Updated Study Report

Niagara Hydroelectric Project (FERC No. 2466)

December 6, 2021

Prepared by:

Prepared for:

Appalachian Power Company

APPALACHIAN POWER
An AEP Company
BOUNDLESS ENERGY

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Acronyms and Abbreviations

ºC	degrees Celsius
2-D	two-dimensional
Appalachian or Licensee	Appalachian Power Company
AEP	American Electric Power
APE	Area of Potential Effects
BEHI	Bank Erosion Hazard Index
CFR	Code of Federal Regulations
cfs	cubic feet per second
CPUE	catch per unit effort
DO	dissolved oxygen
EDGE	Edge Engineering and Science, LLC
EPRI	Electric Power Research Institute
FERC or Commission	Federal Energy Regulatory Commission
GIS	Geographic Information System
HDR	HDR Engineering, Inc.
HSC	Habitat Suitability Criteria
Hydrolab	Hach Hydrolab® MS5
ICM	Integrated Catchment Model
ILP	Integrated Licensing Process
ISR	Initial Study Report
KOP	key observation point
mg/l	milligrams per liter
NOI	Notice of Intent
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PAD	Pre-Application Document
Project	Niagara Hydroelectric Project
PSP	Proposed Study Plan
RSP	Revised Study Plan
SD	Scoping Document
SHPO	Virginia State Historic Preservation Office
SPD	Study Plan Determination
Terracon	Terracon Consultants, Inc.
TOYR	Time-of-Year Restrictions
USR	Updated Study Report
USFWS	U.S. Fish and Wildlife Service
VDEQ	Virginia Department of Environmental Quality
VDCR	Virginia Department of Conservation and Recreation
VDHR	Virginia Department of Historic Resources

VDWR	Virginia Department of Wildlife Resources
WetCAT	Wetland Condition Assessment Tool
YES	Young Energy Services
YOY	young-of-year

1 Project Introduction and Background

1.1 Introduction

Appalachian Power Company (Appalachian or Licensee), a unit of American Electric Power (AEP) is the Licensee, owner, and operator of the 2.4-megawatt (MW) run-of-river Niagara Hydroelectric Project (Project) (Project No. 2466), located on the Roanoke River (River Mile 355) in Roanoke County, Virginia.

The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission) under the authority granted to FERC by Congress through the Federal Power Act, 16 United States Code (USC) §791(a), et seq., to license and oversee the operation of non-federal hydroelectric projects on jurisdictional waters and/or federal land. 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 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 FERC's regulations at 18 CFR §16.9(b), the licensee must file its final application for a new license with FERC no later than February 28, 2022.

In accordance with 18 CFR §5.15, Appalachian has conducted studies as provided in the Revised Study Report (RSP) as subsequently approved and modified by the FERC. This Updated Study Report (USR) describes the methods and results of the studies conducted in support of preparing an application for new license for the Project.

The Commission's regulations at 18 CFR §5.15(c) require Appalachian to hold a meeting with participants and FERC staff within 15 days of filing the USR. Accordingly, **Appalachian will hold an USR Meeting via WebEx from 9 AM to approximately 4 PM on December 14, 2021.** An agenda for the USR Meeting is provided in Attachment 1. Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

Appalachian respectfully requests that those planning on joining the USR Webex Meeting RSVP by emailing Maggie Salazar at maggie.salazar@hdrinc.com on or before close of business Friday, December 10, 2021. Additional information, including instructions to join the virtual meeting, will be provided in response to the RSVP.

1.2 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. 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 Environmental Assessment. 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, 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 and 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 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.

In accordance with 18 CFR §5.13, Appalachian developed a Revised Study Plan (RSP) for the Project, which takes into account comments and study requests considered in developing the PSP, the Commission's July 9, 2019 SD2 and comments on the PSP, and it was filed with the Commission and made available to stakeholders on November 6, 2019. On December 6, 2019 FERC issued the Study Plan Determination (SPD) for the proposed eight studies to be performed in support of issuing a new license for the Project. On July 27, 2020, Appalachian filed an updated ILP study schedule and a request for extension of time to file the Initial Study Report (ISR) to account for fieldwork delays resulting from the COVID-19 pandemic. The request was approved by FERC on August 10, 2020, and the filing deadline for the ISR for the Project was extended from November 17, 2020 to January 11, 2021.

On December 22, 2020, FERC issued Scoping Document 3 (SD3) for the Project, to account for updates about Commission staff intend to conduct their National Environmental Policy Act (NEPA) review in accordance with the Council on Environmental Quality's (CEQ) new NEPA regulations at 40 CFR Part 1500-1518.

Appalachian filed the ISR on January 11, 2021, conducted a virtual ISR Meeting on January 21, 2021, and filed the ISR Meeting summary with the Commission on February 5, 2021. Appalachian provided response to comments on April 6, 2021. FERC provided its Determination on Requests for Study Modifications on May 10, 2021, which approved modifications to one of the eight studies (Water Quality Study) recommended by the U.S. Fish and Wildlife Service (USFWS) and Virginia Department of Environmental Quality (VDEQ). FERC letters of correspondence since the filing of the ISR are included in Attachment 2.

Since July 2020, either by separate filing or in conjunction with the filings described above, Appalachian has provided FERC and relicensing participants with quarterly ILP study progress reports describing study activities completed by Appalachian, updates to the study schedule, and variances from the RSP due to field conditions or other developments. The final quarterly progress report was filed with FERC on November 2, 2021.

Appalachian filed the Niagara Project Draft License Application with the FERC on October 1, 2021 and stakeholders were notified of the filing on October 4, 2021. Major ILP milestones to-date are presented Major ILP milestones to-date are presented in Table 1-1.

Table 1-1. Major ILP Milestones Completed

Date	Milestone
January 28, 2019	Appalachian Filed NOI and PAD (18 CFR §5.5, 5.6)
March 26, 2019	FERC Issued Notice of PAD/NOI and Scoping Document 1 (SD1) (18 CFR §5.8(a))
April 24-25, 2019	FERC Conducted Scoping Meetings and Site Visit (18 CFR §5.8(b) (viii))
May 25, 2019	Stakeholders Submitted Comments on the PAD, SD1, and Study Requests (18 CFR §5.9)
July 9, 2019	FERC Issued Scoping Document 2 (SD2) (18 CFR §5.10)
July 9, 2019	Appalachian Filed Proposed Study Plan (PSP) (18 CFR §5.11(a))
August 1, 2019	Appalachian Held Study Plan Meeting (18 CFR §5.11(e))
October 7, 2019	Stakeholders Submitted Comments on the PSP (18 CFR §5.12)
November 6, 2019	Appalachian Filed RSP (18 CFR §5.13(a))
November 21, 2019	Stakeholders Submitted Comments on the RSP (18 CFR §5.13(b))
December 6, 2019	FERC Issued the SPD (18 CFR §5.13(c))
July 27, 2020	Appalachian Submitted First Quarterly Report, ILP Study Update, and Request for Extension of Time File ISR

Date	Milestone
August 10, 2020	FERC Issued Order Granting Appalachian Extension of Time for Filing of ISR
August – November 2020	Appalachian Conducted First Season of Field Studies (18 CFR §5.15(a))
October 27, 2020	Appalachian Submitted Second Quarterly Progress Report (18 CFR §5.15(b))
December 22, 2020	FERC Issued Scoping Document 3 (SD3) (18 CFR §5.10)
January 11, 2021	Appalachian Submitted ISR (18 CFR §5.15(c)(1))
February 5, 2021	Appalachian Filed ISR Meeting Summary (18 CFR §5.15(c)(3))
April 30, 2021	Appalachian Submitted Third Quarterly Progress Report (18 CFR §5.15(b))
July 22, 2021	Appalachian Submitted Fourth Quarterly Progress Report (18 CFR §5.15(b))
October 1, 2021	Appalachian Filed Draft License Application (DLA) (18 CFR §5.16(a))
November 2, 2021	Appalachian Submitted Fifth Quarterly Progress Report

1.3 Study Plan Implementation

On December 6, 2019 the Commission issued the SPD for the Project. The SPD directed Appalachian to conduct eight studies as listed below:

1. Bypass Reach Flow and 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
7. Recreation Study
8. Cultural Resources Study

Preliminary study reports for the Bypass Reach Flow and Aquatic Habitat Study, Water Quality Study, Aquatic Resources Study, Recreation Study, and Cultural Resources Study were included in the ISR. Section 2 of this USR describes Appalachian's updated study reports and any variances from the study plan and schedule, including those previously reported by Appalachian in the ILP quarterly progress reports.

Final technical reports for all studies are included as appendices to this USR. Note that the final Cultural Resources Study report was filed with the FERC as a controlled unclassified information (CUI)/Privileged volume of the DLA on October 1, 2021, therefore a summary of the report is included herein but the report is not being filed with this USR. The Cultural Resources Study Report

was transmitted on September 8, 2021 to the Virginia State Historic Preservation Office (SHPO) and consulting Tribes for their review and concurrence with the report's recommendations. No reply comments were received.

1.4 Proposals to Modify Ongoing Studies or for New Studies

At this time, Appalachian is not proposing any modifications to the studies approved and modified in the Commission's December 6, 2019 SPD or any new studies. Minor variances to the study plans have been previously reported in the ILP quarterly progress reports (July 27, 2020; October 27, 2020; April 30, 2021; July 22, 2021; and November 2, 2021) and are detailed in the sections that follow, as well as within the individual study reports provided as appendices.

2 Status and Summaries of Studies

This section describes the status of the induvial studies, a summary of the study methods and results, and any variances from the study plan and schedule.

2.1 Bypass Reach Flow and Aquatic Habitat Study

2.1.1 Study Status

Appalachian initiated and completed the Bypass Reach Flow and Aquatic Habitat Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Bypass Reach Flow and Aquatic Habitat Study Report was filed with the ISR on January 11, 2021, and the results of this study were presented at the ISR meeting on January 21, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Bypass Reach Flow and Aquatic Habitat Study is included in Appendix A of this USR.

2.1.2 Summary of Study Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, Appalachian's consultant, HDR Engineering, Inc. (HDR), conducted a Bypass Reach Flow and Aquatic Habitat Study to:

- Delineate and quantify aquatic habitats and substrate types within the bypass reach.

- Identify and characterize locations of habitat management interest located within the bypass reach.
- Develop an understanding of surface water travel times and water surface elevation responses for varying Obermeyer trash sluice gate openings (i.e., varying flow scenarios) in the bypass reach study area to:
    - Demonstrate the efficacy of the existing bypass reach minimum flow requirement (i.e., 8 cubic feet per second [cfs]) on maintaining suitable habitat for aquatic species.
    - Evaluate potential seasonal minimum flow releases in the bypass reach.

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. Therefore, the goal of this study is to characterize changes in quantity of aquatic habitat over a range of flows and operational scenarios.

2.1.2.1 Methods

2.1.2.1.1 Literature Review, Topography Mapping, and Photogrammetry Desktop Study

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

Light detection and ranging data (LiDAR) were collected to support development of comprehensive three-dimensional elevation and visual surface layers of the bypass reach. Topographic information was incorporated as a Geographic Information Systems (GIS) base layer to support field data collection and hydraulic modeling efforts. LiDAR data collection and digital terrain models are discussed further in the Niagara Bypass Reach ICM Model Development report, which is included in Appendix A. These data were used for desktop mesohabitat mapping of each bypass reach according to substrate size (e.g., sand, gravel, cobble, etc.), cover (e.g., no cover, overhead vegetation, etc.), and mesohabitat types (e.g., pools, riffles, runs, bedrock, shoals). Species of interest were determined based on stakeholder consultation and an evaluation of management objectives (e.g., determine potential habitat availability under different flow regimes using guild curves to represent fish species that are or may be present in the bypass reach, including an evaluation specific to Roanoke Logperch).

2.1.2.1.2 Hydraulic Model Development

Field data were collected to support development of a two-dimensional (2-D) hydraulic model of the tailrace and bypass reach of each development. The hydraulic model is based on the Innovyze

Infoworks Integrated Catchment Model (ICM) software (version 7.0), which is capable of simulating depth and velocities in a 2-D grid pattern over a wide range of flow conditions. Flow and water depth data collected at four target flows were used to calibrate and validate the hydraulic model to allow simulation of flow conditions and gate operations other than those that were explicitly sampled during data collection. Recorded gate operations (provided by Appalachian), flow, and level-logger data from the bypass and tailrace study reach were processed to provide operation sequences and flow and elevation hydrographs used for the calibration of gate and bypass reach model hydraulic parameters. Simulations were used to establish matrices of travel time, rise in water surface elevation, and velocities at locations of interest under the different flow regimes.

Target model calibration/validation flows were released into the Niagara bypass reach and data collection was performed during two separate site visits between June 29 – July 8, 2021 to collect depth data, water surface elevations, velocities, and wetted area data under various bypass flow regimes. Detailed description of the bypass reach ICM model development processes and results are provided in Attachment 1 of the Bypass Reach Flow and Aquatic Habitat Study report (Appendix A, Attachment 1).

2.1.2.1.3 Desktop Mesohabitat Mapping

The mesohabitat mapping results and the 2-D model depth and velocity simulation results were used in combination with aquatic species habitat suitability criteria (HSC) (i.e., using depth, velocity, and substrate/cover preferences) to evaluate potential available aquatic habitat in each tailrace and bypass reach under each modeled flow scenario. Using the high-resolution photogrammetry data, polygons were drawn in GIS to encompass the study areas according to presence or type of cover (e.g., no cover, overhead vegetation, etc.) and substrate size (e.g., sand, gravel, cobble, etc.).

2.1.2.1.4 Field Data Collection

Field data were collected to support development of a 2-D hydraulic model (described in Section **Error! Reference source not found.**) of Niagara's tailrace and bypass reach. Calibration flows were released into the tailrace and bypass reaches for purposes of collecting water surface elevation, depth, velocity, and wetted area data under four bypass reach and tailrace flow regimes. The model enables a comparison between powerhouse operations (i.e., flow releases into the tailrace area) and dam operations (i.e., flow releases into the bypass reach via the Obermeyer trash sluice gate). To aid calibration and validation of the model, flow data collection was performed under several different steady flow releases into the bypass reach. Eleven water level loggers were deployed in the Niagara bypass reach and tailrace prior to the model calibration target flow releases. Reference water elevations were collected using a staff gage at each level logger upon installation. Level loggers recorded water surface elevation data at 5-minute intervals providing detail for travel time, and rates of rise estimations used in the model calibration.

The proposed target flow scenarios were designed to allow 2-D hydraulic model simulations capable of evaluating the full operating range of the newly installed Obermeyer trash sluice gate located on the left abutment (looking downstream) of the Niagara dam and spillway. Data collection for the four target calibration flow scenarios was performed during two separate site visits between June 29 – July 8, 2021. Each scenario was designed to capture a steady calibration flow in the bypass reach. Flow was delivered to the bypass reach through controlled opening of the Obermeyer gate (in addition to normal leakage flow). Total flows in the bypass reach were recorded using a handheld flow meter. In addition to the field data collected during the target calibration flows, a drone was used to capture an aerial imagery orthomosaic of the bypass reach and tailrace at the highest and lowest target calibration flows (see Attachment 1 of Appendix A).

The Obermeyer gate is capable of providing flow releases of approximately 7 cfs to 287 cfs under the authorized reservoir operating range of 883.4 ft to 884.4 ft, respectively, therefore, the four target flows selected support hydraulic model calibration/validation activities and allow model simulations that cover the Obermeyer gate discharge capacity range from 7 cfs up to 287 cfs. Prior to the target flow field data collection activities, water level data loggers (pressure transducers that measure water stage changes) were strategically deployed in the bypass reach and tailrace area immediately downstream from the powerhouse to record changes in water surface elevation at each of the target flows. The instrumentation remained in place for several weeks afterwards to collect additional water surface elevation and flow travel time data under higher (than target flow) conditions (i.e., during rainfall runoff events). Data collected at higher flows provided additional model calibration data to allow model simulations higher than the Obermeyer gate discharge capacity.

2.1.2.1.5 Substrate Mapping and Particle Size Distribution

A Wolman pebble count (Wolman 1954) study was performed in the bypass reach to characterize the existing grain size distribution of substrate and evaluate the potential for sediment transport of smaller particle sizes. Two pebble count transects were established near the middle portion of the bypass reach at locations which contained a variety of smaller substrate particle sizes. Headpins and tailpins were installed at the endpoints of each transect and a tagline was stretched between to provide a visual aid along each transect to reduce location uncertainty between pebble count sampling events. Pebble counts were conducted immediately after each target flow receded. These data were used to characterize the existing surface substrate grain size distribution in the bypass reach and determine if the calibration target flows evaluated have sufficient velocity to mobilize substrate particles in the bypass reach. The Wentworth grain size classification scale (Wentworth 1922) was used to assign size classes to the substrate. Substrate particle sizes were plotted by size class and frequency to determine distributions within the bypass reach study area (see Appendix A for results).

2.1.2.1.6 Aquatic Habitat Evaluation

Activities described above (i.e., literature review and desktop assessment, topographic mapping and photogrammetry, field data collection, and hydraulic model development) were used to develop a flow and aquatic habitat assessment of the Project bypass reach and tailrace. Specifically, for each flow scenario evaluated, incremental changes in depth and wetted area were determined. The water level logger data in combination with the 2-D model results were used to determine rate of rise and fall of water elevation (i.e., water depth) in the tailrace 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 were used in combination with aquatic species habitat suitability criteria (HSC) (i.e., using depth, velocity, and habitat preferences) to evaluate potential available habitat under each modeled flow scenario in the study reach.

Roanoke Logperch was selected as a standalone target species for this study along with a total of eight species-guild representatives, including three shallow-slow, one shallow-fast, two deep-slow, and two deep-fast guilds. Guild representatives were selected from a variety of regionally representative sources, represent a wide range of habitat characteristics, and were selected to represent a wide range of species.

2.1.2.2 Results

2.1.2.2.1 Desktop Mesohabitat Mapping Results

Habitat types were verified and/or updated in GIS as necessary based on field observations performed during the calibration flow fieldwork in 2021 (i.e., June 29 – July 8, 2021). The total area evaluated for the Project bypass reach was 6.87 acres, with an additional 1.01 acre for the tailrace from the powerhouse discharge to the Blue Ridge Parkway bridge. Approximately half of the bypass contained instream cover (60.6 percent), followed by overhead cover (27.3 percent). The majority of substrate in the bypass consisted of boulder, bedrock, or woody debris (63.2 percent), followed by cobble at 25.9 percent. Much of the bypass was categorized as shoal habitat (32.1 percent), however pools and riffles were also prevalent (24.1 and 15.8 percent, respectively). Approximately 11.3 percent of the bypass was characterized as “upland”, which includes areas that are exposed during the 8 cfs minimum bypass flow requirement, but may be inundated at higher flows (i.e., during rainfall runoff events that result in flow over the Project’s main and auxiliary spillways).

The relatively short tailrace reach was categorized as run mesohabitat type, composed mainly of boulder and bedrock (85.5 percent) with no cover (99.8 percent).

2.1.2.2.2 Surface Water Travel Times

Field data collection at the four target calibration flows was conducted during two site visits between June 29 – July 8, 2021. Each target flow was designed to capture a controlled, steady flow in the bypass reach delivered via the Obermeyer trash sluice gate[1]. After the calibration flow field data collection effort, several level loggers were left in place to capture changes in water surface elevations and travel times during naturally occurring rainfall runoff events. These results are presented in Appendix A from June 29 – October 27, 2021, which captured two tropical storms. Summary results include the following:

- The main flow path through the bypass reach shifts from river right (looking downstream) near the spillway to river left at approximately the mid-point of the reach.
- Along this main flow path, depths increased approximately 0.32 ft between the minimum flow and low flow, 0.14 ft between the low and mid flows, and 0.46 ft between the mid and high flows. The overall depth increase from the minimum flow to high flow was approximately 0.92 ft.
- Depth increases along the right descending bank (outside the main flow path) were less noticeable as the channel bed elevation is slightly higher along the right bank (which forces flow to the lower left side of the bypass reach channel).
- Flow travel times through the approximately 1,500-ft-long bypass reach were approximately 35 minutes for the low and mid model calibration flows and 16 minutes for the high calibration flow.

2.1.2.2.3 Substrate Mapping and Particle Size Distribution

Both transects where pebble counts were conducted are dominated by bedrock, which covers approximately 55 – 75 percent of the transect widths. At the upstream transect, there was a fairly even distribution of particle sizes between 5.7 and 22.6 millimeters (fine to coarse gravel) as well as particles between 22.6 and 256 millimeters (coarse gravel to large cobble) recorded after each calibration flow sampling event. At the downstream transect there was a fairly even distribution of particles ranging from 5.7 to 180 millimeters (fine gravel to large cobble) recorded after each flow sampling event. Overall, the individual size class percentages were relatively small (compared to bedrock) and there do not appear to be any noticeable trends attributable to sediment transport over the model calibration flow regime (which ranged from 7 – 91 cfs).

[1] In addition to flows released via the Obermeyer trash sluice gate, a small amount of flow from leakage through the mud gates (estimated at approximately 1.0 cfs) was also included.

2.1.2.2.4 Aquatic Habitat Evaluation

Habitat suitability maps under each modeled flow scenario are included in Attachment 3 of Appendix A. Individual map series are provided for the eight species-guild representatives (i.e., two deep-fast, two deep-slow, one shallow-fast, and three shallow-slow) and Roanoke Logperch (adult, subadult, and young-of-year life stages). Potential available habitat under each modeled flow scenario is provided in Appendix A.

2.1.2.3 Identify and Characterize Locations of Habitat Management Interest

Habitat model results for the Niagara bypass reach indicate suitable habitat for the four guilds (i.e., Deep-Fast, Deep-Slow, Shallow-Fast, and Shallow-Slow) and the Roanoke Logperch standalone target species under all four modeled flow scenarios. The bypass reach contains shoals, shallow and deep pools, riffles, and runs which offer a variety of habitat types. Model results for species and life stages that prefer larger substrate types (e.g., cobble, boulder, bedrock) with cover (e.g., instream, overhead) generally had larger amounts of potential available habitat. The amount of potential available habitat generally increases as bypass flows increase with most of the incremental gain between the lowest modeled flow (i.e., 7 cfs) and the two middle flows (i.e., 24 – 33 cfs).

Habitat modeling results for the Roanoke Logperch indicate preferred habitat is primarily along the main flow path in the bypass reach, which is in agreement with the observation data presented in the 2021 Roanoke Logperch Survey performed by EDGE Engineering, Inc. (Attachment 2 of Appendix C). The modeling results for the adult and subadult life stages may be under-represented for the bypass reach due to the relatively low suitability values assigned to the larger substrate categories (i.e., boulder/bedrock). Most of the field observations for Roanoke Logperch in the bypass reach listed boulder/bedrock as the prevalent substrate type. Increasing the habitat suitability for the boulder/bedrock substrate category would likely increase the amount of modeled habitat for these two life stages.

2.1.2.4 Efficacy of Existing Bypass Reach Minimum Flow Requirement

The minimum calibration flow field measurement was used to set the low end of the 2-D hydraulic model range. Habitat model results from this flow scenario were used to evaluate the efficacy of the existing 8 cfs minimum bypass flow requirement. Suitable habitat is available in the bypass reach at the minimum flow requirement. However, for most of the guilds (and the standalone Roanoke Logperch target species), modeled habitat generally increases as bypass flows increase with a significant incremental gain between the minimum calibration flow (i.e., 7 cfs) and the low calibration flow (i.e., 24 cfs). Between these two flow scenarios, water depths increase by approximately 0.2 ft, velocities increase by approximately 0.3 ft/s and the total wetted area increases by approximately 25 percent (see Appendix A, Attachment 1). While these increases are fairly incremental, increases in

potential habitat availability for the Shallow-Fast and Shallow-Slow guilds are noticeable between these two modeled flow scenarios (see maps in Appendix A, Attachment 3).

2.1.2.5 Evaluate the Impacts of Seasonal Minimum Flows

The purpose of seasonal minimum flow releases to the bypass reach would be primarily to increase spawning habitat for species or guilds using this area, however general habitat availability could also be considered in this context. With respect to spawning habitat, only the Redbreast Sunfish (representing Shallow-Slow Guild with fine- to coarse-substrate sizes with no boulder/bedrock) could be evaluated for this exercise. Spawning Redbreast Sunfish construct nests over silt-free sand and gravel substrates, typically located in calmer areas of pool margins or the lee of large boulders in water less than 3-ft deep (Jenkins and Burkhead 1993). According to the habitat modeling results (Appendix A, Attachment 3), spawning habitat with these characteristics is abundant in the upper half of the bypass reach at the minimum modeled flow (i.e., 7 cfs) and little additional spawning habitat would be gained with increasing flow releases. In fact, slightly less spawning habitat would be available at the highest flow release (91 cfs), likely due to increased flow velocities. As a result, seasonal minimum flows in the Niagara bypass reach would not provide a significant amount of additional available spawning habitat for this species/life stage.

2.1.3 Variances from FERC-Approved Study Plan

The Bypass Reach Flow and Aquatic Habitat Study was conducted in accordance with the FERC-approved RSP.

2.2 Water Quality Study

2.2.1 Study Status

Appalachian initiated and completed the Water Quality Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Water Quality Study Report was filed with the ISR on January 11, 2021, and the results of this study were presented at the ISR meeting on January 21, 2021. Based on the results and findings from the 2020 water quality monitoring period, FERC approved a study modification requiring additional water quality data collection at Niagara in 2021 due to higher than normal flows in the bypass reach during the 2020 field collection effort.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the final Water Quality Study is included in Appendix B of this USR.

2.2.2 Summary of Study Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, HDR conducted a Water Quality Study 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 Chapter 260).
- Provide data (temperature and dissolved oxygen [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 protection, mitigation, and enhancement measures may be appropriate for the protection of water quality at the Project.

2.2.2.1 Methods

HDR performed continuous temperature and DO monitoring, discrete multiparameter water quality sampling, and reservoir and forebay vertical profile data collection at eight locations within the study area.

During the initial deployment and subsequent download events, discrete multi-parameter water quality measurements (i.e. spot measurements) of temperature, DO concentration, pH, and specific conductivity were collected at each monitoring location using a Hach Hydrolab® MS5 (Hydrolab). For riverine monitoring locations, Hydrolab water quality data was collected at one location within the water column at a depth similar to the sondes. Profile measurements were collected at 1.0-foot (ft) vertical intervals using the Hydrolab for the two reservoir monitoring locations to record temperature and DO values throughout the water column at the time of the data sonde downloads.

Calibrated Onset® HOBO U26 DO/Temperature Loggers (i.e. sondes) were deployed for continuous in situ measurements and were set to record water temperature and DO at 15-minute intervals. See the Water Quality Study Report (Appendix B) for details on equipment calibration and quality assurance. During the 2020 study period, continuous data was collected from July 29 through November 10 and the data sondes were downloaded five times (August 12 and 26, September 22-23, October 21, and November 9-10, 2020). At each of the eight continuous monitoring locations, two data sondes were deployed to provide redundancy. In the forebay, one sonde was deployed near the water surface and a second was deployed near the reservoir bottom to capture any temperature and DO stratification. The download schedule was accelerated from monthly to bi-weekly when possible to reduce effects associated with biofouling, which was greater than

anticipated at the time of the RSP development. During the 2021 study period, continuous data was collected from June 29 through October 27 at three continuous monitoring locations. Similar to the 2020 study period, two data sondes were deployed at each of the three continuous monitoring locations to provide redundancy. The download schedule was roughly every two to three weeks, and the data sondes were downloaded seven times over the monitoring period.

Upon completion of the field data collection effort, data was checked for errors and omissions. Data that more closely matched the discrete measurement readings made in the field during download events were preferentially reported and analyzed for each monitoring location. Note there are several data gaps that occurred during the field data collection period that were the result of biofouling, equipment malfunction, and/or equipment theft. These data gaps did not affect the overall summary results and conclusions of this study report.

Real-time flow data (15-minute) was obtained from the USGS Roanoke River at Niagara Gage (USGS 02056000), which is approximately 500 ft downstream of the Niagara powerhouse and includes the combined flows from the powerhouse and bypass reach. Flows have been recorded since October 1990 at the USGS Roanoke River at Niagara gage and corresponding stage from October 2007 to present.

2.2.2.2 Results

2.2.2.2.1 Temperature

Water temperatures varied seasonally at continuous and discrete water temperature data collection locations. Water temperature measurements during July and August 2021 were slightly higher than during 2020 at all monitoring locations with daily peaks in the 25 – 30ºC range. The diurnal variation in temperature fluctuation at the two bypass reach monitoring locations in 2021 was also greater than 2020. The higher water temperatures and greater diurnal variation in water temperatures were likely the result of lower Project inflows during 2021, particularly in the bypass reach. While 2021 water temperatures were generally higher than in 2020, water temperatures for both years were less than the state maximum water temperature limit of 31ºC.

Vertical profile data indicated that while water temperature varied seasonally, there was no thermal stratification at the reservoir monitoring location during 2020 and no to very weak (i.e., <1.0 degrees Celsius [ºC]) thermal stratification at the forebay monitoring location for most of 2020 and 2021. The one exception was during the September 15, 2021 download event where the difference between forebay surface and bottom temperatures was approximately 3.1ºC. This download event occurred during a powerhouse outage when flows in the forebay area were reduced, thus allowing the water column to thermally stratify.

All continuous and discrete water temperature data as well as vertical profile data are included in Appendix B.

2.2.2.2.2 Dissolved Oxygen

In 2020, continuous and discrete DO concentration data indicated that all measurements were greater than the 5.0 mg/l daily average (4.0 mg/l instantaneous minimum) DO standard (9 Virginia Administrative Code 25-260-50) except in the project's forebay and tailrace monitoring locations on September 8 and 11, 2020 when instantaneous DO concentrations dropped slightly below the numeric state water quality standard due to a planned powerhouse outage, which began on September 8, 2020 and continued throughout the end of the monitoring period; each occurrence lasted less than 1.5 hours. During these two events, DO concentrations near the surface remained above 5.0 mg/l and as a result, overall DO concentrations in the forebay met the state's DO criteria[2]. Similar to water temperature profile trends, there was little (i.e., < 0.5 mg/l) difference in DO concentrations between the forebay surface and bottom sonde locations (with the exception of the two events noted above); indicating little to no stratification of DO concentrations throughout the forebay water column. DO concentrations in the tailrace were generally higher (by less than 0.5 mg/l) compared to the surface forebay monitoring location during both periods of generation and non-generation. Overall magnitude and trends in DO concentrations were very similar between the forebay, tailrace and bypass reach monitoring locations.

During 2021, continuous and discrete DO concentration data indicated that all values exceeded the 4.0 mg/l instantaneous and 5.0 mg/l daily average standard with the exception of the upper bypass reach monitoring location during the hottest portion of the summer (July/August) when bypass flows were at the 8.0 cfs minimum required release. The upper bypass reach data sonde is located in a slow moving/stagnant pool which at times exhibited DO concentrations less than 4.0 mg/l during nighttime hours on several days in July and August. Hot, relatively dry weather conditions conducive to supersaturation due to photosynthesis during daylight hours and a DO sag during nighttime hours is assumed to be the principal cause; significant biofouling that occurred in these instruments under the lowest monitored flow likely contributed to low DO values. From August 11 – 13, 2021, the bypass flow was increased from 8.0 cfs to approximately 20 cfs due to an operational adjustment associated with the Obermeyer trash sluice gate (see Figure 4-2 in Appendix B). During this 2-day period, DO concentrations at the upstream bypass reach monitoring location remained above the 4.0 mg/l instantaneous and 5.0 mg/l daily average standard and did not experience a nighttime DO sag.

[2] For a thermally stratified man-made lake or reservoir in Class III, IV, V or VI waters that are listed in 9VAC25-260-187, these dissolved oxygen and pH criteria apply only to the epilimnion of the waterbody. When these waters are not stratified, the dissolved oxygen and pH criteria apply throughout the water column.

After August 13, 2021, the Obermeyer gate returned to its normal operating mode and DO concentrations in the bypass reach remained above the Virginia standard during the remainder of the 2021 monitoring period. A planned powerhouse maintenance outage occurred from September 7 – 30, 2021, during which time all Project inflow was routed through the bypass reach. This resulted in DO concentrations greater than 8.0 mg/l during the outage. As water temperatures continued to cool during October 2021, DO concentrations in the bypass reach remained high (i.e., > 8.0 mg/l).

Vertical DO profile measurements during several download events in August and September (2021) indicated some degree of DO stratification at the forebay monitoring location; the strongest of which was measured on September 15, 2021 during the powerhouse outage described in Section 6.1. During this download event, DO concentrations ranged from 8.0 mg/l at the surface to 5.0 mg/l near the bottom of the forebay. All DO concentrations measured at the forebay monitoring location in 2021 were greater than 5.0 mg/l at all depths.

2.2.2.2.3 pH

Vertical profile data during the 2020 and 2021 monitoring periods (forebay and reservoir) showed only minor variations in pH values (between 7.5 and 8.0) during each discrete sampling event, and there was little to no stratification between the reservoir surface and bottom measurements. Measurements at the two upstream USGS stations in 2021 ranged from 7.6 – 8.5, which was slightly higher than the discrete pH measurements at the forebay, tailrace, and bypass reach monitoring locations in 2021, but remained within the Virginia state standard for pH values. All discrete pH data for 2020 and 2021 are included in Appendix B.

2.2.2.2.4 Specific Conductivity

While Virginia does not have a state standard for specific conductivity, concentrations between 150-500 microsiemens per centimeter (µS/cm) are generally considered suitable for most fish species (USEPA 2012). For the 2020 sampling period, conductivity at the forebay monitoring location varied each sampling event, but concentrations were typically the same from reservoir surface to bottom and ranged from 370 – 435 µS/cm over four sampling events during the study period. Specific conductivity at the reservoir monitoring location also varied each sampling event and concentrations were typically the same from reservoir surface to bottom, but with a slightly higher (and narrower) range between 411 – 436 µS/cm) over the four sampling events. For 2021, specific conductivity at the forebay monitoring location was slightly higher than in 2020 ranging from 369 – 501 µS/cm over eight sampling events. Upstream monitoring locations had specific conductivity values averaging between 300 and 500 µS/cm. As expected, declines in specific conductivity at both upstream locations (see data in Appendix B) correspond to higher flows during rainfall runoff events.

Although there were several data gaps that occurred during the field data collection period that were the result of biofouling, equipment malfunction, and/or equipment theft, these gaps did not affect the overall summary results and conclusions of this study report (Appendix B).

Continuous and discrete water quality data collected during the 2020 study period met Virginia Class IV (Roanoke River) and Class VII (Tinker Creek) water quality standards for temperature (<31 ºC), DO (>4.0 mg/l instantaneous minimum; >5.0 mg/l daily average), and pH (range 6.0 – 9.0 for Class IV and 3.7 – 8 for Class VII) at all monitoring locations during the study period.

Continuous and discrete water quality data collected during the 2021 study period also met Virginia Class IV (Roanoke River) water quality standards with the exception of the DO instantaneous standard (4.0 mg/l) at the upstream bypass reach monitoring location during the hottest portion of the summer (July/August) when bypass flows were at the 8.0 cfs minimum required release but returned to meet DO standards when the Obermeyer gate returned to normal operations.

2.2.3 Variances from FERC-Approved Study Plan

Based on the results and findings from the 2020 water quality monitoring period, FERC approved a study modification requiring additional water quality data collection at Niagara in 2021. FERC required that Appalachian conduct continuous monitoring in the bypass reach (two locations) and tailrace (one location) in 2021, as well as the discrete collection of water quality data in the forebay (i.e., vertical profiles), tailrace, and bypass reach. In lieu of reinstalling continuously recording sondes in the upper end of the impoundment, Tinker Creek, and the Roanoke River upstream of the confluence with Tinker Creek, Appalachian proposed, and FERC agreed, to include 2021 water quality data (temperature, DO, pH, and specific conductivity) recorded at both the Thirteenth Street Bridge USGS gage (USGS 02055080) and USGS gage at Tinker Creek above Glade Creek (USGS 0205551614) in the USR. The Commission also required that the 2021 water quality monitoring period extend from July through the end of October. The 2021 water quality study incorporated FERC's requirements from the May 10, 2021 determination for study modifications (included in Attachment 2 of this USR – FERC Consultation).

2.3 Fish Community Study

The Niagara Fish Community Study consists of sub-studies designed to address each of the study objectives identified in the Niagara RSP and includes the following individual studies:

- Fish Community Survey;
- Roanoke Logperch Survey; and
- Fish Impingement and Entrainment Study.

2.3.1 Study Status

2.3.1.1 Fish Community Survey

Appalachian initiated and completed the Fish Community Survey in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A Fish Community Survey Report was filed with the ISR on January 11, 2021, and the results were presented at the ISR meeting held on January 21, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting. The technical report including the results of the Fish Community Survey is included in Attachment 1 of Appendix C of this USR.

2.3.1.2 Roanoke Logperch (Percina rex) Survey

The Roanoke Logperch Survey originally planned for completion in 2020 was rescheduled for 2021 in response to delays resulting from the onset of the COVID-19 global pandemic in the spring of 2020 and higher-than-average precipitation in the Roanoke River watershed during the fall of 2020. Prolonged high flow events reduced the number of potential field sampling dates and delayed field sampling efforts due to safety risks and the decreased likelihood of collecting representative samples. Adult and young-of-year (YOY) Roanoke Logperch sampling activities were completed in 2021, generally consistent with the revised 2021 sampling schedule proposed to and approved by FERC (except for larval drift surveys), but with modifications to the field sampling methodology as described below.

The RSP proposed four paired sites (eight total) for adult Roanoke Logperch surveys, but the Commission's SPD recommended eight independent sites to be located throughout the Project area. Additionally, the RSP proposed five YOY survey sites, but the SPD recommended seven sites including an additional site in the bypass reach and further downstream of the tailrace. Along with the above recommendations, minor adjustments to survey sites also occurred based on target habitat availability at the time of sampling.

The field sampling methodology originally consisted of spring and summer backpack electrofishing for adult Roanoke Logperch in the bypass reach and summer backpack electrofishing at the seven other locations in the study area. It was noted in the RSP that completion of spring backpack electrofishing efforts would require a waiver of the VDWR Time-of-Year Restrictions (TOYR) for Roanoke Logperch and concurrence from the USFWS. On behalf of Appalachian, EDGE Engineering and Science, LLC (EDGE) submitted a request to the services on March 26, 2021, for a TOYR waiver to complete the required spring sampling efforts in the Niagara bypass reach. A meeting (conference call) was held on Wednesday, May 5, 2021, between representatives from Appalachian, HDR, EDGE, Virginia Polytechnic Institute and State University (Virginia Tech), VDWR, and USFWS to discuss the TOYR waiver request. The meeting resulted in a

recommendation to eliminate backpack electrofishing methodology for the spring bypass reach sampling effort during the TOYR. The agencies agreed that the use of snorkeling survey methods would reduce the risk to Roanoke Logperch to a "Not Likely to Adversely Affect" level while allowing the field team to collect necessary and requested baseline information on the Roanoke Logperch. The waiver of TOYR was granted with a change to snorkel survey methods and a commitment to minimize instream disturbance during the survey effort to the extent possible. Based on the success of the initial snorkel surveys of the bypass reach during the spring of 2021, and with concurrence from VDWR and Virginia Tech, the remaining adult Roanoke Logperch surveys were performed using this methodology in the fall of 2021.

The Roanoke Logperch larval drift survey originally proposed for spring 2020 was rescheduled for the spring of 2021 in response to delays related to the onset of the COVID-19 pandemic. Following discussions with the VDWR and USFWS, Appalachian was notified that a federal recovery permit authorizing the incidental take of Roanoke Logperch would be required prior to performing the Roanoke Logperch larval drift survey. As such, the study was subsequently rescheduled for spring of 2022 to allow time for EDGE, on behalf of Appalachian, to apply and receive a federal recovery permit authorizing the incidental take of the federally endangered Roanoke Logperch during the larval drift study.

2.3.1.3 Fish Impingement and Entrainment Study

Appalachian initiated and completed the Fish Impingement and Entrainment Study in accordance with the RSP, with minor schedule variances as previously noted in the ISR. A preliminary Fish Impingement and Entrainment Study Report was filed with the ISR on January 11, 2021, and the results were presented at the ISR meeting held on January 21, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

2.3.2 Summary of Study Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, HDR and EDGE conducted a Fish Community Study 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 a comprehensive baseline (abundance and distribution) of the Roanoke Logperch population (including larval, young-of-year, and adults) in the vicinity of the Project.
- Confirm flow velocities at the intake structure to facilitate a desktop assessment of entrainment and impingement potential at Niagara.

- Perform a desktop assessment of entrainment and impingement potential at the Niagara intake structure, including an assessment of turbine mortality and survival of fish passage through the turbines or other routes using the USFWS Turbine Blade Strike Analysis Model.

The results of the three separate sub-studies (Fish Community Survey, Roanoke Logperch Study, and Fish Impingement and Entrainment Study) of the Niagara Fish Community Study are summarized below and are provided in Attachment 1, Attachment 2, and Attachment 3 of Appendix C.

2.3.2.1 Fish Community Survey

2.3.2.1.1 Methods

General fish community surveys were conducted between September 15 and 16 and October 20 and 21, 2020 during relatively low flow and low-turbidity stream conditions. Sampling was performed by state permitted fish biologists under Virginia Scientific Collecting Permit Nos. 068630 and 068631. Specific sampling dates were based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the public.

Sampling methods were derived from National Rivers and Streams Assessment Field Operations Manual (USEPA 2019), which guides standardized electrofishing methods in lotic waterbodies of variable sizes. Backpack electrofishing was used to target riffle/run (i.e., wadeable) habitats, two of which were located upstream and five locations downstream of Niagara Dam. Boat electrofishing targeted deeper (i.e., non-wadeable) pool habitats (eight locations) within Niagara impoundment.

2.3.2.1.2 Results

A total of 590 fish representing 32 species were collected during the study, the majority (89 percent) of which were taken by backpack electrofishing. Twenty-six (26) species were collected upstream of Niagara Dam while 23 species were collected downstream of the dam. Central Stoneroller (*Campostoma anomalum*; 27.4 percent), Rosefin Shiner (*Lythrurus ardens*; 25.5 percent), and Riverweed Darter (*Etheostoma podostemone*; 8.2 percent) were the most abundant species at riffle/run sites. Redbreast Sunfish (*Lepomis auratus*; 40.0 percent), Golden Redhorse (*Moxostoma erythrurum*; 18.5 percent), and Bluegill (*Lepomis macrochirus*; 16.9 percent) were the most abundant species at pool sites. Central Stoneroller, White Sucker (*Catostomus commersonii*), and Rock Bass (*Ambloplites rupestris*) were the most dominant by weight at riffle/run sites and Golden Redhorse, Redbreast Sunfish, and V-lip Redhorse (*Moxostoma pappillosum*) were the most dominant by weight at pool sites. A single Roanoke Logperch, a federally and state listed endangered species, was collected at the upstream-most survey site, above the confluence of Tinker Creek and the Roanoke River.

