

FEDERAL ENERGY REGULATORY COMMISSION  
WASHINGTON, DC 20426  
November 18, 2019

OFFICE OF ENERGY PROJECTS

Project No. 2514-186 Virginia  
Byllesby-Buck Hydroelectric Project  
Appalachian Power Company

VIA FERC Service

Ms. Elizabeth Parcell, Process Supervisor  
American Electric Power Services Corporation  
P.O. Box 2021  
Roanoke, VA 24022-2021

**Reference: Study Plan Determination for the Byllesby-Buck Hydroelectric Project**

Dear Ms. Parcell:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Byllesby-Buck Hydroelectric Project (Byllesby-Buck Project) located on the New River in Carroll County, Virginia. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On June 21, 2019, Appalachian Power Company (Appalachian) filed its proposed plan for eight studies covering water quality, aquatic habitat and fishery resources, terrestrial resources, recreation resources, and cultural resources in support of its intent to relicense the project.

Appalachian held its initial Study Plan Meeting on July 18, 2019. Comments on the Proposed Study Plan (PSP) were filed by Commission staff, the U.S. Fish and Wildlife Service (FWS), and the Virginia Department of Game and Inland Fisheries (Virginia DGIF). Virginia Tech's College of Natural Resources and Environment (Virginia Tech) filed multiple study requests on March 15, 2019.

Project No. 2514-186

2

On October 18, 2019, Appalachian filed a Revised Study Plan (RSP) that includes revisions to five of the eight studies included in the PSP. Comments on the RSP were filed by Virginia DGIF and FWS.

### Study Plan Determination

Appalachian's RSP is approved with the staff-recommended modifications discussed in Appendix B. As indicated in Appendix A, of the eight studies proposed by Appalachian, three are approved with staff-recommended modifications and five are approved as filed by Appalachian. This determination also addresses seven additional studies requested by stakeholders that were not adopted by Appalachian and are not required by this determination (see Appendix A). In Appendix B, we explain the specific modifications to the study plan and the bases for modifying, adopting, or not adopting requested studies. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, staff only reference the specific study criteria that are particularly relevant to the determination.

Recommendations for protection, mitigation, and enhancement measures are not study requests, and therefore, are not discussed in this determination. Unless otherwise indicated, all components of the approved studies not modified in this determination must be completed as described in Appalachian's RSP. Pursuant to section 5.15(c)(1) of the Commission's regulations, the initial study report for all studies in the approved study plan must be filed by November 17, 2020.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, Appalachian may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

Project No. 2514-186

3

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

Sincerely,

for  
Terry L. Turpin  
Director  
Office of Energy Projects

Enclosures: Appendix A – Summary of determinations on proposed and requested study modifications and studies requested but not adopted by Appalachian  
Appendix B – Staff's recommendations on proposed and requested study modifications and studies requested

Project No. 2514-186

**APPENDIX A****SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED  
STUDY MODIFICATIONS AND STUDIES REQUESTED BUT NOT ADOPTED  
BY APPALACHIAN**

<b>Study</b>	<b>Recommending Entity</b>	<b>Approved</b>	<b>Approved with Modifications</b>	<b>Not Required</b>
Flow and Bypass Reach Aquatic Habitat Study	Appalachian		X	
Water Quality Study	Appalachian		X	
Aquatic Resources Study	Appalachian		X	
Wetlands, Riparian, and Littoral Habitat Characterization Study	Appalachian	X		
Terrestrial Resources Study	Appalachian	X		
Shoreline Stability Assessment Study	Appalachian	X		
Recreation Study	Appalachian	X		
Cultural Resources Study	Appalachian	X		
Comprehensive Sediment Study to Develop a Sediment Management Plan	Virginia DGIF			X
Fish Protection and Downstream Passage Studies	FWS			X

Project No. 2514-186

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
PCB Contamination and Pollution Minimization Plan	Virginia Tech			X
Water Willow Propagation, Rehabilitation, and Water Level Plan	Virginia Tech			X
Target Biological Community in the Two Bypass Reaches and Rehabilitation of the Foundational Plant, Riverweed	Virginia Tech			X
Survey of Rare Dragonflies and Multi Taxa Survey	Virginia Tech			X
Recreational Value and Access Development Mitigation	Virginia Tech			X

Project No. 2514-186

## APPENDIX B

### STAFF'S RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDY MODIFICATIONS AND STUDIES REQUESTED

The following discusses staff's recommendations on studies proposed by Appalachian Power Company (Appalachian), requests for study modifications, and requests for additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. section 5.9(b)(1)-(7)].

