed from thickly-bedded metagraywacke and metasandstone (USDA 2017).

The soils within the Project boundary upstream of Tinker Creek vary and primarily include occasionally flooded Speedwell-Urban land complex with 0 to 2 percent slopes, Chiswell-Litz complex with 25 to 50 percent slopes, urban land, and Udorthents-Urban land complex. The Speedwell series consists of very deep, well-drained, moderately permeable soils on floodplains formed in medium-textured alluvium. The Chiswell series consists of shallow, well-drained, moderately permeable soils on uplands. They formed in materials weathered from shale, siltstone, and fine-grained sandstone. The Litz series consists of moderately deep, well-drained soils formed in residuum from leached calcareous shale and with widely spaced thin layers of limestone (USDA 2017).

Appalachian currently implements the WMP. Under the WMP, Appalachian consults with VDGIF and the USFWS every five years regarding the WMP and files a report with FERC. The WMP provides for the following measures:

- Conducting an annual visual inspection for evidence of increased human disturbance and, in the event of such disturbance, consulting with the VDGIF;
- Consulting with VDGIF about any planned activity that may affect the riparian forest areas;
- Monitoring the riparian forest areas for evidence of increased bank erosion and, in the event of increased erosion, consulting with VDGIF; and
- Notifying VDGIF if unanticipated impacts occur to the riparian forest areas.

The most recent WMP report was filed on November 5, 2015, documenting inspection reports for years 2010 through 2014.

## 9.5 Project Nexus

Shoreline erosion is a common concern at hydroelectric projects. Operating in run-of-river mode provides protection against erosion. Appalachian recognizes that aspects of the Project's geological setting may contribute to the potential for shoreline erosion.



## 9.6 Methodology

Appalachian is proposing this study as a desktop analysis followed by field confirmation of shoreline areas within the study area, including the reservoir, bypass reach, and tailrace identified in the desktop analysis as requiring confirmation or additional investigation. The shoreline will be assessed in the field for susceptibility to erosion, and for need and potential for remediation. The study methods proposed by Appalachian will provide adequate information to assess shoreline-erosion effects by Project operations.

### 9.6.1 Task 1 – Literature Review

Appalachian or their consultant will review existing available information on the study area, to assess bank composition and erosion potential in the study area. Information sources may include USGS topographic quadrangles, other contour and elevation data, high-resolution orthoimagery, NRCS soil surveys, and the USGS National Hydrography Dataset (see Section 8.6.1).

### 9.6.2 Task 2 – Shoreline Survey

A field survey will be conducted to characterize the shoreline of the Project's reservoir, bypass reach, and tailrace area. Appalachian's consultant will use the modified BEHI method to estimate erosion susceptibility (WVDEP 2015) at the Project. For each area observed, vegetative cover, quantity of material, height, and slope of bank, existing erosion control mechanisms, soil or rock type, composition, and thickness of various bank materials or strata, and other relevant data will be noted. A GPS will be used to identify and record areas of erosion with photograph documentation. Geographic Information System (GIS) maps will be produced to characterize the banks of the study area.

### 9.6.3 Task 3 – Determine Areas Potentially Needing Remediation

An analysis of erosion potential for the areas identified within the study area will be conducted. Recommendations for minimizing the effects of bank erosion from Project operations and/or enhancing bank stability will be assessed. A report characterizing bank erosion potential and stability in the study area will be provided to stakeholders with the ISR. The final report will include an analysis of the degree of susceptibility to erosion for all shorelines in the study area.

## 9.7 Analysis and Reporting

Results of this study will be summarized in a study report. Appalachian anticipates that the Shoreline Stability Assessment study report will include Project information and background, a depiction and description of the study area, methodology, results, and analysis and discussion. The report will also include any stakeholder correspondence and/or consultation, as well as literature cited.

## 9.8 Schedule and Level of Effort

The preliminary schedule for this study is outlined in Table 9-1. The estimated level of effort for this study is approximately 150 hours. Appalachian estimates that this study will cost approximately \$15,000 to complete.

**Table 9-1. Proposed Schedule for Shoreline Stabilization Study**

Task	Anticipated Schedule
Study Planning and Data Review	September 2019 – March 2020
Shoreline Survey and Determination of Areas Potentially Needing Remediation	April – July 2020
Distribute Draft Study Report with the ISR	December 2020

## 10 Recreation Study

### 10.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues related to recreation to be analyzed in the EA for the Project relicensing:

- Effects of continued Project operation and maintenance on recreation, land use, and aesthetics within the study area including the project impoundment, tailrace, and bypassed reach.
- Adequacy of existing recreational facilities and public access to the project to meet current and future recreational demand.

In Section 6.2.6 of the PAD, Appalachian proposed to conduct a recreational assessment of the Project to assess existing recreational opportunities and potential improvements to recreation facilities. In response to the PAD and SD1, one stakeholder, NPS, provided a formal recreation-related study request specifically addressing the seven criteria set forth in §5.9(b) of the Commission's ILP regulations. VDGIF, NPS, VDEQ, RC, and RRBC provided comments on the recreation assessment proposed by Appalachian in the PAD, which are summarized as follows:

- Request for Recreational Use and Enhancement Assessment to determine the need for enhanced recreational access in the study area.
- Request for Aesthetic Flow Study to determine the extent to which flows can be modified or controlled to improve visitor's experience associated with spillage.
- Comments on recreational assessment supporting the need for a recreational use survey.
- Comments on recreational assessment requesting considerations to extend and complete the Roanoke River Greenway through the Project, develop a boating access facility within the reservoir, and improve the existing portage.
- Comment on recreational assessment requesting the evaluation of the possibility of a controlled recreational release for whitewater boating downstream of the dam and in the bypass reach.

Additional comments or requests related to this study were received from VDGIF, RRBC, RVGC, and FORVA in response to Appalachian's filing of the PSP. These comments are summarized as follows:

- RRBC stated that in the interest of assisting Appalachian to reach the maximum number of stakeholders in the community, the Committee would like to offer assistance with this task, including coordination with Appalachian and their consultants to ensure that several key stakeholders are involved in the meeting.
- RRBC recommended distribution of the online survey through its contacts, webpage, and social media sites. RVGC also recommended the survey be more widely publicized

and specifically recommended a notice be sent to outfitters, shops that provide boating equipment, paddling and fishing groups, and other media and social media outlets such as Roanoke Outside.

- RVGC recommended that the study gather information on boating facilities upstream and downstream of the Project, and that the study area extend downstream to Back Creek, because of the impact of the Project on recreation use on that adjacent river section. VDGIF similarly stated that the proposed study will not address the true need for recreation access enhancement. VDGIF previously suggested that Appalachian survey existing recreational use in areas not impacted by the Project (e.g, upstream of the Project boundary). This will provide a realistic comparison of recreational demand and use between the study area and an area with reasonably good access.
- RVGC recommended that the Background and Existing Information section of this study plan include a review of all plans that are impacted by the Project and an analysis of how the Project might restrict or facilitate implementation of those plans (such as the 2018 Roanoke Valley Greenway Plan, or others submitted such as by Roanoke County).
- RVGC recommended that the facility inventory consider other facilities in addition to the Niagara portage, such as the Tinker Creek boat launch and other access points upstream and downstream such as Bennington and Rutrough roads and other recreation facilities in the study area.
- RVGC recommended that one stakeholder meeting is insufficient, and that Appalachian or their consultant should visit local offices of agencies, meeting with stakeholders, local governments, NGO's in the area.
- RVGC recommended that the Recreational Use Documentation task be expanded to include the Tinker Creek and Rutrough Road boat launches.
- RVGC recommended that the Analysis and Reporting section of this study plan include 1) a research and review section documenting other plans and recreation programs that were reviewed and portions that were considered; 2) a list of potential cooperative recreation projects in the study area; 3) opportunities within the scope and beyond the scope of the project.
- RRBC, RVGC, and FORVA provided specific measures for potential recreational enhancements to the Project including:
  - Appalachian to purchase property on the river-right bank near Niagara dam to provide parking and boating access.
  - Appalachian to provide portage around Niagara dam on the river-right bank (or alternative portage methods).
  - Appalachian to work with local outfits to provide debris removal at the dam and sponsor periodic trash clean up in the Project vicinity.
  - Appalachian to provide Roanoke County with right-of-way for Roanoke River Greenway on river-right bank on Appalachian-owned land.
  - An improved and more accessible trail leading to the bypass reach.

- The potential for scheduled releases or increased flows for special events.
- FORVA also recommended that a recreational release study consider the potential for releases from the upstream Spring Hollow Reservoir to increase recreational flows at the Project.

In addition to the formal comments filed, the following points relevant to this study plan were discussed at the PSP meeting on August 1, 2019:

- The group noted that it may not be worth the effort to capture usage information at the current canoe portage since it is not highly used. FORVA noted that tailwater fishing on river-right is very common. Appalachian noted that public access (other than by boat access and portage) is restricted on the river-left bank due to the railroad crossing and non-public nature of the access road.

## 10.2 Goals and Objectives

The goal of this study is to determine the need for enhancement to the existing recreation facility, or the need for additional recreational facilities, to support the current and future demand for public recreation in the study area. The objectives of this study are to:

- Gather information on the condition of the one FERC-approved public recreation facility at the Project and identify any need for improvement;
- Gather information on the condition and facilities provided at non-Project recreation sites;
- Characterize current recreational use of the study area;
- Estimate future demand for public recreation at the Project;
- Evaluate opportunities, processes, and constraints related to short-term or temporary modifications to Project operation to facilitate downstream boating flows;
- Solicit comments from stakeholders on potential enhancements or new facilities; and
- Analyze the effects of Project operation on Project-related recreation facilities.

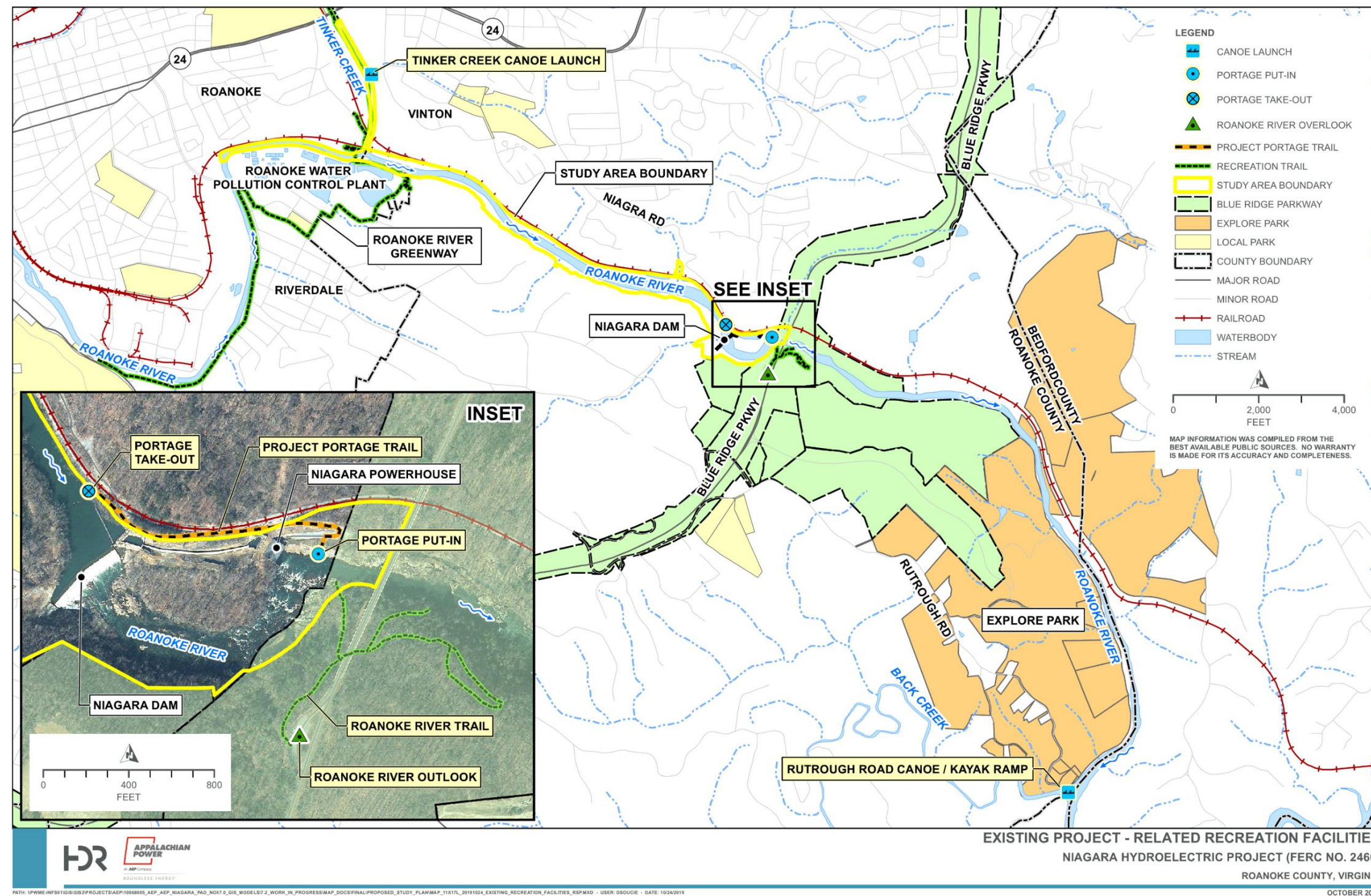
## 10.3 Study Area

The general study area for the Recreation Study includes the study area shown on Figure 1-3. Facilities encompassed by certain tasks of this study have been expanded downstream from that proposed in the PSP to include the Blue Ridge Parkway Roanoke River Trail and Explore Park/Rutrough Point access area, in addition to the Project and non-project facilities within or adjacent to the Project boundary (Figure 10-1). This is an appropriate study area as it includes lands and recreation facilities managed by Appalachian under the license and other recreational opportunities that may potentially be affected by Project operations.

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**Figure 10-1. Recreational Facilities Within and Adjacent to the Project Boundary**





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## 10.4 Background and Existing Information

Section 5.8 of the PAD describes existing information about recreation facilities and opportunities in the study area. The Roanoke River is a significant recreation and amenity resource. Of significant note is the Roanoke River Blueway and Roanoke River Greenway. The Roanoke River Blueway Committee was established in 2013 by the Roanoke Valley-Alleghany Regional Commission to facilitate the planning, development, and marketing of the Roanoke River Blueway. The Roanoke River Blueway offers a unique combination of urban, front country, and back country recreation opportunities in the upper Roanoke River watershed. The Roanoke River lends itself to canoeing, kayaking, fishing, tubing, wading, wildlife viewing, and watershed education. Maps, trip planning, water level, and rental information are available online on the Roanoke River Blueway website (Roanoke River Blueway undated). Additionally, the Roanoke Valley Greenway Commission was established in 1997 to establish a greenway plan for the Roanoke Valley, advise and assist participating governmental agencies, facilitate cooperation among stakeholders, and more. While the Project only contains one FERC-approved recreational facility (the Project canoe portage trail), there are federal, state, and local recreational opportunities available nearby.

The one FERC-approved Project recreation area is a canoe portage trail. The canoe portage trail was constructed at the Project in 1996 by the VDGIF as part of the Partners in River Access program, a cooperative effort among VDGIF, VDCR, and Appalachian to develop various recreation sites on the Roanoke, New, and James rivers in the vicinity of hydroelectric projects. The trail provides safe passage around the dam for those wishing to paddle the short reach downstream to the Rutrough Road access or Smith Mountain Lake. The 1,600-foot-long canoe portage trail consists of a take-out point (upstream of the boat barrier) consisting of steps installed by Appalachian in 2014, a crushed stone surface, and gravel maintenance road to a put-in point near the Blue Ridge Parkway Bridge. A portage sign is located at the take-out and at the beginning of the pathway leading to the downstream put-in point. The canoe portage is maintained by Appalachian.

Non-Project recreation sites nearby provide recreational opportunities and include:

- (1) A canoe launch located on Tinker Creek maintained by the Town of Vinton which provides a concrete boating ramp, canoe rack, informational kiosk, paved parking lot with handicapped spaces, and a picnic area.
- (2) The Roanoke River Trail begins at the NPS Roanoke River Outlook and traverses into the Niagara bypass reach. It provides a short hike or walk, bird watching, and access to fishing in the bypass reach.
- (3) A canoe/kayak launch/take-out located at the terminus of Rutrough Road (Rutrough Road Canoe/Kayak Ramp), approximately 3 miles downstream of the Project powerhouse.



Recreational boating (paddling) occurs both upstream and downstream of the Project, and relicensing stakeholders have expressed interest in exploring the potential for Project operations to support provision of enhanced and/or steady flow conditions for boating downstream of the Project and potentially in the bypass reach. Existing limitations and considerations relative to these requests are as follows:

- The Project operates in a run-of-river mode under all flow conditions, with outflows from the Project approximating inflows to the Project. There is no appreciable storage available, and inflows are either used for generation, spilled, or used in combination.

When operated in this mode, Project operation does not affect flows or river conditions downstream of the powerhouse tailrace. Modifications to Project operations would be required to impact downstream flows.

- The Project is typically operated 0.6 feet below the spillway crest. Except during periods of high inflow when the reservoir level rises and uncontrolled flows are passed over the spillway crest, the only viable means of passing significant flow at the dam is through the 6-foot wide sluice gate, which has a maximum calculated discharge capacity of 207 cfs at full pond. Based on a review of aerial photos and on-site observations of the bypass reach under a range of flows, Appalachian expects that a bypass reach flow of approximately 400 cfs would be required to boat in the bypass reach in a craft such as a kayak or canoe and meet basic navigation requirements (e.g., minimum depth of 1 foot across a channel at least 10 feet wide at each point of passage).

It is presently not feasible or desirable from a public safety perspective to provide boat access to the bypass reach immediately below Niagara dam.

Given the run-of-river operating mode of the Project and the lack of available reservoir storage, the adverse effects that varying water elevations may have on aquatic resources, the relatively high flows expected to be required for boating in the bypass reach, and the discharge limit of the existing sluice gate, it is not feasible to provide recreational flows in the bypass reach.

Based on these constraints, combined with the short (1,500-foot-long) nature of the bypass reach, there would be little benefit to providing a recreational flow release at the dam, which would only be possible within a narrow range of Project inflows and would require reduction of powerhouse generation not representative of normal operations.

- Under normal operating conditions, the Niagara Project uses available flows for powerhouse generation, maintaining the elevation of the Niagara reservoir between 884.4 feet and 883.4 feet National Geodetic Vertical Datum (NGVD). The volume of water contained in this 1-foot operating band is approximately 56.5 acre-feet, which equates to approximately 60 minutes of run-time with the powerhouse at maximum discharge capacity (684 cfs), assuming no Project inflow. The crest of the spillway is

at elevation 885 feet, allowing 0.6 feet of freeboard between the upper end of the normal operating band and the spillway crest. The additional volume of water that could be stored in the freeboard is approximately 34.3 acre-feet which could provide an additional 36 minutes of run-time at maximum powerhouse capacity, assuming no Project inflow.

While the duration of releases could be extended slightly by foregoing powerhouse generation, excluding a narrow range of ideal inflow conditions, this would still require ponding and drawdown of the reservoir within the authorized operating band, which would represent a significant departure from Project operation under the existing license.

As noted in comments filed by FORVA on the PSP, Appalachian has in the past cooperated with Roanoke Valley jurisdictions to provide short-term increased releases from the Project (within the limits of authorized operating restrictions).

## 10.5 Project Nexus

The Project currently provides public recreational opportunities. The results of this study, in conjunction with existing information, will be used to inform analysis in the license application regarding potential Project effects on public recreation and recommendations for potential PM&E measures to be included in the new license.

## 10.6 Methodology

### 10.6.1 Task 1 – Recreation Facility Inventory and Condition Assessment

Appalachian or their consultant will perform a field inventory to document the existing Project and non-project recreation facilities located within or adjacent to the Project boundary, which are as follows:

- Tinker Creek Canoe Launch
- Niagara Project Canoe Portage Trail
- The Roanoke River Trail

Appalachian or their consultant will record the following information for each facility:

- A description of the type and location of existing facility;
- The type of recreation provided (boat access, angler access, picnicking, etc.);
- Length and footing materials of any trails;
- Existing facilities, signage, and sanitation;
- The type of vehicular access and parking (if any);

- Suitability of facilities to provide recreational opportunities and access for persons with disabilities (i.e., compliance with current Americans with Disabilities Act standards for accessible design); and
- Photographic documentation of recreation facilities and GPS location.

Additionally, a qualitative assessment of the condition of each recreation facility identified above will be performed using a Facilities Inventory and Condition Form (Appendix B). Using the Facility Inventory and Condition Assessment Form, the recreation amenities available at the facility will be rated using the following criteria: (N) Needs replacement (broken or missing components, or non-functional); (R) Needs repair (structural damage or otherwise in obvious disrepair); (M) Needs maintenance (ongoing maintenance issue, primarily cleaning); and (G) Good condition (functional and well-maintained). If a facility is given a rating of “N”, “R”, or “M”, an explanation for the rating will be provided.

### 10.6.2 Task 2 – Convene Meeting with Stakeholders to Discuss Existing and Future Recreational Opportunities

Appalachian proposes to convene a meeting with interested relicensing participants (e.g., RRBC, RVGC, FORVA, and relevant state and federal agencies) for a focused discussion of existing and future recreational opportunities at or associated with the Project. Appalachian will seek input from primary relicensing participants on other organizations or stakeholders to be invited to this meeting. Appalachian expects that this meeting will include discussion of potential conceptual level recreation enhancements and improvements to the canoe portage trail and other areas of the Project where enhancements may be feasible. Appalachian tentatively proposes to hold this meeting in late summer of 2020 and will notify interested relicensing participants at least three weeks in advance.

Appalachian appreciates the concerns expressed by stakeholders in response to the filing of the PSP that a single meeting may not be sufficient to identify and evaluate additional or enhanced recreational opportunities at the Project. Appalachian believes that conduct of an initial meeting, along with the activities proposed in this study plan, is appropriate for this study period (2020 study season). Based on the results of the other tasks of this study and discussions at the ISR meeting, Appalachian will evaluate the need for additional Recreation Study meetings or other stakeholder coordination and outreach to evaluate potential recreational enhancements to be included in Appalachian’s licensing proposal.

### 10.6.3 Task 3 – Recreation Visitor Use Online Survey

Appalachian has developed an interview/survey instrument that draws from general concepts and guidance from the National Visitor Use Monitoring Handbook (USFS 2007) as well as from other relicensing studies approved by FERC for recreation visitor use surveys. This survey will be administered through a website (online) and will offer



respondents the opportunity to provide survey responses electronically, which will allow respondents to complete a survey at a later time upon returning home from their visit.

Appalachian will post a brief description of the purpose and intent of the survey, as well as the website address, at the Canoe Portage Trail, Tinker Creek Canoe Launch, Roanoke River Trail, and Rutrough Road Canoe/Kayak Ramp. Additionally, notice of the survey will be posted on the Project's relicensing website and relevant social media outlets maintained by Appalachian. Appalachian will also make a good faith effort to communicate with local outfitters and regional organizations (e.g., RRBC, RVGC, FORVA) to complete the survey and distribute notice of the survey to their members or clients. Appalachian or their consultant will notify relicensing participants when the online survey is available through a quarterly ILP study progress report.

The proposed questionnaire to be used for the online survey is provided in Appendix C of this study plan. The questionnaire is designed to collect information about the following, from both existing and potential recreational visitors to the area:

- General user information;
- Resident/visitor;
- Purpose and duration of visit;
- Distance traveled;
- Day use/overnight lodging;
- History of visiting the site or area;
- Types of recreational activities respondents participated in during their visit, including primary and secondary recreation activities;
- General satisfaction with recreational opportunities, facility, and the respondents overall visit and/or areas that need improvement;
- Effects of Project operations on recreation use and access; and
- Accessibility of facility.

#### 10.6.4 Task 4 – Recreational Use Documentation

Appalachian or their consultant will collect visitor use data at the following (non-Project) recreation facilities through a combination of in-person surveys, interviews, field reconnaissance, and photo documentation:

- Tinker Creek Canoe Launch
- The Roanoke River Trail
- Rutrough Road Canoe/Kayak Ramp

Personnel obtaining visitor use data will also assess usage of the Project canoe portage put-in from the river access on the Roanoke River Trail in the bypass reach. The canoe

put-in is located directly across the Roanoke River from the end of the Roanoke River Trail and is visible from that location.

Visitor use in-person surveys will occur a total of 12 times during prime recreational months of May 2020 through October 2020 on the schedule provided below:

- May – One weekend day (Memorial Day Weekend) and one randomly selected weekday.
- June – One randomly selected weekend day and one randomly selected weekday.
- July – One weekend day (July 4th Weekend) and one randomly selected weekday.
- August – One randomly selected weekend day and one randomly selected weekday.
- September – One weekend day (Labor Day Weekend) and one randomly selected weekday.
- October – One randomly selected weekend day and one randomly selected weekday.

Personnel obtaining visitor use data will rotate between each of the three non-Project recreation sites spending four hours at each site within the time period from 8:00 AM through 6:00 PM. The starting time for each field survey may vary giving consideration to weather conditions and other factors including but not limited to temporary closing of the Blue Ridge Parkway, construction activities, and events taking place. In addition, a windshield flyer or postcard will be provided to individuals who either did not elect to fill-out survey forms in-person, as applicable, or were not available to be interviewed while personnel were on site.

## 10.6.5 Task 5 – Aesthetic Flow Documentation

Article 403 of the current license requires a minimum flow of 8 cfs into the bypass reach, which is presently provided via an existing spillway sluice gate. The Project is located adjacent to the Blue Ridge Parkway and is visible from the Roanoke River Overlook and the trail that extends down to the base of the dam area, making the Project an important aesthetic resource.

To characterize and capture the appearance of the dam and bypass reach under a range of flows, Appalachian or their consultant will collect photo and video documentation from key observation points (KOP), specifically the NPS Roanoke River Outlook adjacent to the Blue Ridge parking and a few key locations along the Roanoke River Trail, subject to restrictions on access that may be imposed by weather or seasonal conditions. Photos and videos will be collected on no less than a quarterly basis from November 2019 through November 2020 at the KOPs in order to provide views during the four seasons of the year under a range of flow conditions (including periods of spill over the spillway crest). The video and photos will be dated, and flow and operations information will be documented. The photos, video, flow, and operations information will be presented as a separate section in the final Recreation Study Report and at the ISR meeting. Flow

information will be documented utilizing operations information provided by Appalachian along with data obtained from the USGS 02056000 streamflow gage located on the Roanoke River immediately downstream from the Project powerhouse.

### 10.6.6 Task 6 – Recreational Flow Release Desktop Evaluation

To address stakeholders' interests while recognizing the prevailing Project constraints related to enhancement of downstream flow conditions presented in Section 10.4, Appalachian proposes to conduct a limited desktop evaluation of the potential for Project operations to support short-term enhancement of flow conditions for downstream boating. Appalachian will consult (through email and/or a conference call) with FORVA, RRBC, RVGC, and interested agencies to determine the range of flows and potential timing of recreational flow releases of interest to relicensing stakeholders (with the assumption that in the future any such releases would only be provided on an as-requested basis and subject to approval by Appalachian on a case-by-case basis). Appalachian will then use the existing operations model and hydrology data set developed for the Project (see Section 4.4) to evaluate selected scenarios. The results of this evaluation will be presented in the draft study report to be distributed with the ISR, and the results of this evaluation will be discussed at the ISR meeting.

FORVA also recommended that a recreational release study consider the potential for releases from the upstream Spring Hollow Reservoir to increase recreational flows at the Project. As this facility is not operated by Appalachian, Appalachian does not believe that this particular aspect of FORVA's request is feasible or appropriate for the relicensing study, as it would not be expected to inform the development of reasonable license requirements (ILP Study Criteria No. 5).

## 10.7 Analysis and Reporting

Results of the facility inventory and condition assessment; stakeholder site visit; online surveys, recreational use documentation; and aesthetic flow documentation will be summarized and incorporated into the Recreation Study Report. Appalachian anticipates that the Recreation Study Report will include the following elements:

- Project information and background
  - To include review of relevant recreation-related plans with a potential nexus or connection to the Project and the relicensing.
- Study area
- Methodology
- Study results
- Analysis and discussion

- To include identification and evaluation of potential recreational enhancements or opportunities, including cooperative projects identified or requested by Project stakeholders.
- Any agency correspondence and/or consultation
- Literature cited

## 10.8 Schedule and Level of Effort

The preliminary schedule for this study is outlined in Table 10-1. The estimated level of effort for this study is approximately 430 hours. Appalachian estimates that this study will cost approximately \$55,000 to complete.

**Table 10-1. Recreation Study Schedule**

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	November 2019 – March 2020
Recreation Facility Inventory and Condition Assessment	November 2019
Convene Meeting with Stakeholders	July - August 2020
Recreation Visitor Use Online Survey	May - October 2020
Recreational Use Documentation (2x/month)	May – October 2020
Aesthetic Flow Documentation (Quarterly)	November 2019 – November 2020
Recreational Flow Release Desktop Evaluation	August 2020 – October 2020
Distribute Draft Study Report with the ISR	December 2020

# 11 Cultural Resources Study

## 11.1 Study Requests

The Commission's March 26, 2019 SD1 identified the following environmental resource issues to be analyzed in the EA for Project relicensing:

- Effects of Project operation and maintenance on historic properties and archeological resources that are included in, eligible for listing in, or potentially eligible for inclusion in the National Register of Historic Places (NRHP).
- Effects of Project operation and maintenance on any previously unidentified historic or archeological resources or traditional cultural properties that may be eligible for inclusion in the NRHP.

In Section 6.2.8 of the PAD, Appalachian proposed to assess the potential for Project effects (if any) on identified historic and archaeological resources, and the need for any additional archaeological site file search and/or additional Phase 1 investigation of the Project's area of potential effects (APE), through consultation with Virginia State Historic Preservation Office (SHPO) and federally recognized Indian tribes.

No formal study requests or comments on the PAD were received in response to the PAD and SD1 regarding historical or cultural resources.

No comments or requests related to this study were received from Project stakeholders in response to Appalachian's filing of the PSP, nor were any concerns expressed or comments provided at the PSP meeting on August 1, 2019.

## 11.2 Goals and Objectives

The proposed Cultural Resources Study will identify reported historic properties within the Project's APE. This study will also assess the potential effects of continued Project operations and maintenance activities on historic and cultural resources. The goals and objectives of this updated study are to:

- Consult with Virginia SHPO and Delaware Nation to determine the appropriate APE for the Project
- Conduct background research and an archival review
- Conduct an Archaeological Phase I Reconnaissance Survey of the APE
- Consult with the Delaware Nation to develop and conduct an inventory of properties of traditional religious and cultural importance (often referred to as "traditional cultural properties" or TCPs) within the APE

An architectural survey is not proposed within the APE since the Niagara Project has previously been determined to be ineligible for the National Register of Historic Places.

## 11.3 Study Area

The study area for the Cultural Resources Study is the APE for Project relicensing, which Appalachian preliminarily proposes to define as the Project boundary (Figure 1-3). Appalachian intends to define the APE in consultation with the SHPO and Delaware Nation as a component of the Cultural Resources Study. The Commission has not yet defined an APE for the Project. Appalachian tentatively proposes the following APE which may be refined through consultation:

“The APE includes all lands within the Project boundary. The APE also includes any lands outside the Project boundary where cultural resources may be affected by Project-related activities that are conducted in accordance with the FERC license.”

The Project boundary encompasses all lands that are necessary for Project purposes, all Project-related operations, potential enhancement measures, and routine maintenance activities associated with the implementation of a license issued by the Commission are expected to take place within the Project boundary. The proposed APE, as the Project boundary, is consistent with the potential scope of Project effects and the manner in which the Commission has defined the APEs for similar hydroelectric relicensings in the Commonwealth of Virginia.

## 11.4 Background and Existing Information

During the previous relicensing, Appalachian initiated an archaeological study at the Project. Research largely consisted of an examination of archaeological site files at the Virginia Department of Historic Resources in Richmond, Virginia. Attempts were made to determine previously recorded sites and studied areas near the Project. Local and regional histories were studied at the Virginia State Library and Virginia State Archives (Appalachian 1991).

Additionally, a Phase IA Archaeological Investigation concluded that there were no historic or prehistoric archaeological sites recorded for the Project site, but a number of sites were recorded in the vicinity of the Project (Appalachian 1991).

Cultural resource studies previously carried out in the general vicinity of the Project reveal a high potential for prehistoric sites along the Roanoke River. However, urban and industrial development have resulted in repeated disturbance to the floodplain area, thereby greatly diminishing the potential for sites containing undisturbed deposits. It is noteworthy that the majority of sites identified along the Roanoke River in the general vicinity of the Project are surface sites. Archaeological potential for prehistoric resources at the Project is limited. Construction of the facility, as well as the railroad which traverses the plant's northern borders, has caused severe disturbance and has eliminated the potential for prehistoric archaeological resources on the northern banks of the river. Repair and maintenance activities at the facility have created further disturbance on both banks of the river (Appalachian 1991). Based on a review of the Virginia SHPO's Cultural Resources Information System, there are no archaeological



resources mapped within the Project's proposed APE. The nearest mapped archaeological resource, an unevaluated Late Archaic site, is located on an upland plain more than 2,000 feet west of the Niagara Dam.

In support of developing the previous license application and other relicensings, a comprehensive cultural resource evaluation of 19 hydroelectric power generating facilities of Virginia was conducted by Louis Berger & Associates, Inc. for Appalachian. The Project was evaluated for inclusion in the NRHP, pursuant to Section 106 of the National Historic Preservation Act of 1966. The study determined the Niagara Project did not meet the National Register Criteria for Eligibility (36 CFR 60.4) because it lacks requisite integrity of design and workmanship as a result of modern alterations. The Project dates from the first significant period of hydroelectric plant construction in the state (ca. 1895-1920) and, based on available information, appears to have been one of very few "medium-head" projects built during that time, as it was reported to have been built to operate at a head of about 60 feet (Appalachian 1991). The powerhouse was originally equipped with Victor turbine wheels, four 750-kW generators, and one 350-kW generator (Appalachian 1991). These elements appear to have been replaced, possibly prior to 1924, with four horizontal S. Morgan Smith turbines in steel pressure casings that were direct-connected to four generators. The potential significance of the Niagara powerhouse, however, is significantly diminished by alterations that have occurred since the 1950s. The major alterations are the 1954 reconstruction of the powerhouse floor for the two existing vertical generating units, whose type and placement have greatly changed the original character of the facility, and the installation, in 1988, of the steel penstock, with its associated intake and discharge structures, in the former headrace canal. While the modification of powerhouses for new generating equipment has historical precedent, the remodeling of the Niagara facility has occurred within the past 40 years and has largely obliterated structural evidence of the kind of equipment it was originally designed to contain. The Niagara Project thus does not possess the integrity of design and workmanship that would permit its physical remains to clearly represent its type or its association with the early years of the hydroelectric industry in the state (Appalachian 1991). The Virginia SHPO has previously determined that the Project is not eligible for the NRHP.

While the Project's facilities are not eligible for the NRHP, the Project is located adjacent to the historic Blue Ridge Parkway. The Blue Ridge Parkway was conceived during the Great Depression and seen as a scenic tourist link between two National Parks, Shenandoah in Virginia and Great Smoky Mountains in North Carolina and Tennessee. The Blue Ridge Parkway Historic District is NRHP eligible under Criterion A for its association with important events in U.S. social history, community planning and development, and recreation. The Blue Ridge Parkway Historic District is NRHP eligible under Criterion C for its association with important trends in landscape architecture and highway construction. The VA SHPO has concluded that components of the Blue Ridge Parkway in the vicinity of the Project are potentially eligible for inclusion in the NRHP.

Article 409 of the existing license for the Project includes measures to protect and manage historic properties:

Article 409. If archeological or historic sites are discovered during project operation, the licensee shall: (1) consult with the Virginia SHPO; (2) prepare a cultural resources management plan and a schedule to evaluate the significance of the sites and to avoid or mitigate any impacts to any sites found eligible for inclusion in the NRHP; (3) base the plan on the recommendations of the SHPO and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; (4) file the plan for Commission approval, together with the written comments of the SHPO on the plan; and (5) take the necessary steps to protect the discovered sites from further impact until notified by the Commission that all of these requirements have been satisfied. The Commission may require cultural resources survey and changes to the cultural resources management plan based on the filings. The licensee shall not implement a cultural resources management plan or begin any land-clearing or land-disturbing activities in the vicinity of any discovered sites until informed by the Commission that the requirements of this article have been fulfilled.

In FERC's EA for the previous relicensing, FERC determined that the Project had no effect on any archaeological or historic sites listed or eligible for inclusion in the NRHP; the Virginia SHPO concurred with FERC's assessment.

## 11.5 Project Nexus

At present, there is no evidence that archaeological or historic resources are currently affected by the Project's operations. However, the Project has the potential to directly or indirectly affect historic properties listed in or eligible for inclusion in the NRHP.

## 11.6 Methodology

### 11.6.1 Task 1 – APE Determination

Appalachian has tentatively proposed an APE in Section 13.3. Pursuant to the implementing regulations of Section 106 at 36 CFR § 800.4(a), Appalachian will consult with the Virginia SHPO and Indian Tribes, and other parties, as appropriate, to determine and document the APE for the Project as defined in 36 CFR § 800.16(d).

### 11.6.2 Task 2 – Background Research and Archival Review

Appalachian will conduct background research and an archival review to inform the specific research design and the historic and environmental contexts. Appalachian will review relevant sources of information that may include (but are not necessarily limited to):

- Information on archaeological sites, historic architectural resources, and previous cultural resources studies on file with Virginia SHPO;
- A review of Virginia's NRHP listings;
- Historic maps and aerial photographs of the APE;

- Relevant documents related to Project construction;
- Relevant information available from local repositories;
- Information on the current and historical environment, including mapped soils, bedrock geology, physiography, topography, and hydrology in the vicinity of the APE;
- Relevant historical accounts of the area; and
- Any additional relevant information made available by the Virginia SHPO, Indian Tribes, or other stakeholders.

The results of the background research and archival review will be integrated into the Archeological Phase I Reconnaissance Survey Report (Task 3), as appropriate.

### 11.6.3 Task 3 – Archeological Phase I Reconnaissance Survey of the APE

Appalachian's consultant will conduct a Phase I Reconnaissance Survey (Reconnaissance Survey) of the Project's APE to identify historic properties that may be affected by Project operations. The Reconnaissance Survey will be conducted by a qualified cultural resources professional<sup>2</sup> and geomorphologist retained by Appalachian and will be in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 Federal Register [FR] 44716, Sept. 1983) and the Virginia's Department of Historic Resources Guidelines for Conducting Historic Resources Survey in Virginia (VDHR 2017).

The proposed methods for the Reconnaissance Survey take into account the nature and extent of potential effects on historic properties, and the likely nature and location of historic properties within the APE (36 CFR 800.4(b) (1)). Pursuant to the Advisory Council on Historic Preservation's (ACHP) Section 106 Archaeology Guidance, the identification of archaeological sites "should be conditioned by where effects are likely to occur and the likely impact of these effects on listed or eligible archaeological sites. For example, archaeological identification efforts for a license renewal from the Federal Energy Regulatory Commission likely would not involve the entire APE. Rather it would be directed to those locations within the APE that are experiencing project related effects associated with operation, usually along the shoreline" (ACHP 2007).

The Reconnaissance Survey will include a visual reconnaissance of the APE. Based on the results of the background literature review and field observations, Appalachian or their consultant will identify any geographic areas within the APE that (a) that have a high archaeological potential, and (b) where Project-related effects (e.g., shoreline erosion) that have the potential to adversely affect historic properties (should they be present) are occurring or have a reasonable potential to occur in the future. If any such areas of the APE are identified, Appalachian or their consultant will conduct subsurface testing of

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<sup>2</sup> For this study, a "qualified cultural resources professional" is defined as an individual who meets the Secretary of the Interior's Professional Qualification Standards (48 FR 44738-44739, Sept. 1983).

those areas in accordance with the Phase I methodology as described in the Virginia SHPO's Guidelines for Conducting Historic Resources Survey in Virginia (VDHR 2017).

Appalachian's consultant will conduct a preliminary assessment of any archaeological sites that will consist of the delineation of site boundaries. The maximum length and width of each site will be measured and recorded and the site's location geo-located. Site dimensions and elevations will be recorded on standardized field forms along with sketch maps of site settings and notations regarding landform, site aspect, temporal affiliations (if possible) and density of observed materials, site condition, any evidence of Project-related effects, and the nature of site deposits. Site boundaries will be located on Project maps and USGS topographic maps. Appalachian's consultant will geo-locate, record, and collect any observed artifacts, features, or other pre-contact or historic period cultural material (as appropriate), and any new archaeological sites discovered will be documented on Virginia's Preliminary Information Form (Appendix D).

Treatment and disposition of any human remains that may be discovered will be managed in a manner consistent with the Native American Graves Protection and Repatriation Act (NAGPRA) (P.L. 101-601; 25 U.S.C. 3001 et seq.),<sup>3</sup> and the Council's Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects (ACHP 2007). Any human remains, burial sites, or funerary objects that are discovered will at all times be treated with dignity and respect. In the event that any Native American graves and/or associated cultural items are inadvertently discovered, Appalachian will immediately notify the Virginia SHPO and potentially affected Indian Tribes.

As a component of the Reconnaissance Survey, Appalachian's consultant will also review properties of architectural significance within the APE and if determined necessary, will update existing information on architectural resources in the Virginia SHPO's files. If new architectural resources are identified, Appalachian's consultant will document properties of architectural significance using photographs, brief descriptions, condition, and location information. Additionally, Appalachian's consultant will conduct limited research on the history of the buildings, sites, and features, and complete a survey form for each property. The location will be documented on Project maps and USGS topographic maps.

#### 11.6.4 Task 4 – Inventory of Traditional Cultural Properties

TCPs are properties of traditional religious and cultural importance to an Indian Tribe that meet the National Register criteria (36 C.F.R. § 800.16(l)(1)). TCPs may be eligible for inclusion in the NRHP because of their association with cultural practices or beliefs of a

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<sup>3</sup> Pursuant to 43 C.F.R. Part 10, NAGPRA applies to human remains, sacred objects, and items of cultural patrimony (described as "cultural items" in the statute) located on federal or tribal lands or in the possession and control of federal agencies or certain museums. Regardless of where cultural items are discovered, the principles described in NAGPRA's implementing regulations will serve as guidance for Appalachian's actions should the remains or associated artifacts be identified as Native American and to the extent such principles and procedures are consistent with any other applicable requirements.

living community that are (1) rooted in that community's history, and (2) important in maintaining the continuing cultural identity of the community.

Appalachian recognizes the special expertise that Indian Tribes have in identifying properties that have traditional and religious significance to their communities. As such, Appalachian will consult with the Delaware Nation to develop specific methods and approaches to conducting a TCP inventory for lands within the APE.

### 11.6.5 Task 5 – Historic Properties Management Plan

Depending on the results of Task 3 and 4, Appalachian will consult with Virginia SHPO, Indian Tribes, and other parties to determine if an Historic Properties Management Plan (HPMP) is necessary for the Project. If an HPMP is required, Appalachian will develop it in consultation with Virginia SHPO, Indian Tribes, and other parties as appropriate. The measures provided in the HPMP will assist Appalachian in managing historic properties within the Project's APE throughout the term of the new license.

If a HPMP is necessary for the Project, it will be prepared in accordance with the Guidelines for the Development of HPMP for FERC Hydroelectric Projects, promulgated by the Commission and the ACHP on May 20, 2002. The HPMP will address the following items (ACHP and FERC 2002):

- Potential effects on historic properties resulting from the continued operation and maintenance of the Project;
- Protection of historic properties threatened by future ground-disturbing activities;
- Protection of historic properties threatened by other direct or indirect Project-related activities, including routine Project maintenance and vandalism;
- The resolution of unavoidable adverse effects on historic properties;
- Treatment and disposition of any human remains that are discovered, taking into account any applicable state laws and the Council's Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects (ACHP 2007);
- Compliance with the Native American Graves Protection and Repatriation Act (25 United States Code [U.S.C.] §3001), for tribal or federal lands within the Project's APE;
- Provisions for unanticipated discoveries of previously unidentified cultural resources within the APE;
- A dispute resolution process;
- Categorical exclusions from further review of effects;
- Public interpretation of the historic and archaeological values of the Project, if any; and
- Coordination with Virginia SHPO and other interested parties during implementation of the HPMP.

## 11.7 Analysis and Reporting

Based on the results of Task 3, Appalachian or their consultant will prepare a report of the results of the Archeological Phase I Reconnaissance Survey. The report will include: 1) a summary of information obtained through the background research and archival review, 2) maps and descriptions of reported archaeological and historic resources within the Project's APE, 3) an assessment of the APE's archaeological sensitivity and potential, 4) the results of any subsurface sampling conducted to identify archaeological resources within the APE, 5) an assessment of significant architectural resources within the APE, and 6) recommendations regarding additional cultural resource studies and/or management measures for identified resources. Appalachian will consult with Virginia SHPO, Indian Tribes, and other interested parties (as appropriate) regarding the Phase I report. Appalachian anticipates that the Cultural Resources study report will include the following elements:

- Project information and background
- Study area
- Methodology
- Study results
- Analysis and discussion
- Any agency/tribal correspondence and/or consultation
- Literature cited

Pursuant to Task 4, Appalachian will also document consultation with the Delaware Nation regarding the TCP inventory. If the Delaware Nation determine that a TCP inventory is appropriate, Appalachian will develop a scope in consultation with Indian Tribes, conduct an inventory of TCPs within the APE, and prepare a report documenting the findings of the TCP inventory. The TCP inventory report will include the following elements, as appropriate:

- Project information and background
- Study area
- Methodology
- Study results
- Analysis and discussion
- Any tribal/agency correspondence and/or consultation
- Literature cited

## 11.8 Schedule and Level of Effort

Appalachian anticipates initiating Task 1 at the beginning of 2020. Task 1 and Task 2 will be completed by the spring of 2020. Task 3, the Archaeological Phase 1



Reconnaissance Survey and Report will be prepared and provided to the applicable parties in conjunction with the ISR that will be distributed to stakeholders and filed with the Commission in accordance with the Commission's ILP Process Plan and Schedule. The first field season is anticipated to be the spring through fall in 2020.

Appalachian will consult with the Delaware Nation regarding the TCP inventory in 2019 and, if necessary, will develop a scope for the TCP inventory on consultation with the Indian Tribes in quarter 1 and quarter 2 of 2020. Appalachian anticipates conducting any ethnographic studies associated with the TCP inventory in quarters 3 and 4 of 2020. Appalachian will file any TCP inventory reports with the Commission concurrent with the DLA. As necessary, and pursuant to Task 5, Appalachian will prepare a HPMP in consultation with the Virginia SHPO and Indian Tribes. Appalachian estimates that this Cultural Resources study will cost approximately \$75,000 to complete.

**Table 11-1. Proposed Cultural Resources Study Schedule**

Task	Proposed Timeframe for Completion
APE Determination	January– June 2020
Background Research and Archival Review	January – June 2020
Archeological Phase I Reconnaissance Survey of the APE	May - October 2020
Inventory of Traditional Cultural Properties	October 2019 – October 2020
Distribute Draft Study Report with the ISR	December 2020
Historic Properties Management Plan (if necessary)	With the DLA or Preliminary Licensing Proposal

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# Appendix A

Stakeholder Comments  
Regarding PAD, SD1,  
and/or Study Requests

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TRI-COUNTY LAKES ADMINISTRATIVE COMMISSION

400 Scruggs Road, Suite 200

Moneta, VA 24121

Telephone: (540) 721-4400

*Leesville Lake*

*Smith Mountain Lake*

May 21, 2019

Federal Energy Regulatory Commission  
Office of Energy Projects  
Division of Hydropower Licensing

RE: Niagara Project Number P-2466-034 -Virginia  
Niagara Hydroelectric Project  
Appalachian Power Company

Dear Sirs:

It has been recommended by the Tri-County Lakes Administrative Commission's Environmental Committee, that we provide comment in response to the Scoping Document 1 (SD1) for the above referenced project.