The average catch per unit effort (CPUE; individuals per minute) was 6.55 at riffle/run sites with average diversity (H'; Shannon index) of 1.83, and CPUE was 1.44 at pool sites with average diversity of 1.10. The raw fish collection data and representative photos of survey sites and fish collections, as well as a site-specific summary of sampling information, are provided in the Preliminary Fish Community Study Report in Appendix C.

2.3.2.2 Roanoke Logperch Survey

2.3.2.2.1 Methods

Adult Roanoke Logperch

Adult Roanoke Logperch sampling was completed twice in the bypass reach (once in early summer and once in late summer 2021) to identify any seasonal trends in habitat utilization. Sampling at the other seven sites was completed once between late summer and fall 2021. Sampling methods were derived from the line-transect method and simple Emlen model described in Ensign et al. (1995), which are specific to Roanoke Logperch in the Roanoke River. Within the constraints of the Project's objectives and geographic limits, snorkeling techniques were employed to most-effectively target specific sites based on the habitat types present in the study area. Upstream of the Niagara impoundment, three snorkeling sites were in the Roanoke River and one site was in Tinker Creek. Four sites were located downstream of the Niagara Dam, with one in the bypass reach and the other three in the Roanoke River downstream of the tailrace. Sampling techniques are described in Attachment 2 of Appendix C. Specific sampling dates were based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the public. Adult Roanoke Logperch densities were calculated for each site using methods from Ensign et al. (1995), which facilitated a direct comparison of results to those from the historical Roanoke Logperch assessment (Appalachian 1992). Using these methods, density estimates of adults are generally greater than CPUE because density calculations consider the decreased probability of seeing Roanoke Logperch at greater distances. Data from this study was then compared to data from the historical Roanoke Logperch assessment (Appalachian 1992), as applicable. Temporal habitat availability/occupancy was also evaluated in the bypass reach and is reported in Appendix A of the USR.

Juvenile and Young-of-Year Roanoke Logperch

One YOY Roanoke Logperch sampling event was completed at each site between late summer and fall 2021. Sampling methods were derived from those described in (Argentina and Roberts 2014; Roberts et al. 2016), which are specific to Roanoke Logperch. Within the constraints of the Project's objectives and geographic limits, seining techniques were employed to most-effectively target specific sites based on the habitat types present in the Project area. Upstream of the Niagara impoundment, two sites in the Roanoke River and one site in Tinker Creek were sampled using

seining techniques. Four sites located downstream of the Niagara Dam were seined, two in the bypass reach and two in the Roanoke River downstream of the Niagara tailrace. Sampling techniques are described further in Attachment 2 of Appendix C. Specific sampling dates were based on factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the public.

No data analyses were required as no YOY Roanoke Logperch were collected during the sampling efforts; however, other observed species and habitat information is discussed in Attachment 2 of Appendix C.

Larval Drift

Larval Roanoke Logperch sampling will be completed at five sites between April and June 2022. Sampling methods were derived from methods described in Buckwalter et al. (2019), which are specific to larval Roanoke Logperch. Within the constraints of the Project's objectives and geographic limits, drift-net techniques will be employed according to equipment requirements to target specific sites in the study area. Drift net set sites will include one site located upstream of the Niagara impoundment above the confluence of Tinker Creek with the Roanoke River, one site in Tinker Creek, one site in the Niagara impoundment directly upstream of the dam along the left descending bank, and two sites downstream of Niagara Dam, one of which is in the bypass reach and the other immediately downstream of the tailrace. Sampling techniques are described in detail in Attachment 2 of Appendix C. Specific sampling dates will target the known spawning season of Roanoke Logperch but will ultimately be determined by multiple factors including (but not limited to) weather conditions, water temperatures, river flows and reservoir elevations, and safety of field staff and the public.

Roanoke Logperch larvae will be sampled after dusk from April to June 2022 using two, 20-minute drift net sets (early and late) per site in riffle/run adjacent habitat. In total, 100 net sets will be completed (5 sites, two sets once a week for 10 weeks) using analogous studies as a methodological reference (Hallerman et al. 2017; Buckwalter et al. 2019). Site photos, field conditions, and water quality parameters will also be collected. Water velocity will be measured at the mouth of each net to determine water volume sampled with each net set. Each night, two teams will sample two sites and three sites, respectively. 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. All survey protocols and methods have been developed in coordination with appropriate state and federal agencies, stakeholders, clients, and Roanoke Logperch experts.

2.3.2.2.2 Results

Adult Roanoke Logperch

Adult Roanoke Logperch densities from the 2021 sampling efforts were variable and occur between the upper and lower ranges (Roberts et al. 2016) for the assessed reach of the Roanoke River. The mean density for the three sites above Niagara Dam and three sites below Niagara Dam (within the mainstem Roanoke River) were comparable. Additionally, upstream sites exhibited marginally lower habitat suitability and adult Roanoke Logperch density estimates overall – indicating locally negligible differences in Roanoke Logperch status within the Project area.

Roanoke Logperch density in the bypass reach was the greatest of any adult snorkeling site in the study area (during both sample periods), despite having the least suitable Roanoke Logperch habitat overall. The upstream terminus of this stream segment (i.e., bypass reach) provides an abundance of suitable but fair/poor habitat. Although this is arguably the most altered portion of the study area (aside from the pool habitat created by the Project impoundment), the bypass reach appears to provide suitable habitat for a relatively high density of Roanoke Logperch.

Juvenile and Young-of-Year Roanoke Logperch

Juvenile Roanoke Logperch density is even more variable than adult density over space and time and densities in the summer tend to be lower than adult densities at the same sites (Roberts et al. 2016). With so few juveniles observed during the study, statistically relevant conclusions cannot be drawn. Three juveniles were observed above Niagara Dam at the upstream-most site (Roanoke Logperch1), while the only juveniles observed below Niagara Dam were in the Bypass Reach (four individuals). One juvenile was observed in June and three were observed in August. Although the sample size is small, this may be a result of young Roanoke Logperch moving into swifter, deeper habitat as the summer progressed where they were observed more often during snorkel surveys.

It is also well documented that dams generally reduce the overall amount of smaller substrate particle sizes from moving from the upstream reach to the downstream reach below the dam. Juvenile and YOY Roanoke Logperch generally rely on habitat with smaller substrates (i.e., gravel and sand), which are not abundantly available downstream of Niagara Dam; however, this is somewhat characteristic for a reach of stream with a relatively high gradient and lack of floodplain like the reach between Niagara and Smith Mountain Lake. The lack of YOY captured during seine surveys may also be a result of their progression away from YOY habitat later in the year. Argentina and Roberts (2014) collected very few YOY overall using these methods and especially during the late summer 2021 surveys. Project logistics limited the survey window in 2021, thus, the low density of YOY Roanoke Logperch should not be mistaken for a complete lack of YOY within the study area. Visual surveys also resulted in zero YOY Roanoke Logperch, which likely indicates YOY had moved to different habitat by the time surveys took place.

Larval Drift

Larval Drift sampling will take place in April – June of 2022. The final report will be submitted FERC at the end of 2022 as additional information to support the FLA.

2.3.2.2.3 Comparison to Previous Studies

Rosenberger and Angermeier (2002) found the mean density of adult Roanoke Logperch in the Roanoke River to be approximately 84 individuals per hectare (site estimates ranging from 19.8 to 337.7 individuals per hectare) and Roberts et al. (2016) estimated adult Roanoke Logperch densities as high as 260 individuals per hectare but generally lower than 100 individuals per hectare in summer. Overall, mean density for the entire Project area in 2021 was 32 Roanoke Logperch per hectare (site estimates ranging from 4.6 to 72.4 Roanoke Logperch per hectare).

Appalachian (1992) observed 10 total Roanoke Logperch using snorkeling and electrofishing methods downstream of Niagara Dam. They did not estimate density but stated Roanoke Logperch were not expected to populate the portion of stream outside of the reach they sampled (0.5 to 1.0 mile downstream of the dam). During 2021 sampling efforts, Roanoke Logperch were observed at each of the sample locations throughout the Project area, including the sites where they were observed in 1992.

2.3.2.2.4 Conclusions

The Roanoke Logperch Survey report (Attachment 2 of Appendix C) provides preliminary results based on the partial completion of the study objective in the vicinity of the Project for the purpose of establishing a baseline and to potentially support FERC's environmental analysis. The Roanoke Logperch-specific larval studies scheduled to be performed in 2022 will provide further insights regarding Roanoke Logperch status within the Project area. A final report detailing the conclusions of the study will be provided in 2022.

The Project influences habitat availability through formation of a reservoir (creating pool habitat and eliminating riffle habitat), which influences the species presence and distribution within the Project area; however, the habitats present within the study area are currently supporting a relatively diverse fish community with little evidence of physical abnormalities or stressors.

2.3.2.3 Fish Impingement and Entrainment Study

Appalachian has completed the Fish Impingement and Entrainment Study in accordance with the RSP and the Commission's SPD, and the study report is provided as Attachment 3 of Appendix C. Results from the 2020 Fish Community Study and the Preliminary Roanoke Logperch Survey are incorporated into the impingement and entrainment study. Additionally, the assessment of turbine mortality using the USFWS Turbine Blade Strike Analysis Model was performed in 2021 following

the completion of field sampling activities and is included in the Impingement and Entrainment Study Report (Attachment 3 of Appendix C).

2.3.2.3.1 Methods

Information on the physical and operational characteristics the Project, including trash rack bar spacing, intake velocities and flows, and intake proximity to feeding and rearing habitats was used to make general assessments of impingement and entrainment potential at the Project using a desktop study approach. A species list was developed based on data from recent (Appalachian 2020) and historical (Appalachian 1991) fish community studies (i.e., composition, abundance, listed or protected status, recreational significance), as well as known occurrence records from the VDWR for the Roanoke River at the time of the historical fish community study.

With consideration of site-specific facility characteristics and fishery information, detailed entrainment data from 33 sites included in the Electric Power Research Institute (EPRI) (1997) entrainment database were applied in this analysis. Entrainment data were standardized to the number of fish/hour of unit capacity based on the site-specific hydraulic capacity of the sampled units and the number of hours sampling occurred during each study from the database, and then used to calculate fish entrainment rates (fish/hour) at maximum design turbine discharge at the Project (684 cfs).

2.3.2.3.2 Results

Using intake opening structure dimensions of 40-ft wide and 15.4-ft high[3], the calculated approach velocity in front of the intake is approximately 1.1 fps (i.e., 40 ft x 15.4 ft / 684 cfs). This approach velocity is similar to those presented in the historical entrainment report (Appalachian 1991). Burst swim speeds for target or representative species were compared to the estimated intake velocity to evaluate whether fish may be susceptible to intake flows at the Project. Fish swim burst speeds obtained from literature indicate that all target species and life stages evaluated, with the exception of eggs, larvae, and juvenile Spottail Shiner, would be able to avoid entrainment at the Project given that estimated swim burst speeds are greater than approach velocities at the intake. Although most species were considered of entrainable size (i.e., smaller than the 3.625-inch clear-spacing width of the trash rack), it is likely fish can avoid the intake if of juvenile or adult size.

According to the EPRI (1997) database, fish measuring less than six inches in length were the majority (88 percent) of entrained fish, and fish less than eight inches exhibit the highest entrainment rates throughout the year. Catfishes, Rock Bass, suckers and redhorses, *Lepomis* sunfishes, and

[3] The top of the normal reservoir operating band is 884.4 ft NGVD. At this reservoir level, the depth in front of the intake structure is approximately 13.9 ft. The trash racks are angled at a 15 degree slope from top to bottom, therefore wetted height of the trash racks is approximately 15.4 ft.

Black Crappie have the highest entrainment rates of the target species and groups. Peak months of entrainment for these species and species groups varied. Smallmouth and Largemouth bass, species often sought after by anglers, have some of the lowest entrainment rates of the target species and groups. Entrainment rates were highest from April to October, with peaks in April, July, and October. Peaking months may correspond to spawning movements (April), recruitment to catchable size (July or October), or large storm/flow events. Susceptibility to entrainment is variable depending on species and time period, however most target species and species groups have low entrainment potential for most of the year.

While the greatest opportunity for fish mortality through a facility is typically attributed to potential contact with the turbine runner blades, injuries and mortalities can result from other mechanisms including barotrauma from extreme pressure changes, shear stress, water turbulence, cavitation, and grinding (Deng et al. 2005). A review of survival rates from the EPRI entrainment survival database indicates that survival rates from comparable project with similar turbine characteristics as Niagara were generally high (FERC 1995). Further, the historical desktop entrainment study (Appalachian 1991) performed at the Project determined that the risk related to these factors is minimal. Since no significant changes have occurred at the facility that would change these parameters since the last relicensing study effort (Appalachian 1991), injuries and mortalities caused by factors other than turbine strikes are expected to be negligible.

The findings of this study concur with the historical entrainment study completed for the prior relicensing in that effects to the fish community in the Project vicinity are expected to be minimal and short in duration. Most fish would not be excluded by the intake trash racks, however velocities in front of the intake are comparable to normal flow conditions of the Roanoke River and would therefore likely be navigable by most juvenile and adult fish in the area. Entrainment of early life stage fishes (eggs and larvae) is likely minimal given the life history characteristics of species in the vicinity of the Project. Susceptibility to entrainment is variable depending on species and time period, however most target species and species groups have low entrainment potential for most of the year.

2.3.3 Variances from FERC-Approved Study Plan

2.3.3.1 Fish Community Survey

The Fish Community Survey was conducted in accordance with the FERC-approved RSP.

2.3.3.2 Roanoke Logperch Survey

As described in Section 2.3.1, the larval drift component of the Roanoke Logperch Survey sub-study was not completed in 2020 and was rescheduled for spring 2021. Further delays occurred associated with obtaining a federal recovery permit from the USFWS authorizing incidental take of

the federally endangered Roanoke Logperch; therefore, the larval drift study component will be completed in spring 2022. The Roanoke Logperch Survey was conducted in conformance with the Commission's SPD, with the following exceptions:

- The RSP proposed four paired sites (eight total) for adult Roanoke Logperch surveys, but the Commission's SPD recommended eight independent sites. The RSP proposed five YOY survey sites, but the SPD recommended seven sites including an additional site in both the bypass reach and further downstream of the tailrace. Along with the above recommendations, minor adjustments to survey sites also occurred based on target habitat availability at the time of sampling.
- It was noted in the RSP that completion of spring backpack electrofishing efforts would require a waiver of the VDWR TOYR for Roanoke Logperch with concurrence from the USFWS. Appalachian submitted a request to the services on March 21, 2021, for a TOYR waiver to complete the required Roanoke Logperch spring study in the Niagara bypass reach. A meeting (conference call) was held on Wednesday, May 5, 2021, between representatives from Appalachian, HDR, EDGE, Virginia Tech, VDWR, and USFWS to discuss the TOYR waiver request. The meeting resulted in a recommendation to eliminate backpack electrofishing methodology for the spring bypass reach sampling effort during the TOYR. The agencies agreed that the use of snorkeling survey methods would pose less of a potential effect on Roanoke Logperch (Not Likely to Adversely Affect) while allowing the field team to collect necessary and requested baseline information for Project-specific Roanoke Logperch studies. Waiver of the TOYR was granted with a change to snorkel survey methods and a commitment to minimize instream disturbance during the survey effort to the extent possible. The initial snorkel surveys were successful, and with concurrence from VDWR and Virginia Tech that snorkel methods were an acceptable substitute for the proposed backpack sampling methods, the remaining adult Roanoke Logperch surveys were performed using this methodology.

2.3.3.3 Fish Impingement and Entrainment Study

The Fish Impingement and Entrainment Study was conducted in accordance with the FERC-approved RSP, with the following exceptions:

- Per the Project RSP and Commission's SPD, intake velocities were to be measured using an ADCP along the upstream face of the angled trash racks to determine the approximate approach velocity immediately upstream of the intake structure. During the 2020 field season, a combination of high flow events and inoperable turbine-generator units at the Project prevented field data collection efforts. As a result, approach velocity was calculated using the intake structure and trash rack dimensions along with the design maximum flow capacity of the two generating units. Using this approach, the calculated velocity in front of the intake is approximately 1.1 fps, which is similar to the intake velocities presented in the historical entrainment report (Appalachian 1991). Further, a desktop evaluation using flow data from the nearest upstream gage (USGS 02055000 Roanoke River at Roanoke, Virginia) and channel dimensions from the Roanoke River within the Project vicinity suggests that the velocity of the river in the vicinity of the Project is comparable to that estimated in front of the intake. Given this information, and since the design and the general operation of the facility have not changed since the prior license application, the calculated approach velocity is

representative of actual conditions at the Niagara intake structure and is used to support evaluations of impingement and entrainment at Niagara.

- In accordance with the RSP, the Turbine Blade Strike Analysis was completed using the USFWS's Turbine Blade Strike Analysis Model. The RSP listed this report as being included with the ISR at the end of the 2020 field season; however, this effort was rescheduled for and completed at the end of the 2021 field season, when the remaining fish sampling activities were completed. The evaluation was performed using the most recent version available of the Turbine Blade Strike Analysis Model, mean and standard deviation of fish lengths based on fish data collected during the 2020-2021 Fish Community Study, and site-specific inputs for required model parameters, as summarized in Attachment 1 of Appendix C.

2.4 Benthic Aquatic Resources Study

2.4.1 Study Status

Appalachian initiated and completed the Benthic Aquatic Resources Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR. A preliminary Benthic Aquatic Resources Study Report was filed with the ISR on January 11, 2021, and the results of this study were presented at the ISR meeting on January 21, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Benthic Aquatic Resources Study is included in Appendix D of this USR.

2.4.2 Summary of Study Methods and Results

In accordance with the RSP approved in the Commission's SPD, EDGE conducted an Aquatic Resources Study 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 using two temporally independent sampling efforts (fall 2020 index period and spring 2021 index period); and
- Identify potential habitat and characterize mussel communities within the Project area.

A Benthic Aquatic Resources Study was performed to document a comprehensive representation of the study area and to correlate results with previous sampling efforts (Appalachian 1991) for comparison. Macroinvertebrate and crayfish sampling efforts employed a variety of methods to target representative habitat at 10 sites throughout the study area. Mussel sampling targeted representative habitat at 13 sites throughout the study area. Additional information and results are described below and are provided in Appendix D.

2.4.2.1 Macroinvertebrate and Crayfish Survey

2.4.2.1.1 Methods

Macroinvertebrate and crayfish surveys were performed using sampling methods derived from the National Rivers and Streams Assessment Field Operations Manual and VDEQ Biological Monitoring Program Quality Assurance Project Plan and included quantitative and qualitative sampling methods that target different habitats (USEPA 2019; VDEQ 2008). Quantitative sampling methods targeted riffle/run habitats and qualitative sampling methods targeted available microhabitats in pools habitats. Sampling was performed by an EDGE state and federally permitted astacologist under Virginia Scientific Collecting Permit No. 068630.

All macroinvertebrate sites were sampled between September 15 and 16 and October 5, 2020, during the fall sample index period (September 1 – November 30), and on June 3 and 4 during the spring 2021 sample index period (March 1 – May 31) as defined by VDEQ (2008). Although spring 2021 sampling occurred three days beyond the spring sample index period, the impacts of the delay (described in Section 2.3.1.2) were deemed negligible.

There were differences in habitat type and substrates observed between sites; however, differences in sampling dates, time of day, and low number of intra- and inter-site samples do not facilitate statistical comparison of physiochemical properties between sites. Results of physiochemical data collected at sample sites met the state water quality standards established for the New River, indicating that water quality within the Project area is capable of supporting macroinvertebrate communities. Additional water quality data are provided in the Water Quality Study Report presented in Appendix B of the USR.

Quantitative Sampling

Benthic macroinvertebrate and crayfish sampling were completed at five riffle/run sites along 100-meter transects. Macroinvertebrate sampling was conducted holding the D-frame net on the bottom of the stream perpendicular to flow and kicking substrate to agitate and dislodge organisms, thus allowing dislodged organisms to flow into the net. A single quantitative sample consisted of a composite of six kick sets, each disturbing approximately 0.33 meters^2 above the dip net for a duration of 30-90 seconds and totaled an area comprising 2.0 meters^2. For quality assurance measures, replicate sampling was conducted at one quantitative site within close proximity (not in the same locations as the first set of samples) of the initial sampling area.

To assess the crayfish community, additional kick samples and seining efforts were performed following benthic macroinvertebrate sampling to ensure all crayfish habitat had been covered. Additionally, crayfish collected during backpack electrofishing efforts (completed as part of fall 2020

field efforts) were processed and added to crayfish data for inclusion as a qualitative data point at analogous sites.

Qualitative Sampling

Benthic macroinvertebrate and crayfish were also sampled at five qualitative sites (i.e., multi-habitat) along 100-meter transects following guidelines defined by USEPA (2019) and VDEQ (2008). Sampling was conducted by performing 20 jabs with a D-frame net into suitable, stable habitats (snags, vegetation, banks, and substrate) 20 times. A single jab consists of forcefully thrusting the net into a microhabitat for a linear distance of 1.0 meter, followed by 2-3 sweeps of the same area to collect dislodged organisms for 20-90 seconds per jab, sweep, or kick. Different types of habitat were sampled in rough proportion to their frequency within the reach. Sampling effort was proportionally allocated (20 jabs/sweeps/kicks) to shore-zone and bottom-zone, 20-90 seconds per jab, sweep, or kick.

2.4.2.1.2 Results

Upstream of Niagara Dam

A total of 38 macroinvertebrate taxa were collected upstream of Niagara Dam from two quantitative sites and three qualitative sites. The average Virginia Stream Condition Index (VSCI) score for riffle/run sites and pool sites sampled upstream of Niagara Dam in fall 2020 were 48.1 and 34.7, respectively, with all five sites scoring below 60. The average VSCI score for riffle/run sites and pool sites sampled upstream of Niagara Dam in spring 2021 were 44.1 and 20.6, respectively, with all five sites scoring below 60. However, a quantitative site (NF/NSQT2) in the mainstem of the Roanoke River in this Project area had a HBI (Hilsenhoff Biotic Index) value indicating “Good” water quality in fall and spring and one qualitative site (NSQL3) had an HBI value indicating “Excellent” water quality in spring based on the tolerance of the macroinvertebrate community. Detailed results are included in Appendix D.

Downstream of Niagara Dam

A total of 45 macroinvertebrate taxa were collected downstream of Niagara Dam from three quantitative sites and two qualitative sites. The average VSCI score for riffle/run sites and pool sites sampled downstream of Niagara Dam in fall 2020 were 39.0 and 42.8, respectively, with all five sites scoring below 60. The average VSCI score for riffle/run sites and pool sites sampled downstream of Niagara Dam in spring 2021 were 38.1 and 41.1, respectively, with all five sites scoring below 60. However, one quantitative site (NFQT6) and one qualitative site (NFQL8) in this Project area had HBI value indicating “Good” water quality in fall and one quantitative site (NSQT10) had an HBI value indicating “Good” water quality in spring 2021 based on the tolerance of the macroinvertebrate community.

Five species of crayfish were collected and identified in the field during survey efforts at 8 of the 10 sites sampled: the Appalachian Brook Crayfish (*Cambarus bartoni bartoni*), Atlantic Slope Crayfish (*Cambarus longulus*), Ozark Crayfish (*Faxonius ozarkae*), Virile Crayfish (*Faxonius virilis*), and the Red Swamp Crayfish (*Procambarus clarkii*). The Appalachian Brook Crayfish and Atlantic Slope Crayfish are native to the Roanoke River while the Ozark Crayfish, Virile Crayfish, and Red Swamp Crayfish are considered invasive species in the state of Virginia. Representative site and crayfish photos are provided in the study report in Appendix D.

2.4.2.2 Mussel Survey

Mussel surveys were performed October 6-8, 2020, following methods defined in the RSP, derived from the Draft Freshwater Mussel Guidelines for Virginia (USFWS and VDGIF 2018), and performed by EDGE's state permitted malacologist and a commercial dive team under Virginia Scientific Collecting Permit No. 068630. Mussel surveys were carried out using habitat dependent methods (e.g., water depth, substrate, stream flow) and included snorkeling, viewscope, and/or Surface Supplied Air. Sampling dates were chosen within approved survey windows and occurred during relatively low flow and high visibility.

2.4.2.2.1 Methods

Transect Surveys

Sampling for freshwater mussels involved surveying along eight transects (from 30 to 75 meters in length) placed every 500 meters in the reservoir above Niagara Dam and the free-flowing reach near the upstream extent of the Project area. Divers searched transects using Surface Supplied Air methods at an approximate rate of one minute per square meter in heterogeneous substrates.

Abbreviated Surveys

Sampling for freshwater mussels involved surveying five abbreviated sites outside the impounded area. Abbreviated mussel surveys were completed throughout the assigned survey reach using viewscopes, snorkeling, and Surface Supplied Air methods. Surveyors targeted habitat(s) suitable for the occurrence of freshwater mussels and searched those areas at an approximate rate of one minute per square meter in heterogeneous substrates.

2.4.2.2.2 Results

Unionids were mostly absent throughout all 13 survey reaches. Eight transect surveys in the Niagara reservoir, totaling 430 meters^2 of search effort, resulted in the collection of zero live or deadshell specimens. Abbreviated surveys at five locations, with a cumulative search effort of 1,335 minutes, resulted in the collection of four live unionids representing one species, Eastern Elliptio (*Elliptio complanata*). The Eastern Elliptio is native to the Roanoke River system and a common species in Atlantic Slope mussel assemblages. Additionally, a single Notched Rainbow (*Villosa constricta*) was

observed as weathered deadshell material during quantitative macroinvertebrate and crayfish surveys near the Tinker Creek site. No live mussels or deadshell were collected downstream of Niagara Dam. The invasive Asiatic Clam (*Corbicula fluminea*) was present in relatively even densities throughout the mainstem Roanoke River (above and below Niagara Dam) with the higher densities occurring where suitable mollusk habitat was present. The highest density of Asiatic Clams in the Project area was noted in Tinker Creek. They were also noted at the mouth of Wolf Creek but did not persist beyond the confluence with the Roanoke River. Representative site and mussel photos are provided in the study report in Appendix D.

2.4.2.2.3 Conclusions

Macroinvertebrate and Crayfish Community

VSCI scores recorded at each site were greater on average in the fall than in the spring. The average VSCI scores upstream and downstream of Niagara Dam indicated “impaired” conditions during the fall and spring samples. Upstream of Niagara Dam had an overall average VSCI score of 33.8 whereas downstream of Niagara Dam had an overall average VSCI score of 39.7. Zero sites within either Project area, during either season, resulted in a VSCI score above the threshold of “similar to reference” conditions (60). During both seasonal collections, the lowest VSCI scores were recorded upstream of Niagara Dam and the highest were recorded downstream of Niagara Dam, which indicates less impairment as you move downstream through the project area. This trend likely results from the impacts of point and non-point source pollution from the Roanoke River watershed.

Although the species composition varied, four of five species of crayfish were present above and below Niagara Dam. There were zero crayfish captured at the one qualitative site upstream of Niagara Dam. Above the dam there were two native and two invasive species and below the dam there was one native species and three invasive species. The Appalachian Brook Crayfish (i.e., native) was only collected in Tinker Creek. The invasive Ozark Crayfish and Red Swamp crayfish were collected both above and below the dam, whereas the Virile Crayfish was only collected below the dam (however there are records of Virile Crayfish above the Project in the Roanoke River [Foltz, unpublished data]). Native species were collected at three of the 10 sampled sites while invasive species were collected at eight of the 10 sampled sites. The invasive Ozark Crayfish was collected at all sites where crayfish were present, as one of five sites above the dam resulted in zero crayfish

Mussel Habitat and Community

A geographic search on VDWR’s Fish and Wildlife Information Service and communications with USFWS identified potential occurrence of seven mussel species that may occur in the Project vicinity, including the Atlantic Pigtoe (*Fusconaia masoni*, proposed for federal listing), the Green Floater (*Lasmigona subviridis*, state threatened) and James Spinymussel (*Parvaspina collina*,

federally and state endangered). No evidence of these aforementioned species was encountered during the 2020 mussel surveys.

Two Eastern Elliptio mussels were collected near one another at the most upstream site in the Roanoke River project area (UNIO-1). Two live Eastern Elliptio mussels and approximately 12 deadshell specimens, were collected in Tinker Creek (UNIO-2). Although these two sites offer minimal suitable mussel habitat, they are likely the most productive within the Project area. Although the measured water quality parameters appear suitable, with high DO and cool temperatures, the habitat at many sites was unsuitable for unionid colonization due to heavy scouring and bedrock substrates and may be impaired due to other water quality issues that were not assessed as part of this study. Anthropogenic impacts to the Roanoke River upstream and within the Project area, along with a dearth of suitable habitat, appear to support marginal populations exhibiting a lack of recruitment and strong presence of invasive Asiatic Clams throughout. The lack of suitable habitat and depauperate unionid community suggests the probable absence of federally or state-listed species within the study area.

2.4.3 Variances from FERC-Approved Study Plan

The Benthic Aquatic Resources Study was conducted in accordance with the FERC-approved RSP.

2.5 Wetlands, Riparian, and Littoral Habitat Study

2.5.1 Study Status

Appalachian initiated and completed the Wetlands, Riparian, and Littoral Habitat Study in accordance with the RSP as subsequently modified by FERC. Due to delays in the schedule documented previously, the Wetlands, Riparian, and Littoral Habitat Characterization Study Report was not filed with the ISR.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Wetlands, Riparian, and Littoral Habitat Characterization Study is included in Appendix E of this USR.

2.5.2 Summary of Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, HDR conducted a Wetlands, Riparian, and Littoral Habitat Study to:

- Perform a desktop characterization using the USFWS National Wetlands Inventory (NWI), VDEQ Wetland Condition Assessment Tool (WetCAT), 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);

- 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;
- Document wildlife utilizing or present within observed areas 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;
- Riparian communities will be classified according to the Virginia Department of Conservation and Recreation (VDCR) Natural Communities of Virginia of Ecological Groups and Community Types; and
- 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.

2.5.2.1 Methods

An initial desktop study was carried out to identify areas likely to contain wetlands, riparian, and littoral habitat and estimate the amount of each resource area. Wetland areas and streams identified in the desktop study were field-verified, but not formally delineated (i.e., no flagging or boundary marking).

Data collected during the desktop study were used to create preliminary habitat characterization maps that were used to facilitate the field verification efforts. Information sources included the USFWS NWI, the VDEQ WetCAT, USGS topographic maps and National Hydrography Dataset, elevation data, and Natural Resources Conservation Service (NRCS) soil surveys. The VDEQ WetCAT was used to determine NWI habitat condition within the study area (VDEQ 2021). WetCAT scores wetland types based on the habitat and water quality stressors associated with surrounding land use types; classifications include slightly stressed, somewhat stressed, somewhat severely stressed, and severely stressed.

Potential streams and wetland areas not confirmed previously (i.e., through prior licensing studies or other sources) were field-verified by HDR wetland scientists between June 22nd and June 24th, 2021. A visual assessment and field evaluation of wetland hydrology, hydrophytic vegetation, and hydric soils was performed to identify wetlands. Wetland cover types were classified according to dominance by trees (palustrine forested), herbaceous species (palustrine emergent), open water

(palustrine unconsolidated bottom), or riverine rocky outcrop/shore. For wetlands, once the approximate upland boundary of the resource was determined, field personnel identified the edges of the wetland habitat, creating a polygon. In some instances, it was determined that all or a portion of the wetland observed in the field was consistent with boundaries depicted by on the USFWS NWI as well as topography contours. In these instances, the confirmed desktop information including USFWS National Hydrography Dataset, USFWS NWI boundaries and topography contours were used to digitize stream and wetlands boundaries in GIS.

A visual assessment was performed to characterize the availability of littoral zone aquatic habitats including emergent aquatic vegetation and submerged aquatic vegetation beds within the bypass reach and reservoir. Spot-check based surveys were performed to characterize the availability of littoral zone aquatic habitats including emergent and submerged aquatic vegetation beds occurring within the study area. The species and general location of invasive aquatic vegetation and evident wildlife usage observed during the field assessment were also noted.

Transect-based surveys were performed to characterize the availability of littoral zone aquatic habitats within the Study area. Four transect lines were evaluated in the reservoir. Transects were oriented parallel to the shoreline in boat accessible areas, with transects distributed to represent both shorelines.

Each transect line was approximately 100 meters in length and 1.0 square meter areas spaced equally along the transect line at 10-meter intervals were surveyed. The survey at each of the 10-meter intervals consisted of a visual presence/absence assessment for emergent or visible submerged aquatic vegetation. A vegetation sampling throw rake was also deployed at each 10-meter sample point on transect lines to capture any non-visible submerged aquatic vegetation.

Data from the desktop review were 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 was characterized by recording the dominant species of vegetation at three strata (tree, sapling/shrub, and herb). Invasive species identified during the assessment were also recorded. Field data was compared to the general vegetative community types identified in the preliminary map (developed during the desktop study) to verify their accuracy.

2.5.2.2 Results

Approximately 61.36 acres of wetlands and waterbodies identified during the desktop study using the USFWS NWI database were verified, and an additional 12.45 acres of features were delineated in the field. Two major types of aquatic habitat systems occur in the study area: (1) riverine systems consisting of open-channel and unconsolidated bottom habitats, and (2) palustrine wetlands dominated by trees, shrubs, or emergent vegetation. Approximately 57 percent of the study area

consists of wetlands and waterways. A total of 10.37 acres of wetlands were palustrine forested, and 3.33 acres were palustrine emergent, 25.94 were palustrine unconsolidated bottom, and 34.16 acres were riverine. WetCAT data determined that there are several wetlands that are somewhat severely stressed near the mouths of Tinker and Wolf Creek, and one wetland that appears slightly stressed near the mouth of Wolf Creek. These wetlands may be considered stressed due to the flooding potential caused by the impounded Roanoke River. Palustrine forested wetlands within the study area occur primarily on the higher floodplains and point bars of the Roanoke River. Palustrine emergent wetlands occur primarily as fringe wetlands and floodplain wetlands along the shorelines of the Roanoke River. Palustrine unconsolidated bottom in the study area are permanently flooded habitats with less than 30 percent vegetative cover. Riverine habitats in the study area include the Roanoke River and associated tributaries.

The littoral zone contained seasonally flooded to intermittently exposed herbaceous vegetation of boulder and cobbly depositional bars, or less frequently bedrock exposures, on the shores and islands and in the bypass reach of the Roanoke River, though some were observed at the northern extent of the study area. Littoral zone vegetation contained water willow, various terrestrial plants, and algae. The majority of the terrestrial plants observed in the bypass reach were located on floating islands that were likely formed from depositional bars in heavy flow events. The riparian area consists of approximately 65 acres and is found along most of the shoreline of the Roanoke River. The majority of the riparian area appeared to be flooded on a seasonal or annual basis. The riparian areas surveyed ranged from early to mid-successional stage, with most trees at an intermediate age and height, between 20 and 70 feet. These areas contain a mixture of forests, forested wetlands, emergent wetlands, and scrub-shrub wetland habitat. Refer to Appendix D for study details.

The Licensee does not anticipate that operation and maintenance of the Project over the new license term will have any short- or long-term, unavoidable, adverse impacts on wetland, riparian, and littoral resources. Wetland, riparian, and littoral habitats at the Project are reflective of current Project operations. Appalachian proposes to maintain the run-of-river mode of operation for each development and existing measures and programs to protect wildlife habitat.

2.5.3 Variances from FERC-Approved Study Plan

The Wetland, Riparian, and Littoral Habitat Study was conducted in accordance with the FERC-approved RSP.

2.6 Shoreline Stability Assessment

2.6.1 Study Status

Appalachian initiated and completed the Shoreline Stability Assessment in accordance with the RSP as subsequently modified by FERC. Due to delays in the schedule documented previously, the Shoreline Stability Assessment Report was not filed with the ISR.

Field activities and analyses required for this study were completed in 2021. The technical report including the results of the Shoreline Stability Assessment is included in Appendix F of this USR.

2.6.2 Summary of Study Methods and Results

In accordance with the RSP approved and modified in the Commission's SPD, HDR conducted a Shoreline Stability Assessment 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) (Rosgen 2001; 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.

2.6.2.1 Methods

The Shoreline Stability Assessment was performed as a desktop analysis followed by field confirmation of shoreline areas within the study area, including the reservoir, bypass reach, and tailrace areas identified in the desktop analysis as requiring confirmation or additional investigation. Relevant literature and data were reviewed including ESRI Geographic Information System data, Virginia Geographic Information Network aerial photos, USGS topographic maps, and Natural Resources Conservation Service soil surveys to assess bank composition and erosion potential in the study area.

The field surveys for the Shoreline Stability Assessment were conducted on July 20-22, 2021. Streambanks were assessed in the field for susceptibility to erosion and the need and potential for remediation by two, two-person field crews either by canoe or walking along the streambanks. Best professional judgement was used to estimate root depths and density since bank materials were not disturbed or removed during the study. The Bank Erosion Hazard Index (BEHI) method (Rosgen 2001; WVDEP 2015) was used to assess physical and geomorphic properties of the streambank to validate the probable sources of bank instability using streambank variables. The metrics used to estimate BEHI include ratio of bank height to bankfull height, ratio of root depth to bank height, root density percentage, surface protection percentage, and bank angle in degrees. These metrics are

associated with scores as based on Rosgen (2001) and were totaled to categorize the overall condition of the stream reach assessed. Detailed methods are included in Appendix F of this USR.

2.6.2.2 Results

Of the approximate seven miles of shoreline assessed, results of the field investigation indicated that approximately 90 percent of the shoreline within the study area exhibited no signs of erosion. The areas identified as having some degree of shoreline erosion had average BEHI scores ranging from 13.75 (low) to 33.85 (high). There were no areas categorized as having extreme or very high erosion potential. Where erosion was noted, coordinates were recorded on the upstream and downstream side of the erosion area, and in between, if necessary. Individual points within each area of erosion scored into the same total category (i.e., high, moderate, low). The average scores for each area of erosion and locations of the erosion areas assessed within the study area are provided in Appendix F.

The majority of the banks with some level of visible erosion had moderate to high root depth, moderate to high surface protection, and moderate to high bank angle. Generally, banks that were steep exhibiting moderate to high channel incision were least stable. High erosion potential was observed in localized areas along both banks of Tinker Creek and immediately downstream of the confluence of Tinker Creek and the Roanoke River. Streambanks in the upstream portion of the Roanoke River exhibited generally moderate erosion potential. Erosion areas were mainly concentrated in areas in the upstream reaches that experienced higher and/or more flashy flows. No active erosional areas were observed further downstream on the Roanoke River (below the confluence of Tinker Creek) or below Niagara Dam and bypass reach. Details, erosion area maps, and photographs of each erosion area are included in the Shoreline Stability Assessment Report in Appendix F.

Under the new license term, Appalachian proposes to continue operating the Project as presently operated, including run-of-river operations. Overall, visual inspection of the majority of the Project shoreline during this study indicated stable banks, no noticeable aggradation/degradation, and only localized streambank erosion. The most significant signs of erosion observed during the study occurred in the upper Roanoke River reach and Tinker Creek reach, which are located in urban areas. Accelerated shoreline erosion due to anthropogenic impacts is a well-documented phenomenon and has nothing to do with operations at the Project, therefore, Appalachian does not, propose remediation of any shoreline areas in the Project Boundary or study area at this time.

2.6.3 Variances from FERC-Approved Study Plan

The Shoreline Stability Assessment was conducted in accordance with the FERC-approved RSP.

2.7 Recreation Study

2.7.1 Study Status

Appalachian initiated and completed the Recreation Study in accordance with the schedule provided in the RSP, with minor variances as previously noted in the ISR and quarterly progress reports. A Preliminary Recreation Study Report was filed with the ISR on January 11, 2021, and the results were presented at the ISR meeting. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

Since filing the ISR, additional field activities and consultation in support of this study were completed in 2021. The final Recreation Study Report is included in Appendix G of this USR.

2.7.2 Summary of Study Methods and Results

2.7.2.1 Recreation Facility Inventory and Conditions Assessment

As discussed in the ISR, Appalachian's sub-consultant, Young Energy Services (YES), conducted a field inventory for the four assessed facilities at the Project (list the facilities here) between October 18 and October 28, 2020 and provided an analysis of the Recreation Facility Inventory and Condition Assessment.

YES observed several common themes among the recreation facilities and concluded that, overall, the facilities are in good condition. Common themes included:

- Each facility is well maintained with no trash or vandalism observed during the assessment.
- In general, signage is adequate and in good shape at the facilities, except for the Project-related Canoe Portage Trail, where some improvements could be made.
- Americans with Disabilities Act designated parking spots are provided only at the Tinker Creek Canoe Launch.
- Toilet facilities are not provided at any of the facilities.

The Recreation Facility Inventory and Condition Assessment is provided in Appendix G, Attachment 1. Efforts for this task were completed in 2020 and no updates have been made since the ISR.

2.7.2.2 Convene Meeting with Stakeholders

Due to delays related to the COVID-19 pandemic in 2020, the meeting with stakeholders was postponed until 2021. The virtual meeting occurred on April 20, 2021 with interested relicensing participants and existing and future recreational opportunities at or associated with the Project were discussed.

Appendix G, Attachment 4 includes the stakeholder meeting summary.

2.7.2.3 Recreation Visitor Use Online Survey

HDR developed an online survey as described in the RSP. The online survey was administered through the Project's relicensing website and offered respondents the opportunity to provide survey responses electronically. The online survey results include responses from April 2020 through October 2021.

Appalachian posted signs that included a brief description of the purpose and intent of the survey and website address on Appalachian-owned and/or operated facilities (Canoe Portage Trail and Tinker Creek Canoe Launch). Roanoke County posted a sign at the Rutrough Point and at two kiosks within the Explore Park Project, a nearby park maintained by Roanoke County. Additionally, notice of the survey was posted on the Project's relicensing website. HDR provided an update and website address to local and regional stakeholders so they would have the opportunity to distribute notice of the survey to their members or clients. Appalachian also notified relicensing participants the online survey was available through the quarterly ILP study progress reports. Appalachian posted the survey link on the Claytor Lake and Smith Mountain Facebook pages, as well as the NextDoor application.

The online survey provided a method for existing and potential recreation visitors to respond and provide feedback on recreation opportunities (Project and Non-Project facilities) near the Project. From April 21, 2020 to October 31, 2021, Appalachian received 119 responses to the online survey. Seventy-nine percent of the responses pertained to three recreation facilities: Niagara Canoe Portage Trail (owned by Appalachian), Roanoke River Trail/Overlook (owned by the National Park Service), and Rutrough Point (owned by Roanoke County), indicating these sites were the most frequently utilized by online survey respondents. Canoe/kayaking/stand-up paddle boarding (65%) and fishing (17%) were the most popular activities at the Project documented in the online survey. Visitors rated each recreational visit at the Project for its accessibility, parking, crowding, safety, condition, availability, and overall experience. The sliding scale rating system indicated that visitors generally found the individual metrics and overall experience "acceptable." The only metric that was not rated highest in the acceptable category was the Available Facilities metric, which was rated neutral.

Several comments included requests or recommendations for flow releases, which was analyzed as part of this study. The top two suggestions for improvement included better and more public access and improvements to portages.

Facility-specific summaries and verbatim user comments from the online survey are included in Appendix G, Attachment 6.