#### I. General Issues

The Virginia Department of Game and Inland Fisheries (Virginia DGIF) and the U.S. Fish and Wildlife Service (FWS) submitted comments stating that the Byllesby-Buck Project impacts the New River for many miles both upstream and downstream of the project's dams and hydroelectric facilities. Both agencies identify multiple project-related impacts including influencing ambient New River water temperature and water quality parameters (habitat effects on resident coolwater flora and fauna), liberation of project sediment deposits during project operation resulting in increased downstream turbidity, placement of the dams causing inundation of historic New River walleye spawning habitat and blocking the upstream migration of walleye, and the loss of upstream mussel fauna due to the dams blocking migration of host fishes. Virginia DGIF and FWS state that the magnitude and spatial scale of the project's influence is not adequately addressed in the revised study plan (RSP) and that expanding the study area would help determine adequate reference conditions for ecological comparisons during multiple study efforts.

Generally, the geographic scope (or study area) of the required studies is established based on the anticipated extent of direct project-related effects. Neither agency identifies the specific studies that neglect to address potential direct project-related effects. Neither Virginia DGIF nor FWS state which studies should have extended geographic scopes beyond what Appalachian defines as the study area in the RSP. Further, the agencies have not provided an estimate of how far upstream or downstream they believe the geographic scope should be expanded or how the geographic scope of potential project effects should be determined for various resources. In the following sections, we address the geographic scope of individual studies to the extent that comments and requested study modifications specifically address this issue.

Regarding the recommendation that expanding the study area would help determine adequate reference conditions (i.e., a reference reach) for purposes of informing an analysis of project effects, we note that the environmental baseline for our effects analysis is the condition that exists at the time of relicensing, not pre-project conditions or a surrogate for pre-project conditions like a reference reach. Therefore, we

Project No. 2514-186

do not recommend expanding the overall geographic scope or documenting reference conditions for the purposes of determining environmental effects.

## II. Required Studies

### Flow and Bypassed Reach Aquatic Habitat Study

#### Applicant's Proposed Study

Appalachian proposes to develop and calibrate a two-dimensional (2-D) hydraulic model that would be used in conjunction with an operations model [the Computerized Hydro Electric Operations Planning Software (CHEOPS) platform] to assess how aquatic habitat (depth and flow velocity) in each development's tailrace and bypassed reach varies across a range of flows and project operation scenarios. Hydrology data from the U.S. Geological Survey (USGS) gage (No. 03165500) at Ivanhoe, Virginia (years 1996 through 2019) would be used to develop the CHEOPS model, which is capable of simulating flow releases under various gate opening scenarios. For example, Appalachian plans to use the CHEOPS model to help determine which of the 10 total (six Tainter and four Obermeyer) spillway gates at the Buck Development should be used during down-ramping<sup>1</sup> to ensure a safe, continuously wetted and sufficiently deep, exit route for walleye or other spring-spawning fishes that may be attracted to intermittent spill events into the 4,100-foot-long Buck bypassed reach.<sup>2</sup> The results from the hydraulic model would be coupled with a Physical Habitat Simulation (PHABSIM) model to evaluate how aquatic habitat suitability varies as a function of flow for fish species of interest. The species and range of flows (calibration and test flows) to be evaluated at each development (Buck and Byllesby) would be determined through consultation with stakeholders and resource agencies and based on the management objectives for each bypassed reach. Appalachian would also measure leakage into each bypassed reach at the low end of the tested flow regime. Lastly, Wolman pebble counts would be conducted along at least three transects in each bypassed reach to characterize substrate type and size to aid in development of the PHABSIM model.

---

<sup>1</sup> Following periods of spill into the Buck bypassed reach when a spillway gate has been opened 2 feet or more [corresponding to a release of at least 320 cubic feet per second (cfs)], Article 406 of the current license requires Appalachian to discharge flows through a 2-foot-wide gate opening for at least 3 hours. Appalachian is then required to reduce the gate opening to 1 foot for at least an additional 3 hours, after which time Appalachian may close the gate.