Upon review of the SD1, and the tables on pages 15, 16, and 17 of Appalachian's proposed studies, we acknowledge the absence of a resource area and/or study name that would provide an assessment relative to debris. Therefore, given Appalachian's debris responsibilities for the Smith Mountain Project under their license (Article 411), it is reasonable to believe that a study should be conducted to consider enhancing and/or extending Niagara's catchment equipment to reduce the amount of floating debris that arrives at Smith Mountain Lake by way of the Roanoke River.

Thank you for your consideration of the above.

Sincerely,

Paula Shoffner, Executive Director  
Tri-County Lakes Administrative Commission

FEDERAL ENERGY REGULATORY COMMISSION  
WASHINGTON, D.C. 20426  
May 22, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2466-034 – Virginia  
Niagara Hydroelectric Project  
Appalachian Power Company

Jonathan Magalski  
Environmental Specialist Consultant  
Appalachian Power Company  
1 Riverside Plaza  
Columbus, OH 43215

**Reference: Comments on Preliminary Study Plans and Request for Studies**

Dear Mr. Magalski,

After reviewing the Pre-Application Document (PAD) for the Niagara Hydroelectric Project, participating in discussions at the scoping meetings held on April 24 and 25, 2019, and participating in a project environmental site review on April 24, 2019, we have determined that additional information is needed to adequately assess potential project effects on environmental resources. We have one study request (enclosed in Schedule A) for aquatic resources, and recommend that you consider our comments on the PAD and your preliminary study plans (enclosed in Schedule B). Please provide the requested additional information when you file your proposed study plan, which must be filed by July 9, 2019.

Please include in your proposed study plan, a master schedule that includes the estimated start and completion date of all field studies, when progress reports will be filed, who will receive the reports and in what format, and the filing date of the initial study report. All studies, including fieldwork, should be initiated and completed during the first study season, and the study reports should be filed as a complete package. If, based on the study results, you are likely to propose any plans for measures to address project effects, drafts of those plans should be filed with your Preliminary Licensing Proposal (or draft license application).

Project No. 2466-034

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Please note that we may, upon receipt and review of scoping comments/study requests from other entities due May 25, 2019, as well as your proposed study plan, request additional studies or information at a later time.

If you have any questions, please contact Allyson Conner at (202) 502-6082, or via email at [allyson.conner@ferc.gov](mailto:allyson.conner@ferc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "John B. Smith". The signature is stylized with a large initial "J" and a prominent "S".

John B. Smith, Chief  
Mid-Atlantic Branch  
Division of Hydropower Licensing

Enclosure:   Schedule A  
                  Schedule B

Project No. 2466-034  
Schedule A

**Schedule A**

**Study Request**

After reviewing the information in the Pre-Application Document (PAD), we have identified information that is needed to assess project effects. As required by section 5.9 of the Commission's regulations, we have addressed the seven study request criteria in the study request below.

**Fish Survey**

*§5.9(b)(1) – Describe the goals and objectives of each study proposal and the information to be obtained.*

The goal of the study is to obtain current information on the fish community in the Roanoke River in the vicinity of the Niagara Hydroelectric Project to enable an analysis of project effects. Information to be collected should include, at a minimum, relative abundance and length frequency data on the fish communities in the impoundment, bypassed reach, and tailwaters. The study should also include a comparison of this data with other water bodies in the region. The study plan should be developed in consultation with the U.S. Fish and Wildlife Service and Virginia Department of Game and Inland Fisheries.

*§5.9(b)(2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resources to be studied.*

Not applicable.

*§5.9(b)(3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.*

Sections 4(e) and 10(a) of the Federal Power Act require that the Commission give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values.

*§5.9(b)(4) – Describe existing information concerning the subject of the study proposal and the need for additional information.*

The PAD summarizes the fish community in the project area, including the Niagara impoundment and sites upstream and downstream of the project, from a study



Project No. 2466-034  
Schedule A

2

conducted in 1990 for the previous licensing.<sup>1</sup> In addition, the PAD provides no information on the fish community in the bypassed reach. Current fisheries community data are needed to evaluate any project-related effects on this resource.

*§5.9(b)(5) – Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.*

Operation of the project reduces flow in a 1,500-foot-long section of the natural river channel and may entrain fish. Current fish data are necessary in order to assess whether project operation is affecting the overall health of the fish community.

*§5.9(b)(6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.*

If more recent information is not already available from other studies, several fish sampling methodologies could be used to survey the impoundment, bypassed reach, and downstream river including electrofishing, netting, and angling to name a few; all of which have been used successfully in licensing hydroelectric projects. If field work is necessary, one field season should be sufficient to perform the study with a month or two of data analysis and report writing. Specific methodologies and scope can be refined during the study planning phase and study plan meeting(s), if needed.

*§5.9(b)(7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.*

Cost will depend on whether field work is needed, and if so, the specific methodology chosen. We expect the specific methodology and scope to be refined in consultation with the agencies during the study planning phase. If field work is needed, the study could cost between \$60,000 and \$90,000. If existing information is available, the cost of the study will be minimal.

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<sup>1</sup> Appalachian Power Company. 1991. Application for License for Major Water Power Project 5 Megawatts or Less (Project No. 2466).

Project No. 2466-034  
Schedule B

## **Schedule B**

### **Comments on the Pre-Application Document and Preliminary Study Plans**

Based on our review of your preliminary study plans outlined in your Pre-Application Document (PAD), we request the following modifications. Please address these requests in your proposed study plans.

#### **Project Operation**

In an October 20, 2000, order approving modification to the flow monitoring plan,<sup>2</sup> the Commission approved the use of a siphon pipe to provide a minimum flow of 8 cubic feet per second (cfs) to the bypassed reach and the use of an ultrasonic flow meter to be mounted on the discharge pipe to monitor the flow. On page 4-10 of the PAD, you state that the minimum flow to the bypassed reach is provided through the sluice gate or flow over the spillway, however, no flow data for the bypassed reach are provided. It was indicated during the site visit that the monitoring device may no longer be operational. When you file your proposed study plan, please clarify if the ultrasonic flow meter is currently in use or when it ceased to become operational, and provide a summary of historic flow data in the bypassed reach, if available.

#### **Bypassed Reach Aquatic Habitat Study**

On page 6-4 of the PAD, you propose to conduct an assessment of available habitat under the current 8-cfs minimum flow in the 1,500-foot-long bypassed reach. While your proposed study would describe existing conditions in the bypassed reach, it would not inform the availability of habitat under alternative flow releases. Therefore, in order for staff to determine whether additional flows are needed to protect or enhance aquatic species, staff recommends that the study evaluate habitat availability over a range of flows. We recommend consultation with the U.S. Fish and Wildlife Service and the Virginia Department of Game and Inland Fisheries regarding the target species, species life stages, and flow ranges to be studied as you develop your study plan.

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<sup>2</sup> 93 FERC ¶ 62, 049 (2000).



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

May 23, 2019

Ms. Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE, Room 1A  
Washington, DC 20426

Re: Scoping for an Environmental Assessment for Relicensing the Niagara Hydroelectric Project  
(FERC No. 2466-034) (Niagara Project)

Dear Ms. Bose,

In accordance with the National Environmental Policy Act (NEPA) of 1969, Section 309 of the Clean Air Act, and the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), the U.S. Environmental Protection Agency (EPA) is responding to the Federal Energy Regulatory Commission (FERC) request for scoping suggestions on the planned Environmental Assessment (EA) to analyze and assess the environmental impacts related to relicensing the Niagara Project.

Thank you for the opportunity to provide comments on the scoping document. EPA has prepared both general and specific comments for your consideration in the preparation of the planned EA. EPA recommends consideration of analysis to understand conditions at the site and study of improved practice and operation, to address impacts to resources. Please see attached comments. EPA would be pleased to discuss suggestions in detail at the convenience of the FERC project manager. The staff contact for this project is Matthew Lee. He can be reached at (215) 814-2917 or [lee.matthew@epa.gov](mailto:lee.matthew@epa.gov). We thank you for the opportunity to review this project and participate in the project development as a cooperating agency. EPA looks forward to the continued work on the development of this study.

Sincerely,

Barbara Rudnick  
NEPA Program Coordinator  
Office of Communities, Tribes & Environmental  
Assessment

Enclosure

## **Enclosure**

### **Technical Comments**

#### **Purpose and Need**

Since the range of alternatives evaluated is defined by the purpose and need for the project, it is imperative that the purpose and need be clearly identified in the EIS. The purpose or objective of the proposal should be defined in relationship to the need for the action. Therefore, the need for the action should identify and describe the underlying problem or deficiency; facts and analyses supporting the problem or deficiency in the location at the particular time should be specified; and the context or perspective of the agency mission in relation to the need for action stated.

#### **Land Use and Applicable Regulation**

The project area should be clearly described, specifying the type and acreage of land impacted. In addition to NEPA, other laws, regulations, permits, licenses and Executive Orders may be applicable to the Proposed Action. EPA recommends a summary of applicable regulatory requirements and approvals with which the Proposed Action will demonstrate compliance be discussed in the EPA.

#### **Environmental Impacts**

EPA recommends the applicant examine the potential direct and indirect impacts of the project on the environment. In addition, it is recommended mitigation measures for any adverse environmental impacts be described. Areas recommended for detailed analysis are described below.

Potentially useful information can be accessed from the following on-line tools:

**NEPAssist**: NEPAssist is a tool that facilitates the environmental review process and project planning in relation to environmental considerations. The web-based application draws environmental data dynamically from EPA Geographic Information System databases and web services and provides immediate screening of environmental assessment indicators for a user-defined area of interest. <https://www.epa.gov/nepa/nepassist>

**EnviroMapper for Envirofacts**: A single point of access to select U.S. EPA environmental data. This Web site provides access to several EPA databases to provide you with information about environmental activities that may affect air, water, and land anywhere in the United States. With Envirofacts, you can learn more about these environmental activities in your area or you can generate maps of environmental information. <https://www.epa.gov/emefdata/em4ef.home>

**Watershed Resources Registry (WRR)**: The WRR is a GIS tool that fosters a collaborative approach to regulatory streamlining, data sharing, planning and decision-making for sustainable watershed restoration and protection. <http://aii.transportation.org/Pages/Watershed-Resources-Registry.aspx>

#### **Air Resources**

*Attainment/Non-attainment*: The EA should identify areas that meet the NAAQS standard for a criteria pollutant as well as those areas where a criteria pollutant level exceeds the NAAQS.



*Submerged Aquatic Vegetation:* EPA recommends the EA identify the location of any Submerged Aquatic Vegetation (SAV) beds and fisheries and shell fisheries resources found in the project area as well as any sensitive or high-quality spawning areas. A location map identifying the above resources should be provided. In addition, the EA should describe the existing benthic environment of the project area. A complete species composition list (plants and animals) should be provided for the above-mentioned habitats. A description of the potential impacts to the migration or spawning activities of the animal species in the project area should be provided in the EA as well as proposed mitigation for the possible loss of this habitat. EPA recommends a buffer of 100 ft from any known SAV beds be incorporated into project design.

### **Threatened and Endangered Species**

The Endangered Species Act (ESA) provides for the listing of endangered and threatened species of plants and animals as well as the designation of critical habitat for listed species. The ESA prohibits the taking of any listed species without (for federal agencies) an "Incidental Take Statement." EPA recommends the EA include a description of terrestrial, wildlife and aquatic species in the study area. Any threatened or endangered species and critical habitat for threatened or endangered species should be properly identified. The EA should describe the potential project impacts to these species. The most recent state and federal threatened and endangered species coordination letters should be included in the EA. In addition, EPA recommend that the appropriate state and federal agencies be contacted annually at a minimum regarding these issues.

Due to the presence of the Roanoke Logperch and the Orange-fin Madtom, EPA recommends the applicant consider incorporating the recommended study approach in Bilotta et al 2016 (referenced below).

### **Terrestrial Resources**

EPA recommends the EA provide a description of the terrestrial habitat resources in the study area, which can include species lists for mammals, birds, amphibians, reptiles, and plants present, a summary of composition and characteristics of each community type and the functions and total acreage indicated. Please discuss potential impacts to these communities as a result of operation and maintenance activities and possible mitigation measures to minimize/avoid impacts.

### **Physiography**

EPA recommends the physical and natural resources of the project area be described, including physiographic provinces, topography, climate and geologic setting. Soils at the project should be mapped and outlined. Distribution and classification of soils within the study area, and the major soil types found at the project site should be described.

### **Hazardous Waste Management**

EPA recommends the applicant identify and evaluate any hazardous sites nearby the project boundary. This would include sites being investigated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) or sites regulated under the Resource Conservation and Recovery Act (RCRA). Any impact on these sites from the operation and maintenance of the project should be considered.

## **Adaptation and Resiliency**

EPA recommends that the document include a discussion of reasonably foreseeable effects that changes in the climate may have on the proposed project and the project area. This could help inform the development of measures to improve the resiliency of the proposed project.

## **Natural and Human Environment, Secondary and Cumulative Impacts**

The Council on Environmental Quality (CEQ) in 40 CFR 1508.8 defines secondary effects as "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable". Examples of these could be the environmental effects of interconnected projects, such as additional infrastructure that may be needed to support the project. Impacts of these types of activities should be considered and evaluated in the EA.

Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time. The CEQ in 40 CFR 1508.7 defines cumulative impacts as "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions." A cumulative impacts assessment should be a part of the EA.

EPA recommends that the indirect and cumulative impact assessment include analysis specific to resources. EPA also recommends utilizing a trend analysis for resources that may be adversely affected by the proposed alternatives. We suggest an approach that would manage and link proposed projects to overall water quality and habitat on a sub-basin and sub-watershed basis, as well as allow for a full evaluation of public and community impacts that need to be evaluate.

## **References:**

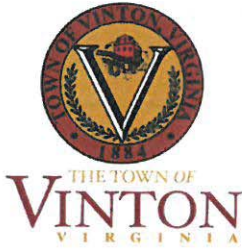
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P. Gibeau, B.M. Connors, W.J. Palen; *Run-of-River hydropower and salmonids: potential effects and perspective on future research*; Canadian Journal of Fisheries and Aquatic Sciences, 2017, 74:1135-1149; <https://doi.org/10.1139/cjfas-2016-0253>





## **Town of Vinton**

311 S. Pollard Street  
Vinton, VA 24179  
Phone (540) 983-0607  
Fax (540) 983-0646

**Barry W. Thompson**  
Town Manager

May 23, 2019

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
888 First Street, NE, Room 1A  
Washington, DC 20426

**Re: Niagara Hydroelectric Project (P-2466-034)**

Dear Secretary Bose:

On behalf of the Town of Vinton, I am providing comments in response to the Niagara Hydroelectric Project (P-2466-034) that is located to the southeast of the Town with an access from Niagara Road that is located in the Town of Vinton.

Recreation in Virginia's Blue Ridge, which includes the Town of Vinton, Roanoke and Botetourt Counties, Cities of Roanoke and Salem, is a major contributor to economic growth in the region. The growth of outdoor recreation venues and related businesses over the past twenty years has resulted in the addition of millions of dollars to the area economy. The development of the Roanoke Valley Greenway and Blueway has not only contributed to significant increases in recreation spending but has been instrumental in attracting businesses and individuals moving to the Roanoke Valley. Both the Greenway and Blueway are oriented to the Roanoke River which passes through both the Town of Vinton and Roanoke County and includes the reservoirs for the Niagara Project and Smith Mountain Project along its route. Due to their proximity to the Town and County, any recreation facilities developed and maintained under the requirements of the respective licenses for the referenced projects can have a significant impact on recreation development implemented by others than the licensees for these projects.

The Niagara Hydroelectric Project was last licensed in 1993. At that time there was little recreational demand in the area of the Project, and consequently the only recreational amenity provided in the license was a canoe portage around the Dam. Since 1993, there have been many changes in the recreational desires of citizens of the Roanoke Valley as indicated by the Virginia Department of Conservation and Recreation's 2017 Virginia Outdoors Demand Survey. The survey reported that 45% and 49% of households in the Roanoke Valley Alleghany Region indicated the need for increased access to trails and water access, respectively.

One of the two only boating access to the Project Reservoir is provided by the nearest upstream canoe/kayak access facilities in the **Town of Vinton (3<sup>rd</sup> Street off Virginia Avenue)** and the



City of Roanoke (Bridges Access and Bennington Access). While these facilities and others upstream allow paddlers to get to the Reservoir, there is no public place for boaters to take out and load boats onto vehicles once they get to the Reservoir or Dam. Paddling back upstream to the access areas in Roanoke City and Vinton requires considerable effort; consequently, few people take full advantage of the opportunities on the Reservoir. As part of the Recreational Needs Assessment outlined in the Scoping Document we encourage the applicant to consider development of a boating access facility within the Reservoir on either river left or right. This facility could provide a much needed take out point at Niagara Dam and facilitate improvements to the Project public recreational amenities and the Roanoke River Blueway system.

In 1997, the Town of Vinton, along with the City of Roanoke, Roanoke County, and the City of Salem formed the Roanoke Valley Greenway Commission. In 2016 Botetourt County joined the Commission. The purpose of the Greenway Commission is to promote and facilitate coordinated direction and guidance in the planning, development, and maintenance of a system of greenways throughout the Roanoke Valley. The development of the Roanoke Valley Greenway and Blueway systems have helped to meet, and yet have encouraged greater, demand for outdoor recreational opportunities and have been major contributors to economic growth in the region. Completion of the Roanoke River Greenway through the Project will help to provide additional trail access for the public.

**Wolf Creek Greenway** in the Town of Vinton and Roanoke County is completed for 2.2 miles from Hardy Road to the Blue Ridge Parkway, with an extension to the Roanoke River (north side) included in the 2018 Roanoke Valley Greenway Plan. The Appalachian Power Company (Appalachian) service road into the Project Dam and Powerhouse parallels Wolf Creek and is thus in the corridor for extension of this greenway.

The **Town of Vinton's Glade Creek Greenway** is contiguous with the Project, connecting to Tinker Creek Greenway at Route 24/Virginia Avenue. A 0.4-mile section of this paved greenway opened in 2017 and connects Virginia Avenue to Walnut Avenue. Another 0.6-mile section extending this greenway to Gus Nicks Boulevard is in the engineering phase, projected to go to construction by the end of 2019. The 2018 Greenway Plan includes additional sections that would extend this greenway to Vinyard Park and the Blue Ridge Parkway.

Trash and debris in the Roanoke River have been a continual problem in Roanoke Valley for years. During the relicensing of the Smith Mountain Project (P-2210) this was a major concern for residents of the lake. Trash and debris traveling down the river and through the Niagara Reservoir are gathered by a trash rake and passed over the Project Dam to continue downstream. The Town understands that the applicant did not generate this trash and debris, but the Dam provides a mechanism for collecting it. Perhaps it is time for the applicant to work together with the Roanoke Valley and Franklin County Waste Management Departments to develop a cooperative process for removing this trash and debris from the river system. Appalachian spends a considerable amount of time and money every year removing this trash and debris from Smith Mountain Lake. There might be a more economical method for removing the trash at the Project Dam or upstream, instead of letting it accumulate on the river banks of Explore Park and downstream in Smith Mountain Lake.

Thank you for giving Town's personnel the opportunity to attend the site visit on April 24, 2019 and for the opportunity to provide comments at this point. Please contact me if you have any questions or concerns regarding the Town's comments.

Sincerely,

A handwritten signature in blue ink that reads "Barry W. Thompson". The signature is written in a cursive style with a large, stylized 'B' and 'T'.

Barry W. Thompson  
Town Manager



## United States Department of the Interior



**NATIONAL PARK SERVICE**  
**NORTHEAST REGION**  
15 State Street  
Boston, Massachusetts 02109-3572

Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

May 24, 2019  
ER 19/0111  
Filed Electronically

Review of Notice of Intent to File License Application, Pre-Application Document (PAD), Commencement of Pre-filing Process, Scoping, Soliciting Comments on the PAD and SD, Study Requests, Niagara Hydroelectric Project FERC #2466-034 on the Roanoke River near the City of Roanoke, Roanoke County, Virginia.

Dear Secretary Bose:

The National Park Service (NPS) has reviewed the above referenced FERC Notice issued on March 26, 2019, and offers the following comments and study requests.

### **NPS Unit Potentially Affected by the Relicensing**

The project impact area, or the area in which NPS units are potentially affected by this relicensing, includes a portion of the Blue Ridge Parkway (BLRI). On June 20, 1936, Public Law 74-848, was signed by President Franklin Roosevelt, and officially named the "Blue Ridge Parkway." Secretary of the Interior Harold Ickes had recommended the chosen name in a press release on February 18 after receiving an endorsement from the Division of Geographic Names, which favored the name "because the parkway lies upon the Blue Ridge throughout most of the length of both the parkway and the ridge. It is, geographically, a most appropriate name."

### **Comprehensive Plans**

The NPS has prepared a number of plans associated with BLRI. They include, but are not limited to the following.

**The Blue Ridge Parkway General Management Plan/Environmental Impact Statement**, completed in 2011. <https://parkplanning.nps.gov/projectHome.cfm?projectID=10419>

The Final General Management Plan provides comprehensive guidance for perpetuating natural systems, preserving cultural resources, and providing opportunities for high-quality visitor experiences along the parkway for the next 20+ years. After more than 75 years since the parkway was established, this is the parkway's first comprehensive management plan.

**Roanoke Valley/Blue Ridge Parkway Trail Plan and Finding of No Significant Impact**  
September 2015.

<https://parkplanning.nps.gov/documentsList.cfm?parkID=355&projectID=10392>

The intent of the project was to determine whether an integrated trail system that would provide critical linkages between the Roanoke Valley Greenways Trail Network and the Blue Ridge Parkway was appropriate after a consideration of project impacts. The proposed trail system would provide the public with a greatly enhanced range of trail opportunities as well as provide the Parkway with rehabilitation and general maintenance assistance from the Roanoke Valley Greenway Commission and associated trail groups.

See also the Blue Ridge Parkway Foundation Document Overview for Virginia/North Carolina.  
[https://www.nps.gov/blri/learn/management/upload/BLRI\\_OV\\_2016\\_508.pdf](https://www.nps.gov/blri/learn/management/upload/BLRI_OV_2016_508.pdf)

The above referenced completed plans may constitute Comprehensive Plans under Section 10a of the Federal Power Act; the NPS intends to submit them to FERC for such consideration.

**Project Area Trails**

The Blue Ridge Parkway trails in the Roanoke area were planned in the context of the original design of the Parkway. The trails were intended to follow the Parkway motor road from Stewart's Knob at MP 110.6 to State Route 220 at MP 121.4.

The Roanoke Valley Greenway Commission and Blue Ridge Parkway signed a General Agreement in 2001 allowing the Commission to assist with trail planning, mapping and rehabilitation under the direction of Parkway staff. Ensuing discussions followed to explore options for development of an integrated system that would provide a valley-wide trail system connecting to the Parkway.

The Blue Ridge Parkway Visitors Center and Virginia's Explore Park have both been developed since the current license was issued. As noted in the Roanoke Valley Greenway Commission's (RVGC) comments dated May 23, 2019, the Roanoke Valley Greenway network has been developed over the last 22 years. Those comments discuss the six existing greenways in the project vicinity, as well as ongoing efforts that have been conducted with the valuable assistance of AEP. The Roanoke River Greenway is the primary trail artery and several sections are in various stages of completion and design. Of particular note for the NPS is the eastern leg of Roanoke River Greenway located within the Project boundary which is in the right-of-way



phase; construction is scheduled to begin in 2020. The design for this section is on the south side of Roanoke River, adjacent to the Project Reservoir, then going around the south side of the Project Dam. *The next sections will go under the Blue Ridge Parkway and connect to and go through Roanoke County's Explore Park before terminating at the confluence of Back Creek on the upper end of Smith Mountain Lake.* This key section of trail will allow visitors to traverse on river right from public access points well below the dam all the way up to the project reservoir.

## General Comments

The PAD provides information on existing recreation facilities and opportunities provided on project lands and in the vicinity of the project. There have been considerable changes in population density related to development in the vicinity of the projects, recreational use patterns and needs have changed as a result, have affected the way in which the public uses these resources. Additional public parks, access points and trails have been developed in the project vicinity. Existing information normally in the Form 80 data has not been collected since 1997 when an exemption was granted by FERC, and that data will no longer required to be collected periodically by the licensee. Therefore it is important to have the latest and most comprehensive recreational use and needs data currently available.

A number of popular recreational facilities and opportunities have been created within the project area during the term of the current license, and efforts continue to develop additional facilities and options. <https://www.roanokecountyparks.com/373/Trail-Maps> Among them are Explorers Park and the NPS Visitor Center located there. Other land based trails and facilities are more fully described in the RVGC's comments. Several issues associated with the project area were also identified in the Outdoors Demand Survey conducted in 2017.

The current license issued in 1993 required the development of a canoe portage, as described in Section 5.8.2 of the PAD. Although the applicant completed this requirement of the license, the portage was never ideal given its length and location. It is located in a steep section of the Reservoir, making it difficult to take out canoes and kayaks. The portage around the Dam is more than ¼ mile long, and vehicle access to the portage is restricted by a keyed gate. This portage should be evaluated to determine what improvements may be needed consistent with current and projected usage, erosion control, and those whose needs are characterized under the "Americans with Disabilities Act" or ADA, including angling and access options.

Future use estimates should be calculated by assessing future demand for recreation activities and population trends for the expected term of the new license. Growth in recreation activities and recreation use projections for the anticipated growth in recreational use through 2060 should be developed using Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends (Cordell et al., 1999), Outdoor Recreation Participation in the United States – Projections to 2060 (Bowker et al., 2012), as well as numerous additional sources and commonly used methodologies. Current use estimates should be projected with indexed values of expected changes in the number of recreation days for given activities at the projects to estimate future recreation use in the project for 10-year increments out to 2050.



## **Aesthetic Flow Study Request**

(1) Describe the goals and objectives of each study proposal and the information to be Obtained.

The goals and objectives of the Aesthetic Flow Study (AFS) are to determine the extent to which flows can be modified and or controlled to improve the visitor's experience associated with experiencing spillage or controlled spillage under various flow levels. Information to be obtained would come from photos, videos and direct observations of flows under different levels, magnitude and duration. Information to be developed would include possible measures that could be taken to modify the existing dam to give the licensee additional control over flows, by means of installing removable or notched flashboards or possibly an inflatable type of system. Part of the proposed study would be predicated on what type of controls could be installed in this area.

The USFWS has or will be requesting a bypassed reach flow study that, as proposed, would involve demonstration flows of different magnitudes in order to evaluate how much habitat is available for target species under different flows. That study and as associated flows could overlap with the release of different aesthetic flows.

In addition to releases through the debris sluice gate or the valves that discharge to the bypassed reach, AEP can also ramp down their turbine operations to cause water level in the impoundment to come up, which allows for providing different flows. Inflow available at the time of the study may have a bearing on time, duration and magnitude of flows, but this can be addressed in the study plan to allow for better timing.

(2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;

The Selected Alternative identified in the FONSI GMP/EIS notes that one of the most popular viewing areas in the Roanoke area is the Roanoke River Overlook, as well as the trail that extends down to the base of the dam area. Note also the pending trail segment to be completed that will go under the Blue Ridge Parkway on river right and connect to and go through Roanoke County's Explore Park before terminating at the confluence of Back Creek on the upper end of Smith Mountain Lake. Once completed, this trail will likely see considerable increased use, and provide an opportunity for users to enjoy viewing flows over the dam and through the bypassed reach.

(3) If the requester is a not resource agency, explain any relevant public interest considerations in regard to the proposed study;

Requester is a Federal Resource Agency, the National Park Service.

(4) Describe existing information concerning the subject of the study proposal, and the need for additional information;

An AFS has never been conducted at the site, either before or after its designation as a unit of the National Park System. The results will enable the stakeholders to determine the extent to which flows may be modified to achieve desired future conditions.

(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

At certain times, under various flow conditions, virtually no water is going over the falls, making them effectively invisible and inaudible from the overlook.

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;

Generally accepted practices for Aesthetic Flow Studies would be employed for this study. All Key Observation Points (KOP) are easily. A component of the study is to determine the extent to which the applicant currently has the ability to control and/or modify flows, what measures might be necessary to enable the applicant to better control and/or flows and thus be better able to provide specific timing, duration and magnitude of flows, as well as how and to what extent modifications to project works to allow for increased control of flows might affect project operations, power generation, and revenues.

(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

This type of study is routinely conducted during FERC proceedings and in this case, can be done at a reasonable cost and time frame. Several KOPs are easily accessible. Conducting an AFS, using photo, video and personal observation is the simplest way to provide the information needed. This includes images from numerous flow levels and conditions and can be used to supplement information to be gathered during the AFS.

Methodologies and examples of this type of study

<https://www.nps.gov/ncrc/programs/hydro/info.htm> are readily available <http://www.hydroreform.org/hydroguide/science/83-waterfalls-and-cascades> and the NPS would assist in the development, conduct and assessment of such a study. See also, <https://www.questia.com/library/journal/1G1-351947034/waterfalls-science-and-aesthetics>

### **Trash containment, collection and disposal.**

Under current operations, large trash is removed, but the vast majority is simply corralled and dumped back into the river, resulting in unsightly and environmentally problematic

accumulations below the dam and far down river into high use areas. This practice is not common at FERC licensed dams, and should be discontinued. A more environmentally sound method would be to develop and install a trash collection system (or conduct such activity manually by boat or small barge), and periodically remove trash from the river to be properly disposed of. This will provide a better user experience for those who use the area below the dam, as trash can often be found well down the river, especially during high flows when trash is dumped down the debris sluiceways or discharge valves. A Debris Management Plan (DMP) should be prepared in consultation with applicable stakeholders, including the NPS. Such a DMP could be similar to those in place for the Smith Mountain Dam (FERC 2210) and Leesville. See May 16, 2019 letter from AEP to the Leesville Lake Association. A better trash collection system at the Niagara Dam would serve to reduce the trash collection necessary in the Smith Mountain impoundment.

The NPS appreciates the opportunity to comment on the PAD and to offer study requests. We look forward to working with the applicant and other stakeholders during this relicensing. Questions or comments should be addressed to Kevin Mendik at [kevin\\_mendik@nps.gov](mailto:kevin_mendik@nps.gov)

Sincerely,



Kevin Mendik  
NPS Northeast Region  
Hydro Program Manager



**Matthew J. Strickler**  
*Secretary of Natural Resources*

**COMMONWEALTH of VIRGINIA**  
**Department of Game and Inland Fisheries**

**Gary F. Martel**  
*Acting Executive Director*

May 24, 2019

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 201426

**Re: Niagara Project (P-2466-034) – Application for New License  
Virginia Dept. of Game and Inland Fisheries Comments on PAD/Scoping Document  
and Study Requests**

Dear Secretary Bose:

Thank you for the opportunity to provide input into the relicensing process for the Niagara Hydroelectric Project (P-2466). The mission of the Virginia Dept. of Game and Inland Fisheries (VDGIF) is to conserve and manage wildlife populations and habitat, connect people to Virginia's outdoors, and protect people and property by promoting safe outdoor experiences. Additionally, VDGIF is the state agency responsible for managing aquatic and terrestrial wildlife resources, including rare/listed species of fish and wildlife.

With our mission statement in mind, we have identified several issues regarding the project that we believe should be addressed in the relicensing process. In broad terms, these issues include the following:

- Maintaining the current run-of-river operating scheme for the project to prevent alterations of the natural flow regime downstream from the project.
- Protection and enhancement of populations of fish and other aquatic resources within the area affected by the project. Currently, very little information regarding the fish community upstream and downstream of Niagara Dam exists. Additional data are needed to fully evaluate project impacts.
- Protection and enhancement of populations of the Federally-Endangered Roanoke Logperch (*Percina rex*), located in the project vicinity and downstream. Limited records of this species in the impacted area are available, but additional information is needed to determine project impacts.
- Restoration of habitat through flow management in the bypassed reach of the Roanoke River associated with this project. The current minimum flow regime through this reach was only designed to reduce the likelihood of fish kills. The Agency's management goal for this reach is to restore it so that it supports all species/life stages of aquatic resources present in this portion of the Roanoke River.

- Protection and enhancement of populations of freshwater mussel species potentially in the project area. Currently, little to no information regarding mussels is available for the area impacted by the project. Data are needed to fully assess potential project impacts. Species possibly present include:
  - *Alasmodonta undulata* (Triangle Floater, Tier IV)
  - *Elliptio complanata* (Eastern Elliptio)
  - *Elliptio roanokensis* (Roanoke Slabshell, Tier IV)
  - *Fusconaia masoni* (Atlantic Pigtoe, State Threatened, proposed Federal Threatened, Tier I)
  - *Lampsilis cariosa* (Yellow Lampmussel, Tier II)
  - *Lasmigona subviridis* (Green Floater, State Threatened, Tier II)
  - *Pyganodon cataracta* (Eastern Floater)
  - *Strophitus undulatus* (Creeper, Tier IV)
  - *Utterbackia imbecillis* (Paper Pondshell)
  - *Villosa constricta* (Notched Rainbow, Tier III)
- Passage for resident and migratory species, both upstream and downstream.
- Enhancement of recreational access both upstream and downstream of the Niagara Dam, including foot access (trails) and boat access (boat landings). This would include both river access and parking.
- The amount of debris and trash that accumulate at Niagara Dam. Presently, this material is simply passed downstream, where it impacts habitat and aesthetic values of the Roanoke River between Niagara Dam and Smith Mt. Lake.

### Study Requests

In light of the issues identified above, the Dept. of Game and Inland Fisheries requests the following studies in order to fully assess the impacts of the project on aquatic resources and aquatic-based recreation.

### Fish Community Assessment

1. *Study Goals and Objectives* – Based upon information presented in the PAD, the applicant is describing the fish assemblage using data from almost 30 years ago. It is extremely likely that the fish assemblage has changed since that time, and thus the data need to be updated. The overall goal of this study would be to describe the fish community in the area of the Roanoke River affected by the project. The primary objective would be to determine the fish community composition (both permanent and seasonal residents) and size structure of fish species in the pool, bypass reach, and downstream reach of the Roanoke River. The secondary objective would be to compare the fish community structure of the bypass reach with that of the reach below the powerhouse in order to evaluate the impacts of operations on the 1500 ft. bypass reach.
2. *Agency Resource Management Goals* – The Dept. of Game and Inland Fisheries is the state agency responsible for managing fish and wildlife resources within the Commonwealth. For this study request, the agency goals will be to determine the current characteristics of fishery resources within the area impacted by the project, in order to fully evaluate potential effects on fishery resources due to project operations.
3. *Public Interest Considerations (non-resource agency)* – n/a
4. *Existing Information and Need* – Based upon information presented in the PAD, no fishery resource data have been collected in the project area since 1991. We are also unaware of any more recent relevant data. Because fish communities in river systems are dynamic, the fish community composition could have changed substantially over 30

years, and while the data from 1991 are useful for comparisons, they do not necessarily describe the current fish community. Additionally, the fish community composition data presented in the PAD appear to be only from the impounded area, and do not include data from either the bypass reach or the reach below the powerhouse. Finally, the existing data may not adequately capture seasonal use of the river by seasonally-resident fish species. Current data are needed in order to fully evaluate project impacts.

5. *Project Nexus* – The project has altered habitat in the Roanoke River by maintaining a pool above the dam and by releasing very limited flows through the bypass reach. All of these alterations could, and likely have, impacted the fish community in the project vicinity. By comparing the community composition and other population indices among the pool above the dam, the bypass reach, and the reach below the powerhouse; a determination can be made regarding the project impacts upon the Roanoke River fish community.
6. *Study Methodology* – This proposal would utilize a combination of electrofishing gear-types to sample the Roanoke River above the dam, in the bypass reach, and below the powerhouse. The pool above the dam can be adequately sampled with boat electrofishing gear. The bypass reach can be sampled with backpack and/or barge-mounted electrofishing gear. The reach below the powerhouse can be sampled using a combination of raft-mounted (deeper habitats) and backpack (wadeable habitats) electrofishing gears. Effort should be measured for all sampling, as should gear efficiency (capture probability). The estimates of capture efficiency can then be utilized to estimate population size for the various species collected. Comparisons should then be made of the fish community composition among the 3 sample areas (pool, bypass, downstream). Additionally, lengths and weights should be recorded for captured fish to compare size indices and relative weight/condition factors among the 3 sample areas. Finally, a seasonal component (spring, summer, fall) should be incorporated into the sampling in order to capture seasonal variations in fish community structure. The suggested duration of this study would be for a minimum of two years in order to evaluate annual variations in fish community composition.
7. *Level of Effort* – This study would require a moderate level of effort (3 sampling events/year for 2 years). Additionally, it would require the use of multiple electrofishing gear types (boat, raft, backpack, and possibly barge) and a sizeable field crew. This level of effort would be necessary in order to evaluate project impacts upon fishery resources using standard methodological approaches. The applicant proposes to utilize past data and perform an undetermined level of additional data collection. It cannot be determined from the PAD whether this is likely to sufficiently document the current status of the fish community in the area impacted by the project. Estimated costs would be \$50,000 - \$100,000/year.

#### Roanoke Logperch Assessment

The previously proposed study (Fish Community Assessment) should adequately determine the presence and status of Roanoke Logperch in the project vicinity.

#### Bypass Reach Flow and Habitat Assessment

1. *Study Goals and Objectives* – Based upon information presented in the PAD, flows in the bypass reach were specifically set to prevent stranding of fish species in this reach, but not to provide suitable amounts of habitat to support aquatic life year-round. The goal of this study is to determine the minimum amount of habitat, as regulated by instream



flows, necessary to support all species/life stages of fish and other aquatic life present in this segment of the Roanoke River. One specific objective of this study would be to determine minimum flows needed to provide suitable habitat for a suite of species inhabiting the Roanoke River at a level comparable with non-impacted reaches. A second objective would be to provide suitable habitat for all life stages of Roanoke Logperch at levels similar to non-impacted reaches.

2. *Agency Resource Management Goals* – The Dept. of Game and Inland Fisheries is the state agency responsible for managing fish and wildlife resources within the Commonwealth, including listed species. For this study request, the agency goals will be to determine a recommended flow regime for the bypass reach, in order to restore full ecological function to this 1500 ft. reach.
3. *Public Interest Considerations (non-resource agency)* – n/a
4. *Existing Information and Need* – Based upon information presented in the PAD, no fishery resource or habitat data have been collected in the bypass reach since 1991. We are unaware of any more recent relevant data. The bypass reach represents a significant river segment that currently does not provide the full range of ecological services needed to sustain aquatic communities. Additionally, the current flow regime does not always meet the stated goal of presenting significant flow-related fish kills. In April, 2012, a significant fish kill occurred in the bypass reach due to stranding of large numbers of, primarily, redhorse spp. following a high water event. The dam went from a spilling condition to minimum flows over a short time period, which resulted in very high numbers of redhorse spp. and other species becoming stranded in the bypass reach. The biomass was high enough that dissolved oxygen concentrations in the semi-isolated pools dropped to lethal levels. While fish kills have not been a regular event in the bypass reach, this example does indicate that the 8 cfs minimum is not adequate to support aquatic life in all instances. Thus, a more intensive study than simply a desktop evaluation for desirable flow regimes in the bypass reach is needed.
5. *Project Nexus* – The project has significantly altered habitat in the bypass reach by releasing minimal flows through this reach. During the previous relicensing, VDGIF was not intending to restore full ecological function to this reach. However, in the 30 years since, we have determined that all river segments have intrinsic value and provide a wide range of ecological services. Thus, we now believe that it is imperative that this significant reach be restored to a fully functioning river segment. Additionally, this reach, if restored, would provide an additional 1500 linear feet of habitat for Roanoke Logperch and other aquatic species.
6. *Study Methodology* – We recommend modeling instream flow needs using a PHABSIM approach utilizing guilds instead of individual species. Guild preference curves have been developed for the upper Roanoke River by Vadas and Orth (2001). This study would provide the necessary information to establish suitable flow regimes in the bypass reach for all species/life stages of fish present in this segment of the Roanoke River. Using the guild approach should satisfy the need to evaluate instream flow needs of Roanoke Logperch in this reach, since specific habitat suitability curves for this species are not available.  
Vadas, R.L., Jr. and D.J. Orth. 2001. Formulation of Habitat Suitability Models for Stream Fish Guilds: Do Standard Methods Work? Transactions of the American Fisheries Society 130: 217-235.
7. *Level of Effort* – This study would require a moderate level of effort extending over one field season (to capture a minimum of 3 levels of discharge through the reach), since the current ability to manipulate flows in the bypass reach is limited by the lack of available

storage in the reservoir. Anticipated costs would be in the \$50,000-100,000 range. Alternatives to a PHABSIM study exist, but because the guild habitat suitability curves are available and highly applicable to this system (no issues with transferability since they were developed in the upper Roanoke River), this method provides the most robust and defensible way to assess instream flow needs in this reach.

### Freshwater Mussel Assessment

1. *Study Goals and Objectives* –The goals of this study proposal would be to assess the presence, distribution, and abundance of any freshwater mussel species inhabiting the area affected by the project. Specific objectives would include the identification of the amount of suitable mussel habitat in the project area, determine the species composition of the extant mussel fauna, evaluate population trends (via the presence of multiple cohorts and overall age structure of the various populations present), and to compare the distribution and abundance of mussels among the pool area, the bypass reach, and the segment downstream from the powerhouse.
2. *Agency Resource Management Goals* – The Dept. of Game and Inland Fisheries is the state agency responsible for managing fish and wildlife resources within the Commonwealth, including listed species. For this study request, the agency goals will be to determine the species composition, abundance, population trends, and available habitat for mussel species in the project impact area.
3. *Public Interest Considerations (non-resource agency)* – n/a
4. *Existing Information and Need* – Currently, essentially no data are available for freshwater mussel species in the area impacted by the project. Thus, in order to assess project impacts on this faunal group, there is a need to determine the presence, abundance, population trends, and amount of habitat available for mussel species in the area.
5. *Project Nexus* – The project has significantly altered habitat in the affected area, which may be impacting mussel populations. Since no data are currently available, it is impossible to assess what these impacts might be. Given the habitat alterations associated with the project (impounded area, bypass reach, movement barrier), one would assume some level of impact to the mussel fauna associated with this project.
6. *Study Methodology* – We recommend mussel surveys be conducted by an approved expert in the impoundment, the bypass reach, upstream of the impoundment, and below the powerhouse. Species composition, abundance, and age structure of collected mussels could be compared to determine project impacts. Available and potential habitat could be assessed by this same approved expert using a standard methodology.
7. *Level of Effort* – This study would require a moderate level of effort extending over one field season. Since no mussel data are currently available, there appear to be no alternatives to this study that would provide the information necessary to assess project impacts. Estimated costs would be in the range of \$25,000-50,000.

### Fish Passage Assessment

1. *Study Goals and Objectives* –This study would examine the options for enhancing upstream and downstream fish passage for resident and migratory species, including Roanoke Logperch, at the project location, with the goal of restoring connectivity in this segment of the Roanoke River. The first objective would be to use data from the proposed fish community assessment to determine the species present that would require passage ability. The second goal would be to assess potential upstream fish

passage options (e.g., nature-like fishway, vertical slot weir, fish lift, etc.) given the site characteristics and fish species present. The final goal would be to assess potential downstream fish passage options using these same factors.

2. *Agency Resource Management Goals* – The Dept. of Game and Inland Fisheries is the state agency responsible for managing fish and wildlife resources within the Commonwealth, including listed species. For this study request, the agency goals will be to restore connectivity in this segment of the Roanoke River for resident and migratory fish species, including Roanoke Logperch.
3. *Public Interest Considerations (non-resource agency)* – n/a
4. *Existing Information and Need* – Currently, no data exist regarding options for fish passage at the project. Information describing fish passage specifications exists for some of the species present in this segment of the Roanoke River, but data for some important species (i.e., Roanoke Logperch) are limited or lacking. Additionally, the need for passage cannot be adequately determined without a complete assessment of the adjacent fish community. Theoretically, restoring connectivity would benefit both resident and migratory species by allowing for movement between preferred habitats and restoring geneflow between currently separated populations.
5. *Project Nexus* – The project is a significant barrier to fish passage on the Roanoke River. Currently, upstream passage is essentially impossible, and downstream passage is only available by going over the spillway or through the turbines. In the case of downstream passage, mortality rates are unknown, but can be assumed to be significant. Thus, the project prevents fish from moving to preferred habitat upstream and limits geneflow among populations to one direction, and that is likely to be limited. This has resulted in population fragmentation of resident species, as well as preventing upstream movement of migratory species (e.g., Striped Bass from Smith Mt. Lake).
6. *Study Methodology* – This study would be based upon the assumption that restoring connectivity is desirable and would significantly benefit both resident and migratory species. As a result, the study would focus on examining options for upstream and downstream passage for all species. Information exists regarding passage facility requirements for most of the species likely to be present, although additional information regarding Roanoke Logperch passage requirements will likely be needed. Assuming these data were obtained, the study would utilize existing literature to evaluate fish passage options, and preliminary engineering studies to determine potential fish passage facilities and/or operational methods needed to restore connectivity.
7. *Level of Effort* – The effort required for this study would largely depend upon the amount of information needed to determine fish passage specifications for Roanoke Logperch. Assuming these data were either available or obtained, the remainder of the study would require relatively modest effort. Information regarding the requirements of various fish passage facilities and operational methods could be obtained from the literature, and a preliminary engineering study could then evaluate the feasibility of installing the various options at the project. Estimated costs are unknown.

#### Recreational Use and Enhancement Assessment

1. *Study Goals and Objectives* – The goals of this study would be to determine the need and potential demand for enhanced recreational access in the project area. The objectives would be to (1) evaluate the potential use of enhanced bank fishing access via trail development; (2) evaluate the potential use of water-borne recreational opportunities via development of boat access points within the project area (above and below the

dam); (3) evaluate options for enhancing both bank and boat access within the project area; and (4) evaluate off-site recreational enhancement options, should options within the project boundary prove to be impractical.

2. *Agency Resource Management Goals* – The Dept. of Game and Inland Fisheries is the state agency responsible for managing fish and wildlife resources, as well as boating recreation, within the Commonwealth. For this study request, the agency goals will be assess the need for enhanced bank and boat access within the project area, as well as assessing potential options within the project boundary (preferable) or off-site for recreational access enhancements.
3. *Public Interest Considerations (non-resource agency)* – n/a
4. *Existing Information and Need* – The Virginia Outdoors Plan and Demand Survey have identified a need for additional water-based recreational opportunities in the Roanoke area. Additionally, the Greenway Commission has a limited amount of use data that should be available to the applicant. There is a need to obtain data on use of the Roanoke River by anglers (bank or boat) and boaters. Currently, access to the project area is limited to a canoe portage and a steep trail downstream. Given the project's location in a major metropolitan area, demand for access is expected to be very high. Better access is needed within the project boundary, both above and below the dam. Since no data exist, the potential level of use of enhanced access is unknown. A recreational use survey could evaluate current use of the Roanoke River in locations with adequate access in order to project anticipated use should access in the project area be enhanced.
5. *Project Nexus* – Currently, the project offers extremely limited access opportunities to the Roanoke River. The presence of the dam effectively blocks most boating traffic through this reach of the river, as the available portage is long and somewhat difficult for most users. Upstream access via the Roanoke River Blueway cannot be fully utilized due to the presence of the dam with no available boating access facilities. Additionally, the lack of developed boating access below the dam effectively limits use of the river between Niagara Dam and Smith Mt. Lake. Developed access locations upstream (Blueway) and downstream (Explore Park) cannot be fully utilized because the dam effectively blocks this portion of the river to most users. In essence, it functions as a major impediment to recreational use on this segment of the Roanoke River.
6. *Study Methodology* – This study would compare actual and potential recreational use by assessing recreational use (hiking, fishing, boating) upstream of the project, within the project area, and downstream of the project. The study would estimate recreational use of the existing greenway and blueway trails upstream of Tinker Creek (areas with adequate access), estimate use within the project boundary, and estimate use between the project and Back Creek (Explore Park). Exact methodologies would be determined via consultation among stakeholders and the applicant, but would likely include methods to estimate amount and type of use of Greenway trails and the Roanoke River by hikers, anglers, and boaters. The duration of the recreational use study would likely be 9 months (spring, summer, fall), and would follow accepted survey practices/designs. The second component of the study would be to evaluate options within and outside the project boundary for recreational access enhancement facilities (e.g., boat access points, trail development, parking, etc.). This would be done in consultation between the applicant and stakeholders.
7. *Level of Effort* – The effort required for this study would be moderate, and would likely require multiple survey personnel. The geographic extent would also be relatively small

(Salem – Explore Park), which would reduce the cost. A duration of 9 months should be sufficient to generate the necessary data. The evaluation of recreational enhancement options would involve a relatively modest level of effort, but would require expertise in trail and boating access development, as well as some level of engineering expertise. Costs associated with the recreational use/demand survey would likely be in the range of \$30,000-50,000, while the cost of assessing access enhancement options would likely be somewhat less.