2.7.2.4 Recreation Use Documentation

Due to local shelter-in-place directives in 2020 resulting from the COVID-19 pandemic, the Recreation Use Documentation task was re-scheduled for 2021. From May through October of 2021, recreation use monitoring was conducted at the Roanoke River Trail, Tinker Creek Canoe Launch, Rutrough Point, and Niagara Project Canoe Portage Trail. For the first three sites referenced, monitoring was accomplished by documenting in the field the number of vehicles and individuals observed during each visit. Individuals were asked (using a survey questionnaire) about their preferred use and opinion of the recreation facilities along with suggested improvements. Usage of the Niagara Project Canoe Portage Trail was determined from field observations made from the Roanoke River Trail and recordings from a trail camera placed along the portage route.

Results of the Recreational Use Documentation task are included in Appendix G, Attachments 2 and 5.

2.7.2.4.1 Roanoke River Trail

The information obtained from the in-person surveys recorded at the Roanoke River Trail indicate that those using that location primarily partake in bank fishing, hiking, and viewing of the Project spillway, bypass, and powerhouse. Individuals visiting the Roanoke River Trail do so the entire year with most of the visits occurring from March through September.

2.7.2.4.2 Tinker Creek Canoe Launch

Individuals utilizing the Tinker Creek Canoe Launch consisted of canoeists, kayakers, paddle boarders, and persons participating in boat fishing. The general pattern of their activities is to launch at the Tinker Creek Canoe Launch and float down Tinker Creek to the Roanoke River. From that point, the trip continues either upstream toward the Bennington Canoe Launch or downstream toward the Project spillway. The portion of the Roanoke River that is traveled includes the Project reservoir thus the waters are normally very still. The users return to the Tinker Creek Canoe Launch to end their trip.

2.7.2.4.3 Rutrough Point

Rutrough Point represents the normal endpoint for canoeists and kayakers who have floated through the rapids beginning at the Project put-in. Other activities observed at Rutrough Point include bank fishing and hiking the adjacent trails in Explore Park. Some kayaks and canoes launched from Rutrough Point float to the upper end of Smith Mountain Lake to fish and/or enjoy the still waters and then return to Rutrough Point. Others travel approximately five miles to the Hardy Ford Public Boat Access on Smith Mountain Lake.

2.7.2.4.4 Niagara Canoe Portage Trail

Review of the trail camera data indicates that the Niagara Canoe Portage Trail is used during the spring to fall months for non-motorized activity (i.e. kayaks, canoes), bank fishing, and observation of the facility and river. June through August were the most popular months for recreational activity to occur. Over the course of the study, the Project facility was used for its intended use (portaging) 21 times and viewing and observing occurred 21 other times. The Project facility was most frequently used for bank fishing with 28 uses recorded. The frequency of visits while perhaps lower than other portages in the area, was higher than anticipated. It is unclear if individuals access the facility via portaging around the dam, or from nearby neighborhoods.

2.7.2.5 Aesthetic Flow Documentation

As described in the ISR, YES collected photo and video documentation from three key observation points (KOPs) to characterize and capture the appearance of the dam and bypass reach under a range of flows,[4] including:1) the NPS Roanoke River Outlook adjacent to the Blue Ridge parking lot, 2) a bench midway down the stairs to the bypass, and 3) the bank fishing area located at the end of the trail steps at the Roanoke River.

YES took photos and videos at these three KOPs on ten different occasions to gather comparable data for all four seasons under a range of flow conditions (including periods of spill over the spillway crest). As a result of the photograph and video documentation, YES found that in leaf-off months (approximately October to April), aesthetically pleasing views of the spillway, dam, and bypass reach are available from the Roanoke River Trail. In leaf-on months (approximately May to September) when recreation typically increases, the spillway is not easily viewed from KOP 2 due to vegetation. Overall, the optimal time for viewing the Project spillway and bypass reach appears to be late October and early November when leaves are changing colors and falling. The fall colors, along with the open views created by the leaf-fall, create optimal aesthetic conditions.

In general, existing Project operations provide an appropriate aesthetic experience. Appendix G, Attachment 3 provides photograph documentation of views from the KOPs over the course of the study period. This task was completed in 2020 and no updates have been made since the ISR.

2.7.2.6 Recreation Flow Release Desktop Evaluation

As described in the ISR, the objective of the Recreational Flow Release Desktop Evaluation is to evaluate the potential for controlled flow releases from the Project to support short-term

[4] Article 403 of the current license requires a minimum flow of 8.0 cfs into the bypass reach, which is provided via the trash sluice gate. The trash sluice gate hoist operator system was not operational in 2020; as a result, bypass reach flows during 2020 were higher than the license requirement. The gate has been repaired and a new gate and operating system installed, which was operational in early 2021.

enhancement of downstream flow conditions for recreational boating (i.e., primarily canoeing, kayaking, and other paddling activities). To address stakeholders' interests while recognizing Project constraints related to enhancement of downstream flow conditions, HDR conducted a desktop evaluation to assess the potential for Project operations to support short-term enhancement of flow conditions for downstream boating.

Paddlers using the described stretch of river would benefit the most from a potential short-term recreation flow release as a flow pulse between 1 and 3.5 hours which could be maintained depending on the number of units generating and the available reservoir storage volume. This run-time would likely allow paddlers enough time to navigate this stretch of river. Any short-term operational modification to provide flow enhancement downstream of the Project would be subject to sufficient inflow, availability of Project facilities, and availability of operating personnel. Appalachian also notes that operating the reservoir with more fluctuation than is typical (i.e., utilizing the full authorized operating band) to provide what would amount to a very minor "bump" in downstream flow may have unintended effects on reservoir littoral habitat.

On a monthly average basis, there appears to be enough Project inflow to support operation of at least one unit year-round. However, during drier/drought years, there are periods when Project inflows are too low to operate a unit. During these periods, Project flow releases would be made via the Obermeyer trash sluice gate into the bypass reach to maintain reservoir levels and provide the required minimum flow. The potential for the short-term enhancement of downstream flow conditions, if feasible given the limits of Project operations and reservoir storage, to support recreation activities would be most advantageous to boaters during the typically lower flow late-summer/early-fall months (i.e., July through October).

If scheduled short-term releases of flow could be planned, a system of notifying the public as to when such releases were to be made would need to be established. One option is to have the information provided on websites for Appalachian, National Weather Service, and the Roanoke River Blueway Committee, amongst others. Additionally, to enhance the paddling experience for canoeists and kayakers downstream of the Project powerhouse without requiring modification of run-of-river operation of the Project, it is possible to utilize the flow information provided by river gauges in the watershed.

This task was completed in 2020 and no updates have been made since the ISR.

2.7.3 Variances from FERC-Approved Study Plan

The Recreation Study was conducted in accordance with the FERC-approved RSP; however, as noted in the third quarterly progress report, as an alternative to in-person periodic observation of the

portage from across the river due to closure of the Blue Ridge Parkways, Appalachian installed a trail camera in the vicinity of the portage put-in location to record activity during the Recreation Use Documentation timeframe (May through October 2021).

2.8 Cultural Resources Study

2.8.1 Study Status

Appalachian completed the Cultural Resources Study in accordance with the schedule provided in the RSP. A preliminary Cultural Resources Study Report was filed with the ISR on January 11, 2021, and the results of this study were presented at the ISR meeting on January 21, 2021. No study modifications were made or required by FERC subsequent to comments received at or following the ISR meeting.

The final Cultural Resources Study report was filed with the FERC as a CUI/Privileged volume of the DLA on October 1, 2021, therefore a summary of the report is included below but the report is not being filed with this USR. The Cultural Resources Study Report was transmitted on September 8, 2021 to the Virginia SHPO and consulting Tribes for their review and concurrence with the report's recommendations. No reply comments were received.

2.8.2 Summary of Study Methods and Results

The goal of the Cultural Resources Study is to collect additional information regarding cultural resources within the Project APE to assist in identifying Project effects on archeological and historic properties and developing appropriate management measures.

Concurrent with the January 28, 2019 PAD and NOI, Appalachian requested designation as the Commission's non-federal representative for carrying out informal consultation pursuant to Section 106. The Commission granted Appalachian's request by notice dated March 26, 2019. Pursuant to 36 CFR §800.4(a)(1), in a letter dated September 1, 2020, Appalachian consulted with the Advisory Council on Historic Preservation, the U.S. National Park Service, Bureau of Indian Affairs, SHPO, the Cherokee Nation, the Catawba Indian Nation, the Delaware Nation, the Monacan Indian Nation, the Pamunkey Indian Tribe, the Eastern Band of Cherokee Indians, and the Archaeological Society of Virginia, and requested concurrence for determining the APE for the Project defined as all lands necessary for Project operations. Responses from these stakeholders are included in the Cultural Resources Study report filed with the FERC on October 1, 2021.

2.8.2.1 Methods

In August 2020, Terracon Consultants, Inc. (Terracon) (Appalachian's sub-consultant) reviewed the Virginia Cultural Resource Information System to identify previously recorded cultural resources

within a 0.5-mile radius of the Study Area. On September 10, 2020, Terracon staff traveled to the Virginia Department of Historic Resources office in Richmond, VA to gather additional information. Terracon recommended that none of the resources identified, either within the Area of Potential Effects (APE) and those within a 0.5-mile radius, will be affected by continued operation of the Project.

On October 13 and 14, 2020 Terracon conducted an archaeological assessment of the Project APE, including areas along Tinker Creek. Most areas were accessed by canoe except the areas immediately surrounding the dam, which were accessed by vehicle.

In addition to the archaeological investigations, geomorphological investigations were conducted by Seramur & Associates from April 20-22, 2020. Fifteen hand auger borings were placed in various locations along the Roanoke River and Tinker Creek. The sediment encountered above the water table in the borings was interpreted as historic alluvium with no potential to contain intact buried prehistoric cultural deposits (including site 44RN170).

2.8.2.2 Results

Background research indicated there is one previously recorded archaeological site, 44RN170, located within or immediately adjacent to the Niagara FERC Project Boundary. Although the site was recorded as being prehistoric rockshelter, investigations at the site in 1989 only recovered twentieth century materials to a depth of 70 centimeters below surface. Despite this, they believed the rockshelter had the potential to contain prehistoric remains and recommended the site for additional work (Haynes and Hediger 1989). In addition to the archaeological sites, there are four aboveground resources identified within the Project Boundary; the Niagara Powerhouse Station and Dam (080-0095); the Blue Ridge Parkway Historic District (080-5161); the Blue Ridge Parkway Bridge (080-5161-0444); and the Virginian Railroad (128-6160).

The Niagara powerhouse and dam were re-evaluated as historic resources during this study effort. Much of the footprint of the original 1906 facility remains, including the length and general dimensions of the dam and the powerhouse. Within this footprint, however, many of the original components have been removed or modified. The most significant is the replacement of the original power canal (which failed in 1987) with the current steel penstocks in 1988. Within the powerhouse, the substructure was altered in 1954 to support the replacement of Unit 1 and the original Unit 2 was replaced in 1991. In January 1991, following a survey of the Project by Louis Berger and Associates, Inc (Berger 1991), the SHPO determined that the Project was ineligible for the National Register of Historic Places (NRHP). Despite the importance of this facility to the history of Roanoke region, and considering the extensive alterations that have been made from the 1950s to the present, the current

cultural resources survey reinforces the recommendation that the Niagara powerhouse and dam are ineligible for the NRHP.

The Blue Ridge Parkway and Blue Ridge Parkway Bridge are eligible for inclusion in the NRHP, the Virginian Railroad is potentially eligible, and the Niagara powerhouse and dam were determined to be ineligible.

Because areas along the Roanoke River east of Tinker Creek had the potential to yield deeply buried archaeological remains, a geomorphological assessment was carried out. Fifteen hand auger borings were placed in various locations along the Roanoke River and Tinker Creek; sediment encountered above the water table in the borings was interpreted as historic alluvium with no potential to contain intact buried prehistoric cultural deposits.

Based on these results, Terracon recommends that none of these resources are currently being affected by Project operations, that the Project will have no effect on historic properties in the future, and that no additional cultural resource investigations are warranted for the proposed undertaking. If new construction were to occur in the areas outlined in the Niagara Cultural Resources Study Report, then additional archaeological investigations may be warranted and consultation with the SHPO would be necessary.

2.8.3 Variances from FERC-Approved Study Plan

The Cultural Resources Study was conducted in accordance with the FERC-approved RSP.

3 Upcoming ILP Milestones and Study Reporting

Table 3-1 presents upcoming ILP milestones.

Table 3-1. Upcoming Major ILP Milestones

Date	Milestone
December 6, 2021	Appalachian File USR (18 CFR §5.15(f))
December 14, 2021	Appalachian Host USR Meeting (18 CFR §5.15(f))
December 29, 2021	Appalachian File USR Meeting Summary (18 CFR §5.15(f))
December 30, 2021	Stakeholders File Comments on DLA (18 CFR §5.16(e))
January 28, 2022	Stakeholders File Disagreements with USR Meeting Summary (18 CFR §5.15(f)(4)) (if necessary)
February 27, 2022	Appalachian File Response to USR Meeting Summary Disagreements (18 CFR §5.15(f)(5)) (if necessary)
February 28, 2022	Appalachian File Final License Application (18 CFR §5.17)

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Attachment 1

Attachment 1 – USR Meeting Agenda

Updated Study Report Meeting Agenda

Project:	Niagara Hydroelectric Project
Subject:	Updated Study Report Meeting
Date:	Tuesday, December 14, 2021
Location:	WebEx

The Updated Study Report (USR) meeting is scheduled for December 14, 2021 from 9 a.m. to approximately 4 p.m. The USR meeting topics are currently scheduled for the following times:

Topic	Schedule*
Welcome and Introduction	9:00 AM – 9:10 AM
Shoreline Stability Study	9:10 AM – 9:35 AM
Wetlands, Riparian, and Littoral Habitat Study	9:35 AM – 10:00 AM
Cultural Resources Study	10:00 AM – 10:15 AM
Morning Break	10:15 AM – 10:30 AM
Recreation Study	10:30 AM – 11:30 AM
Lunch Break	11:30 AM – 12:00 PM
Fish Community Study • Fish Community • Roanoke Logperch Survey • Impingement and Entrainment • Benthic Aquatic Resources Study	12:00 PM – 1:15 PM
Water Quality Study	1:15 PM – 2:15 PM
Afternoon Break	2:15 PM – 2:30 PM
Bypass Reach Flow and Aquatic Habitat Study	2:30 PM – 3:30 PM
Discussion, Questions and Next Steps	3:30 PM – 4:00 PM

*Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

Attachment 2

Attachment 2 – FERC Consultation

American Electric Power
1 Riverside Plaza
Columbus, OH 43215
aep.com

Via Electronic Filing

January 11, 2021

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 Initial Study Report and Schedule for Virtual ISR Meeting

Dear Secretary Bose:

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.

Appalachian developed a Revised Study Plan (RSP) for the Project that was filed with the Commission and made available to stakeholders on November 6, 2019. On December 6, 2019 FERC issued the Study Plan Determination (SPD). On July 27, 2020, Appalachian filed an updated ILP study schedule and a request for extension of time to file the Initial Study Report (ISR) to account for Project delays resulting from the COVID-19 pandemic. These delays pushed the start of the 2020 field season into early August 2020 and resulted in some of the spring and summer 2020 field work being rescheduled for 2021. The request was approved by FERC on August 10, 2020, and the filing deadline for the ISR for the Project was extended from November 17, 2020 to January 11, 2021.

During the restricted 2020 field season, Appalachian has conducted studies in accordance with 18 CFR §5.15, as provided in the RSP and as subsequently modified by FERC's SPD. In accordance with 18 CFR §5.15, Appalachian is hereby filing the ISR with the Commission. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes any variances from the study plan and schedule approved by the Commission.

The Commission's regulations at 18 CFR §5.15(c) require Appalachian to hold a meeting with participants and FERC staff within 15 days of filing the ISR. **Accordingly, Appalachian will hold**

an ISR Meeting via Webex from 10 AM to 3 PM on Thursday, January 21, 2020. An agenda for the ISR Meeting is provided in Attachment 2. Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

Appalachian respectfully requests that the stakeholders interested in participating in the Virtual ISR Meeting contact Maggie Yayac at maggie.yayac@hdrinc.com on or before close of business Tuesday, January 19, 2021 to obtain instructions to join the virtual meeting.

If there are any questions regarding this filing, please do not hesitate to contact me at (614) 716-2240 or jmmagalski@aep.com.

Sincerely,

Jonathan M. Magalski
Environmental Specialist Consultant
American Electric Power Services Corporation, Environmental Services

cc: Distribution List
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February 5, 2021

Via Electronic Filing

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 Initial Study Report Meeting Summary

Dear Secretary Bose:

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.

Pursuant to 18 CFR § 5.15(c), Appalachian filed the Initial Study Report (ISR) with the Commission on January 11, 2021. The ISR filing also included notification of the ISR Meeting date, time, and proposed agenda. As required by the ILP schedule within 15 days of the ISR filing, Appalachian held a virtual ISR Meeting via Webex from 10am to 3pm on Thursday, January 21, 2021.

Pursuant to 18 CFR § 5.15(c)(3), Appalachian hereby files for Commission and stakeholder review the ISR Meeting summary. The ISR Meeting presentation is included as an attachment to the ISR Meeting summary.

If there are any questions regarding this filing, please do not hesitate to contact me at (614) 716-2240 or jmmagalski@aep.com.

Sincerely,

Jonathan M. Magalski
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cc: Distribution List
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Meeting Summary

Project:	Niagara Hydroelectric Project (P-2466)
Subject:	Initial Study Report Meeting
Date:	Thursday, January 21, 2021
Location:	WebEx Virtual Meeting
Attendees:	Jonathan Magalski (AEP) Elizabeth Parcell (AEP) David Bailey (AEP) Kenny Morrison (AEP) Sarah Kulpa (HDR) Maggie Yayac (HDR) Misty Huddleston (HDR) Ty Ziegler (HDR) Erin Settevendemio (HDR) Joe Dvorak (HDR) Jon Studio (EDGE) John Spaeth (EDGE) Frank Simms (YES) Allyson Conner (FERC) Jeremy Feinberg (FERC) Laurie Bauer (FERC) Woohee Choi (FERC) Rick McCorkle (USFWS) John McCloskey (USFWS) Scott Smith (VDWR) Anita McMillion (Town of Vinton) Nathan McClung (Town of Vinton) Liz Belcher (Greenway Commission - Coordinator) Lindsay Webb (Roanoke County - Parks Planning and Development Manager) Amanda McGee (Roanoke Valley – Alleghany Regional Commission) Paul Angermeier (VA Tech) Brian McGurk (VDEQ) Bill Tanger (FORVA)

Overview

This document provides the meeting summary for Appalachian Power Company's (Appalachian) Niagara Hydroelectric Project Initial Study Report (ISR) Meeting. The meeting was held via WebEx to review with stakeholders the progress and results of the ISR, which was filed with the Federal Energy Regulatory Commission (FERC) on January 11, 2021. The ISR can be accessed from either FERC's website or from the website: http://www.aephydro.com/HydroPlant/Niagara. A copy of the meeting presentation is included with this meeting summary as Attachment 1.

Welcome and Introductions (Slides 1-7)

Jon Magalski introduced the Niagara Project and the ISR meeting goals and objectives, and encouraged participation and feedback. He provided an overview of the agenda and the completed and upcoming ILP schedule milestones. The studies presented in the ISR meeting correspond to those for which Appalachian made substantive progress toward completion in the first ILP study season (2020) and for which preliminary study reports were filed with the ISR:

- Fish Community Study
- Benthic Aquatic Resources Study
- Bypass Reach Flow and Aquatic Habitat Study
- Water Quality Study
- Recreation Study
- Cultural Resources Study

Fish Community Study (Slides 8-22)

Misty Huddleston (Study Lead) introduced herself and the study team, including Erin Settevendemio and HDR's sub-consultants, Jon Studio and John Spaeth with EDGE Engineering & Science, LLC (EDGE).

Study Results

J. Studio presented the fish community study methods and results for the fall survey period (September 15-16; October 20-21, 2020), which included collecting 26 species above Niagara dam and 23 below, found in both riffle/run and pool sites. Several intolerant species were collected. Riffle/run sites had higher catch per unit effort (CPUE) than pool sites. A single adult specimen of the federally endangered Roanoke Logperch was collected from the most upstream sample site in a riffle/run habitat. Roanoke Logperch were collected at this site during the prior relicensing surveys in the early 1990s.

E. Settevendemio discussed the methods and preliminary results of the desktop assessment of impingement and entrainment. Target species and groups were identified from the fall fish community survey by EDGE, previous historical relicensing results, and historical range records for the Roanoke River. The calculated intake approach velocity (1.1 feet per second) was compared to fish swim burst speeds, which indicate that most juvenile and adult species can avoid the intake. Spawning habitat for most target species/groups is not present near the intake structure, therefore, potential for entrainment is considered low for most early life stages.

Questions/Comments

Fisheries

Paul Angermeier asked for clarification regarding units for the calculated CPUEs. J. Studio responded that it is the total number of individuals of species combined per unit of time (Summary). John McCloskey noted it would be valuable to compare CPUE above and below the dam; J. Studio noted these values are presented in the Preliminary Fish Community Study Report.

P. Angermeier asked for additional information about the sampling methodology in riffle/run habitat during high flows (given that prevailing base flows were high throughout the 2020 sampling season). J. Studio noted that the methodology was dependent on flow. For higher flows in complex habitats, EDGE used block nets (seine) in addition to backpack shocking. With larger substrate, EDGE used a mixture of kicking/shocking to move fish downstream into a block net positioned at the end of the transect (in addition to staff with dipnets). P. Angermeier agreed, noting that without the block net it would be hard to catch logperch and madtoms. J. Magalski noted that this survey methodology was strictly for sampling the general fish community and that more complex, life stage-specific methods will be used in 2021 in support of the targeted Roanoke Logperch surveys.

Laurie Bauer noted in the study report, there is a table with raw data for backpack electrofishing. She requested in the Updated Study Report (USR) that those numbers be provided for the boat electrofishing surveys as well. She also requested specific length/weight information. J. Studio confirmed that the requested information and format would be provided in the USR.

A permit from the USFWS will be required for Appalachian's consultants to complete the Roanoke Logperch surveys (multiple life stages) planned for 2021, J. Studio confirmed the permit application was submitted to USFWS Region 5 in late December. J. Magalski asked J. McCloskey if there was anything he could do to move the permit along internally. J. McCloskey confirmed that USFWS is proceeding with processing, based on internal communications he has seen. He noted there is a possibility EDGE may be limited to snorkel surveys (instead of backpack shocking) during seasonal in-stream work restrictions this spring if a waiver could not be provided, but this is to be determined. J. McCloskey recommended that if EDGE has not received the permit or been notified by USFWS regarding the permit by March to check in with him.

Impingement and Entrainment

P. Angermeier asked if swim speed data were only for adults or if it was life stage-specific. E. Settevendemio confirmed that evaluation is based on readily available swim speed data for juvenile and adult life stages. Since most stages of larvae are not actively swimming, little data exists for those life stages. E. Settevendemio clarified that when species-specific swim speed data were unavailable, HDR used swim speeds from a representative or surrogate species.

P. Angermeier asked how HDR estimated qualitative risk for larval entrainment. E. Settevendemio explained that if larvae are potentially being carried in the current and are in the vicinity of the intake then HDR would assume they would be entrained.

Rick McCorkle asked how the approach velocity was determined. E. Settevendemio noted that field work to confirm the approach velocity was planned in 2020, but due to high flows and unit outages, HDR estimated the approach velocity via desktop methods. The calculated approach velocity is comparable to the value presented in a previous relicensing study (also calculated). Ty Ziegler noted that after several trips to the Project, it became apparent that it would be difficult to get an accurate velocity measurement with an acoustic doppler current profiler (ADCP) due to the distance that it would need to be operated from the angled trash racks. In response to a question as to whether debris was taken into account for the calculated intake velocities (e.g., any potential for localized "hot spots" due to trashrack clogging), T. Ziegler noted that the evaluation did not assume any clogging or bio-fouling of the intake structure. David Bailey explained the function of the trash racks and noted that they are run on a timer. J. Magalski clarified that there is a barrier that keeps large debris out of the trash racks and the racks are continually clean/cleared of debris for optimal project operation.

J. McCloskey asked whether HDR considered species that are migrating and dispersing downstream in regard to avoidance. E. Settevendemio confirmed that the model included those fish and noted that the evaluation acknowledges that one of the reasons for potential entrainment is migration and dispersal associated with spawning activity. M. Huddleston also added that if a fish is moving towards the intake structure, size exclusion helps reduce entrainment.

P. Angermeier noted that some species of larvae are known to be carried downstream by drifting in the current, and asked when computing the entrainment were the results stratified by these specific characteristics, or was an average taken across the species. E. Settevendemio explained that by using the entrainment database, the method used is to average across the species group. However, in the

report, HDR provides a qualitative assessment of each species that considers life stage-specific characteristics.

Variances from FERC-approved Study Plan

HDR was unable to evaluate flows with the ADCP due to high flow events and Project operating conditions throughout the 2020 study season. In lieu of field confirmation of the approach velocity, Appalachian proposes to use the desktop approach velocity calculation in the evaluation of impingement and entrainment susceptibility at the intake structure. J. McCloskey asked whether or not evaluating the approach velocity could be part the 2021 season and noted that a measured velocity may be preferable. T. Ziegler noted that it was difficult to get close enough to the trash racks (they are angled which makes it difficult to measure velocities near the upstream face of the racks, so a measurement would have to be taken 8-10 feet upstream, at which point velocities may be equivalent to Roanoke River velocities in other areas of the reservoir, and would likely be lower than the calculated velocity) to calculate the actual inflow and potentially could result in less accurate approach velocity results.

Second Field Season (2021)

- Roanoke Logperch adult surveys (August – October 2021), young-of-year surveys (August – October 2021), larval surveys (April – June 2021).
- Turbine Blade Strike Analysis (July – December 2021)

Benthic Aquatic Resources Study (Slides 23-32)

M. Huddleston reviewed the study goals, objectives, and the status of the study and introduced Jon Studio to discuss the methods and results.

Study Results

J. Studio presented the macroinvertebrate methods and results for the fall period (September 15-16 and October 5). Macroinvertebrate taxonomic identification is in process and scheduled for completion prior to the spring 2021 sampling event. Crayfish identification was made in the field; 5 crayfish species were collected (2 native and 3 invasive species) at 8 out of 10 sampling sites. J. Studio also presented the mussel habitat and community methods and results of the fall 2020 survey (October 5-8) where commercial divers were used to collect the mussels. Zero live or dead shell specimens were found in the impounded reach. In the abbreviated sites, there were four live Eastern Elliptio found and one dead Notched Rainbow in Tinker Creek. No mussels were collected downstream of the dam.

Questions/Comments

R. McCorkle noted that the mussel survey approach described by J. Studio does not meet the strict definition of “quantitative” as used in the scientific community, as typically the quantitative methodology is to use quadrats and excavation at the survey locations. J. Spaeth confirmed that they coordinated the methodology with Brian Watson (VDWR) and he further explained that quadrats are more effort, for typically little return, especially where mussels are likely not present (i.e., true quantitative methodology is better used on the Mississippi River or Ohio River or Clinch River, where dense mussel beds are known to be present). J. Spaeth confirmed that the methodology for this study may be better termed “semi-quantitative”, but that it is the preferred method for the Roanoke River. J. Studio clarified that anything that is directly sub-surface would be collected (see additional response below).

P. Angermeier asked about the methodology and noted that some mussel species are known to move up/down in the substrate depending on the temperature during the year. He wondered if the decision not to excavate would still capture mussels that moved down into the substrate. J. Spaeth confirmed that the approach used in the field included probing into the substrate with the diver's hands and fingers and that the commercial divers who conducted the survey with EDGE have significant experience and skill at finding and retrieving mussels in a variety of habitats, even in zero visibility conditions. J. Spaeth confirmed that the survey was completed within the recognized mussel survey window in Virginia, which is from April through the end of October.

P. Angermeier also asked about the macroinvertebrate survey and whether or not VDEQ methods will present taxonomic results and taxonomy based metric scores (i.e., number of EPT, number of intolerant taxa, etc.). J. Studio noted that the study followed state methodology and that the laboratory process and data processing will follow the same standard operating procedures and methodologies described in VDEQ 2008. This includes the presentation of sampling results into multiple metrics based on quantitative sampling methods, qualitative sampling methods, or combination of all collected data.

2021 Field Season

- Macroinvertebrate and Crayfish Community Study (April – May 2021)

Bypass Reach Flow and Aquatic Habitat Study (Slides 34-44)

Results

T. Ziegler (Study Lead) introduced the study, methodology, and results. The desktop habitat mapping assessment identified significant boulder and bedrock habitat in the bypass reach with approximately 50 percent cover (instream and overhead vegetation). The desktop results will be field verified in 2021 and include the tailrace area. Habitat suitability Index (HSI) curves for the various habitat guilds have been assembled from other instream flow studies in the region and created specifically for Roanoke Logperch based on available literature. T. Ziegler also reviewed the proposed model calibration target flows with stakeholders. Sarah Kulpa noted that one objective of this meeting is to have discussion and seek input from stakeholders regarding the proposed target flows for the model calibration (field measurements at target flow conditions to be conducted in 2021).

Questions/Comments

P. Angermeier asked how the four calibration flows were determined. T. Ziegler noted that these flows were determined to: a) make sure we have sufficient field data collected at the lower end of the flow regime as model calibration can be more difficult at lower flows, b) capture field data at current relevant licensed minimum flow requirements of 8 cfs and 50 cfs, and c) help reduce safety concerns for the field crews. P. Angermeier noted that his goal would be to have a model produce habitat suitability over seasons/years. He recommended looking at a 30-year hydrograph and identifying typical flows (seasonally dependent). T. Ziegler noted a time series analysis using the most recent 30-yr period of record to evaluate actual Project inflows on a seasonal basis is feasible.

The group discussed whether "common" flows are represented in the model calibration flows. T. Ziegler clarified that the proposed calibration flows are not necessarily the 'flows of interest' to the stakeholders but are used to calibrate the 2-D model. The calibrated model will then be used to simulate flows of interest to the stakeholders. Joe Dvorak noted that surface roughness has a stronger influence on the flow dynamics at the lower end of the flow regime which is why the proposed target flows are on the lower end of the flow spectrum. As flows increase, depth increases which lessens the effect of surface

roughness. Level logger data will also be collected at higher flows (during runoff conditions) which will provide additional calibration data as the model is used to extrapolate to high flows.

Brian McGurk questioned how HDR is evaluating and gathering data on historical flows. T. Ziegler noted that the USGS gage downstream of the Project measures the combined flow from the bypass reach and powerhouse. HDR will use the operations model developed specifically for the Niagara Project (i.e., the "CHEOPS model") to determine the portion of flow in the bypass reach.

J. McCloskey noted that that to date there has not been discussion modeling flows over the dam (i.e., sheet flow over the spillway instead of a release through the gated trash sluice). T. Ziegler explained that the model will be able to simulate releases to the bypass reach via the trash sluice gate and/or over the main spillway.

P. Angermeier noted that the last few years have been particularly wet and raised concern as to whether wet conditions again in 2021 would impede the planned fieldwork. T. Ziegler noted that flow conditions were challenging in 2020 and very well could be again in 2021, but we have LiDAR data that is the basis for the terrain model, and HDR expects to able to collect enough data for model calibration, even if data collection has to be broken into multiple sampling events. B. McGurk asked if it was possible to extend into September and S. Kulpa agreed the time period could be extended earlier or later dependent on when there is a dry period; that is, even during a wet year, we still expect to see brief periods of low flow and minimal precipitation, and HDR will be monitoring weather and flows throughout the 2021 field season to take advantage of such periods.

L. Bauer asked about the habitat/substrate desktop mapping and whether HDR will field verify the mesohabitats. T. Ziegler confirmed the desktop habitat mapping effort will be field verified during the 2021 field season.

2021 Study Activities

- Mesohabitat Mapping and Substrate Characterization Field Data Verification (June – August 2021)
- Conduct Flow and Water Level Assessment and Hydraulic Model Development (June – October 2021)

Water Quality Study (Slides 46-59)

T. Ziegler (Study Lead) introduced the study, methods and results during the period of July 29 – November 10, 2020.

Results

Water temperature results peaked at approximately 28°C (well below the Virginia Class IV water quality standard of 31 °C). Dissolved oxygen (DO) concentrations (upstream locations) were consistently above the state standard (5.0 mg/L daily average; 4.0 mg/L instantaneous) and increased as water temperatures decreased over the course of the study period. Dissolved oxygen (forebay and tailrace) also remained above the state standards during the entire study period. While there were two brief (less than 1.5 hours) excursions below 4.0 mg/L at the forebay bottom, state water quality standards only apply to the upper portion of the water column which remained above 5.0 mg/L. Dissolved oxygen (bypass reach) was above the state standards during the entire study period. Discrete vertical profiles in the reservoir and forebay area show little to no stratification for temperature, DO, pH, and specific conductivity. Water quality in the streams flowing into the Niagara reservoir, the reservoir itself (including the Project's forebay

area), tailrace, and bypass reach is consistent with applicable Virginia state water quality standards for temperature, DO, and pH for Class IV (Roanoke River) and Class VII (Tinker Creek) surface waters. While there is no state standard for specific conductivity, concentrations were above 150 µS/cm and less than 500 µS/cm, which is generally considered to be suitable for most fish.

Questions/Comments

J. McCloskey asked about the powerhouse outage noted during the presentation and depicted on the graphs. T. Ziegler confirmed the powerhouse outage began on September 8, 2020 and continued through the remainder of the study period. During this time, all Project inflows were routed to the bypass reach. J. McCloskey noted that as a result, water quality in the bypass reach might not be representative of typical conditions. T. Ziegler agreed and referenced the Preliminary Water Quality Study Report which recommends collection of supplemental temperature and DO data in the bypass reach during lower flow summer and licensed minimum flow conditions (i.e., July – August 2021).

L. Bauer asked about the two data sondes at each continuous monitoring location and wondered how they are presented on the graphs in the report. T. Ziegler explained that data from each sonde was evaluated to determine which was the most representative (based on comparison to discrete measurements using a freshly calibrated data sonde) and only this data is presented in the Preliminary Water Quality Study Report. Deploying two data sondes at each continuous monitoring location was advantageous as biofouling was an issue particularly in the Tinker Creek and reservoir monitoring locations, resulting in brief study data gaps.

B. McGurk asked about the bypass flow vs rainfall graph in Attachment 4 of the Preliminary Water Quality Study Report. He noted it appeared 25-30 cfs was coming through the sluice gate (prior to the powerhouse outage). T. Ziegler confirmed.

J. McCloskey questioned why Appalachian is not proposing to extend the bypass reach water quality monitoring through September (or later) as the lowest flow months can occur in September and/or October. T. Ziegler explained the goal is to collect supplemental temperature and DO data in the bypass reach during a combination of low flow and higher temperatures, which typically occur during July – August. J. McCloskey noted that the supplemental data collection could extend beyond August if water temperatures continue to increase throughout August and into September. T. Ziegler agreed and stated that we would expect not to pull the instruments until temperature trends were on a steady decrease into the fall.

L. Bauer noted that the DO concentrations increased throughout the study period. T. Ziegler explained that this is typical; as water temperature decreases, the water has a higher DO carrying capacity.

R. McCorkle noted the schedule for the continuous monitoring (per the SPD) was to be from May 1 through October. May and June probably aren't that important, but most of July was missed, as was a good chunk of August due to equipment malfunction, bio-fouling, etc. R. McCorkle asked if there was an approved variance to the required monitoring period. S. Kulpa noted that the July filing by Appalachian provided an updated study schedule and a request for extension of the time to file the ISR, Only the latter required approval from FERC; the updated study schedule was simply reported as a variance (Allyson Connor confirmed). T. Ziegler explained that while the study didn’t commence until late-July, the water quality parameters collected during the first couple of weeks are indicative of warm summer conditions and the measurements were well within state water quality standards. S. Kulpa noted that the field effort and cost to collect additional water quality data at all monitoring locations would be significant, and Appalachian does not believe the return on the effort to be commensurate with the effort, given the results of the 2020 sampling (Project waters well above numerical state water quality standards).

Scott Smith asked if there was a way to model water quality parameters and flows in the bypass reach. S. Kulpa noted it was not the intent of the study, but HDR would consider the possibility of comparing water quality (i.e., temperature and/or DO) to flows in the bypass reach to determine if a correlation exists that would enhance the conclusions provided in the Preliminary Water Quality Study Report.

2021 Field Season

- Re-install two bypass reach monitoring locations (July – August) to collect supplemental water quality data under lower flow conditions.

Recreation Study (Slides 60-102)

Maggie Yayac (Study Lead) introduced the Recreation Study goals and Project and Non-Project Facilities. M. Yayac introduced HDR's sub-consultant, Frank Simms with Young Energy Services, who presented the Recreation Facility Inventory and Conditions Assessment and the Aesthetic Study methods and results. M. Yayac reviewed the online survey methods and results, and T. Ziegler reviewed the Recreation Flow Release desktop assessment.

Results

F. Simms reviewed each recreation facility (Project and Non-Project) and listed the condition of the amenities. Frank explained that aesthetically pleasing views occur under low to mid flows (50 to 200 cfs) and similarly acoustics are optimal within this range. M. Yayac explained the peak months for recreation at all the facilities were observed to be April and June (based on the online survey), and canoeing/kayaking is the number one reported recreation activity.

Questions/Comments

Liz Belcher recommended revising the location of the Project canoe portage put-in on the figure included in the presentation and Preliminary Recreation Study Report to show it under the Blue Ridge parkway bridge. Lindsay Webb recommended updating the ownership of some of the parcels and noted she would send comments to Appalachian. Action Item: HDR to update canoe portage put-in location on the map and L. Webb to send comments on recreation parcels.

A. Conner asked who owns the Rutrough Rd Canoe/Kayak Ramp? F. Simms confirmed it is owned by Roanoke County.

L. Belcher noted that the Roanoke River and Tinker Creek Greenways are not included in the facility inventory. She explained that boaters often use these locations as a put in/take out providing access to the river and the head of the reservoir. The view from the bridge has an aesthetic overlook of the reservoir. Action Item: HDR to add this bridge to the recreation feature map, for reporting in the USR.

L. Belcher also noted that in regard to F. Simms observing little/no recreation activity during the holiday weekends, it was a very wet year and 2020 was an exceptionally unusual year (COVID). She does not predict recreation use will be "normal" in 2021 since the National Park Service (NPS) is closing the Blue Ridge Parkway and replacing the bridge causing closure the Roanoke River trail outlook/trail. F. Simms confirmed the NPS expects to close the parkway and trail from March 2021 – March 2022. Appalachian is not proposing to revise the 2021 field season schedule. L. Webb offered to assist F. Simms with any correspondence with the NPS. She also noted it's likely that U.S. 220 North will also be closed.

Bill Tanger asked if there is a time he could comment on the improvements he would like to see. S. Kulpa confirmed that he can provide them on the call and/or file comments with FERC by March 7th. B. Tanger noted that boaters would like to see a take-out on river right just above the dam. That way boaters can float the reservoir and then take out just above the dam to shuttle downstream and put back in at the Parkway steps, Journey's End, or Rutrough Rd. B. Tanger also explained that boaters would like to see flow events on a weekend (3 or 4 times over the summer), assuming full pond and asked if that would be possible. S. Kulpa confirmed that the flow release would be from the powerhouse. B. Tanger responded that a water burst would provide a more enjoyable trip downstream vs. a minimum flow during a low flow period. It would be helpful if there could be some recreation flow events. J. Magalski noted that a flow pulse would require a relatively rapid reservoir drawdown (within the presently authorized reservoir limits) compared to normal run-of-river project operation, which could impact shoreline erosion or littoral habitat, and that such impacts would have to be evaluated. J. Magalski also noted that rapid reservoir drawdowns during spawning periods would have to be avoided.

L. Belcher recommended further consideration regarding trash management. She understands it is not necessarily Appalachian's responsibility, but it's a common issue in the watershed. She asked whether any aspects of the Recreation Study are looking at regional cooperation to pick up litter. E. Parcell commented that there has been a decrease of trash over the years especially with other local trash clean-ups. E. Parcell supports any initiatives to discourage littering, but these studies are not designed to look at this issue.

S. Kulpa noted that the recommendations during this call can also be further discussed at the stakeholder meeting schedule for early 2021.

Cultural Resources (Slides 104-109)

M. Yayac reviewed the cultural resources methods and results by Terracon Consultants, Inc. (sub-consultant).

Results

Terracon received five response to the Area of Potential Effects (APE) consultation with no objections. Phase I completed, geomorphological assessment scheduled for 2021. No historic properties are adversely affected by the Project. New construction would require consultation with the State Historic Preservation Office (SHPO).

Questions/Comments

None.

Next Steps and Discussion

J. Magalski reviewed key milestones for the ILP including meeting summary, stakeholder requests, FERC determination.

Questions/Comments

B. McGurk noted that the overall schedule includes filing the draft license agreement (DLA) in October 2021. Brian asked when Appalachian intends to submit the Virginia Water Protection (VWP) Permit (401 certification). Brian noted that the sooner he knows the better so he can gather individuals to support the application processing. J. Magalski noted that Appalachian is aware to set up a meeting 30 days before

filing to discuss the contents of the application, and that Appalachian and their consultants would be giving this further consideration. The FERC deadline for the licensee to file the 401 certification application is after the filing of the Final License Application (i.e., 60 days after FERC's notice of Ready for Environmental Assessment), though Appalachian understands an earlier filing may be preferred by VDEQ. S. Kulpa noted that the VWP application would benefit from completion of the relicensing studies and definition of Appalachian's licensing proposal, so the application will likely be after the DLA filing.

J. Magalski noted that the March 7th stakeholder comments filing date is a Sunday, so stakeholder would have until the close of business March 8th (Monday) to file comments.

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Niagara Hydroelectric Project

Initial Study Report Meeting
January 21, 2021

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Initial Study Report

- 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.

- The Initial Study Report (ISR) describes the Licensee's overall progress in implementing the study plan and schedule, the data collected, and any variances from the study plan and schedule.

- The Commission's regulations at 18 CFR § 5.15(c) requires Appalachian to hold an ISR Meeting within 15 days of filing the ISR.

- The purpose of the ISR Meeting is to discuss available study results and any proposals to modify the study plans in light of the data collected.