<sup>2</sup> On an annual basis, spillage into the Buck bypassed reach occurs 13 percent of the time on average, but spillage is most common in the spring (March through May). There is no existing minimum flow requirement for the Buck bypassed reach.

## Project No. 2514-186

*Ramping Rate Assessment*Comments on the Study

A study was conducted in 1997 to assess the effectiveness of the current ramping rates at the Buck development by electrofishing in the bypassed reach following three spill events that ranged from 4,300 cfs to 6,140 cfs (amount of spillage through the spillway gates).<sup>3</sup> In its comments on the RSP, Virginia DGIF states the results of that study may not apply to the current walleye population in the New River because the population is more robust today than it was 20 years ago due to an active stocking and management program. Virginia DGIF believes that it is reasonable to collect current information on walleye stranding in the Buck bypassed reach, particularly with regards to how such impacts vary in wet and dry versus average flow years during the spawning and post-spawning periods. In its comments on the RSP, FWS supports Virginia DGIF's request for current information on the likelihood of walleye stranding in the Buck bypassed reach and notes that fish serving as mussel hosts could also be impacted by stranding.

Discussion and Staff Recommendation

Neither Virginia DGIF or FWS explicitly recommend a methodology such as that used in the 1997 Ramping Rate study or an alternative methodology for assessing the likelihood of fish stranding in the Buck bypassed reach. As described above, the modeling efforts proposed by Appalachian as part of its Flow and Bypassed Reach Aquatic Habitat Study (Flow Study), will evaluate a range of gate opening and water release scenarios for the Buck spillway to help determine the optimal gate operation scenario(s) for minimizing walleye stranding risk during intermittent spill events. For example, output from the models will include the depths of various exit routes under different ramping rate and/or gate opening scenarios, which could be compared to the body depths of adult walleye (or other species of interest) to provide information on stranding risk under different operation scenarios. Therefore, because the Flow Study, as proposed, will inform the development of potential license requirements concerning project operation [section 5.9(b)(5)], we do not recommend that additional field studies of fish stranding be performed in the Buck bypassed reach.

---

<sup>3</sup> Ramping Rate Assessment. Appalachian Power Company Byllesby/Buck Hydroelectric Project FERC No. 2514. Filed on September 12, 1997. Accession No. 19970916-0311.



Project No. 2514-186

*Substrate Sizes in a Reference Reach*

Comments on the Study

In comments on the PSP and RSP, Virginia DGIF and FWS question how the sediment size data Appalachian proposes to collect in the bypassed reaches (at Byllesby and Buck) would be analyzed without an adequate reference data set from a free-flowing section of the New River.

In the RSP, Appalachian states that a suitable reference reach, with comparable high gradient and substrate conditions, proximate to the project for the purposes of study execution, is not reasonably available. Appalachian notes the river has a gradient of 6.3 feet per mile throughout the upper New River Basin, but within the Buck bypassed reach and just downstream (1 mile below) the gradient is higher, at 24 feet per mile and 20 feet per mile, respectively.

In its comments on the RSP, Virginia DGIF states that a reference reach (for the purpose of substrate size comparisons) is readily available in the New River upstream of the Byllesby impoundment.

Discussion and Staff Recommendation

In addition to depth and velocity, substrate type is one of the main input variables for PHABSIM modeling, which Appalachian proposes to use to determine how aquatic habitat suitability varies across a range of flows for fish species of interest. As such, the sediment size data (Wolman pebble counts) proposed to be collected in each bypassed reach is appropriate to inform and develop the PHABSIM model and to characterize existing sediment conditions in the bypassed reach.

As noted above, the Commission's long-standing baseline for environmental analysis at relicensing is the existing conditions, not pre-project conditions or a surrogate for pre-project conditions like a reference reach. Therefore, we do not recommend that Appalachian be required to collect sediment size data from a reference reach of the New River outside of the influence of the project.

*Consultation on Leakage Measurements and Calibration Flows*

Comments on the Study

In comments on the RSP, Virginia DGIF and FWS state that the proposed methodology for estimating leakage flows at each dam is unclear and request to be consulted prior to any measurements being made. In addition, these entities request to be

## Project No. 2514-186

included as an ‘interested licensing participant’ and consulted in regards to the selection of calibration and test flows for Appalachian’s Flow Study.