In addition to the comments and study requests noted above, the Dept. of Game and Inland Fisheries fully supports the comments and study requests submitted by resource agencies (e.g., USFWS, VDEQ, VDCNR), localities (e.g., Roanoke Co.), and NGO's (e.g., Greenway Commission).

Thank you again for the opportunity to provide input. Should there be any questions, or the need for additional information, please contact Scott M. Smith, Regional Fisheries Manager at [scott.smith@dgif.virginia.gov](mailto:scott.smith@dgif.virginia.gov) or 434/525-7522.

Sincerely,

/s/ Scott M. Smith

Scott M. Smith  
Regional Fisheries Manager

Cc: Ernie Aschenbach – VDGIF  
Dan Wilson – VDGIF  
Ray Fernald – VDGIF  
Ron Southwick – VDGIF  
Mike Bednarski – VDGIF  
Mike Pinder – VDGIF  
Brian Watson – VDGIF  
Rick McCorkle – USFWS  
John McCloskey – USFWS  
Lindsay Webb – Roanoke Co.  
Paul Angermeier – Virginia Tech

## Niagara Project (P-2466-034)

**Study Request:** Coupling Studies of Hydrodynamics and Fish Behavior to Improve Roanoke Logperch Passage at Niagara Dam

### 1. *Goals and Objectives*

Comprehensive knowledge of hydrodynamics and fish behavior is essential to designing any effective fish passage technology. The goal of the proposed work is to answer two overarching questions: 1) Are there specific locations or configurations of depth, velocity, and turbulence near Niagara Dam that attract or repel Roanoke Logperch (RLP)? and 2) How might these locations or configurations be manipulated or enhanced to safely pass RLP? We hypothesize that volitional RLP passage can be improved by providing or enhancing hydraulically attractive paths through (or over) dams. Our proposed work develops coupled knowledge of hydrodynamics and RLP behavior that can enable operators of Niagara Dam to increase safe passage of RLP without considerably reducing power generation. Importantly, a desktop analysis would not meet the goal of this study request.

We propose to characterize the hydrodynamics of the flow fields upstream and downstream of Niagara Dam, including its intake structures, various gates, and turbine outflows. This work will help us a) understand which hydraulic features attract/repel RLP and b) recommend how to design hydraulic alterations to improve RLP passage. We will use a combination of hydrodynamic measurements, computational fluid dynamics (CFD) simulations, and fish behavior studies to characterize current and potential pathways for volitional fish passage. Obvious pathways include going through the powerhouse or over the dam crest, but undiscovered pathways may also exist and be amenable to hydraulic enhancement.

Specific objectives of the proposed work are to a) characterize the hydrodynamics near Niagara Dam (upstream and downstream) using measurements and physical modeling based on computational fluid dynamics (CFD); b) relate observed physical conditions to observed RLP behavior and spatial orientation; and c) use this new knowledge to inform turbine operations and future designs of new passage technologies that enhance RLP movement and survival. A major outcome of this work will be a *generalizable framework* for describing hydrodynamic conditions at Niagara Dam over a range of seasonal, flow, and dam-operating conditions, and for relating those conditions (especially velocity and turbulence) to behavioral responses by RLP. With this information in hand, dam operators will have a better understanding of how purposeful hydraulic alteration can affect RLP behavior and promote safe passage.

The final tangible products of this project include:



- Synthesized comprehensive three-dimensional hydrodynamics maps correlated with RLP behavior relative to the dam, providing information for turbine operations and future designs of new passage technologies to enhance RLP passage and survival.
- A generalizable methodological framework describing the hydrodynamic conditions at Niagara Dam and their relation to behavioral responses by RLP. This product will highlight various flow and operational conditions germane to RLP passage.
- A CFD-based “virtual test-rig” to test effects of hypothetical hydraulic manipulations on hydrodynamic characteristics near Niagara Dam for future use.
- A statistical model of relationships among RLP behaviors, seasons, times of day, and CFD-modeled flow dynamics.

## 2. *Resource Management Goals*

A primary management goal for public water resources is to restore and protect populations of native freshwater fishes, including Roanoke Logperch (*Percina rex*), which is listed as endangered under the U.S. Endangered Species Act of 1973. Government agencies such as the U.S. Fish and Wildlife Service and Virginia Department of Game and Inland Fishes lead efforts to conserve and recover endangered and threatened species, but many other stakeholders also have roles in such efforts. Especially valuable are the roles scientists play in providing new knowledge to inform management actions so that management goals can be met cost-effectively.

## 3. *Public Interest*

This study request has significant public interest because enhancing fish passage could contribute to a) conservation and recovery of a federally endangered species, b) restoration of the ecological health of Roanoke River upstream and downstream of Niagara Dam, and c) improved fishing.

## 4. *Existing Information*

The Roanoke logperch (RLP; *Percina rex*) is an endangered fish occurring in the Roanoke River drainage; its strongest population is in Roanoke River upstream of Smith Mountain Lake (Roberts et al. 2013. *Freshwater Biology* 58: 2050–2064); this reach includes the Niagara Hydroelectric Project. In 1990 and 1991, fish surveys conducted for Appalachian Power Company found RLP upstream and downstream of Niagara Dam. RLP have been captured in the Niagara Dam tailwater before it enters Smith Mountain Lake (Rosenberger, 2007. An update to the Roanoke Logperch Recovery Plan. Technical Report to U.S. Fish and Wildlife Service, Virginia Field Office). No information was provided in the pre-application document (PAD) to assess impacts of Niagara Dam on RLP movement and we are not aware of any systematic studies to characterize RLP distribution or movement near Niagara Dam.

Presumably, Niagara Dam is a barrier to movement by RLP, but the extent to which it impairs fish movement is unknown. Roberts et al. 2016 (Ecology of Freshwater Fish 25: 1–16) estimated median lifetime dispersal distances of 6–24 km for RLP in Roanoke River. This information indicates that Niagara Dam is a barrier for many RLP spawned upstream or downstream in Roanoke River. Therefore, additional studies are needed to assess a) how RPL interact with Niagara Dam and b) options for enhancing RLP passage.

### *5. Nexus to Project Operations and Effects*

A key cause of RLP's imperilment is fragmentation of its habitat by dams, which cause a wide range of adverse impacts. In addition to impeding movements crucial to completing RLP's life history, dams and their impoundments a) exacerbate population isolation and genetic drift; b) eliminate spawning, rearing, and foraging habitats; c) entrain larvae through gates and turbines (direct mortality); d) alter temperature and oxygen regimes, which affect growth and survival; and e) starve downstream reaches of gravel/pebble/cobble sediments, which are crucial to RLP spawning and foraging. Collectively, these impacts imposed on RLP by Niagara Dam represent a significant, but unmeasured and unmitigated, "incidental take" of an endangered species. Moreover, none of these impacts is addressed substantively in the PAD. Aside from removing the dam altogether, the main management action that can reduce this take is to enhance fish passage. Therefore, additional studies are needed to assess a) how RPL interact with Niagara Dam and b) options for enhancing RLP passage.

Niagara Dam has operated since its construction with no fish passage facility or requirement. Therefore, cumulative impacts on RLP movement are, and continue to be, significant. These impacts need to be reduced and mitigated to contribute to RLP recovery. Conditions on the new license should include provision for RLP passage. **However, it is not currently possible to make an informed decision regarding how to enhance fish passage without more detailed knowledge of how RLP interact with the hydrodynamics upstream and downstream of Niagara Dam.**

### *6. Methodology Consistent with Accepted Practice*

The proposed work for this study request comprises four main tasks, each of which will be conducted consistent with generally accepted practices. Methods for each task follow.

#### Task 1 - Hydrodynamic Measurements (Year 1):

We will characterize hydrodynamics upstream and downstream of Niagara Dam. We will collect bathymetric and velocity data using an acoustic Doppler current profiler (ADCP) paired with a real-time kinematic global positioning system (RTK-GPS) deployed from a manned boat. The RTK-GPS will measure our 3-D position at centimeter resolution while the ADCP will measure vertical profiles of 3-D water velocity and bed elevation (actually water depth post-processed into bed elevation along four individual beams, including corrections for boat/instrument pitch

and roll). Data will be collected at roughly one-second intervals using HYPACK hydrographic survey data collection and processing software for bathymetric data collection and Sontek's Riversurveyor Live software for ADCP data collection and processing. Water depth measurements using acoustics are sensitive to variations in the speed of sound in water. Temperature and salinity are the primary factors affecting the speed of sound in water. Reservoir depth is presently unknown; but if it is deep enough to potentially stratify thermally, it may exhibit a temperature gradient from surface to bottom. We will measure temperature and salinity profiles periodically during our surveys. The HYPACK software notes the timestamp and location of these temperature/salinity profiles, computes the speed of sound in water, and spatio-temporally interpolates the speed of sound estimates to correct bathymetric measurements. Additionally, we will use a rod to physically probe the depth at various locations to verify the fidelity of our acoustic bathymetric survey. We will measure bathymetry and velocity upstream of the dam, near intake structures and gates, throughout the reservoir, and downstream of the dam into the free-flowing river. More detail will be obtained near the dam and intake structures because we hypothesize that the flow field in these locations strongly influences fish behavior during migration and other movements.

In order to safely obtain bathymetric and velocity data near the dam crest and intake structures, we will deploy the ADCP and GPS from a tethered boat and maneuver the tethered boat using a rope from the manned boat. In this way, we can maneuver the ADCP nearly to the dam crest and adjacent to the intake structures while maintaining a safe distance in the manned boat farther upstream. We will measure velocity over a range of annual flow conditions (e.g., high, medium, low flow), and as conditions allow, work with the dam operators to coordinate intake/turbine operation to reflect full (two turbines on), partial (one turbine on), and off operating conditions. In effect, we will characterize multiple hydrodynamic conditions during each of a few field surveys.

Hydrodynamic data will be processed in the office to filter spurious data and to prepare the data into a suitable format for use in the CFD modeling (described below). Velocity time-series data at various locations will be used to quantify turbulence characteristics. The results of each detailed flow and operating condition will be summarized in a 3-dimensional map of the flow field upstream of the dam; maps will highlight regions of flow acceleration/deceleration, turbulence levels, and sudden changes in flow direction. (Czuba et al., 2011. Bed morphology, flow structure, and sediment transport at the outlet of Lake Huron and in the upper St. Clair River. *Journal of Great Lakes Research* 37(3): 480-493; Parsons et al., 2013. Velocity Mapping Toolbox (VMT): a processing and visualization suite for moving-vessel ADCP measurements. *Earth Surface Processes and Landforms* 38(11): 1244-1260). Such maps will also be generated from the CFD modeling, but the independently generated characterization of the flow conditions from the hydrodynamic field surveys will serve to validate the major features of the flow simulated by the CFD modeling (Liu et al., 2012. Sediment mobility and bed armoring in the St.

Clair River: insights from hydrodynamic modeling. *Earth Surface Processes and Landforms* 37(9): 957-970).

We will characterize hydrodynamic conditions beyond those observed in the field surveys by installing velocity and stage sensors near the dam. Two or three velocity sensors will be affixed at key locations and measure a horizontal or vertical velocity profile at regular time intervals (e.g., 15 minutes) for the study duration. We envision placing sensors to measure velocities just upstream of the dam crest, near the intake structure, and downstream of the dam. We anticipate that the regions of high and low velocity that deter/attract fish may shift spatially in the reservoir, depending on flow and operating conditions. These velocity measurements will capture the expected shifts in high-flow regions beyond what we could measure during our comprehensive field surveys. A total of four stage sensors will be deployed just below the low-water surface along the bank, both upstream and downstream of the dam. An additional sensor will be deployed in the air over the reservoir to correct water pressure measurements with air pressure measurements to achieve accurate water stage measurements via hydrostatic pressure. These sensors will measure water stage at regular time intervals throughout the study duration. Water-surface elevations will be measured by the RTK-GPS at each sensor location to convert the stage record to water-surface elevation. The stage data will provide another boundary condition for the CFD simulations. We will also deploy a few additional temperature sensors near the dam, distributed throughout the water column, to characterize water temperatures in the reservoir, which may influence fish movement or orientation.



Figure 1. Areas near Niagara Dam where the requested study will be conducted. The two spatial domains for hydrodynamics surveys and simulations are outlined in red.



### Task 2 - CFD Simulations (Years 1 and 2):

We will conduct physics-based, high-fidelity computational fluid dynamics (CFD) simulations to obtain detailed information about the velocity field, streamlines, and turbulence levels of water flow upstream and downstream of Niagara Dam across a wide range of flow conditions. In our CFD simulations, incompressible Navier-Stokes equations are discretized using the Finite Volume Method (FVM) with an unstructured grid and the resulting system of equations are numerically solved. Simulations will be conducted for two computational spatial domains, one extending ~100 m upstream of the dam crest and the other extending ~150 m downstream of the powerhouse (see Figure 1). The extent of the domains will ensure that all complex flow features near the dam that may affect fish behavior are represented.

Due to the spatiotemporal complexity of the flow upstream/downstream of a dam, we will use advanced three-dimensional unsteady numerical simulations based on blending Reynolds-Averaged Navier-Stokes (RANS) and Large Eddy Simulations (LES), the so-called hybrid RANS-LES, to ensure that detailed characteristics of the flow are well represented. Hybrid RANS-LES models resolve important flow features such as transient streams and energy-carrying eddies using LES, while near-surface flow is modeled using the RANS approach. The application of these models to Engineering Fluid Mechanics problems has grown extensively over the past few years due to a favorable tradeoff between computational costs and accuracy. Methods proposed here are consistent with generally accepted practices (e.g., Lindberget al. 2013. Methods for locating the proper position of a planned fishway entrance near a hydropower tailrace. *Limnologica* 43: 339-347; Gisen et al. 2017. Optimizing attraction flow for upstream fish passage at a hydropower dam employing 3D detached-eddy simulation. *Ecological Engineering* 100: 344-353).

We will use the bathymetric data obtained from our field surveys (described above) to construct computational domains for simulations. Additionally, the measured velocity profiles will be used as boundary conditions in our CFD simulations, as well as a means to validate our modeling results. To account for turbulence generated at the riverbed or near dam structures, which can significantly affect flow patterns, our simulations will use wall-roughness characterization functions. To accurately represent the river surface and water/air interactions in the numerical models, we will use the Volume of Fluid (VOF) method. The VOF method introduces a volume fraction field  $F$ , which for each element in the computational grid contains the fraction of that element's volume that is occupied by a specific fluid. An element in the water phase has  $F=1$ , an air element has  $F=0$ , and elements with  $0 < F < 1$  are in the numerical interphase. Fluid properties are weighted using this fraction field. The computational grid will be locally refined near the upstream surface of the dam, just downstream of the powerhouse, and near the by-pass reach mouth to capture details of the flow fields in all dimensions. Tests will be conducted to quantify the sensitivity of results to various spatial and temporal resolutions of the simulations.

We will conduct our CFD simulations for a range of river discharge and dam-operating conditions. The main product of our CFD simulations will be 3-dimensional maps of the flow-fields upstream and downstream of the dam. Maps will highlight regions of flow acceleration/deceleration, turbulence levels, and sudden changes in flow direction – all of which may influence a fish’s spatial associations with the dam. In addition, the CFD framework developed here can serve as a “virtual test-rig” to test effects of many other potential hydraulic manipulations on hydrodynamic characteristics near the dam, without actually implementing them in the real world.

### Task 3 - Fish Behavior Studies (Years 1-2):

Studies of fish behavior will account for diel (time of day), seasonal, and flow variation that may affect how fishes orient to Niagara Dam and move within the impoundment. Studies will focus on RLP but will also encompass other common species observed near the dam. We expect all three factors (diel cycle, season, and flow) to affect RLP behavior and abundance near the dam. Fish behavior can be observed effectively, and movements quantified, via deployment of underwater cameras. We will conduct five main sub tasks: 1) characterize general patterns of RLP occurrence/abundance near the dam during the full range of annual conditions; 2) describe orientation of RLP relative to the dam (e.g., facing versus parallel, moving versus stationary); 3) identify specific locations near the dam that attract or repel RLP; 4) document shifts in the patterns of RLP location and behavior in response to changes in time of day, season, and river flow; and 5) document shifts in patterns of RLP location and behavior in response to changes in turbine operation.

We will monitor RLP distribution and behavior throughout approximately 22 months, employing a stratified-random sampling design, with more frequent sampling during March – November and daylight hours. Years and days each will be divided into four periods (strata). Sampling days and times will be randomized but subject to anticipated or prearranged changes in flow conditions (e.g., high, medium, low flow and turbines operating versus not operating).

The design goal is to capture at least a replicated sample of RLP behavior for each distinct flow condition defined by the CFD model during each of the period by time-of-day combinations. Given that we will not have control over river flow and associated seasonal temperatures that also likely act as cues for fish behavior we will measure and treat these variables as covariates in a factorial experimental design. The range of flows in which we can observe fish will be limited by high velocity and turbidity. Behavioral responses of RLP to diel cycle, season, and river flow will be modelled with a generalized linear model equivalent of an analysis of covariance (ANCOVA).

We will use underwater observations to characterize RLP’s spatial associations with the dam and associated structures or flow conditions over the full range of temporal factors (i.e., period and



time-of-day). Observations will also aim to determine the conditions under which individuals initiate and/or maintain upstream or downstream movement, as well as how their frequency of movement varies with flow. Observations will be collected by stationary cameras set at strategic places such as upstream across the dam face and intake, downstream below the dam, and at the confluence of the bypass channel with the turbine outflow (Figure 2). Where possible, these cameras and the velocity sensors (described in the hydrodynamic measurements section) will be co-located. Individual orientation, movement, and aggregation are aspects of behavior that will be quantified for statistical analyses.

Camera monitoring will be conducted with GoPro Hero 5 HD cameras capable of videotaping continuously in deep water for up 2.5 hours at a time and also capable of taking time-lapse photos. For nighttime monitoring (and during periods of high turbidity), an underwater infrared video system will be adapted (Chidami et al. 2007. Underwater infrared video system for behavioral studies in lakes. *Limnology and Oceanography: Methods* 5: 371-378). The Go Pro Hero 5 model can also be equipped with infrared lens filters for night and low-light vision.



Figure 2. Locations immediately upstream (top) and downstream (bottom) of Niagara Dam. Red arrows indicate specific locations where stationary underwater cameras might be mounted to collect images of fishes.

Task 4: Synthesize Results (Year 2):

The 3-D, CFD-generated maps of the flow-fields near the dam will highlight regions of flow acceleration/deceleration, turbulence levels, and sudden changes in flow direction; these will be correlated with RLP behavior and abundance data from the fish surveys. The goal is to determine the specific hydrodynamic conditions that attract and/or repel RLP. We will contextualize our results by analyzing long-term flow data from the U.S. Geological Survey gage just downstream of Niagara Dam, and thereby determine when during the year various flow conditions and RLP behaviors are expected to occur. Finally, based on links between hydrodynamic conditions and RLP behavior, we will suggest where/how to alter the flow fields to promote RLP passage. **We believe this synthesized assessment is a critical first step before any effective technology to promote fish passage should be implemented.**

*7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The requested study is time- and computation-intensive, requiring coordination among three teams of technicians and experts; separate teams will conduct Tasks 1, 2, and 3. Field crews will generally comprise three persons. Teams will coordinate with dam operators so data can be collected during specific operational conditions. The study duration is a minimum of two years to encompass a wide range of river discharges and seasonal variation in RLP movement. We know of no alternative approaches to characterizing the hydrodynamics near Niagara Dam or how RLP interact with and respond to those hydrodynamics. No alternative studies were proposed in the PAD to address the questions posed in this study request.

Suggested Budget and Justification

Funds will be used to support a) three graduate students (one per team), for 12-15 months each and b) three professors (one per team), for 1-2 months each. Graduate students also will be supported, in part, by teaching assistantships during the project period. Total direct cost for graduate students will be \$156,500; total direct cost for professors will be \$56,000. Funds totaling \$25,000 will be used to purchase equipment and supplies (e.g., cameras and accessories) and support field data collection and instrument deployment. Graduate students will organize and conduct fieldwork, manage sensors, collect and process hydrodynamic data, perform CFD simulations, and write up summaries of all results. Professors will oversee data collection and analysis and model simulations, and ensure successful completion of all tasks. Total estimated cost, including 60% indirect cost charged by Virginia Tech, is \$380,000.

Suggested Investigators (all at Virginia Tech):

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# ROANOKE COUNTY

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May 24, 2019

Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

**Re: Appalachian Power Company Notice of Intent to File License Application, Pre-Application Document (PAD), Commencement of Pre-Filing Process, and Scoping: Niagara Hydroelectric Project (Project No. 2466-034) Submission of Comments from Roanoke County, Virginia**

Dear Secretary Bose:

Roanoke County staff have reviewed Appalachian Power Company's Pre-Application Document (PAD) issued in January 2019 and the Federal Energy Regulatory Commission's Scoping Document issued in March 2019. A significant portion of the Niagara Hydroelectric Project boundary is located along the Roanoke River in eastern Roanoke County. Locality staff have reviewed the PAD and Scoping Document and respectfully offer the following comments and recommendations for your consideration.

## **Recreation**

As referenced in Section 5.8 of the PAD, "the Roanoke River is a significant recreation and amenity resource". Outdoor recreation in Virginia's Blue Ridge, which includes Roanoke County, Roanoke City, Botetourt County, the Town of Vinton, and the City of Salem, is a major contributor to economic growth in this region. The development of Explore Park, the Roanoke Valley Greenway system, and the Roanoke River Blueway has not only contributed to significant increases in recreational spending, but has been instrumental in attracting businesses and individuals to the Roanoke Valley. These recreational amenities are located or proposed along the Roanoke River which passes through eastern Roanoke County and falls within the reservoirs for both the Niagara and Smith Mountain (P-2210) hydroelectric project areas. From Roanoke County's perspective, it is critical that mechanisms exist to encourage coordination between the licensee, federal agencies, state agencies, local governments, and other stakeholders to support development of recreational resources.

In 1993, when the Niagara Project was last licensed, there was limited recreational use within the Project boundary, and the Licensee was exempted from filing Form 80 recreation

reports, until further notice on December 3, 1997. In accordance with Article 411, Appalachian supported the installation of a canoe portage around the dam which was coordinated with the Virginia Department of Game and Inland Fishers (DGIF) and Virginia Department of Conservation and Recreation (DCR). Since then, there have been many changes in the recreational desires of citizens of the Roanoke Valley, as indicated by the DCR 2017 Virginia Outdoors Demand Survey. The survey reported that 45% and 49% of households in the Roanoke Valley Alleghany Region indicated the need for increased access to trails and water access, respectively. The development of Explore Park, the greenway network, and the Roanoke River Blueway have helped meet the demands for increased outdoor recreational opportunities and have been major contributors to economic growth in the region.

The PAD provides information on existing recreation facilities and opportunities provided on project lands and in the vicinity of the project boundary. There have been considerable changes in recreational use patterns and needs have changed, impacting the way in which the public uses these resources. Additional public parks, access points and trails have been developed in the project vicinity. Existing recreational data normally required in the Form 80 has not been collected since 1997, when an exemption was granted by FERC. Now recreational data will no longer be required to be collected periodically by the licensee.

Roanoke County supports Appalachian's proposal to conduct a Recreational Needs Assessment for the Niagara Hydroelectric project boundary. Existing recreational usage may be monitored through vehicular and pedestrian counters that can be installed at upstream and downstream portages on the Roanoke River and Tinker Creek. Recreational use estimates may be calculated by assessing future demand for recreation activities and population trends for the expected term of the new license. Current use estimates should be projected with indexed values of expected changes in the number of recreation days for given activities at the projects to estimate future recreation use in the project for 10-year increments out to 2050, or the end of the proposed relicensing period.

### **State, Regional, and Local Initiatives**

Roanoke County's interest in the Niagara project boundary aligns with the following initiatives:

- **The 2016 Roanoke County [Strategic Plan](#)** is a citizen defined set of objectives defining the County as a "vibrant, innovative and scenic community that values its citizens, heritage and quality of life." Continued focus on Explore Park fulfills two of the main pillars of the plan including "Keeping Roanoke County Healthy Clean and Beautiful" and "Positioning the County for Future Economic Growth.
- **The "Visit Virginia's Blue Ridge" [Destination Vision 2030 Study](#)** released in 2017 prioritized the development of outdoor recreation amenities at Explore Park as one of the top regional objectives in our area.

- The [Roanoke Regional Partnership](#) in 2018 highlights the regional need for developing amenities such as river outfitters, campgrounds, cabins and outdoor focus retail operations as critical to the economic growth of our region.

The 2018 [Roanoke Valley Greenway Plan](#) and [Roanoke River Blueway](#) efforts spearheaded by the Roanoke Valley Alleghany Regional Commission prioritize the Niagara Dam area as important crossroads for walking, biking and boating. The Roanoke Valley Greenway Plan may constitute a Comprehensive Plan under Section 10a of the Federal Power Act.

- The 2018 [Virginia Outdoors Plan](#) focuses on recreational fishing and boating access in and around this area of the Roanoke River. The cover page features a section of the Roanoke River Gorge located downstream of the Niagara Dam and Blue Ridge Parkway.
- The intent of the [Virginia Department of Conservation and Recreation Scenic Rivers Program](#) is to identify, designate and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. Roanoke County is currently coordinating with DCR on an application for the eastern section of the Roanoke River located between Roanoke City and Explore Park. Roanoke County requests Appalachian Power Company's support of this designation.
- **Trash containment, collection, and disposal** in the Roanoke River is an impediment to recreational use and has negative effects on wildlife habitat, aquatic resources, and the environmental quality of the Roanoke River. It is Roanoke County's understanding that under current hydroelectric operations, large debris is removed, but the vast majority of trash is allowed to overtop the spillway, resulting in accumulations below the dam downstream into the Smith Mountain Lake project boundary. Roanoke County acknowledges that Appalachian Power did not generate this trash and debris and that Appalachian Power spends a considerable amount of time and money removing trash and debris from the Niagara and Smith Mountain Lake project boundaries.

Roanoke County has been organizing community volunteer work days to remove trash and debris along the Roanoke River downstream at Explore Park. Roanoke County encourages Appalachian Power to evaluate trash and debris removal alternatives. Roanoke County requests that Appalachian Power work with localities and regional entities, such as the Roanoke Valley Resource Authority and Clean Valley Council, to develop a cooperative process for removing this trash and debris from the river. A Debris Management Plan (DMP) could be prepared in consultation with applicable stakeholders.

- As indicated in Section 6.2.1.1 of the PAD, the Niagara Dam is known to impound sediment, and increased sedimentation is attributed to sources such as urban stormwater runoff and stream bank erosion. Roanoke County is concerned about the water quality of the Roanoke River, which is currently considered impaired by the Virginia Department of Environmental Quality, as referenced in Section 5.3.7 of the PAD. Localities adjacent to the Roanoke River are required to address these impairments. Based on the PAD,



Roanoke County understands that Appalachian Power has not regularly drawn down the reservoir for maintenance purposes and sediment is not regularly mechanically removed from the reservoir; however, Roanoke County is concerned about PCB levels in the Roanoke River and fishing limitations, as the release of sedimentation may impact Roanoke County's compliance with MS-4 and TMDL regulations.

## Explore Park

Roanoke County signed a 99-year lease with the Virginia Recreational Facilities Authority (VRFA) in 2013 to operate Explore Park, a 1,100 acre recreational facility that straddles the Roanoke River and lies adjacent to both the Niagara and Smith Mountain hydroelectric project boundaries. Development of Explore Park as a regional outdoor recreation destination is among the County's top administrative priorities. The development of Explore Park achieves several key objectives in the areas of regional tourism, economic development, and improved quality of life for our residents. Central to the Explore Park mission is recreational use of the river above and below the Niagara Dam, as well as preservation of the natural amenities and beauty of the Roanoke River Gorge.

In 2016, the Roanoke County Board of Supervisors adopted an [Adventure Plan](#) for Explore Park, consisting of a 20-year vision for the facility, strategic business plan, phasing report, and natural places inventory. The Explore Park Adventure Plan may constitute a Comprehensive Plan under Section 10a of the Federal Power Act. Among the initiatives identified in the plan include:

- Improved River Access;
- Continued development of the Roanoke River Greenway from Roanoke City to Rutrough Road at the confluence of Back Creek and the Roanoke River;
- Development of an In-River Kayak Park downstream of the Niagara Dam; and
- Economic Development opportunities through public private partnerships with outdoor recreation concessionaires.

Now in 2019, Roanoke County is implementing the vision outlined in the Adventure Plan. Working with private partners, regional organizations, the National Park Service, the Roanoke Valley Resource Authority, the VRFA, and public advocacy groups we have made achievements such as:

- Improvements to Rutrough Point, a blueway access point at the confluence of Back Creek and the Roanoke River, located within the Smith Mountain Lake Project boundary, through support from Appalachian Power and FERC;
- Implementation of campground and cabin operations;
- Expansion of programs and events;
- Increase in park attendance of over 150,000 visitors per year;
- Planned opening of an aerial adventure course this summer;

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- Planned expansion of agro-tourism business operations this fall;
- Planning opening of a restaurant and brewery this fall; and
- Planned improvements to recreational trails this fall.

### **Blue Ridge Parkway**

The Blue Ridge Parkway is a National Park and All American Road located adjacent to, and contiguous with, the Niagara Project boundary. The Niagara Dam is located within the viewshed of the Parkway and the Roanoke River Overlook (Mile Marker 115). Roanoke County operates the Blue Ridge Parkway Visitor Center which is located in Explore Park. The Blue Ridge Parkway Visitor Center and Roanoke County's Explore Park have both been developed since 1993 when the current Niagara Dam license was issued. The National Park Service (NPS) has prepared a number of plans associated with BLRI which include, but are not limited to the following:

- **The Blue Ridge Parkway General Management Plan/Environmental Impact Statement**, completed in 2011. <https://parkplanning.nps.gov/projectHome.cfm?projectID=10419>

The Final General Management Plan provides comprehensive guidance for perpetuating natural systems, preserving cultural resources, and providing opportunities for high-quality visitor experiences along the parkway for the next 20+ years. After more than 75 years since the parkway was established, this is the parkway's first comprehensive management plan.

- **Roanoke Valley/Blue Ridge Parkway Trail Plan and Finding of No Significant Impact** September 2015.  
<https://parkplanning.nps.gov/documentsList.cfm?parkID=355&projectID=10392>

The intent of the project was to determine whether an integrated trail system that would provide critical linkages between the Roanoke Valley Greenways Trail Network and the Blue Ridge Parkway was appropriate after a consideration of project impacts.

- **Blue Ridge Parkway Foundation Document Overview for Virginia/North Carolina.**  
[https://www.nps.gov/blri/learn/management/upload/BLRI\\_OV\\_2016\\_508.pdf](https://www.nps.gov/blri/learn/management/upload/BLRI_OV_2016_508.pdf)

**The above referenced completed plans may constitute Comprehensive Plans under Section 10a of the Federal Power Act.**

Because the Niagara Dam is generally inaccessible, the public is most familiar with the dam by seeing it from the Blue Ridge Parkway and by accessing it from the Roanoke River Overlook, Roanoke River Trail, and Fisherman's Trail. The Roanoke Valley Greenway Commission has worked cooperatively with the Parkway since 1997, particularly providing skilled trail volunteers to assist the Parkway with trail construction and maintenance. In 2015, greenway supporters

completed over 200 steps to provide access to the river from the Parkway via the Fisherman's Trail. This access connects to the river at the bottom of the bypass reach and tailrace, providing access for both fishermen and boaters. Roanoke County suggests that Appalachian monitor this use as part of its Recreational Needs Assessment as a gauge of the demand. Given that this national park is adjacent to the Project and given that this trail currently provides the only public access to the Project, we request that the Blue Ridge Parkway plans pertinent to this geographic area be considered as comprehensive plans under section 10(a)(2)(A) of the Federal Power Act.

### **Roanoke Valley Greenways**

The Roanoke Valley Greenway Commission was formed in 1997 by an Intergovernmental Agreement among the four local governments of the City of Roanoke, Roanoke County, the City of Salem and the Town of Vinton. In 2016, Botetourt County was added to the Commission. The purpose of the Greenway Commission is to promote and facilitate coordinated direction and guidance in the planning, development, and maintenance of a system of greenways throughout the Roanoke Valley. In accordance with the Intergovernmental Agreement, the Greenway Commission's responsibilities are to encourage incorporation of greenways into each jurisdiction's planning efforts, explore greenway opportunities, make recommendations on legislation, investigate funding and grants, recommend standards, pursue partnerships, and coordinate the efforts of the federal, state, and local governments involved.

The Roanoke Valley Greenway network has been developed over the last 22 years. There are two greenways within the vicinity of the Project Boundary. These greenways are:

- The **Wolf Creek Greenway** in the Town of Vinton and Roanoke County is completed for 2.2 miles from Hardy Road to the Blue Ridge Parkway, with an extension to the Roanoke River (north side) included in the 2018 Greenway Plan. The Appalachian Power Company service road into Niagara Dam parallels Wolf Creek and is thus in the corridor for extension of this greenway.
- The **Roanoke River Greenway** is the main greenway artery through the valley, projected to be 31 miles from Montgomery County to Franklin County at Back Creek. Existing sections begin in western Roanoke County in Green Hill Park and traverse through the City of Salem and Roanoke City. In the urban area fourteen miles are complete, one mile under construction, five miles in the right-of-way phase, one mile in the engineering phase, and another three miles funded for design and construction.

The section of the Roanoke River Greenway proposed within the Niagara Project boundary is fully designed, currently in right-of-way negotiations with landowners, and construction is scheduled to begin in 2020. Roanoke County has been working with Appalachian over the last five years to facilitate the passage of the Roanoke River Greenway through the Niagara Project boundary. Appalachian has been very helpful in this endeavor and preliminary right-of-way negotiations are underway to obtain easements for the greenway through the project. We would ask that this partnership continue through the relicensing process for the Niagara Project. This final section of

Roanoke River Greenway is critical to the economic redevelopment of Explore Park and completion of the Roanoke River Greenway through the valley.

As mentioned above, the Roanoke Valley Greenway system has been an important recreational resource for the residents of the Roanoke Valley and has also been responsible for considerable economic growth in the valley. Given the importance of greenways to the region and the anticipated incorporation of the greenway into the Project, we request consideration of this plan as a comprehensive plan under section 10(a)(2)(A) of the Federal Power Act.

### **Roanoke River Blueway**

The Roanoke River Blueway Committee exists predominantly to support recreational use of the Roanoke River Blueway, a 45-mile long designated water trail located in the Roanoke Valley that passes through the localities of Roanoke County, the Cities of Salem and Roanoke, and the Town of Vinton, and terminates at the Hardy Ford DGIF access point at Smith Mountain Lake. Recreational boating access to the Niagara Project reservoir is provided by upstream facilities located in the City of Roanoke on the Roanoke River and the Town of Vinton on Tinker Creek. While these facilities and others upstream allow paddlers to get to the reservoir, there is no place for boaters to access the Roanoke River near the dam. Paddling back upstream to the access areas in Roanoke City and Vinton requires considerable effort. The existing canoe portage around the dam, described in Section 5.8.2 of the Pre-Application Document, is difficult to maneuver. Similarly, public access to the portage downstream of the dam underneath the Blue Ridge Parkway bridge is restricted by a gate that requires permission from Appalachian Power.

Roanoke County supports Appalachian's proposal to conduct a Recreational Needs Assessment to evaluate current use of the canoe portage and improvements that may be needed consistent with projected usage, erosion control, and those whose needs are characterized under the Americans with Disabilities Act (ADA). Recreational demand and usage has increased along the Roanoke River and portage improvements, such as installation of an emergency phone, are encouraged. Roanoke County appreciates Appalachian's support of recreational programming on the Roanoke River through the 2018 execution of a right-of-entry permit to Roanoke County Parks, Recreation and Tourism for use of the maintenance access road located north of the Niagara Dam. This right-of-entry permit expires in 2021, and Roanoke County requests continued support for recreational programming and access to the tailrace below the Niagara Dam.

Roanoke County also encourages Appalachian to consider supporting development of a public access facility upstream (river right) and adjacent to the Niagara reservoir that will provide vehicular parking. Roanoke County is interested in partnering with Appalachian to make these blueway improvements possibly on land located adjacent to the Niagara project boundary that is owned by the Virginia Recreational Facilities Authority and under a long term lease for development of Explore Park.

Lastly, Roanoke County encourages Appalachian to assess the possibility of a controlled recreational release that would benefit whitewater boating downstream of the dam and in the bypass reach, especially during the summer and fall months. Section 5.8.1 of the PAD indicates

that class 1 and II whitewater conditions exist downstream of the Niagara Dam, and the Roanoke County Explore Park Adventure Plan proposes development of an in-river kayak park downstream near the Smith Mountain lake project boundary. Roanoke County requests that Appalachian Power conduct an Aesthetic Flow Study in conjunction with the Recreational Needs Assessment to determine what the parameters would be required for controlled releases, and how releases could be coordinated with hydroelectric project operations to reduce impact to downstream aquatic resources. Coordination would be needed with the US Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (DGIF).

### Closing

Roanoke County appreciates the opportunity to comment on the Appalachian Power Company PAD and FERC Scoping Document. We look forward to working with Appalachian Power and other stakeholders during this relicensing effort. Please forward any questions, comments, or concerns from Roanoke County to Doug Blount, Director of Parks, Recreation and Tourism at [dblount@roanokecountyva.gov](mailto:dblount@roanokecountyva.gov) or (540) 777-6321.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Richard L. Caywood', is written over a light blue rectangular background.

Richard L. Caywood, P.E.  
Assistant County Administrator

May 24, 2019

# ROANOKE RIVER BLUEWAY COMMITTEE

## COMMENTS

NIAGARA HYDROELECTRIC PROJECT NO. 2466-034

### RECREATION STUDIES

The Roanoke River Blueway Committee exists predominantly to support recreational use of the Roanoke River Blueway, a 45-mile long designated water trail located in the Roanoke Valley which passes through the localities of Roanoke County, the Cities of Salem and Roanoke, and the Town of Vinton, and ends in Franklin County at the Hardy Ford DGIF Access at Smith Mountain Lake. The main focus of our comments will deal with recreation access and studies to improve the impacts of the Niagara Dam on the Blueway. We ask to be included in any Recreation Working Group that is used to shape or undertake any recreation studies.

### PORTAGE AROUND THE DAM

A primary concern of boaters, fishermen and other outdoor enthusiasts who use or would like to use the Roanoke River is the obstacle presented by Niagara Dam.

The only current portage around the dam involves a boat haul of approximately a quarter mile up a small hill, down a long gravel driveway and over a rocky shoreline often filled with debris and trash. There are major obstacles to access as well, making a take-out by vehicle dependent on prior approval and logistical support from AEP. Any recreational use of this area has thus been severely stunted by the dam.

Accordingly, the Roanoke River Blueway Committee recommends that the portage be included in any recreation study undertaken by AEP. Such a study could focus on two aspects of the portage: first, existing conditions, including the use of the portage by individual boaters as well as the use of the access below the dam by Roanoke County via their right of entry permit; second, opportunities to improve access. Some ideas of improvements to the portage of which the Committee is aware include a phone on location which can be used to call for assistance, improvements to the existing portage takeout above the dam and the shore below the dam, and an access point on river right just above the dam to provide an alternate portage location. This last option is further discussed below.

### ACCESS ABOVE THE DAM

Boating recreation could be vastly improved with the creation of a river access on river right just above the dam.

While there are potential impacts to a local wetland and right-of-way concerns that would need to be address in analyzing this option, we believe this possibility needs further investigation.



A river access at this location might reduce or obviate the need for any portage on river left if boaters could use a shuttle around the dam and put in again below the dam. Such considerations should be included in the recreation study. Any proposals from this work should take into account the planned Roanoke River Greenway which is under development in this area.

#### ACCESS TO THE BYPASS REACH FROM THE BLUE RIDGE PARKWAY

Regular use is currently made of the bypass reach via an informal trail to the river. In 2016 a Fishermen's Trail was created down to the river by installing over 200 steps over rocky ledge and slope. This works for the Roanoke River Gorge, but not for the bypass. Exploring the option for a trail to be built for boaters off the existing parkway overlook trail, which would likely follow an existing informal footpath down the mountain, is requested.

#### SCHEDULED RELEASES FOR BOATING EVENTS

Recreational releases would benefit boating downriver of the sit and in the bypass reach, especially during the summer months. Documentation is needed to determine what the parameters would be for such releases, and how such releases could be coordinated in order to reduce impact to the fish species which rely on the river for habitat. Coordination would be needed with the US Fish & Wildlife Service and the Virginia Department of Game and Inland Fisheries.

#### AESTHETIC IMPROVEMENTS

Trash in the river is a major impediment to enjoyable use for boaters, and can also have negative affects on wildlife habitat. Trash along the river above the dam and below the dam could be addressed by a more pro-active program to remove trash before it goes over the dam. AEP should evaluate any possible trash removal options, including partnerships with local organizations already working to improve the water quality of the river such as Roanoke County, Clean Valley Council, or the Blueway Committee.

Trash removal both above and below the dam is an important consideration going forward. The dam is a natural catch point, and installation of a trash boom upriver may help reduce the burden on AEP's existing machinery. Additionally, cleanups in the bypass reach cannot be coordinated without access through AEP property.

#### ENVIRONMENTAL STUDIES

While the Roanoke River Blueway Committee is primarily focused on recreational use of the river, several of our stakeholders are also actively involved in bettering water quality. Currently, the Roanoke River is considered an impaired stream by the Virginia Department of Environmental Quality, and the localities of the Cities of Salem and Roanoke, the County of Roanoke, and the Town of Vinton, are all required to address these impairments. Recreational use often depends on the perceived safety of being in the water. Additionally, activities such as fishing which may be undertaken by recreational users are dependent on the health of fish stocks.

#### PCBS IN SEDIMENT

Fishing both above and below the dam is impacted by PCBs in the river. While a study has been done of PCBs in the water column, no study exists of PCBs in the sedimentation behind the dam. The Roanoke River is listed as an impaired stream for PCBs.

The Roanoke River Blueway Committee requests that AEP further measure the PCBs in the sediment behind the dam, and consider methods of future remediation.

#### ENDANGERED FISH TRAVEL UPRIVER

Dams are an impediment to the breeding habits of certain fish species. The Blueway Committee would also endorse a study of any possible fish methods to address this impediment for the endangered Roanoke Logperch and other endangered or threatened species. Such a study would need to be shaped in partnership with the US Fish and Wildlife Service and the Virginia Department of Game and Inland Fisheries.



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Pennsylvania Field Office  
110 Radnor Road, Suite 101  
State College, Pennsylvania 16801-4850



May 28, 2019

Ms. Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First St., N.E., Room IA  
Washington, DC 20426

**RE: Niagara Hydroelectric Project (FERC No. 2466-034) Review of Scoping Document and Pre-Application Document, and Study Requests**

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the March 26, 2018 "NOTICE OF INTENT TO FILE LICENSE APPLICATION, FILING OF PRE-APPLICATION DOCUMENT (PAD), COMMENCEMENT OF PRE-FILING PROCESS, AND SCOPING; REQUEST FOR COMMENTS ON THE PAD AND SCOPING DOCUMENT, AND IDENTIFICATION OF ISSUES AND ASSOCIATED STUDY REQUESTS" for the Niagara Hydroelectric Project (FERC No. 2466-034) (Project). The Project is owned and operated by Appalachian Power Company (Appalachian), a unit of American Electric Power, and is located on the Roanoke River in Roanoke County, Virginia. The features associated with the Federal Energy Regulatory Commission (FERC; Commission)-licensed Project include a concrete ogee spillway dam creating a 62-acre reservoir, a metal pipe penstock with associated entrance and discharge structures, and a concrete powerhouse on the north end of the dam containing two generating units with a total installed capacity of 2.4 MW.

### **Comments on the Scoping Document**

**Section 3.1.1, Existing Project Facilities, page 7:** The bar-spacing on the steel trash racks is not specified. This information is important for evaluating fish entrainment and impingement potential. The Service is also interested in what the intake velocity is within 1 foot of the trash racks.

The Service would also appreciate more details pertaining to the two horizontal bulb turbines, such as runner diameter, rated speed (rpm), and number of blades/buckets.

**Section 3.2.2, Proposed Environmental Measures, page 8, Aquatic Resources:** Depending on results of requested studies (as noted below), the Service may be recommending revised and/or additional Protection, Mitigation and Enhancement (PM&E) measures.

**4.1.1, Resources that could be Cumulatively Affected:** The Service agrees with the suggested possible cumulative effects to water quality (i.e., dissolved oxygen (DO) and temperature) and aquatic habitat. We suggest that there may also be cumulative effects to the endangered Roanoke logperch (*Percina rex*) and other aquatic resources that would use the bypassed reach if it were sufficiently wetted and not sediment-starved, and the section of river above the Niagara Dam if it hadn't been converted to a lacustrine impoundment. The dam creates an impoundment, replacing riffle and run habitats that are important to aquatic resources. The same aquatic resources are affected by the Smith Mountain Hydroelectric Project dam which, in combination with the Leesville Dam, operates as a pumped storage project, with both dams creating very large impoundments that also eliminate riffle and run habitats. In addition, the John H. Kerr Dam Hydropower Project (Federal project not regulated by FERC), and the Gaston and Roanoke Dams that comprise the Roanoke Rapids and Gaston Hydroelectric Project, also create large impoundments that eliminate riffle and run habitats in the Roanoke River. All of these projects combine to greatly reduce available riffle and run habitats in the Roanoke River, cumulative effects to which the Niagara Project contributes.

Further supporting the case for cumulative effects, the Virginia Department of Game and Inland Fisheries (VDGIF) has stated that the Smith Mountain and Leesville dams and reservoirs have displaced over 85 miles of what they believe was former habitat in the center of the endangered Roanoke logperch's range. The Service and VDGIF also believe that those dams serve to physically and genetically isolate logperch populations in the upper Roanoke, Pigg and middle Roanoke Rivers. Roanoke logperch adults usually inhabit pools, runs and riffles, and select areas with exposed, silt-free gravel substrate. In the Roanoke and Pigg Rivers, adults were found primarily in runs and riffles (USFWS 2010). Young are usually found in slow runs and pools with clean sandy bottoms. Spawning occurs in deep runs over gravel and small cobble. They feed by flipping over stones and ingesting bottom-dwelling insects. Conversion of large stretches of the Roanoke River to impoundments, with sand, gravel and cobble substrates buried under accumulated silt, thus eliminating habitat for aquatic insects, has eliminated a significant portion of this logperch's former habitat.

Another species that has been impacted by the cumulative effects of multiple hydropower dams and reservoirs is the American eel (*Anguilla rostrata*). It is worth noting that the Niagara Dam was completed several decades prior to completion of any of the other downstream barriers and was, therefore, the first major barrier to upstream eel migration. Since 2009, efforts to trap and transport eels past the Roanoke Rapids Dam in North Carolina have resulted in the safe passage of over 2 million eels into Roanoke Rapids Lake (Sturke et al. 2018), demonstrating that there are large numbers of eels attempting to migrate upstream in the Roanoke River. Radio telemetry studies tracking some of these transported and released eels indicate that these eels are exhibiting natural upstream migratory behavior after release. Trap and transport past the upper dam into Lake Gaston began in 2010, and numbers passed into the upper impoundment have steadily increased each year since then. The U.S. Army Corps of Engineers (USACE) plans to provide, or may have already begun providing, eel passage at the John H Kerr Dam, depending on numbers of eels being passed into Lake Gaston. However, there are no eel passage facilities, or trap and transport efforts, at the Smith Mountain and Leesville dams, nor are there any such

facilities or efforts at the Niagara Project. The American eel's distribution in the Roanoke River at one time extended up into the headwaters ([Dominion 2010] *In* USACE 2016), prior to construction of dams. The Niagara Project contributes to cumulative effects on the American eel population in the Roanoke River.