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Meeting Agenda

Topic	Schedule
Welcome and Introduction	10:00 AM – 10:15 AM
Fish Community Study	10:15 AM – 11:15 AM
Benthic Aquatic Resources Study	11:15 AM – 11:45 AM
Morning Break	11:45 AM – 11:50 PM
Bypass Reach Flow and Aquatic Habitat Study	11:50 AM – 12:30 PM
Lunch Break	**12:30 PM – 1:00 PM**
Water Quality Study	1:00 PM – 1:30 PM
Recreation Study	1:30 PM – 2:30 PM
Afternoon Break	2:30 PM – 2:35 PM
Cultural Resources Study	2:35 PM – 2:50 PM
Discussion, Questions and Next Steps	2:50 PM – 3:00 PM

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Process Plan and Schedule

Date	Milestone
January 28, 2019	Appalachian Filed NOI and PAD (18 CFR §5.5, 5.6)
March 26, 2019	FERC Issued Notice of PAD/NOI and Scoping Document 1 (SD1) (18 CFR §5.8(a))
April 24-25, 2019	FERC Conducted Scoping Meetings and Site Visit (18 CFR §5.8(b) (viii))
May 25, 2019	Stakeholders Submitted Comments on the PAD, SD1, and Study Requests (18 CFR §5.9)
July 9, 2019	FERC Issued Scoping Document 2 (SD2) (18 CFR §5.10)
July 9, 2019	Appalachian Filed Proposed Study Plan (PSP) (18 CFR §5.11(a))
August 1, 2019	Appalachian Held Study Plan Meeting (18 CFR §5.11(e))
October 7, 2019	Stakeholders Submitted Comments on the PSP (18 CFR §5.12)
November 6, 2019	Appalachian Filed RSP (18 CFR §5.13(a))
November 21, 2019	Stakeholders Submitted Comments on the RSP (18 CFR §5.13(b))
December 6, 2019	FERC Issued the SPD (18 CFR §5.13(c))
July 27, 2020	Appalachian Submitted First Quarterly Report, ILP Study Update, and Request for Extension of Time File ISR
August 10, 2020	FERC Issued Order Granting Appalachian Extension of Time for Filing of ISR
August – November 2020	Appalachian Conducted First Season of Field Studies (18 CFR §5.15(a))
October 27, 2020	Appalachian Submitted Second Quarterly Progress Report (18 CFR §5.15(b))
December 22, 2020	FERC Issued Scoping Document 3 (SD3)
January 11, 2020	**Appalachian Submitted ISR (18 CFR §5.15(c)(1))**

Studies Approved in the SPD

FERC's December 6, 2019 Study Plan Determination (SPD) directed Appalachian to conduct eight studies:

1. Bypass Reach Flow and 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

Proposals to Modify Studies or for New Studies

At this time, Appalachian is not proposing any modifications to the studies approved and modified in the Commission's December 6, 2019 SPD or any new studies.

Minor variances to the study plans have been previously reported in the ILP quarterly progress reports (July 27, 2020 and October 27, 2020) and are detailed in the sections that follow, as well as within the individual study reports provided as appendices to the ISR.

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Upcoming ILP Milestones

Date	Milestone
January 21, 2020	**Appalachian Hosts ISR Meeting (18 CFR §5.15(c)(2))**
February 5, 2021	Appalachian File ISR Meeting Summary (18 CFR §5.15(c)(3))
March 7, 2021	Stakeholders File Disagreements with ISR Meeting Summary (18 CFR §5.15(c)(3)) (if necessary)
April 6, 2021	Appalachian File Response to ISR Meeting Summary Disagreements (18 CFR §5.15(c)(5)) (if necessary)
May 6, 2021	FERC Provide Determination on Disputes (18 CFR §5.15(c)(6)) (if necessary)
Spring – Fall 2021	Appalachian Conduct Second Year of Studies
October 1, 2021	Appalachian File Draft License Application (DLA) (18 CFR §5.16(a))
December 5, 2021	Appalachian File USR (18 CFR §5.15(f))
December 20, 2021	Appalachian Host USR Meeting (18 CFR §5.15(f))
December 30, 2021	Stakeholders File Comments on DLA (18 CFR §5.16(e))
January 4, 2022	Appalachian File USR Meeting Summary (18 CFR §5.15(f))
February 3, 2022	Stakeholders File Disagreements with USR Meeting Summary (18 CFR §5.15(f)(4)) (if necessary)
February 28, 2022	Appalachian File Final License Application (18 CFR §5.17)
March 5, 2022	Appalachian File Response to USR Meeting Summary Disagreements (18 CFR §5.15(f)(5)) (if necessary)

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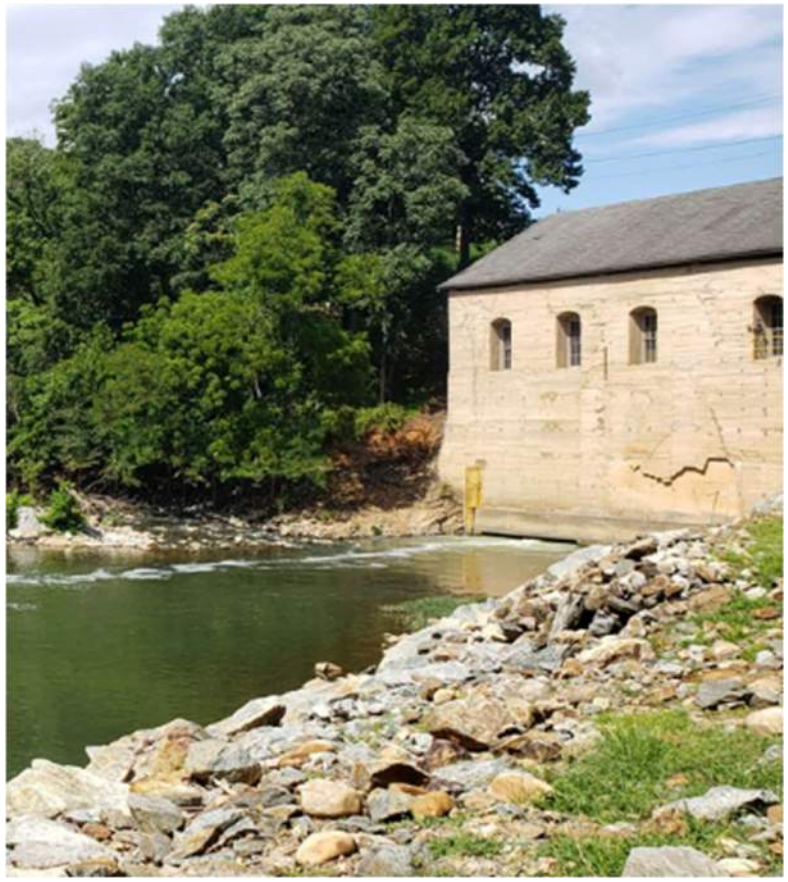
Fish Community Study



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Fish Community Study

- **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:**
  - 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
  - Confirm intake velocities to evaluate the potential of fish impingement or entrainment

Fish Community Study

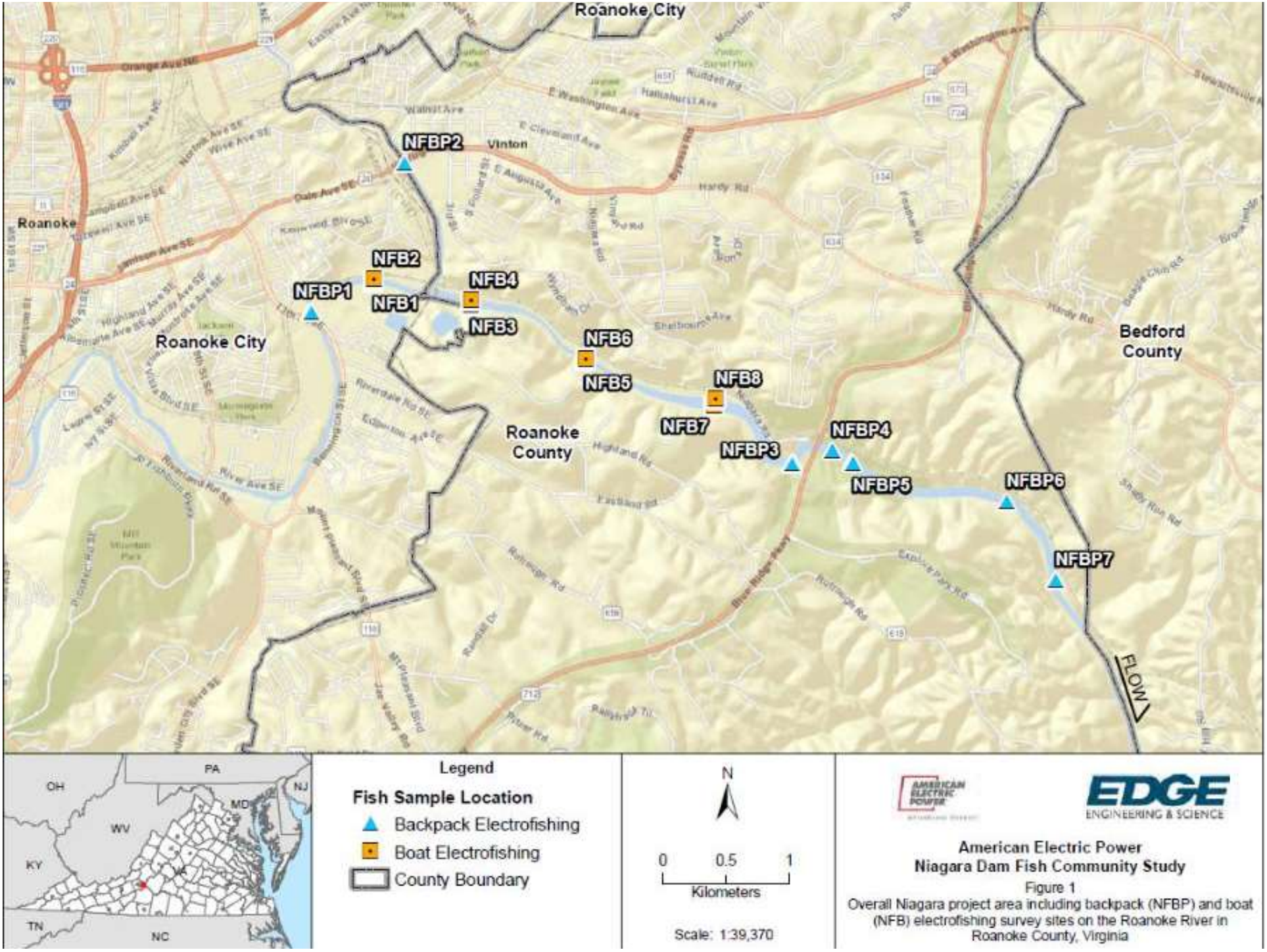
Study Status

- Appalachian initiated the Fish Community Study in accordance with the methods described in the RSP and SPD.
  - General fish community survey completed fall 2020
  - Roanoke Logperch (larval, juvenile, adult) surveys rescheduled for 2021
  - Preliminary assessment of impingement and entrainment at the intake structure

Fish Community Study

General Fish Community Study Methods

- September 15-16 and October 20-21, 2020
  - Eight sites in impoundment electrofished by boat, a minimum of 5 minutes each site
  - Backpack electrofished 100-m transects in riffles/runs for minimum of 5 minutes each, 2 sites upstream and 5 downstream of dam
  - Fish ID to species, enumerated, and examined for anomalies; up to 30 individuals per taxon measured and weighed
  - Calculated catch per unit effort (CPUE) and H'; Shannon index and compared preliminary results to those from historical studies



American Electric Power
Niagara Dam Fish Community Study

Figure 1
Overall Niagara project area including backpack (NFBP) and boat (NFB) electrofishing survey sites on the Roanoke River in Roanoke County, Virginia

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Fish Community Study

Summary of Fall 2020 Survey Results

- 590 fish representing 32 species
- 26 species above Niagara Dam and 23 below
- Riffle/run sites
  - Average CPUE of 6.55
  - Average diversity (H'; Shannon Index) of 1.83
- Pool sites
  - Average CPUE of 1.44
  - Average diversity of 1.10
- Continued presence of intolerant species observed in prior relicensing

Fish Community Study

Summary of Fall 2020 Survey Results

- Dominant Taxa by Relative Abundance at Riffle/Run Sites
  - Central Stoneroller – 27.4%
  - Rosefin Shiner – 25.5%
  - Riverweed Darter – 8.2%

- Dominant Taxa by Relative Abundance at Pool Sites
  - Redbreast Sunfish – 40%
  - Golden Redhorse – 18.5%
  - Bluegill – 16.9%

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Fish Community Study

Summary of Fall 2020 Survey Results

- No Orangefin Madtom collected during fall sampling efforts
- Single adult specimen of endangered Roanoke Logperch collected
  - Location: upstream-most survey site, above confluence of Tinker Creek and Roanoke River
  - Habitat: riffle/run
  - Sampling Method: backpack electrofishing
  - Site History: prior collections at this site
  - Increased sampling effort in riffle habitats when using RLP specific methods

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Fish Community Study

Impingement and Entrainment Assessment Methods

- Compiled intake specifications, flow characteristics, and calculated approach velocity
- Identified target species/groups
- Assessed potential of impingement or entrainment
  - Intake avoidance (swim burst speed comparison)
  - Size exclusion (max length:width scaling)
  - Early life stage entrainment (spawning periodicity)
- Evaluated entrainment rate based on EPRI entrainment database

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Fish Community Study

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Fish Community Study

- Target species/groups

Common Name	Scientific Name
Largemouth Bass	*Micropterus salmoides*
Smallmouth Bass/Spotted Bass	*Micropterus dolomieu/M. punctulatus*
Black Crappie	*Pomoxis nigromaculatus*
Rock Bass	*Ambloplites rupestris*
Lepomis Sunfishes	*Lepomis* spp.
Shiners, Chubs, and Minnows	Leuciscinae
Bullheads and Madtoms	*Ameiurus* spp. and *Noturus* spp.
Catfishes	*Ictalurus* spp.
Suckers and Redhorse	Catostomidae and Moxostoma spp.
Darters	*Etheostoma* spp.
Roanoke Logperch	*Percina rex*

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Fish Community Study

Impingement and Entrainment Assessment Results

- Intake avoidance
  - Approach velocity - 1.1 fps
  - Swim burst speeds indicate that most juvenile and adult species can avoid the intake
- Size exclusion (impingement assessment)
  - Except for Channel Catfish, all target and surrogate species would pass through the trash racks (and be entrained)
- Early life stage entrainment susceptibility
  - Spawning May-June, subsequent egg and larvae development June-August
  - Many species spawning requirements are not found in the vicinity of the intake structure; therefore, entrainment potential is considered low for most early life stages.

Fish Community Study

Impingement and Entrainment Assessment Results

- Fish entrainment rate analysis
  - 88% of entrainment consisted of fish less than six inches in length
  - Dominant species entrained
    - Catfishes, Rock Bass, suckers and redhorses, *Lepomis* sunfishes, and Black Crappie
    - Peak entrainment occurred in April, July, and October
    - Entrainment susceptibility varied temporally and by species
    - Most target species/groups have low entrainment potential for most of the year
    - Roanoke Logperch considered low risk of entrainment due to a lack of required habitat (for any life stage) in the vicinity of the intake

Variances from FERC-approved Study Plan

Variances from FERC-approved Study Plan:

- Intake velocity
  - Unable to evaluate with ADCP due to high low events and station operation
  - Determined using desktop calculation

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Variances from FERC-approved Study Plan

Proposed Changes to the 2020-2021 Study Plan Schedule for the Niagara Project (FERC No. 2466)		
	Activity	**Proposed Timeframe for Completion (January 2021 update)**
Fish Community Study	Study Planning and Existing Data Review	Completed (July 2020)
	Fish Community Study	Completed (September – November) 2020
	Roanoke Logperch Adult Surveys (*spring sampling conditioned on receipt of waiver from USFWS for sampling within time-of-year restriction period*)	May – June 2021, August – October 2021
	Roanoke Logperch Young-of-Year Surveys	August – October 2021
	Roanoke Logperch Larval Surveys	April – June 2021
	Desktop Impingement and Entrainment Evaluation and Turbine Blade Strike Analysis	Impingement and Entrainment Evaluation Completed (December 2020) Turbine Blade Strike Analysis (July – December 2021)
	Distribute Draft Study Report with the ISR/USR	ISR Completed (January 2021) USR December 2021

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Benthic Aquatic Resources Study

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Benthic Aquatic Resources Study

- **Study Goal:** Obtain current information on the benthic aquatic community in the Roanoke River in the vicinity of the Project to support an analysis of Project effects
- **Specific Objectives:**
  - 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 using two temporally independent sampling efforts (fall 2020 index period and spring 2021 index period); and
  - Identify potential habitat and characterize mussel communities within the Study Area.

Benthic Aquatic Resources Study

Study Status

- Appalachian has partially completed study activities for the Benthic Aquatic Resources Study in accordance with the schedule and methods described in the RSP and SPD.
  - Completed fall 2020 sampling
  - Taxonomic identification in process
  - Spring sampling scheduled for 2021

Benthic Aquatic Resources Study

Summary of Study Methods

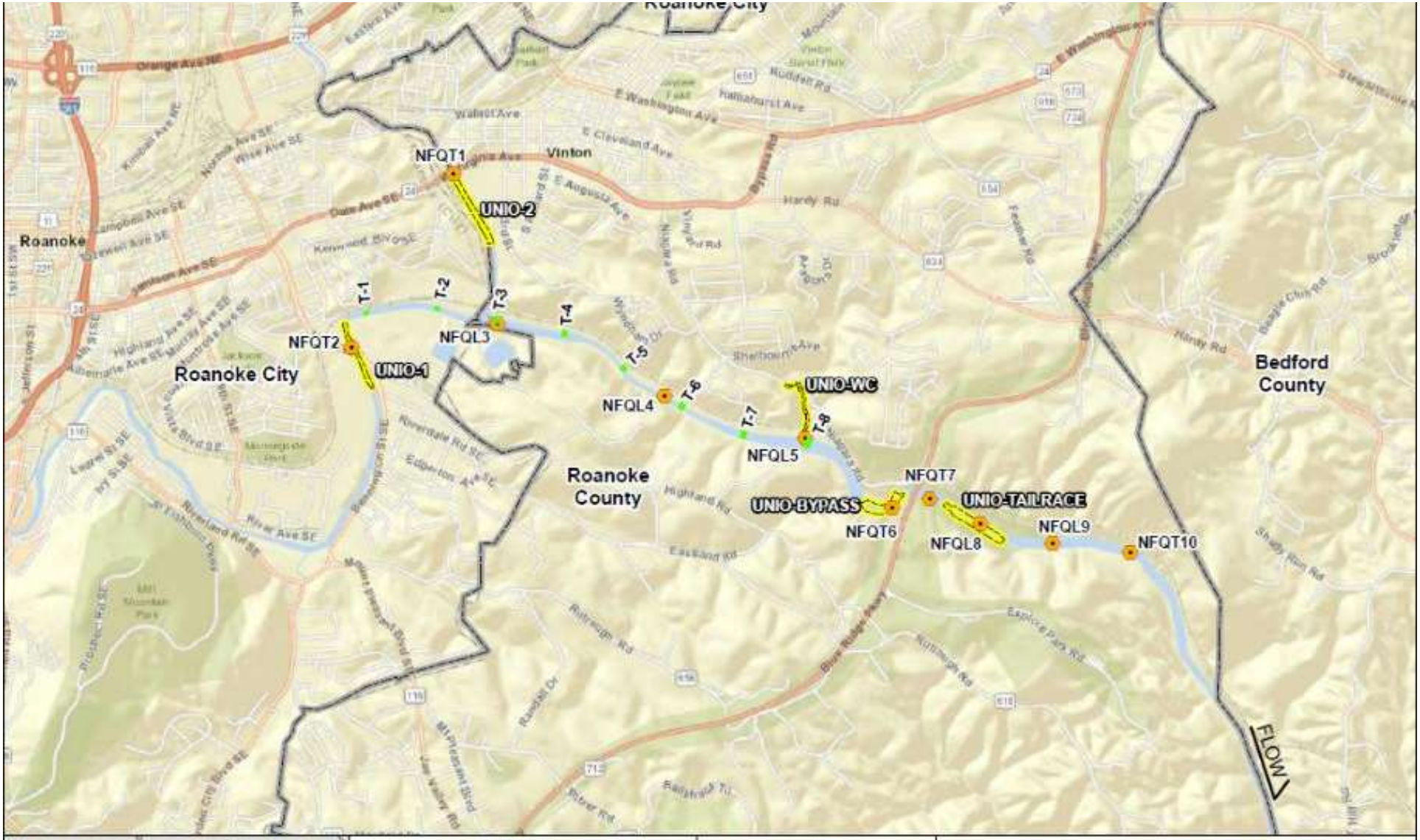
- Macroinvertebrates and crayfish:
  - Visual habitat assessment
  - Qualitative and quantitative sampling

- Mussels:
  - Literature review
  - Compilation of results of prior surveys completed in Project vicinity
  - Quantitative transects and qualitative abbreviated samples

Benthic Aquatic Resources Study

Macroinvertebrate and Crayfish Study Methods

- September 15-16 and October 5, 2020
- Quantitative Transect Samples
  - 5 riffle/run sites along 100-m transects, 2 above and 3 below Niagara dam
  - Each site consists of 6 kick net sets composited into one sample
  - Each sample equals approximately 2 square meters
  - Crayfish data supplemented with seine hauls
- Qualitative Abbreviated Samples
  - 5 pool sites, 3 above and 2 below Niagara dam
  - 20 dip-net grabs of representative habitats in proportion to their availability
  - Each sample covers approximately 1 linear meter of habitat



Legend

- Macroinvertebrate Sample Location
- Mussel Survey Transect
- Mussel Survey Area
- County Boundary

N

0 0.5 1

Kilometers

Scale: 1:39,370

American Electric Power

Niagara Dam Benthic Aquatic Resource Study

Figure 1

Overall Niagara project area including quantitative (NFQT) and qualitative (NFQL) macroinvertebrate survey sites and transect (T) and abbreviated (UNIO) mussel survey sites on the Roanoke River in Roanoke County, Virginia

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Benthic Aquatic Resources Study

Macroinvertebrate and Crayfish Study Results

- Taxonomic identification of macroinvertebrates in process
- 5 species of crayfish collected and identified in the field during survey efforts at 8 of the 10 sites
- *Native Species*
  - Collected two native species upstream and one downstream of dam
  - Appalachian Brook Crayfish (*Cambarus bartoni bartoni*)
  - Atlantic Slope Crayfish (*Cambarus longulus*)
- *Invasive Species*
  - Collected two species upstream and three species downstream of dam
  - Ozark Crayfish (*Faxonius ozarkae*) – present at all sites where crayfish collected
  - Virile Crayfish (*Faxonius virilis*)
  - Red Swamp Crayfish (*Procambarus clarkii*)

Atlantic Slope Crayfish

Virile Crayfish

Benthic Aquatic Resources Study

Mussel Habitat and Community Survey Methods

- October 6-8, 2020
- Snorkeling, viewscope, and/or Surface Supplied Air
- Transect surveys
  - Eight 30-75 meter transects spaced 500 meters apart in impounded reach
  - Divers search approx. 1 min/square meter using surface supplied air
- Abbreviated surveys
  - Five sites outside of impounded reach
  - Divers used viewscopes, snorkeling, and Surface Supplied Air to first identify potential habitat and then search approx. 1 min/square meter

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Benthic Aquatic Resources Study

Mussel Habitat and Community Survey Results

- Transect surveys
  - 8 transects covered approx. 430 square meters of impoundment
  - No live mussels nor dead shell specimens
- Abbreviated sites
  - 5 unimpounded sites were searched approximately 1,335 minutes
  - 4 live unionids representing one species, Eastern Elliptio (*Elliptio complanata*)
  - Specimens collected from sites with most suitable mussel habitat, the upper most riffle site in the Roanoke River and a riffle site in Tinker Creek
  - No mussels collected downstream of the dam

Eastern Elliptio

Notched Rainbow

Variances from FERC-approved Study Plan

Restrictions on non-essential travel and safety considerations for field staff prohibited spring 2020 field efforts.

Proposed Changes to the 2020-2021 Study Plan Schedule for the Niagara Project (FERC No. 2466)		
	Activity	**Proposed Timeframe for Completion (January 2021 update)**
Benthic Aquatic Resources Study	Study Planning and Existing Data Review	Completed (August 2020)
	Benthic Habitat Assessment	Completed (September 2020)
	Macroinvertebrate and Crayfish Community Study	Completed (September 2020) April – May 2021
	Mussel Habitat and Community Survey	Completed (October 2020)
	Distribute Draft Study Report with the ISR/USR	ISR Completed (January 2021) USR December 2021

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5-Minute Break

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Bypass Reach Flow and Aquatic Habitat Study

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Bypass Reach Flow and Aquatic Habitat Study

Study Goal: Conduct a flow and habitat assessment of the Project's tailrace and bypass reach using desktop, field survey, and hydraulic/habitat modeling methodologies

Specific Objectives

- Delineate and quantify aquatic habitats and substrate types within the bypass reach
- Identify and characterize locations of habitat management interest within the bypass reach
- Determine surface water travel times and water surface elevation responses at various gate openings to:
  - Evaluate potential available habitat at the existing 8 cfs minimum bypass flow requirement
  - Evaluate potential seasonal minimum flow releases in the bypass reach

Bypass Reach Flow and Aquatic Habitat Study

Study Status

Appalachian initiated the Bypass Reach Flow and Aquatic Habitat Study in accordance with the methods described in the RSP and SPD

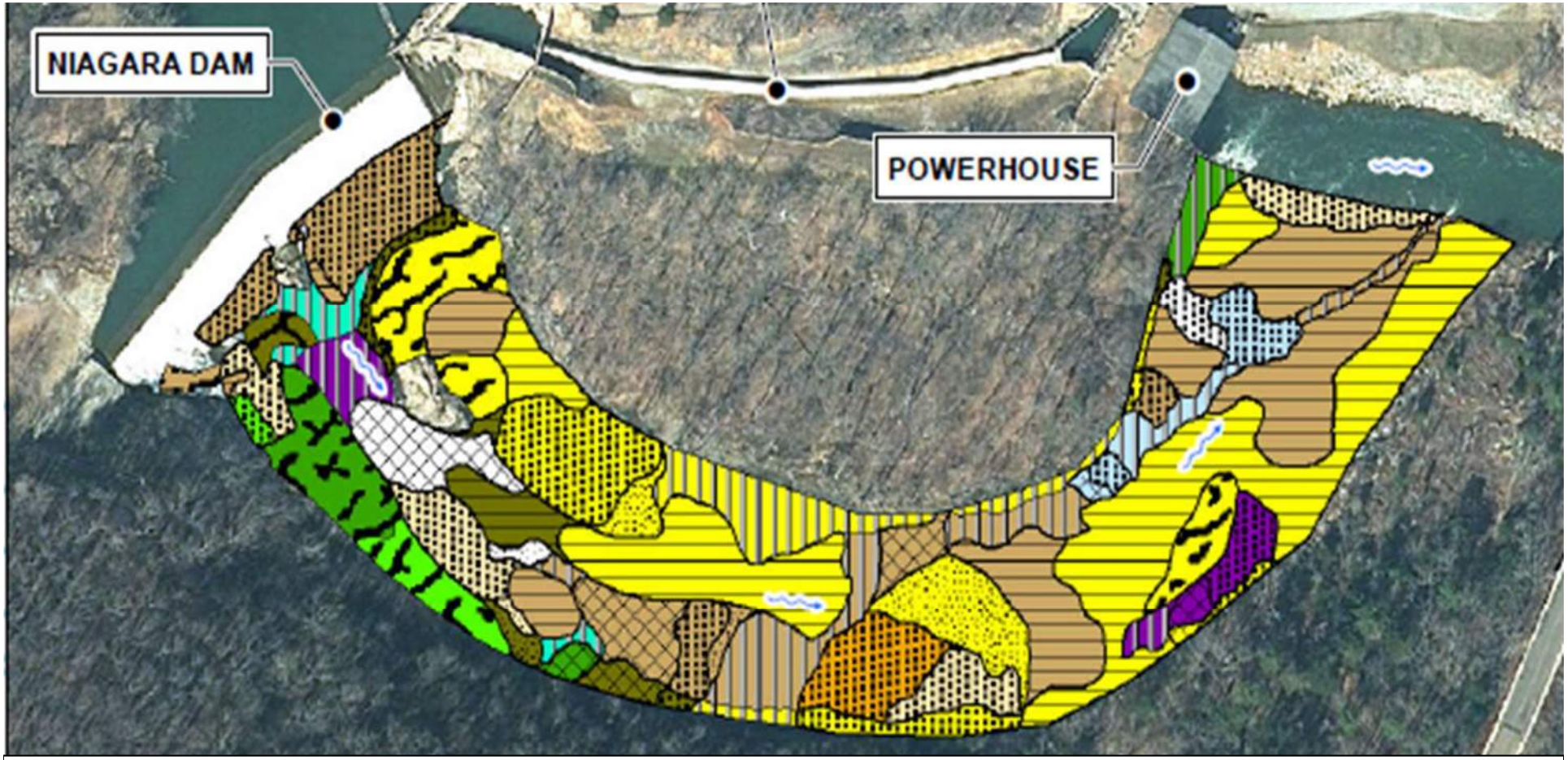
Preliminary Summary of Study Methods and Results

- Completed desktop habitat mapping and evaluation of Project inflows
- Assembled/Developed Habitat Suitability Index (HSI) criteria
- Developed a model calibration target flow recommendation

NIAGARA DEVELOPMENT BYPASS REACH STUDY AREA

NIAGARA HYDROELECTRIC PROJECT (FERC NO. 2466)

ROANOKE COUNTY, VIRGINIA



Mesohabitat Type

- Glide
- Pool
- Riffle
- Run
- Shoal
- Upland

Cover, Substrate Catagories

- No Cover, and Boulder
- No Cover, and Boulder, Bedrock, or Woody Debris
- No Cover, and Cobble
- No Cover, and Gravel
- No Cover, and Mud or Bedrock
- No Cover, and Sand
- No Cover, and Small Boulder
- Overhead Veg and Boulder, Bedrock, or Woody Debris
- Overhead Veg, and Cobble
- Overhead Veg, and Gravel
- Overhead Veg, and Sand

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Summary of Aquatic Habitat Characteristics

Habitat Characteristics	Area (ac.)	Percent
Cover		
Overhead Vegetation	3.45	50.9
No Cover	3.34	49.1
Substrate		
Boulder, Bedrock, or Woody Debris	5.10	75.1
Sand	0.55	8.1
Cobble	0.54	7.9
Gravel	0.42	6.1
Small Boulder	0.19	2.8
Mesohabitat		
Shoal	2.51	37.0
Pool	1.68	24.8
Riffle	1.00	14.8
Upland	0.77	11.3
Run	0.49	7.2
Glide	0.34	4.9

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Species of Interest RLP and Guilds

Species or Guild	Life Stage/ Category	Representative
Roanoke Logperch	Adult	--
	Subadult	--
	Young-of-Year	--
Shallow-Slow Guild	Fine substrate, no cover	Redbreast Sunfish spawning
	All substrate with aquatic vegetation	Silver Redhorse Young-of-Year
	Coarse substrate	Generic shallow-slow guild
Shallow-Fast Guild	Moderate velocity with coarse substrate	Generic shallow-fast guild
Deep-Slow Guild	Cover	Redbreast Sunfish Adult
	No cover	Generic deep-slow guild
Deep-Fast Guild	Slightly weighted for fine substrate, Cover	Silver Redhorse adult
	Coarse-mixed substrate	Shorthead Redhorse adult

Redbreast Sunfish
Courtesy: Virginia DWR

Silver Redhorse
Courtesy: USGS

Shorthead Redhorse
Courtesy: Iowa DNR

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Roanoke Logperch Habitat Suitability Indices

Habitat Suitability Criteria	Habitat Suitability Index*		
Mean Velocity (m/s)	**Adult**	**Subadult**	**YOY**
0	0.00	0.00	0.26
0.01-0.04	0.03	0.00	1.00
0.04-0.1	0.26	1.00	0.08
0.11-0.4	0.70	0.17	0.00
>0.41	1.00	0.24	0.00
Depth (cm)	**Adult**	**Subadult**	**YOY**
0-15	0.00	0.00	0.06
16-30	0.10	0.68	1.00
31-50	0.91	1.00	0.00
>51	1.00	0.25	0.00
Substrate (rank)	**Adult**	**Subadult**	**YOY**
<3	0.03	0.00	0.00
4-6	1.00	1.00	1.00
7	0.10	0.66	0.00
8-9	0.25	0.10	0.00

*Based on Rosenberger and Angermeier (2003)

Male Roanoke Logperch
Courtesy: The Roanoke Star News

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Proposed Model Calibration Target Flows

- Newly Installed Obermeyer Gate Capacity: 7 – 287 cfs
- Proposed steady-state model calibration flows:

  8 cfs, 20 cfs, 50 cfs, and 115 cfs
- Level loggers will be installed to capture water surface elevations during higher bypass flow events

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Bypass Reach Flow and Aquatic Habitat Study

2021 Study Activities

- Collect model calibration data at steady-state target flows
- Develop 2-D hydraulic model (Innovyze Infoworks Integrated Catchment Model)
- Simulate potential aquatic habitat under various bypass flow scenarios
- Evaluate existing 8 cfs minimum flow requirement
- Evaluate potential seasonal minimum flow releases in the bypass reach

Variances from FERC-approved Study Plan

The Bypass Reach and Habitat Assessment Study is being conducted in conformance with the Commission's SPD.

Proposed Changes to the 2020-2021 Study Plan Schedule for the Niagara Project (FERC No. 2466)		
	Activity	**Proposed Timeframe for Completion (January 2021 update)**
Bypass Reach Flow and Aquatic Habitat Study	Topographic Mapping and Photogrammetry Data Collection	Completed (January 2020)
	Desktop Habitat Assessment	Completed (December 2020)
	Mesohabitat Mapping and Substrate Characterization Field Data Collection	June - August 2021
	Distribute Proposed Flow Test Scenario Framework to Interested Parties for Review	Completed (January 2021)
	Conduct Flow and Water Level Assessment and Hydraulic Model Development	June – October 2021
	Distribute Draft Study Report with the ISR/USR	ISR Completed (January 2021) USR December 2021

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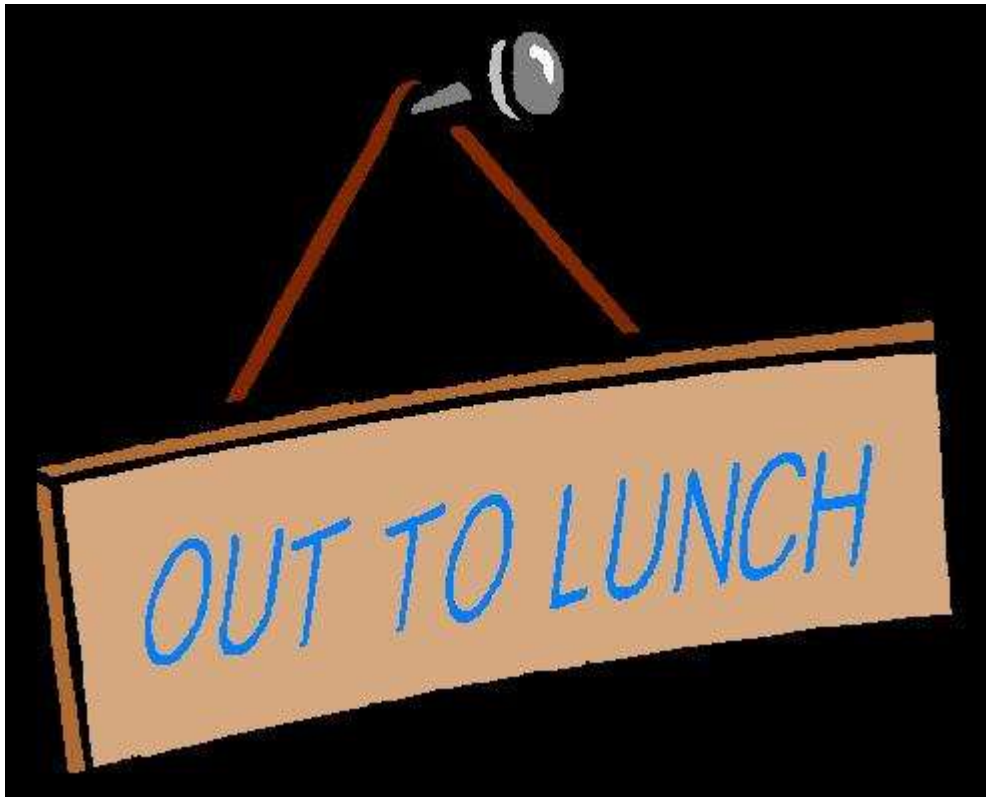
30-minute lunch break



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Water Quality Study

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Water Quality Study

Study Goal: Conduct a study to support an analysis of the potential Project-related effects on water quality

Specific Objectives:

- Gather baseline water quality data sufficient to determine consistency of existing Project operations with applicable Virginia state water quality standards and designated uses
- Provide data to determine the presence and extent, if any, of temperature or dissolved oxygen (DO) stratification in the Niagara impoundment
- Provide data to support a Virginia Water Protection Permit application (CWA Section 401 Certification)
- Provide information to support evaluation of whether additional or modified protection, mitigation, and enhancement (PM&E) measures may be appropriate for the protection of water quality at the Project

Water Quality Study

Study Status

Appalachian has initiated and completed the Water Quality Study in accordance with the schedule and methods described in the RSP and SPD

Summary of Study Methods and Results

- Study period: July 29 – November 10, 2020
- Temperature and DO data collected at 15-minute intervals
- Discrete data collected during equipment installation, download events, and demobilization (temperature, DO, pH, and specific conductivity)
- Vertical profile data collected during discrete data collection events

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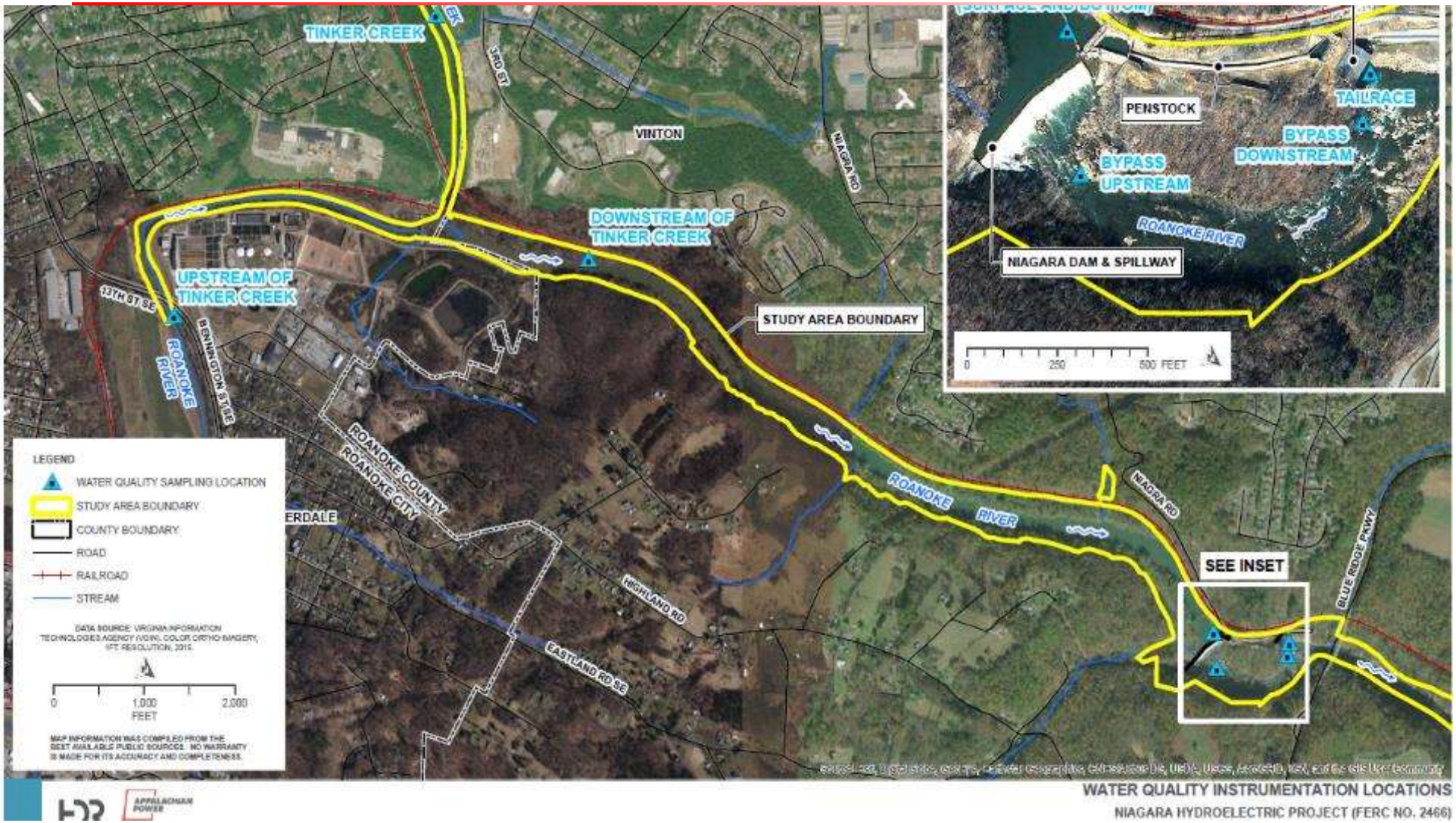
Water Quality Study Area



WATER QUALITY INSTRUMENTATION LOCATIONS

NIAGARA HYDROELECTRIC PROJECT (FERC NO. 2466)

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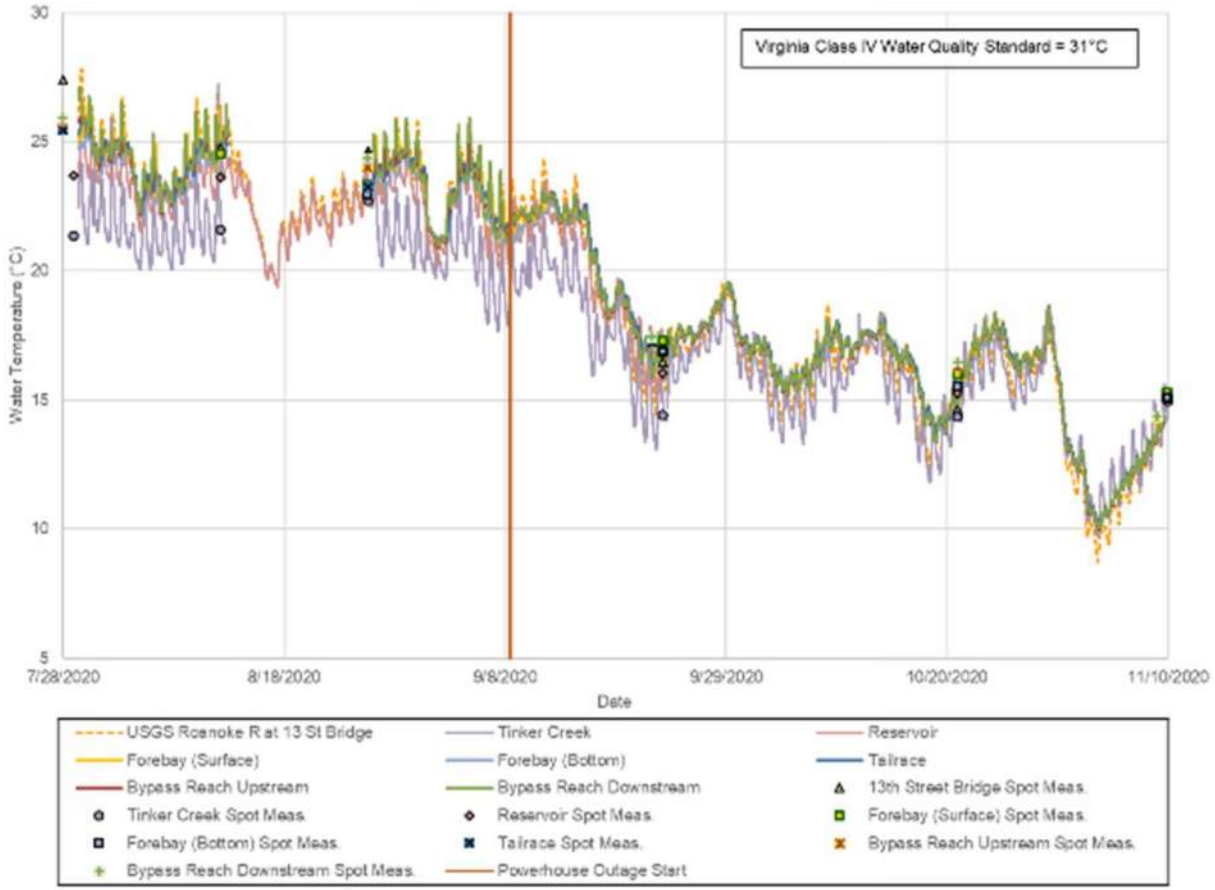
Water Temperatures