Other species that historically migrated into the upper Roanoke, prior to dam construction, include the anadromous alewife (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*) [although land-locked herring are all now apparently hybrids of the two species]. The federally listed endangered Atlantic sturgeon and shortnose sturgeon also occur in the lower Roanoke River, and likely historically migrated far upriver, within the mainstem. Recent studies have documented a population of Atlantic sturgeon that migrate up the Roanoke River in late summer and spawn in September (Smith et al. 2015). In the free-flowing portion of the mainstem Delaware River, both species have been documented far upstream, well above (> 50 miles above) the head of tide. The Niagara Project has also contributed to the cumulative effects of multiple dams on the populations of these migratory species.

A list of threatened and endangered species of the Roanoke River Basin, compiled for the John H Kerr Dam and Reservoir Water Control Plan Final Environmental Assessment (USACE 2016) also includes freshwater mussels such as the green floater (*Lasmigona subviridis*), a species that is currently under review for possible Federal listing under the Endangered Species Act (ESA), the yellow lampmussel (*Lampsilis cariosa*), the Atlantic pigtoe (*Fusconaia masoni*), which has been proposed for listing as threatened under the ESA, and the brook floater (*Alasmidonta varicosa*), also under review for possible listing. The eastern elliptio (*Elliptio complanata*), a relatively common mussel species, also likely occurs in the lower Roanoke, as one of the most successful hosts for this species is the American eel. The barriers to upstream migration of migratory fish and associated dispersal of mussels they host has also led to a loss of important ecosystem services, as healthy mussel communities provide a very significant water filtering service. Providing passage at all of the barriers on the Roanoke River would undoubtedly lead to improved water quality which, in turn, would benefit the fish community and recreational angling. Therefore, the Niagara Project's contribution to cumulative water quality effects should also take into account its contribution to this lost or reduced ecosystem service.

**4.1.2, Geographic Scope:** The Service does not completely agree with the Commission's defined geographic scope. We believe that the many dams and hydropower projects on the Roanoke River combine to create cumulative effects on fish populations, freshwater mussels and other aquatic resources, as described above. In addition, because of the large number of stacked hydropower projects on the river, we believe the Commission should consider the Roanoke River from the upstream extent of the Niagara impoundment to the first hydropower project dam encountered on the river, Roanoke Rapids. The series of hydropower dams, described above, have caused cumulative impacts to the American eel population, affecting or preventing their upstream migration, and eels that do manage to find their way around these barriers are then, as outmigrating adults, subjected to turbine entrainment at multiple projects. Other migratory species (e.g., walleye) are also prevented from migrating upstream by multiple barriers and subject to entrainment through multiple powerhouses when migrating downstream. The conversion of large stretches of former riverine habitat (i.e., including riffle and run habitats) to

lacustrine conditions with benthic substrates (i.e., sand, gravel, cobble) buried under accumulated silt, is also a cumulative effect that extends down to the Roanoke Rapids Dam. This is a cumulative effect on a federally listed endangered fish species, the Roanoke logperch, which has eliminated much of its habitat within the river. The Niagara Project contributes to this cumulative effect, which extends well downstream of the Commission's suggested geographic scope.

**Section 4.2.4, Threatened and Endangered Species:** The Service agrees with this list of federally listed threatened and endangered species as potentially occurring in the vicinity of the Project. However, there are several state and federally listed mussel species that have the potential to occur in the Project area that should be added to this list including: Atlantic pigtoe, state threatened and proposed federally threatened; green floater, state threatened; and James spiny mussel (*Pleurobema collina*), federally and state endangered.

**Section 5, Proposed Studies, Table 1:** The Service will be requesting the following studies in addition to those listed: (1) Benthic habitat quality assessment in the bypass reach and downstream areas, (2) Aquatic habitat instream flow study in the bypass reach, (3) Aquatic macroinvertebrate/crayfish surveys, (4) Fish surveys including Roanoke logperch targeted surveys, (5) Fish protection and upstream and downstream passage studies, (6) Freshwater mussel surveys to be conducted by a qualified/approved surveyor, and (7) Entrainment and impingement study. The Service does not intend to request bat surveys unless there are proposed activities that may require tree/forest removal. It may be possible to combine some of these surveys. For example the Benthic habitat quality assessment could be combined with the Aquatic macroinvertebrate/crayfish surveys; the Entrainment and Impingement study could be combined with the Fish protection and upstream and downstream passage studies; and the Aquatic habitat instream flow study in the bypassed reach could be combined with Appalachian's proposed Bypass Reach Aquatic Habitat Study.

**Section 9.0 Comprehensive Plans:** The following comprehensive plan should be considered for this Project:

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2016. Roanoke River Diadromous Fishes Restoration Plan. Raleigh, North Carolina. May 2016.

There is currently considerable effort on the restoration of diadromous fish populations in the Roanoke River, including passage on many of the dams below this Project. Current efforts are focused on the upstream passage of juvenile American eels. As this restoration effort moves upstream there may be a need at some point within the timeframe of the license to evaluate whether passage is needed at this Project.

The Service will also consider filing the following plan for FERC's consideration as a comprehensive plan:

U.S. Fish and Wildlife Service (USFWS). 1992. Roanoke Logperch (*Percina rex*) Recovery Plan. Prepared by G.A. Moser, Annapolis Field Office, U.S. Fish and Wildlife Service,



Annapolis Maryland. Online [URL]:  
[https://ecos.fws.gov/docs/recovery\\_plan/920320a.pdf](https://ecos.fws.gov/docs/recovery_plan/920320a.pdf) (Accessed May 22, 2019).

### **Comments on the PAD**

**Section 4.2, Project Location:** This section states the Project is located at approximate river mile 355 on the Roanoke River. Figure 4.2-1 provides an overview of the Project location, setting, and Project boundary. This figure only shows the Project boundary extending as far downstream as just below the powerhouse. It is unclear how the downstream extent of the Project boundary was determined. The Project boundary should extend downstream to the extent of influence from the powerhouse and dam discharge. Without hydraulic modeling or a habitat assessment, the Service recommends that the project boundary extend a minimum of 1.6 km (1 mi) downstream of turbine discharge. This is the area that should be investigated as part of the relicensing studies.

**Section 4.3.3, Low-Level Outlets:** Appalachian should add more specificity regarding where the trash sluice and valves discharge to (i.e., they discharge to the bypassed reach).

**Section 4.3.5, Forebay and Intake:** This section states an intake structure is integrated into the left non-overflow section of the main dam. Flow to the penstock is controlled by five inlets equipped with steel head gates, each 6-feet 5-inches wide by 8-feet, 3-inches high. Steel trash racks with 3 5/8 inch clear bar spacing are inclined upstream of the headgates. To protect fish from entering the intake, Service's standards for water intake racks call for a 1-inch (0.75 inch if American eel is present) clear spacing and an approach velocity not exceeding 2 feet per second measured at a distance of 1 foot upstream of the trash tracks. Downstream fish passage options at the Project are currently limited to through the turbines, or passage over the dam at high flows or through the trash sluice at low flows. Passage over the dam is an option that may not be available year round and may not be safe depending on the depth of the plunge pool. If spillage over the dam is reduced as a result of operation of the Project, a large percentage of fish attempting to move downstream past the Project would be forced to travel through the turbines. This would put fish in danger of becoming entrained in the powerhouse turbines resulting in some injury or mortality. It is not clear what measures have been taken to reduce entrainment.

The use of horizontal bars on the trash racks has also been shown to exclude more fish than those with vertical bars having the same spacing, and impinged fish are also better able to escape trash racks with horizontal bars because their side-to-side movements are not restricted as they would be when impinged between vertical bars. There are also examples of trash racks with rounded bars which allow for tighter spacing with much less associated head loss. Sloped racks have demonstrated success in protecting fish from entrainment, particularly American eels. The Service recommends an entrainment study to assess impacts of entrainment on fish in the river (see Study Requests below).

**Section 4.3.7, Bypass Reach:** This section states the Project includes an approximately 1,500-foot-long bypass reach. An aerial view of the Project structures and bypass reach is provided in

Figure 4.3-1. This section further stated a continuous minimum flow of 8 cubic feet per second (cfs) is provided to the bypass reach when Project inflows are less than or equal to the powerhouse capacity. Based on the aerial view provided in Figure 4.3-1, it appears that much of the bypass reach is dry and would not support aquatic life. The Service would like to revisit this issue of minimum flow requirements in the bypass reach as part of the relicensing.

During periods where only the minimum flow is directed to the bypass reach and the remainder of the flow is directed to the powerhouse, the Service is concerned that fish do not have a viable route to move downstream. The Service requests a fish passage study to evaluate the potential for fish passage both upstream and downstream at different flow regimes (see Study Requests below). We are also concerned with water quality (primarily temperature and DO) during these low flow periods. The Service supports the proposed water quality study to evaluate water quality both upstream and downstream of the Project, including in the bypass reach.

**Section 4.3.9, Turbines and Generators:** This section states the Project is equipped with two vertical shaft Francis units. Mortality rates of fish passing through Francis turbines are quite variable and frequently greater than those of fish passing through Kaplan turbines (EPRI 1992). For Francis turbines, Eicher (1987) reviewed 22 previous studies and found the reported fish mortality ranging from 5% to 50%. (*In* Fu et al. 2016). The Service recommends an updated entrainment study to assess impacts to fish.

**Section 4.4.1, Current and Proposed Operations:** This section states Article 403 requires Appalachian to provide a minimum flow of 8 cfs into the bypass reach as measured by the gage immediately downstream of the Project's dam, which is operated and maintained by USGS. This gage is not in the bypass reach but in the mainstem of the river, and there does not appear to be a gage in the bypass reach, thus it is unclear whether the flow in the bypass reach is directly measured or calculated. This should be clarified including what was included in the plan required under Article 404 of the license to file a plan to monitor and record flow required under Article 403 (maintaining 8 cfs in the bypass reach).

**Table 4.4-2, Monthly and Annual Average Project Outflows (cfs) (2010-2015):** The Service questions whether Project Outflow data covering only a 6-year period is truly representative of average Project outflows. Monthly average outflows may be changing with climate change, but we are interested in a longer period of record for understanding monthly average outflows and how they affect flows (i.e., spillage) to the bypass reach. Below is a table comparing the average monthly outflows provided in this section of the PAD (2010-2015) to the average monthly outflows from the period of record (1926-2018), obtained from USGS Gage 02056000 Roanoke River at Niagara, VA. The monthly averages are similar, although less flow was provided to the bypass reach over the period of record, compared to the 2010-2015 period and, whereas the 2010-2015 data indicate some additional flow to the bypass reach during the month of May, when some fish and mussels species are spawning, there is generally no additional flow, on average, to the bypass reach during the month of May, based on the period of record.

**Table Comparing Monthly Outflows from the Period of Record (1926-2018) to Monthly Outflows from 2010-2015, and Associated Flows to the Bypass Reach (assumes additional flow to bypassed reach only when inflow exceeds hydraulic capacity).**

Month	2010-2015 Average Outflow (cfs)	Bypass Reach (2010-2015) – Excess (Outflow minus 684* + 8 cfs)	1926-2018 Average Outflow	Bypass Reach (1926-2018) Excess + 8 cfs
January	525	8 cfs	619	8 cfs
February	584	8 cfs	754	78 cfs
March	926	250 cfs	876	200 cfs
April	888	212 cfs	819	143 cfs
May	754	78 cfs	592	8 cfs
June	402	8 cfs	437	8 cfs
July	592	8 cfs	313	8 cfs
August	248	8 cfs	325	8 cfs
September	370	8 cfs	340	8 cfs
October	397	8 cfs	357	8 cfs
November	436	8 cfs	383	8 cfs
December	706	30 cfs	489	8 cfs
Annual Avg	569	8 cfs	525	8 cfs

\*Total Project Hydraulic Capacity from PAD

**Table 5.3-1, Daily Flow Data:** The dates for the period corresponding with the presented data are not provided. The average flows do not match those of the period of record provided by the Service in the above table, and they differ enough that these data likely do not correspond with a significant portion of the period of record. The dates should be provided.

**5.3.3, Flow Duration Curves:** Flow duration curves are provided in Appendix E. The scale for flow depicted on the y-axis of these curves does not allow for much interpretation or visualization of what percentage of time the flows are within Project hydraulic capacity versus when flows are above that capacity. The Service would be interested in a finer resolution presentation of flow duration, relative to hydraulic capacity.

**Section 5.3.6, Federally Approved Water Quality Standards:** This section states Project waters are designated as Class IV waters and the minimum DO and daily average DO water quality criteria are designated as 4.0 mg/L and 5.0 mg/L, respectively.

It is the Service's position that the DO criteria (minimum DO level of 4.0 mg/L; average DO minimum of 5.0 mg/L per day) are not fully supportive of optimal growth conditions for many fish and other aquatic species. A literature review by Chamberlain et al. (1980) found that

largemouth bass experienced reduced larval growth at 6 mg/L (temperature: 20-23 degrees C), and juvenile swimming speed was reduced at DO concentrations of < 5.0-6.0 mg/L (temperature = 25 degrees C). Carlson and Siefert (1974) concluded that DO concentrations up to 6.3 mg/L reduced the growth of early stages of the largemouth bass by 10 to 20 percent. Stewart et al. (1967) observed reduced growth of juvenile largemouth bass at 5.9 mg/L and lower concentrations, with significant growth reductions at concentrations below 5.5 mg/L.

In general, prolonged exposure to 4 mg/L causes acute mortality in many invertebrates and non-salmonid fish embryos (Gray et al. 2002). Severe production impairment of early-life-stage non-salmonid species occurs when oxygen falls below 4.5 mg/L (EPA 1986). The Habitat Suitability Index Model for largemouth bass considers a DO concentration of 5-8 mg/L as providing a suitability of 80 percent during midsummer within pools or littoral areas, and a concentration > 8 mg/L as being optimal (suitability rating of 100 percent) (Stuber et al. 1982). Optimal DO concentration for walleye spawning and embryo development is  $\geq 6.5$  mg/L (McMahon et al. 1984). Therefore, the optimal DO growth range is more likely  $\geq 6.5$  mg/L for target fish species.

**Section 5.3.7, Existing Water Quality Data:** This section states that the existing water quality data suggest that inflows to and outflows from the Project meet numeric water quality standards. This section further states that no water quality data are available specifically for the Project reservoir or bypass reach. This represents a data gap that will need to be addressed as part of the water quality study. This section also states that VDEQ collects water quality data along the mainstem of the Roanoke River and the nearest sampling point to the Project is located approximately 480 feet downstream of the powerhouse. Sampling at this location found that DO concentrations ranged from 7.6 mg/L to 14.4 mg/L. However, no data are available between the powerhouse and this sampling location. This data gap will also need to be addressed as part of the water quality study. The Service is particularly interested in water quality during low flow conditions in the summer and fall when water temperatures are high and DO can be low. The Service is also interested in whether the presence of the reservoir raises the temperature in the river compared to the free-flowing river upstream of the Project.

**Section 5.4.1.2, Bypass Reach:** This section states that during evaluation of the minimum bypass flow for the previous relicensing, VDGIF indicated that their goals were not to establish a permanent fishery habitat but to provide enough flow to aid fish that have travelled into the bypass reach during spills in their return to the downstream channel. It is time to revisit this goal and determine whether creating permanent fishery habitat is a viable goal for the upcoming relicensing. Fish habitat at different flows should be evaluated as part of the bypass reach study.

We would also like to note that there is at least one record of the current goal of avoiding fish stranding and fish kills not being attained, as reported by VDGIF. In April 2012, there was a high water event that ended rather abruptly, such that flows in the bypass reach went from fairly substantial to the minimum in a short amount of time. Apparently during the high flows, a very large number of adult redhorse and other species moved up into the bypass reach, below the dam, and did not move back downstream with the receding flow. Under the current minimum flow, there was not enough water to support this large biomass of fish, resulting in a significant fish kill (almost all redhorse). There was pool connectivity, but the fish did not leave the deeper

pools via the shallow connections to get back to the main channel. The minimum flow to the bypass reach was not sufficient to maintain adequate DO concentration or temperature for the extremely high biomass present in the pools (Scott Smith, VDGIF, personal communication, May 7, 2019). This was the only fish kill event that VDGIF is aware of during the current license term, but suggests that the current required minimum flow is not sufficient to prevent fish kills under all possible scenarios. The Service is interested in a goal of maintaining suitable habitat for all aquatic species throughout the year, at densities similar to those observed in free-flowing reaches of the main channel (e.g., upstream of the Project reservoir and downstream of the extent of Project effects).

**Section 5.4.1.3, Tailrace (Below Powerhouse):** This section states that potential effects of Project operations on tailwater habitat were evaluated with respect to erosional and depositional considerations, spring spawning habitat, and low-flow summer habitat during the previous relicensing in 1990. The section further states based on field observations during various flows, a flow of 28 cfs was determined to be adequate for fish habitat. This flow to the tailrace should be revisited as part of the current relicensing to determine whether all goals for fish habitat are being met. Of particular concern for the Service is whether the habitat immediately downstream of the Project is starved of sediment, which will limit the suitability of this reach for fish and other aquatic organisms.

**Section 5.4.2, Existing Fish and Aquatic Resources:** This section states that fish surveys were conducted six times, twice in June and September and once in July and October. Other than the October survey, all surveys were conducted during the warmer parts of the year when water temperatures are high. This may affect the number of species found and their relative abundance, as some species are more difficult to sample or detect at high water temperatures, particularly in the reservoir where fish go deeper during these warmer months. It would be beneficial to sample during the spring and later in the fall to assess whether additional species are present or relative abundance varies with water temperature.

It is also stated that fish passage facilities are not available at downstream facilities and diadromous fish are not present at the Smith Mountain Project; therefore, it is unlikely diadromous fish are present at the Project. This information should be updated. The two most downstream dams on the Roanoke River (Roanoke Rapids and Lake Gaston) are currently required to provide passage for American eels as part of the recent relicensing. The resource agencies are also working with the Corps of Engineers to facilitate eel passage at the Kerr Dam. Eels are currently being trapped and transported above the Roanoke Rapids and Gaston Dams. As this effort progresses upstream, eels may eventually be able to reach the upper Roanoke River.

**Table 5.4-1, Fish Collected in Niagara Reservoir in 1990:** This table shows four Roanoke logperch were collected in the reservoir, but according to Section 5.4.2, the logperch were collected in an upstream riffle/run site. This should be clarified, given the species' endangered status and the Service's interest in determining potential for this species to become entrained in Project turbines.

**Section 5.4.2.1, Entrainment:** This section states the calculated intake velocities at upper and lower normal forebay operating elevations at the Project ranged from 0.9 to 1.2 feet/sec, which is very similar to the current velocity of the free-flowing portion of the Roanoke River. Therefore, the intake velocities would be easily avoided by most fish. This conclusion does not take into account the migratory behavior of some species and, therefore, the potential for such species to be attracted to the intake flow as they attempt to move downstream, particularly when this is the only viable downstream migration route when flows are low and no spillage is occurring over the dam. It is unclear whether the previous entrainment study evaluated potential risk to migratory species.

The turbine blade strike analysis was based on Cada (1990), which is out of date. The Service's Fish Passage Engineering group and others have developed turbine blade strike analyses based on a more updated study by Franke et al. (1997). In addition, the fish community may have changed over the past 30 years. Therefore, the Service is requesting a new entrainment study.

**Section 5.4.4, Temporal and Spatial Distribution of Fish Communities:** This section states that catch rates of most species within reservoir sites were statistically equivalent or greater than catch rates at the upstream riffle/run site. However, most surveys were conducted during summer (i.e., high water temperature) conditions, which may have influenced spatial distribution of some fish species. It is also stated that recent comprehensive temporal or spatial distribution data is not readily available for the fish communities within the vicinity of the Project. This provides justification for updated fish surveys as the fish community may have changed over the past 30 years. As previously stated, surveys should not be limited to summer/warm water conditions, and should be conducted during the spring, summer and fall seasons. The Service may also consider requesting a winter survey focusing on potential for Roanoke logperch to occur within the Project reservoir during this season, as the species is believed to occur under boulders in deep pools during the winter (USFWS 1992).

**Section 5.4.7, Freshwater Mussels:** This section states seven mussel species have been known to occur within a 3-mile radius of the Project. This list is shown in Table 5.4-2. The table includes Atlantic pigtoe (*Fusconaia masoni*) identified as state threatened and the yellow lance (*Elliptio lanceolata*). The Atlantic pigtoe is proposed for Federal listing as threatened. The yellow lance is currently federally listed as a threatened species. This section and table should be updated to reflect the updated status of these two mussel species. The Service questions the inclusion of the Carolina slabshell mussel (*Elliptio congaraea*) in this list. There is also some uncertainty regarding inclusion of the yellow lance, but we defer to VDGIF regarding the potential for these species to occur in the vicinity of the Project. According to VDGIF, other species that may potentially be found within or downstream of the Project area include the Roanoke slabshell (*Elliptio roanokensis*), yellow lampmussel (*Lampsilis cariosa*), green floater (*Lasmigona subviridis*) which is currently under review for possible Federal listing, Eastern floater (*Pyganodon cataracta*), and paper pondshell (*Utterbackia imbecillis*). There is also a remote possibility for the occurrence of the federally listed endangered James spinymussel (*Pleurobema collina*), which occurs in the Dan River, a major Roanoke River tributary. Due to the potential presence of rare and federally listed mussels, a mussel survey in the Project area is warranted.



**Section 5.5.2.2, Avifauna:** This section summarizes bird species that occur in Virginia. Our records indicate that there is a bald eagle nest (as of 2014) approximately 1.5 miles downstream of the Project. Other bald eagle nests may occur within or near the Project boundary. The bald eagle was removed from the Federal Endangered Species List on August 8, 2007, and is no longer protected under Section 7 of the ESA; however, bald eagles are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). If bald eagles are present in the Project area, we recommend that you follow the Service's Bald Eagle Management Guidelines. These guidelines, as well as additional eagle information, are available on the Service's website.<sup>1</sup> To assist you in making a decision regarding potential impacts to bald eagles, a screening form can also be found on the Service's website.<sup>2</sup>

**Section 5.5.2.4, Invasive Terrestrial Species:** This section only provides a general list of invasive plant species that occur within the State. No site-specific survey of invasive plant species has been performed. It is unclear why monitoring of invasive plant species is not included as part of the Wildlife Management Plan in Article 407, as the monitoring and control of invasive plant species is important for maintaining healthy wildlife populations. It is preferable to monitor and implement control measures before invasive plants become widespread. The Service noted several invasive plants along the access road to the Project during the site visit on April 24, 2019. The disturbed nature of the site, particularly around the structures makes the site susceptible to invasion by invasive plants. The Service recommends monitoring and control of invasive plant species be included as part of the Wildlife Management Plan.

**Section 5.7.1, Federally Listed Threatened, Endangered, and Candidate Species:** This section states that the Service indicated in a letter dated August 14, 2017, that the federally endangered Indiana bat and Roanoke logperch, as well as the federally threatened northern long-eared bat, may occur within the Project vicinity. Since the Service provided these comments, the yellow lance was federally listed as a threatened species on April 3, 2018, although there is some uncertainty as to the potential for this species to occur in the Project area. The Atlantic pigtoe was also proposed to be listed as a threatened species on October 11, 2018, and the green floater is also under review for possible Federal listing. The James spinymussel also has the potential to occur within or near the Project area. Because no recent mussel surveys have been completed in this section of the Roanoke River, mussel surveys are needed to assess whether these species are present.

**Table 5.7-1, Rare Species with Historical Records at or within the Project Vicinity:** The American eel is listed as a species potentially at or within the Project vicinity. Appalachian should provide additional information on the potential presence of this species at the site. The Service is currently working to restore populations of this migratory species, primarily through the development of upstream passage for juvenile eels at dams. The current status of this species in this section of the Roanoke River should be discussed to better understand potential Project effects on migration. This table also lists the bog turtle as potentially occurring within the

<sup>1</sup> <http://www.fws.gov/northeast/EcologicalServices/eagle.html>

<sup>2</sup> <http://www.fws.gov/northeast/EcologicalServices/eagleguidelines/constructionnesting.html>

Project vicinity. Additional information should also be provided on this species to determine if additional consideration should be given to assessing potential Project impacts to this species.

**Section 5.8, Recreation and Land Use:** The Service did not have time to review this section of the PAD, but we have discussed the need for recreational (e.g., access) and aesthetic (e.g., flows to the bypass reach) improvements with our sister agency, the National Park Service (NPS), and we defer to the NPS and support their recommendations.

**Section 6.2.1.2, Proposed Studies:** This section states Appalachian does not propose to conduct a sedimentation study for this relicensing. In addition, Appalachian does not expect there is a need or management objective to transport sediment below the dam. The Service does not support this position. A sediment study is needed to understand how the dam may affect sediment transport and its potential impacts to areas downstream of the dam, including the bypass reach. The trapping of sediment behind dams can result in a significant decrease in sediment in downstream areas resulting a wider channel, lower habitat diversity, and lower quality habitat for fish and benthic invertebrates. An understanding of sediment transport within the system is needed to fully evaluate how operations have affected the river. A study request to assess sediment habitat in downstream areas is provided below.

**Section 6.2.2.2, Proposed Studies:** This section states Appalachian proposes to conduct a seasonal temperature and DO study to confirm compliance with water quality standards and designated uses. The Service supports performing a water quality study and would like to work with Appalachian on the development of the study plan. As stated previously, the Service does not believe the current water quality standards for DO are protective of all fish life-stages. A higher DO concentration is recommended to protect aquatic life.

**Section 6.2.3.1, Potential Issues:** Regarding Appalachian's statement that fish passage facilities are not available at downstream facilities, as previously discussed, there is currently an active trap and transport program for passing American eels above the Roanoke Rapids and Gaston Dams, and a plan in place for the U.S. Army Corps of Engineers to begin passing eels above the John H. Kerr Dam, which may have been implemented by now.

**Section 6.2.3.2, Proposed Studies:** This section states Appalachian proposes to determine the amount of available habitat under the minimum flow of 8 cfs. While the Service supports this evaluation, an instream flow evaluation of aquatic habitat in the bypass reach is also recommended to assess the amount of potential aquatic habitat that is lost with the current minimum flow and how much habitat could be gained by increasing the minimum flow released over the dam. Based on the photographs provided, it appears the bypass reach is not fully wetted at this minimum flow and the available habitat could be increased with additional flow. As previously discussed, there has also been at least one significant fish kill in the bypass reach during the current license term, illustrating the inadequacy of the currently required minimum flow to attain the goal of preventing such events. A study request to assess the minimum flow is provided below.

This section also states that Appalachian does not propose to conduct a desktop entrainment study at this time, because a detailed entrainment study was conducted for the previous relicensing, and because there have been no significant changes in Project equipment or operations since that time. The Service believes it is premature to make this determination. Because the previous entrainment study was conducted almost 30 years ago, the assumptions and reference studies used do not consider information collected since the last relicensing. In addition, the fish community information was based on surveys conducted during only the summer and early fall and, as such, it is unclear whether the evaluated fish species, including migratory species, or their relative abundance, were representative of the current fish community across all seasons. The requested fish surveys (below) may find rare or sensitive species that were not evaluated as part of the previous entrainment study. These would need to be included in an updated entrainment study. As previously discussed, the turbine blade strike analysis was based on Cada (1990), which is out of date. The Service's Fish Passage Engineering group and others have developed turbine blade strike analyses based on a more updated study by Franke et al. (1997).

This section does not propose benthic macroinvertebrate/crayfish, fish or mussel surveys for this Project. The Service does not support this position. Benthic macroinvertebrate/crayfish, fish and mussel surveys in the vicinity of the Project have either not been performed or are out of date. The Service recommends updated surveys to better understand the resources in the vicinity of the Project and how those resources may be affected by the Project operations. The fish surveys should include methods for documenting the Roanoke logperch, across all seasons, so that the current distribution, both upstream and downstream of the Project, can be assessed.

**Section 6.2.4.2, Proposed Studies:** This section states that because botanical and wildlife species are likely well-established under the current and proposed operations of the Project facilities, the existing Wildlife Management Plan has provided a means for monitoring habitat over the term of the existing license, and Appalachian does not currently propose any activities at or changes to the Project that would impact habitat, no formal study is being proposed for wildlife and botanical resources. The Service agrees with the proposal to not conduct a botanical study. However, we do recommend invasive plant monitoring (and invasive plant control if needed) be implemented as part of the Wildlife Management Plan.

**Section 6.3, Potential Studies or Information Needs List:** This section lists the studies that are proposed. The Service recommends additional studies including: benthic habitat quality assessment, aquatic habitat instream flow study for the bypass reach, aquatic macroinvertebrate/crayfish surveys, fish surveys, a mussel survey, and an upstream/downstream fish passage study. An updated entrainment study is also requested, as the previous study is likely out of date, and relied on an out-of-date turbine blade-strike analysis. Study requests addressing the seven required criteria are provided below.

**Section 7, Comprehensive Plan:** This section lists the comprehensive plans considered applicable to the Project. The following comprehensive plan should also be considered for this Project:

National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2016. Roanoke River Diadromous Fishes Restoration Plan. Raleigh, North Carolina. May 2016. [The Service recently brought this comprehensive plan to FERC's attention, via email sent to Allyson Conner on 5/10/2019, for consideration during this relicensing process]

There is currently considerable effort in the restoration of diadromous fish populations in the Roanoke River, including passage on many of the dams below this Project. As this restoration effort moves upstream there may be a need at some point to evaluate whether passage is needed at this Project.

In addition, the Service will be requesting treatment of the following plan as a comprehensive plan:

U.S. Fish and Wildlife Service (USFWS). 1992. Roanoke Logperch (*Percina rex*) Recovery Plan. Prepared by G.A. Moser, Annapolis Field Office, U.S. Fish and Wildlife Service, Annapolis Maryland. Online [URL]: [https://ecos.fws.gov/docs/recovery\\_plan/920320a.pdf](https://ecos.fws.gov/docs/recovery_plan/920320a.pdf) (Accessed May 22, 2019).

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Chamberlain, A.J., T. Kellar, and D. Maraldo. 1980. Water Quality Requirements for Sport Fishes of the Grand River Watershed: A Literature Review. Grand River Water Management Study Technical Report Series, Report # 13. Ontario Ministry of Natural Resources, Ontario, Canada.

Eicher Associates. 1987. Turbine-related Fish Mortality: Review and Evaluation of Studies. Electric Power Research Institute, Palo Alto, California. EPRI AP-5480.

EPA. 1986. Quality Criteria for Water. EPA: 440/5-86-001.

EPRI. 1992. Fish Entrainment and Turbine Mortality Review and Guidelines. TR-101231. Gray, J.S., R.S. Wu, and Y.Y. Or. 2002. Effects of hypoxia and organic enrichment on the coastal marine environment. Mar Ecol Prog Ser 238: 249-279.

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## Study Requests:

### I. Benthic Habitat Quality Assessment in the Bypass Reach and Downstream Areas

The Service is requesting an assessment of the quality of benthic habitat in the bypass reach and areas downstream of the Project. The placement of dams in rivers and streams affects sediment transport processes. This typically results in reaches below dams being: (1) starved of certain sediment types; (2) less diverse instream and floodplain habitat; (3) stream bank erosion and channel degradation leading to a wider, deeper stream or river channel; and (4) lower quality

habitat for benthic invertebrates (including mussels) and fish. The Service is interested in an assessment of the quality of benthic habitat in the bypass reach and downstream areas compared to an upstream reference reach that is unaffected by the Project.

### 1. *Goals and Objectives*

One objective of the study would be to assess the amount and type of benthic habitat in the bypass reach and downstream area. The goal would be to determine how much habitat could be gained by increasing the sediment released downstream. Information that should be obtained would include the sediment grain size and depth in representative habitats and the percentage area of different benthic habitat types (e.g., cobble, gravel, sand, bedrock). This information would be compared to an upstream reference reach to determine the impact of the Project on sediment transport and benthic habitats in the bypass reach and the affected reach of the main channel river, downstream of the Project.

### 2. *Resource Management Goals*

The resource management goal would be to assess whether the Project is affecting the benthic habitat in the bypass reach and downstream areas and, if the Project is having an effect, determine how to increase the quality and diversity of benthic habitats downstream of the Project in order to support a greater diversity and abundance of aquatic species. An additional goal would be to increase available habitats for the rare, threatened and endangered (RTE) species that are expected to occur in the Roanoke River, but are limited by the lack of appropriate benthic habitat. Habitat use by the Roanoke logperch varies with age in the Roanoke River. According to the Updated Recovery Plan for the Roanoke logperch, age 1+ logperch primarily use deeper areas (15-74 cm), with medium to high water velocities, often directly over gravel substrate in areas dominated by cobble. Burkhead (1983) witnessed four spawnings in the upper Roanoke River when the water was between 12-14°C. These spawnings took place in swift, deep runs over gravel and small cobbles. Lack of appropriate sediment types in the river can affect whether logperch can use the area and successfully reproduce.

### 3. *Public Interest*

The requestor is a resource agency.

### 4. *Existing Information*

The Service is not aware of any previous assessment of the benthic habitat in the bypass reach or downstream areas.

### 5. *Nexus to Project Operations and Effects*

The presence of the Project dam changes the transport of sediment in the river. This may result in areas immediately downstream of the dam being starved of certain types of sediment which, in turn, may decrease the habitat available for RTE species and other benthic species that rely on



high quality benthic habitat to survive and reproduce. Project operations also cause scouring downstream of the powerhouse, also resulting in a lack of sand and gravel substrates.

## 6. *Methodology Consistent with Accepted Practice*

The characterization of sediment grain size, depth of depositions and habitat types can be accomplished with standard methods. There are a number of accepted pebble count methods that can be applied to an upstream reference reach, the bypass reach, and the affected main channel reach downstream of the Project, in order to compare the particle size distributions in these reaches. The Service would be interested in discussing possible methods with Appalachian and interested stakeholders. Some of the accepted methods include:

Leopold, L.B. 1970. An improved method for size distribution of stream-bed gravel. *Water Resources Research*. 6(5):1357-1366.

Wolman, M.G. 1954. A method of sampling coarse river-bed material. *Transactions American Geophysical Union*. Volume 35. Number 6. Pp. 951-956. See also:

[https://andrewsforest.oregonstate.edu/sites/default/files/lter/data/studies/g002/Wolman\\_Pebble\\_Count.pdf](https://andrewsforest.oregonstate.edu/sites/default/files/lter/data/studies/g002/Wolman_Pebble_Count.pdf) or  
[https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent\\_object\\_id=1271&object\\_id=1274#1274](https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=1271&object_id=1274#1274)

Methods used by West Virginia Department of Environmental Protection:

<https://dep.wv.gov/WWE/getinvolved/sos/Pages/SOPpebble.aspx>

## 7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort would be moderate and could be combined with benthic invertebrate/crayfish, fish, and/or mussel surveys, although benthic substrate characterizations associated with such surveys would generally be more subjective, compared to the suggested methods listed above. If combined with other studies, cost should be low.

Burkhead, N.M. 1983. Ecological studies of two potentially threatened fishes (the orangefin madtom, *Noturus gilberti*, and the Roanoke logperch, *Percina rex*) endemic to the Roanoke River drainage. Report to Wilmington District Corps of Engineers, Wilmington, NC.

U.S. Fish and Wildlife Service. 2007. An update to the Roanoke Logperch Recovery Plan.

Hadley, Massachusetts. 84 pp. Online [URL]:

[https://www.fwspubs.org/doi/suppl/10.3996/032015-JFWM-026/suppl\\_file/10.3996\\_032015-jfwm-026.1.s11.pdf](https://www.fwspubs.org/doi/suppl/10.3996/032015-JFWM-026/suppl_file/10.3996_032015-jfwm-026.1.s11.pdf) (Accessed May 22, 2019).

## II. Aquatic Habitat Instream Flow Study in the Bypass Reach

The Service requests an instream flow study in order to determine an appropriate minimum flow

or range of flows (i.e., monthly or seasonal) for meeting the water quality and physical habitat requirements of aquatic species found in the mainstem Roanoke River downstream of the Project. The study should utilize Acoustic Doppler Current Profiler (ADCP) technology and a 2-dimensional (2-D) hydraulic model, coupled with the Physical Habitat Simulation Model (PHABSIM). Alternative approaches may not be sufficient for accurately and quantitatively evaluating a range of possible minimum flows. The Service also recommends consideration of providing not just one minimum flow, but a range of minimum flows (e.g., monthly or seasonally) that mimic the natural seasonal flow variability to which many aquatic species and life stages have adapted. The Service requests a collaborative approach among Appalachian, Virginia Tech, and the resource agencies, to determine the best approach.

# *1. Goals and Objectives*

The primary objective of the study is to identify a bypass reach minimum flow, or range of monthly or seasonal minimum flows, that will support the aquatic species and life stages found in the non-impacted mainstem river downstream of the Project. The goal of the study is to ensure that sufficient flow is provided to the bypass reach, at all times, to meet the habitat requirements of all aquatic species and life stages found downstream of the Project. In order to achieve this goal, additional objectives include selecting a suite of representative species, guilds and life stages for which habitat suitability curves (HSCs) exist or can be developed, and calculating the amount of available habitat for each under a range of flows. This typically involves defining the wetted perimeter and calculating the weighted usable area (WUA) for selected species and life stages representing specific guilds (e.g., shallow fast) at different modeled or demonstrated flows.

Additional objectives include modeling or measuring water depth and velocity through the bypass reach at the different flows, for comparison with HSCs, and quantifying the degree of wetted perimeter and pool connectivity at each evaluated flow. In order to model velocity at different flows, we recommend computational fluid dynamics modeling, which would complement one of the objectives in Virginia Tech's recent study request, although use of ADCP technology during demonstration flows may accomplish the same objective. The Service also requests (1) in-situ monitoring of water quality parameters (i.e., DO, temperature) along established transects under a range of demonstration flows, and (2) pebble counts along these transects in order to determine substrate suitability for meeting spawning and other habitat requirements of selected species. These two objectives could be combined with other requested studies (e.g., water quality study; the Benthic Habitat Quality Assessment, above).

This study should also include an objective for evaluating the macroinvertebrate and crayfish community within the bypass reach, and determining an appropriate flow that will support this community. We recommend the VDEQ's Virginia Stream Condition Index (VSCI) approach for achieving this goal. The Service has also requested a separate macroinvertebrate/crayfish study (below), so it may be possible to combine this aspect of the study with that study.

## 2. *Resource Management Goals*

Resource management goals include: (1) increasing the abundance and species diversity of aquatic life in the bypass reach; (2) ensuring that flows to the bypass reach provide suitable habitat conditions (including DO and temperature) at all times for species found in the non-impacted mainstem downstream of the Project; and (3) increasing available habitat for RTE species that are expected to occur in the Roanoke River, including the Roanoke logperch.

## 3. *Public Interest*

The requestor is a resource agency.

## 4. *Existing Information*

As stated in Section 5.4.1.2, the goal of the minimum flow was not to establish a permanent fishery habitat but to provide enough flow to aid fish that have travelled into the bypass reach during spills in their return to the downstream channel. No hydraulic modeling or detailed flow study was performed to determine the minimum flow, and under the current license there has been at least one documented fish kill (see PAD Section 5.4.1.2. comments), demonstrating the inadequacy of the current minimum flow requirement.

## 5. *Nexus to Project Operations and Effects*

The Project utilizes a 500 foot long penstock resulting in a bypass reach of approximately 1,500 feet. A minimum flow of only 8 cfs is provided to the bypass reach. This results in much lower flows (approximately 1-2.5% of monthly average inflow) in the bypass reach compared to the rest of the river.

## 6. *Methodology Consistent with Accepted Practice*

All of the methodologies suggested for consideration are industry-accepted and commonly applied practices in hydropower licensing and relicensing activities. The 2-dimensional modeling approach is preferred for the evaluation of the bypass flow needs, and coupled with the PHABSIM software, this approach would provide an accurate quantitative assessment of changes in available habitat over a wide range of flows. If demonstration flows are provided as part of this study, then photo documentation of each targeted flow should be provided at established stations, and ADCP technology should still be utilized to develop the bathymetry for calculating WUA for selected species/guilds under the different evaluated flows. The VDEQ's VSCI methodology for assessing the health of the macroinvertebrate community is a standard methodology used in Virginia.

## 7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort and cost will depend on the chosen methodologies, but this type of study is very common in hydropower project relicensing activities. An alternative Delphi (observation of

demonstration flows) approach would be subjective and insufficient for determining an appropriate minimum flow, or range of flows, to meet aquatic resource management goals in the bypass reach. A Delphi approach was used for the previous relicensing, and the resulting selected minimum flow proved to be insufficient to avoid fish kills under all possible scenarios. Alternative approaches are also insufficient for determining the needs of the full suite of fish and other aquatic species found in the Roanoke River, including those of the Roanoke logperch. The Service has requested a collaborative process for choosing methodologies that are acceptable to Appalachian and all interested stakeholders.

### III. Aquatic Macroinvertebrate/Crayfish Surveys

Appalachian does not propose to conduct aquatic macroinvertebrate species/life stage surveys. The Project contributes to the disruption of the aquatic/lotic habitat longitudinal continuum, hindering the natural downstream movement of sediment, particulate matter, nutrients, aquatic species and plant propagules. These effects may result in reduced invertebrate density, species richness, and invertebrate community evenness (Bilotta et al. 2017) in the Project impoundment, bypass reach and downstream reaches. A healthy macroinvertebrate community, including native crayfishes, is important to the aquatic food web and the fish community.

#### 1. *Goals and Objectives*

The objectives of this requested study are to compare the occurrences and abundance of crayfish and other macroinvertebrates within the Project boundary with upstream and downstream reference locations. The goal of the study is to determine what the Project effects are on the aquatic macroinvertebrate community.

#### 2. *Resource Management Goals*

The resource management goal of the study is to determine what the Project effects are on the aquatic macroinvertebrate community in order to identify potential protection, enhancement and mitigation measures that could, in turn, benefit the local fish community, including the federally listed endangered Roanoke logperch, which feeds primarily on bottom-dwelling aquatic/larval insect life stages.

#### 3. *Public Interest*

The requestor is a resource agency.

#### 4. *Existing Information*

According to PAD Section 5.4.6, macroinvertebrate sampling has been conducted by the Virginia Department of Environmental Quality (DEQ) along the mainstem of the Roanoke River downstream of the Project. However, based on the limited description of this sampling effort, it is not clear how much of the Project area was sampled or if the study area included the bypass reach. In addition, it is unclear whether reference locations, unaffected by the Project, were

sampled. The DEQ effort did not include any areas upstream of the Project dam. According to the PAD, the community was dominated by net-spinning caddisfly larvae and midges. There was low taxa richness and diversity as well as a low number of pollution-sensitive taxa (i.e., mayflies and stoneflies). Crayfish apparently were not sampled. The Service has not had time to review the full DEQ report cited in the PAD, but, based on this summary, the study did not provide the necessary information for determining Project impacts on the macroinvertebrate/crayfish community.

## 5. *Nexus to Project Operations and Effects*

The Project contributes to the disruption of the aquatic/lotic habitat longitudinal continuum, hindering the natural downstream movement of sediment, particulate matter, nutrients, aquatic species and plant propagules. These effects may result in reduced invertebrate density, species richness, and invertebrate community evenness (Bilotta et al. 2017) in the Project impoundment, bypassed reach and downstream reaches. A healthy macroinvertebrate community, including native crayfishes, is important to the aquatic food web and the fish community, including the federally listed endangered Roanoke logperch.

## 6. *Methodology Consistent with Accepted Practice*

The VDEQ's VSCI methodology is a commonly used and accepted approach for this type of study. Haag et al. (2013) and Williams et al. (2014) also describe field methods commonly used for collecting macroinvertebrates and crayfish. Crayfish and macroinvertebrate surveys were also recently conducted by Virginia Tech in support of the Fries Hydroelectric Project (FERC #2883) relicensing.

## 7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort would involve one field crew sampling during the spring (April-May) and late summer (August-September). It may be possible to combine the spring portion of this study with the requested spring Roanoke logperch/fisheries study. The level of effort is expected to be moderate. The Service is unable to estimate the costs of the study which may vary considerably depending on whether or not this survey can be combined with the fisheries study, and the chosen methodology which may be constrained by Appalachian's policy which prohibits snorkeling surveys at their projects. The Service also recommends that Appalachian consult with Virginia Tech to better determine costs and appropriate survey methods.

Bilotta, G.S., N.G. Burnside, M.D. Turley, J.C. Gray, and H.G. Orr. 2017. The effects of run-of-river hydroelectric power schemes on invertebrate community composition in temperate streams and rivers. PLoS ONE 12(2): e0171634. Doi: 10.1371/journal.pone.0171634.

Haag, W.R., R.J. DiStefano, S. Fennessy, and B.D. Marshall. 2013. Invertebrates and plants. VPages 453-519 in A.V. Zale, D.L. Parrish, and T.M. Sutton, editors. Fisheries Techniques, Third Edition. American Fisheries Society, Bethesda, Maryland.

Williams, K., S.K. Brewer, and M.R. Ellersieck. 2014. A comparison of two gears for quantifying abundance of lotic-dwelling crayfish. *Journal of Crustacean Biology* 34:54-60.

#### IV. Fish Surveys

We do not agree with Appalachian's conclusion that no fish surveys are needed. Fish surveys are needed in order to obtain an updated assessment of fish populations across all seasons in the vicinity of the Project, and to better understand the distribution of Roanoke logperch within the Project area.

##### 1. *Goals and Objectives*

The goals and objectives of this study are to provide information on the existing fishery resources in the vicinity of the Project including information on the current distribution of the Roanoke logperch in the vicinity of the Project. Fish surveys should be performed both upstream and downstream of the Project, including dam tailwaters and bypass reach, to aid in the determination of what the Project impacts may be and to establish a baseline for future assessments. A comprehensive list of species found in the Project reservoir, and information on how the fish community varies by season, is also necessary to inform the requested ntrainment and impingement study (below). The information to be obtained should include both the temporal and spatial aspects of species distribution; age, size, sex, and condition data; habitat utilization; and fish movement patterns. Information on the habitat present in the river should also be collected.

##### 2. *Resource Management Goals*

Resource management goals include: (1) protecting populations of the federally endangered Roanoke logperch; (2) protecting the existing warmwater fishery; (3) ensuring protection of species that are known or potential hosts for the glochidia (larva) of federally listed and/or rare freshwater mussels; and (5) possibly developing passage measures for these species, as well.

##### 3. *Public Interest*

The requestor is a resource agency.

##### 4. *Existing Information*

Fish surveys were conducted in 1990 and 1991 as part of the previous relicensing. In 1990, fish were sampled in the reservoir by electrofishing, hoop netting, and gill netting. Upper, middle, and lower portions of the reservoir were sampled. In addition, riffle/run habitat was sampled upstream and downstream of the Project. Each station was sampled six times, twice in June and September and once in July and October. A total of 1,936 fish representing 36 species were collected during this study. In 1991, additional sampling was conducted in a 0.25 mile riffle/run



located 0.5 miles downstream of the Project. Three Roanoke logperch were collected during this sampling effort. The Service is not aware of any fish surveys conducted since the last relicensing. Updated information on fish in the vicinity of the Project is needed.

#### 5. *Nexus to Project Operations and Effects*

The Niagara Dam serves as a barrier to upstream and downstream fish migration and may reduce survival of downstream migrants due to turbine entrainment. The Project also redirects flow and changes flow patterns, impacts channel morphology and substrates (e.g., spawning gravels) in downstream areas, and impacts habitats in the impoundment above the dam.

#### 6. *Methodology Consistent with Accepted Practice*

The recommended study uses standard scientific collecting techniques used in most hydro licensing activities. A variety of sampling gear, including gill nets, trap nets, seines, and electroshocking should be used as appropriate for site conditions. In addition, the Service supports Virginia Tech's proposed use of GoPro cameras for monitoring behavior of Roanoke logperch and other fish species immediately upstream of the Project and in the Project tailrace, and use of an underwater infrared video system for monitoring behavior at night and during turbid conditions. The surveys should cover at least three seasons (spring, summer, and fall), and all four seasons if possible (e.g., for Roanoke logperch to determine possible winter use of the Project reservoir). The study should be done for 1 full year, with provision for a second year of study if data collected are inadequate based on review by the Service and other resource agencies, or if river flows are atypical during the initial study year. Information to be collected should include species, size, age, sex, and condition, as well as movement patterns and habitat utilization. Standard water quality data (i.e., water temperature, DO, pH, and conductivity) should be collected in conjunction with these surveys. The study should include the Project reservoir near the dam and powerhouse intake, the dam tailrace area, the Roanoke River beyond the downstream extent of Project effects, and the bypass reach.