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Dissolved Oxygen Upstream Monitoring

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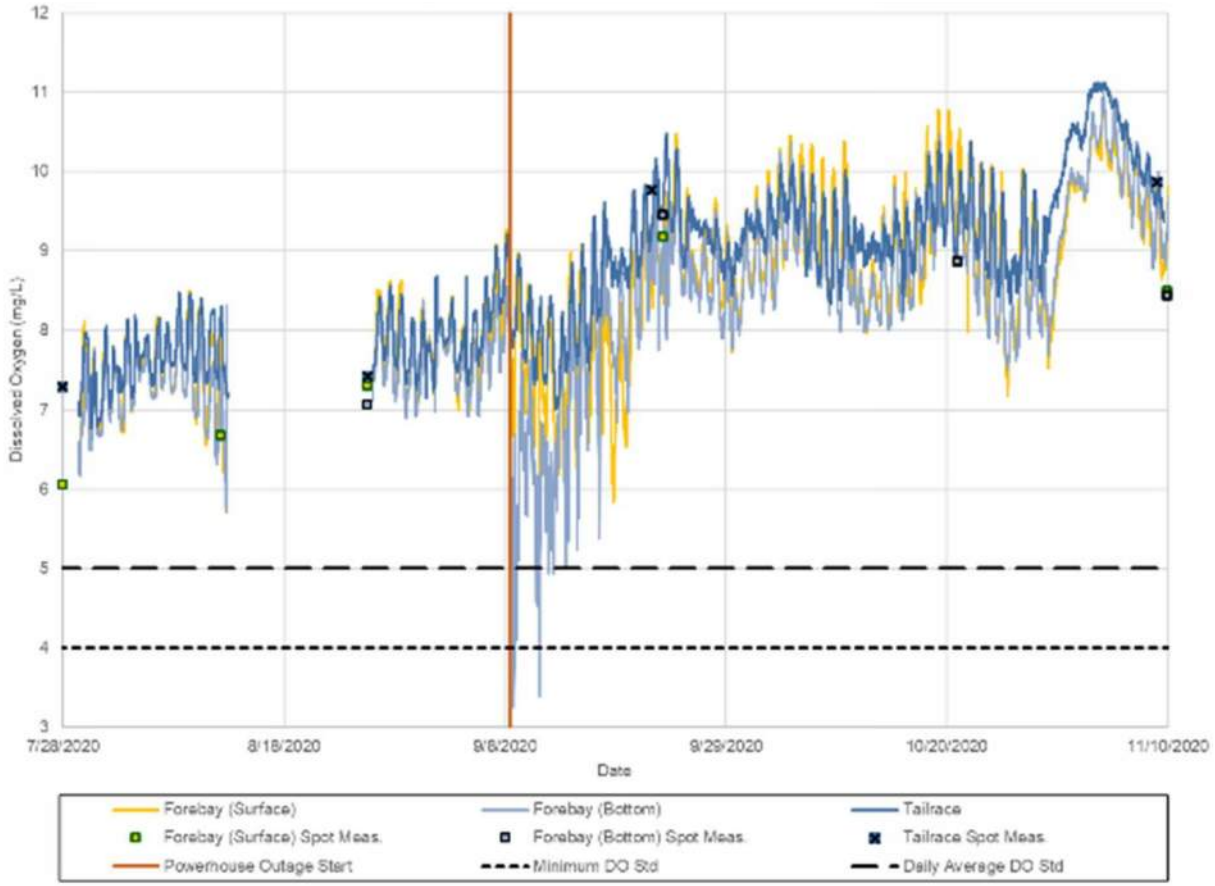
Dissolved Oxygen Forebay and Tailrace



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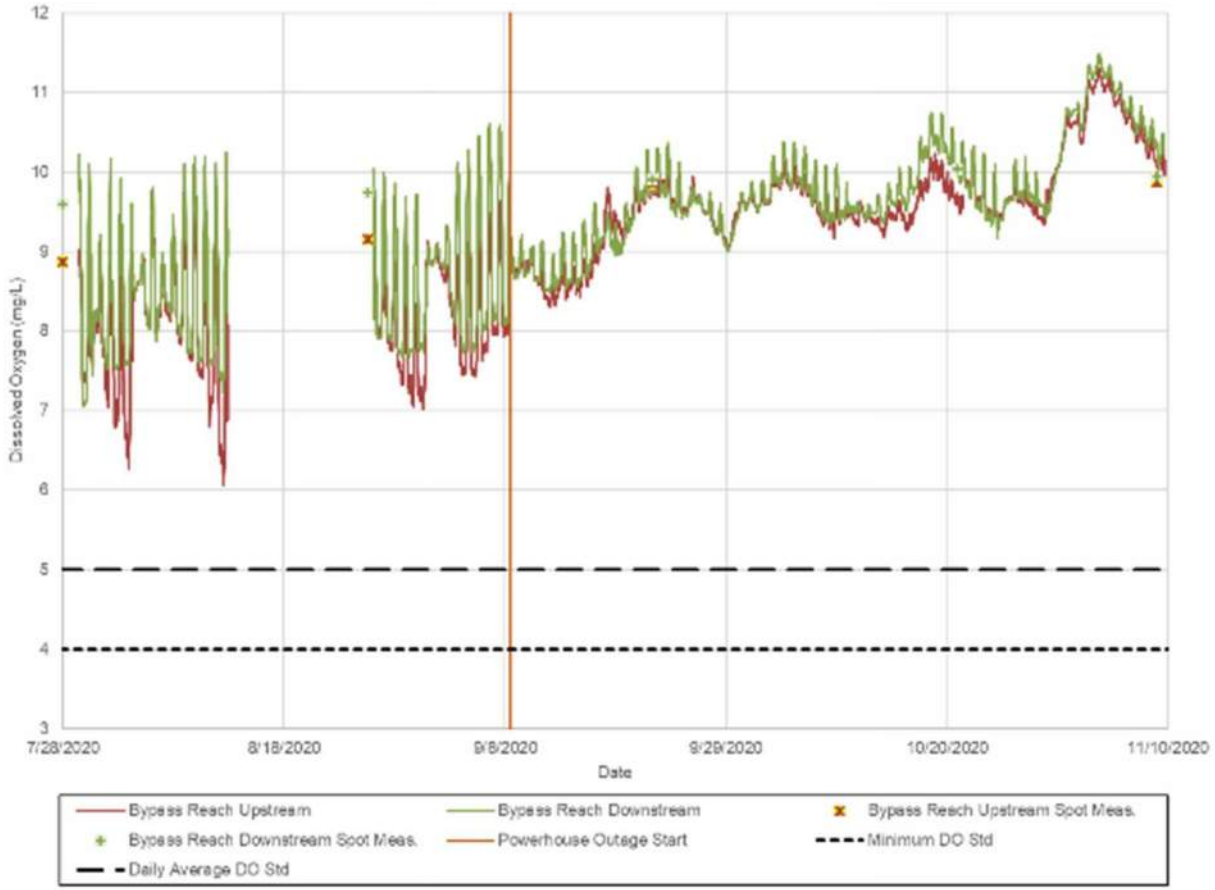
Dissolved Oxygen Bypass Reach



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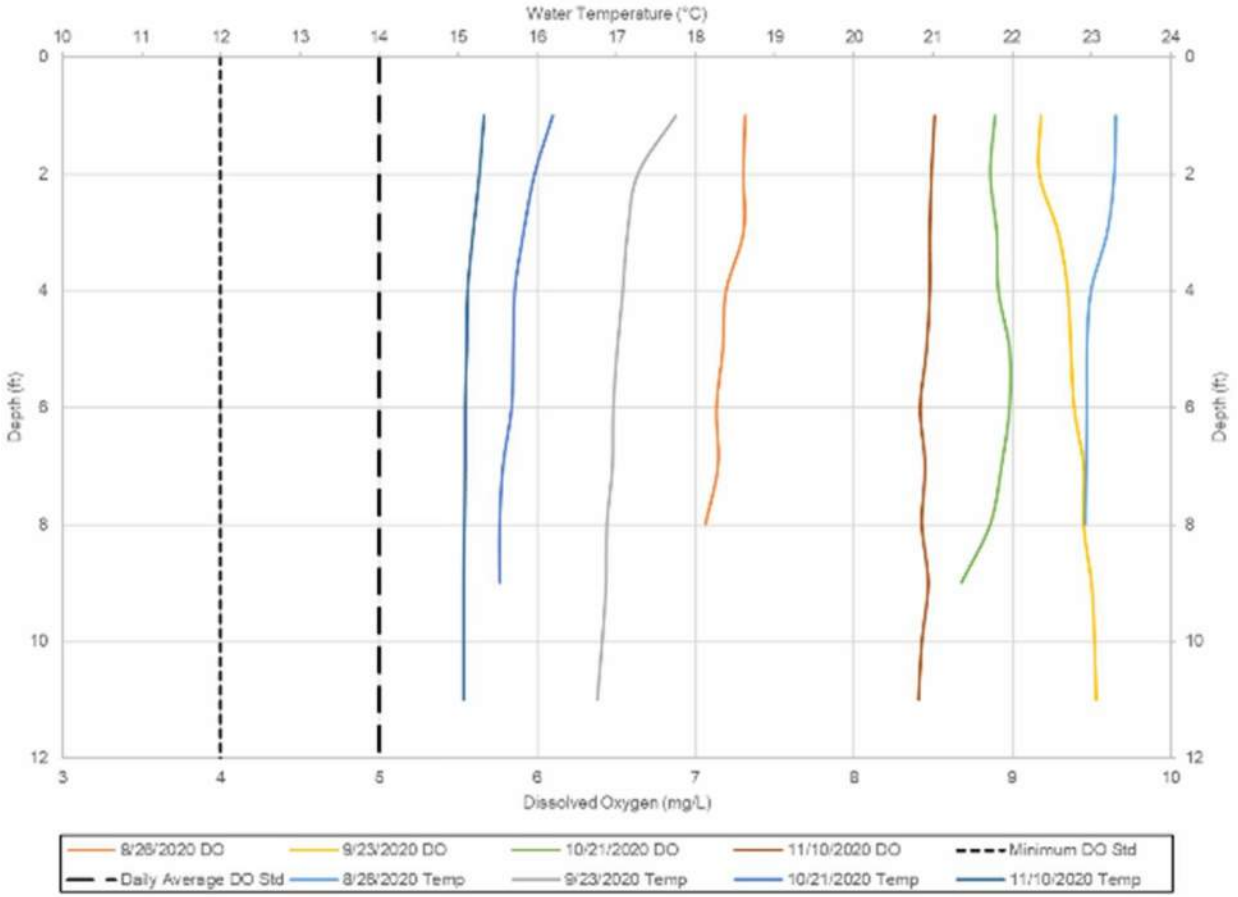
Forebay Vertical Profiles Temperature and DO



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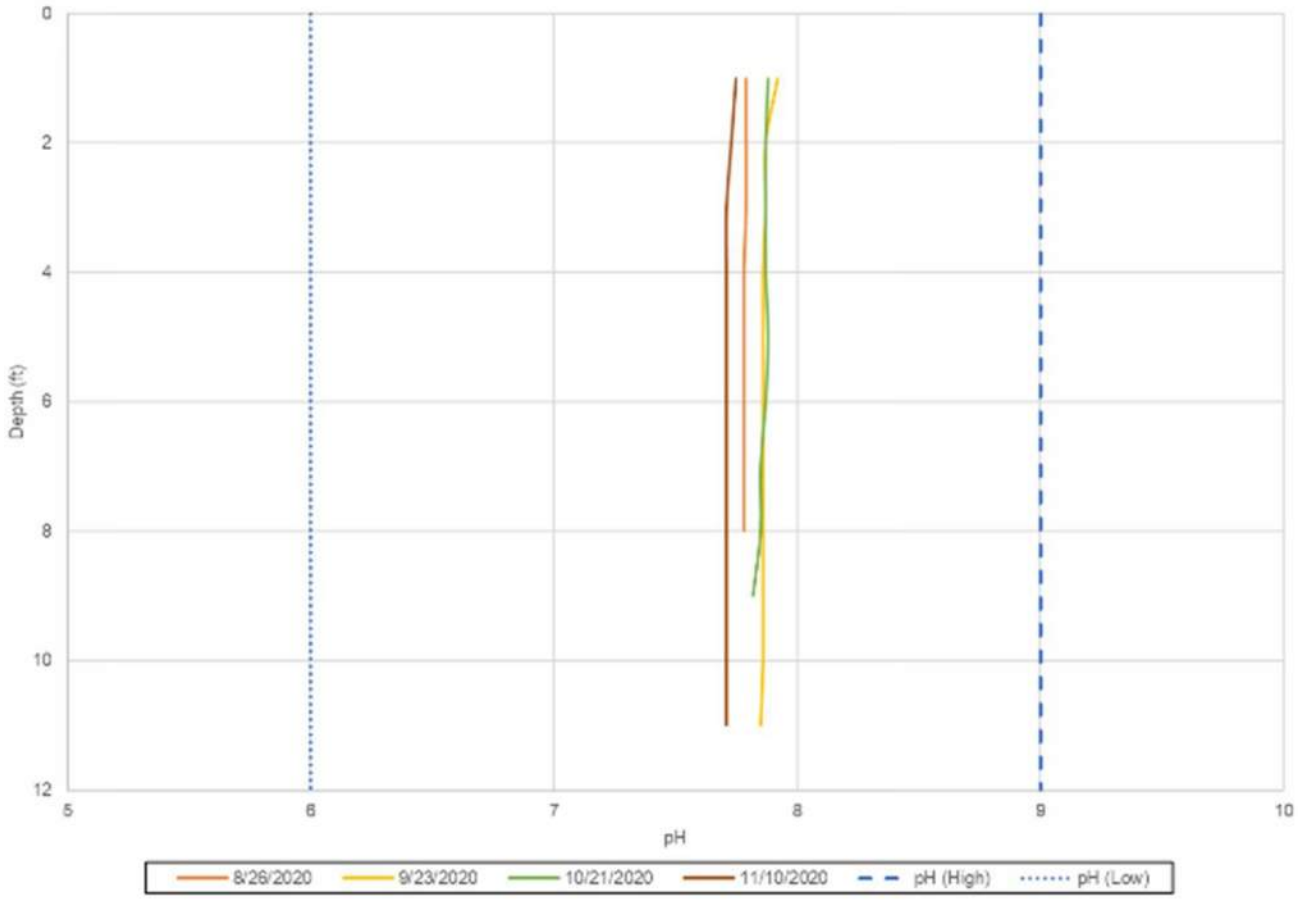
Forebay Vertical Profiles
pH



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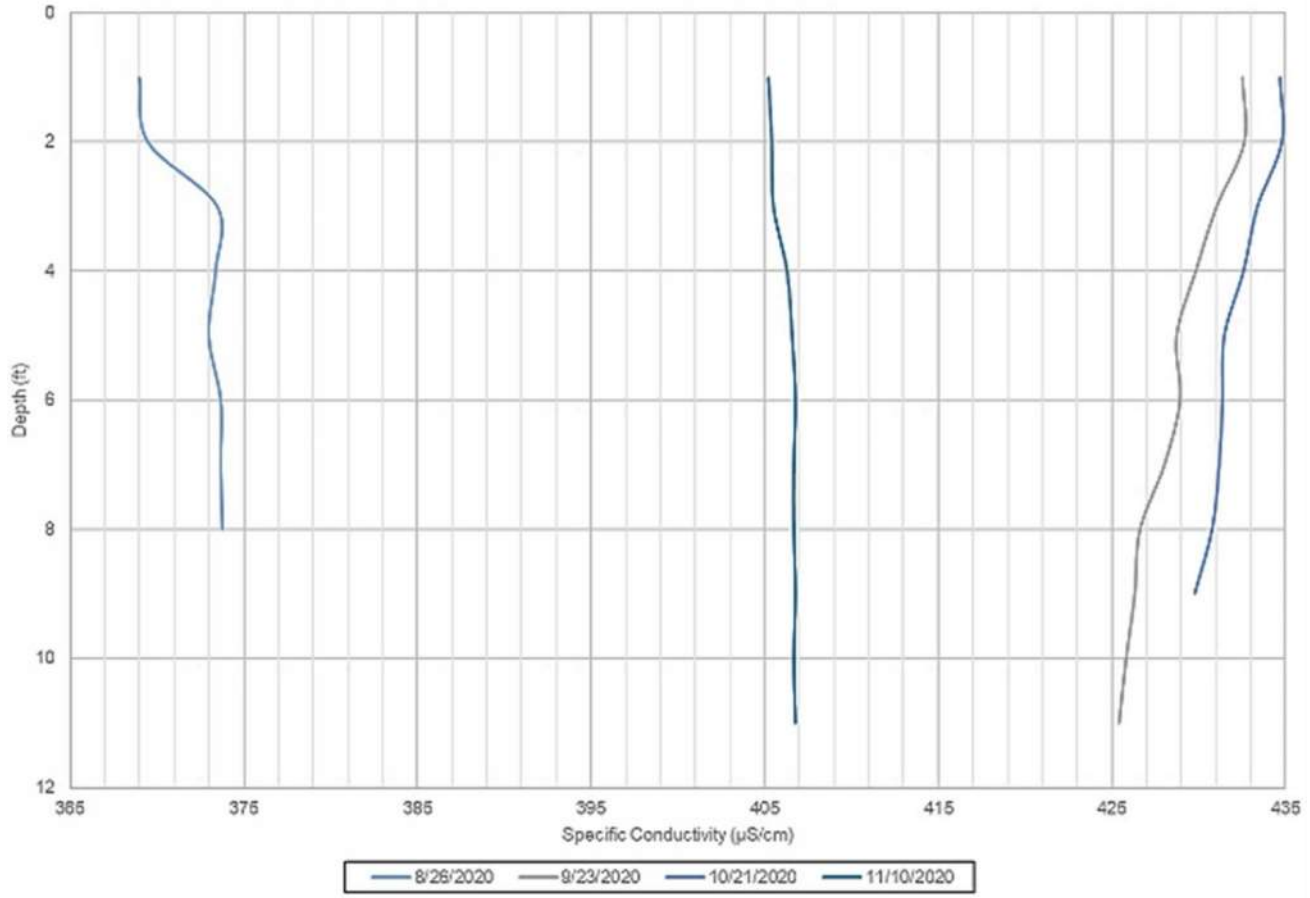
Forebay Vertical Profiles Specific Conductivity



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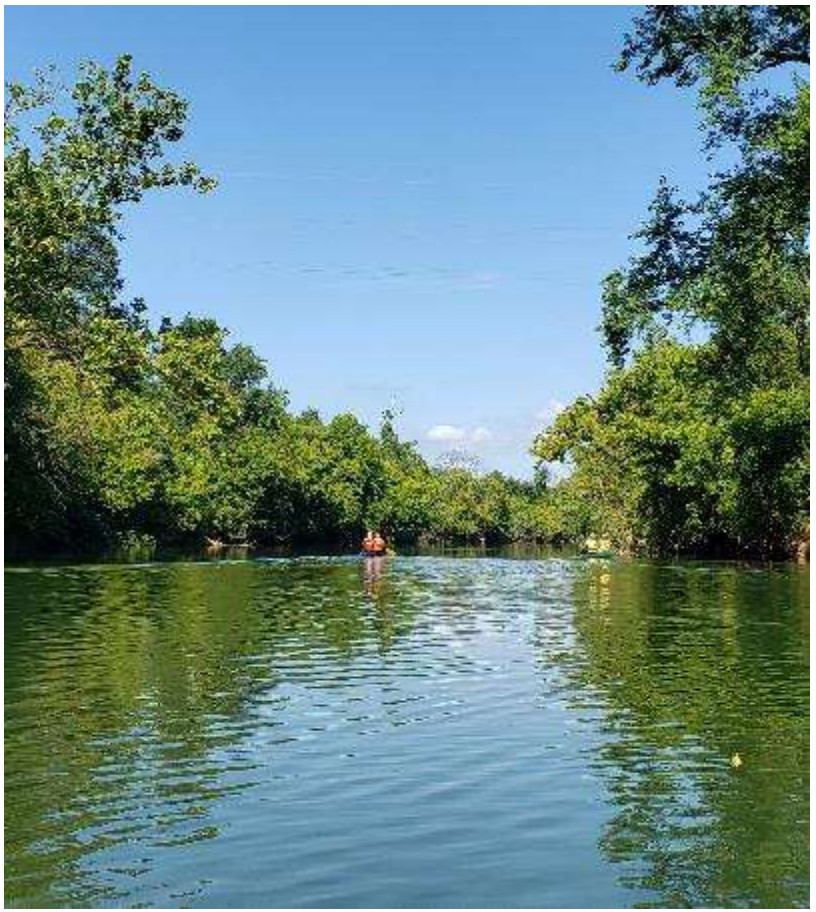
Water Quality Study Summary and Conclusions

- Water temperatures, DO concentrations, and pH measurements met Virginia Class IV (Roanoke River) and Class VII (Tinker Creek) water quality standards
- Specific conductivity range is suitable for aquatic species
- Little to no thermal or DO stratification at the reservoir and forebay monitoring locations
- As a result, no need for additional PM&E measures to protect water quality at the Project



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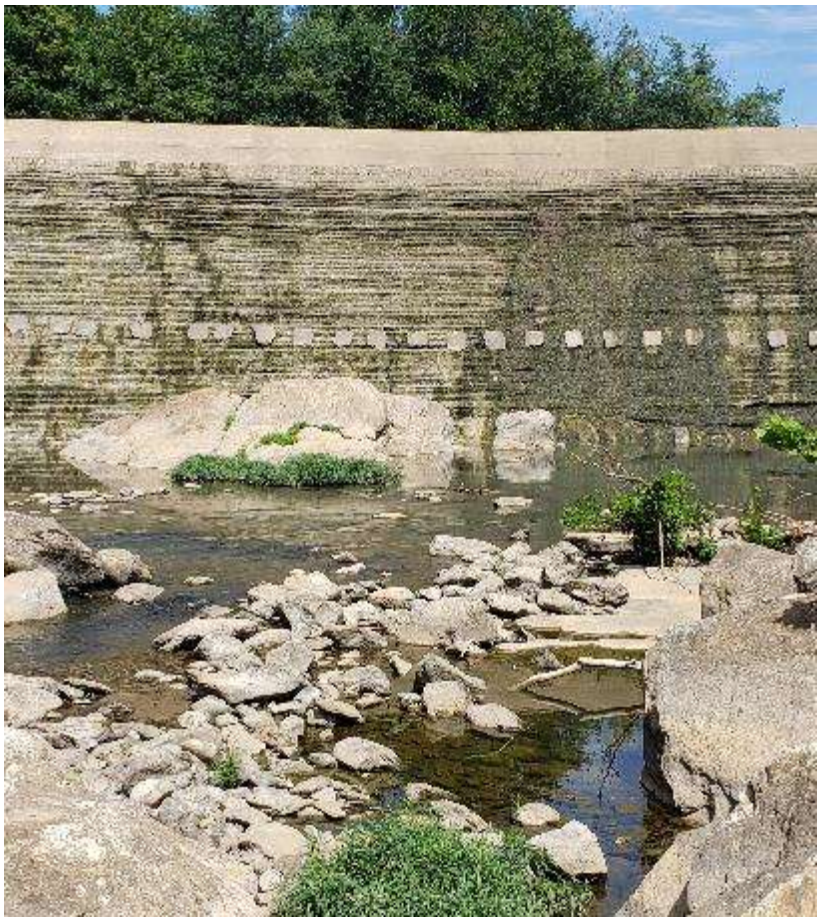
Additional Water Quality Data Needs (Bypass Reach)



- Water quality measurements in the bypass reach met Virginia Class IV standards
- Bypass reach flows were higher than normal during the 2020 data collection period
- Recommend re-installing the two bypass reach monitoring locations during July-August 2021 to collect supplemental data during the warmest portion of the summer when bypass reach flows should be closer to normal

Variances from FERC-approved Study Plan

The Water Quality Study was conducted in conformance with the Commission's SPD.

Proposed Changes to the 2020-2021 Study Plan Schedule for the Niagara Project (FERC No. 2466)		
	Activity	**Proposed Timeframe for Completion (January 2021 update)**
Water Quality Study	Study Planning and Existing Data Review	Completed (August 2020)
	Continuous and Monthly Water Quality Monitoring (Dissolved Oxygen and Temperature)	Completed (August – November 2020)
	Bypass Reach Continuous Dissolved Oxygen and Temperature Monitoring	July – August 2021 (Supplemental)
	Distribute Draft Study Report with the ISR/USR	ISR Completed (January 2021) USR December 2021

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Recreation Study

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Recreation Study

Study Status

- Appalachian has commenced the Recreation Study in accordance with the RSP and the Commission's SPD.

Task	Status
Recreation Facility Inventory and Condition Assessment	Completed in January 2020.
Existing and Future Recreational Opportunities	Postponed until Q1 2021.
Recreation Visitor Use Online Survey	Preliminary data provided. Survey has been extended through October 2021.
Recreational Use Documentation	Postponed until May 2021.
Aesthetic Flow Documentation	Completed (potential for one more visit to capture bypass reach minimum flow conditions in 2021).
Recreational Flow Release Desktop Evaluation	Completed in November 2020.

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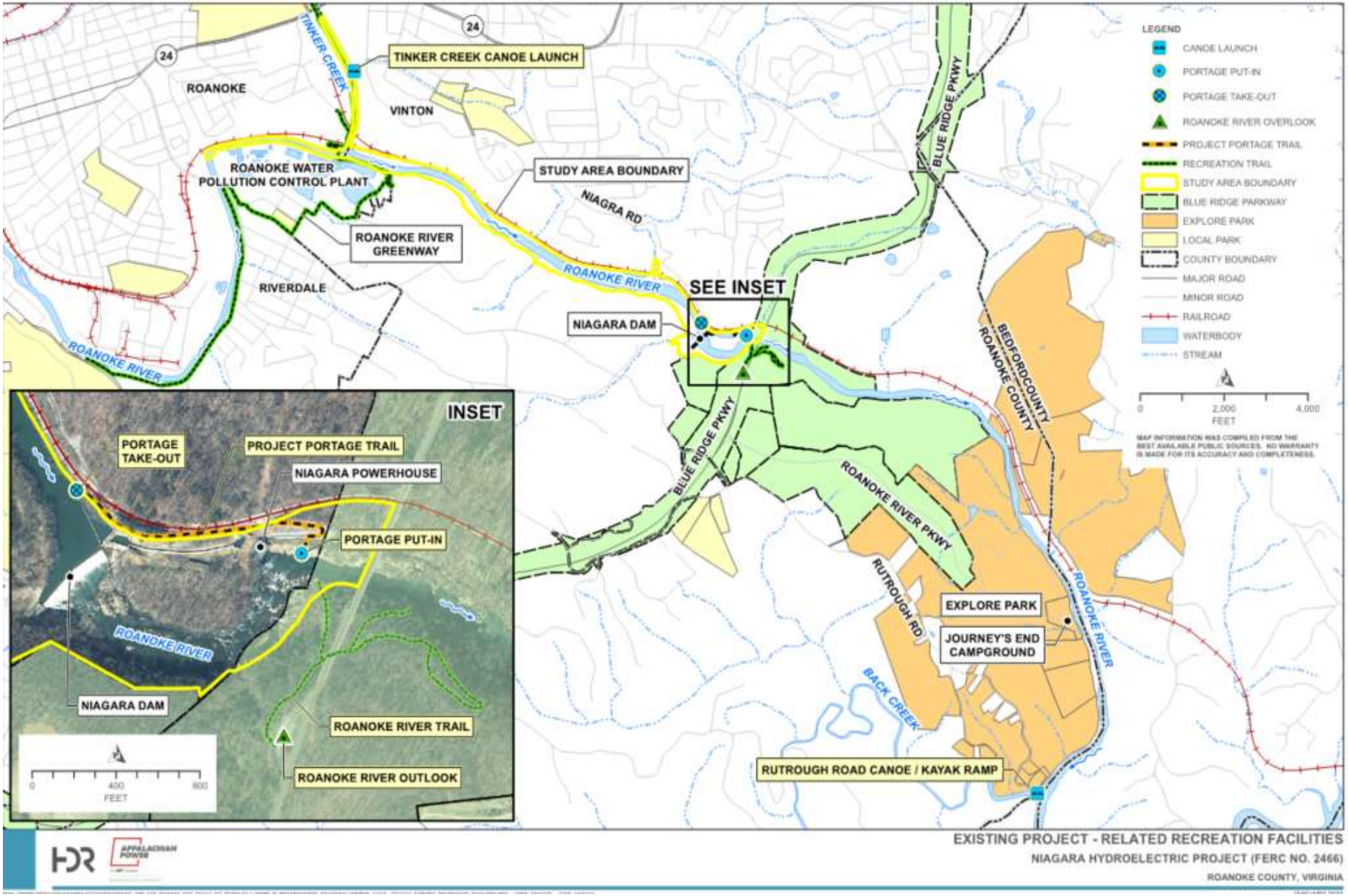
Recreation Study

Study Goal: 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.

Existing Project and Non-Project facilities:

- Project Canoe Portage Trail (Project Facility) includes a take-out and put-in below the Niagara dam.
- Tinker Creek Canoe Launch (Non-Project Facility) is upstream of the Niagara dam.
- The Roanoke River Trail (Non-Project Facility) includes a short-inclined trail and access to fishing in the bypass reach.
- Rutrough Road Canoe/Kayak Ramp (Non-Project Facility) is 3RM downstream from the Niagara dam.



EXISTING PROJECT - RELATED RECREATION FACILITIES

NIAGARA HYDROELECTRIC PROJECT (FERC NO. 2466)

ROANOKE COUNTY, VIRGINIA

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Recreation Study: Recreation Facility Inventory and Conditions Assessment

Summary of Study Methods (October 2019)

- Young Energy Services (YES) staff conducted a field inventory and qualitative assessment of the condition of the four Project and Non-Project facilities.

Recreation Facility Inventory and Conditions Assessment: Project Portage Trail

Existing Facilities:

- Timber steps at take-out.
- Boat barrier upstream of spillway.
- Portage Trail shares access road.
- Rock outcrop at put-in.
- Signage at take-out, put-in and along trail.

Condition:

- Portage path 10 ft. to 12 ft. wide. Slope up to 10%. Primarily gravel surface. Good condition.
- Take-out poorly signed and difficult to use. Debris and silt on steps.
- Put-in along rocks somewhat difficult to use.
- Number of signs adequate. Some signs are worn and faded.
- No sanitary facilities or trash receptacles.

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Niagara Project Canoe Portage

Steps at Take-Out

Portage Trail at Take-Out

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Niagara Project Canoe Portage

Boat Barrier

Trail/Access Road

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Niagara Project Canoe Portage

Put-in at River

Signs at Put-In

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Recreation Facility Inventory and Conditions Assessment: Tinker Creek Canoe/Kayak Access

Existing Facilities:

- Parking for 23 vehicles of which 5 designated for boaters (one ADA).
- Concrete ramp to Tinker Creek
- Timber storage rack that can hold 6 canoes/kayaks.
- Excellent signage and postings provided.

Condition:

- Parking area paved and in good condition.
- Ramp in good condition.
- Put-in rocky and shallow.
- Storage rack in good condition.
- Signage is adequate and kept in good condition.
- No sanitary facilities or trash receptacles.

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Tinker Creek Canoe Access

Concrete Ramp

Tinker Creek at End of Ramp

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Tinker Creek Canoe Access

Canoe/Kayak Storage

Example of An Information Sign

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Tinker Creek Canoe Access

Shared Parking Area

Boater Only Parking

Recreation Facility Inventory and Conditions Assessment:
Roanoke River Trail

Existing Facilities

- 35 asphalt paved parking spaces.
- Upper trail portion: asphalt paved; Mid-Section: gravel surface; Lower Section has 200 timber steps with gravel fill.
- Rock outcropping providing bank fishing area at end of steps.
- No sanitary facilities. Trash receptacle provided at parking area.
- Information sign and benches provided at observation sites along steps.

Condition

- Parking area in good condition (No ADA).
- Trail in good condition but maintenance needed along paved upper portion of trail and at steps.
- USGS gage (No. 02056000) located at end of steps.
- Signs and benches in good condition.

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Roanoke River Trail

Parking Area

Trash Receptacle and Information Sign at Parking Area

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Roanoke River Trail

Seating at Parking Area

Steps to the Bypass

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Roanoke River Trail

Bench Mid-Way On Trail

Mid-Portion of Trail

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Roanoke River Trail

Fishing Area at End of Steps

USGS Gage at End of Steps

Recreation Facility Inventory and Conditions Assessment: Rutrough Road Canoe/Kayak Ramp

Existing Facilities

- 12 gravel surface parking spaces.
- Dirt and gravel surface trail from parking area to put-in/take-out.
- Timber steps at put-in/take-out.
- Bank fishing.
- Access from parking area to Explore Park trails.
- Picnic table and trash receptacles provided.
- Numerous information and directional signs.

Condition

- Put-in/take-out in good condition.
- Parking area in good condition (No ADA).
- Trail from parking area to put-in/take-out in decent condition. Needs resurfacing.
- Access from parking area to Explore Park trails in good condition with adequate directional signs.
- Picnic table in poor condition.
- Very good signage providing direction and information. No signage directing vehicles along Rutrough Road to parking area.

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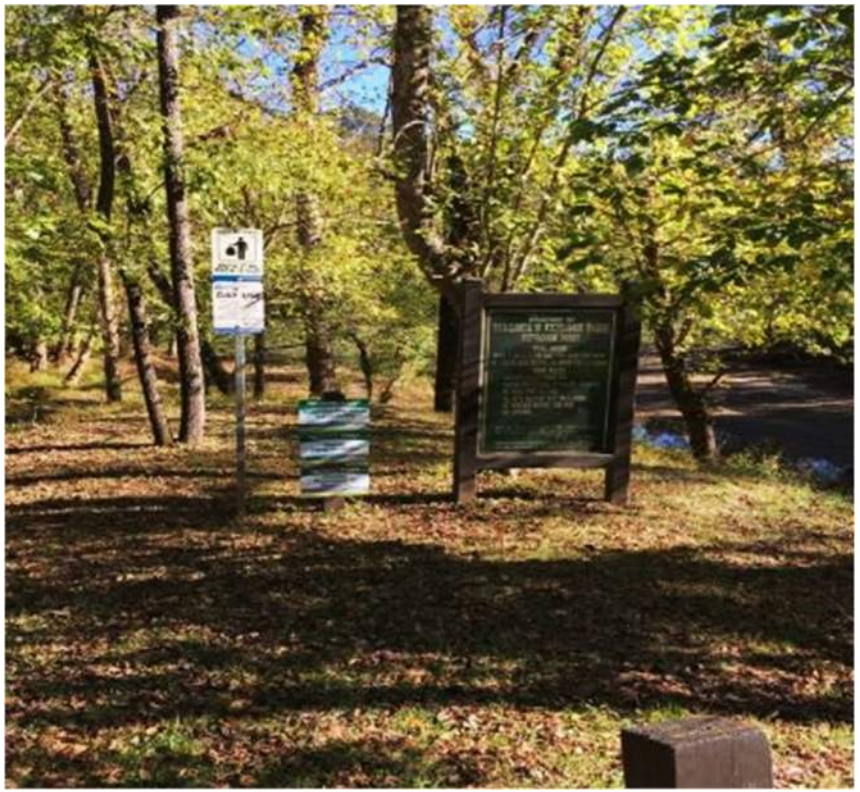
Rutrough Road Canoe/Kayak Ramp

Parking Area

Information Signs at Parking Entrance



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Rutrough Road Canoe/Kayak Ramp

Trail from Parking Area to Put-in/Take-out

Put-in/Take-out

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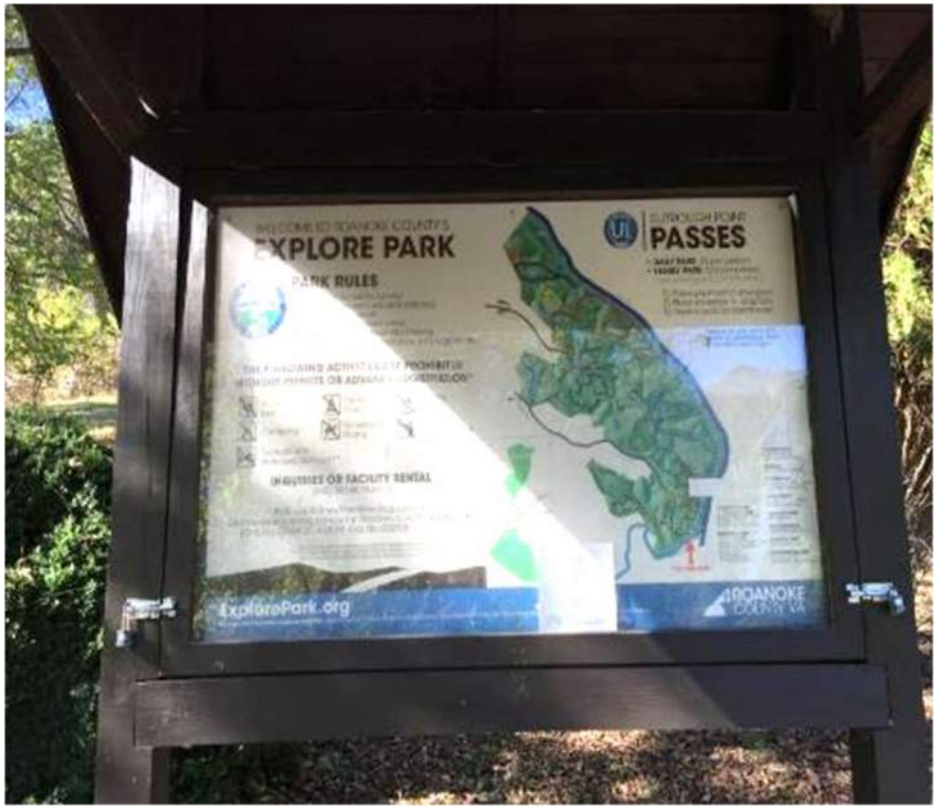
Rutrough Road Canoe/Kayak Ramp

Information Board



Explore Park Trails Entrance at Parking Area

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Recreation Study: Aesthetic Study

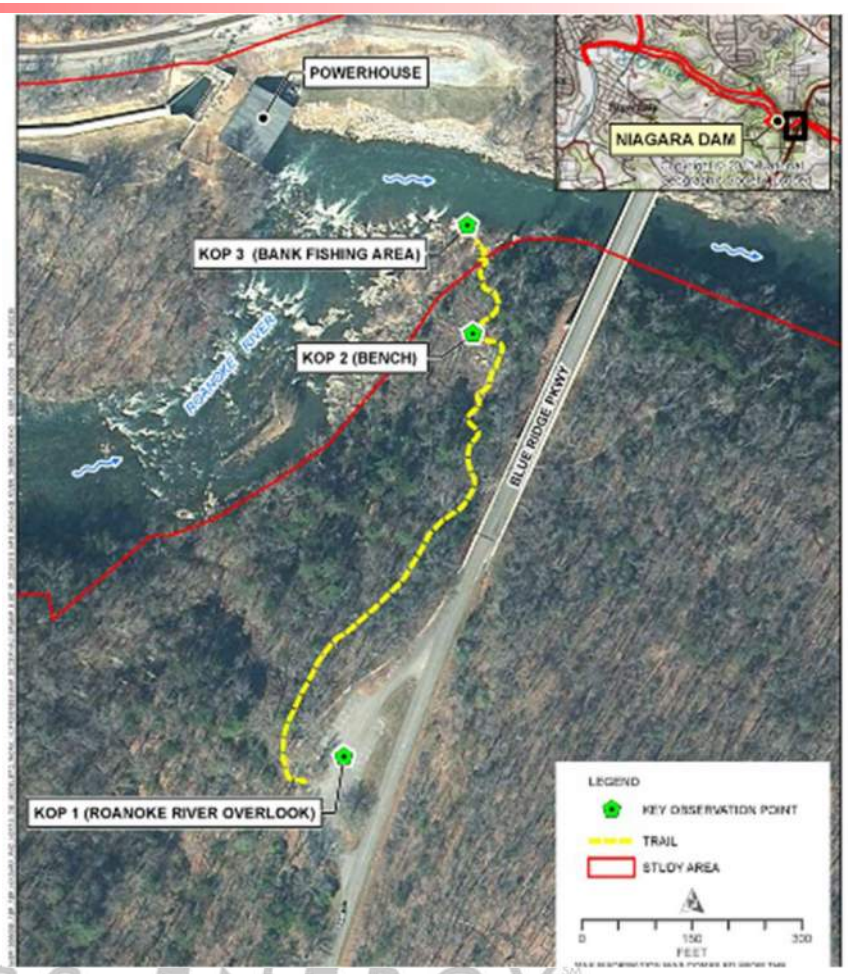
Summary of Study Methods

YES collected photo and video documentation from three key observation points (KOP), including:

1) The NPS Roanoke River Outlook adjacent to the Blue Ridge parking lot,

2) A bench midway down the stairs to the bypass, and

3)The bank fishing area located at the end of the trail steps at the Roanoke River.



January 1, 2020

Estimated 332 cfs

KOP 1

KOP 2

KOP 3

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January 1, 2020

Estimated 332 cfs

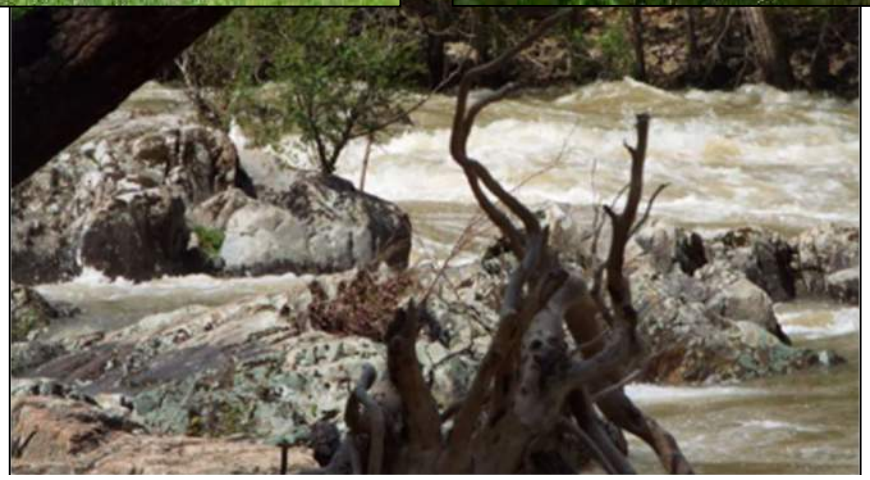
Video of KOP 3

May 1, 2020

Estimated 3,317 cfs

KOP 1

KOP 2



KOP 3

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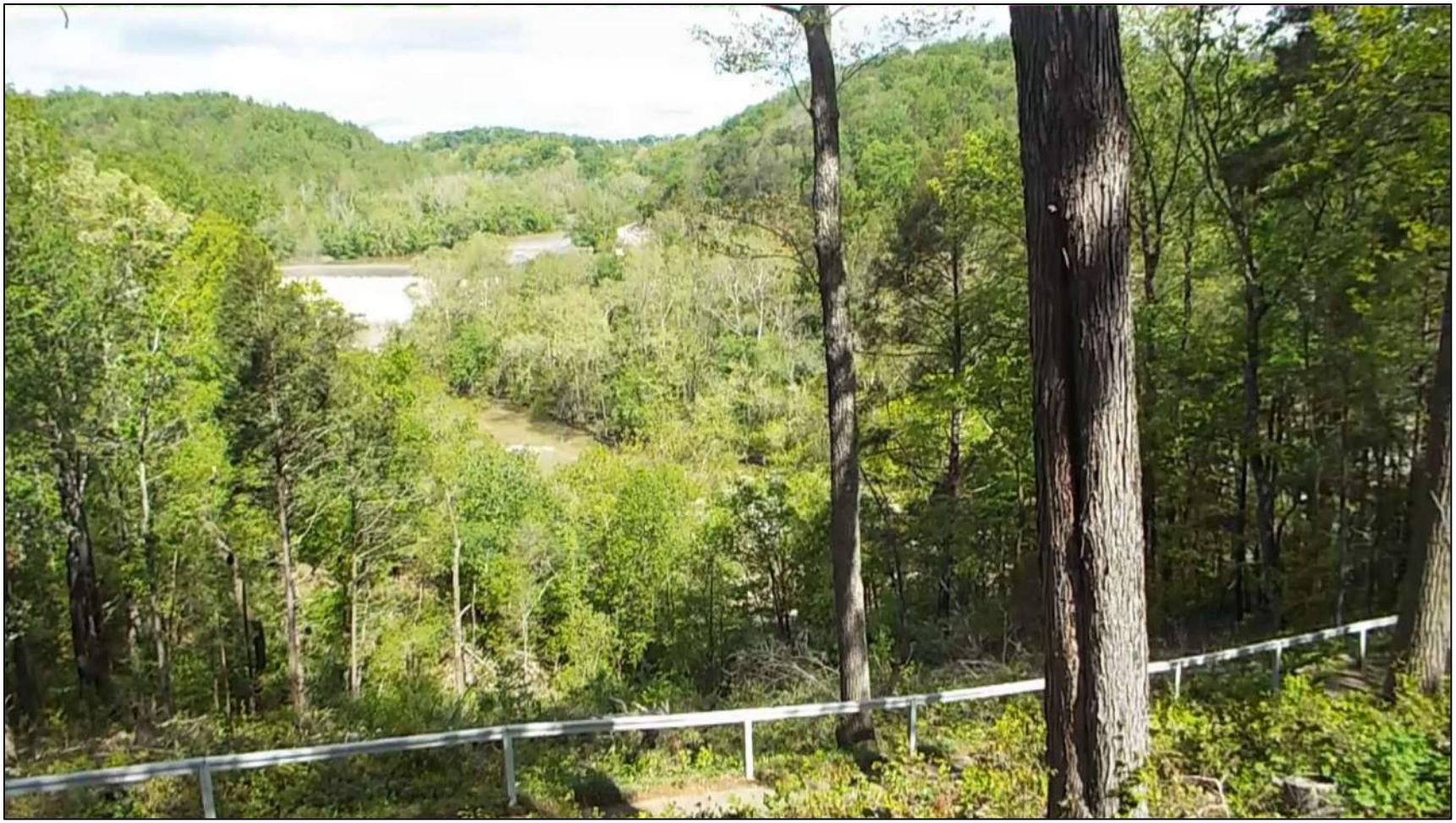
May 1, 2020

Estimated 3,317 cfs

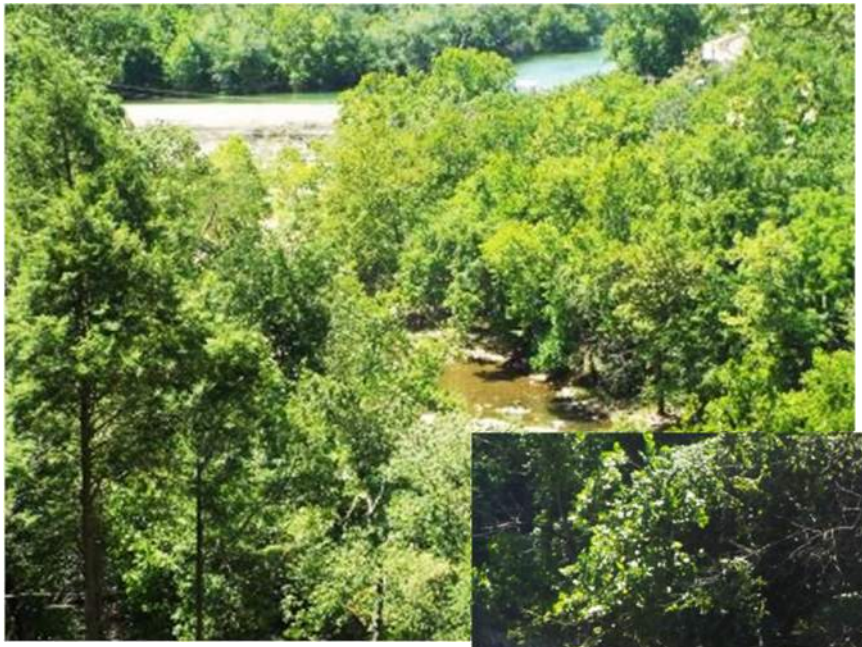
Video of KOP 1



July 11, 2020

Estimated 32 cfs

KOP 1



KOP 2

KOP 3

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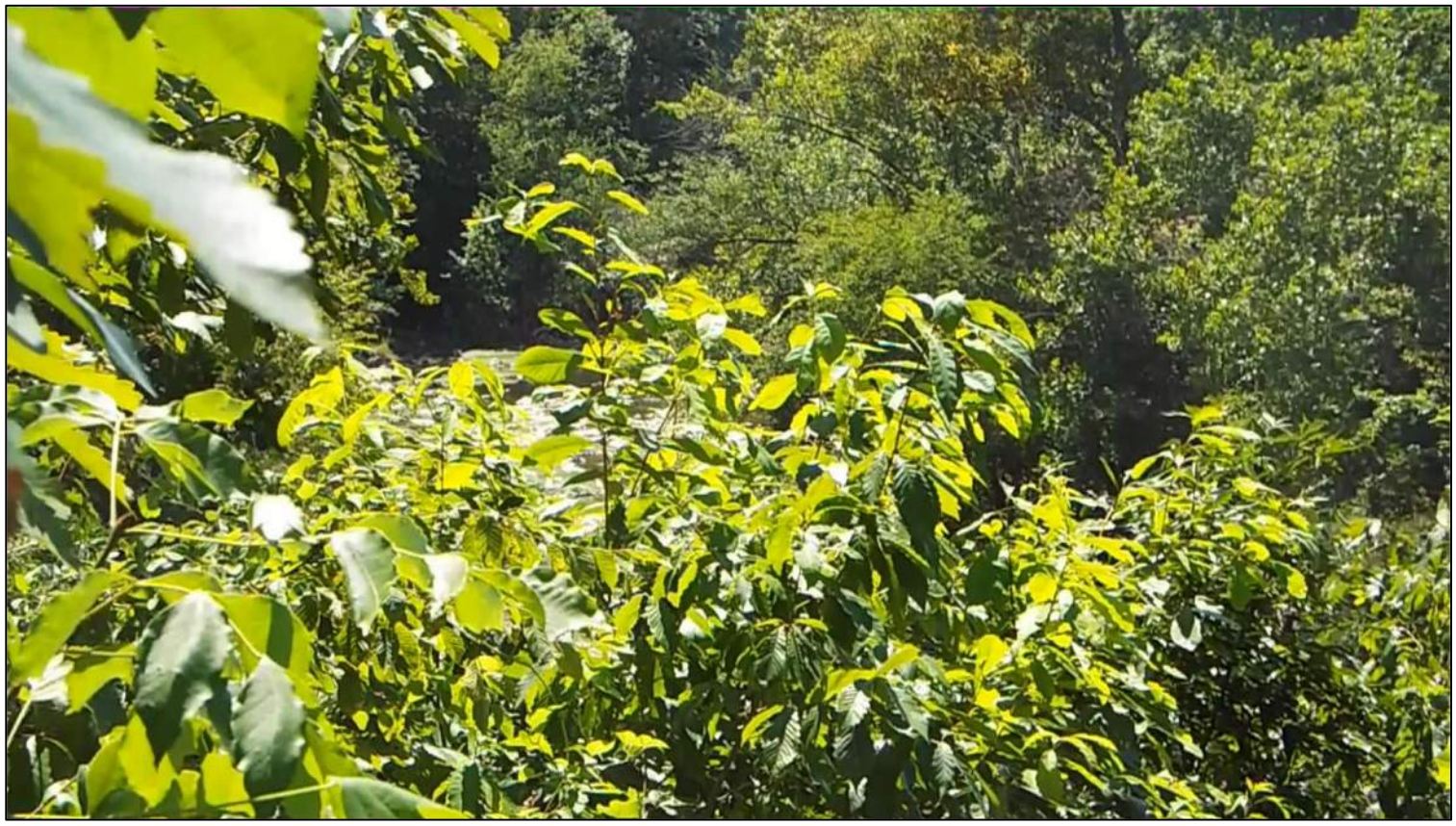
July 11, 2020

Estimated 32 cfs

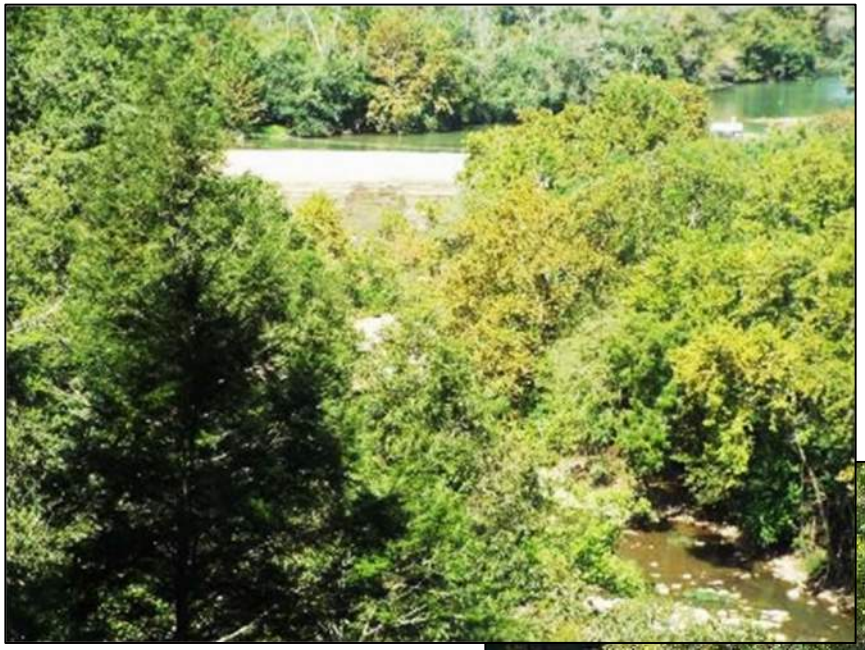
Video from KOP 2



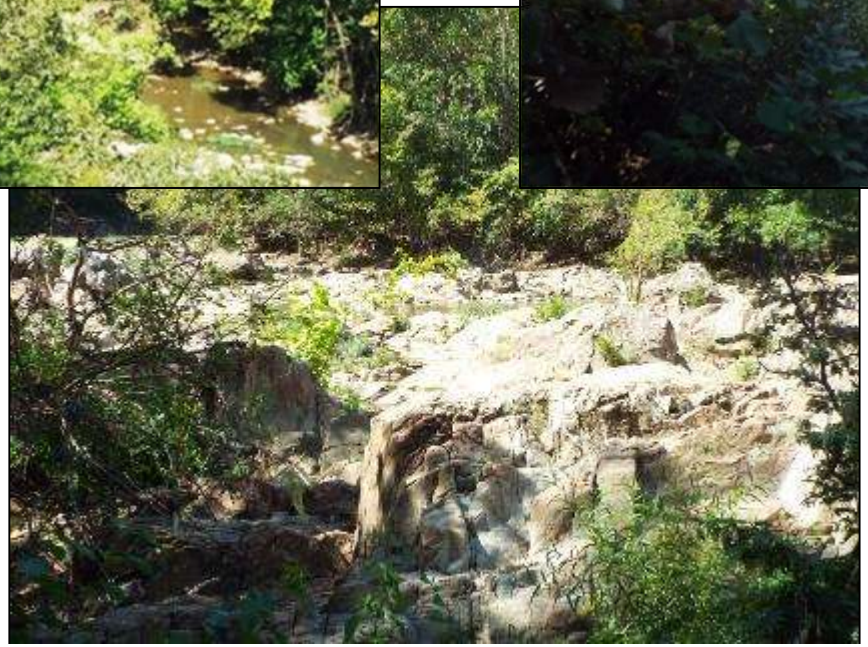
September 5, 2020

Estimated 30 cfs

KOP 1



KOP 2



KOP 3

Aesthetic Study Results

- Optimal time for viewing the Project spillway and bypass reach appears to be late October and early November when leaves are changing colors and falling.
- High flow conditions: spillway may be aesthetically appealing but can cause turbidity in the bypass and cover the unique geological features.
  - Aesthetically pleasing views occur under low to mid flows
- Existing Project operations provide an appropriate aesthetic experience
- In 2021, collect an additional aesthetic flow observation during a period of approximately 8 cfs (minimum flow requirement) bypass reach flow conditions.

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Recreation Study: Online Survey

Summary of Study Methods and Results

- Administered through the Project's relicensing website and offered respondents the opportunity to provide survey responses electronically.
- Outreach methods included posted signs at facilities, coordination with stakeholders, and notice in ILP Progress Report.
- From April 21 to October 31, 2020, Appalachian received 120 responses.
- Will continue into 2021.

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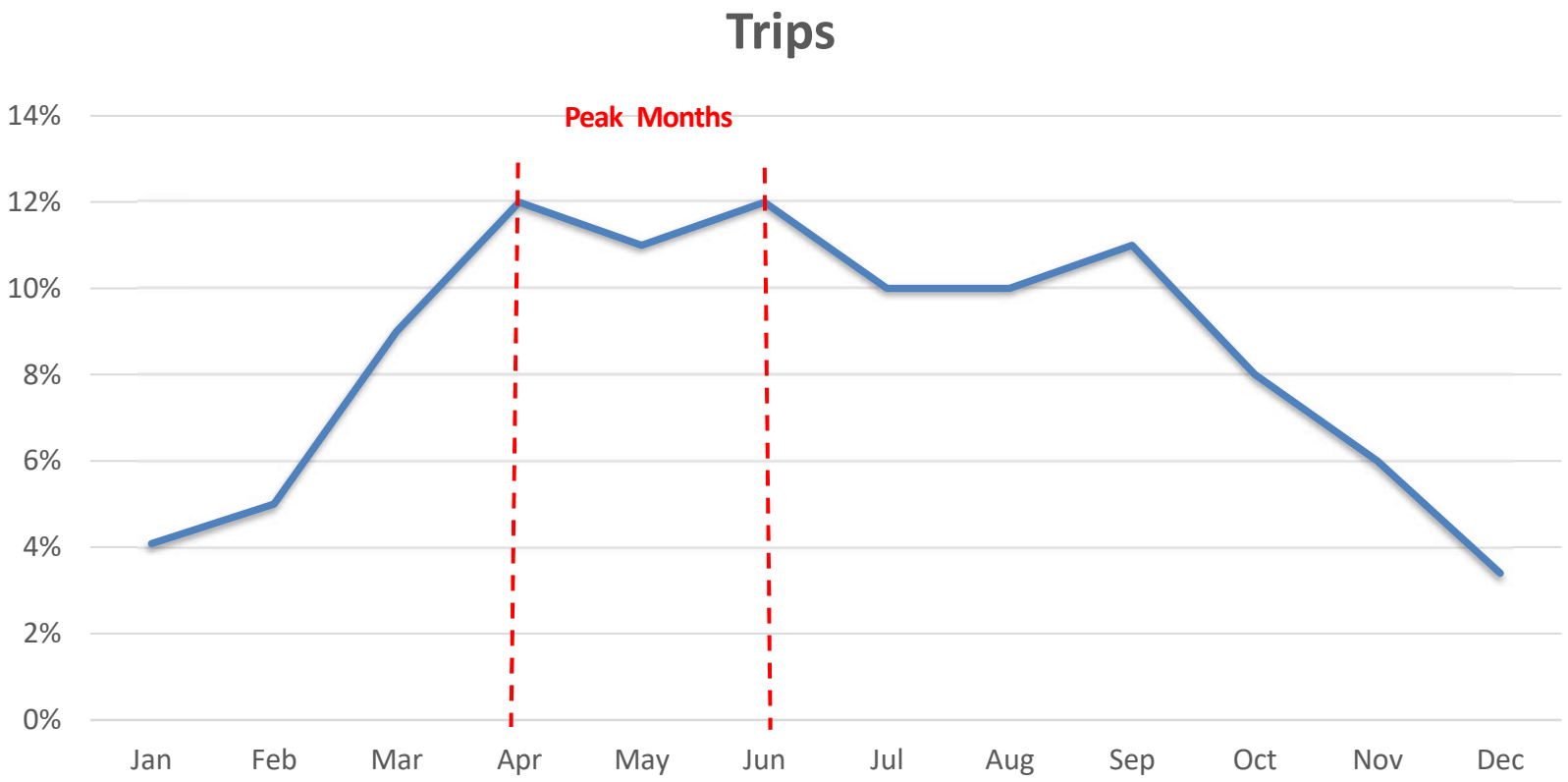
Monthly Recreation Activity for Project and Non-Project Facilities



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Summary for Primary Recreation Activities at all Project and Non-Project Facilities

Primary Activity	Percent (%)
Canoeing/kayaking	67
Fishing	17
Hiking	6
Sight-seeing	3
Picnicking	1
Pleasure boating	1
Running	1
Swimming	1
Tubing	1
Wildlife viewing	1

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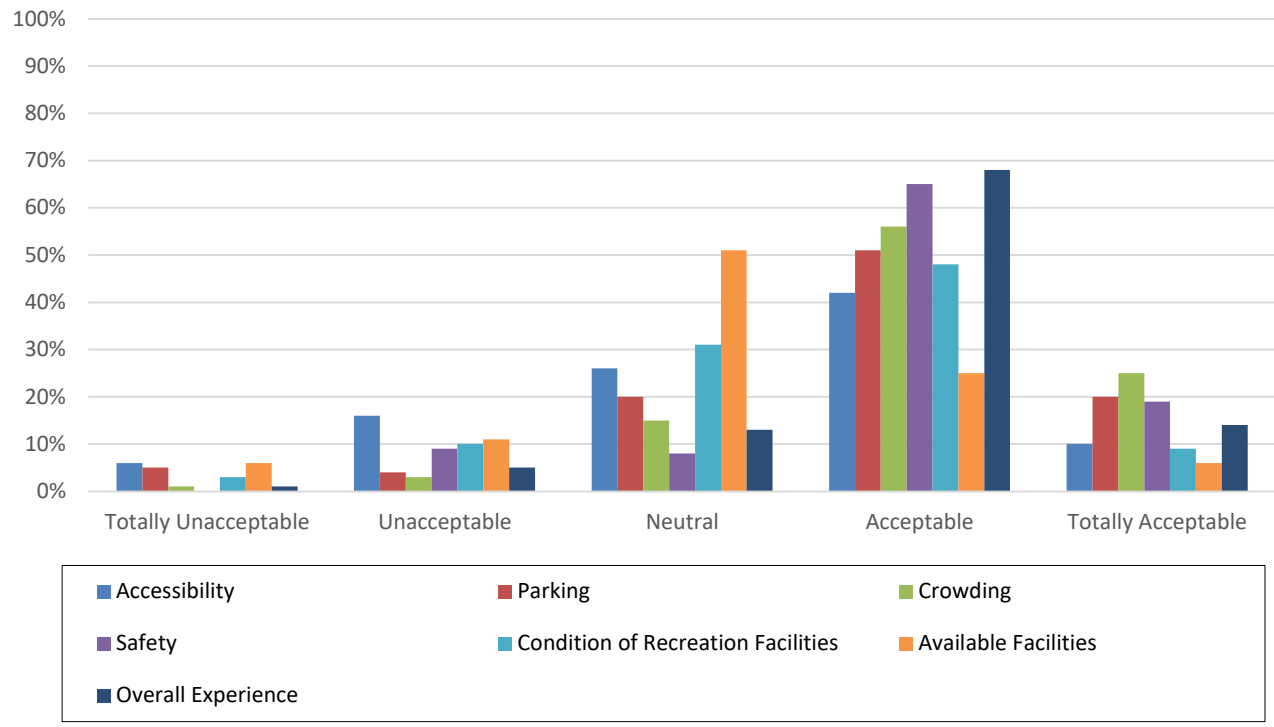
Online Survey Summary for Overall Rating on All Visits at Project and Non-Project Facilities



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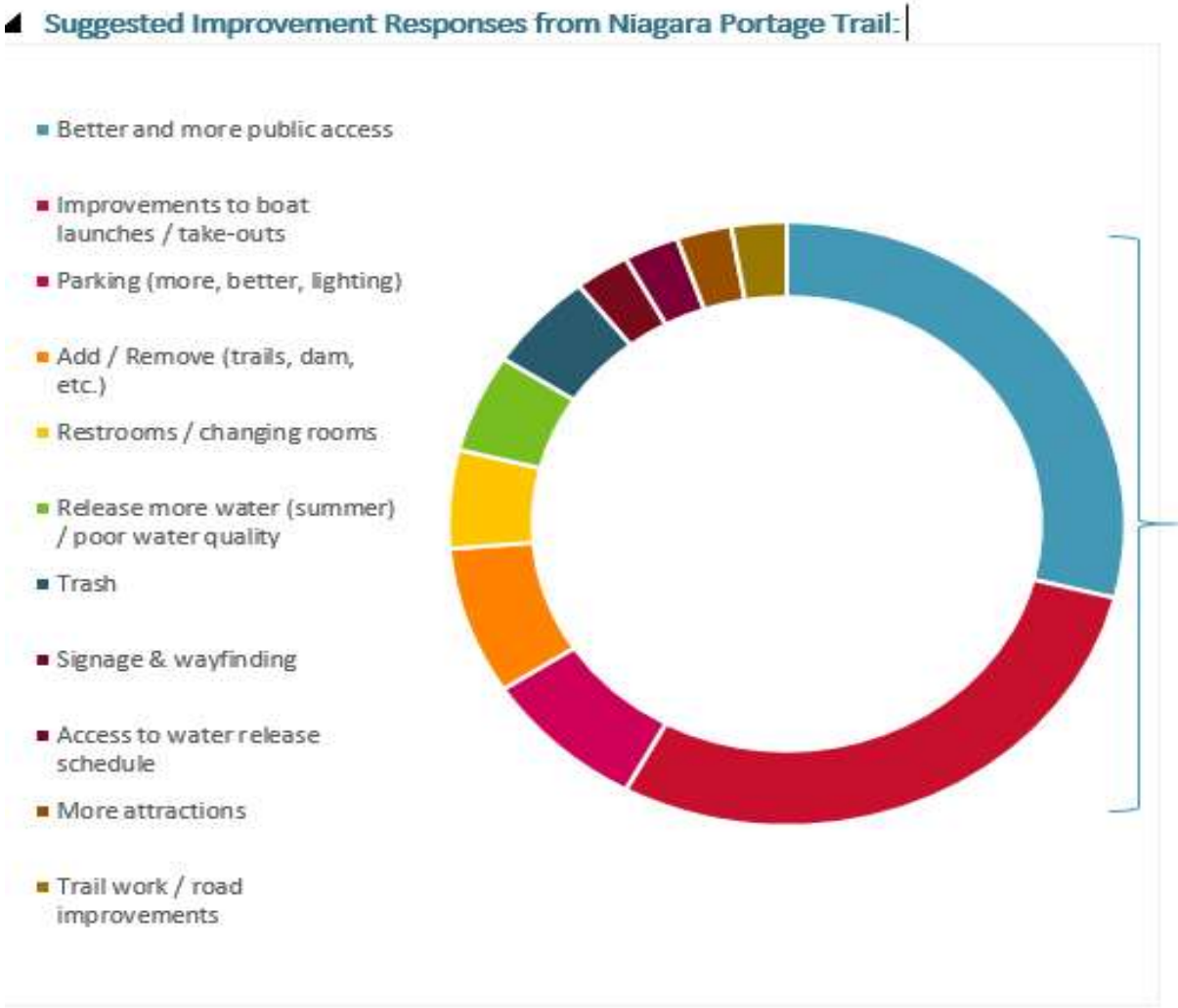
Niagara Canoe Portage: Online Survey Suggested Improvements



Improvement Suggestions	#
Better and more public access	11
Improvements to boat launches / take-outs	11
Parking (more, better, lighting)	3
Add / Remove (trails, dam, etc.)	3
Restrooms / changing rooms	2
Release more water (summer) / poor water quality	2
Trash	2
Signage & wayfinding	1
Access to water release schedule	1
More attractions	1
Trail work / road improvements	1

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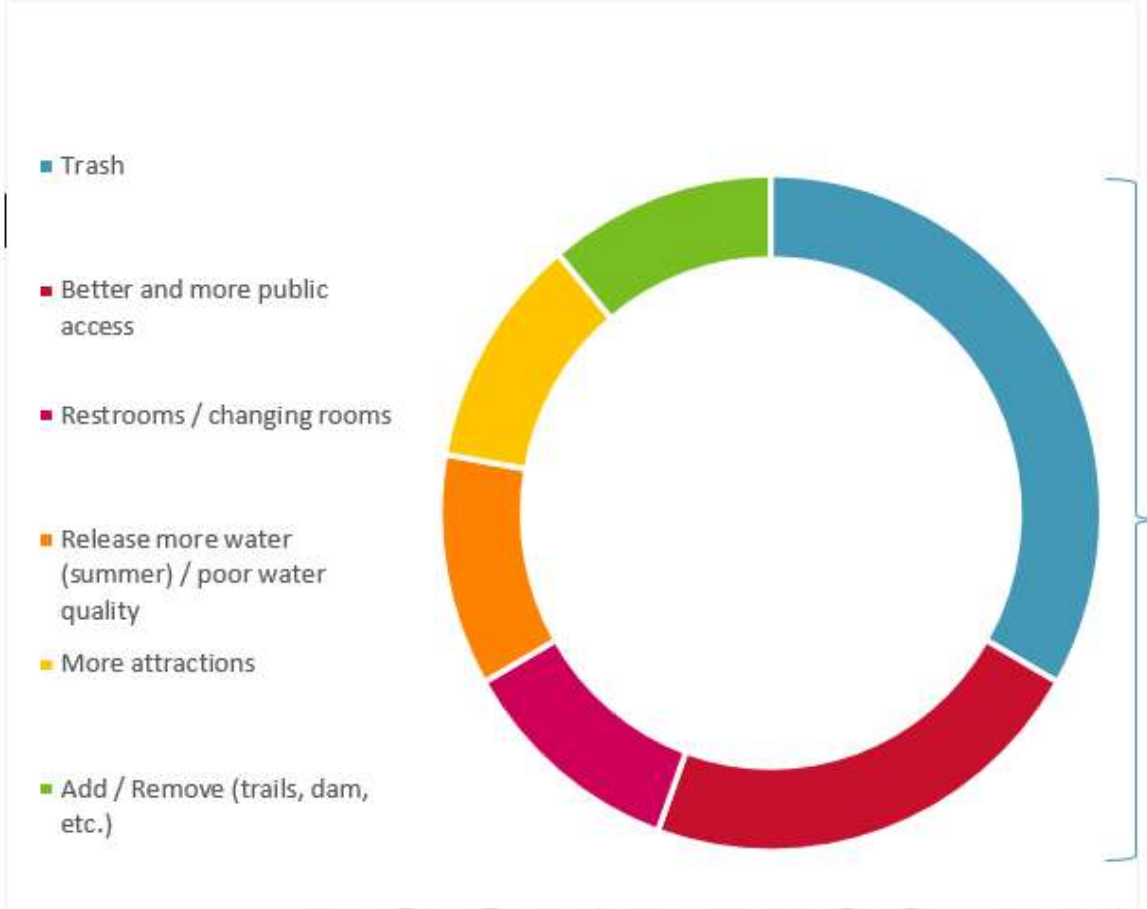
Tinker Creek Canoe Portage: Online Survey Suggested Improvements

Suggested Improvement Responses from Tinker Creek Canoe Launch:



Improvement Suggestions	#
Trash	3
Better and more public access	2
Restrooms / changing rooms	1
More attractions	1
Add / Remove (trails, dam, etc.)	1

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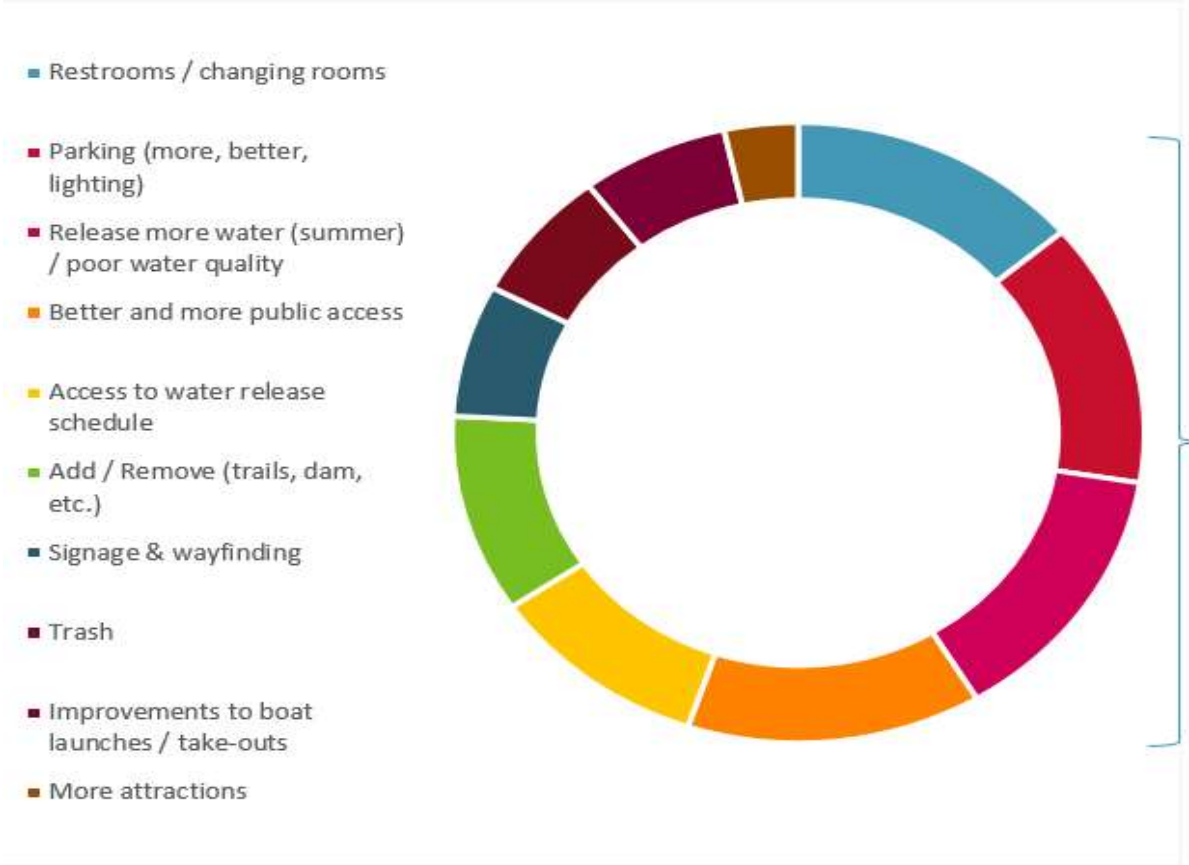
Roanoke River Trail/Overlook: Online Survey Suggested Improvements

Suggested Improvement Responses from Roanoke River Trail / Overlook:



Improvement Suggestions	#
Restrooms / changing rooms	4
Parking (more, better, lighting)	4
Release more water (summer) / poor water quality	4
Better and more public access	4
Access to water release schedule	3
Add / Remove (trails, dam, etc.)	3
Signage & wayfinding	2
Trash	2
Improvements to boat launches / take-outs	2
More attractions	1

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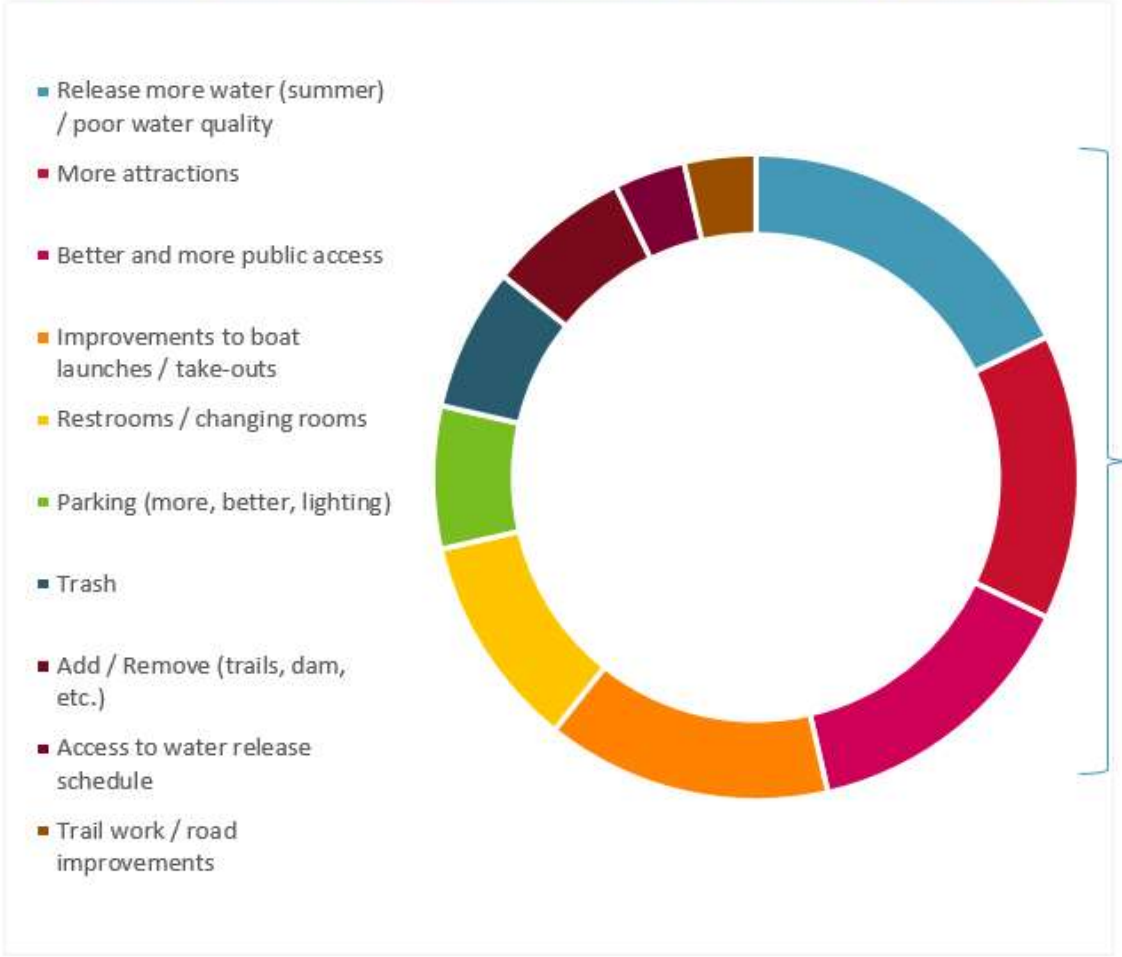
Rutrough Road Canoe/Kayak Ramp: Online Survey Suggested Improvements

Suggested Improvement Responses from Rutrough Road Canoe / Kayak Ramp:



Improvement Suggestions	#
Release more water (summer) / poor water quality	5
More attractions	4
Better and more public access	4
Improvements to boat launches / take-outs	4
Restrooms / changing rooms	3
Parking (more, better, lighting)	2
Trash	2
Add / Remove (trails, dam, etc.)	2
Access to water release schedule	1
Trail work / road improvements	1

Recreation Study: Recreational Flow Release Desktop Evaluation Results

Summary of Study Methods

To address stakeholders' interests while recognizing Project constraints related to enhancement of downstream flow conditions, HDR conducted a desktop evaluation to assess the potential for Project operations to support short-term enhancement of flow conditions for downstream boating.

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Recreational Flow Release Results

Parameter	Minimum Downstream Flow Requirement (Project) 50 cfs	Powerhouse Generation		
		Unit 1 379 cfs (hr:min)	Unit 2 305 cfs (hr:min)	Unit 1 & 2 684 cfs (hr:min)
Current Operating Band Volume (56.5 acre-ft) (i.e., under impoundment elevation and fluctuation limits of the existing license)	--	1:46	2:12	1:00
Additional Freeboard Volume (34.3 acre-ft)	--	1:05	1:21	0:36
Total Available Volume (90.8 acre-ft)	--	2:51	3:33	1:36
Roanoke River at Niagara USGS stage	0.99 ft	2.75 ft	2.49 ft	3.61 ft

Recreation Flow Release Results

- Benefits limited to river reach between Project's portage put-in and the downstream Explore Park/Rutrough Point canoe/kayak access area (3 RM)
- Potential short-term recreation flow release in form of brief flow pulse (1-3 ½ hours).
- Ability to provide bump in flow ("recreational release") subject to sufficient inflow, availability of Project facilities, and availability of operating personnel.
- Operating the reservoir with more fluctuation than is typical may have unintended effects on reservoir littoral habitat.

Variances from FERC-approved Study Plan

The Recreation Study has been and will be conducted in conformance with the Commission's SPD.

Study	Activities	Proposed Timeframe for Completion (January 2021 update)
Recreation Study	Study Planning and Existing Data Review	Completed (March 2020)
	Recreation Facility Inventory and Condition Assessment	Completed (November 2019)
	Convene Meeting with Stakeholders	January – April 2021
	Recreation Visitor Use Online Survey	May 2020 – October 2021
	Recreational Use Documentation (2x/month)	May – October 2021
	Aesthetic Flow Documentation (Quarterly)	Completed (November 2020)
	Recreational Flow Release Desktop Evaluation	Completed (December 2020)
	Distribute Draft Study Report with the ISR/USR	ISR Completed (January 2021) USR December 2021

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5-minute break

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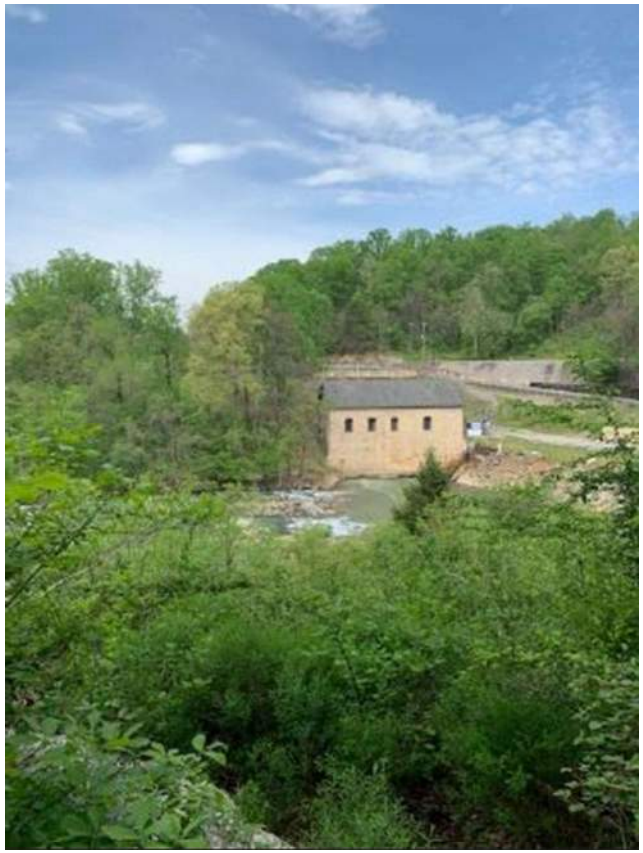
Cultural Resources Study



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Cultural Resources Study

Study Status

- Initiated the Cultural Resources study in accordance with the schedule and methods described in the RSP and SPD.
- Tasks completed to date (late summer – November 2020):
  - Consultation for the APE Determination (Task 1),
  - Background Research and Archival Review of the Study Area (Task 2),
  - Phase I Reconnaissance Survey of the Area of Potential Effects (APE) (Task 3).
- Tasks to be completed in 2021:
  - Inventory of Traditional Cultural Properties (Task 4)
  - Consulting with agencies to determine if a Historic Properties Management Plan is necessary for the Project (Task 5)

Cultural Resources Study

APE Consultation

On September 1, 2020, Terracon consulted with the SHPO and applicable tribes requesting concurrence on the Project's APE.

APE responses were received from:

- The Catawba Indian Nation
- The Virginia DHR/SHPO
- The Pamunkey Indian Tribe
- The Monacan Indian Nation
- The Delaware Nation

Cultural Resources Study: Background Research and On-Site Fieldwork

- Archaeological assessment of the Project APE, including areas along Tinker Creek.
  - Areas within the APE along Tinker Creek and the Roanoke River west of Tinker Creek have a low potential for containing archaeological resources.
- Niagara powerhouse and dam re-evaluated as historic resources.
  - Terracon confirmed that while much of the footprint of the original 1906 facility remains many of the original components have been removed or modified.
  - Consistent with SHPO's January 1991 finding, this study reinforces the recommendation that the Niagara powerhouse and dam are ineligible for the NRHP
- None of the resources identified during Terracon's research, either within the APE and those within a 0.5-mile radius, will be affected by the Project.