#### 7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort would involve one field crew sampling on a seasonal basis. The study would last for 1-2 years. The actual cost is unknown and would depend upon the gear types used, number of sampling locations, local labor costs, and the ability to combine multiple studies (e.g., fisheries and water quality) into one task. All recent surveys in the vicinity of the Project were performed in mid-summer to early fall. No recent spring, late fall or winter surveys have been conducted. New surveys during these times of year are needed. Methods specifically targeting Roanoke logperch should also be employed. The existing data and literature are inadequate to fully address Project impacts, and there are no alternatives to conducting standard fishery surveys. However, Appalachian has flexibility to design the most cost-effective way to acquire the necessary data.

## V. Fish Protection and Upstream and Downstream Passage Studies

There are two viable options for the downstream passage of fish including: (1) over the dam/ through the debris sluice gate, and (2) through the penstocks and powerhouse turbines. Without an adequate plunge pool, fish moving over the dam or through the debris sluice gate would be susceptible to injury or mortality. Fish moving downstream through the turbines will be subjected to potential injury or mortality from impingement and entrainment. Many hydroelectric project licenses have incorporated trash racks with 1-inch clear bar spacing to physically exclude most adult fish from the turbines, alternate downstream passage routes, and other features (e.g., reduced approach velocities, adequate plunge pools, etc.) to encourage safe downstream fish passage. In the context of multiple, stacked hydropower projects, cumulative entrainment impacts are likely. Appalachian has not proposed any measures to ensure safe, timely and effective upstream and downstream fish passage. Therefore, we request that upstream and downstream passage studies be undertaken.

### 1. *Goals and Objectives*

The goals and objectives of this study are to provide information on potential fish passage and protection structures, or other measures that could be utilized at this Project. An additional goal should be to determine whether Roanoke logperch are able to pass through the Project and whether the populations upstream and downstream of the Project are isolated from one another. The information obtained will allow the Service's fishway engineers to evaluate the potential effectiveness of various options.

### 2. *Resource Management Goals*

Resource management goals include providing safe, timely and effective passage to migratory fish species (e.g., smallmouth bass, largemouth bass, white bass, redhorse, channel catfish), and fish species that serve as glochidial hosts for freshwater mussels found in the Project area. In addition, although it is unlikely that adult Roanoke logperch enter the powerhouse intake, there is some potential for this, given their preferred winter habitat in deep pools; therefore, an additional resource management goal is to prevent entrainment of any individuals that may attempt to move downstream, given their endangered status and the Service's goal of recovering this species.

### 3. *Public Interest*

The requestor is a resource agency.

### 4. *Existing Information*

The PAD provides very little information regarding passage alternatives.

### 5. *Nexus to Project Operations and Effects*

Available options for safe downstream passage are currently very limited, and any fish

attempting to move downstream are likely to be attracted to the powerhouse intake and become entrained in the Project turbines, resulting in some immediate mortality, as well as latent mortality and cumulative mortality from multiple, stacked hydropower projects. Without an adequate plunge pool, fish moving over the dam or through the trash sluice gate are susceptible to injury. There is currently no way for fish to move upstream past the Project.

#### *6. Methodology Consistent with Accepted Practice*

The recommended study uses standard literature reviews and site-specific data collection techniques common to most hydropower licensing activities.

#### *7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort would involve moderate literature review, discussions with fishway engineers, and site-specific data collection. The study could be completed in less than 1 year, but may require more time to design effective facilities or measures. The actual cost is unknown and would depend on the number of alternatives examined. The existing information in the PAD is inadequate to allow for a thorough examination of alternatives; however, most of the information needed should be available in the existing literature.

### VI. Mussel Surveys

We do not agree with Appalachian's conclusion that no mussel surveys are needed. The Service is not aware of any mussel surveys in this portion of the Roanoke River. A mussel survey is needed in order to determine whether any federally listed and/or rare freshwater mussel species are present within the potentially affected area, and to determine the potential for operation of the Project to adversely affect any mussel species that may be present. We recommend that a detailed habitat assessment be conducted by an approved surveyor to identify suitable habitat, and that a mussel survey be conducted within all suitable habitat, extending at least as far downstream as the extent of Project effects. Surveys are not needed if the approved surveyor determines that no suitable habitat is present within this potentially affected area.

#### *1. Goals and Objectives*

The goals and objectives of this study are to assess the presence, distribution and abundance of freshwater mussels and their habitats within the area affected by the Project and upstream of the impoundment, in order to establish a baseline from which to measure increases or decreases in mussel populations over time, to assess the potential for the proposed Project to adversely affect federally listed mussel species or other mussel species of conservation concern, and to develop protection and mitigation measures for these species if a determination is made that such measures are necessary and appropriate.

## 2. *Resource Management Goals*

To restore and protect viable populations of freshwater mussels, including federally listed species and other species of conservation concern.

## 3. *Public Interest*

The requestor is a resource agency.

## 4. *Existing Information*

We are not aware of any recent, systematic mussel surveys in this portion of the Roanoke River. Therefore, a survey is needed in order to assess the potential for the Project to affect mussel communities, and to establish a baseline for future determinations of any effects of the Project on mussel communities.

## 5. *Nexus to Project Operations and Effects*

If present, freshwater mussel populations could be impacted by the Project, both directly (scouring, sedimentation, changes in flow distribution) and indirectly (reduced upstream and downstream movements of host fish species, and possible entrainment impacts to host species). Lack of host fish passage options can result in fragmentation of mussel populations and lost genetic exchange, leading to reduced genetic diversity. The replacement of the upstream lotic habitat (e.g., riffles) with lentic habitat that includes benthic substrates smothered by accumulated silt also eliminates suitable habitat for most mussel species. Project effects can also include downstream water quality issues (i.e., DO and temperature effects) which can result in reduced reproduction and recruitment or, in extreme cases, mortality.

## 6. *Methodology Consistent with Accepted Practice*

While there are Freshwater Mussel [survey] Guidelines for Virginia ([https://molluskconservation.org/Mussel\\_Protocols.html](https://molluskconservation.org/Mussel_Protocols.html)), based on a recent communication from VDGIF, a specific survey methodology is not recommended upfront as that is usually developed in consultation with the surveyor. The Virginia guidelines include a link to the list of approved surveyors in Virginia for Atlantic Slope freshwater mussels.

## 7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort would be moderate. At a minimum, the river channel and banks upstream and downstream of the Project should be surveyed, extending downstream beyond the influence (e.g., sedimentation) of the Project. A few to several person-days would be required. Costs would be moderate, depending on the number of person-days needed to thoroughly survey the area, and quantitative methods used. Estimated costs would be in the range of \$25,000-50,000. There are no known alternative approaches to determining presence, distribution and abundance of freshwater mussels.

## VII. Entrainment and Impingement Study

Appalachian states that because a detailed entrainment study was conducted for the previous relicensing and there have been no significant changes in Project equipment or operations since that time, they do not propose to conduct a desktop entrainment study. The Service does not support this position. The previous turbine blade strike analysis was based on Cada (1990), which is out of date. The Service's Fish Passage Engineering group and others have developed turbine blade strike analyses based on a more updated study by Franke et al. (1997). In addition, the fish community may have changed over the past 30 years. It is also unclear whether all sensitive and rare fish species, including the federally listed endangered Roanoke logperch, were evaluated as part of the previous study and whether attraction of migratory species to the intake flow was considered. Therefore, an updated desktop entrainment study is needed using current information.

### *1. Goals and Objectives*

The goals and objectives of this study are to provide information on survival rates of all species and life stages of fish that may be impinged on powerhouse intake trash racks or entrained in powerhouse turbines, and to develop estimates of annual mortality rates for all species and life stages. Estimates should also consider indirect, latent mortality of injured fish that are subjected to predation (e.g., due to disorientation or loss of equilibrium), disease (e.g., as a result of cavitation injuries) or physiological stress. With regards to the Roanoke logperch, passage of adults through the Project turbines may not be an issue, but larvae of the species, which drift long distances, is very likely. While it may not be feasible to estimate survival rates for logperch larvae, it is feasible to estimate how many enter the intake and pass through the turbines, which would be considered "take" under the ESA.

### *2. Resource Management Goals*

To protect native fish populations and ensure that entrainment and impingement impacts are not resulting in population-level effects to species of conservation concern, including the federally listed endangered Roanoke logperch. Conclusions regarding potential population-level effects should consider the cumulative effects of multiple, stacked hydropower project in the Roanoke River.

### *3. Public Interest*

The requestor is a resource agency.

### *4. Existing Information*

A desktop entrainment study was done as part of the previous relicensing. However, it is unclear that it would still be applicable (e.g., no changes in the fish community; consideration of potential impact to migratory species that would be attracted to the intake). It also does not

consider new research that has been done since the previous study, and is out of date in terms of the blade strike analysis that was used.

### *5. Nexus to Project Operations and Effects*

Operations of the Project result in injury and mortality of a percentage of fish that are impinged on powerhouse intake trash racks or entrained in Project turbines. Entrainment of Roanoke logperch larvae, which drift long distances (multiple km), is also a significant issue potentially affecting this listed species. Passage of larvae or individuals of this species through the Project turbines, which would constitute a form of “take” under the ESA.

### *6. Methodology Consistent with Accepted Practice*

The recommended study uses standard methodologies used in many hydropower licensing activities.

### *7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort and cost are to be determined during the study plan development phase. The Service is interested in working with Appalachian, FERC and the other resource agencies to develop a study plan that will address resource agency concerns.

Cada, G.F. 1990. Assessing fish mortality rates. *Hydro Review* (Feb. 1990): 52-60.

Franke, G.F., D.R. Webb, R.K. Fisher, Jr., D. Mathur, P.N. Hopping, P.A. March, M.R. Headrick, I.T. Laczó, Y. Ventikos, F. Sotiropoulos. Development of Environmentally Advanced Hydropower Turbine System Design Concepts. Idaho National Engineering and Environmental Laboratory, Renewable Energy Products Department, Lockheed Martin Idaho Technologies Company, Idaho Falls, Idaho. Prepared for the U.S. Department of Energy, Energy Efficiency and Renewable Energy and Hydropower Research Foundation, Inc. INEEL/EXT-97-00639. Voith Report No. 2677-0141.

## VIII. Water Quality

The Service supports the Licensee's proposal to conduct a seasonal temperature and DO study at the Project and would like to work with the Licensee to develop the study plan for monitoring that evaluates the potential for DO and temperature issues in the reservoir and in the river downstream of this Project. We recommend that the study be conducted over a 2-year period to increase the likelihood of conducting the monitoring effort under conditions that are typical for that time of year.

## IX. Recreational Access

The Service supports the Licensee's proposal to evaluate the need for any improvements to the existing recreational facilities in the vicinity of the Project. We support any studies



recommended by the resource agencies, county/city officials or NGOs regarding an assessment of recreational use and needs.

In addition to the above study requests, the Service fully supports study requests submitted by the other resource agencies (e.g., VDGIF, VDEQ, EPA), universities (e.g., Virginia Tech), localities (e.g., Roanoke Co.) and NGOs (e.g., Roanoke Valley Greenway Commission).

The Service recommends that the Draft Study Plan developed by the Licensee incorporate all of the above-listed studies. The study proposals incorporated into the Draft Study Plan should be as detailed as possible so that all parties know exactly what is being agreed to when the study plan is approved. We would also appreciate having opportunities to work collaboratively with Appalachian and the other resource agencies in developing study plans.

Thank you for the opportunity to comment on the Scoping Document and PAD, and to provide study requests. If you have any questions, please contact Richard McCorkle of my staff at 814-206-7470.

Sincerely,

A handwritten signature in black ink that reads "Sonja Jahrsdoerfer". The signature is fluid and cursive, with the first name "Sonja" being more prominent and the last name "Jahrsdoerfer" written in a continuous script.

Sonja Jahrsdoerfer  
Project Leader

Cc: Stephanie Nash – USFWS, BER (ERT)  
Diane Opper – USFWS, RO  
Cindy Shulz – USFWS, VAFO  
Shawn Alam – USDO, OEPC  
Lindy Nelson – USDO, OEPC  
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Kevin Mendik - NPS  
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Paul Angermeier – Virginia Tech



*Commonwealth of Virginia*

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Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

May 24, 2019

**Re: Niagara Hydroelectric Project P-2466-034, Request for Comments and Study Requests on SD1 and PAD**

Dear Secretary Bose:

Thank you for the opportunity to provide comments on the Pre-Application Document (PAD) and Scoping Document 1 (SD1) related to the re-licensing of the Niagara Hydroelectric Project. Following below are comments on the PAD and SD1.

The Virginia Department of Environmental Quality (DEQ) will require a new Clean Water Act § 401 certification for the current project in conjunction with the FERC relicensing process. This certification is administered according to the Virginia Water Protection (VWP) Permit regulations ([9VAC25-210](#)). The permit application review for the § 401 certification includes an evaluation of the potential effect of the project, when operated and maintained as designed, upon downstream flow-dependent beneficial uses throughout the drought of record for the watershed.

**Comments on the PAD:**

**Section 4.4.1, Current and Proposed Operations:** This section states that compliance with Article 402 of the current license requiring a minimum flow downstream of the powerhouse is monitored using USGS gage 02056000. It also states that compliance with Article 403 (requiring a minimum flow in the bypass reach of 8 cfs) "...as measured by the gage immediately downstream of the Project's dam, which is operated and maintained by the USGS with funding provided by Appalachian". No further information was provided regarding the identity of this second gage, and there does not appear to be a gage located in the bypass reach that is identified in the USGS National Water Information System ([NWIS](#)). The details of the water level and flow monitoring plans approved by FERC (see Section 4.5 below) should be

provided and the methods used to monitor compliance with Article 403 should be clearly described.

**Section 4.5, Current License Requirements and Compliance History:** As stated in this section, Articles 404 through 406 of the current FERC license required submittal, for approval by FERC, of plans for monitoring water elevations and flows to record compliance with Articles 401 through 403 regarding project operation and minimum flows. These plans were submitted and approved by FERC in 1994, and the bypass-reach flow monitoring plan was modified in 2000. The PAD and SD1 state that the project operates in run-of-river mode and meets the minimum flow requirements of these articles, but do not provide any documentation of compliance with Article 403 regarding minimum flow in the bypass reach. The water level and flow data collected in compliance with the current license, if available, should be included and/or summarized as part of the Draft License Application and the VWP permit application for § 401 certification.

**Section 5.3.7, Existing Water Quality Data:** This section describes the collection of water quality data (specifically temperature, conductivity, and dissolved oxygen (DO) at stations located upstream and downstream of the project. It also states that water quality data are not available for the project reservoir or within the bypass reach. The VWP permit regulations include a requirement that permitted facilities contain conditions requiring compliance with Virginia Water Quality Standards. Therefore, water quality data are needed from these portions of the project in order to demonstrate that the project operations do not violate water quality standards.

**Section 5.4.1, Aquatic Habitat:** This section states that inflow exceeds project capacity approximately 17% of the time. This statement implies that, when inflow does not exceed hydraulic capacity (approximately 83% of the time), water does not flow over the dam and the minimum flow of 8 cfs must be released to the bypass reach. Therefore the bypass reach receives water at low rates most of the time. Of particular concern are periods when fish that have populated the bypass reach during periods of spillage may be stranded when inflow drops below the project hydraulic capacity. Detailed information regarding the use of the bypass reach by aquatic organisms is needed to assess whether the 8 cfs minimum release requirement is sufficient to avoid harm to aquatic resources.

**Section 6.2.2, Water Resources:** This section mentions that the Project has the potential to alter water quality in the bypass reach during periods of minimum flow and high ambient air temperatures. The reference to minimum flow is misleading. If, as is stated in Section 5.4, inflow exceeds the powerhouse capacity only 17% of the time, then it is diverted through the powerhouse around the bypass reach the majority of the time, not just during periods of minimum flow.

**Section 7, Comprehensive Plans:** This section states that AEP reviewed the July 2017 FERC List of Comprehensive Plans applicable to Virginia. This list has since been updated to include the [Commonwealth of Virginia State Water Resources Plan](#). The applicant should include an updated list of comprehensive plans with subsequent submittals.

## **Comments on SD1**

**Section 3.2.2, Proposed Environmental Measures:** No changes are proposed to Project operations, including the minimum required flow to the bypass reach. The DEQ Office of Water Supply recommends that the flow monitoring currently required by Article 406 of the current license should be required to be reported on a periodic basis to assist the Project operators and stakeholders in assessing whether the minimum bypass reach flow required by the new license is protective of beneficial uses in the bypass reach and downstream.

### **Section 5.0, Proposed Studies:**

**Water Quality Study:** A seasonal temperature and DO study is proposed. Details regarding the locations (e.g. in the reservoir, bypass reach, tailwater, or all three), and timing and frequency of water quality sampling were not provided. Such details are needed in order to assess the adequacy of the proposed study for performing its stated purpose of confirming compliance with water quality standards.

**Bypass Reach Aquatic Habitat Study:** According to the information provided in the PAD, inflow is normally diverted around the bypass reach except for periods of higher-than average flow in the Roanoke River. Therefore, during most months, there may be extended periods of low flow in the bypass reach that are punctuated by periods of higher flow from spillage over the dam. Aquatic resources in the bypass reach may be susceptible to stranding and high temperatures when the inflow rate drops and water stops spilling. The desktop approach proposed to assess habitat in the reach did not mention any site-specific information. Site-specific data regarding the types and numbers of benthic and fish species that use the bypass reach is needed to assess whether the current 8 cfs minimum flow is adequately protective.

In addition, any mussel surveys conducted as part of this study or within the tailwater area should not be limited to SCUBA-only. Such surveys would be expected to include situations when the river flow is relatively low and temperatures relatively warm. Methods using snorkeling, viewscopes, or electrofishing would be more useful and less hazardous to the surveyors.

**Recreational Needs Assessment:** DEQ agrees with the need for a recreational use survey. As Roanoke County's plans and projects at nearby Explore Park become a reality, there will be substantially more use by boaters, tubers, anglers, etc in the section of the river below Niagara Dam.

Finally, it is very important to note that the information and/or results from the studies conducted to support the Draft License Application, should be incorporated into the VWP permit applications so that the §401 certification is included as part of the Final License Application. It is recommended that, in order to expedite the §401 certification process, the licensee should begin the VWP permit application process as soon as any such studies are complete.

Thank you again for the opportunity to provide comments.

Respectfully,

A handwritten signature in black ink, appearing to read "Brian McGurk", with a stylized flourish at the end.

Brian E. McGurk, P.G.  
DEQ Office of Water Supply  
P. O. Box 1105, Richmond VA 23218  
[Brian.McGurk@deq.virginia.gov](mailto:Brian.McGurk@deq.virginia.gov) (804-698-4180)

Cc: Joseph Grist, VA DEQ – via email  
Jason Hill, VA DEQ – via email  
George Devlin, VA DEQ – via email  
Allyson Connor, FERC – via email



1206 KESSLER MILL ROAD

SALEM, VA 24153

540-777-6330

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Liz.Belcher@greenways.org

[www.greenways.org](http://www.greenways.org)

May 23, 2019

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
888 First Street, NE, Room 1A  
Washington, DC 20426

**Re: Niagara Hydroelectric Project (P-2466-034)**

1. Roanoke Valley Greenway Commission Comments on Scoping Document and Pre-Application Document (PAD)
2. Consideration of the 2018 Roanoke Valley Greenway Plan as a Comprehensive Plan under Section 10(a)(2)(A) of the Federal Power Act
3. Consideration of the Roanoke Valley/ Blue Ridge Parkway Trail Plan Environmental Assessment (2015) and Blue Ridge Parkway General Management Plan/ Environmental Impact Statement (2013) as Comprehensive Plans under Section 10(a)(2)(A) of the Federal Power Act

Dear Secretary Bose:

The Roanoke Valley Greenway Commission was formed in 1997 by an Intergovernmental Agreement among the four local governments of the City of Roanoke, Roanoke County, the City of Salem and the Town of Vinton. In 2016 Botetourt County joined the Commission. The purpose of the Greenway Commission is to promote and facilitate coordinated direction and guidance in the planning, development, and maintenance of a system of greenways throughout the Roanoke Valley. In accordance with the Intergovernmental Agreement, the Greenway Commission's responsibilities are to encourage incorporation of greenways into each jurisdiction's planning efforts, explore greenway opportunities, make recommendations on legislation, investigate funding and grants, recommend standards, pursue partnerships, and coordinate the efforts of the federal, state, and local governments involved.

**1. Roanoke Valley Greenway Commission Comments on Scoping Document and Pre-Application Document (PAD)**

Greenway Development

The Roanoke Valley Greenway network has been developed over the last 22 years. There are six greenways within the vicinity of the Niagara Hydroelectric Project (Project), in addition to numerous natural surface trails. These greenways are:

- Wolf Creek Greenway in the Town of Vinton and Roanoke County is completed for 2.2 miles from Hardy Road to the Blue Ridge Parkway, with an extension to the Roanoke River (north side) included in the 2018 Greenway Plan. The Appalachian Power Company (Appalachian) service road into the Project Dam and Powerhouse parallels Wolf Creek and is thus in the corridor for extension of this greenway.



- Mill Mountain Greenway is noted in the PAD, providing access from downtown to the Roanoke River, Roanoke River Greenway, Mill Mountain Park, and Mill Mountain Park Trails.
- Garden City Greenway opened in 2019 and provides a paved trail from Roanoke River Greenway to the Blue Ridge Parkway boundary, with access to its paralleling natural surface trail. This new greenway is approximately 1.4 miles upstream from the Project.
- Tinker Creek Greenway in the City of Roanoke is adjacent to the Project boundary, providing 1.9 miles of paved trail parallel to Tinker Creek from Roanoke River to Wise Avenue and Fallon Park. (The section of Tinker Creek Greenway mentioned in the PAD is approximately ten miles upstream from the Project, while the portion described under this bullet is within the Project.)
- Glade Creek Greenway is contiguous with the Project, connecting to Tinker Creek Greenway at Route 24. A 0.4-mile section of this paved greenway opened in 2017 and connects Route 24 (Virginia Avenue) to Walnut Avenue. Another 0.6-mile section extending this greenway to Gus Nicks Boulevard is in the engineering phase, projected to go to construction by the end of 2019. The 2018 Greenway Plan includes additional sections that would extend this greenway to Vinyard Park and the Blue Ridge Parkway.
- Roanoke River Greenway is the main greenway artery through the valley, projected to be 31 miles from Montgomery County to Franklin County at Back Creek. Existing sections begin in western Roanoke County at Green Hill Park and traverse through the Cities of Salem and Roanoke. In the urban area fourteen miles are complete, one mile under construction, five miles in the right-of-way phase, one mile in the engineering phase, and another three miles funded for design and construction. An eastern leg of Roanoke River Greenway is within the Project boundary and is engineered from an existing section in Roanoke City to the Blue Ridge Parkway; it is currently in right-of-way phase; construction is scheduled to begin in 2020. The design for this section is on the south side of Roanoke River, adjacent to the Project Reservoir, then going around the south side of the Project Dam. The next sections will go under the Blue Ridge Parkway and connect to and go through Roanoke County's Explore Park before terminating at the confluence of Back Creek on the upper end of Smith Mountain Lake.

Roanoke County's Parks and Recreation staff has been working with Appalachian over the last five years to facilitate the passage of Roanoke River Greenway through the Niagara Hydroelectric Project. Appalachian has been very helpful in this endeavor and preliminary right-of-way negotiations are underway to obtain easements for the greenway through the Project. We ask that this partnership continue through the relicensing process for the Project. This final section of Roanoke River Greenway is critical to the economic redevelopment of Explore Park and completion of the Roanoke River Greenway through the valley.

#### Recreational Access to the Project

The Niagara Hydroelectric Project was last licensed in 1993. At that time there was little recreational demand in the area of the Project, and consequently the only recreational amenity provided in the license was a canoe portage around the Dam. Since 1993, there have been many changes in the recreational desires of citizens of the Roanoke Valley as indicated by the Virginia

Department of Conservation and Recreation's 2017 Virginia Outdoors Demand Survey. The survey reported that 45% and 49% of households in the Roanoke Valley Alleghany Region indicated the need for increased access to trails and water access, respectively. The development of the Roanoke Valley Greenway and Blueway systems have helped to meet, and yet have encouraged greater, demand for outdoor recreational opportunities and have been major contributors to economic growth in the region. Completion of the Roanoke River Greenway through the Project will help to provide additional trail access for the public.

The only boating access to the Project Reservoir is provided by the nearest upstream canoe/kayak access facilities in the City of Roanoke (Bridges Access and Bennington Access) and the Town of Vinton (3<sup>rd</sup> St. off Virginia Avenue). While these facilities and others upstream allow paddlers to get to the Reservoir, there is no public place for boaters to take out and load boats onto vehicles once they get to the Reservoir or Dam. Paddling back upstream to the access areas in Roanoke City and Vinton requires considerable effort; consequently, few people take full advantage of the opportunities on the Reservoir. As part of the Recreational Needs Assessment outlined in the Scoping Document we encourage the applicant to consider development of a boating access facility within the Reservoir on either river left or right. This facility could provide a much needed take out point at Niagara Dam and facilitate improvements to the Project public recreational amenities and the Roanoke River Blueway system.

As mentioned above, the Project license issued in 1993 required that the applicant develop a canoe portage around Niagara Dam. The applicant completed this requirement of the license; however, the portage was never very useful because of the length and location. It is located in a very steep section of the Reservoir, and it is difficult to take out canoes and kayaks. Once you do get the boats out of the water, the portage around the Dam is more than ¼ mile long. In addition, vehicle access to the portage is restricted by a keyed gate. As part of the Recreational Needs Assessment, we would encourage the applicant to review the usefulness of the current portage and consider ways in which the portage can be improved to provide better public access and use.

### Trash

Trash and debris in the Roanoke River have been a continual problem in the valley for years. During the relicensing of the Smith Mountain Project (P-2210) this was a major concern for residents of the lake. Trash and debris traveling down the river and through the Niagara Reservoir are gathered by a trash rake and passed over the Project Dam to continue downstream. We understand that the applicant did not generate this trash and debris, but the Dam provides a mechanism for collecting it. Perhaps it is time for the applicant to work together with the waste management departments of the localities upstream and downstream of the Project to develop a cooperative process for removing this trash and debris from the river system. Appalachian spends a considerable amount of time and money every year removing this trash and debris from Smith Mountain Lake. There might be a more economical method for removing the trash at the Project Dam or upstream, instead of letting it accumulate on the river banks of Explore Park and downstream in Smith Mountain Lake.

**2. Consideration of the 2018 Roanoke Valley Greenway Plan as a Comprehensive Plan under Section 10(a)(2)(A) of the Federal Power Act.**

As mentioned above, the Roanoke Valley Greenway system has been an important recreational resource for the residents of the Roanoke Valley and has also been responsible for considerable economic growth in the valley. Roanoke County has been working with Appalachian for the past five years to route the eastern end of Roanoke River Greenway through the Niagara Project and into Explore Park. Given the importance of greenways to the region and the anticipated incorporation of a greenway into the Project, we request consideration of this plan, which was e-filed on the FERC website May 20, 2019, as a comprehensive plan under section 10(a)(2)(A) of the Federal Power Act.

**3. Consideration of the Roanoke Valley/ Blue Ridge Parkway Trail Plan Environmental Assessment (2015) and Blue Ridge Parkway General Management Plan/ Environmental Impact Statement (2013) as Comprehensive Plans under Section 10(a)(2)(A) of the Federal Power Act.**

The Blue Ridge Parkway is a National Park adjacent to, and contiguous with, the Project area. Because Niagara Dam is generally inaccessible, the public is most familiar with the Dam by seeing it from the Blue Ridge Parkway and by accessing it from the Parkway's Roanoke River Overlook, Roanoke River Trail, and Fisherman's Trail. The Roanoke Valley Greenway Commission has worked cooperatively with the Parkway since 1997, particularly providing skilled trail volunteers to assist the Parkway with trail construction and maintenance. In 2015 greenway supporters completed over 200 steps to provide access to the river from the Parkway via the Roanoke River and Fisherman's Trails. This access connects to the river at the bottom of the bypass reach and provides access for both fishermen and boaters. We suggest that Appalachian monitor this use as part of its Recreational Needs Assessment as a gauge of the demand and use when recreation facilities are provided. Given that this national park is adjacent to the Project, that this trail currently provides public access to the Project, and that the Project is the primary viewshed from the Blue Ridge Parkway bridge, we suggest that the Project maintenance of buildings, shoreline, and riparian areas be aesthetically pleasing and compatible with the Parkway. Also, we request that the Blue Ridge Parkway plans pertinent to this geographic area be considered as comprehensive plans under section 10(a)(2)(A) of the Federal Power Act.

Thank you for the opportunity to attend the site visit and provide comments at this point.

Sincerely,

Liz Belcher  
Roanoke Valley Greenway Coordinator  
1206 Kessler Mill Road  
Salem, VA 24153  
540-777-6330

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A decorative graphic consisting of several overlapping rectangles. A large red rectangle is on the left. A dark gray rectangle is at the top right. A light gray rectangle is at the bottom left. A black rectangle is at the bottom right. The text is positioned to the right of the red rectangle.

# Appendix B

Stakeholder Comments  
Regarding PSP

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# Agenda

Project: Niagara Hydroelectric Project (FERC No. 2466)

Subject: Proposed Study Plan Meeting

Date: Thursday, August 01, 2019

Location: Jefferson Center, Roanoke, Virginia

9 a.m. – 9:30 a.m.

## **Introduction**

Meeting Objectives  
Process Plan and Schedule  
Project and Study Plan Overview

9:30 a.m. – 12:00 p.m.  
(15-min. break)

## **Aquatic Studies**

Flow and Bypass Reach Aquatic Habitat  
Fish Community  
Benthic Aquatic Resources

12:00 p.m. – 1:00 p.m.

## **Lunch Break (on your own)**

1:00 p.m. – 4:00 p.m.

## **Recreation Study**

### **Water Quality Study**

### **Terrestrial and Shoreline Studies**

Wetlands, Riparian, and Littoral Habitat  
Shoreline Stability

### **Cultural Resources**

4:00 p.m. – 4:30 p.m.

## **Closing**

Next Steps / Filing Comments on the PSP  
Open Discussion  
Adjourn

NAME	AFFILIATION	EMAIL ADDRESS
Kenny Morrison	AEP	KLMorrison@aep.com
DAVID BAILEY	AEP	dwbailey@aep.com
Paul Angermeyer	Virginia Tech	brota@vt.edu
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John McCloskey	U.S. FWS	john.mccloskey@fws.gov
Rick McCorkle	US FWS	richard-mccorkle@fws.gov
Frank Borsuk	US EPA (on speaker phone)	
Scott Smith	VOGIR	scott.smith@dgif.virginia.gov



Niagara Hydroelectric Project (FERC No. 2466)  
Proposed Study Plan Meeting  
August 1, 2019



NAME	AFFILIATION	EMAIL ADDRESS
John Shepelwich	Appalachian Power	jeshepelwich@aep.com
Jonathon McCoy	Roanoke Co. Parks + Rec	jmc coy@roanokecountyva.gov
Jonathan Magalski	American Electric Power	jmagalski@aep.com

**Yayac, Maggie**

---

**Subject:** FW: [EXTERNAL] FERC Relicensing

**From:** Jonathan M Magalski  
**Sent:** Wednesday, September 11, 2019 2:34 PM  
**To:** 'Jonathan McCoy' <[JMCCOY@roanokecountyva.gov](mailto:JMCCOY@roanokecountyva.gov)>  
**Subject:** RE: [EXTERNAL] FERC Relicensing

Hi Jon,

Thanks for reaching out and my apologies if it wasn't clear that the presentation would be posted to the website we (AEP) created for the relicensing (<http://www.aephydro.com/HydroPlant/Niagara>). We have been posting AEP generated documents there, including the August 1 presentation.

Yes, you are correct, comments on the Proposed Study Plan are due to FERC by October 7. Have you signed up for FERC's eLibrary? This is the best way to file comments and to receive other stakeholder comments and other notices. The link is: <https://www.ferc.gov/docs-filing/elibrary.asp>. If you need any guidance, please let me know, but it's pretty straightforward. You'll just want to have the Niagara project number handy so you can sign up for those project specific notices. The project number is FERC No. 2466-034.

Let me know if you have any additional questions. Thanks again...Jon



**JONATHAN M MAGALSKI | ENVIRONMENTAL SPEC CONSULT**  
[JMMAGALSKI@AEP.COM](mailto:JMMAGALSKI@AEP.COM) | D:614.716.2240  
1 RIVERSIDE PLAZA, COLUMBUS, OH 43215

---

**From:** Jonathan McCoy <[JMCCOY@roanokecountyva.gov](mailto:JMCCOY@roanokecountyva.gov)>  
**Sent:** Wednesday, September 11, 2019 1:07 PM  
**To:** Jonathan M Magalski <[jmmagalski@aep.com](mailto:jmmagalski@aep.com)>  
**Subject:** [EXTERNAL] FERC Relicensing

This is an **EXTERNAL** email. **STOP. THINK** before you **CLICK** links or **OPEN** attachments. If suspicious please click the 'Report to Incidents' button in Outlook or forward to [incidents@aep.com](mailto:incidents@aep.com) from a mobile device.

---

Jon,

I hope you're doing well. I have a meeting for the Roanoke River Blueway tomorrow morning and I wanted to reach out to you for any updates on the FERC Relicensing Process. I have in my notes from the meeting on August 1st that comments are due by October 7th.

I never did receive a copy of the presentation for that day. Can you send me one? Or can you let me know where to find it?

Thanks,

Jon McCoy

**Jonathan McCoy**

Planner I

1206 Kessler Mill Road | Salem, VA 24153

[\(540\) 777-6324](tel:5407776324) | [\(540\) 613-2223](tel:5406132223) (cell)

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*Environmental Consultant*  
Patti Jackson  
*FORVA*  
Howard Kirkland  
*Blue Ridge River Runners*  
Randi Lemmon  
*Friends of the New River*  
Tom Miller  
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Bob Born  
*Float Fishermen of Virginia*  
Bo Calvert  
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Debbie Coffin  
*James River State Park*  
Mark Frondorf  
*Shenandoah Riverkeeper*  
Greg Garman  
*Fisheries Biologist*  
Terry Grimes  
*Jackson River Defense Fund*  
Bob Hicks  
*FORVA*  
Kat Imhoff  
*FORVA*  
Pete Katt  
*Creek Freaks of Franklin Co*  
Jerry Lovelace  
*Rural Planning Caucus of Virginia*  
Nelson Mackey  
*Float Fishermen of Virginia*  
Shelton Miles  
*Citizens for the Preservation  
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*New River Conservancy*  
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*Friends of the Staunton*  
Steven Tingle  
*Headwaters Watch*  
Charles Vandervoort  
*Friends of the Shenandoah*  
Jeff Wold  
*Float Fishermen of Virginia*

FILED  
SECRETARY OF THE  
COMMISSION August 10, 2019

2019 SEP -3 P 4:19

FEDERAL ENERGY  
REGULATORY COMMISSION

Honorable Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, D.C. 20426

**Subject: Niagara Hydroelectric Project FERC No.  
P-2466-034**

### **Proposed study for portage around Niagara Dam:**

The impact of Niagara Dam on boating and fishing recreation is well known. Over the decades boaters and float fishermen have avoided the Roanoke River section below Tinker Creek as there is no practical portage around the dam. Thus any statistics on past use would be meaningless.

At other dam locations across the country, such impediments have resulted in various solutions ranging from creating a new channel for boating around the dam to maintaining a phone that boaters can use to call for a shuttle ride.

A viable solution to a recreational portage is clearly made difficult by the railroad tracks and by the narrow right of way to and around the dam. There still remain possible options for recreation.

A portage study should include examining the idea of a portage on river right, for example, that would allow for boaters to take out just above the dam and to then use a shuttle vehicle to drive themselves and their boating equipment around to the Blue Ridge Parkway where boaters could then re-enter the river just below the Niagara powerhouse using the Fishermen's Trail and steps that go down to the water.

Access to a river right landing would also help fishermen and boaters as a better place to put in boats to paddle upstream for recreation.

Another option might be to put in a shorter hand carry portage on river right that would then allow boaters to enter the river again just below the dam. This option would allow boaters to float the river in the bypass reach, which is currently used by some kayakers and canoeists today.

A third option, of course, would be to maintain a working phone at the river left takeout that would allow boaters to call for assistance from APCo for a shuttle to below the powerhouse.

A study of the options for a workable portage around Niagara Dam should evaluate these and other ideas solicited from the public and pulled from research on similar hydro projects.

### **Proposed study for improved access to the Roanoke River below the Niagara Dam:**

Currently, access to the bypass reach below the dam is extremely difficult due to the lack of an access point on river right below the dam or an access trail from the Blue Ridge Parkway that would allow boaters to carry their boats upstream to below the dam.

PO BOX 1750 • ROANOKE, VA 24008  
CELL: 1-540-266-0237 • HOME: 1-540-366-2228



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Steven Tingle  
*Headwaters Watch*  
Charles Vandervoort  
*Friends of the Shenandoah*  
Jeff Wold  
*Float Fishermen of Virginia*

Access is obtained by use of an informal dirt trail running steeply down from the parkway overlook trail. This trail is an extremely steep, slippery and eroded trail that is hazardous and regularly contributes sediment to the river below.

Is can be used only by those in top-notch physical condition, and excludes those who are older, children, or handicapped in any way.

The National Park Service (NPS) now allows volunteer organizations to develop plans and build trails on park service property. A vastly improved trail down to the bypass reach is needed. This will likely require funding to build a better trail than the existing trail.

A study should be done to determine the best way for the public to access the Niagara Dam bypass reach.

## **Proposed study for recreational releases from the dam:**

In the past APCo has cooperated with valley jurisdictions to provide increased releases from the dam. These have been for organized float trips to study the river for various purposes including river cleanups, whitewater recreation evaluations, scenic river designation, fishing capacity and evaluating viewsheds for Explore Park.

The public needs to know if scheduled releases can be obtained, or, if not regularly scheduled, if commitments can be made by APCo to increase flows for special events planned by the community.

We recognize the inherent problems with a run-of-the-river hydro operation and with the lack of storage capacity due to sedimentation behind the dam.

We are aware of the sensitivity of the endangered Roanoke Logperch, but we believe such relatively small additions to the flows should not affect the species, or any other species, in a negative way.

The release of 100 to 200 cfs for special events can mean the difference between having an event or having to cancel it.

A larger question should also be considered. Can there be releases from Spring Hollow Reservoir for special occasions? While Spring Hollow is not within the project boundary, collaboration with APCo could provide greater opportunities for further recreation below the powerhouse.

A study should be done to determine potential releases from Spring Hollow to increase recreational flows.

## **Proposed study on recreational fishing:**

Fishing both above and below the dam is impacted by PCBs in the river. While some monitoring has been done of PCBs in the water column, no study exists of PCBs in the sediment behind the dam.

The sediment behind the dam is thought to contain PCBs.

Much discussion and some theories have been put forth that some PCBs behind the dam are contributing to PCBs flowing downstream and being ingested by fish.

PO BOX 1750 • ROANOKE, VA 24008  
CELL: 1-540-266-0237 • HOME: 1-540-366-2228

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Rick Roth, Treasurer  
*Friends of the New River*  
Del. Watkins M. Abbitt, Jr.  
*Float Fishermen of Virginia*  
Juanita Callis  
*Friends of the Roanoke River*  
Karen Firehock  
*Environmental Consultant*  
Patti Jackson  
*FORVA*  
Howard Kirkland  
*Blue Ridge River Runners*  
Randi Lemmon  
*Friends of the New River*  
Tom Miller  
*Float Fishermen of Virginia*

**STEERING COMMITTEE**

Tony Adams  
*Float Fishermen of Virginia*  
Bob Born  
*Float Fishermen of Virginia*  
Bo Calvert  
*Blue Ridge River Runners*  
Debbie Coffin  
*James River State Park*  
Mark Frondorf  
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Greg Garman  
*Fisheries Biologist*  
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*Jackson River Defense Fund*  
Bob Hicks  
*FORVA*  
Kat Imhoff  
*FORVA*  
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*Rural Planning Caucus of Virginia*  
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*Citizens for the Preservation  
of the River (CPR)*  
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*Friends of the Staunton*  
Steven Tingle  
*Headwaters Watch*  
Charles Vandervoort  
*Friends of the Shenandoah*  
Jeff Wold  
*Float Fishermen of Virginia*

A study of any contaminants in the fish below the dam should be undertaken to determine if the fish are safe for consumption.

If not, the river should be posted for whatever contaminants are found. Currently there is no posted warning about fish consumption below the powerhouse.

If PCBs are present but only reintroduced to the river during high water events, that knowledge would help those who consume fish know what the risks are.

FORVA hopes that these proposed studies will help improve recreation above, below and in the bypass reach of the Niagara Dam project area.



Bill Tanger, Chair, Friends of the Rivers of Virginia  
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## Yayac, Maggie

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**Subject:** FW: AEP Niagara Hydro (FERC P-2466-034) - Fish Community and Roanoke Logperch Study Plan  
**Attachments:** Niagara\_Roanoke Logperch\_Fish Community\_Meeting Summary\_09252019.pdf

**From:** Jonathan M Magalski [mailto:jmmagalski@aep.com]

**Sent:** Thursday, October 10, 2019 3:17 PM

**To:** Angermeier, Paul <biota@vt.edu>; Scott Smith (Scott.Smith@dgif.virginia.gov) <Scott.Smith@dgif.virginia.gov>; McCorkle, Richard <richard\_mccorkle@fws.gov>; John McCloskey <john\_mccloskey@fws.gov>; McGurk, Brian <brian.mcgurk@deq.virginia.gov>; Borsuk, Frank <borsuk.frank@epa.gov>

**Cc:** Elizabeth B Parcell <ebparcell@aep.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Yayac, Maggie <Maggie.Yayac@hdrinc.com>; Huddleston, Misty <Misty.Huddleston@hdrinc.com>; Jon Studio <JStudio@envsi.com>; John Spaeth <jspaeth@envsi.com>

**Subject:** RE: AEP Niagara Hydro (FERC P-2466-034) - Fish Community and Roanoke Logperch Study Plan

Good afternoon,

Please find attached our meeting notes for the subject call held on September 25, 2019. Also contained in the document are the slides presented during the call. Please let us know if you have any questions or want to clarify anything in the notes.

We appreciate your time and feedback during the call and look forward to working with you through the relicensing process....Jon



**JONATHAN M MAGALSKI** | ENVIRONMENTAL SPEC CONSULT  
[JMMAGALSKI@AEP.COM](mailto:jmmagalski@aep.com) | D:614.716.2240  
1 RIVERSIDE PLAZA, COLUMBUS, OH 43215

---

**From:** Jonathan M Magalski

**Sent:** Saturday, September 21, 2019 8:47 AM

**To:** 'Angermeier, Paul' <biota@vt.edu>; 'Scott Smith' (<Scott.Smith@dgif.virginia.gov>) <Scott.Smith@dgif.virginia.gov>; 'McCorkle, Richard' <richard\_mccorkle@fws.gov>; 'John McCloskey' <john\_mccloskey@fws.gov>; 'McGurk, Brian' <brian.mcgurk@deq.virginia.gov>; Borsuk, Frank <borsuk.frank@epa.gov>

**Cc:** Elizabeth B Parcell <ebparcell@aep.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Huddleston, Misty <Misty.Huddleston@hdrinc.com>; Yayac, Maggie <Maggie.Yayac@hdrinc.com>

**Subject:** AEP Niagara Hydro (FERC P-2466-034) - Fish Community and Roanoke Logperch Study Plan

Gentlemen,

Please find attached, AEP's proposed fish community and Roanoke logperch study plan for discussion during our conference call on September 25. I will be updating the meeting invitation with the Webex and conferencing information momentarily. We look forward to the call. Have a great weekend....Jon



**JONATHAN M MAGALSKI** | ENVIRONMENTAL SPEC CONSULT  
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# Meeting Summary

Project:	Niagara Hydroelectric Project (FERC No. 2466)
Subject:	Fish Community and Roanoke Logperch Study Plan
Date:	Wednesday, September 25, 2019
Location:	WebEx (1:00pm-2:30pm)
Attendees:	Jon Magalski (AEP) Liz Parcell (AEP) Scott Smith (VDGIF) Paul Angermeier (VA Tech) Rick McCorkle (USFWS) John McCloskey (USFWS) John Spaeth (ESI) Jon Studio (ESI) Brian McGurk (VDEQ) Sarah Kulpa (HDR) Misty Huddleson (HDR) Maggie Yayac (HDR)

## **Introduction**

Jon M. (AEP) introduced two new additions to the team, John Spaeth/Jon Studio from ESI. Jon M. (AEP) reviewed meeting objectives and the agenda.

## **Fish Community Study: Goals and Objectives**

- Misty provided an overview of the fish community study goal and reviewed the 1990's fish surveys previously completed, including illustrating historical sampling sites and locations where Roanoke Logperch were collected.
- Rick asked whether there was actually riffle-run habitat upstream of the confluence of Tinker Creek (historical sampling site at upper limit of Project boundary). Based on aerial imagery and reports from this group, this area does appear to be a riffle, though the group agreed that a better riffle area is located upstream of the Project boundary, at the next upstream bend in the Roanoke River.
- Misty reviewed the methodology for the fish community study (Task 1a of the Revised Study Plan)
  - Paul questioned if the two season study would include the same sites and methodology (Misty confirmed).
    - Paul noted the spring season may be difficult because Roanoke Logperch may be present and the VDGIF has a Time of Year Restriction, so that electrofishing won't be allowed to occur until the beginning of July. Group agreed that it would be satisfactory to limit the general community survey to a single sampling event (July/August timeframe).
    - Rick, Scott, and Paul agreed that a spring survey for Roanoke Logperch would be beneficial.

- **Action Item:** Scott is going to check with VDGIF environmental group to see if they can waive the time-of-year-restrictions and approve a collector's permit to allow an electrofishing survey of the bypass reach (where Roanoke Logperch are not known to occur) during the spring months. Also will need to coordinate and receive approval from USFWS.
- Paul asked about the intent of weighing/measuring the fish. Misty noted that this will give us general health data and was an agency (VDGIF) request. Paul noted that weight does not provide much value for non-game species.
- Misty clarified that 30 fish per transect will be examined, although all fish collected will be identified. **Action Item:** Clarify in the RSP.
- The group discussed using Index of Biological Integrity (IBI) as a method/tool for evaluating fish communities.
  - Paul does not think there is an IBI developed for Roanoke River and thus it may not be the best indicator of the fish community. Scott agreed.
  - Jon M. noted that this is a data analysis consideration and will not affect the data collection (survey), so can be determined in the future if this or other statistical comparison method is most appropriate.
  - USFWS clarified they previously recommend DEQ Virginia Stream Condition Index in relation to macroinvertebrates (not fish community).
  - Misty clarified that data will be compiled and summarized using descriptive statistics and general fish community metrics (species diversity, abundance, dominance, number of recreational taxa, etc.). Results will also be compared to historical data.
  - **Action Item:** Remove IBI reference and update language in the RSP.
- Misty illustrated the proposed new (4) and historical fish study site locations.
  - Rick questioned the most upstream survey location (1E/2E) since group agreed better habitat upstream. He noted that for comparison to historical data it may be useful, but if there is no suitable habitat than you may not need to survey there. Misty noted that these two locations were just for the fish community survey and there will be different locations for the Roanoke Logperch.
  - **Action Item:** AEP to evaluate (for the RSP) moving upstream sampling location for fish community survey to match Roanoke Logperch upstream sampling location.

### **Roanoke Logperch Study**

- John Spaeth (ESI) provided background of ESI's qualifications and resources. John discussed Roanoke Logperch sampling requirements and proposed field sampling approach.
- Jon M. (AEP) indicated that snorkeling may be possible in wadeable areas (e.g., <3 ft depth) to augment the electrofishing and potentially detect juveniles, but still contingent upon AEP corporate dive coordinator approval and site conditions.
- Paul questioned the spatial extent being sampled at each of the proposed Roanoke Logperch survey locations. John S. (ESI) noted that this will be habitat driven and will include as many quadrats within the suitable habitat as possible. Adjacent survey sites (shown on figures) represent two separate riffle areas being evaluated in the same general location, often on opposite sides of the river. Group discussed potential size of each location; Paul noted that 20m seems a bit small. John asked Paul what a recommended survey reach would be. Paul noted that it will vary due to suitable habitat but he could foresee 20-30 net

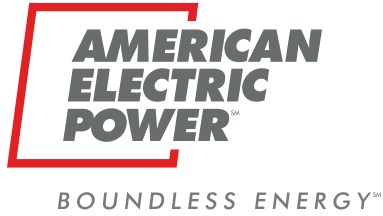
sets per survey location. John Studio (ESI) noted that for example, survey point 1A had a 100m reach, but moving downstream the riffle-run habitats are smaller. **Action Item:** RSP to provide clarification on approach – each sample site will consist of an assessment of the entire suitable habitat in that location and will include as many net sets (quadrat samples) needed to provide 100% sample coverage of suitable habitat.

- Scott asked if Paul had detection probability based on quadrats surveyed. Paul noted that he doesn't have this information readily available, their 10% detection probability comes from survey efforts involving tagging fish and re-sampling (different than the proposed study).
- Discussion of whether a single sampling event would be sufficient for Roanoke Logperch. Paul stated that he can't say so definitively, but it is possible and likely based on his experiences, particularly if survey done during late summer/low-flow period. Young-of-year (YOY) are more easily observed later in the year as they attain larger body size. Sample during that period increases odds of documenting multiple life stages (if present).
  - Brian asked about sampling in the bypass reach during this same period. Discussion of whether Roanoke Logperch could occur in bypass reach during the spring when flows are higher and then move out of area as flows recede. Scott will talk internally about spring sampling in the bypass reach. Group agreed that it would be ideal to survey for Roanoke Logperch in the bypass reach in the spring and summer/late fall (2 times/year), pending VDGIF/USFWS approval to remove time-of-year restriction (if/as applicable). Snorkeling may not be possible during the higher/swifter flow conditions. The rest of the survey locations will just be surveyed in the late summer/fall timeframe. **Action Item:** HDR to clarify in the RSP survey season timeframes and locations.
- Paul requested measuring lengths of Roanoke Logperch if caught. **Action Item:** HDR to clarify lengths will be recorded in Task 1b of the RSP.
- John S. (ESI) noted that there is not an anticipated targeted effort for egg or larval Roanoke logperch life stages since it's difficult to identify the specimens taxonomically and may entail a complex or significant sampling effort.
  - Rick noted that this is a problem and feels strongly that there should be an effort to document the larval presence/absence. Rick noted that USFWS needs to know the use of the Project area by all life stages to determine take for the Biological Opinion. Absent this information, they may have to assume a worst-case scenario.
  - Scott noted that without any information it is hard to provide mitigation methods and VDGIF would also assume larvae presence in the reservoir. Jon M. (AEP) noted potential to sequence the study, first documenting the presence/location of adults (and juveniles) before surveying for larvae.
  - Paul said that eggs are not of a concern. There's high likelihood that larvae are entering the impoundment since they can drift in an order of kilometers. VA Tech's field work showed that it is relatively easy to sort out Roanoke Logperch larvae. Paul disagreed that a complex sampling effort is required and suggested larval drift net sets as an option.
  - John S. asked Rick if USFWS could provide or point to any examples of projects where larvae were surveyed to provide numbers for Incidental Take determination. USFWS did not have any examples specific to Roanoke Logperch.



- Paul noted that a recent VA Tech study report on Roanoke Logperch was submitted to VDGIF. Additionally, they are submitting a manuscript in the next few weeks.  
**Action item:** Paul to send Jon M. available references.
- Jon M. (AEP) questioned the effort/timeframe on larvae drift.
  - Paul noted the locations would be the same as the adult survey locations currently proposed just above confluence with Tinker Creek and just below confluence (upper reach of impoundment).
  - Paul noted that at each site could have a rotation set up and drift nets deployed for 20 minutes every three days from mid-April to the first week of June.
  - Paul noted the major effort is sorting the larvae out.
  - Paul noted that you need to sample enough to capture different river stages and temperature. Larvae appear 1-2 weeks after spawning (temperature-dependent).
- Discussion of interest/value in sampling for larvae downstream of the Project (not resolved; for AEP consideration in the RSP).
- VDGIF recognized that the primary concern for the Roanoke Logperch survey is the level of effort and noted that there is the potential for reduced sampling with interpolation of catch per unit effort.
- Misty confirmed that the fish community study report will include the fish community composition and abundance and document identified suitable habitat and species presence of the Roanoke Logperch, along with raw data collected during the surveys.
- Paul requests a description of the adult Roanoke Logperch transect habitats in the study report. **Action Item:** Clarify in the RSP level of habitat description to be provided in the study report.
- Discussion of whether additional effort is appropriate to target juvenile Roanoke Logperch. Paul recommended running seine nets through potential habitat along edges for juvenile and to target shallow, clean gravel/pebble or vegetated habitat locations. **Action Item:** Paul to provide Jon M. with existing guidance/ reports on juvenile and larval sampling methodology.
- Discussion of whether sampling methods would capture Orangefin Madtom, if present. Group agreed that Roanoke Logperch targeted surveys would detect this species as well (if present).
- Group generally reached consensus on the general fish community survey locations and methods. Group agreed that it is acceptable to drop the hoop net and gill net sampling as historically conducted/proposed in the PSP. Expectation that current electrofishing methods will capture species present.
- **Action Item:** AEP/HDR refine study activities schedule and cost estimates in the RSP.

**Attachment:** Fish Community and Roanoke Logperch Study Plan PowerPoint



# Niagara Hydroelectric Project FERC No. 2466

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Agency Coordination Call for Fish Studies – September 25, 2019



**BOUNDLESS ENERGY**

# Call Agenda

<b>1 p.m. – 1:15 p.m.</b>	<b>Introduction</b> Participant Introductions Meeting Objectives Topics for Discussion
<b>1:15 p.m. – 1:30 p.m.</b>	<b>Fish Community Study</b>
<b>1:30 p.m. – 2:00 p.m.</b>	<b>Roanoke Logperch Study</b>
<b>2:00 p.m. – 2:30 p.m.</b>	<b>Discussion and Wrap-up</b>

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# Meeting Objectives

- Appalachian developed a Proposed Study Plan (PSP) - filed with FERC on July 9, 2019.
- The PSP meeting was held on August 1, 2019 at the Jefferson Center in Roanoke, Virginia.
- The objectives of this conference call are to:
  - Review the proposed revisions to the Fish Community Study and Roanoke Logperch Study
  - Discuss outstanding concerns regarding the proposed revisions to the studies in the RSP
- Comments on the PSP are due to FERC no later than October 7, 2019.

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# Topics for Discussion

- Recommended changes to Fish Community Study:
  - Remove proposed use of gill and/or hoop nets
- Comments related to Roanoke Logperch:
  - Potential for occurrence in bypass reach
  - Potential for larval drift (into impoundment)





# Fish Community Study



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# Fish Community Study: Goals and Objectives

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- **Study Goal:** Obtain current information on the fish community in the Roanoke River in the vicinity of the Project to support an analysis of Project effects
- **Specific Objectives (Task 1):**
  - Collect comprehensive baseline of the existing fish community in the vicinity of the Project
  - Compare current fish community data to historical data to evaluate changes to species composition, abundance, or distribution
  - Assess life stage-specific presence and abundance of Roanoke Logperch within the Study boundary

# Fish Community Study: Background and Existing Information

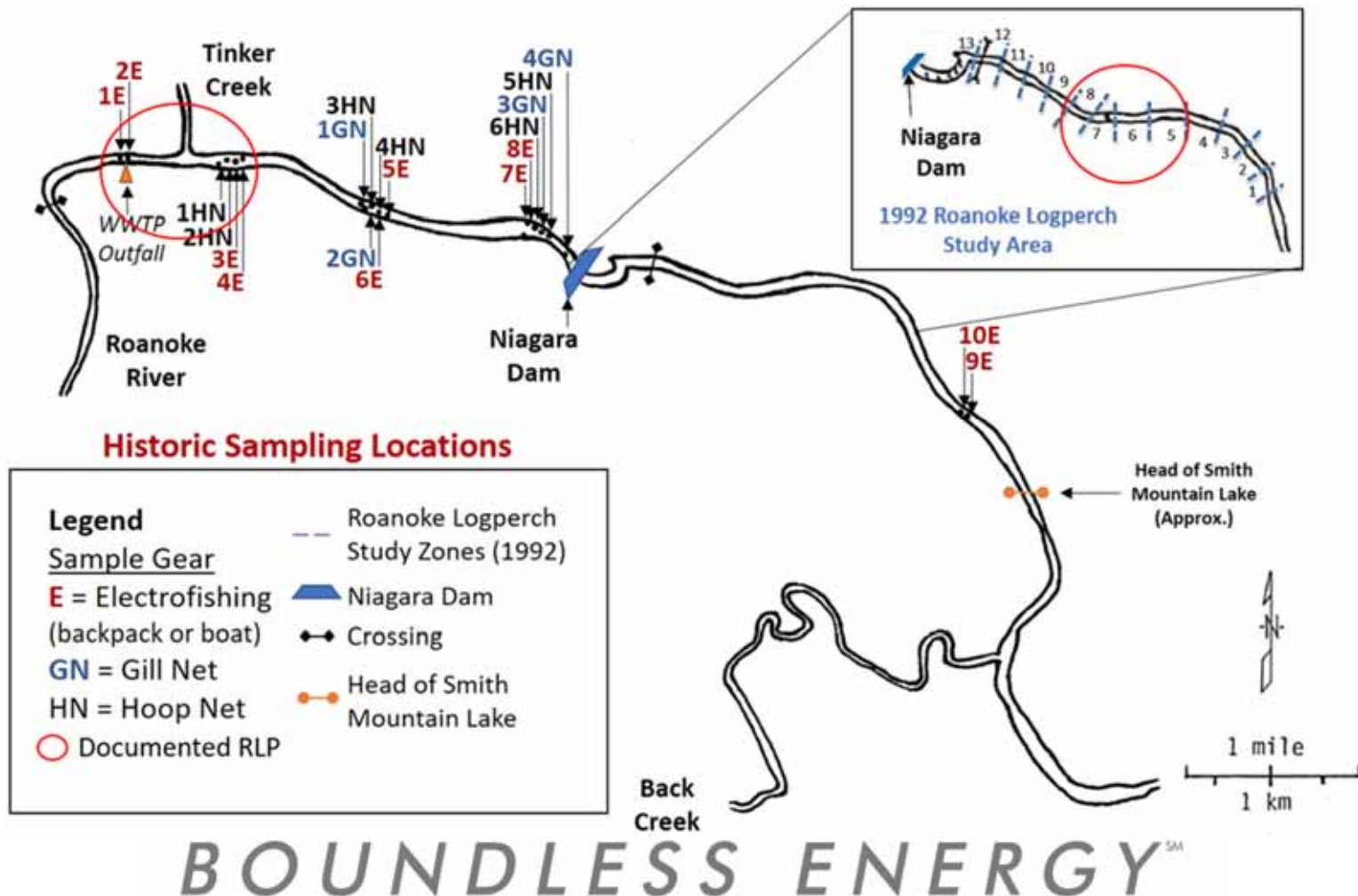
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- **1990's Fish Surveys**

- Electrofishing, hoop netting, and gill netting; reservoir and riffle/run habitat up- and downstream
- Warmwater fish community: sunfish, bass, redhorse, carp, shad, suckers, shiners, catfish, and four Roanoke Logperch\* (\*protected species, collected upstream and downstream of Project)
- Longitudinal trend of increasing catch rate, species richness, and abundance from upstream to downstream sites
  - New site added in 1991 (0.5-mi below dam) exhibited greater abundance and species richness than upstream reservoir and riffle/run sites. Three Roanoke Logperch were collected at this location (the most downstream extent of Study Area)
  - In 1992, additional 1.25-mi reach below dam was evaluated to identify available habitat for and presence of Roanoke Logperch

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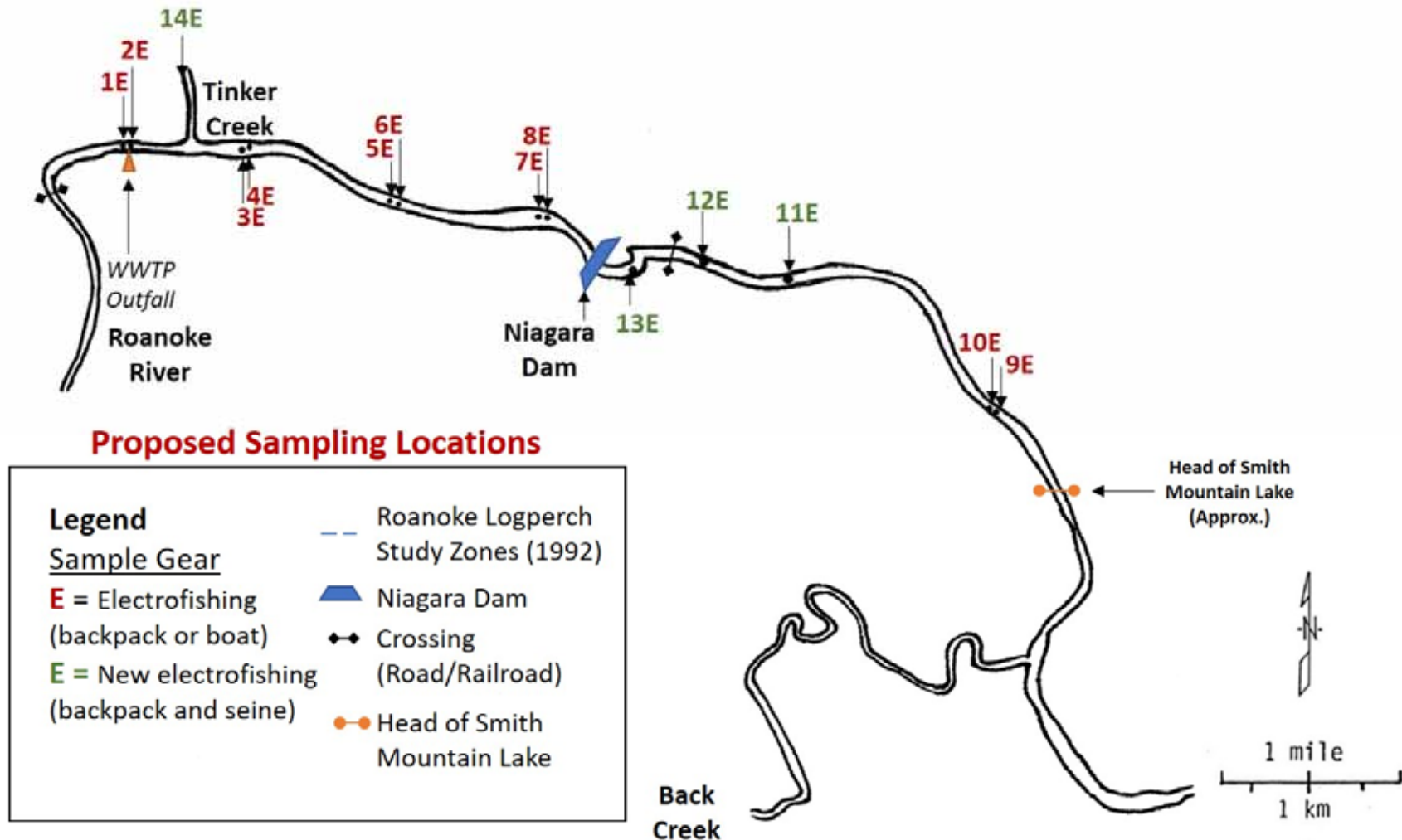
# Fish Community Study: Summary of Historical Sampling



# Fish Community Study: Methodology

Task 1a	
Fish Community Study	<i>Sampling Requirements:</i> Scientific collection permit
	<i>Field sampling</i> <ul style="list-style-type: none"> <li>• April-June and August-September 2020</li> <li>• Sample sites: 1989-1990 historical sites, new site on Tinker Creek, new site in bypass reach, and two new sites downstream of Project</li> <li>• Methodology: electrofishing (boat/backpack) and seines</li> <li>• Fish will be enumerated and identified to species; up to 30 individuals per taxon will be measured, weighed and examined</li> </ul>
	<ul style="list-style-type: none"> <li>• Calculate catch per unit effort (CPUE) and develop indices of biotic integrity for <i>comparison of study results</i> to historical data to detect trends or changes in the fish community.</li> </ul>

# Fish Community Study: Proposed Fish Community Study



# Fish Community Study: Methodology

## Task 1b



*Sampling Requirements:* Special permit or skilled surveyor requirements will be identified and obtained in coordination with USFWS and VDGIF.

### Roanoke Logperch Study

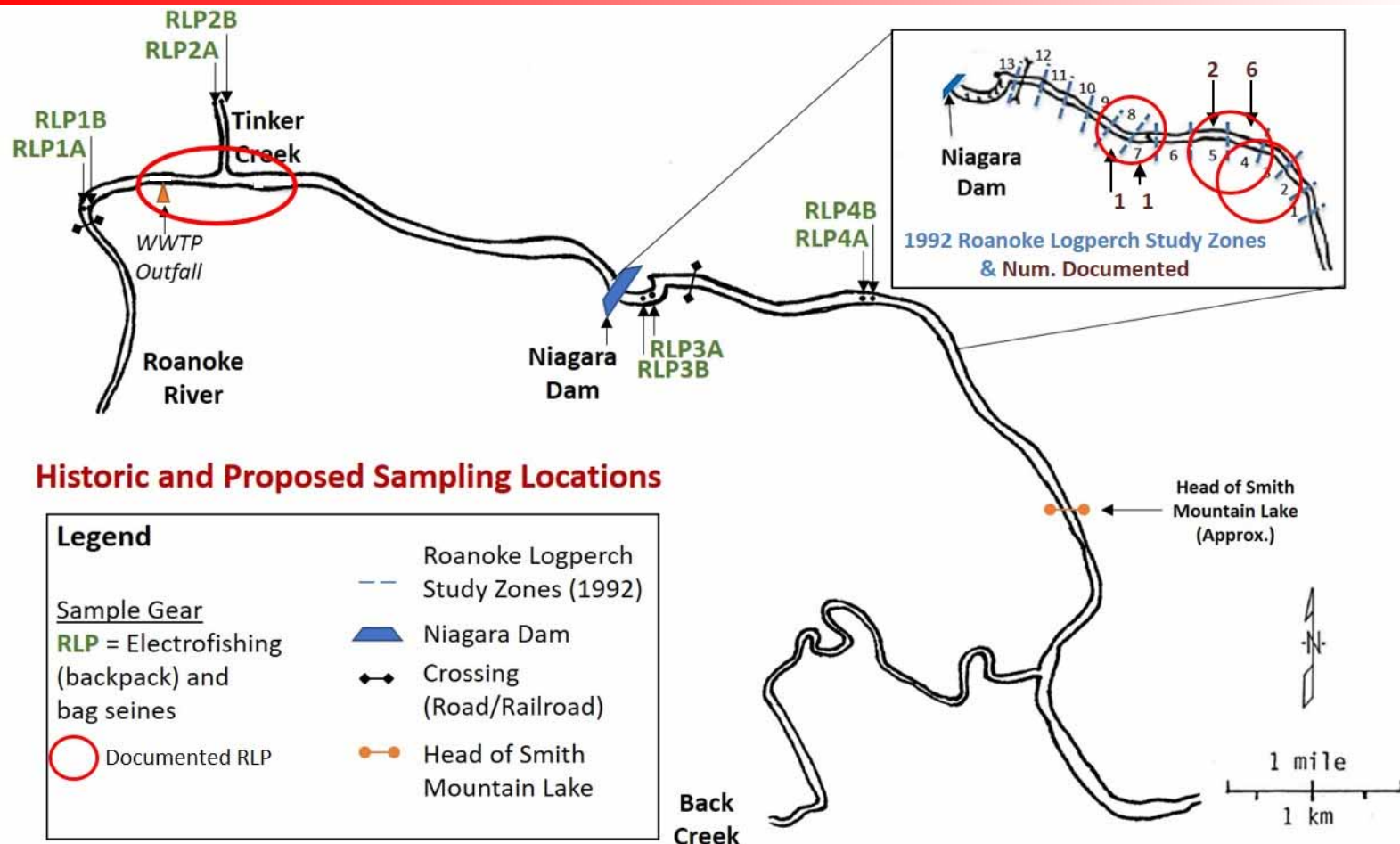
#### *Field sampling*

- Sample sites will include 4 historical logperch study sites and four new locations (2 above and 2 below Project)
- Methodology: backpack electrofishing into bag seine using fixed-area quadrats (4m x 2m) and timed snorkel surveys (3 ft maximum depth)
- Adults and juveniles: single event between July and September 2020
- Fish will be enumerated, weighed, and assessed for signs of injury, illness, or parasites

Calculate catch per unit effort (CPUE)  
Evaluate results in Initial Study Report



# Fish Community Study: Proposed Roanoke Logperch Study



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# Fish Community Study: Larval Life Stage

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- The proposed fish community studies do not include targeted effort for egg or larval Roanoke Logperch life stages
- Larval drift study concerns:
  - Difficult to separate Roanoke Logperch taxonomically at the egg and larval stages
  - Complex sampling methodology will be needed to increase likelihood of sufficient effort and appropriate, life stage-specific habitat

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# Fish Community Study: Analysis and Reporting

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- As part of the study report, the results will include:
  - Spatial and temporal trends in fish community composition and abundance across the study area
  - Documented habitat and species presence for Roanoke Logperch (adult and juvenile)
  - Raw data

# Fish Community Study: Schedule and Level of Effort

- Level of effort: ~700 hours
- Cost: ~\$150,000

Task	Proposed Timeframe for Completion
Study Planning and Existing Data Review	September 2019 – March 2020
Fish Community Study	April 2020 – September 2020
Roanoke Logperch Study	July – September 2020
Distribute Draft Study Report with the ISR	December 2020



# PSP and Revised Study Plan: Stakeholder Participation

- Comments on the PSP are due to FERC by October 7, 2019. Proposed modifications to the PSP must address the seven FERC study criteria in 18 CFR §5.9(b).
- Formal comments should be filed with FERC and include the FERC Project number in the subject line (P-2466-034). These documents will also be available from FERC's elibrary under Docket P-2466.
- Stakeholders can contact Appalachian with questions or comments:

Jon Magalski

American Electric Power Service Corporation

c/o Appalachian Power Company

1 Riverside Plaza, Columbus, OH 43215

(614) 716-2240 [jmmagalski@aep.com](mailto:jmmagalski@aep.com)

- Appalachian will file the Revised Study Plan (RSP) on or before November 6, 2019.

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# Closing



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## Yayac, Maggie

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**Subject:** FW: Niagara Hydro - Historic Fisheries Surveys and Related Studies

**From:** Jonathan M Magalski [mailto:jmmagalski@aep.com]

**Sent:** Wednesday, September 25, 2019 5:36 PM

**To:** Angermeier, Paul <biota@vt.edu>; Scott Smith (Scott.Smith@dgif.virginia.gov) <Scott.Smith@dgif.virginia.gov>; McCorkle, Richard <richard\_mccorkle@fws.gov>; John McCloskey <john\_mccloskey@fws.gov>

**Subject:** RE: Niagara Hydro - Historic Fisheries Surveys and Related Studies

Thank you, Paul for the information and thanks everyone for participating in today's call. I think it was a valuable and productive discussion. Have a nice evening....Jon



**JONATHAN M MAGALSKI | ENVIRONMENTAL SPEC CONSULT**

JMMAGALSKI@AEP.COM | D:614.716.2240  
1 RIVERSIDE PLAZA, COLUMBUS, OH 43215

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**From:** Angermeier, Paul <biota@vt.edu>

**Sent:** Wednesday, September 25, 2019 2:51 PM

**To:** Jonathan M Magalski <jmmagalski@aep.com>; Scott Smith (Scott.Smith@dgif.virginia.gov) <Scott.Smith@dgif.virginia.gov>; McCorkle, Richard <richard\_mccorkle@fws.gov>; John McCloskey <john\_mccloskey@fws.gov>

**Subject:** [EXTERNAL] RE: Niagara Hydro - Historic Fisheries Surveys and Related Studies

This is an **EXTERNAL** email. **STOP. THINK** before you **CLICK** links or **OPEN** attachments. If suspicious please click the 'Report to Incidents' button in Outlook or forward to [incidents@aep.com](mailto:incidents@aep.com) from a mobile device.

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Hi Jon

Thanks for orchestrating the webex today. As promised, here are copies of the 2 reports I mentioned. Glad to discuss further as needed.

Paul

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**From:** Jonathan M Magalski <jmmagalski@aep.com>

**Sent:** Monday, August 26, 2019 9:57 AM

**To:** Scott Smith (Scott.Smith@dgif.virginia.gov) <Scott.Smith@dgif.virginia.gov>; McCorkle, Richard <richard\_mccorkle@fws.gov>; John McCloskey <john\_mccloskey@fws.gov>; Angermeier, Paul <biota@vt.edu>; McGurk, Brian <brian.mcgurk@deq.virginia.gov>

**Cc:** Elizabeth B Parcell <ebparcell@aep.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; Yayac, Maggie <Maggie.Yayac@hdrinc.com>

**Subject:** Niagara Hydro - Historic Fisheries Surveys and Related Studies

Good morning Scott, et al.,

As a follow up to our conversation during the Niagara PSP meeting a few weeks ago, please find attached historic reports for the comprehensive fisheries survey, the targeted Roanoke logperch survey and a report related to the bypass reach visual flow evaluation. We are currently working through the fisheries survey plans and will be in touch to discuss in September. In the meantime, please let me know if you have any questions or need anything else.

## Niagara Project (P-2466-034)

The following comments refer to the Proposed Study Plan (PSP) and updated study plan (Fish Community Study) presented by AEP via conference call on 25 September 2019.

### Study Request 1: Assessing Use of Project Waters by Larval Roanoke Logperch

The study plan (fish community study) presented via conference call on 25 September 2019 states in slide 13:

“The proposed fish community studies do not include targeted effort for egg or larval Roanoke Logperch life stages

- Larval drift study concerns:
  - Difficult to separate Roanoke Logperch taxonomically at the egg and larval stages
  - Complex sampling methodology will be needed to increase likelihood of sufficient effort and appropriate, life stage-specific habitat”

These concerns seem overstated. Recent work shows RLP larvae can be reliably distinguished from most co-occurring darter species via morphometric measures (primarily pre-anal myomere count). The most similar species (*P. nevisense*) is much less abundant. Further, the field sampling for RLP larvae is not especially complex or intensive. Processing the samples, sorting and photographing larvae, and doing the morphometric analysis is more time consuming. However, stopping short of verifying species identity via DNA barcoding (which is expensive) would still enable us to estimate about how many RLP larvae enter and exit the Project area. In any case, it’s not clear why sampling “complexity” justifies NOT sampling for RLP larvae, especially when proven methods are available and unmeasured incidental take is highly likely. More specifics regarding this study request follow.

#### 1. Goals and Objectives

- a. Fill the knowledge gaps associated with assessing and mitigating incidental take of RLP, especially for larvae, upstream of, within, and downstream of the Project. These gaps are based on existing data summarized in the PAD.
- b. Assess distribution and abundance of RLP larvae upstream of the Project (in Roanoke River and Tinker Creek), at the upstream (reservoir-river) boundary of the Project, downstream of the powerhouse, and in the by-pass reach.
- c. Use meristic and morphometric features to identify RLP larvae from field samples.
- d. Compare RLP larval catch rates among sampling locations to assess differences in abundance attributable to the Project.

## 2. Resource Management Goals

A primary management goal for public water resources is to restore and protect populations of native freshwater fishes, including Roanoke Logperch (*Percina rex*), which is listed as endangered under the U.S. Endangered Species Act of 1973. Government agencies such as the U.S. Fish and Wildlife Service and Virginia Department of Game and Inland Fishes lead efforts to conserve and recover endangered and threatened species, but many other stakeholders also have roles in such efforts. Especially valuable are the roles scientists play in providing new knowledge to inform management actions so that management goals can be met cost-effectively.

## 3. Public Interest

This study request has significant public interest because it could contribute to a) conservation and recovery of a federally endangered species and b) restoration of the ecological health of Roanoke River upstream and downstream of Niagara Dam.

## 4. Existing Information

The Roanoke Logperch (RLP; *Percina rex*) is an endangered fish occurring in the Roanoke River drainage; its strongest population is in Roanoke River upstream of Smith Mountain Lake (Roberts et al. 2013. *Freshwater Biology* 58: 2050–2064); this reach includes the Niagara Hydroelectric Project. In 1990 and 1991, fish surveys conducted for Appalachian Power Company found RLP upstream and downstream of Niagara Dam. RLP have been captured in the Niagara Dam tailwater before it enters Smith Mountain Lake (Rosenberger, 2007. An update to the Roanoke Logperch Recovery Plan. Technical Report to U.S. Fish and Wildlife Service, Virginia Field Office).

Although RLP do not migrate distances comparable to many diadromous fishes, their movements typically far exceed the extent of the Project's boundaries. Roberts et al. (2016. *Ecology of Freshwater Fish* 25: 1–16) reported that 61 half-sibling pairs of RLP were captured an average of 14 km (maximum of 55 km) apart across the Roanoke River watershed over a 2-year period. The authors estimated the median lifetime dispersal distance of RLP to be 6–24 km. Most of this distance is covered during the first year of life.

RLP larvae enter the drift after hatching and ride the current for several km before moving to side channel and pool margin habitats to grow into juveniles. Thus, RLP larvae certainly enter the Project area during spawning season (early April to early June) but their abundance, spatial extent, and rates of survival are unknown. The sharp decrease in flow velocity, during typical discharge, as Roanoke River enters the Project area presumably leads to most RLP larvae settling to the river bottom, then dying because RLP larvae are poor swimmers, with limited ability to swim upstream. I know of no previous studies (including desktop studies) to help estimate Project impacts on early-life mortality of RLP. It is also possible that during high spring flows some RLP larvae drift all the way to the intake and go through the turbines or are carried over the dam into the bypass reach. Thus, sampling for RLP larvae downstream of the dam (but upstream of any riffles that might provide spawning habitat), as well as at

the mouth of the bypass reach, is warranted. Overall, it is likely that the Project substantially restricts movement and/or increases mortality for RLP living upstream and downstream of the Project, thereby qualifying as incidental take.

### *5. Nexus to Project Operations and Effects*

A key cause of RLP's imperilment is fragmentation of its habitat by dams, which cause a wide range of adverse impacts. In addition to impeding movements crucial to completing RLP's life history, dams and their impoundments a) exacerbate population isolation and genetic drift; b) eliminate spawning, rearing, and foraging habitats; c) entrain larvae through gates and turbines (direct mortality); d) alter temperature and oxygen regimes, which affect growth and survival; and e) starve downstream reaches of gravel/pebble/cobble sediments, which are crucial to RLP spawning and foraging. Collectively, these impacts imposed on RLP by Niagara Dam represent a significant, but unmeasured and unmitigated, incidental take of an endangered species. Moreover, none of these impacts is addressed substantively in the PAD. Additional study of the distribution and abundance of RLP (all life stages) in and near the Project is needed to test AEP's belief that "aquatic resources downstream are [not] presently being significantly impacted by Project operations".

As currently presented, the PSP is not designed to fill the knowledge gaps germane to assessing and mitigating incidental take of RLP, especially for early-life stages. This shortcoming stems from the fact that previously used conventional methods (i.e. "historical fish community surveys") are ill-suited to documenting RLP distribution and abundance. Further, RLP data collected for the relicensing surveys conducted in 1990-1991 do not provide the statistical power needed to credibly assess potential Project impacts. AEP now proposes "using a combination of electrofishing and snorkel survey techniques" to sample for RLP. These methods may suffice for adult and subadult life-stages but are not appropriate for early life-stages. Although AEP asserts "The use of snorkel surveys can be an important tool for locating larval ... stages", I know of no cases where snorkel surveys have been used to document occurrence of RLP larvae, and strongly doubt such an approach is feasible. Further, the spatiotemporal design of the proposed surveys is not explained in sufficient detail to ensure the resulting data will provide the statistical power needed to credibly assess potential Project impacts on RLP.

As AEP correctly asserts, RLP "is not typically found in reservoirs or other lentic environments, preferring riverine habitat types and silt-free, loosely embedded substrate". However, I know of no studies documenting RLP use of a river-reservoir boundary, such as occurs in the upstream portion of the Project. It seems highly likely that various life-stages of RLP commonly use these relatively lotic habitats, especially during certain seasons. Documenting the spatiotemporal extent of this use is crucial to managing the Project in ways that minimize incidental take of RLP.

In conclusion, additional focused studies are needed to a) accurately document the distribution and abundance of RLP (all life stages) in and near the Project and b) assess potential impacts of the Project on RLP in terms of likely incidental take. In particular, distinct sampling protocols – not implemented in

previous Project surveys – are needed to document the distribution and abundance of RLP larvae, young-of-year juveniles, and adults (including subadults).

#### 6. *Methodology Consistent with Accepted Practice*

The proposed work for this study request will be conducted consistent with generally accepted practices. The methods outlined herein draw heavily from recent and ongoing analogous studies in Roanoke River conducted by Dr. Eric Hallerman and colleagues at Virginia Tech.

I propose a spatial design with 7 sample sites:

1. upstream Roanoke River at AEP's RLP1 site shown in slide 12 of their 25 Sep 2019 presentation;
2. upstream Tinker Creek at AEP's RLP2 site shown in slide 12 of their 25 Sep 2019 presentation;
3. Roanoke River at upstream Project boundary;
4. Tinker Creek at upstream Project boundary;
5. 500 meters downstream of Tinker Creek mouth (or further upstream if river velocity is inadequate for drift-net sampling);
6. between the powerhouse and the mouth of the bypass reach;
7. at the mouth of the bypass reach.

Each site will be sampled with similar frequency and effort. Methods from analogous studies are summarized below.

We used drift nets to sample larval fishes during the RLP spawning period (early April – early June). Sites were sampled on average once every 4.2 days. Each night, two teams sampled 2–3 sites each. Sampling began soon after sunset and was completed by 2 am. Sampling at each site included two 20-minute drift-net sets (early and late) of one net. Drift nets were staked into the substrate in a riffle or run. Depth and velocity were measured at the mouth of each net. All solid material (larvae + debris) from a sample was placed in glass jars containing 95% ethanol.

Larval darters were separated based on distinguishing characters, including vent location, yolk sac and oil globule characters, pectoral fin development, myomere count, and pigmentation patterns. Each darter larva was photographed under magnification and stored in 95% ethanol in a microcentrifuge tube labeled with a unique identification number.

We counted preanal myomeres (*PM*) and measured total length (*TL*) along with seven other body measurements, which we expressed relative to (i.e., as a ratio of) *TL*, including: preanal length (*RPREL*, tip of snout to posterior margin of vent), head height (*RHEADH*, apex of optic lobe to ventral margin of head), head length (*RHEADL*, tip of snout to pectoral fin insertion), snout length (*RSNOUTL*, tip of snout to anterior margin of eye iris), eye diameter (*REYED*, longitudinal iris diameter), pectoral fin length (*RPECL*, from foremost visible point of insertion to distal tip of the membranous edge), and caudal peduncle height (*RPEDH*, least peduncle height excluding finfold. We counted all preanal myomeres

between the anterior-most myoseptum and an imaginary vertical line drawn at the posterior margin of vent, including any bisected by the line.

Findings to date show that *Etheostoma* and *Percina* have completely disjoint distributions of *RPECL*, with all *Etheostoma* having *RPECL*  $\geq 0.11$  (approximately  $2 \times$  eye diameter) and all *Percina*  $< 0.11$  ( $1 \times$  eye diameter). *PM* completely segregated *P. roanoka* (*PM*  $< 21$ ) from the two other *Percina* species (*PM*  $\geq 21$ ), but 2 of 19 *P. nevisense*, along with 14 of 36 *P. rex* had *PM* = 23.

A principal components analysis shows how darter larvae were distributed in multivariate morphometric space (Figure 2 below). Groups of larvae along the first component (x axis) were generally consistent with species identifications from DNA barcoding, but the three *Percina* species overlapped marginally. The first component, which contrasted *PM* and *RPREL* against the other variables (except *RSNOUTL*), explained 63% of the variation among the eight morphometric variables.

A classification-tree model also shows how morphometrics can be used to identify larval darters to species (Figure 3 below). Important morphometrics in the classification tree included *PM*, *RPECL*, and *RPEDH*. The model was 100% accurate in predicting genus (*Etheostoma* or *Percina*) and 89.5% accurate in predicting species overall. Among the misclassifications, two *P. nevisense* were predicted to be *P. rex*.

Overall, after considering both morphometrics and pigmentation, *P. nevisense* versus *P. rex* is the only species pair among Roanoke River darters for which some uncertainty remains. About 10% of *P. nevisense* – those with 23 *PM* – may be misclassified as *P. rex*, but no *P. rex* are likely to be misclassified as *P. nevisense*. However, these species can be distinguished readily via genetic markers. Given that *P. nevisense* is much less common than *P. rex*, reasonably accurate estimates of the distribution and abundance of RLP larvae can be obtained even if DNA barcoding is not used to confirm identities of larvae that may be either *P. nevisense* or *P. rex*.



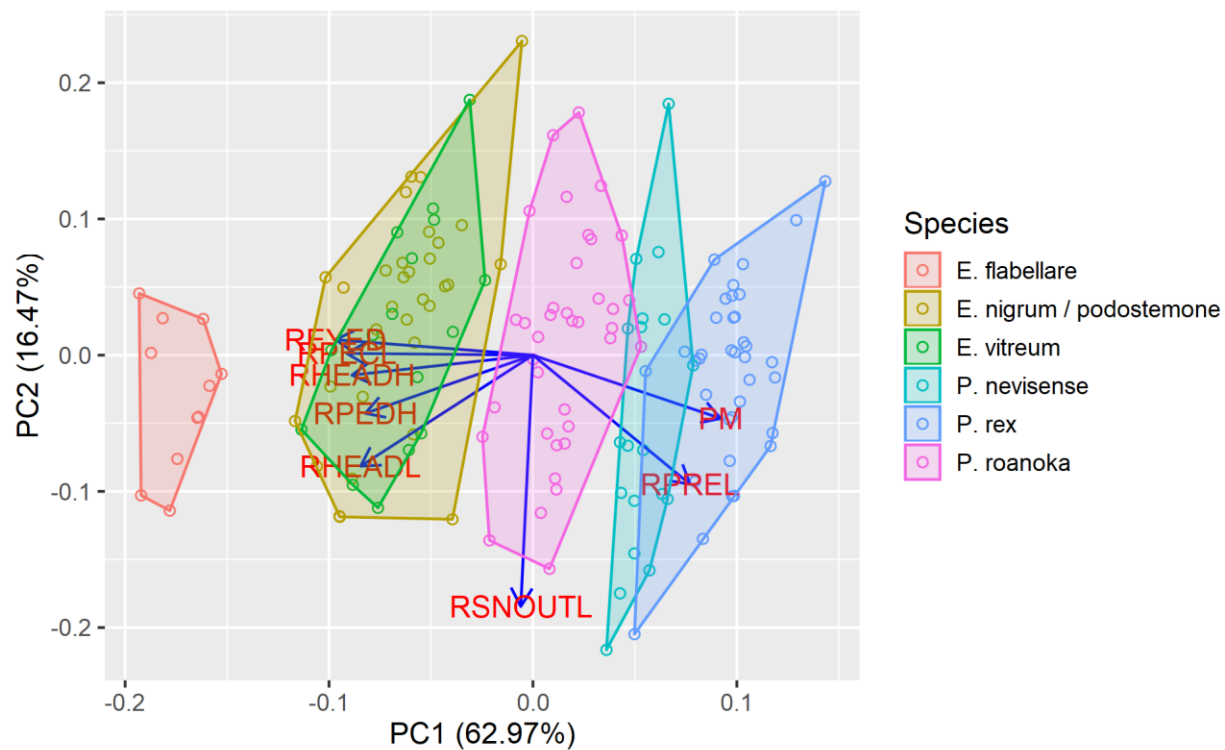


Figure 2 from Buckwalter et al (2019). Biplot from principal components (PC) analysis of eight morphologic variables measured on 152 larvae of six darter species. Each plotted circle represents one larva.

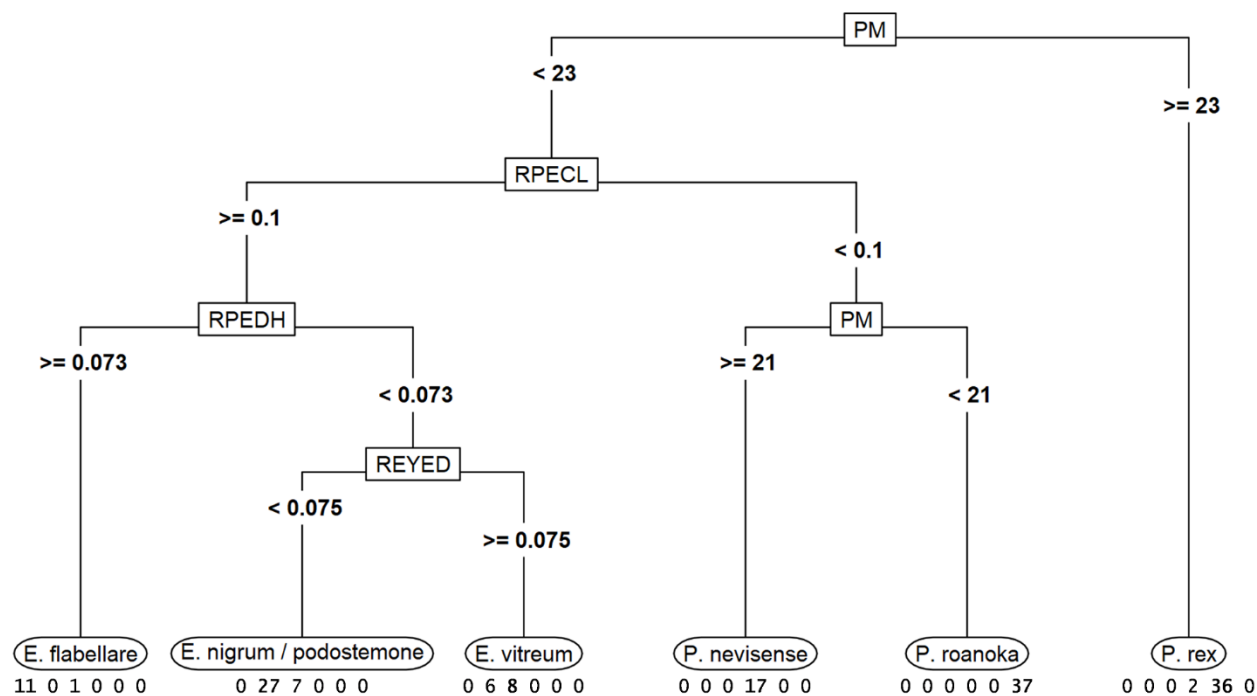


Figure 3 from Buckwalter et al (2019). Classification tree model used to predict the species of 152 larval darters based on eight morphologic variables, only four of which appeared in the final model: preanal myomere count (*PM*); relative (to total length) pectoral fin length (*RPECL*), relative caudal peduncle height (*RPEDH*), and relative eye diameter (*REYED*). Counts at the bottom of the tree represent 136 correct (bold) and 16 misclassified identifications when the tree model was run on held-out larvae from 10-fold cross-validation. Counts are sorted alphabetically by species name.

References

Buckwalter, J. et al. 2019. Drift of larval darters (Family Percidae) in the upper Roanoke River basin, USA, characterized using phenotypic and DNA barcoding markers. Unpublished manuscript.

Hallerman, E.M. et al. 2017. Phenology and habitat use of larval darters in the upper Roanoke River basin. Final Report to Virginia Department of Game and Inland Fisheries.

7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice

We know of no alternative approaches to assessing distribution and abundance of RLP larvae. No alternative studies were proposed in the PAD to address the assessment posed in this study request. Based on recent and ongoing analogous studies, I estimate that the **direct cost of the study requested above will be \$62,000 - \$68,000**. However, indirect costs will increase the total cost by an unknown amount, depending on AEP’s negotiations with the eventual vendor.

## Study Request 2: Assessing Use of Project Waters by Young-of-year Roanoke Logperch

The study plan (fish community study) presented via conference call on 25 September 2019 states in slide 14:

“As part of the study report, the results will include:

- Spatial and temporal trends in fish community composition and abundance across the study area
- Documented habitat and species presence for Roanoke Logperch (adult and juvenile)”

The proposed work, as described, **does not document any patterns for juvenile RLP**. All Age 1+ RLP are indistinguishable by length. Only young-of-year (YOY) juveniles are distinguishable by length but this age group is not addressed in AEP’s proposed work. Surveys to establish distribution and abundance of YOY RLP do not require complex methods. Such surveys could be based on standardized seining (per previous studies) at selected near-shore sites in the Project area, as well as upstream and downstream. These seine-based surveys can be supplemented with visual surveys conducted from the riverbank. Most survey sites for YOY could be near the sites used to survey adult RLP. More specifics regarding this study request follow.

### 1. Goals and Objectives

- a. Fill the knowledge gaps associated with assessing and mitigating incidental take of RLP, especially for YOY, upstream of, within, and downstream of the Project. These gaps are based on existing data summarized in the PAD.
- b. Assess distribution and abundance of RLP YOY upstream of the Project (in Roanoke River and Tinker Creek), at the upstream (reservoir-river) boundary of the Project, and downstream of the powerhouse.
- c. Assess microhabitat suitability for RLP YOY along pool margins at all sample locations.
- d. Compare RLP YOY catch rates and microhabitat suitability among sampling locations to assess differences attributable to the Project

### 2. Resource Management Goals

A primary management goal for public water resources is to restore and protect populations of native freshwater fishes, including Roanoke Logperch (*Percina rex*), which is listed as endangered under the U.S. Endangered Species Act of 1973. Government agencies such as the U.S. Fish and Wildlife Service and Virginia Department of Game and Inland Fishes lead efforts to conserve and recover endangered and threatened species, but many other stakeholders also have roles in such efforts. Especially valuable are the roles scientists play in providing new knowledge to inform management actions so that management goals can be met cost-effectively.

### 3. Public Interest

This study request has significant public interest because it could contribute to a) conservation and recovery of a federally endangered species and b) restoration of the ecological health of Roanoke River upstream and downstream of Niagara Dam.

#### 4. Existing Information

The Roanoke Logperch (RLP; *Percina rex*) is an endangered fish occurring in the Roanoke River drainage; its strongest population is in Roanoke River upstream of Smith Mountain Lake (Roberts et al. 2013. *Freshwater Biology* 58: 2050–2064); this reach includes the Niagara Hydroelectric Project. In 1990 and 1991, fish surveys conducted for Appalachian Power Company found RLP upstream and downstream of Niagara Dam. RLP have been captured in the Niagara Dam tailwater before it enters Smith Mountain Lake (Rosenberger, 2007. An update to the Roanoke Logperch Recovery Plan. Technical Report to U.S. Fish and Wildlife Service, Virginia Field Office).

RLP larvae enter the drift after hatching and ride the current for several km before moving to side channel and pool margin habitats to grow into juveniles. Thus, RLP larvae certainly enter the upstream portion of the Project area during spawning season (early April to early June) but their distribution and abundance as YOY juveniles are unknown. Some may find their way to the impoundment margins and grow into YOY juveniles, especially in the upstream portion of the Project. I know of no previous studies (including desktop studies) to help estimate Project impacts on early-life mortality of RLP. It is also possible that during high spring flows some RLP larvae drift all the way to the intake and go through the turbines or are carried over the dam into the bypass reach. Thus, sampling for RLP YOY downstream of the dam, as well as in the bypass reach, is warranted.