Cultural Resources Study: Summary

Conclusion

- Areas along the Roanoke River east of Tinker Creek may have the potential to yield deeply buried archaeological remains, however, the results of a pending geomorphological assessment are needed to confirm this.
  - Geomorphological assessment scheduled for 2021.
- No historic properties are currently being adversely affected by the Project.
- If new construction were to occur in the areas outlined in the Study Report, then additional archaeological investigations may be warranted and consultation with the SHPO would be necessary.

Variances from FERC-approved Study Plan

The Preliminary Cultural Resources Study has been and will continue to be conducted in conformance with the Commission's SPD.

Proposed Changes to the 2020-2021 Study Plan Schedule for the Niagara Project (FERC No. 2466)		
	Activity	**Proposed Timeframe for Completion (January 2021 update)**
Cultural Resources Study	Determination of Area of Potential Effect (APE)	Completed (September 2020)
	Background Research and Archival Review	Completed (August - September 2020)
	Phase I Reconnaissance Survey of APE	Completed (October 2020)
	Inventory of Traditional Cultural Properties	January 2021 – October 2021
	Distribute Draft Study Report with the ISR/USR	December 2021
	Historic Properties Management Plan (if necessary)	With the DLA or Preliminary Licensing Proposal

ISR Meeting: Stakeholder Participation

- Appalachian will file ISR Meeting Summary with FERC by February 5, 2021.
- Meeting summary disagreements, requests for modifications to studies, or requests for new studies should be filed with FERC by **March 7, 2021**.
  - If requesting modifications to studies, stakeholders must take into account FERC's Criteria for Modification of Approved Studies (18 C.F.R. § 5.15(d)).
  - If requesting new studies, stakeholders must take into account FERC's 7 Criteria for New Study (18 C.F.R. § 5.15(e)).
- Appalachian will file responses to meeting summary disagreements by April 6, 2021.
- FERC will make a determination on any disputes/amendments to the approved study plan by May 6, 2020.
- Stakeholders can contact Appalachian with questions or comments:

Jonathan Magalski
(614) 716-2240
jmmagalski@aep.com

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Closing

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
March 5, 2021

OFFICE OF ENERGY PROJECTS

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

VIA Electronic Mail

Mr. Jonathan Magalski
Environmental Specialist Consultant
American Electric Power
jmmagalski@aep.com

Reference: Comments on Initial Study Report and Meeting Summary

Dear Mr. Magalski,

On January 11, 2021, Appalachian Power Company (Appalachian) filed the Initial Study Report (ISR) for the Niagara Hydroelectric Project (Niagara Project) describing Appalachian's overall progress in implementing the approved study plans. On January 21, 2021, Appalachian held a virtual meeting to discuss the ISR. On February 7, 2021, Appalachian filed its ISR Meeting Summary (Meeting Summary). We have reviewed the ISR and the Meeting Summary and provide our comments in Appendix A, pursuant to 18 C.F.R. § 5.15(c)(4).

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

Sincerely,

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

APPENDIX A
Comments on the Initial Study Report and Meeting Summary

General:

1. To facilitate our NEPA analysis, please file with the draft license application (DLA) the geospatial data (e.g., exports from Global Positioning System (GPS) devices, or Geographic Information System (GIS) shapefiles), including the sampling locations, mesohabitat, substrate, and cover maps; shoreline habitat classifications; and any other GIS data layers that were created as part of the following studies: 1) Bypass Reach Flow and Aquatic Habitat Study, 2) Benthic Aquatic Resources Study, 3) Fish Community Study, 4) Water Quality Study, 5) Shoreline Stability Assessment Study, and 6) Wetlands, Riparian, and Littoral Habitat Characterization Study.

Fish Community Study:

2. In Appendix C of the Preliminary Fish Community Study Report, you provide raw species abundance data for the backpack and electrofishing surveys. As requested in the ISR meeting, please provide summary length and weight information (e.g., size distributions) for each fish species in the updated study report or DLA.

American Electric Power
1 Riverside Plaza
Columbus, OH 43215
aep.com

Via Electronic Filing

April 6, 2021

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)
Response to Comments on the Initial Study Report

Dear Secretary Bose:

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.

Pursuant to 18 CFR § 5.15(c), Appalachian filed the Initial Study Report (ISR) with the Commission on January 11, 2021. The ISR filing also included notification of the ISR Meeting date, time, and proposed agenda. As required by the ILP schedule, within 15 days of the ISR filing Appalachian held a virtual ISR Meeting via Webex from 10am to 3pm on Thursday, January 21, 2021. The ISR meeting summary was filed with FERC on February 5, 2021. Stakeholder comments on the ISR meeting summary were due by March 7, 2021.

The following parties provided written comments in response to Appalachian's filing of the ISR meeting summary: FERC staff, Roanoke County, United States Fish and Wildlife Service (USFWS or the Service), Roanoke Regional Partnership, Roanoke River Blueway Committee, Roanoke Valley Greenways, and the Virginia Department of Environmental Quality (VDEQ).

Appalachian is hereby providing responses to stakeholder comments received on the ISR, including general comments and requests as well as those that constitute a request for a modified

or new study. [1] Based on the information presented in the ISR and at the ISR meeting and provided by commenting entities in their responses, Appalachian does not believe that any modifications to existing studies or new studies are required. Appalachian has, however, made a good faith effort to accommodate reasonable requests, including extension of certain study activities into the 2021 field season, as explained in detail in Appalachian's responses below.

General

Stakeholder Comments:

FERC requests that in order to facilitate the National Environmental Policy Act (NEPA) analysis, Appalachian should file with the draft license application (DLA) the following: the geospatial data (e.g., exports from Global Positioning System (GPS) devices, or Geographic Information System (GIS) shapefiles), including the sampling locations, mesohabitat, substrate, and cover maps; shoreline habitat classifications; and any other GIS data layers that were created as part of the following studies: 1) Bypass Reach Flow and Aquatic Habitat Study, 2) Benthic Aquatic Resources Study, 3) Fish Community Study, 4) Water Quality Study, 5) Shoreline Stability Assessment Study, and 6) Wetlands, Riparian, and Littoral Habitat Characterization Study.

Appalachian's Response:

Appalachian will submit applicable GIS data directly to FERC staff for the purposes described above in conjunction with the DLA, as available. (Because the DLA will be filed before the Updated Study Report (USR), for certain studies final geospatial data may not be available until and provided concurrently with the FLA).

Water Quality Study

Stakeholder Comments:

Due to concerns that water quality measurements collected during the 2020 study period may not be representative of water quality conditions at normal or below normal flow conditions, the VDEQ and USFWS recommended that bypass reach temperature and dissolved oxygen (DO) monitoring in 2021 be extended through October 2021 to ensure that water quality during low flow periods is captured.

[1] Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must include a demonstration that: (1) approved studies were not conducted as provided for in the approved study plan; or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (1) any material change in law or regulations applicable to the information request; (2) why the goals and objectives of the approved study could not be met with the approved study methodology; (3) why the request was not made earlier; (4) significant changes in the project proposal or that significant new information material to the study objectives has become available; and (5) why the new study request satisfies the study criteria in section 5.9(b).

In addition, the USFWS recommends that the Water Quality Study be repeated in 2021 based on the following: (1) data was not collected or available for approximately 50% of the 2020 study period, (2) there was a 47% increase in average annual precipitation, thus the 2020 data was collected during an abnormally wet year, and (3) the Project was not operating for the last two months of the 2020 study, thus it is not possible to assess the impact of Project operations on water quality during this normally low flow period.

USFWS also recommends that Appalachian check and clean data loggers weekly during data collection to avoid the loss of water quality data from biofouling.

Appalachian's Response:

Appalachian agrees with VDEQ's and USFWS's statements that flows in the bypass reach during the 2020 water quality study season were not representative of typical or minimum bypass flow conditions at the Project. Appalachian believes this is not primarily due to river flows, but instead to the inoperability (i.e., held in constant open position) of the trash sluice gate and the extended powerhouse outage reported in the Preliminary Water Quality Study Report. Consistent with VDEQ's and USFWS's request for additional water quality data collection in the bypass reach in 2021, for the upcoming 2021 water quality study season, Appalachian proposes to reinstall two continuous temperature and DO data sondes in the bypass reach (one at the upstream monitoring location and the other at the downstream monitoring location) from July – September. Due to the effort and costs associated with extending the field sampling for an additional month relative to the value of the additional data collected to the overall Water Quality Study, Appalachian proposes to continue sampling through October if water temperatures do not appear to be decreasing by the end of September. Appalachian does not believe that the need for continued sampling in the bypass reach beyond September be based on flow conditions, unless the July – September sampling period fails to capture water quality conditions at the approximately required minimum bypass flow of 8 cfs and it is projected (based on Project operating conditions and weather forecasts) that bypass reach flows will decrease to this level in October. To coincide with this additional bypass reach data collection, Appalachian also proposes to reinstall a continuous temperature and DO data sonde in the tailrace to capture additional data during powerhouse operations.

Appalachian will check and clean the data sondes at approximately two-week intervals[2] and adjust accordingly depending on degree of biofouling observed in the field. Based on the 2020 data collection effort, biofouling was less prevalent at the non-reservoir monitoring locations. The existing plan to check and clean the data sondes at these locations at two-week intervals is based on the direct experiences of Appalachian's consultant with instrumentation in these locations in 2020 and takes into appropriate consideration the significant increase in study costs and efforts to perform this task on a weekly basis.

[2] The term approximately is used here because of the potential for fieldwork to be shifted and rescheduled to accommodate site conditions and field personnel safety.

Except as noted in the paragraph below, Appalachian does not propose to collect additional water temperature, DO, pH, and specific conductivity data at the upstream and reservoir locations in 2021. Appalachian does not believe that doing so would significantly improve the understanding of water quality at these locations, or result in different conclusions than presented in the Preliminary Water Quality Study Report. To evaluate USFWS's comments, Appalachian's consultant conducted a review of water quality data collected at the U.S. Geological Survey (USGS) Roanoke River at Thirteenth Street Bridge gage (USGS 02055080), which is at the upstream end of the Niagara impoundment, to see how water quality parameters measured at the upstream Project locations in 2020 compare to those measured for inflow to the Project in previous years for which (continuous) water quality data is available. This review revealed that **baseflow and episodic significant precipitation events do not appear to impact water quality in the upstream reservoir locations.** Even during 2008, which is the third driest year on record[3], Roanoke River water temperature and pH upstream of the Project met Virginia Class IV water quality standards. Specific conductivity concentrations recorded in 2008 were also consistent with concentrations measured during the 2020 study period. This indicates that even under very low flow conditions, water temperature, pH, and specific conductivity measurements upstream of the Project are similar to those collected by Appalachian in 2020, under higher prevailing baseflow conditions. DO data were not collected at the Thirteenth Street Bridge location in 2008; however, concentrations at this location during September 2019 ranged from 6.8 – 10.0 milligrams per liter (mg/l) under a monthly average flow of only 108.5 cubic feet per second (cfs), which was less than half the September 2020 monthly average flow of 256.4 cfs. DO concentrations and water temperatures measured at the Thirteenth Street Bridge gage were similar between September 2019 and 2020 indicating that lower project inflows do not necessarily equate to significant differences in water temperatures or DO concentrations.

Based on the results and conclusions presented in the Preliminary Water Quality Study Report and the historic flow and water quality data provided by the Thirteenth Street gage, water temperature, DO concentrations, and pH meet state water quality standards during periods of high and low Project inflows. Additional collection of continuous water quality data, which is largely redundant with that already being done [by others] at the Thirteenth Street gage, is neither warranted nor necessary to evaluate potential Project impacts on water quality.

As stated in the Preliminary Water Quality Study Report, water quality at the Project forebay monitoring location met Virginia Class IV water quality standards for temperature, DO, and pH during the entire 2020 study period. While the generating units were not operating during the last two months of the study period, this resulted in a worse-case scenario whereby 100 percent of the inflow to the Project was routed away from the powerhouse and into the bypass reach. The only significant decrease in DO concentrations observed during the study period occurred during the week immediately after the start of an unplanned outage which began on September 8, 2020 and

[3] Based on flows recorded at the Roanoke River at Roanoke, VA gage (USGS 02055000) from 1900 – 2020. This gaging station is approximately 2.6 river miles upstream from the Thirteenth Street Bridge gage (USGS 02055080).

lasted through the end of the study period on November 10, 2020. During a more typical year when the units are operating, temperature and DO stratification in the forebay area would be minimized as flow is routed to the powerhouse. Because this "worse case" condition for water quality in the forebay was captured during the 2020 study season, Appalachian does not believe it necessary to repeat continuous water quality data collection at this location in 2021 and does not believe that the return on this effort with respect to informing the results of the Water Quality Study is commensurate with the additional effort and cost. Appalachian appreciates, however, stakeholders' interests in confirming 2020 Water Quality Study results in the forebay location during the 2021 field season. Therefore, Appalachian proposes that during equipment checks and data downloads for the bypass reach and tailrace monitoring locations, Appalachian will also collect discrete water quality profile data (temperature, DO, pH, and specific conductivity) at the forebay monitoring location. Additionally, Appalachian proposes to reinstall a continuous temperature and DO data sonde in the tailrace that can be correlated with the Thirteenth Street data.

Because Appalachian is not proposing to reinstall the upstream and reservoir continuous monitoring locations in 2021, water quality data (temperature, DO, pH, and specific conductivity) recorded at the Thirteenth Street Bridge USGS gaging station and Tinker Creek above Glade Creek at Roanoke, VA (USGS 0205551614) monitoring location will be included in the USR to represent water quality for Project inflow.

Benthic Aquatic Resources

Stakeholder Comments:

USFWS notes that there is a large riffle at the bottom of the UNIO-Tailrace Survey Area that offered the first continuous area of stable gravel/cobble substrate and may represent the beginning of suitable mussel habitat that was not surveyed. To address this data gap, USFWS recommends that an additional 500 meters of the downstream Survey Area be established in this area of suitable habitat below the UNIO-Tailrace Survey Area and surveyed for freshwater mussels

Appalachian's Response:

During review of USFWS's comment summarized above, it came to the attention of Appalachian and Appalachian's consultants that the ISR figure illustrating the UNIO-Tailrace Survey Area did not accurately represent the area that was actually surveyed (instead portraying a relic shapefile created during the study planning process). Additionally, the ISR text provided an oversimplified summary of the survey effort completed in that location. Appalachian's consultants have corrected these errors, and Attachment 1 to this filing provides figures illustrating the correct location and extent of the UNIO-Tailrace Survey Area that was evaluated during the 2020 field effort. As shown in these figures, the mussel survey for the UNIO-Tailrace Survey Area was initiated further downstream from the Blue Ridge Parkway Bridge, extended downstream for 500 meters, and covered the full extent delineated in the Revised Study Plan (RSP) methods and maps.

With respect to USFWS's request for expanded mussel survey, Appalachian notes the following:

- The selection of sites and proposed methodology identified in the RSP and completed during the 2020 field season were developed in consultation with specialty staff from the Virginia Department of Wildlife Resources (DWR).

- The UNIO-Tailrace Survey Area is already located well downstream of the Project boundary.

- Results of the 2020 Mussel Survey indicated that very low mussel density and diversity exists throughout the study area, a trend that was consistent above and below Niagara Dam and in Tinker Creek. The low density and diversity observed during the study is attributable to numerous confounding factors in the watershed, including but not limited to: (1) the high proportion of bedrock in the study reach; (2) the Roanoke River flows through the City of Roanoke before reaching Niagara Dam and is influenced by urban point source and non-point source impacts, and (3) the upstream watershed is also influenced by residential and agricultural land uses and runoff.

- The stretch of Roanoke River between the lower extent of the study area and the Smith Mountain Project downstream may offer additional small patches of potential mussel habitat. However, a portion of the area requested for further survey effort was already included in the 2020 survey, as shown in Attachment 1.

On the basis of the following, Appalachian does not propose to perform additional mussel survey as requested by USFWS. (1) The results of the 2020 Mussel Survey indicate mussel density and diversity of the Roanoke River near the Project is very low. (2) The downstream extent of the 2020 field sampling efforts was just over a mile downstream of the Niagara Dam. The requested expanded area is beyond the extent of hydraulic influence of Project operations. Appalachian also does not believe that results of additional survey in this downstream reach would meaningfully inform the development of license requirements for the run-of-river Niagara Project. (3) The 2020 survey was conducted in conformance with the approved Study Plan and included specific agency consultation regarding sampling locations and methods. The completed study fulfills the study objectives and did not result in any new information that is material to the study objectives and merits additional study.

Fish Community

Stakeholder Comments:

FERC requests a summary of length and weight information (e.g., size distributions) for each fish species collected during the backpack and electrofishing surveys (note: this request was made during the ISR meeting as well).

Appalachian's Response:

A summary of fish length and weight data by species and sampling methodology will be provided in the final Fish Community Study Report to be submitted with the USR.

Stakeholder Comments:

USFWS indicates that if it is not feasible to directly measure the intake velocity using an ADCP, they would recommend that the Licensee perform a 1-Dimensional (1-D) analysis, which would provide a more accurate estimate of intake velocities than the method used in the study. The 1-D analysis should calculate normal flow (not approach flow) and open-area velocity (also known as impingement velocity) as per the Service's Fish Passage Engineering Design Criteria (Criteria). They also request that Appalachian provide the calculations for review before using the velocities in the entrainment and impingement study.

Regarding the susceptibility of fish to impingement/entrainment at the Project based on their burst swim speeds, USFWS recommends that Appalachian address the fact that migratory fish species may be attracted to the intake and may not actively avoid the intake, which can lead to higher entrainment rates for migratory species than would be predicted by the current (entrainment) study. USFWS also recommends that the Licensee expand its analysis to compare swimming capability to the open-area velocity; the estimate of the open-area velocity is important since fish that contact an intake rack will experience a far greater velocity than the approach velocity (within several inches of the rack, fish will experience the open-area velocity per Criteria reference Plate 9-1). The open-area velocity is influenced by the blockages created by the structure of the rack and for typical intake racks, this translates to an open-area velocity approximately twice that of the approach velocity.

Appalachian's Response:

Appalachian and Appalachian's consultants appreciate USFWS's technical review and feedback on this study. In the experiences of Appalachian's consultant, approach velocities are typically used in desktop entrainment and impingement analyses and are compared to swim burst speeds of target fish species to determine their ability to escape velocities directly in front of the intake structure. As requested by USFWS, as part of the ongoing Fish Community Study, Appalachian's consultant will calculate open-area velocity at the intake structure trash rack and compare fish swim burst speeds to the open-area velocity, as fish that contact the trash racks would be exposed to an increased intake velocity on the trash rack bars. Corresponding assumptions, inputs, and results for both calculations will be presented in the final entrainment and impingement study report to be submitted with the USR.

Stakeholder Comments:

USFWS requests further clarification regarding whether the racks are continually cleaned/cleared of debris for optimal project operation and if debris cleaning is sufficient to prevent an effect on intake velocity.

Appalachian's Response:

Appalachian will present, in the USR, the requested additional description of operating protocol for cleaning the trash racks in front of the intake structure. Discussion in the USR will address the frequency and magnitude of the debris clearing process and the expected efficacy of the process at maintaining consistent intake velocities.

Stakeholder Comments:

USFWS requests that the following issue be addressed: Section 5.3 states that none of the habitats preferred by the Roanoke Logperch (RLP) are found in the vicinity of the intake, and therefore, the likelihood of entrainment of RLP is considered low. Because larvae of RLP drift for long distances downstream from their spawning habitats (Buckwalter et al. 2019), the potential for entrainment for RLP during the spawning season (March to June) would be higher than what is presented in Table 5-10 (Qualitative Monthly Turbine Entrainment Potential for Target Species).

Appalachian's Response:

Although larval RLP may drift large distances downstream from spawning sites, it is unknown if larval RLP in the Roanoke River drift a sufficient distance to become susceptible to entrainment at the Niagara Dam intake structure. In accordance with the approved RSP, an RLP Larval Drift Study is currently proposed and planned for the upcoming 2021 field season, pending issuance of a Section 10(a)(1)(A) permit from the USFWS's regional office to support the field study sampling efforts. An application for this permit was filed by Appalachian's consultant in December and discussed during the ISR meeting. Results of the study will then be used to refine the determination of RLP susceptibility to entrainment at the Niagara intake structure. In the event that the RLP Larval Drift Study is not able to be completed in 2021, the qualitative assessment of larval RLP susceptibility to entrainment will be revised from low to moderate susceptibility to provide a more conservative assessment of risk.

Bypass Reach Flow

Stakeholder Comments:

USFWS notes that Section 4.6.3 of the RSP states that the 2-D model would be capable of simulating different flow release points to the bypassed reach including through the sluice gate and over the spillway crest. The Service requests clarification that this modeling will be performed as part of this study as stated in the RSP.

Appalachian's Response:

Appalachian will simulate bypass flow releases via the Obermeyer trash sluice gate and across the spillway crest to evaluate differences in depth and flow patterns in the bypass reach. If there are significant differences in depths and velocities that extend below the bedrock pool at the toe of the spillway, habitat modeling results will be developed and evaluated to determine if there are differences in the amount and location of potential available habitat.

While the hydraulic/habitat model will be capable of simulating minimum flows over the spillway crest, Appalachian has not assessed the feasibility or practicality of operating the Project in this manner (i.e., at a constantly higher reservoir level to deliverable minimum flows to the bypass reach via the overflow spillway during certain periods).

Recreation Study

Study Plan Revision Requests

Stakeholder Comments:

Due to the upcoming scheduled closing of a portion of the Roanoke River Trail and Overlook from March 2021 – March 2022 for rehabilitation of the Blue Ridge Parkway bridge over the Roanoke River, Roanoke County, Roanoke Regional Partnership, Roanoke Valley Greenways, and Roanoke River Blueway Committee request that the final assessment of the Recreation Study be amended to extend the window of field data collection through the fall of 2022.

Appalachian's Response:

Appalachian does not propose to continue the Recreation Study in 2022 (after the filing of the FLA) to accommodate the abovementioned Blue Ridge Parkway bridge closure. Construction at the Blue Ridge Parkway has been delayed a month already, and the National Park Service estimates construction will continue through Spring of 2022, so a full season of data collection may not even be feasible in 2022. Appalachian's consultant will complete the Recreation Use Documentation task to the best of their ability in 2021 at the Roanoke River Overlook and Trail (Non-Project facility) and expects and to conduct at least two on-site interviews before the closing. Appalachian has also collected relevant information about the Roanoke River Overlook and Trail through the online survey (which will continue through the 2021 study season) as well as anecdotal observations of recreation usage of this area made by Appalachian and Appalachian's consultants in 2020 and 2021.

Postponing the Recreation Use Documentation task (or even a portion of it) until 2022 would constrain Appalachian from completing the Recreation Study on time and in alignment with the ILP schedule. In summary, if planned construction at the Blue Ridge Parkway closes the Roanoke River Outlook and Trail, the Recreation Use Documentation task will not be completed at this location due to circumstances beyond Appalachian's control (i.e. COVID-19 in 2020 and Blue Ridge Parkway construction in 2021). However, the Recreation Use Documentation task will continue as planned to gather use data at the other Non-Project facilities listed in the RSP.

In the RSP, it was assumed that personnel obtaining visitor use data from the Roanoke River Overlook and Trail would also assess usage of the Project canoe portage since the put-in is located directly across the river and is visible from the end of the Roanoke River Trail. However, since Appalachian may not be able to access the Roanoke River Trail throughout the course of the 2021 study, Appalachian proposes to install a trail camera in the vicinity of the portage put-in location

to record any activity during the Recreation Use Documentation timeframe (May through October).

Based on collection of data and relevant information about the Roanoke River Trail through other study activities and stakeholder consultation, Appalachian does not believe that conducting the Recreation Use Documentation task of the Roanoke River Overlook and Trail (a Non-Project Recreation Facility) would meaningfully inform the development of license requirements for the Niagara Project.

Stakeholder Comments:

Roanoke Valley Greenways requested that the Roanoke River and Tinker Creek Greenways be included in the Recreation Facility Inventory, which would update the analysis to include bicycling and additional fishing and boating access.

The Roanoke Regional Partnership, Roanoke River Blueway Committee, and Roanoke County requested that the Roanoke River Greenway, Tinker Creek Greenway, Roanoke River Blueway, and Explore Park are added to the Recreation Facility Inventory as Non-Project Recreation Facilities.

Appalachian's Response:

Appalachian does not propose to expand or modify the Recreation Facility Inventory task of the Recreation Study. The Recreation Facility Inventory was completed in 2020 in full conformance with the approved RSP, with results provided in the ISR. Appalachian does not believe that the stakeholders' requests to expand this task to include additional Non-Project Recreation Facilities that lack a nexus to Project operation and effects meet the ILP criteria for a modified or additional study.

Recommended Recreation Improvements

Stakeholder Comments:

The Roanoke River Blueway Committee, Roanoke County, and the Roanoke Regional Partnership encourage Appalachian to consider supporting development of a public access facility upstream (river-right) and adjacent to the Niagara reservoir that will provide vehicular parking. 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.

Roanoke County is interested in partnering with Appalachian to make these blueway improvements possibly on land located adjacent to the Project boundary that is owned by the Virginia Recreational Facilities Authority and under a lease for Explore Park. Roanoke River Blueway Committee concurs with this request and added that any proposals from this work should take into account the planned Roanoke River Greenway which is under development in this area.

Roanoke Valley Greenways has requested that Appalachian consider the following solutions to

improve recreational opportunities in the Project area: purchase property on river-right near Niagara Dam to provide parking and boating access, provide a portage around Niagara Dam on river-right, and provide Roanoke County with right-of-way for Roanoke River Greenway on river-right on AEP-owned land.

Appalachian's Response:

Appalachian appreciates the detailed comments provided by stakeholders and looks forward to additional consultation with recreation stakeholders in 2021 to inform Appalachian's licensing proposal and to identify opportunities for practical cooperation regarding regional recreation initiatives with a nexus to the Niagara Project.

Stakeholder Comments:

Roanoke River Blueway Committee indicated support for any proposed improvements to the existing portage. Possible improvements to consider include increased or more effective signage, and improvements to the take-out or put-in locations above and below the dam, respectively. Other ideas which should be included in the study of the portage include a phone that could be used to call for assistance and consideration of an access point on river right just above the dam to provide an alternate portage location.

Appalachian's Response:

Appalachian will continue to study use of the Project canoe portage in 2021 through installation of a trail camera, as described above. Also as previously noted, Appalachian looks forward to additional consultation with recreation stakeholders in 2021 to inform Appalachian's licensing proposal and to identify opportunities for practical cooperation regarding regional recreation initiatives with a nexus to the Niagara Project.

Recreation Flow Releases

Stakeholder Comments:

Roanoke County and Roanoke Regional Partnership encourages Appalachian to continue evaluating the possibility of controlled releases for recreational purposes that would be advantageous for paddlers during the lower flow late-summer/early-fall months (i.e., July through October) along the Roanoke River downstream of the dam to Explore Park's Rutrough Point. At a minimum, Roanoke Regional Partnership request weekend releases during this period. The 2016 Roanoke County Explore Park Adventure Plan proposes development of an in-river kayak park downstream near the Smith Mountain Lake Project boundary and scheduled releases would enhance this. They also note Class 1 and II white water conditions exist downstream of the Niagara Dam.

Appalachian's Response:

Appalachian appreciates the additional information provided in these comments and looks forward to additional consultation with recreation and other resource stakeholders in 2021 to inform

Appalachian's licensing proposal.

Existing Recreation Facilities Map Updates

Numerous comments were filed related to figures presented in the Preliminary Recreation Study Report. Appalachian has proactively updated the Existing Recreation facilities map where feasible, and a revised version of this map with the below noted revisions is provided in Attachment 2.

Stakeholder Comments:

Roanoke County and the Roanoke River Blueway Committee request that the Rutrough Road Canoe/Kayak Ramp Non-Project facility name be updated to Rutrough Point.

Appalachian's Response:

The Existing Project-Related Recreation Facilities map has been updated to reflect Rutrough Point. Appalachian will use this naming convention in the USR as well.

Stakeholder Comments:

Roanoke County, Roanoke River Blueway Committee, and Roanoke Regional Partnership request updates to the Existing Project-Related Recreation Facilities map.

Appalachian's Response:

Appalachian has updated the Existing Project-Related Recreation Facilities map to include the following requests:

- Added the Tinker Creek Greenway Bridge and the Roanoke River Greenway.
- Added a portage location at the Bennington trailhead.
- Moved the Niagara Portage canoe access closer to the Blue Ridge Parkway.
- Appalachian has to the best of their ability aligned the parcel and recreation facility data publicly available and requested by the stakeholders into the Existing Project-Related Recreation Facilities map. If the stakeholders have a GIS file with more specific details requested that what is publicly available, please e-mail geospatial data or figures to Appalachian so the map can be more effectively updated.

Proposed recreational facilities have not been added to the map at this time (e.g., extensions of the greenway) as the map is intended to illustrate existing recreation facilities around the Study Area (Attachment 2). Garden City Greenway was not added to the map, as it is far upstream and outside of the Study Area.

Debris and Trash

Stakeholder Comments:

Roanoke County, Roanoke Regional Partnership, and Roanoke Valley Greenways encourage

Appalachian to continue evaluating trash and debris removal alternatives; Roanoke Valley Greenways also recommends that Appalachian consider removing trash at the dam or having a small trash barge on the reservoir.

Appalachian's Response:

Appalachian supports educational outreach and trash cleanup on the Roanoke River and routinely removes large debris at the intake such as tires. Appalachian appreciates the additional information provided in these comments and looks forward to additional consultation with stakeholders in 2021 to inform Appalachian's licensing proposal and to identify opportunities for practical cooperation, including educational outreach, trash cleanups within the Roanoke River watershed, and removal of large debris (e.g., tires) at the Project intake.

Appalachian sincerely appreciates the detailed comments provided by relicensing stakeholders and has put careful consideration into the proposals and commitments presented in this response. If there are any questions regarding this filing, please do not hesitate to contact me at (614) 716-2240 or jmmagalski@aep.com.

Sincerely,

Jonathan M. Magalski
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Attachments

Attachment 1 – Benthic Aquatic Resources Study Figures
Attachment 2 – Existing Recreation Facilities Map

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Niagara Hydroelectric Project (FERC No. 2466)
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Upper Roanoke River Roundtable
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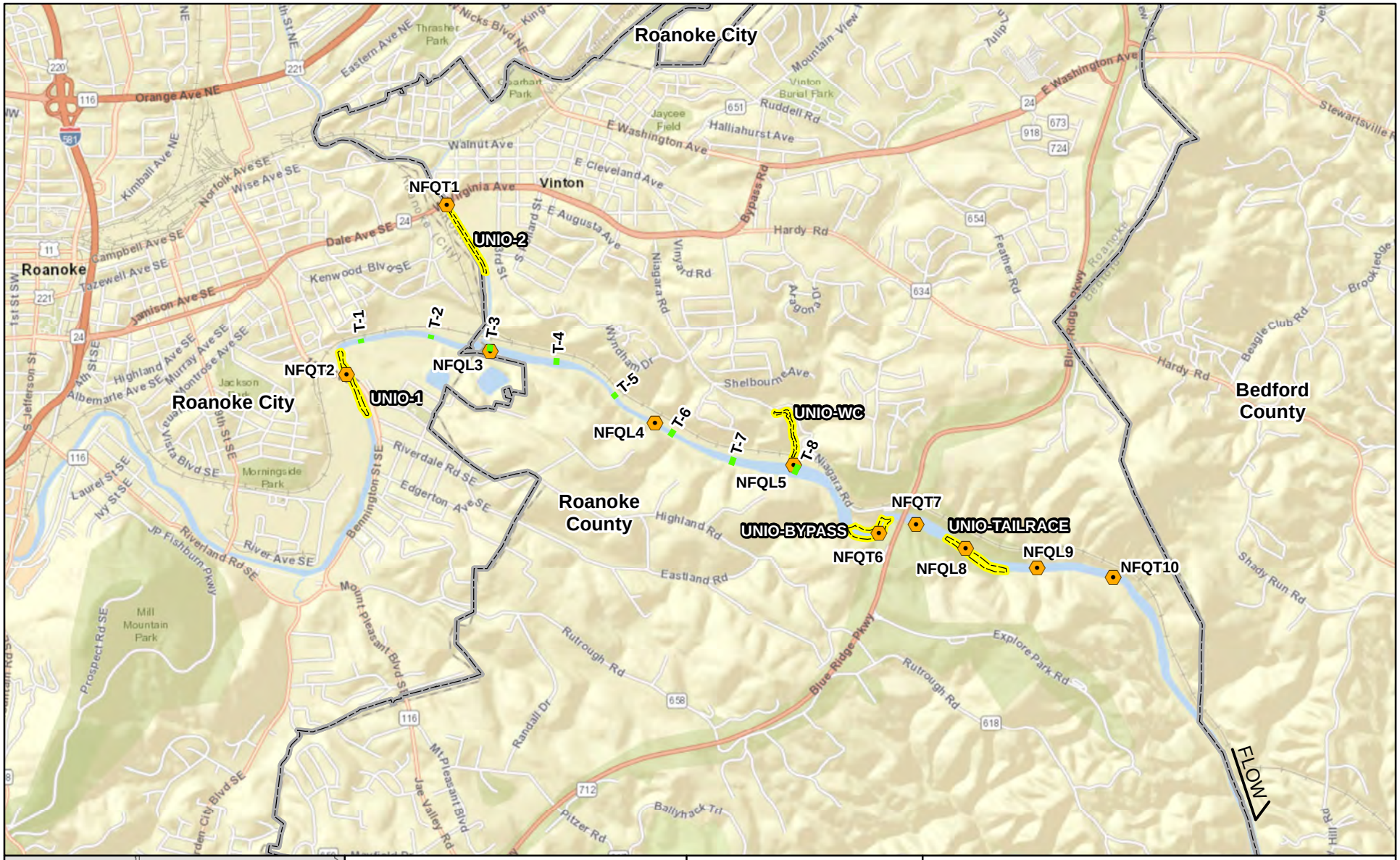
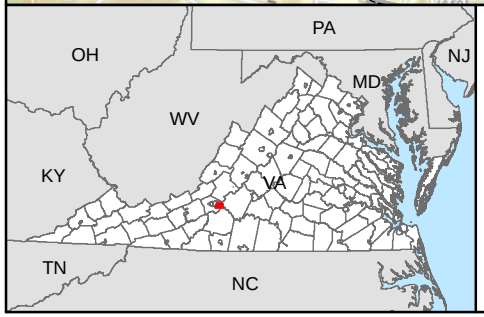
Roanoke, VA 24014





Legend

- Macroinvertebrate Sample Location
- Mussel Survey Transect
- Mussel Survey Area
- County Boundary

N

0 0.5 1

Kilometers

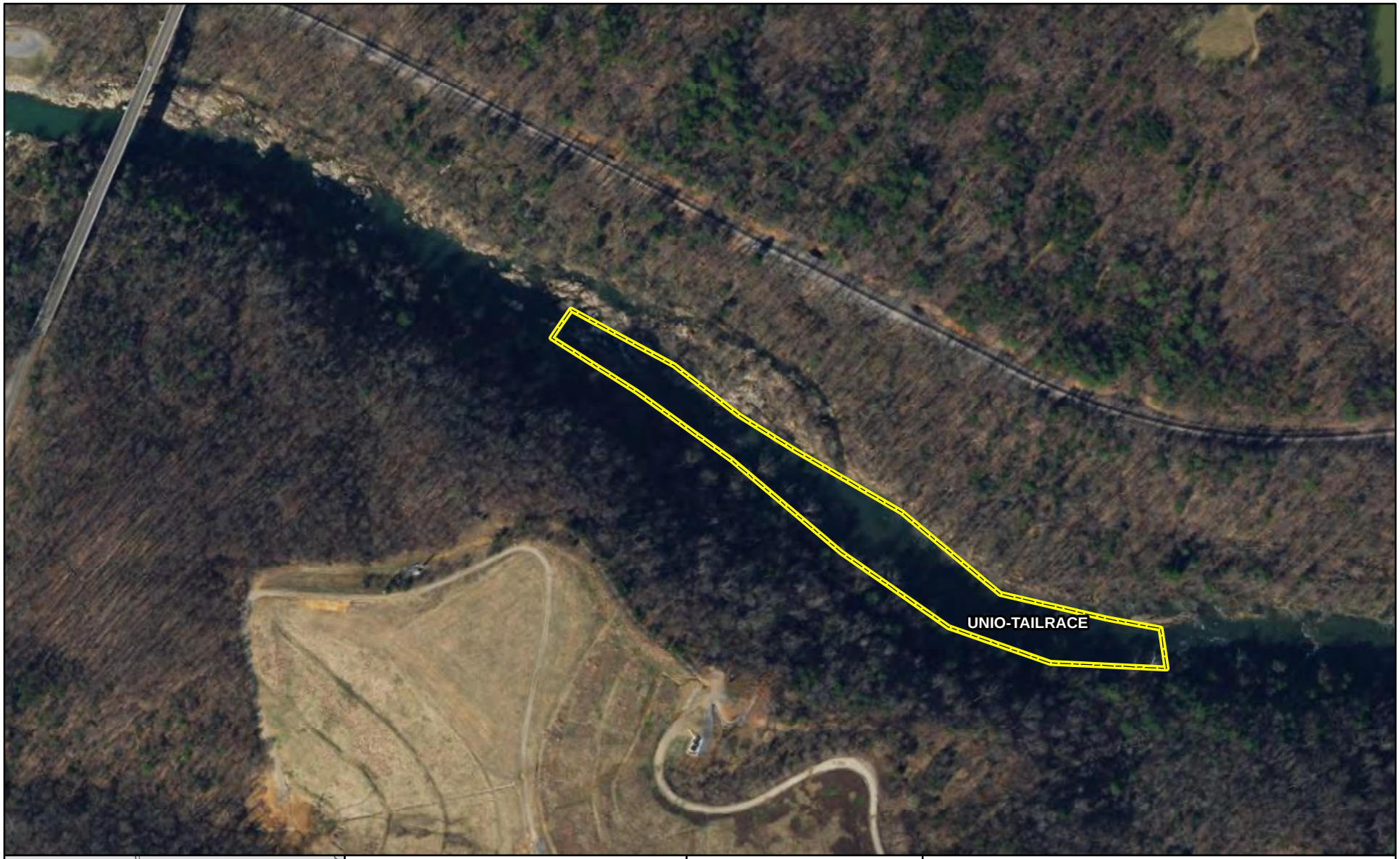
Scale: 1:39,370

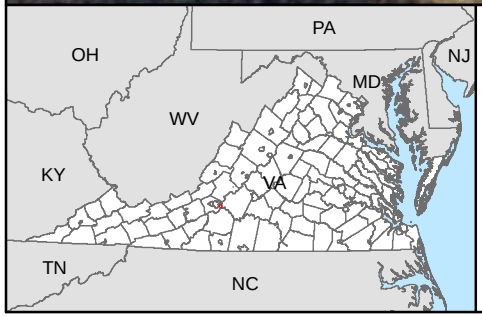
American Electric Power
Niagara Dam Benthic Aquatic Resource Study

Figure 1

Overall Niagara project area including quantitative (NFQT) and qualitative (NFQL) macroinvertebrate survey sites and transect (T) and abbreviated (UNIO) mussel survey sites on the Roanoke River in Roanoke County, Virginia

D:\PROJECTS\HDR\HDR2020-0002 Niagara Dam Relicensing\GIS\MXD\MacroInvtbrts\Report_Figs\20201124_Sbmtl\HDR2020-0002_McroInvbrts_Fig1_20210317.mxd





Legend

Mussel Survey Area

N

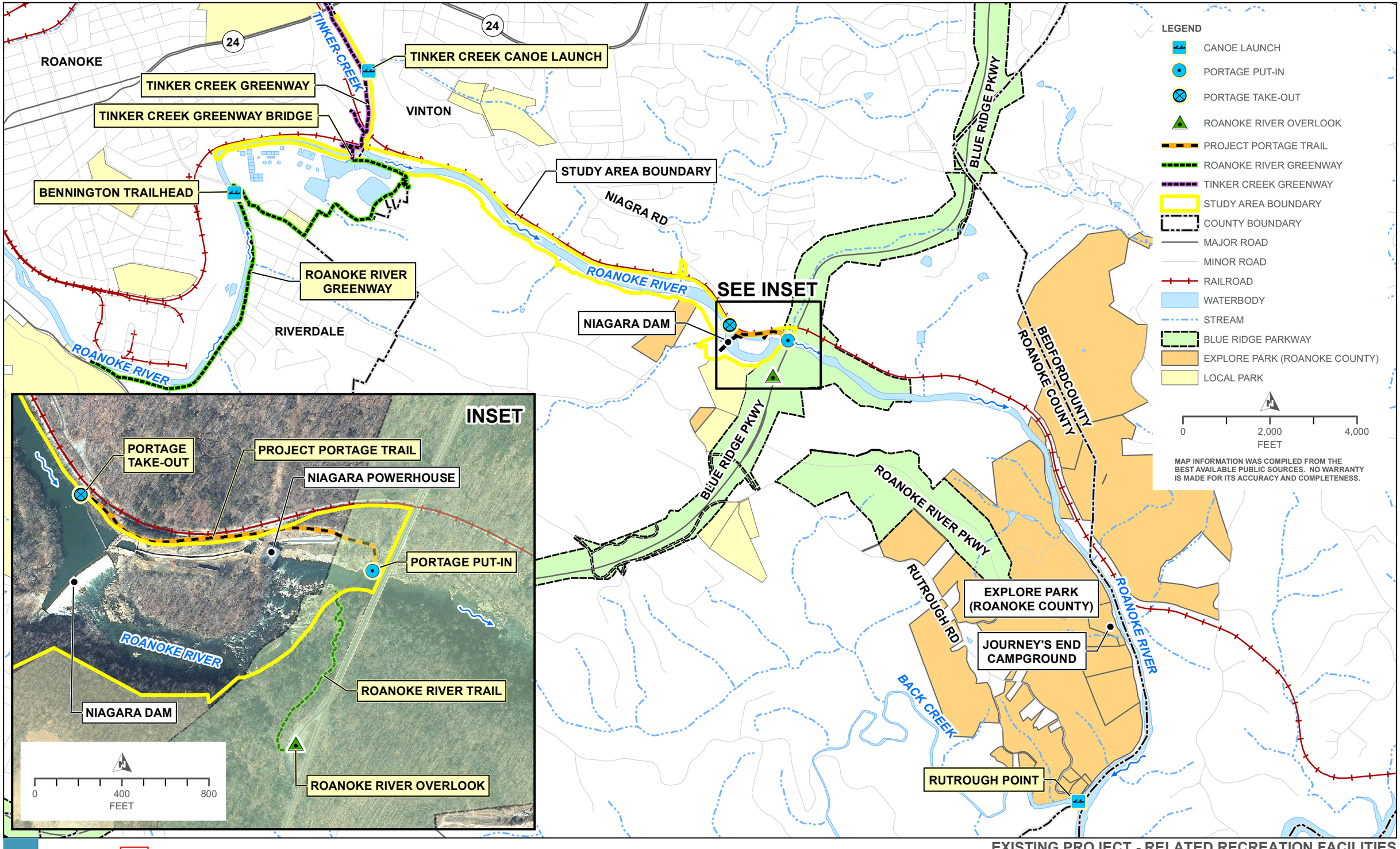
0 50 100

Meters

Scale: 1:3,937

American Electric Power
Niagara Dam Benthic Aquatic Resource Study
Figure 24
Abbreviated mussel survey extent in mixed habitat
in Roanoke County, Virginia

D:\PROJECTS\HDR\HDR2020-0002 Niagara Dam Relicensing\GIS\MXD\MacroInvtbrts\Report_Figs\20201124_Sbmtl\HDR2020-0002_McroInvbrts_Fig2_24_20210317.mxd



EXISTING PROJECT - RELATED RECREATION FACILITIES

NIAGARA HYDROELECTRIC PROJECT (FERC NO. 2466)

ROANOKE COUNTY, VIRGINIA

MARCH 2021

PATH: \\PWME-INFS01\GIS\GIS2\PROJECTS\AEP\10068005_AEP_AEP_NIAGARA_PAD_NOI\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\ISR\MAP_11X17L_20210401_EXISTING_RECREATION_FACILITIES.MXD - USER: DSOUCIE - DATE: 4/1/2021

American Electric Power
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Columbus, OH 43215
aep.com

April 30, 2021

VIA ELECTRONIC FILING

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)
Third Quarterly Study Progress Report – Spring 2021

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 currently undergoing relicensing following the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP).