Recent study of YOY RLP shows they prefer sandy, backwater, or *Justicia* patches over rocky or gravel patches (see Argentina and Roberts. 2014. Habitat associations for young-of-year Roanoke Logperch in Roanoke River. Final Report to Virginia Department of Game and Inland Fisheries). YOY RLP also prefer shallow, slow-velocity patches with gravel and cobble substrates. Between June and October, mean length of YOY RLP increase from 32 mm to 65 mm (standard length), and they gradually shift into deeper, faster water with coarser substrates. Argentina and Roberts (2014) also noted that YOY RLP are difficult to capture and recommended that multiple sampling techniques be used to determine site occupancy and abundance.

#### 5. Nexus to Project Operations and Effects

A key cause of RLP's imperilment is fragmentation of its habitat by dams, which cause a wide range of adverse impacts. In addition to impeding movements crucial to completing RLP's life history, dams and their impoundments a) exacerbate population isolation and genetic drift; b) eliminate spawning, rearing, and foraging habitats; c) entrain larvae through gates and turbines (direct mortality); d) alter temperature and oxygen regimes, which affect growth and survival; and e) starve downstream reaches of gravel/pebble/cobble sediments, which are crucial to RLP spawning and foraging. Collectively, these impacts imposed on RLP by Niagara Dam represent a significant, but unmeasured and unmitigated,

incidental take of an endangered species. Moreover, none of these impacts is addressed substantively in the PAD. Additional study of the distribution and abundance of RLP (all life stages) in and near the Project is needed to test AEP's belief that "aquatic resources downstream are [not] presently being significantly impacted by Project operations".

As currently presented, the PSP is not designed to fill the knowledge gaps germane to assessing and mitigating incidental take of RLP, especially for early-life stages. This shortcoming stems from the fact that previously used conventional methods (i.e. "historical fish community surveys") are ill-suited to documenting RLP distribution and abundance. Further, RLP data collected for the relicensing surveys conducted in 1990-1991 do not provide the statistical power needed to credibly assess potential Project impacts. AEP now proposes "using a combination of electrofishing and snorkel survey techniques" to sample for RLP. These methods may suffice for adult and subadult life-stages but electrofishing is not appropriate for early life-stages. Further, the spatiotemporal design of the proposed surveys is not explained in sufficient detail to ensure the resulting data will provide the statistical power needed to credibly assess potential Project impacts on RLP.

As AEP correctly asserts, RLP "is not typically found in reservoirs or other lentic environments, preferring riverine habitat types and silt-free, loosely embedded substrate". However, I know of no studies documenting RLP use of a river-reservoir boundary, such as occurs in the upstream portion of the Project. It seems highly likely that various life-stages of RLP commonly use these relatively lotic habitats, especially during certain seasons. Documenting the spatiotemporal extent of this use is crucial to managing the Project in ways that minimize incidental take of RLP.

In conclusion, additional focused studies are needed to a) accurately document the distribution and abundance of RLP (all life stages) in and near the Project and b) assess potential impacts of the Project on RLP in terms of likely incidental take. In particular, distinct sampling protocols – not implemented in previous Project surveys – are needed to document the distribution and abundance of RLP larvae, young-of-year juveniles, and adults (including subadults).

#### *6. Methodology Consistent with Accepted Practice*

The proposed work for this study request will be conducted consistent with generally accepted practices. The methods outlined herein draw heavily from recent analogous studies in Roanoke River conducted by Dr. Paul Angermeier and colleagues at Virginia Tech.

I propose a spatial design with 7 sample areas:

1. 0-2 km upstream of the upper Project boundary in Roanoke River;
2. 0-1 km upstream of the upper Project boundary in Tinker Creek;
3. 0-2 km downstream of the upper Project boundary in Roanoke River;
4. 0-1 km downstream of the upper Project boundary in/near Tinker Creek;
5. in the bypass reach;
6. between the mouth of the bypass reach and the lower boundary of the Project; and

## 7. 0-2 km downstream of the lower Project boundary in Roanoke River.

Each area will be sampled with similar frequency and effort. In particular, sampling will focus on available habitat patches preferred by RLP YOY, including sandy, backwater, and *Justicia* patches and shallow, slow-velocity patches with gravel and cobble substrates; these patches typically occur along river margins. Methods are summarized below from Argentina and Roberts (2014. Habitat associations for young-of-year Roanoke Logperch in Roanoke River. Final Report to Virginia Department of Game and Inland Fisheries).

We quantified YOY RLP distributions and habitat associations using targeted, intensive sampling in the Roanoke River from mid-July through September. Within each site, we used a 6'-tall x 8'-wide seine (1/16" mesh) to sample fishes in 20 habitat patches along a 200-300-m long reach. Beginning at the downstream end of the site, we made seine hauls at 10-m intervals, moving upstream. Within each 10-m segment, we began approximately 2 m from the bank and seined toward the bank perpendicularly to the river channel; each patch was sampled with a single seine haul. A 10-m section was not sampled if water velocity was too fast or if bed sediments created an area that we could not sample efficiently with a seine (root wads or rip rap, for example). Depending on available habitat at each site, we sampled patches of sandy and rocky margins, backwaters, and water willow (*Justicia americana*) beds. All captured YOY RLP were measured and released alive at the point of capture.

We quantified microhabitat within each patch by measuring depth, velocity, and substrate size (on a modified Wentworth scale) at each corner of a 1-m<sup>2</sup> sampling frame placed in the center of each patch and visually estimated embeddedness of the entire sampled patch. These values were later averaged to create a mean value for each variable for each sampled patch.

The seining methods described above should be supplemented with visual surveys, as described in Roberts et al. 2016 (A long-term study of ecological impacts of a flood reduction project to an endangered riverine fish: lessons learned for assessment and restoration. Water 8, 240; doi:10.3390/w8060240) and summarized here. Visual surveys are based on methodical shoreline walks along low-velocity pool-margin habitats during July-August. Sampling was performed at base-flow conditions by two to four investigators slowly walking upstream while scanning shallow areas for juvenile *P. rex*. During surveys, all investigators wore polarized sunglasses and took great care to not disturb the water surface. RLP YOY counts were converted to an estimate of population density by dividing the number of individuals observed by the length of river surveyed.

### *7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

We know of no alternative approaches to assessing distribution and abundance of RLP YOY. No alternative studies were proposed in the PAD to address the assessment posed in this study request. Based on recent analogous studies, I estimate that the **direct cost of the study requested above will be \$24,000 - \$27,000**. However, indirect costs will increase the total cost by an unknown amount, depending on AEP's negotiations with the eventual vendor.



## **Study Modification Request: Assessing Habitat Suitability of Project Waters for Roanoke Logperch**

The study plan (fish community study) presented via conference call on 25 September 2019 states in slide 14:

“As part of the study report, the results will include:

- Spatial and temporal trends in fish community composition and abundance across the study area
- Documented habitat and species presence for Roanoke Logperch (adult and juvenile)”

Although it is a good idea to assess habitat suitability for Roanoke Logperch (RLP), there is no description presented in the PSP or the updated study plan regarding how that will be done. This methodology needs to be added. **Habitat assessments should be completed at all sites used to survey for adult, subadult, and YOY RLP.**

### *1. Goals and Objectives*

- a. Fill the knowledge gaps associated with suitability of microhabitat for RLP upstream of, within, and downstream of the Project. These gaps are based on existing data summarized in the PAD.
- b. Assess microhabitat suitability in riffle-runs upstream of the Project (in Roanoke River and Tinker Creek), at the upstream (reservoir-river) boundary of the Project, downstream (in Roanoke River) of the Project, and in the by-pass reach.

### *2. Resource Management Goals*

A primary management goal for public water resources is to restore and protect populations of native freshwater fishes, including Roanoke Logperch (*Percina rex*), which is listed as endangered under the U.S. Endangered Species Act of 1973. Government agencies such as the U.S. Fish and Wildlife Service and Virginia Department of Game and Inland Fishes lead efforts to conserve and recover endangered and threatened species, but many other stakeholders also have roles in such efforts. Especially valuable are the roles scientists play in providing new knowledge to inform management actions so that management goals can be met cost-effectively.

### *3. Public Interest*

This study request has significant public interest because it could contribute to a) conservation and recovery of a federally endangered species, b) restoration of the ecological health of Roanoke River upstream and downstream of Niagara Dam, and c) improved fishing.

### *4. Existing Information*

The Roanoke Logperch (RLP; *Percina rex*) is an endangered fish occurring in the Roanoke River drainage; its strongest population is in Roanoke River upstream of Smith Mountain Lake (Roberts et al. 2013. *Freshwater Biology* 58: 2050–2064); this reach includes the Niagara Hydroelectric Project. In 1990 and 1991, fish surveys conducted for Appalachian Power Company found RLP upstream and downstream of Niagara Dam. RLP have been captured in the Niagara Dam tailwater before it enters Smith Mountain Lake (Rosenberger, 2007. An update to the Roanoke Logperch Recovery Plan. Technical Report to U.S. Fish and Wildlife Service, Virginia Field Office).

### 5. *Nexus to Project Operations and Effects*

A key cause of RLP's imperilment is fragmentation of its habitat by dams, which cause a wide range of adverse impacts. In addition to impeding movements crucial to completing RLP's life history, dams and their impoundments a) exacerbate population isolation and genetic drift; b) eliminate spawning, rearing, and foraging habitats; c) entrain larvae through gates and turbines (direct mortality); d) alter temperature and oxygen regimes, which affect growth and survival; and e) starve downstream reaches of gravel/pebble/cobble sediments, which are crucial to RLP spawning and foraging. Collectively, these impacts imposed on RLP by Niagara Dam represent a significant, but unmeasured and unmitigated, "incidental take" of an endangered species. Moreover, none of these impacts is addressed substantively in the PAD. Additional study of the condition of RLP habitat in and near the Project is needed to test AEP's belief that "aquatic resources downstream are [not] presently being significantly impacted by Project operations".

### 6. *Methodology Consistent with Accepted Practice*

The proposed work for this modification request will be conducted consistent with generally accepted practices.

A widely used quantitative assessment of habitat suitability for RLP is described in Ensign et al. (2000) and Anderson and Angermeier (2015). Briefly, this approach samples a series of 1-m<sup>2</sup> cells centered on (and occurring every 3 m along) a series of transects throughout the study reach. Depth and water velocity (cm s<sup>-1</sup>) are taken at the center of the cell. Within each cell, we measure depth (cm) and water velocity (cm s<sup>-1</sup>) at 0.6 times depth at the center of the cell and describe how much of the area of the cell is covered by silt using a five-point scale. A pebble-count is also used to describe the substrate size at five locations equally spaced across the width of the cell. Ordinal particle sizes are assigned using the modified Wentworth scale. The five substrate measurements are then averaged to obtain a mean substrate size for analysis. These four variables are then used to evaluate the suitability of the cell for Age-1+ Roanoke Logperch based on the habitat suitability index (HSI) developed by Ensign and Angermeier (1994) and Ensign et al. (2000). The HSI for each cell is calculated, then placed into a suitability category.

A habitat suitability index (HSI) for RLP in Roanoke River was developed by Ensign and Angermeier (1994) based on habitat availability-versus-use data collected during underwater observation of adult RLP. Habitat suitability mapping and analysis were accomplished using spatial interpolation procedures in ArcGIS for each sampled site. Cartesian coordinates were based on the transect georeferencing system described above, and interpolation was used to predict habitat values for unmeasured cells that occurred between measured cells. We used an inverse distance-weighting interpolation routine for silt-cover, the ordinal variable, and a universal kriging interpolation routine for the three continuous variables. Once each cell in the grid was assigned its empirical or estimated habitat values, we calculated a HSI value for each cell and assigned a suitability category based on RLP adult preference values. Using the cell values, we calculated the proportion of cells in a site that were in each suitability category. Spatiotemporal changes in these proportions can be used to gauge shifts in the availability of suitable RLP habitat.

## References

Anderson, G.B. and P.L. Angermeier. 2015. Assessing Impacts of the Roanoke River Flood Reduction Project on the Endangered Roanoke Logperch. Annual report to U.S. Army Corps of Engineers, Wilmington, NC.

Ensign, W.E. and P.L. Angermeier. 1994. Summary of population estimation and habitat mapping methods for the Roanoke River Flood Reduction Project. Final Report to U.S. Army Corps of Engineers, Wilmington, NC.

Ensign, W. E., P. L. Angermeier, B. W. Albanese, and G. H. Galbreath. 2000. Pre-construction monitoring of the endangered Roanoke Logperch (*Percina rex*) for the Roanoke River Flood Reduction Project: Phase 3. Final report to U. S. Army Corps of Engineers, Wilmington, NC.

## *7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

We know of no alternative approaches to characterizing microhabitat suitability for RLP. No alternative studies were proposed in the PAD to address the assessment posed in this study modification request. Proposed methods to assess habitat suitability will add a few person-hours to each fish survey. We estimate total additional cost to be < \$10,000.

## **Minor Comments on AEP-Proposed Studies:**

The study plan (fish community study) presented via conference call on 25 September 2019 states in slide 11:

*“Field sampling for RLP (Task 1b)*

- Sample sites will include 4 historical logperch study sites and four new locations (2 above and 2 below Project)
  - Methodology: backpack electrofishing into bag seine using fixed-area quadrats (4m x 2m) and timed snorkel surveys (3 ft maximum depth)
  - Adults and juveniles: single event between July and September 2020
  - Fish will be enumerated, weighed, and assessed for signs of injury, illness, or parasites
- Calculate catch per unit effort (CPUE)”

I suggest two minor modifications to the study plan:

1. Conduct field sampling in late summer (September), as young-of-year RLP are much more likely to be captured during this period than in July-August.
2. Measure total length of all RLP captured to enable distinctions between young-of-year versus Age 1+.

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# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Pennsylvania Field Office  
110 Radnor Road, Suite 101  
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October 3, 2019

Ms. Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
Mail Code: DLC, HL-11.2  
888 First St., NE  
Washington, DC 20426

RE: **Niagara Hydroelectric Project (FERC No. 2466-034) Proposed Study Plan  
Comments**

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed Appalachian Power Company's (Appalachian) Proposed Study Plan for Relicensing Studies (PSP), filed with the Federal Energy Regulatory Commission (FERC) on July 9, 2019, for the Niagara Hydroelectric Project (Project; FERC No. 2466-034). The Service also participated in the August 1, 2019 PSP meeting held in Roanoke, Virginia. The Project is located at approximately river mile 355 on the Roanoke River, approximately 6 miles southeast of the City of Roanoke, in Roanoke County, Virginia. The Service filed comments on the Scoping Document (SD1) and Pre-Application Document (PAD), and study requests, on May 28, 2019. The Service offers the following comments on the PSP in accordance with 18 CFR §5.12.

**3.2, Study Requests Deemed Not Appropriate for Study, 3.2.1, Sediment:** While the Service believes that the critical information from this study can be incorporated into other studies as stated (Flow and Bypass Reach Aquatic Habitat Study and Benthic Aquatic Resource), it is unclear from the information provided that the primary objective from this study request will be met by these other studies. The primary objective is to determine whether the river below the dam is sufficiently starved of sediment to reduce the quality and quantity of habitat for benthic invertebrates and fish. These other studies will need to address this issue.

Appalachian has elected not to adopt this larger sediment study as part of the PSP. Three reasons for not adopting this study were provided. One of the reasons is the existing outlet structure does not provide a means to pass reservoir sediment. This ignores the use of other methods to augment sediment downstream including mechanical placement. A second reason for not

adopting this study as stated by Appalachian is that any sediment that could be passed would likely travel through the bypass reach and settle into Smith Mountain Reservoir. This would likely not be a significant issue if sediment augmentation was ongoing as needed to maintain optimal benthic invertebrate and fish habitat. The third reason for not adopting the study as stated in this section is Appalachian does not believe the aquatic resources downstream are presently being significantly impacted by Project operations. The specific issue regarding sediment transport has not yet been studied and it would be premature to make conclusions regarding potential impacts to aquatic species downstream of the dam.

**3.2, Study Requests Deemed Not Appropriate for Study, 3.2.3, Hydrodynamics and Fish Behavior:** While this study was deemed not appropriate for study, there is at least one goal of the study that the Service believes should be incorporated into other studies. In addition, the Service questions Appalachian's rationale regarding its belief that "it is premature to study the need for Project modifications or other measures related to fish passage without justification that such measures are required or reasonable" while choosing not to adopt at least some elements of this proposed study that would help to determine whether or not there is justification for such modifications or measures.

The effects of the Project on the federally listed endangered Roanoke logperch (e.g., barrier to upstream and downstream movements; possible source of mortality for larvae that drift into the Project impoundment; genetic isolation of upstream and downstream sub-populations) likely results in "incidental take" as defined under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.; ESA). Under the ESA, "take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct" (ESA §3(29)). "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Harass" is defined by the Service as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR §17.3).

The Service supports the proposed study's goal of characterizing Roanoke logperch's spatial associations with the dam and associated structures or flow conditions over a full range of temporal factors. In addition, we support Appalachian's proposal to revisit whether additional study or protection measures are required for this species in the Initial Study Report (ISR), based on the results of the Fish Community Survey proposed in the PSP. The Service has additional comments below regarding possible changes to the Fish Community Survey methods to increase the efficacy of the study for determining the Roanoke logperch's distribution and abundance, across all life stages, in relation to the Project.

**3.2.4, Fish Passage:** Appalachian states that the Roanoke logperch is not typically found in reservoirs or other lentic environments. This is generally true of adults, but there may be some potential for larvae to drift into the impoundment and either settle out of the water column or pass through Project turbines. According to Rosenberger (2007), isolated specimens of logperch have been found in Beaverdam Creek Cove and Moorsman's Cove of Smith Mountain Reservoir



Therefore, it appears logperch have some ability to utilize reservoirs. In addition, while Appalachian is correct that it is not a migratory species, tagged Roanoke logperch were documented moving 3.2 km and 2.5 km between study sites (Roberts et al. 2007), and another study estimated a median lifetime dispersal distance of 6-26 km (Roberts et al. 2016).

This section states Appalachian does not believe there is an appreciable population benefit to Roanoke logperch for providing passage of this species upstream at Niagara dam. It is unclear on what this statement is based particularly since this issue has not yet been studied. There would be clear benefits to logperch downstream of the dam if they were not isolated from other populations in the river, particularly as it relates to genetic isolation and inbreeding. In addition, if a chemical spill or other hazard were to impact this population, it could be difficult for this population to recover because of its physical isolation from other populations.

The Service appreciates Appalachian's willingness to consider a study plan modification following completion of the ISR, to evaluate downstream passage alternatives if such measures are found to be potentially appropriate, based on the results of the Fish Community Survey. In order to fully inform any such decision, the Service recommends that the proposed Fish Community Survey methods be refined to ensure that occurrences and distribution of all life stages of Roanoke logperch (i.e., including larvae and young of year [YoY]) in the vicinity of the Project are documented, including any occurrences within the impoundment or near the Project intake. This will also require survey efforts during multiple seasons in order to document all life stages.

**6.6.1, Flow and Bypass Reach Aquatic Habitat Study, Methodology, Task 1 – Literature Review and Desktop Assessment:** Regarding selection of species of interest, the Service recommends a guild approach, utilizing the guild density histograms developed in relationship to four habitat variables (% cover; average substratum size; water depth; average water column velocity) in a study conducted by Vadas and Orth (2001) for the upper Roanoke River drainage. The study grouped fish species into seven habitat guilds, including four guilds for rheophiles (species that live in flowing water) (fast riffle; riffle-run; fast generalist; shallow rheophilic) and three guilds for limnophiles (species that live in lakes or pools) (pool-run; open pool; pool cover). Representative fish taxa included minnows, darters, suckers, catfishes, sunfishes and sculpins.

A separate habitat suitability analysis is needed for Roanoke logperch, and we recommend the Virginia Department of Transportation Fish and Habitat Survey Protocol (Anderson, unpublished; Anderson and Angermeier 2015; Roberts and Angermeier 2005), which includes specific habitat suitability indices (substrate category; % silt cover; water depth; water velocity) for age-1+ (adult and juvenile, non-fry) Roanoke logperch. Because of the pronounced habitat shifts exhibited by the species as it develops (Rosenberger and Angermeier 2003), the habitat suitability index (HSI) developed for Age-1+ logperch is not directly applicable to Age-0 (fry) logperch. For Age-0 Roanoke logperch habitat evaluations, the Service recommends the HSI developed by Roberts and Angermeier (2006), with modification to substrate measurements described in Roberts and Angermeier (2007).

**6.6.3.1, Mesohabitat Mapping Verification:** We appreciate Appalachian's proposed adoption of substrate characterization methods previously recommended by the Service; however, after further review of methodologies already developed for the Roanoke River and Roanoke logperch, we recommend habitat mapping characterization methods that follow the above recommendations (section 6.6.1 comments), including utilization of a different substrate characterization approach (modified Wentworth scale).

**6.6.3.2, Flow and Water Level Assessment:** The Service recommends representative bypass reach flow releases ranging up to a maximum flow release that will enable accurate hydraulic modeling of the average annual flow (532 cfs) for the 30-year hydrologic period from January 1, 1988 through December 31, 2017 (i.e., modeling of the bypassed reach under this annual flow).

The first bulleted paragraph under this section states a range of representative flows of interest, developed in consultation with interested relicensing participants, will be released at the dam into the bypass reach via the existing sluice gate. The Service recommends hydraulic modeling also be performed with water spilling over the dam instead of only through the sluice gate to see how this changes the available habitat within the bypass reach. If the same flow was evaluated using these two different release methods (sluice gate versus dam spillage), a comparison of the available habitat between methods can be made.

The second to last bulleted paragraph under this section states that total flow in the tailwater and bypass reach under each target flow release will be determined by generation and sluice gate opening calculations and/or direct flow measurements using an appropriate velocity meter, and that cross-sections will be established to facilitate direct flow measurements. The Service requests the use of a velocity meter to also record velocity measurements at different depths, under each target flow release, at the cross-section that will be established for calculating total flow. The Service previously requested the establishment of cross-sections in the bypassed reach for conducting pebble counts and measuring temperature and dissolved oxygen (DO) at each of the demonstration flows. We request that at least one of these cross-sections be established at a riffle, if the bypass reach includes riffle habitat, and that velocity measurements also be taken at this riffle cross-section. At a minimum, velocity measurements should be taken at 20 percent of depth and 80 percent of depth, where total depth is greater than 1.5 feet, or at 60 percent depth where total depth is less than 1.5 feet. We understand that hydraulic modeling results will include modeled velocities under the different flows, but it is not explicitly stated in the study plan that in-field velocity measurements also will be taken. In-field measurements can be used to verify modeled velocities. This information will be important for determining habitat suitability for target species/guilds under different flow scenarios.

**6.6.4, Task 4 - Hydraulic Model Development:** The Service requests additional details regarding the spatial resolution of some of the model inputs, including the digital terrain model and the Manning's roughness coefficient input. For example, how will the Manning's roughness coefficient be applied, spatially?

**6.7, Analysis and Reporting, 5. Substrate characterization and mapping of the bypass reach (including Wolman pebble count data):** As previously stated, the Service requests the

use of the modified Wentworth scale for substrate characterization, to be consistent with the recommended and already established habitat suitability analysis approach for Roanoke logperch in the Roanoke River (see Sections 6.6.1 and 6.6.3.1 comments, above).

**6.7., Analysis and Reporting, 7. An evaluation of potential available aquatic habitat for species of interest (e.g., Orange-fin Madtom and Roanoke Logperch) using substrate, depth, and velocity parameters developed in Tasks 1 - 4:** In addition to evaluating substrate in terms of particle size, a fourth habitat variable that was included in the HSI model developed for the Roanoke logperch in the Roanoke River (see above references in Sections 6.6.1 and 6.6.3.1) was percent silt cover. The Service requests the evaluation of four habitat variables, to be consistent with the aforementioned HSI model for this species: (1) depth; (2) velocity; (3) substrate particle size; and (4) percent silt cover. We recognize it may not be possible to model percent silt cover, but request that this habitat variable be evaluated during the substrate characterization and mapping, which will include pebble count data.

**7.6.1, Water Quality Study, Methodology, Task 1:** This section lists the proposed locations of the water quality instrumentation. The most upstream location identified (in the reservoir upstream of the confluence of Tinker Creek) is located within the impoundment. The Service recommends water quality be measured upstream of the impoundment in a free-flowing section of the river as an upstream reference to assess how the project (including both the impoundment and powerhouse) impacts water quality in the river. The addition of this location would be consistent with the information needed by FERC to complete the Environmental Assessment (EA) as described in Section 7.1. The first bullet in this section states FERC identified the effect of operations on water quality upstream and downstream of the impoundment as an environmental resource issue to be analyzed in the EA for the Project relicensing.

Water quality monitoring instrumentation locations proposed for downstream of the dam and powerhouse include one location in the tailrace below the powerhouse and two locations in the bypass reach (upstream section and downstream section). If the water quality data show that a low temperature and/or low DO plume is present downstream of the powerhouse discharge, an additional year of monitoring may be needed to define the vertical, lateral and longitudinal extent of this plume. Of particular interest would be whether this impact to water quality extends downstream to where Roanoke logperch are known to occur. A second year of monitoring may also be needed if abnormally high flows are experienced during this monitoring period, or if water quality information cannot be collected during an extended low flow period as these low flow periods are when water quality would be expected to be affected the most.

The last paragraph states that in the forebay of the impoundment, data sondes (sensors) will be deployed at two discrete depths to determine the existence and extent, if any, of thermal and DO stratification occurring in the impoundment. Information should be provided on how these two depths will be selected to ensure any thermal and/or DO stratification is identified as part of this study.

**7.7, Water Quality Study, Analysis and Reporting:** This section states that data analysis will be performed after all data have been collected. Results of this study will be summarized in a

final study report. The types of analysis that will be performed with the data are not discussed. The Service recommends the analysis include how water quality changes during different river flows and Project operations (e.g., most flow going through the powerhouse versus some flow going over the dam and through the bypass reach). We are interested in a comparison of hourly operations to water quality.

**Study Plan Criteria (CFR 18 § 5.11 (b)-(e)) Addressed for Service's Requested Monitoring of Water Quality in a Free-Flowing Section of the Roanoke River, Upstream of the Project Impoundment:**

*1. Goals and Objectives*

The Service's goal for the proposed water quality study is to ensure that the Project is not having an adverse water quality effect on fish and wildlife resources. The objectives of this study are to provide baseline and Project-influenced water quality information, and to determine whether project operations are having an effect on water quality and aquatic resources in the Roanoke River. These objectives cannot be completely met by the proposed water quality study as currently designed.

*2. Resource Management Goals*

Currently there are periods of time when most inflow is diverted to the powerhouse, thus significantly reducing flow to the bypass reach. The impounding of water above the dam may also result in temperature and DO effects. Resource management goals include ensuring the protection of existing fish and macroinvertebrate communities in the vicinity of the Project, and ensuring that the Project does not cause adverse water quality effects to the federally listed endangered Roanoke logperch. An additional resource management goal is ensuring that the Project bypass reach provides suitable habitat conditions for fish and other aquatic resources found in other nearby reaches of the Roanoke River.

*3. Public Interest*

The requestor is a resource agency.

*4. Existing Information*

The PAD included historical water quality data collected by the U.S. Geological Survey and the Virginia Department of Environmental Quality (VDEQ) upstream and downstream of the Project area. Temperature, DO, pH and specific conductivity data indicate that inflows to and outflows from the Project meet numeric water quality standards (9VAC25-260-50) required to support designated uses identified at 9VAC25-260-10. However, no water quality data specific to the Project reservoir or bypass reach are available.

## 5. *Nexus to Project Operations and Effects*

Operation of the Project involves the diversion of most inflow to the powerhouse when river flows are within the Project's hydraulic capacity, resulting in a minimum flow to the bypass reach (8 cfs) that represents only 1.5 percent of the average Project inflow (532 cfs) for the 30-year hydrologic period from 1988 through 2017. Impoundment of the river above the dam may also result in temperature and DO effects.

## 6. *Methodology Consistent with Accepted Practice*

The requested study modification, deployment of a water quality monitoring sonde in the free-flowing section of the Roanoke River upstream of the impoundment, is consistent with standard water quality monitoring studies which include reference sites that are necessary for determining Project effects. The addition of this monitoring location would be consistent with the information needed by FERC to complete the EA as described in Section 7.1. The first bullet in this section states FERC identified the effect of operations on water quality upstream and downstream of the impoundment as an environmental resource issue to be analyzed in the EA for the Project relicensing.

## 7. *Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

This requested study modification is not expected to result in significant increases in study costs or level of effort. There is no alternative for establishing an upstream water quality reference site that is unaffected by the Project.

**8.1, Fish Community Study, Study Requests:** The Service requested that the Fish Community Study include appropriate methods to demonstrate presence and status of American eel in the Project area. Although the proposed study methodologies do not include appropriate methods specific to American eel, the Service has determined that this species is highly unlikely to be present in the vicinity of the Project because upstream passage measures for eels have not been implemented at the Smith Mountain Pumped Storage Project (FERC #2210), which includes two dams that are located downstream of the Project. The Service will be recommending appropriate American eel monitoring efforts (e.g., eel ramps) during the Ready for Environmental Analysis stage of this relicensing, contingent upon American eel passage being provided at the Smith Mountain Project during the term of the new license.

**8.2, Fish Community Study, Goals and Objectives:** The Service recommends that Virginia Tech (Dr. Paul Angermeier), VDEQ and the U.S. Environmental Protection Agency (EPA) also be consulted during development of the final Fish Community Study plan.

**8.3., Fish Community Study, Study Area:** We appreciate the expansion of the study area to include a reach of the river upstream of the confluence of Tinker Creek. However, riffle habitat within this reach appears to be limited. The Service requests consideration of extending the study area an additional ~150 meters upstream beyond the currently proposed upstream terminus of the study area (PSP Figure 8-1. Fish Community Study Area), in order to capture a large riffle

feature that is just downstream of the 13th Street/Bennington Street Bridge. During the September 25, 2019 Agency Coordination Call for Fish Studies, Appalachian proposed to move the upstream general fisheries survey locations (sites 1E and 2E) farther upstream, to correspond with the most upstream Roanoke logperch sampling locations (RLP1A and RLP1B). To the extent these locations include sufficient riffle/run habitat, the Service supports this proposed study modification.

In addition, the Service requests that the downstream reach (i.e., below the dam), as presented in PSP Figure 8-1, be extended farther downstream. Studies conducted in support of Project relicensing in 1991 and 1992 (APCO and AEPSC 1992) encompassed a reach of the river extending 1.25 miles downstream from the Niagara powerhouse, based on a determination that this river segment was predominantly riffle/run habitat where Roanoke logperch might be found. Suitable Roanoke logperch habitat was confined to a 2,500-foot segment of the river beginning about 0.5 mile downstream of the Niagara powerhouse (i.e., beyond the currently proposed downstream terminus of the study area), and totaling approximately 21,500 square feet. For purposes of documenting Roanoke logperch downstream of the Project area and comparing results of the currently proposed study to those of the 1992 study, the Service supports additional sampling locations (RLP4A, RLP4B, 9E, 10E, 11E) that were proposed by Appalachian during the September 25, 2019 Agency Coordination Call for Fish Studies.

**8.4.1, Fish Community, paragraph 5 beginning at the bottom of page 45:** Appalachian states that the 1991 additional sampling (for Roanoke logperch) was conducted in a 0.25-mile riffle/run habitat reach of the river located 0.5 miles downstream of the Project. This statement is confusing because our understanding is that the additional sampling was conducted in 1992 and the study report for that study (APCO and AEPSC 1992) states that the study encompassed a reach of the river extending 1.25 miles downstream of the powerhouse, and that suitable habitat for the Roanoke logperch was confined to a 2,500-foot (~ 0.5-mile) segment of the river beginning about 0.5 mile downstream of the Niagara powerhouse. Adding to this confusion is the fact that Appalachian does not provide citations for the two fisheries studies (APCO and AEPSC 1991; APCO and AEPSC 1992), but instead cites only the 1991 license application, which preceded the additional, Roanoke logperch-specific, study that was required by the FERC, in response to a request by the Service.

**8.6.1.2, Fish Community Study, Field Sampling:** Sampling will be performed during daylight hours in the late spring/early summer (May - June) and late summer/early fall (August - September). The Roanoke logperch targeted surveys should include surveys for all life stages including larval, juvenile and adult. Larval surveys are best conducted starting in April, which is outside the proposed sampling time. The Service recommends that larval drift surveys be conducted starting in April within the project area to assess potential impacts on Roanoke logperch. Because of time-of-year restrictions (TOYR) to protect Roanoke logperch during the breeding season (March 15 - June 30), no electrofishing should occur in the river until after June 30th. To accommodate this TOYR, fish surveys should be performed in summer (July - August) and fall (October - November).



The proposed methodology provided on September 23, 2019 states that the proposed fish community studies will not include targeted effort for larval Roanoke logperch life stages. This is not acceptable to the Service. The Roanoke logperch is a federally listed endangered species, and the Project's effects on this species likely results in incidental take under the Endangered Species Act. This incidental take needs to be quantified, and the extent to which larvae of this species are present in the Project area will have a bearing on any recommended mitigation measures. Forgoing any effort to document and quantify this life stage in the Project area will result in the resource agencies and other stakeholders assuming that larvae are present.

Regarding Appalachian's concerns related to larval drift sampling, the Service recommends sampling using drift nets (20-minute sets), twice per week (mid-April through early June) after dark, weather and flows permitting. Collected samples should be visually sorted under a dissecting microscope, based on meristic and morphometric features. Ideally, larvae should be identified to the species level using DNA barcoding; however, recognizing the expense of this level of identification, sorting of larvae using meristic and morphometric features would allow for an estimation of how many Roanoke logperch larvae are present in the Project area. Recent work has demonstrated that Roanoke logperch larvae can be reliably distinguished from most co-occurring darter species via morphometric measures (P. Angermeier, personal communication, 1 October 2019). The most similar species (*Percina nevisense*) is much less abundant.

Drift net sampling should be conducted at the following locations:

1. RLP1 upstream Roanoke River survey location (per September 25, 2019 webinar presentation), at the downstream end of the riffle/run
2. RLP2 upstream Tinker Creek survey location (per September 25, 2019 webinar presentation), at the downstream end of the riffle/run
3. Upstream Roanoke River Project boundary
4. Upstream Tinker Creek Project boundary
5. Approximately 500 meters downstream of the upstream Project boundary, but upstream of the waste water treatment plant outfall; or 500 meters downstream of Tinker Creek
6. Immediately downstream of the powerhouse discharge
7. At the mouth of the bypass reach

This section states the use of snorkel surveys can be an important tool for locating larval and juvenile life stages of Roanoke logperch. However, snorkel surveys are not an appropriate method for surveying for larval Roanoke logperch as they are small and are drifting in the water column. More appropriate methods (e.g., drift nets) will need to be used for larval surveys. Snorkel surveys are also not effective for surveying YoY Roanoke logperch. According to Rosenberger and Angermeier (2002), no YoY logperch were observed during snorkeling surveys. Instead YoY were surveyed by walking through backwaters, secondary channels, and the river edges to locate schools of YoY fish. When an individual or school of YoY fish were observed, the surveyor identified any logperch found in the area. More recent work by Argentina and Roberts (2014) found YoY logperch were rarely collected successfully using seines and recommended multiple sampling techniques to determine site occupancy and abundance.

Adult Roanoke logperch surveys should follow previously established protocols (e.g., Roberts et al. 2016b) which involve establishment of transects and sampling of quadrats along transects, using a combination of electrofishing and seine nets. The protocols also include habitat characterization within established quadrats along each transect, measuring the four habitat variables described above (depth, velocity at 0.6 x depth, substrate size using the modified Wentworth scale, and percent silt cover).

### **Study Plan Criteria (CFR 18 § 5.11 (b)-(e)) Addressed for Service's Requested Roanoke Logperch Larval Drift Net Surveys:**

#### *1. Goals and Objectives*

The Service's goal for inclusion of drift net sampling for Roanoke logperch larvae is to identify any Project effects on all life stages of the federally listed endangered Roanoke logperch and, where justified, recommend appropriate mitigation measures to address Project effects. Objectives include documenting Roanoke logperch larvae in the vicinity of the Project, developing quantitative estimates of Roanoke logperch larvae within the Project area, and determining the fate of any Roanoke logperch larvae found within the Project area.

#### *2. Resource Management Goals:*

The Service's resource management goals related to this requested study modification are to identify all Project effects on all life stages of the Roanoke logperch, and recommend mitigation measures to address any Project effects on Roanoke logperch and ensure that any Project effects will not hinder recovery of the species.

#### *3. Public Interest*

The requestor is a resource agency

#### *4. Existing Information*

Adult Roanoke logperch have been documented in riffle and run habitats both upstream and downstream of the Project (e.g., APCO and AEPSC 1992). However, there is no information on other life stages of the Roanoke logperch in the vicinity of the Project, or the fate of any Roanoke logperch larvae that may drift into the Project area.

#### *5. Nexus to Project Operations and Effects*

The Project dam represents a barrier to upstream and downstream movements of Roanoke logperch. In addition, the impoundment created by the dam is unlikely to support Roanoke logperch and has replaced a portion of the free-flowing Roanoke River that historically provided suitable habitat for the species. There is also the potential for larval Roanoke logperch to drift into the impoundment which may be inhospitable to this life stage. Roanoke logperch larvae may also pass through the powerhouse, through the debris sluice gate or over the Project dam.

These may not be safe downstream routes of passage for any Roanoke logperch larvae that may pass through the Project.

#### *6. Methodology Consistent with Accepted Practice*

Established methods for documenting larval Roanoke logperch in the Roanoke River have been described by Hallerman et al. (2017).

#### *7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort is expected to be moderate, and sorting and identifying Roanoke logperch larvae based on morphometric characteristics will require an appropriate level of experience and expertise. The Service estimates that this study plan modification will cost \$62,000 to \$68,000 (not including indirect costs). We are not aware of any alternative methods for documenting and estimating numbers of Roanoke logperch larvae entering and/or passing through the Project area.

**8.6.2, Task 2 - Impingement and Entrainment Desktop Study:** There is no mention of a blade strike analysis in this section. As the Service stated in its May 28, 2019 study request, the blade strike analysis conducted during the previous Project relicensing was based on Cada (1990), which is out of date, and we continue to recommend a blade strike analysis based on a more updated study by Franke et al. (1997). This issue was discussed at the August 1, 2019 Proposed Study Plan meeting.

### **Study Plan Criteria (CFR 18 § 5.11 (b)-(e)) Addressed for Service's Requested Use of the Franke et al. (1997) Blade Strike Equation in the Desktop Entrainment Analysis:**

#### *1. Goals and Objectives*

The Service's goal for the updated desktop impingement and entrainment analysis, including use of the updated blade-strike equation, is to obtain an accurate and up-to-date estimate of intake impingement and turbine entrainment injury and mortality for the present-day fish community in the vicinity of the Project. Objectives include: 1) developing a comprehensive list of fish species that may enter the Project intake or become impinged on the intake trash rack; 2) developing seasonal numeric estimates for each fish species (including Roanoke logperch and all possible life stages, if applicable), that may be subject to entrainment or impingement at the Project; 3) determining swim speeds and behaviors of different life stages of all fish species that may be subject to impingement or entrainment; 4) estimating numbers and life stages of species that may become impinged or entrained on a seasonal basis; 5) conducting blade-strike analyses, based on Franke et al. (1997), to develop seasonal estimates of injuries and mortalities for each species and life stage subject to entrainment; and 6) provide replacement cost estimates for species and numbers of individuals lost to impingement or entrainment, based on the most up-to-date American Fisheries Society replacement costs.

## 2. *Resource Management Goals*

Resource management goals include determining whether or not impingement on Project intake screens or entrainment in Project turbines is contributing to population-level effects to any of the fish species (including Roanoke logperch) that may become impinged or entrained and, if justified, developing appropriate mitigation measures.

## 3. *Public Interest*

The requestor is a resource agency.

## 4. *Existing Information*

Project entrainment effects were estimated in support of the previous Project relicensing (APCO 1991). The previous estimates relied on an outdated blade-strike analysis Cada (1990), which uses a blade strike mathematical equation attributed to Von Raben (1957). In this equation, the fish is essentially modeled as a meridional line segment and the blade is modeled as a point, and it was initially assumed that any impact by the blade along any portion of the fish length would be fatal (Franke et al. 1997). The phenomenon that small fish (relative to blade size) may be transported around the blade leading edge was not considered (Franke et al. 1997). In addition to addressing this shortcoming, Franke et al. (1997) observed that, while the meridional component of the fish length was considered, the tangential component of length was not considered, and the authors explained this by presenting an example where the tangential projection of the fish length is greater than the blade-to-blade spacing, where it is not possible for the fish to pass through the entrance edge region of a runner without touching a runner blade, in which case the actual strike probability is 100 percent; hence, the Von Raben equation results in false blade strike probabilities of less than 100 percent for such fish. By considering the tangential projection of fish length, Franke et al. (1997) developed a more accurate blade strike prediction. The updated blade strike equation was also improved by, among other things, replacing some of the ad hoc estimates of flow angle, using Euler's equation to evaluate flow angle based on known values of key operating parameters such as head and discharge (Franke et al. 1997).

## 5. *Nexus to Project Operations and Effects*

Available options for safe downstream passage are currently very limited, and any fish attempting to move downstream are likely to be attracted to the powerhouse intake and become impinged on the intake trash rack or entrained in Project turbines, resulting in some injury and mortality.

## 6. *Methodology Consistent with Accepted Practice*

The blade-strike analysis used in the previous entrainment study (APCO 1991) relied on an outdated equation (see #4, above). The requested use of the more up-to-date and improved blade-strike analysis (Franke et al. 1997) is consistent with currently accepted practice. In addition, the Service's Fish Passage Engineering team has developed a Microsoft Excel-based

turbine blade-strike analysis model that can be made available to assist Appalachian with the requested analysis.

### *7. Level of Effort, Cost, and Why Alternative Studies Will Not Suffice*

The level of effort and cost is not expected to exceed that of the impingement, entrainment and blade-strike analyses that Appalachian has already committed to undertake as a part of this Project relicensing. In addition, there is the potential for cost savings if Appalachian is interested in using the blade-strike analysis model developed by the Service's engineers.

**9.4.2, Benthic Aquatic Resources Study, Mussel Community:** Table 9-1 lists the mussel species known to occur within 3 miles of the project and includes the Atlantic pigtoe, shown as a state threatened species. This species is also proposed for Federal listing as a threatened species. This table should be updated to reflect this current status.

**9.6.1.2, Benthic Aquatic Resources Study, Task 1 - Macroinvertebrate and Crayfish Community Study, Field Sampling:** Benthic macroinvertebrate sampling will be conducted in the reservoir, tailrace, and bypass reach. Sampling also needs to be conducted upstream of the reservoir in a free-flowing section of the river. This will be used to assess the community upstream of the project and assess potential impacts to any mussels upstream that get washed downstream into the reservoir during high flow events. The surveys also need to be conducted further downstream than the tailrace in appropriate habitat since the downstream impacts of the project have not yet been determined.

**9.6.2.2, Benthic Aquatic Resources Study, Task 2 - Mussel Habitat and Community Study, Field Sampling:** The mussel survey will consist of up to ten line-transects located throughout the Study area based on the type and quantity of available habitats identified in the Desktop Benthic Habitat Assessment. It is unclear how it was determined that a maximum of 10 line-transects was sufficient to assess the composition of mussel populations within the project area. It is also unclear this level of sampling would be sufficient to determine whether any state or federally listed mussels are present in the project area with a high degree of certainty. The number of transects should be based on the amount of habitat present. Justification for this approach will need to be provided. The approved mussel surveyor, the Virginia Department of Game and Inland Fisheries (VDGIF) and the Service can help Appalachian develop a study design for mussel surveys in the river with an appropriate level of effort.

The area to be surveyed as part of the mussel study is not provided. The Service recommends a full survey be conducted. According to the "Freshwater Mussel Guidelines for Virginia (USFWS and VDGIF 2013), a full survey would require a mussel survey 200 meters upstream and 800 meters downstream of the project. To assess potential impacts to mussels that may get washed into the impoundment, the first area with good mussel habitat upstream of the reservoir should be surveyed. To assess potential impacts to mussels downstream of the project, the area between the discharge and 800 meters downstream should be surveyed for mussels. This approach would be consistent with the current guidelines.

**9.6.3.1, Benthic Aquatic Resources Study, Task 3 - Benthic Habitat Assessment, Field**

**Sampling:** A benthic habitat assessment will be performed according to VDEQ protocol and will include scoring habitat characteristics such as substrate and cover availability, substrate embeddedness, flow velocity and depth, sedimentation, frequency of riffles, bank stability, vegetative protection, and riparian zone in order to evaluate the quality of benthic habitat in the survey areas. It is not clear that this effort will address the issue of whether the benthic habitat below the dam is starved of sediment and is therefore reducing the quality and quantity of habitat for benthic organisms. To make this determination, it would be more appropriate to compare the benthic habitat below to an upstream reference reach not impacted by a dam.

**10.1, Wetlands, Riparian, and Littoral Habitat Characterization Study, Study Requests:**

The FERC identified the effects of continued Project operation and maintenance on riparian, wetland, and upland habitat and associated wildlife such as bald eagles as an environmental resource to be analyzed in the EA for the Project relicensing. However, the goals and objectives for this study discussed in Section 10.2 only discuss the characterization of vegetation in the study area and do not include any objectives to assess wildlife use within the Project area. This should be added to this study, particularly river-dependent wildlife such as the bald eagle to assess how the project may be impacting these wildlife species. According to the Center for Conservation Biology Eagle Nest locator (<https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/nest-locator/>), there is an eagle nest (active as of 2014) located 1.25 miles downstream of the Project. There may be other nests within the Project area as not all nests have been mapped. A survey of eagle nests within the Project area is recommended.

**10.2, Wetlands, Riparian, and Littoral Habitat Characterization Study, Goals and**

**Objectives, Fourth Bullet:** Using the results of the desktop characterization and field verification, a map will be developed to identify the location and species of any invasive aquatic vegetation. A map also should be developed identifying the location of invasive plant species in the riparian and upland areas within the Project Area. This information will be useful for determining if any control of invasive plants is needed as part of the Wildlife Management Plan.

**10.3, Wetlands, Riparian, and Littoral Habitat Characterization Study, Study Area:** The study area for this study includes the terrestrial and appropriate aquatic habitats as shown on Figure 1-3. As stated previously for the fish and mussel studies, the project area for this study should be expanded both upstream, to include free-flowing sections of the river, and downstream, to include areas downstream to Smith Mountain Lake, to more fully assess impacts from the Project.

Thank you for your consideration in this matter. If you have any questions regarding this matter, please contact Richard McCorkle of my staff at 814-206-7470.

Sincerely,



Sonja Jahrsdoerfer  
Project Leader



Cc: Stephanie Nash – USFWS, BER (ERT)  
Kevin Mendik – NPS  
Scott Smith – VDGIF  
Brian McGurk – VDEQ  
Paul Angermeier – Virginia Tech

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October 4, 2019

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
888 First Street, NE, Room 1A  
Washington, DC 20426

**Re: Niagara Hydroelectric Project (P-2466-034)**

1. Roanoke Valley Greenway Commission Comments on Recreation Study Plan
2. Consideration of Alternative Solutions to Inadequate Recreation Facilities

Dear Secretary Bose:

The Roanoke Valley Greenway Commission provided comments on the Scoping Document and PAD. We feel that the proposed Recreation Study within the Proposed Study Plan (PSP), Niagara Hydroelectric Project, FERC NO. 2466, July 9, 2019, does not adequately address our comments or those of others. While the PSP does respond to the National Park Service request for Aesthetic Flow Documentation, others who did not respond in accordance with 5.9b still have valid comments which should be given consideration.

**1. Roanoke Valley Greenway Commission Comments on Recreation Study Plan**

a. Inadequate Response to Study Requests (12.1)

While 12.1 of the Proposed Study Plan summarizes comments into five bullets from five agencies, it does not address other comments or clearly tell how the Recreation Study will address these requests. There is global assurance that the Commission will consider “all relevant studies and recommendations”, but there is no step in the Recreation Study that documents this.

b. Goals and Objectives (12.2)

While the goal of the study to determine the need for enhancement of the existing portage or the need for additional recreation facilities is stated, the bullets’ focus, as written and explained, will not sufficiently address these needs. The Study needs to gather information not only on the portage at Niagara, but also on the other boating facilities upstream and downstream. This is a river, and current use and demand within the Project area should not be considered in isolation. There is use upstream and downstream which would continue or expand into the Project area if there were facilities to accommodate such use. Analyzing the effects of the Project operation only on Project-related recreation facilities is insufficient, because Project operation impacts facilities both up and downstream.

c. Study Area (12.3)

The Study Area needs to be extended downstream to Back Creek because of the significant impact of the Project on recreation use on that adjacent river section.

d. Background and Existing Information (12.4)

This section quotes the PAD without acknowledging additional information provided during the scoping period to improve the Recreation Study. For instance, we submitted the 2018 Roanoke Valley Greenway Plan and documented in comments that there are six greenways within the Project Study Area. Others, such as Roanoke County, also submitted comments and plans. There is no acknowledgement of terrestrial use except AEP's portage trail. AEP owns land adjacent to the river and that land could be, and is, used for recreation. The Project impacts recreation activities within the Project Area, but also upstream and downstream.

This section needs to include a review of all plans that are impacted by the Project and an analysis of how the Project might restrict or facilitate implementation of those plans. While those plans may not be "comprehensive" because they were not written by federal or state agencies, this is the point at which there should be documentation that those plans will be read and analyzed to facilitate cooperative relationships with those local entities and to capitalize on opportunities to improve recreation within the Project area.

e. Task 1 – Inventory and Condition Assessment(12.6.1)

The inventory should consider other facilities in addition to the Niagara portage, such as the Tinker Creek boat launch, other access points upstream and downstream such as at Bennington and Rutrough Roads, and other recreation facilities in the Study Area.

f. Task 2 (12.6.2)

One meeting is insufficient. A consultant should not be told to schedule "a meeting" for a focused discussion with the expectation they will then know everything about existing and future recreational opportunities. While developing the study, the consultant needs to go to the offices of other agencies as well as meet with stakeholders, including local governments and NGO's, to consult, learn what else is happening in the area, and review plans and mapping that they have.

g. Task 3 – Online Survey(12.6.3)

The survey needs to be more widely publicized than by signs at three locations and the Project website. A notice should be sent to outfitters, shops that provide boating equipment, paddling and fishing groups, and other media and social media outlets such as Roanoke Outside.

h. Task 4 – Use Documentation (12.6.4)

This documentation should be expanded to include cameras at the Tinker Creek and Rutrough Road boat launches.

i. Analysis and Report (12.7)

The Report should include:

- 1) A research and review section documenting other plans and recreation programs that were reviewed and portions that were considered;
- 2) A list of potential cooperative recreation projects in the Study Area; and
- 3) Opportunities within the scope and beyond the scope of the project.

## **2. Consideration of Alternative Solutions to Inadequate Recreation Facilities**

The stated goal of the Recreation Study is to determine the need for enhancement of existing facilities and the need for additional recreational facilities to support the current and future demand. This can only be done with a true picture of the current and future demand.

The Roanoke region is in the process of building Roanoke River Greenway, the main greenway artery through the valley, from Montgomery County to Franklin County at Back Creek. The eastern leg in Roanoke County from the City line to Highland Road is within the Project boundary and is engineered; construction is scheduled to begin in 2020 - 2021. The next sections are in the engineering phase and will go under the Blue Ridge Parkway and connect to and go through the County's Explore Park before terminating at the confluence of Back Creek. This facility will dramatically increase recreation use within the Project area. We ask that the partnership between the County and AEP for rights-of-way continue through the relicensing process, so that the greenway does not get held up. This final section of Roanoke River Greenway is critical to the economic redevelopment of Explore Park and completion of the Roanoke River Greenway through the valley.

We ask that AEP consider the following solutions to improve recreational opportunities in the Project area.

- a. Purchase property on river right near Niagara Dam to provide parking and boating access.
- b. Provide a portage around Niagara Dam on river right.
- c. Work with the localities to provide debris removal at the dam and sponsor periodic clean ups of trash in the Project Area.
- d. Provide Roanoke County with right-of-way for Roanoke River Greenway on river right on AEP land.

Thank you for the opportunity to provide comments at this point.

Sincerely,



Liz Belcher

Roanoke Valley Greenway Coordinator  
1206 Kessler Mill Road, Salem, VA 24153  
540-777-6330





**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

October 7, 2019

Ms. Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
Mail Code: DLC, HL-11.2  
888 First St., NE  
Washington, DC 20426

Re: Niagara Hydroelectric Project (FERC No. 2466-034) Proposed Study Plan

Dear Ms. Bose:

The U.S. Environmental Protection Agency (EPA) has begun coordination with the Federal Energy Regulatory Commission's (FERC) in development of the Niagara Hydroelectric Project (Project) Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA). The EPA appreciates the interagency coordination taking place to study the Project and FERC's leadership in project impact analysis. The EPA has participated with the interagency team to consider issues associated with Roanoke River, especially study of sediment and the federally-listed endangered Roanoke logperch. Please find below and attached some recommendations for the EA analysis of the Project. We support the suggestions proposed by our federal partners including the U.S. Fish and Wildlife Service.

The primary objective of the proposed sediment study is to determine whether the Roanoke River below the Niagara dam is sufficiently starved of sediment to reduce the quality and quantity of habitat for benthic invertebrates and fish. The EPA agrees with the resource agencies that the current proposal by the facility is inadequate to provide the scientific information concerning the sediment issue and the applicant should incorporate the recommendations of the resource agencies.

The effects of the Project on the endangered Roanoke logperch (such as barriers to upstream and downstream movements and potential genetic isolation of the sub-populations) result in 'incidental take' as defined under the Endangered Species Act. The EPA agrees with the resource agencies that proposed fish community survey methods should be refined to ensure that the occurrence and distribution of all life stages of Roanoke logperch (i.e. larval, young-of-year, and adult) in the vicinity of the Project are documented and addressed in the studies.

The EPA recommends the applicant include the monitoring of water quality in the free-flowing section of the Roanoke River upstream of the Project impoundment. The objectives of the study are to



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provide baseline and Project-influenced water quality information, and to determine whether the Project operations are having an effect on water quality and aquatic resources in the Roanoke River. This additional monitoring location will provide the required scientific information to evaluate the effects of the Project, if any, on the aquatic life and water quality of the Roanoke River.

Please find attached detailed technical suggestions in development of the Project study. If you have any questions regarding the recommendations, please feel free to contact me at (215) 814-332 or [Rudnick.barbara@epa.gov](mailto:Rudnick.barbara@epa.gov) or the staff contact for this project is Mr. Matthew Lee; he can be reached at (215) 814-2917 or [Lee.Matthew@epa.gov](mailto:Lee.Matthew@epa.gov).

Sincerely,

Barbara Rudnick  
NEPA Program Coordinator  
Office of Communities, Tribes &  
Environmental Assessment

Enclosure

**Enclosure**

**Niagara Hydroelectric Project (FERC No. 2466-034) Proposed Study  
Technical Comments**

Please consider the technical comments below in development of the study of the Niagara Project:

Section 8.6.1.2, Fish Community Study, Field Sampling. The EPA recommends targeted surveys of the Roanoke logperch should include surveys for all life stages including larval, young-of-year and adult. The applicant should work with the resource agencies to develop an appropriate monitoring plan to collect the required scientific information.

Section 8.6.2, Task 2 -Impingement and Entrainment. The EPA recommends using the most recent scientific methods in the blade strike analyses. The most updated study is Franke et al. (1997) which should be used by the applicant.

Section 9.6.2.2. Benthic Aquatic Resources Study. Task 1. Mussel Habitat and Community Study, Field Sampling. The EPA agrees with the resource agencies that the current proposed study is inadequate and the applicant should work with the resource agencies to develop an assessment study using the best available science for the assessment of the freshwater mussel community (e.g. Freshwater Mussel Guidelines for Virginia by VDGIF 2013).



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION III  
1650 Arch Street  
Philadelphia, Pennsylvania 19103-2029**

October 7, 2019

Ms. Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
Mail Code: DLC, HL-11.2  
888 First St., NE  
Washington, DC 20426

Re: Cooperating Agency Role in the Development of an Environmental Assessment for Relicensing the  
Niagara Hydroelectric Project (FERC No. 2466-034)

Dear Ms. Bose:

The U.S. Environmental Protection Agency (EPA) has begun coordination with the Federal Energy Regulatory Commission's (FERC) in your development of the Niagara Hydroelectric Project Environmental Assessment (EA) announced earlier this year, in compliance with the National Environmental Policy Act (NEPA). EPA is pleased to commit to an active role as a cooperating agency for the subject project.

The Council of Environmental Quality (CEQ) has determined that a cooperating agency has the responsibility to assist the lead agency by participating in the process at the earliest possible time. This participation includes engaging in the scoping process; in developing information and preparing environmental analyses including portions of the environmental assessment where the cooperating agency has special technical expertise; and in making available staff support at the lead agency's request to enhance the lead agency's interdisciplinary capabilities. Our role as a cooperating agency in support of the subject EA will consist of providing comments on general NEPA compliance and Clean Water Act (CWA), Section 404 as well as providing technical support in the development of the EA.

The many benefits of enhanced cooperating agency participation in the preparation of NEPA analyses include: disclosing relevant information early in the analytical process; applying available technical expertise and staff support; and establishing a mechanism for addressing intergovernmental issues. Other benefits of enhanced cooperating agency participation include fostering intra- and intergovernmental trust (e.g., partnerships at the community level) and a common understanding and appreciation for various governmental roles in the NEPA process, as well as enhancing agencies ability to adopt environmental documents.



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Due to resource constraints, we may limit our attendance of project meetings and hope that video or telephone conference opportunities may be made available. Given reasonable time frames, we would be pleased to review preliminary project documentation including preliminary draft versions of the EA. CEQ guidance recognizes that, while the lead agency has overall responsibility for the content of the EA, status as a cooperating agency should not be construed as expressing agreement with the lead agency regarding the conclusions to be drawn from the EA or selection of the preferred alternative. In addition, EPA has a number of independent responsibilities related to the proposed project and we retain our independent obligations and responsibilities pursuant to Section 309 of the Clean Air Act (CAA), Sections 402(d) and 404(b), (c), and (q) of the CWA.

Thank you for the opportunity to be a cooperating agency on this project. We look forward to working with you to ensure that a scientifically sound and sufficient EA is developed for this project. If you have any questions, please feel free to contact me at (215) 814-3322 or [Rudnick.barbara@epa.gov](mailto:Rudnick.barbara@epa.gov) or the staff contact for this project is Mr. Matthew Lee; he can be reached at (215) 814-2917 or [Lee.Matthew@epa.gov](mailto:Lee.Matthew@epa.gov).

Sincerely,



Barbara Rudnick  
NEPA Program Coordinator  
Office of Communities, Tribes &  
Environmental Assessment

FEDERAL ENERGY REGULATORY COMMISSION  
WASHINGTON, D.C. 20426  
October 7, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2466-034 – Virginia  
Niagara Hydroelectric Project  
Appalachian Power Company

VIA FERC Service

Mr. Jonathan Magalski  
Environmental Specialist Consultant  
American Electric Power Services Corporation  
P.O. Box 2021  
Roanoke, VA 24022-2021

**Reference: Staff Comments on the Proposed Study Plan and Additional  
Information Requests for the Niagara Hydroelectric Project No. 2466**

Dear Mr. Magalski:

We have reviewed your Proposed Study Plan for the Niagara Hydroelectric Project (Niagara Project), filed with the Federal Energy Regulatory Commission on July 9, 2019. In addition to our verbal comments provided during the August 1, 2019, proposed study plan meeting, we are providing comments (Schedule A) pursuant to section 5.12 of the Commission's regulations. We have also included additional information requests in Schedule B. We anticipate that Appalachian Power Company will take our comments into consideration during development of the revised study plan, which must be filed with the Commission by November 6, 2019.



Project No. 2466

We appreciate the opportunity to comment on your Proposed Study Plan for the Niagara Project. Please contact Allyson Conner at (202) 502-6082 or [allyson.conner@ferc.gov](mailto:allyson.conner@ferc.gov) if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "John B. Smith". The signature is fluid and cursive, with the first name "John" and last name "Smith" being clearly legible, and "B." in the middle.

John B. Smith, Chief  
Mid-Atlantic Branch  
Division of Hydropower Licensing

Enclosure:   Schedule A  
                  Schedule B

## **SCHEDULE A**

### **Comments on the Proposed Study Plan (PSP)**

#### ***Flow and Bypass Reach Aquatic Habitat Study***

1. In section 6.2, you state that one of the objectives of the Flow and Bypass Reach Aquatic Habitat Study is to evaluate the need for ramping rates related to potential fish stranding in the bypassed reach. However, no further information is provided on how this objective will be met. In the revised study plan (RSP), please describe the methodology that will be used to evaluate the need for ramping rates for the bypassed reach.
2. In section 6.6.3.2, you describe field data that will be collected to support development of a 2-D hydraulic model in the Niagara Project's tailwater and bypassed reach. To calibrate the model, depth and wetted perimeter data will be collected at three target flows. In the RSP, please explain how the target flows will be selected.
3. In section 6.7, you state that analysis and reporting will include "an evaluation of potential available aquatic habitat for species of interest (e.g., orangefin madtom and Roanoke logperch)." Your RSP should include a refined target species list developed in consultation with the U.S. Fish and Wildlife Service, Virginia Department of Game and Inland Fisheries, and Virginia Department of Environmental Quality so that we can better understand the species focus of your aquatic habitat study.

#### ***Water Quality Study***

1. In section 7.6.1, you describe the locations of the continuous water quality monitoring sites. In the forebay, data loggers will be placed at two discrete depths to determine the existence and extent of any thermal and dissolved oxygen stratification occurring in the impoundment. At the remaining locations, one logger will be deployed. In the RSP, please specify the depths at which the loggers will be located and provide justification for why the depths were chosen.

#### ***Fish Community Study***

1. Additional information is needed in regard to study methodology to more clearly understand the anticipated level of effort that would be associated with the fish community study. In section 8.6.1.2, you describe general areas for fish sampling within the study area (upstream reach, reservoir, tailrace, bypassed reach) and state that "to the extent practical, sampling sites will be placed to overlap with historical

sampling locations.” The RSP should include additional information on the sampling allocation, including the number and locations of sampling sites. In addition, you state that an initial evaluation will be performed to identify microhabitats for Roanoke logperch and that additional surveys will be conducted in these microhabitats using a combination of electrofishing and snorkel surveys. In the RSP, please describe how the microhabitats will be identified, the minimum number of microhabitats that will be selected for sampling, and the minimum number of transect surveys that would be conducted within each survey location. However, as stated in section 8.6.1.2, the use of snorkel is contingent on the ability of Appalachian to receive internal approval for performing in-water survey work. In the event that snorkel methodology is not approved by Appalachian, please describe alternative techniques that would be used to conduct the Roanoke logperch surveys.

### ***Benthic Aquatic Resources Study***<sup>1</sup>

1. In section 9.6.1 (Macroinvertebrate and Crayfish Community Study), you describe general areas for macroinvertebrate and crayfish sampling within the study area (reservoir, tailrace, bypassed reach) and state that “to the extent practical, sampling sites will be placed to overlap with historical sampling locations.” The RSP should include additional information on the sampling allocation, including the number and locations of proposed sampling sites.
2. In section 9.6.2 (Mussel Habitat and Community Study), you state that mussel sampling will be performed along line transects in areas identified as potential mussel habitat. You propose to identify areas of potential mussel habitat as part of the “Desktop Benthic Habitat Assessment;” however, it is unclear if you are referencing the Literature Review and Desktop Assessment in section 6.6.1 of the Flow and Bypass Reach Aquatic Habitat Study or section 9.6.3 Benthic Habitat Assessment of the Benthic Aquatic Resources Study. Further, if the former is to be used, the geographic scope of the study area is limited to the tailwater, bypassed reach, and river reach downstream of the Niagara powerhouse (section 6.3), whereas the proposed study area for the Mussel Habitat and Community Study also includes areas of the Roanoke River and tributary streams upstream of the Niagara Dam (section 9.3). In the RSP, please clarify the study area for the Mussel Habitat and Community Study, how mussel habitat will be identified, and how mussel survey locations will be selected.

---

<sup>1</sup> The proposed Benthic Aquatic Resources Study includes a Macroinvertebrate and Crayfish Community Study, Mussel Habitat and Community Survey, and Benthic Habitat Assessment as separate tasks under the larger study.

Schedule A

Project No. 2466

3. You state that the mussel surveys will be performed by an approved, qualified mussel surveyor, and may include snorkel and scuba techniques. However, as stated in section 9.6.2.2, the use of scuba and snorkel is contingent on the ability of Appalachian to receive internal approval for performing in-water survey work. In the RSP, please describe alternative techniques that would be used should such approval not be granted.

## **SCHEDULE B**

### **Additional Information Requests**

1. The last paragraph of section 5.6.1 in the pre-application document (PAD) references the “2016 riparian forest wildlife habitat plan.” We cannot find any other reference to such a plan in the PAD or any other recent document associated with this project. Please provide a copy of this plan or provide additional detail to clarify what the paragraph is referencing.
2. Section 10.4.2 of the PSP states that “many species likely to occur within the Project vicinity typically use wetland or riparian habitats at some point in their lives for permanent, temporary, or transient uses.” However, section 5.6.2 of the PAD states that there is no available information on specific wildlife species within wetland and riparian habitats of the project vicinity. Please explain why a basic survey of wildlife within these habitats was not included as part of the Wetland, Riparian, and Littoral Habitat Characterization Study proposed in the PSP.
3. In sub-section 6.2.4.1 of the PAD, you state that “ongoing operations may temporarily impact some generalist terrestrial wildlife species, however these species will likely move to adjacent habitat, returning once the activities are complete.” Please provide an explanation on how it was determined that only generalist species might be affected by operations, especially in habitats where existing information on wildlife is unavailable (as per section 5.6.2 of the PAD). Additionally, please provide information supporting your statements that (1) any such impacts would only be temporary and (2) that wildlife would move and then return to their original habitat.
4. As noted by the U.S. Fish and Wildlife Service (FWS) in its comment letter on May 28, 2019, Table 5.7-1 of the PAD lists the bog turtle as a species with historical records at or within the project vicinity. The species is currently listed as potentially occurring in Floyd County immediately south of Roanoke County.<sup>2</sup> Thus, please explain why this species was included in Table 5.7-1 of the PAD and not considered for inclusion in the PSP.

---

<sup>2</sup> <https://www.dgif.virginia.gov/wildlife/information/bog-muhlenberg-turtle/>.

October 7, 2019

# ROANOKE RIVER BLUEWAY COMMITTEE

## COMMENTS

NIAGARA DAM HYDROELECTRIC PROJECT NO. 2466-034, COMMENTS ON THE RECREATION STUDY PLAN

### 12.2 GOALS AND OBJECTIVES

The study plan published on the FERC website indicates the following goals and objectives for a Recreation Study:

- Gather information on the condition of the one FERC-approved public recreation facility at the Project and identify any need for improvement;
- Characterize current recreational use of the Project area;
- Estimate future demand for public recreation at the Project;
- Solicit comments from stakeholders on potential enhancements or new facilities; and
- Analyze the effects of Project operation on Project-related recreation facilities.

The Goals and Objectives do not explicitly state that recommendations for improvements to the facilities will be included as a product of the study. The Roanoke River Blueway Committee is interested in maintaining some method of bypassing or portaging around the dam, as it is a barrier to recreational use of the Roanoke River Blueway. It is the hope of the Committee that the Recreation Study would also result in specific recommendations to improve the portage facility, whether by Appalachian or by Appalachian in partnership with local governments and other entities.

### 12.6 METHODOLOGY

#### 12.6.2 TASK 2- CONVENE MEETING WITH STAKEHOLDERS TO DISCUSS EXISTING AND FUTURE RECREATIONAL OPPORTUNITIES

In the interest of assisting Appalachian to reach the maximum number of stakeholders in our community, the Roanoke River Blueway Committee would like to offer assistance with this task. Specifically, the Roanoke River Blueway Committee represents several key stakeholders who could be impacted in this project, and offers to coordinate with Appalachian and Appalachian's consultants to ensure that these stakeholders are involved in this meeting.

#### 12.6.3 TASK 3 – RECREATION VISITOR USE ONLINE SURVEY

The Roanoke River Blueway Committee would like to recommend distribution of the Recreation Visitor Use Online Survey through our contacts, webpage, and social media sites. The Committee feels that posting at the listed launch points, while likely to catch many users, will not be sufficient to successfully reach the majority of Blueway users. Postings are often disregarded or not noticed by users, and the FERC project website is not a logical venue for Blueway information for most users. The Roanoke River Blueway Committee is happy to work with Appalachian Power and their consultants to provide this additional distribution method.





*Commonwealth of Virginia*

***VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY***

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219

P.O. Box 1105, Richmond, Virginia 23218

(800) 592-5482

[www.deq.virginia.gov](http://www.deq.virginia.gov)

Matthew J. Strickler  
Secretary of Natural Resources

David K. Paylor  
Director  
(804) 698-4000

October 7, 2019

Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

**Re: Niagara Hydroelectric Project P-2466-034, Request for Comments and Study Requests on Proposed Study Plan**

Dear Secretary Bose:

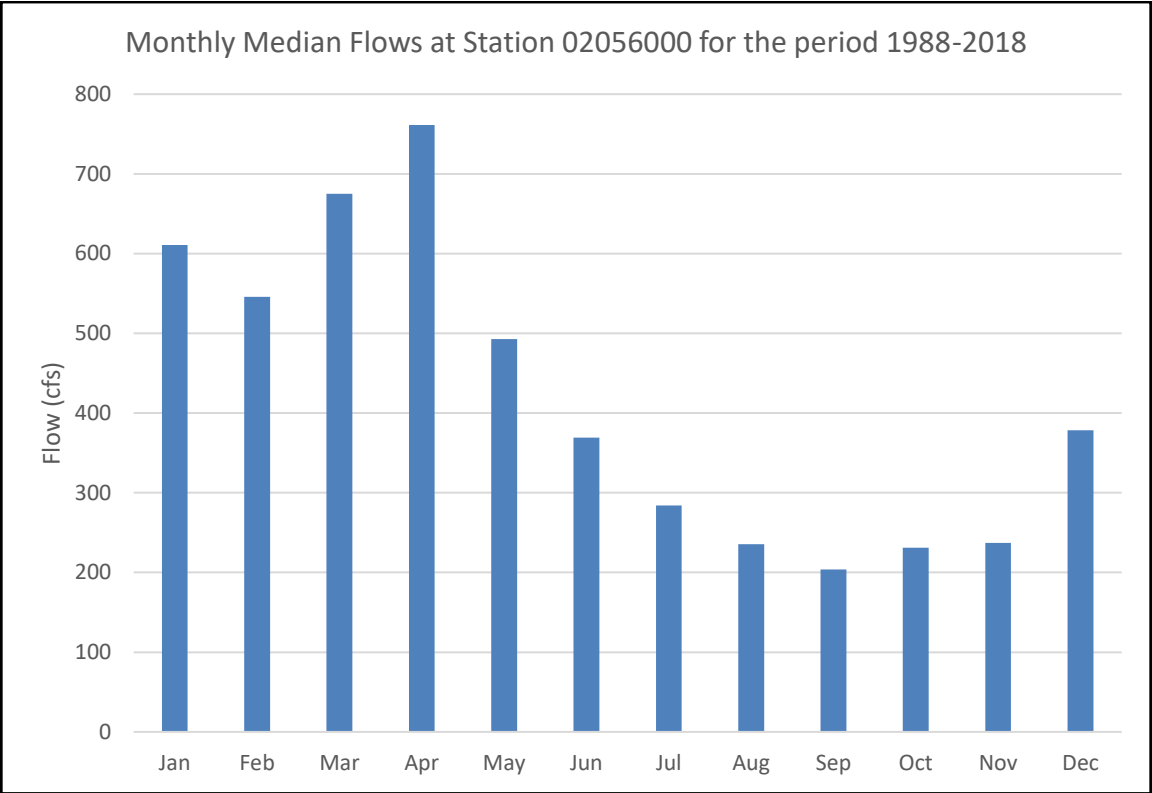
Thank you for the opportunity to provide comments on the Proposed Study Plan (PSP) for Relicensing Studies related to the Niagara Hydroelectric Project. DEQ has reviewed the PSP that was filed with the Federal Energy Regulatory Commission (FERC) on July 9, 2019. DEQ also participated in the August 1, 2019 PSP meeting held in Roanoke, Virginia. DEQ previously filed comments on the Pre-Application Document and Scoping Document on May 24, 2019. Following below are comments on the PSP.

**Section 6: Flow and Bypass Reach Aquatic Habitat Study:**

The stated goals of this proposed study include evaluation of 1) the efficacy of the current minimum flow requirement for the bypass reach (8 cubic feet per second, or cfs), 2) the effects of higher minimum required flows, and 3) the need for ramping rates related to potential fish stranding in the bypass reach. It is stated in Section 6.4 that flows in excess of the powerhouse discharge capacity (684 cfs) are passed over and through the spillway, implying that, under normal operating conditions, all flows less than 684 cfs are diverted through the powerhouse and only the minimum flow of 8 cfs goes to the bypass reach. Flow records from gaging station 02056000, located just downstream of the powerhouse, that are available from the U.S. Geological Survey's National Water Information System (NWIS) database indicate that the monthly median flow rates in the Roanoke River at that location are generally less than 684 cfs during most months of the 1988-2018 period planned for the study (see figure below). The PSP notes in Section 5 that, although flows through the bypass reach are not presently measured, they can be estimated by subtracting powerhouse outflow (calculated from generation data) from the gaged flow at station 02056000. Such estimates should be made and incorporated into the Flow

Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission

and Bypass Reach Aquatic Habitat Study. A time series of estimated flow in the bypass reach would provide critical information on the timing and frequency of various flow rates through the bypass reach and would inform and guide the decision regarding what representative flow rates should be used for the remainder of the study.



(from data downloaded from [NWIS](#) on October 4, 2019)

**Section 8: Fish Community Study:**

Given that flow in the bypass reach may commonly equal the minimum flow during the proposed sampling periods, there may be a potential for fish to occupy the bypass reach only during higher than median flow periods when water is allowed to pass over the dam. This potential variability of the presence of fish species in the bypass reach should be recognized and taken into account when scheduling field sampling. Flexibility in the sampling schedule should include 1) sampling in the bypass reach outside of the two time periods given in the PSP (May-June and August-September), 2) sampling during extended periods of above-minimum flow in the bypass reach, rather than during brief (1-2 day) periods of such flow, 3) scheduled reductions in generation to increase bypass reach flow, and/or 4) consideration of a second year of fish data collection if flows remain at minimum flow levels during the scheduled sampling months or if reduced generation cannot be accomplished for a sufficient period.

As you are aware, DEQ will require a new Clean Water Act § 401 certification for the current project in conjunction with the FERC relicensing process. This certification is administered according to the Virginia Water Protection (VWP) Permit regulations ([9VAC25-210](#)). The

Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission

permit application review for the § 401 certification includes an evaluation of the potential effect of the project, when operated and maintained as designed, upon downstream flow-dependent beneficial uses. The information and/or results from the studies conducted to support the Draft License Application should be incorporated into the VWP permit application so that the §401 certification is included as part of the Final License Application. It is recommended that, in order to expedite the §401 certification process, the licensee should begin the VWP permit application process as soon as studies are completed.

Thank you again for the opportunity to provide comments.

Respectfully,



Brian E. McGurk, P.G.  
DEQ Office of Water Supply  
P. O. Box 1105, Richmond VA 23218  
[Brian.McGurk@deq.virginia.gov](mailto:Brian.McGurk@deq.virginia.gov) (804-698-4180)

Cc: Joseph Grist, VA DEQ – via email  
Jason Hill, VA DEQ – via email  
George Devlin, VA DEQ – via email  
Allyson Connor, FERC – via email



# COMMONWEALTH of VIRGINIA

*Department of Game and Inland Fisheries*

**Matthew J. Strickler**  
*Secretary of Natural Resources*

**Ryan J. Brown**  
*Executive Director*

October 7, 2019

Secretary Kimberly D. Bose  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, DC 201426

**Re: Niagara Project (P-2466-034) – Request for Comments, Proposed Study Plan and New Study Requests**

Dear Secretary Bose:

Thank you for the opportunity to provide comments on the Proposed Study Plan (PSP) for the Niagara Hydroelectric Project (P-2466-034). The mission of the Virginia Dept. of Game and Inland Fisheries (VDGIF) is to conserve and manage wildlife populations and habitat, connect people to Virginia's outdoors, and protect people and property by promoting safe outdoor experiences. Additionally, VDGIF is the state agency responsible for managing aquatic and terrestrial wildlife resources, including rare/listed species of fish and wildlife.

We concur with and support the comments recently submitted by USFWS, VDEQ, and Dr. Paul Angermeir (Virginia Tech) regarding the PSP for this project. In addition, we offer the following comments on the PSP.

**6. Bypass Reach Habitat Study** – We generally concur with the methodology proposed by the applicant for evaluating habitat conditions in the bypass reach under alternative flow regimes. However, in previous comments, we (VDGIF) stated that our resource management goal for this reach was to restore full ecological functionality to this river segment. It is uncertain from the PSP, whether this study will provide the necessary information to compare habitat in the Bypass Reach with that found in unaltered reaches of the Roanoke River. The applicant states that this study will encompass the "tailwater, bypass reach, and river reach downstream", but the study area needs to be better defined. In order to compare flow alternatives in the bypass reach, we will need to assess habitat conditions downstream from the project (below the confluence with the bypass reach). Given that the bypass reach is approximately 1500 ft. in length, we suggest that a further 1500 ft. of similar habitat (e.g., relatively shallow riffles, runs, shoals, etc.) downstream of the project be included in this study. This may require a somewhat non-contiguous study area, as it would be inappropriate to compare habitat in deep pool areas (as found in certain areas below the project) with that in the bypass reach. We further recommend that the study area be delineated in consultation with USFWS, VDEQ, and VDGIF. Determination of habitat amount/quality in the downstream reach will allow for meaningful comparison of habitat quality/quantity in the bypass reach under alternative flow regimes, given

the goal of restoring full functionality to this impacted reach. Without this baseline for comparison, it will be difficult to assess the ecological impacts of various flow alternatives.

**8. Fish Community Study** – As stated previously, we support the comments already submitted by USFWS, VDEQ, and Dr. Paul Angermeir (VT) regarding this study. We would emphasize the need for larval/juvenile Roanoke Logperch (RLP) sampling (as identified by Dr. Angermeir) in order to assess the impacts of project operations on this listed species. We have consulted with the applicant (and other resource agencies) regarding this study, and have reached general consensus on the majority of the details (with the exception of the larval/juvenile RLP sampling, which is under review by the applicant).

**12. Recreation Study** – The applicant proposes to assess current recreational use in the project area, as well as to solicit stakeholders for recreational enhancement suggestions. However, given the very high potential demand for recreational access to the project, and the very limited facilities currently present, the proposed study will not address the true need for recreational access enhancement. In previous comments, VDGIF suggested that the applicant compare existing recreational use within the project boundaries, with existing recreational use in a segment of the Roanoke River that is not influenced by the project (e.g., upstream of the project boundary). This will provide a realistic comparison of recreational demand and use between the project area and an area with reasonably good access. The proposed study will not adequately address the actual demand for recreational access at the project, as the current limited recreational facilities significantly curtails recreational use. Without a comparable survey of use in an unimpacted river segment, it will be exceedingly difficult to determine the true recreational demand for access and facilities within the project boundary.

Thank you again for the opportunity to provide comments. Should there be any questions, please contact Scott Smith ([scott.smith@dgif.virginia.gov](mailto:scott.smith@dgif.virginia.gov) or 434/525-7522).

Sincerely,



Scott M. Smith  
Regional Fisheries Manager  
Virginia Dept. of Game and Inland Fisheries  
1132 Thomas Jefferson Rd.  
Forest, VA 24551  
[Scott.smith@dgif.virginia.gov](mailto:Scott.smith@dgif.virginia.gov)  
434/525-7522

Cc: E. Aschenbach (VDGIF)  
D. Wilson (VDGIF)  
R. Southwick (VDGIF)  
B. McGurk (VDEQ)  
R. McCorkle (USFWS)  
J. McCloskey (USFWS)  
P. Angermeier (VT)

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# Appendix C

## Facility Inventory and Condition Assessment Form



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**RECREATION FACILITY INVENTORY AND CONDITION ASSESSMENT**  
**Niagara Hydroelectric Project (FERC No. 2466)**

<b>Location:</b>
<b>Date:</b>
<b>Surveyor:</b>
<b>Photo Number(s):</b>

Type of Amenity	#	ADA	Condition	Notes
Portage (put-in/take-out)			N / R / M / G	
Portage Trail/Walking Trail (include length and footing materials)			N / R / M / G	
Trash Receptacles			N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	
Other			N / R / M / G	

<b>PARKING</b>	Total Spaces: _____ Standard: _____ ADA: _____ Double (trailer): _____ Other: _____				<b>Condition</b>
	Surface Type: <i>Asphalt</i> <i>Concrete</i> <i>Gravel</i> <i>Other:</i> _____				N / R / M / G

Signs	#	Size	Material	Condition	Comments
FERC Project			wood / metal / other	N / R / M / G	
Facility ID			wood / metal / other	N / R / M / G	
Regulations			wood / metal / other	N / R / M / G	
Directional			wood / metal / other	N / R / M / G	
Interpretive			wood / metal / other	N / R / M / G	

N - Needs replacement (broken or missing components, or non-functional)  
R - Needs repair (structural damage or otherwise in obvious disrepair)  
M - Needs maintenance (ongoing maintenance issue, primarily cleaning)  
G - Good condition (functional and well-maintained)  
If a facility is given a rating of "N", "R", or "M", provide specific details.

**ADDITIONAL COMMENTS/NOTES:**

Note the age of the facilities (if known) as well as any signs of overuse.

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# Appendix D

Online Survey  
Questionnaire

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**ONLINE RECREATION SURVEY**  
**Niagara Hydroelectric Project (FERC No. 2466)**  
**Recreation Survey Questionnaire**

Appalachian Power Company (Appalachian), a unit of American Electric Power (AEP), is the Licensee, owner, and operator of the Niagara Hydroelectric Project (Project or Niagara Project) which is licensed by the Federal Energy Regulatory Commission (FERC). The current operating license for the Project expires on February 29, 2024. As part of the relicensing process, Appalachian is conducting studies on environmental resources to enable FERC to prepare an environmental document. The purpose of this survey is to collect information about use of the Project's recreation facilities. There is one FERC-approved recreation facility, the canoe portage trail, associated with the Project, owned and operated by Appalachian. There are three non-project recreation facilities that are of interest to Project stakeholders, the Tinker Creek Canoe Launch, Roanoke River Trail, and the Rutrough Road Canoe/Kayak Ramp. A map of the Project area is provided in Attachment 1 of this Questionnaire.

<b>Recreation Location (check one):</b>	<input type="checkbox"/> <b>Niagara Portage Trail</b>  <input type="checkbox"/> <b>Tinker Creek Canoe Launch</b>  <input type="checkbox"/> <b>Roanoke River Trail/Outlook</b>  <input type="checkbox"/> <b>Rutrough Road Canoe/Kayak Ramp</b>
<hr/>	
<b>Home Zip Code:</b> _____	<b>Date:</b> _____
<hr/>	
<b>Age:</b> _____	_____
<hr/>	
<b>Are you:</b> <b>Male</b> <input type="checkbox"/>	<b>Female</b> <input type="checkbox"/> <b>Prefer not to answer</b> <input type="checkbox"/>

**Q-1.**     Regarding the Niagara Project area, do you consider yourself: **(Please circle one)**

1.    A regular visitor to this area (*3 or more times per year*)
2.    An occasional visitor (*1-2 times per year*)
3.    An infrequent visitor (*Less than 1 time per year*)
4.    This is my first visit

**Q-2.**     On this trip to the Niagara Study Area, when did you arrive?

<b>Arrival Date</b>	<b>Arrival Time</b>
____/____/____	_____AM/PM

When did you leave the Niagara Study area?

<b>Departure Date</b>	<b>Departure Time</b>
____/____/____	_____AM/PM

**Q-3.** During the last 12 months (including this trip), which month(s) did you visit the Niagara Study area?  
(Please select all that apply)

Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐

**Q-4.** About how many miles did you travel to get to the Niagara Study area?

A. \_\_\_\_\_ miles

**Q-5.** Did you stay overnight in the Niagara Study area (not including at your own home) on this trip?

1. Yes 2. No

**Q-6.** If you answered yes to Q-5, at what type of accommodations did you stay? (Please select one)

1. RV/Auto/Tent Campground
2. Motel/hotel
3. Bed and Breakfast
4. Vacation or rental home
5. Other (Please specify: \_\_\_\_\_)

**Q-7.** On this trip to the Niagara Study area, in which of the following activities did you participate in? (Please select all that apply)

- |                      |                 |                             |
|----------------------|-----------------|-----------------------------|
| 1. Bank fishing      | 5. Picnicking   | 8. Hunting                  |
| 2. Boat fishing      | 6. Swimming     | 9. Wildlife viewing         |
| 3. Pleasure boating  | 7. Sight-seeing | 10. Other (please describe) |
| 4. Canoeing/kayaking |                 | _____                       |

**Q-8.** Of the activities you circled in Q-7 above, what is the primary activity that you participated in on this visit?  
(Please write in the corresponding number from above)

A. Primary activity # \_\_\_\_\_

**Q-9.** Regarding the primary activity you participated in on this visit listed in Q-8, please rate the following at the Project:

	Totally Unacceptable	Unacceptable	Neutral	Acceptable	Totally Acceptable
Safety	1	2	3	4	5
Enjoyment	1	2	3	4	5
Crowding	1	2	3	4	5
Overall Experience	1	2	3	4	5



- Q-10.** If you participated in recreational activities in the Niagara Study area today or in the past, rate the following on a 1-5 scale as listed in Q-9:

	Rating
Accessibility	
Parking	
Crowding	
Safety	
Condition of Recreation Facilities	
Available Facilities	
Overall Experience	

- Q-11.** Please tell us what type(s) of recreation enhancements you believe are needed at the Niagara Project.

Description of recreation enhancement and location:

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- Q-12.** Please share any other comments that you have regarding recreation near the Niagara Project:

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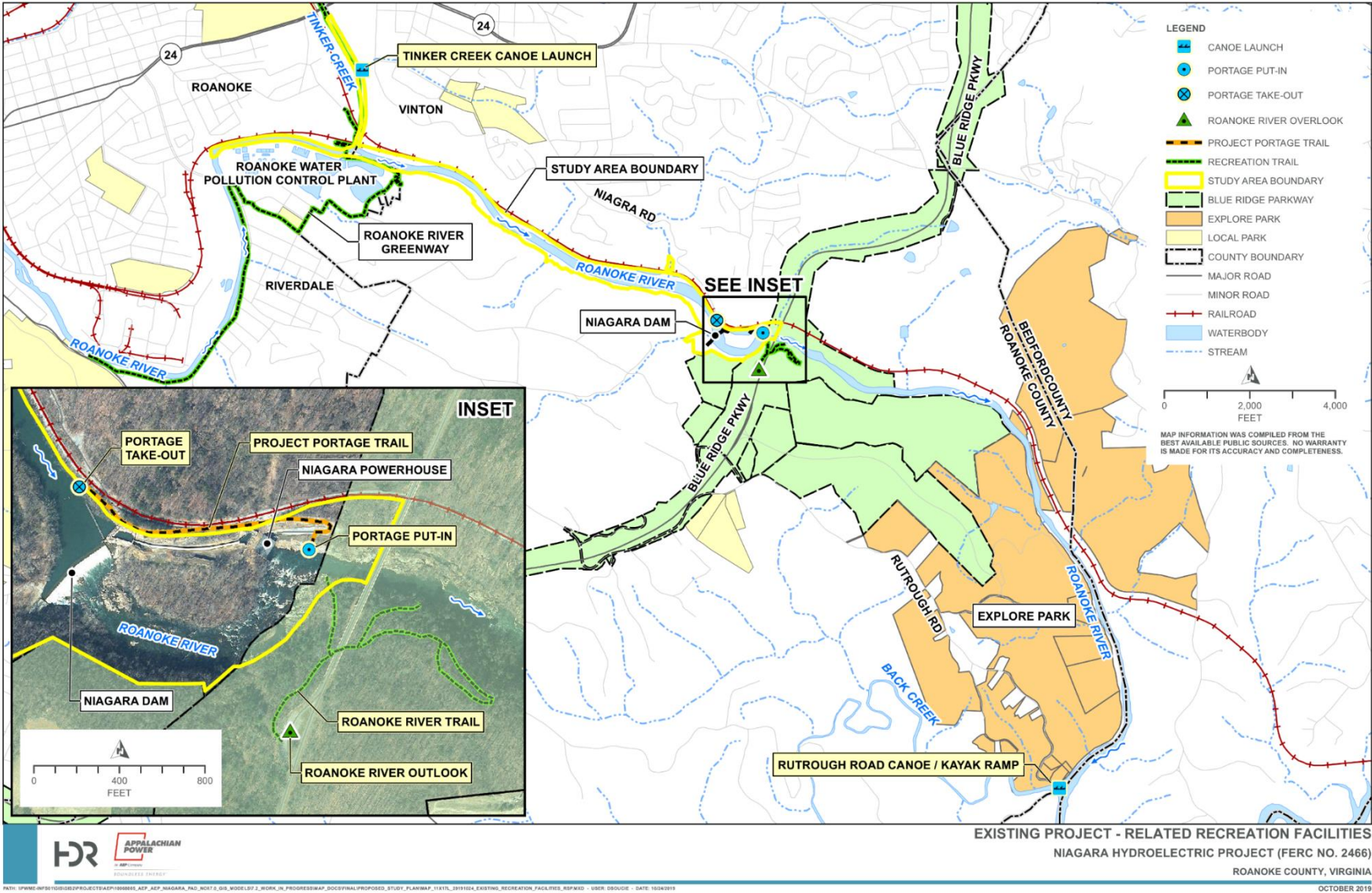
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***Thank you for completing the Recreation Survey!***

## Attachment 1: Project-related Recreational Facilities at the Niagara Project



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# Appendix E

Preliminary Information  
Form Archaeological Site

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# DEPARTMENT OF HISTORIC RESOURCES

2801 Kensington Avenue, Richmond, Virginia 23221

Telephone: (804) 367-2323 Fax: (804) 367-2391

## PRELIMINARY INFORMATION FORM ARCHAEOLOGICAL SITE

The following constitutes an application for preliminary consideration of eligibility for the nomination potential of a site to the Virginia Landmarks Register and the National Register of Historic Places. This does **not** mean that a property is being nominated to the registers at this time. Rather, it is being evaluated by the Virginia Department of Historic Resources (DHR) staff and the State Review Board to determine if the property qualifies for such listings. Applicants will be notified of the staff's and the State Review Board's recommendations.

Contact the appropriate DHR Regional Archaeologist to determine if previous survey material for this site is on file, and if the site has been previously evaluated by DHR. Help identifying the correct regional office is available [here](#). Obtaining previously recorded information could save a significant amount of time in preparing this Preliminary Information Form (PIF). The site must be recorded with DHR, if it has not been previously entered into the DHR inventory. The archaeological inventory manager can assist with the recordation of the site, and will also provide you with the address of the regional office to which you should send your completed PIF materials.

**PIF Materials:** The printed version of this form should be submitted on 8½" X 11" paper, along with the electronic version, preferably in Word format. The form may be typed or hand-written, if an electronic format is not available. The electronic version of this PIF should be submitted on a disc, or it may be attached to an email to the archivist. In addition, a printout of the site form from the DHR database should be submitted with the PIF. A copy of the site database printout may be obtained from the archaeological inventory manager.

**Note:** All submitted materials become the property of the Department of Historic Resources and will not be returned. In addition, the materials will be posted on the DHR public website for a period of time during the evaluation process. Please address questions regarding the PIF application to the archivist or regional office staff.

**Maps:** Please include two (2) maps showing the location of the property:

- A copy of a section of a USGS topographical Quad map with the date, the name of the county/city and the quad printed on the map, and with the name of the site with its state site number and its location on the map labeled with a pencil (USGS Quadrangle maps can be printed free of charge using the Map Locator at the USGS store: <http://store.usgs.gov>).
- A sketch site plan showing the site boundaries in relationship to other features that are important in conveying the location of the site. Please include the name of the site, the state site number, a "North" arrow, date, and "Not to Scale" (if appropriate).

**Note:** Maps may also be generated free-of-charge using DHR's [public V-CRIS MapViewer tool](#).

Before submitting this form, please make sure that you have included the following:

- Section of labeled USGS Quadrangle map showing the location and boundaries of your property
- Sketch site plan map of the site
- Disc with digital files (Word document, TIFs, JPEGs)
- Completed Resource Information Sheet, including
  - Owner's signature – **this is required. The PIF will not be evaluated without owner(s) signature.**
  - Applicant contact information
  - City or county official's contact information

Thank you for taking the time to submit this Preliminary Information Form. Your interest in Virginia's historic resources is helping to provide better stewardship of our cultural past.

## Virginia Department of Historic Resources PIF Resource Information Sheet

This information sheet is designed to provide the Virginia Department of Historic Resources with the necessary data to be able to evaluate the significance of the property for possible listing in the Virginia Landmarks Register and the National Register of Historic Places. This is not a formal nomination, but a necessary step in determining whether or not the property could be considered eligible for listing. Please take the time to fill in as many fields as possible. A greater number of completed fields will result in a more timely and accurate assessment. Staff assistance is available to answer any questions you have in regards to this form.

<b>General Site Information</b>	For Staff Use Only DHR Site #:
Site Name(s): _____	
Site Date(s): _____ <input type="checkbox"/> Circa <input type="checkbox"/> Pre <input type="checkbox"/> Post    Open to Public? <input type="checkbox"/> Yes <input type="checkbox"/> Limited <input type="checkbox"/> No	
Site Address: _____ City: _____ Zip: _____	
County or Ind. City: _____ USGS Quad(s): _____	

<b>Physical Character of General Surroundings</b>	
Acreage: _____ Approximate Dimensions: _____	
Site Description Notes/Notable Landscape Features:          	
Current Use of Site:          	
Any Known Threats to the Site:          	
Ownership Category:	<input type="checkbox"/> Private <input type="checkbox"/> Public-Local <input type="checkbox"/> Public-State <input type="checkbox"/> Public-Federal

**Archaeological Description:** Discuss (a) archaeological deposits present at the site and their level of integrity, and (b) prior investigations at the site as well as prior historical documentation for the site, citing all available references. For sites being evaluated for the Threatened Sites Fund, also discuss types of threats facing the resource, the severity of such threats, and if threats are immediate or long-term in nature.



**Archaeological Significance Statement:** Discuss historical and archaeological reasons that the site is likely to be significant. Briefly note any significant events, personages, and / or families associated with the site. Detail what research issues could be effectively addressed with the archaeological remains preserved at this site.

**Legal Owner(s) of the Property** (For more than one owner, please use a separate sheet.)Mr. ☐ Mrs. ☐ Dr. ☐  
Miss ☐ Ms. ☐ Hon. ☐

(Name)

(Firm)

(Address)

(City)

(State)

(Zip Code)

(Email Address)

(Daytime telephone including area code)

Owner's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**•• Signature required for processing all applications. ••**

In the event of corporate ownership you must provide the name and title of the appropriate contact person.

Contact person: \_\_\_\_\_

Daytime Telephone: (      )

**Applicant Information** (Individual completing form if other than legal owner of property)Mr. ☐ Mrs. ☐ Dr. ☐  
Miss ☐ Ms. ☐ Hon. ☐

(Name)

(Firm)

(Address)

(City)

(State)

(Zip Code)

(Email Address)

(Daytime telephone including area code)

Applicant's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**Notification**

In some circumstances, it may be necessary for the department to confer with or notify local officials of proposed listings of properties within their jurisdiction. In the following space, please provide the contact information for the local County Administrator or City Manager.

Mr. ☐ Mrs. ☐ Dr. ☐  
Miss ☐ Ms. ☐ Hon. ☐

(Name)

(Position)

(Locality)

(Address)

(City)

(State)

(Zip Code)

(Daytime telephone including area code)

Please use the following space to explain why you are seeking an evaluation of this site.

Would you be interested in the easement program? Yes ☐ No ☐