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Appalachian filed the Initial Study Report (ISR) with the Commission on January 11, 2021, which summarized study activities performed in 2020, as well as ILP activities expected to be completed in 2021.

This Third Quarterly Study Progress Report describes the activities performed since the ISR was filed, including activities that occurred in quarter 1 (Q1) of 2021 and activities expected to be conducted in quarter 2 (Q2) of 2021. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

General Updates – ILP Process and Milestones

- As required by the ILP schedule, within 15 days of the ISR filing, Appalachian held a virtual ISR meeting via WebEx on Thursday, January 21, 2021 which included participation by agencies and stakeholders with interest in the Project.
- The ISR meeting summary was filed with FERC on February 5, 2021. Stakeholders' comments on the ISR meeting summary were due by March 7, 2021. Appalachian filed responses to stakeholder comments with FERC on April 6, 2021.

Bypass Reach Flow and Aquatic Habitat Study

- The GIS-based desktop aquatic habitat assessment and Habitat Suitability Index curves for the aquatic species that will be modeled in the bypass reach, as well as the proposed test flow scenarios that will be used to support model calibration and validation activities, were summarized in the Preliminary Bypass Reach Flow and Aquatic Habitat Study Report provided in the ISR.
- Field data collection is planned for the 2021 field season (likely late Q2 or early quarter 3 [Q3]) to avoid higher inflows that typically occur over the early spring months. Once the field data has been collected, a two-dimensional (2D) aquatic habitat model will be developed. Modeling results, conclusions, and recommendations will be provided in the Updated Study Report (USR) in the fourth quarter (Q4) of 2021.

Water Quality Study

- Field data collected during the 2020 field season were summarized in the Preliminary Water Quality Study Report provided in the ISR.
- As described in the ISR and subsequent comments filed by Appalachian, Appalachian plans to reinstall two continuous temperature and dissolved oxygen (DO) data sondes in the bypass reach (one at the upstream monitoring location and the other at the downstream monitoring location) from July – September 2021 (with the possibility of extending through October 2021 depending on water temperatures and bypass reach flow conditions). Appalachian also proposes to reinstall a continuous temperature and DO data sonde in the tailrace (during the same period) to capture additional data during powerhouse operations.
- As described in Appalachian's response to comments filing, Appalachian plans to collect discrete water quality profile data at the forebay monitoring location during equipment checks and data downloads for the continuous monitoring instrumentation.
- Additional water quality data collected during the 2021 field season will be summarized, along with any conclusions or recommendations, in the USR in Q4 2021.

Fish Community Study

- A single season of field data collection for the general fish community study was completed between September and October 2020. Results from the effort were reported in the ISR.
- As communicated in previous study progress reports and requested by U.S. Fish and Wildlife Service (USFWS) in March 2020, Appalachian rescheduled the adult and young-of-year Roanoke Logperch sampling efforts, which were originally planned for 2020, to 2021.

- A Larval Drift Study was planned for early spring 2021 to coincide with the Roanoke Logperch (*Percina Rex*) spawning window. Data collection efforts were scheduled to start at the beginning of April 2021 and continue for 10 consecutive weeks, ending in mid-June. The study requires (prior to field data collection) a Section 10(a)(1)(A) permit from the USFWS regional office. An application for the federal recovery permit was submitted in December 2020 by Edge Engineering & Science, LLC (EDGE) on behalf of Appalachian (Application ID: CS0003751, Permit ID:PER0002735). The timing of this application filing was discussed during the ISR, including with representatives of USFWS. The 30-day public comment period for the permit application was initiated by USFWS via public notice published in the Federal Register on April 28, 2021. Based on the date of publication, the 30-day public comment period, and anticipated time required for Appalachian's subconsultant to receive permit (if approved), Appalachian is unable to complete the Larval Drift Study, as proposed in the RSP. It is not possible to delay the start of the study to mid-June, as Roanoke Logperch will have completed their spawning season in the Roanoke River by then. Appalachian plans to consult with agencies and stakeholders in Q2 regarding potential alternatives or next steps for this study task.
- Field sampling for adult and young-of-year Roanoke Logperch will be completed between August and October 2021. A separate adult Roanoke Logperch sampling event is planned between May and June 2021 to determine if the adult life stage moves into the Niagara bypass channel during higher spring flow conditions. This sampling effort is pending the receipt of a waiver of time-of-year-restrictions (TOYR) in place for protection of Roanoke Logperch. A request for waiver of the TOYR was submitted to the Virginia Department of Wildlife Resources (VDWR) and USFWS by EDGE and HDR on behalf of Appalachian on March 29, 2021, and Appalachian has been in frequent communication with these agencies regarding the status of this request. Appalachian understands that the USFWS and VDWR held an informal virtual coordination meeting on April 23, 2021 to allow agency personnel to discuss the driver, needs, risks, and concerns with approving the TOYR waiver to facilitate spring 2021 field sampling studies. Conclusions of the meeting have not been shared with Appalachian, and coordination efforts concerning the waiver are ongoing at this time. Without the TOYR waiver approval, Appalachian will be unable to determine if adult Roanoke Logperch utilize the Niagara bypass channel, as requested by the USFWS during the study planning stage of this ILP.

- Appalachian will initiate the Turbine Blade Strike Evaluation for Niagara using the most recent version of the USFWS Turbine Blade Strike Analysis Model[1] and will also incorporate available historical information. A tentative list of species collected at the site to be used in the analysis was presented in the ISR. The analysis and reporting will be performed in Q2 2021 and results will be included in the USR.

Benthic Aquatic Resources Study

- Field data collection for the macroinvertebrate and crayfish community was completed between September and October 2020. Taxonomic identification of samples was completed in Q1 2021. Detailed results of the study and data analyses will be provided in the USR. A brief summary of the data is provided here:
    - Crayfish
        i. A few Crayfish specimens representing a single family (Cambaridae) from the genus *Fraxonius* were collected at the farthest upstream and most downstream sampling locations.
    - Macroinvertebrates:
        i. The total number of taxa collected at study sites was between 8 and 22; the lowest number of taxa (between 8 and 12 species) occurred in samples collected in the bypass channel.
        ii. The diversity of the EPTs (Ephemeroptera, Plecoptera, Trichoptera) was consistently on the low end and varied between two and nine species. The largest diversity occurred at the farthest upstream riffle (Site NFQT2) in the study area. The density of EPT organisms varied between 5 and 65 organisms; the lowest densities were documented in the bypass reach and tailrace sample locations. No Plecoptera specimens were collected.
        iii. Specimens from five families of Gastropods and two families of clams (Asian and Fingernail clams) were collected across the study area; these specimens had low relative abundance.
- A second benthic macroinvertebrate and crayfish field sampling effort is currently planned for spring 2021. Appalachian's consultant presently plans to complete the macroinvertebrate and crayfish sampling effort prior to the end of the spring

[1] U.S. Fish and Wildlife Service (USFWS). 2020. TBSA Model: A Desktop Tool for Estimating Mortality of Fish Entrained in Hydroelectric Turbines. Excel file dated December 9, 2020.

macroinvertebrate index period (May 31) as defined by VDEQ 2008. Appalachian has been informed by agencies that the TOYR waiver from USFWS and VDWR for the protection of Roanoke Logperch extends to this sampling effort as well. As described above for the Fish Community Study, Appalachian is actively pursuing this waiver request and coordination is ongoing with the USFWS and VDWR. In the absence of the TOYR waiver authorization, Appalachian will have to delay field sampling effort for the benthic macroinvertebrate and crayfish study until after the end of the TOYR window (June 30). Field sampling would then be initiated as soon as possible in July 2021, as conditions allow. Results of the laboratory processing, taxonomic identification, and data processing will be provided in the USR.

Recreation Study

- The Recreation Visitor Use Online Survey is on-going and will continue to be available in support of the Recreation Use Documentation survey.
- One of the facilities included in the Recreation Use Documentation task is the Roanoke River Overlook and Trail. Construction at the Blue Ridge Parkway is expected to begin in Q2 2021, which will force the trail to close; therefore, HDR's sub-consultant, Young Energy Services (YES) completed four in-person surveys at this facility ahead of schedule, including weekdays and weekends. The remainder of the facilities included in Recreation Use Documentation task will be surveyed by YES beginning in Q2 2021 according to the schedule presented in the RSP.
    - In the RSP, it was assumed that YES would obtain visitor use data from the Roanoke River Overlook and Trail and would also assess usage of the Project canoe portage since the put-in is located directly across the river and is visible from the end of the Roanoke River Trail. Closure of the Blue Ridge Parkway will, however, inhibit access to the Roanoke River Trail throughout the majority of the 2021 study season. As an alternative to in-person periodic observation of the portage from across the river, Appalachian plans to install a trail camera in the vicinity of the portage put-in location to record activity during the Recreation Use Documentation timeframe (May through October 2021).
- Appalachian hosted a virtual (WebEx) meeting on April 20, 2021 for interested recreation stakeholders. In addition to Appalachian and Appalachian's consultants (HDR and YES), the following entities participated in this meeting: Roanoke River Blueway Committee, Town of Vinton, Friends of the Rivers of Virginia (FORVA), Roanoke Valley Greenways, Virginia Department of Conservation and Recreation, Roanoke Regional Partnership, and Roanoke County. The meeting included presentations by Roanoke County, Roanoke River

Blueway Committee, and FORVA and provided updates on recreational initiatives, priorities, and recommendations from these organizations.

Cultural Resources Study

- Data collection for the Cultural Resources Study was completed in 2020 and summarized in the ISR. Appalachian completed the remaining fieldwork, the geomorphology survey, during the week of April 19, 2021. Complete results of this study will be filed with the USR.

If there are any questions regarding this progress report, please do not hesitate to contact me at (614) 716-2240 or via email at jmmagalski@aep.com

Sincerely,

Jonathan M. Magalski
Environmental Specialist Consultant
American Electric Power Services Corporation

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
May 10, 2021

OFFICE OF ENERGY PROJECTS

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

VIA Electronic Mail

Mr. Jonathan Magalski
Environmental Specialist Consultant
American Electric Power
jmmagalski@aep.com

Reference: Determination on Requests for Study Modifications for the Niagara Hydroelectric Project

Dear Mr. Magalski:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on requests for modifications to the approved study plan for Appalachian Power Company's (Appalachian) Niagara Hydroelectric Project No. 2466 (Niagara Project). The determination is based on the study criteria set forth in sections 5.9(b) and 5.15(d) and (e) of the Commission's regulations, applicable law, Commission policy and practice, and Commission staff's review of the record of information.

Background

The study plan determination (SPD) for the project, issued on December 6, 2019, required Appalachian to conduct eight studies and file an initial study report on those studies. On January 11, 2021, Appalachian filed the initial study report. As required by the regulations, the report describes the progress made in implementing the study plan and includes an explanation of reported variances from the study plan and schedule. On January 21, 2021, Appalachian held an Initial Study Report meeting and filed a summary of the meeting on February 5, 2021. Comments on the meeting summary and Initial Study Report were filed by: Roanoke County on March 4, 2021; Roanoke Regional Partnership and Roanoke River Blueway Committee on March 5, 2021; and Roanoke Valley Greenway Commission, Virginia Department of Environmental Quality (Virginia

DEQ), and the U.S. Fish and Wildlife Service (FWS) on March 8, 2021. Appalachian filed reply comments on April 6, 2021.

Comments

Some of the comments received do not specifically request modifications to the approved studies or new studies. This determination does not address these types of responses, which include comments on the presentation of data and results; comments disputing the interpretation of study results; recommendations for protection, mitigation, or enhancement measures; and comments on issues that Commission staff previously addressed in the December 6, 2019 SPD. This determination only addresses specific recommendations to modify the approved study plan.

Study Plan Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must demonstrate that: (1) the approved study was not conducted as provided for in the approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was not made earlier, (4) significant changes in the project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in section 5.9(b).

As indicated in Appendix A, modifications to two studies were requested; one of the requested modifications is approved and one is not required. The bases for modifying the study plan are explained in Appendix B (Requested Modifications to Approved Studies). Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations; however, only the specific study criteria particularly relevant to the study in question are referenced in Appendix B.

Please note that nothing in this determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

If you have any questions, please contact Allyson Conner at allysonconner@ferc.gov or (202) 502-6082.

Sincerely,

Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of determinations on requested modifications to approved studies

Appendix B – Commission staff's recommendations on requested modifications to approved studies and new study requests

APPENDIX A

SUMMARY OF DETERMINATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES (see Appendix B for discussion)

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Requested Modifications to Approved Studies				
Water Quality Study	FWS, Virginia DEQ		X	
Benthic Aquatic Resources Study	FWS			X

APPENDIX B

STAFF RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES AND NEW STUDY REQUESTS

Water Quality Study

Background

Appalachian conducted a water quality study to assess the effects of project operation on parameters including temperature and dissolved oxygen (DO). Continuously recording data sondes were placed at eight sites to measure temperature and DO at 15-minute intervals from July 29 through November 10, 2020. These sites included: (1) upstream of the confluence of the Roanoke River with Tinker Creek; (2) Tinker Creek; (3) the upper end of the impoundment; (4) the forebay (surface and bottom); (5) the upper bypassed reach; (6) the lower bypassed reach; and (7) the tailrace (see figure 3-1 of the *Preliminary Water Quality Study Report*). In addition, during the initial deployment and subsequent data download events, discrete multi-parameter water quality measurements of temperature, DO, pH, and specific conductivity were collected at each monitoring location, including vertical profiles at the sites in the impoundment and forebay.

Due to higher than average flows for much of the 2020 study season, which could have led to atypical temperature and DO conditions, Appalachian proposes to reinstall two continuously recording sondes in the bypassed reach and one sonde in the tailrace to measure temperature and DO from July through September of 2021.

Requested Study Modifications

Study modification requests were filed by the U.S. Fish and Wildlife Service (FWS) and by the Virginia Department of Environmental Quality (Virginia DEQ). We address the requested modifications separately below.

1. *Additional study season*

Requested Study Modification

In its comments on the Initial Study Report (ISR) meeting summary, FWS recommends that the entire Water Quality Study be repeated in 2021. FWS states that an additional study season is needed because data were not collected or available for approximately 50% of the planned 2020 study period, data that were collected are not representative of normal conditions at the project because precipitation and flow conditions were higher than average in 2020, and the data that were collected for

approximately 2 months (September 8 through November 10) cannot be used to assess project operational effects on water quality because the project was not operating during this period.

Comments on Requested Study Modification

In its reply comments, Appalachian states that it agrees that flow conditions in 2020 were wetter than normal, but that the wetter than normal conditions only affected temperature and DO in the bypassed reach and tailrace, but not in the forebay, impoundment, and upstream of the impoundment.

Regarding the forebay water quality monitoring, Appalachian asserts that the 2020 forebay water quality data represent water quality for the "worst-case" scenario, because 100 percent of the inflow to the project in the late summer/fall of 2020 was routed into the bypassed reach rather than through the forebay and powerhouse. Therefore, the forebay was stagnant and subject to poor water quality caused by water temperature and DO stratification. Appalachian asserts that during a more typical year when the units are operating, temperature and DO stratification in the forebay area is minimized because flow is routed to the powerhouse. Therefore, in lieu of conducting additional continuous monitoring in the forebay, Appalachian proposes to collect water quality profile data (temperature, DO, pH, and specific conductivity) at the forebay monitoring location when it conducts equipment checks and data downloads for the bypassed reach and tailrace monitoring locations (i.e., approximately every 2 weeks).

Regarding the need for additional monitoring in the impoundment and further upstream, Appalachian states that it reviewed the historical water quality record for the U.S. Geological Survey (USGS) gage on the Roanoke River at Thirteenth Street Bridge (No. 02055080), which is at the upstream end of the project impoundment. Appalachian observed that since at least 2008, which was the third driest year on record, water quality has been relatively constant regardless of flow and precipitation. Appalachian therefore concludes that water quality data collected in the impoundment and further upstream in 2020 are representative of water quality at and near the project under very low- and high-flow conditions. In lieu of reinstalling continuously recording sondes in the upper end of the impoundment, Tinker Creek, and the Roanoke River upstream of the confluence with Tinker Creek, Appalachian proposes to include 2021 water quality data (temperature, DO, pH, and specific conductivity) recorded at both the Thirteenth Street Bridge USGS gage and USGS gage at Tinker Creek above Glade Creek (USGS 0205551614) in the Updated Study Report (USR).

Discussion and Staff Recommendation

Additional water quality monitoring in the project tailrace and bypassed reach is warranted given the abnormal flow conditions downstream of the project dam during the

2020 study season as described above. The additional continuous DO and temperature monitoring proposed for the tailrace and bypassed reach should provide sufficient information on the effects of project operation on bypassed reach and tailrace DO and temperature.

Regarding the need to resample the forebay in 2021, data provided in the ISR demonstrates that while the project was operating, temperature and DO were similar at the surface and bottom of the forebay confirming Appalachian's assertion that little to no temperature and DO stratification occurs while the project is generating. The data also show that during the first week of the powerhouse outage, DO decreased in the forebay, particularly at the bottom confirming that DO stratification occurs when the project does not operate for an extended period as occurred in 2020. Therefore, the forebay water quality data gathered in 2020 during an extended period of powerhouse shutdown does represent the "worst-case" scenario, and therefore, another full season of continuous water quality monitoring in the forebay is unnecessary. The proposed discrete, biweekly collection of water quality data in the forebay in 2021 would require relatively low effort and could be used to confirm the aforementioned conclusions reached from the 2020 data collection.

Due to the proximity of the USGS gages to the upper extent of the project impoundment, Appalachian's proposal to analyze 2021 continuous monitoring data from the USGS gages rather than re-installing its own sondes at the three most upstream locations is reasonable, particularly since the powerhouse outage is unlikely to have influenced water quality at the upstream locations as demonstrated above by Appalachian. Therefore, we concur with Appalachian's proposal to include 2021 water quality monitoring data from the two upstream USGS gages in the USR in lieu of conducting additional water quality monitoring in the impoundment and further upstream.

In summary, we recommend that Appalachian conduct the proposed continuous monitoring in the bypassed reach and tailrace in 2021, as well as the discrete, biweekly collection of water quality data in the forebay. Therefore, we do not recommend modifying the study plan to repeat continuous water quality monitoring at the three upstream or forebay monitoring locations.

2. *Length of study season*

Requested Study Modification

Virginia DEQ and FWS recommend that temperature and DO monitoring in the bypassed reach be extended through October 2021 to ensure that water quality during low-flow periods is captured.

Comments on Requested Study Modification

In its reply comments, Appalachian states that due to the effort and costs associated with extending the field sampling for an additional month, it proposes to only extend the sampling through October if water temperatures do not begin decreasing by the end of September. Appalachian further states that it does not believe that continued sampling in the bypassed reach beyond September is needed unless no water temperature and DO data are collected at the currently required bypassed reach minimum flow of 8 cfs during the July through September period and weather forecasts indicate that bypassed reach flows of about 8 cfs are likely in October.

Discussion and Staff Recommendation

The study plan determination (SPD) required water quality monitoring through October 31, 2020, based on historical data indicating that low-flow conditions in the Roanoke River often extend into October. As Appalachian acknowledges, flows in the bypassed reach during the 2020 water quality study season were not representative of typical conditions at the project, in part due to the inoperability (i.e., held in constant open position) of the trash sluice gate and the extended powerhouse outage. Therefore, monitoring through October would ensure that Appalachian captures the entire period where low flows and/or high temperatures may occur, which is necessary to inform potential license requirements. Therefore, consistent with the SPD, we do not agree with the triggers for monitoring through October as proposed by Appalachian and instead recommend that the continuous monitoring in the bypassed reach and tailrace continue through October 31 during the 2021 study season.

3. Equipment maintenance

Requested Study Modification

FWS recommends that Appalachian check and clean data sondes weekly during the 2021 study season to avoid the loss of water quality data from biofouling.

Comments on Requested Study Modification

Appalachian proposes to download the data and check and clean the data sondes at approximately 2-week intervals and would adjust accordingly depending on the degree of biofouling observed in the field. In its reply comments, Appalachian states that the chosen frequency of equipment checks is based on observations during the 2020 field season. Biofouling was less prevalent at the non-impoundment monitoring locations during the 2020 data collection, and performing cleaning on a weekly basis is unnecessary and would result in a significant increase in cost and effort.

Discussion and Staff Recommendation

While biofouling of the data sondes resulted in some data loss in 2020, as Appalachian noted, it was less of an issue at the downstream locations that Appalachian is required to study again in 2021. Appalachian's proposal to check and clean the data sondes at 2-week intervals and to adjust as needed is reasonable and should be frequent enough to ensure the data sondes continue to operate. We recommend that Appalachian increase the frequency to weekly only if biofouling is found to hamper data collection.

Benthic Aquatic Resources Study

Freshwater Mussel Survey

Background

As part of the Benthic Aquatic Resources Study, Appalachian conducted a freshwater mussel survey to characterize mussel habitat and community composition in the project area in the fall of 2020. A combination of transect and abbreviated surveys were conducted following methods modified from the "Draft Freshwater Mussel Guidelines for Virginia."[1,2] Transect surveys were performed at eight sites spaced every 500 meters within the impoundment and immediately upstream of the impoundment. Linear transects were established across the width of the impoundment, perpendicular to stream flow, and ranged from 30 to 75 meters in length. Surveyors searched transects for mussels at an approximate rate of one minute per square meter in heterogeneous substrates. Methods used to locate mussels included wafting and raking sediment, searching through aquatic vegetation, and overturning cobble, boulder, and woody debris. No live mussels were recorded in the transect surveys.

Surveys were also conducted in five reaches of riffle and/or run habitats ranging from 315 to 500 meters in length in: (1) Tinker Creek, (2) Wolf Creek, (3) the Roanoke River upstream of the impoundment, (4) the bypassed reach, and (5) below the tailrace using viewscopes, snorkeling, and surface supplied air.[3] Surveyors targeted habitat(s)

[1] FWS and Virginia DGIF. 2018. Draft Freshwater Mussel Guidelines for Virginia. Virginia Field Office, Gloucester, Virginia.

[2] Transect surveys were conducted in pool habitats and include searching all habitat along the entire length, while abbreviated surveys were conducted at sites with mixed habitat and included searching for mussels in suitable habitat throughout the site.

[3] The use of surface supplied air is a sampling technique whereby the diver is supplied breathing gas from the surface, either from the shore or from a diving support vessel.

suitable for the occurrence of freshwater mussels and searched those areas at an approximate rate of one minute per square meter in heterogeneous substrates using similar methods as those used in the transect surveys. A total of four Eastern Elliptio (*Elliptio complanata*) were observed and collected during the abbreviated surveys in Tinker Creek and the Roanoke River upstream of the impoundment.

Requested Study Modification

In its comments on the ISR meeting summary, FWS notes that there is a large riffle at the lower extent of the most downstream survey area ("UNIO-Tailrace Survey Area") that includes a continuous area of stable gravel/cobble substrate and may represent the beginning of suitable mussel habitat that was not surveyed. In addition, FWS states that the location of the UNIO-Tailrace Survey Area differs from the location proposed in the approved study plan. Specifically, the UNIO-Tailrace Survey Area was to start 500 meters downstream of the tailrace and extend a distance of 500 meters to a point 1,000 meters downstream of the tailrace. However, figure 1 in the Benthic Aquatic Resources Study Report shows the UNIO-Tailrace Survey Area started approximately 375 meters rather than 500 meters downstream of the tailrace with the result that the survey ended 875 meters instead of 1,000 meters downstream of the tailrace. FWS states that this appears to have resulted in the first area of suitable mussel habitat not being surveyed and recommends that an additional 500 meters of area below that which was surveyed in 2020 be surveyed for freshwater mussels in 2021.

Comments on Requested Study Modification

In its reply comments, Appalachian states that the figure in the ISR illustrating the UNIO-Tailrace Survey Area contained an outdated shapefile created during the study planning process and did not accurately represent the area that was actually surveyed. In its response comments, Appalachian provided new figures illustrating the correct location and extent of the UNIO-Tailrace Survey Area that was evaluated during the 2020 field effort. The revised figures show that the survey was initiated approximately 500 meters downstream of the tailrace and extended 500 meters downstream, thereby covering the full extent delineated in the approved study plan. Appalachian states that it is not proposing to conduct additional mussel surveys as requested by FWS because the sampling locations and survey methodology were developed in consultation with staff from the Virginia Department of Wildlife Resources, the results of the 2020 survey indicate mussel density and diversity in the Roanoke River near the project is very low, and that the requested expanded area is beyond the extent of hydraulic influence of project operations.

Discussion and Staff Recommendation

The additional information provided by Appalachian in its reply comments indicates that it surveyed the full extent of the survey area as proposed in the approved study plan. In addition, while additional suitable mussel habitat may be located further downstream than the area surveyed in 2020, there is no reason to conclude that project operation would affect areas more than 1,000 meters downstream of the tailrace. FWS does not demonstrate the nexus between project operation and freshwater mussel resources in the Roanoke River more than 1,000 meters downstream of the tailrace or explain how the additional mussel survey would inform potential license requirements [section 5.9(b)(5)]. Therefore, we do not recommend modifying the study to require Appalachian to conduct an additional freshwater mussel survey downstream of the project.

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July 22, 2021

VIA ELECTRONIC FILING

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)
Fourth Quarterly Study Progress Report – Summer 2021

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 currently undergoing relicensing following the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP).

This Fourth Quarterly Study Progress Report describes the activities performed since the Third Quarterly Study Progress Report which was filed on April 30, 2021, and includes activities expected to be conducted in quarter 3 (Q3) of 2021. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Bypass Reach Flow and Aquatic Habitat Study

- Field data collection was completed during the weeks of June 28 and July 5. Once the field data has been analyzed, a two-dimensional (2D) aquatic habitat model will be developed. Preliminary modeling results, conclusions, and recommendations will be provided in the Updated Study Report (USR).

Water Quality Study

- Appalachian's consultant, HDR, reinstalled two continuous temperature and dissolved oxygen (DO) data sondes in the bypass reach (one at the upstream monitoring location and the other at the downstream monitoring location) and a continuous temperature and DO data sonde in the tailrace during the week of June 28th. HDR has completed one download

on July 8 and a second download on July 20. HDR presently plans to download measurements from the equipment approximately every other week through October 2021.

- Appalachian plans to collect discrete water quality profile data at the forebay monitoring location during equipment checks and data downloads for the continuous monitoring instrumentation.
- Additional water quality data collected during the 2021 field season will be summarized, along with any conclusions or recommendations, in the USR in Q4 2021.

Fish Community Study

- As reported in Appalachian's previous progress report, a Larval Drift Study was planned for early spring 2021 to coincide with the Roanoke Logperch (*Percina Rex*) spawning window. Data collection efforts were scheduled to start at the beginning of April 2021 and continue for 10 consecutive weeks, ending in mid-June. The study requires (prior to field data collection) a Section 10(a)(1)(A) permit from the U.S. Fish and Wildlife Service (USFWS) regional office. An application for the federal recovery permit was submitted in December 2020 by Edge Engineering & Science, LLC (EDGE) on behalf of Appalachian (Application ID: CS0003751, Permit ID:PER0002735). The timing of this application filing was discussed during the ISR, including with representatives of USFWS. The 30-day public comment period for the permit application was initiated by USFWS via public notice published in the Federal Register on April 28, 2021. The permit has not yet been issued.
- Due to this permit delay, Appalachian's subconsultant, EDGE, was unable to complete the Larval Drift Study as scheduled. On June 7, an informal conference call was held among FERC Division of Hydropower Licensing staff, staff from USFWS and the Virginia Department of Wildlife Resources (VDWR), and representatives from Appalachian and HDR, to discuss process considerations for delaying the study until the spring of 2022 (i.e., after the filing of the final license application) or alternative approaches or measures. As follow-up to this discussion, and based on findings from adult and juvenile Roanoke Logperch surveys at the Project scheduled for completion this summer, Appalachian plans to further consult with the agencies regarding the Larval Drift Study in advance of or in conjunction with the filing of the draft license application.
- Appalachian did not receive approval from the USFWS to complete the adult Roanoke Logperch electrofishing sampling efforts in the Niagara bypass channel as presented in the RSP. In lieu of and in consultation with USFWS and VDWR, Appalachian completed the spring adult Roanoke Logperch survey in the bypass channel using snorkeling methodologies. The snorkel surveys and habitat assessment efforts in the bypass channel

were completed the week of June 28. Additional field sampling for adult and young-of-year Roanoke Logperch in the vicinity of the Project as presented in the RSP will be completed between August and October 2021.

- Appalachian will initiate the Turbine Blade Strike Evaluation for Niagara using the most recent version of the USFWS Turbine Blade Strike Analysis Model[1] and will also incorporate available historical information. A tentative list of species collected at the site to be used in the analysis was presented in the ISR. The analysis and reporting will be continued to be performed in Q3 2021 and results will be included in the USR.

Benthic Aquatic Resources Study

- Field data collection for the macroinvertebrate and crayfish community was completed between September and October 2020. A second benthic macroinvertebrate and crayfish field sampling effort was completed on June 2-4, 2021. The benthic macroinvertebrate and crayfish sampling is complete. While this sampling was initially scheduled for completion by May 31, prior to the end of the spring macroinvertebrate index period (May 31) as defined by VDEQ 2008, scheduling of the fieldwork was delayed due to the need to obtain a not likely to adversely affect determination (which was received on May 26, 2021) for the protection of Roanoke Logperch from USFWS, which extended to this sampling effort as well.
- Results of the laboratory processing, taxonomic identification, and data processing will be provided in the USR.

Recreation Study

- The Recreation Visitor Use Online Survey is on-going and will continue to be available in support of the Recreation Use Documentation survey. Appalachian provided minor updates to the online survey based on recent stakeholder feedback and included the most up to date Project map. Appalachian reshared the survey link with stakeholders in May, so that they could distribute to their users/groups. Appalachian also posted the survey link on the Claytor Lake and Smith Mountain Facebook pages, as well as the NextDoor application. (The notification was sent to 19 Appalachian serviced neighborhoods, translating to about 3,800 customers in the area of the Niagara Dam and corresponding Project area. These postings were done on June 7, 2021).

[1] U.S. Fish and Wildlife Service (USFWS). 2020. TBSA Model: A Desktop Tool for Estimating Mortality of Fish Entrained in Hydroelectric Turbines. Excel file dated December 9, 2020.

- As described in the previous progress report, driven by the then-pending closure of the Blue Ridge Parkway, Appalachian's sub-consultant, Young Energy Services (YES) was able to complete seven days of in-person survey (weekdays and weekends included) between the time period March 20 and May 11, resulting in twenty in-person surveys. The remainder of the facilities included in Recreation Use Documentation task began being surveyed by YES in May 2021, according to the schedule presented in the RSP.
    - Also as described in the previous progress report, as the alternative to in-person periodic observation of the portage from across the river, Appalachian installed a trail camera on May 26, 2021 in the vicinity of the portage put-in location to record activity during the Recreation Use Documentation timeframe. One download of the trail camera has occurred at the time of this progress report.
- Appalachian is presently evaluating recreation facility enhancements to be included in Appalachian's licensing proposal and plans to conduct additional stakeholder consultation related to potential enhancements in advance of or concurrent with the filing of the Draft License Application.

Wetlands, Riparian, and Littoral Habitat Characterization Study and Shoreline Stability Assessment

- The field work in support of the Wetlands, Riparian, and Littoral Habitat Characterization Study and the Shoreline Stability Assessment was completed during the week of June 21st and results will be provided in the USR.

Cultural Resources Study

- All field investigations for this study have been completed. Final results of the Cultural Resources Study will be filed with the USR.

If there are any questions regarding this progress report, please do not hesitate to contact me at (614) 716-2240 or via email at jmmagalski@aep.com

Sincerely,

Jonathan M. Magalski
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Via Electronic Filing

October 1, 2021

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 Draft License Application

Dear Secretary Bose:

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 § 5.16(a), Appalachian is hereby filing the Draft License Application (DLA) for the Project.

As described in the DLA, Appalachian is proposing to continue the run-of-river operation of the Project and does not propose the development of any new hydroelectric facilities or increased generation capacity. The DLA includes proposals for some preliminary protection, mitigation, and enhancement (PM&E) measures related to resources associated with the Project. The proposed PM&E measures described in the DLA reflect consideration of available information, the preliminary results of studies conducted or in-process, and issues specific to the Project. Appalachian notes that these proposals are preliminary and expects them to be refined within the Final License Application (to be filed with FERC by February 28, 2022), based on the completion of ongoing relicensing studies and study reporting, interests of Project stakeholders, and further evaluation of Project power and non-Power values.

The DLA is composed of four volumes, as described below:

Volume I of IV (Public)
Volume I contains Public information and exhibits as listed below. Final Study Reports are not included as they are still under preparation and will be filed under with the Updated Study Report (to be filed with FERC by December 6, 2021).

- Table of Contents
- Initial Statement and Additional Information Required by 18 CFR §5.18(a)
- Exhibit A – Project Description and Operation
- Exhibit E – Environmental Report
- Exhibit F – List of General Design Drawings
- Exhibit G – Project Boundary Maps
- Exhibit H – Ability to Operate

Volume II of IV (Public)
Volume II contains Appendices to Exhibit E that are Public information. Final Study Reports are not included as they are still under preparation and will be filed under with the Updated Study Report (to be filed with FERC by December 6, 2021).

- Appendix A – Exhibit E Appendices
    - Consultation

Volume III of IV (CRITICAL ENERGY/ELECTRIC INFRASTRUCTURE INFORMATION [CUI//CEII])
Volume III contains CUI/CEII materials not intended for public release, and includes the following:

- Exhibit F – General Design Drawings
- Exhibit H – Single-Line Diagram of the Transmission System

Volume IV of IV (PRIVILEGED [CUI//PRIV])

- Cultural Resources Study Report

Appalachian is filing the DLA with the Commission electronically and is distributing this letter electronically to the parties listed on the attached distribution list. All parties interested in the relicensing process may obtain a copy of the DLA 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.

In accordance with 18 CFR § 5.16(e), interested parties may file comments regarding the DLA within 90 days of the date of this letter, by December 30, 2021. All comments must be filed with FERC electronically or via the following address:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
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If there are any questions regarding this filing, please do not hesitate to contact me at (614) 716-2240 or jmmagalski@aep.com.

Sincerely,

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Enclosures

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Niagara Hydroelectric Project (FERC No. 2466)
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Niagara Hydroelectric Project (FERC No. 2466)
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November 2, 2021

VIA ELECTRONIC FILING

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)
Fifth Quarterly (Final) Study Progress Report – Fall 2021

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 currently undergoing relicensing following the Federal Energy Regulatory Commission's (FERC or Commission) Integrated Licensing Process (ILP).

This Fifth Quarterly Study Progress Report describes the activities performed since the Fourth Quarterly Study Progress Report which was filed on July 22, 2021 and includes the final study plan activities expected to be conducted in quarter 4 (Q4) of 2021. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Bypass Reach Flow and Aquatic Habitat Study

- As previously reported, field data collection was completed during the weeks of June 28 and July 5, 2021. The two-dimensional (2D) aquatic habitat model has been developed and preliminary modeling results, conclusions, and recommendations will be provided in the Updated Study Report (USR).
- As described in the RSP, Habitat Suitability Indices (HSI) for various target life stages of Roanoke Logperch (*Percina rex*) were to be developed to support habitat modeling for this species. Data presented in Rosenberger and Angermeier (2003), Anderson (2016), and data collected during the Roanoke Logperch-targeted snorkel survey of the bypass reach (completed by EDGE in summer 2021) will be used to inform development of HSI for Roanoke Logperch.

Water Quality Study

- As previously reported, Appalachian's consultant, HDR, reinstalled two continuous temperature and dissolved oxygen (DO) data sondes in the bypass reach (one at the upstream monitoring location and the other at the downstream monitoring location) and a continuous temperature and DO data sonde in the tailrace during the week of June 28th. Data downloads and collection of discrete water quality profile data at the forebay monitoring location were completed by HDR on the following dates during the 2021 study season: July 7, 20; August 3, 12, 24; September 15; and October 6, and were removed on October 27.
- During the hottest portion of the 2021 summer (July/August) when bypass flows were at the 8 cfs minimum required release, significant biofouling affected the data sonde located at the upper bypass reach monitoring location. This resulted in two data gap periods at this location: the first was from July 13 – July 20 and the second was from July 24 – August 3. The upper bypass reach monitoring location was located in a slow moving/stagnant pool which likely contributed to the equipment biofouling. The data sonde located at the lower bypass reach monitoring location (faster moving run/riffle) was not impacted by biofouling and continuously recorded temperature and DO throughout the 2021 water quality monitoring period.
- This additional water quality data collected during the 2021 field season will be summarized, along with any conclusions or recommendations, in the USR.

Fish Community Study

- As reported previously, an application for the federal recovery permit was submitted by Edge Engineering & Science, LLC (EDGE) on behalf of Appalachian (Application ID: CS0003751, Permit ID: PER0002735) in December 2020. This permit was required to conduct the Larval Drift Study, which was previously scheduled to be completed in the spring of 2021 but was rescheduled for spring of 2022 due to delays in acquiring the federal recovery permit. The approved Section 10(a)(1)(A) permit (ID: PER0002735) was received from the U.S. Fish and Wildlife Service (USFWS) regional office in July 2021; the permit is valid from July 28, 2021 through July 28, 2026.
- As previously reported, Appalachian did not receive approval from the USFWS to complete the adult Roanoke Logperch electrofishing sampling efforts in the Niagara bypass channel as presented in the RSP. In lieu of the approval and in consultation with USFWS and VDWR, Appalachian completed the spring adult Roanoke Logperch survey in the bypass channel using snorkeling methodologies. The snorkel surveys and habitat

assessment efforts in the bypass channel were completed June 28-30, 2021, with 9 adults and 1 juvenile documented in the surveyed reach during this period.

- Additional late summer/fall field sampling for adult and young-of-year Roanoke Logperch in the vicinity of the Project, as presented in the RSP, was performed in the bypass reach August 9 - 10, 2021, before field sampling was halted due to inclement weather and high flow conditions. Thirteen Roanoke Logperch adults and 3 juveniles were documented in the bypass reach during the August 2021 field effort. The remaining fall sampling effort was completed between October 19 - 23, 2021, with a total of 15 Roanoke Logperch being observed in the mainstem Roanoke River above Niagara Dam, 6 documented downstream of Niagara Dam, and 6 were observed in Tinker Creek. Additional details will be provided in the USR.
- An evaluation of fish passage and turbine blade strike mortality for Niagara was completed in October 2021 using the current version of the USFWS Turbine Blade Strike Analysis Model. The results will be summarized in the USR.

Benthic Aquatic Resources Study

- As previously reported, collection of field data for the macroinvertebrate and crayfish community study was completed as of June 2021. Laboratory processing and taxonomic identification was completed over the summer. Results will be provided in the USR.

Recreation Study

- The Recreation Visitor Use Online Survey has been on-going and open for public comment since early 2020. In conclusion of the Recreation Study the final date for access to the online survey was on October 31, 2021. 2020-2021 survey results will be provided in the USR.
- As described in previous progress reports, driven by the then-pending closure of the Blue Ridge Parkway, Appalachian's sub-consultant, Young Energy Services (YES) was able to complete seven days of in-person survey (weekdays and weekends included) between the time period March 20 and May 11, resulting in twenty in-person surveys. YES completed the remainder of the facilities included in Recreation Use Documentation task between May and October, according to the schedule presented in the RSP. During this period, twelve survey days were completed, resulting in 46 in-person surveys. Of these 46 in-person surveys, 7 occurred at Tinker Creek Canoe Launch, 19 at the Roanoke River Trail, and 20 at Rutrough Point.
    - Also as described previously, as the alternative to in-person periodic observation of the portage from across the river, Appalachian installed a trail camera on May 26,

2021 in the vicinity of the portage put-in location to record activity during the Recreation Use Documentation timeframe. Six downloads of the trail camera have occurred over the study period and the trail camera was removed on October 27, 2021.

- Appalachian is presently evaluating recreation facility enhancements to be included in Appalachian's licensing proposal and plans to conduct additional stakeholder consultation related to potential enhancements concurrent with the USR and/or prior to the filing of the Final License Application.

Wetlands, Riparian, and Littoral Habitat Characterization Study and Shoreline Stability Assessment

- As previously reported, the field work in support of the Wetlands, Riparian, and Littoral Habitat Characterization Study and the Shoreline Stability Assessment was completed during the week of June 21, 2021 and results will be provided in the USR.

Cultural Resources Study

- As noted in the Draft License Application, the Cultural Resources Study was completed by Terracon in 2020-2021. The final study report was distributed to SHPO and Tribes on September 8, 2021 for a 30-day review period. No reply comments have yet been received. The study report was also filed with FERC as a CUI/Privileged volume of the Draft License Application.

If there are any questions regarding this progress report, please do not hesitate to contact me at (614) 716-2240 or via email at jmmagalski@aep.com

Sincerely,

Jonathan M. Magalski
Environmental Specialist Consultant
American Electric Power Services Corporation

Appendix A

Appendix A – Bypass Reach Flow and Aquatic Habitat Study Report

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Appendix B

Appendix B – Water Quality Study Report

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Appendix C

Appendix C – Fish Community Study Report

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Appendix D

Appendix D – Benthic Aquatic Resources Study Report

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Appendix E

Appendix E – Wetlands, Riparian, and Littoral Habitat Study Report

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Appendix F

Appendix F – Shoreline Stability Assessment Study Report

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Appendix G

Appendix G – Recreation Study Report

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