### Discussion and Staff Recommendation

In the RSP, Appalachian proposes to conduct leakage flow measurements at the ‘low end of the flow regime.’ It is unclear as to what constitutes the low end of the flow regime. Therefore, we recommend that Appalachian conduct leakage measurements at each dam under low-flow (e.g., summer) conditions when impoundment elevations are normal (i.e., within their respective 1-foot allowable fluctuation bands) and no spill is occurring. Further, we recommend that Appalachian consult with Virginia DGIF and FWS regarding its methodology for measuring leakage. With respect to the selection and development of calibration and test flow scenarios, Appalachian already proposes, in the RSP, to consult with interested stakeholders on this topic.

## **Water Quality Study**

### Applicant’s Proposed Study

Appalachian proposes to conduct a Water Quality Study to assess the potential effects of project operation on water quality parameters, including water temperature and dissolved oxygen (DO). The single year study would be conducted from May 1, 2020 through September 30, 2020. Appalachian notes that if 2020 is not a suitable year for collecting water quality data, then the 2021 field season would be used. Continuously recording data sondes would be placed at eight sites to measure water temperature and DO at 15-minute intervals. These sites include the: (1) upper end of the Byllesby impoundment; (2) Byllesby forebay; (3) Byllesby bypassed reach; (4) Byllesby tailrace; (5) Buck forebay; (6) upper Buck bypassed reach; (7) lower Buck bypassed reach; and (8) Buck tailrace (see figures 5-3 and 5-4 of the RSP).

Two sondes would be deployed at discrete depths in each forebay to assess the extent of DO and temperature stratification in the project’s impoundments. In the Byllesby forebay, which is about 35 feet deep, sondes would be deployed at depths of 12 feet and 24 feet; and at the Buck forebay, which is about 17 feet deep, sondes would be deployed at depths of 6 feet and 12 feet. Data would be downloaded from the sondes every month; during these monthly downloading events, surface measurements of water temperature, DO, pH, specific conductance, and turbidity would also be taken at each site. Additionally, monthly depth profiles of temperature and DO would be collected at each forebay site. Appalachian notes that, based on the results of the monthly depth profiles, it may adjust the deployment depths of the sondes in the forebays, if needed, as well as increase the frequency of depth profile collections, from monthly to bi-weekly, if stratification appears to be occurring based on a comparison of continuously recorded sonde data (temperature and DO) with vertical profile data.

## Project No. 2514-186

*Deployment Depths of Data Sondes in the Forebays*Comments on the Study

In comments on the PSP, Virginia DGIF and FWS suggest that vertical temperature and DO profiles may need to be conducted on at least a bi-weekly (rather than monthly) basis in the project's forebays to determine stratification depths prior to, or in concert with, deploying the data sondes. In response to this comment, Appalachian proposes (in the RSP, as described above) to potentially adjust the deployment depths of the sondes mid-study and increase the frequency of vertical profile sampling if stratification appears to be occurring. In comments on the RSP, both Virginia DGIF and FWS reiterated their earlier comments from the PSP concerning water quality sampling.

Discussion and Staff Recommendation

It is likely that the onset of stratification (to the extent stratification occurs in the impoundments) will not begin until well after the proposed start date (May 1) for the Water Quality Study, perhaps not until mid-summer. Therefore, conducting depth profiles prior to, or in concert with, sonde deployments, as suggested by Virginia DGIF and FWS, would not appear to inform decisions regarding the proper deployment depths of the sondes. Moreover, adjusting the depths of the sondes mid-study (e.g., based on bi-weekly vertical profiles) could bias and complicate interpretation of the study results.

The greatest (vertical) differences in temperature and DO in the forebays would be expected between the surface and bottom water rather than the middle portions of the water column within which Appalachian proposes to monitor via placement of the sondes at depths of 12 feet and 24 feet at Byllesby and 6 feet and 12 feet at Buck. As such, we recommend that, in each forebay, the sondes be placed as close to the surface and bottom of the water column as possible, and that their locations remain fixed, to ensure the data collected is representative of the maximal degree of stratification that occurs in the forebays. Placing sondes as vertically far apart as possible would obviate the need to continuously re-evaluate (e.g., on a bi-weekly basis during the 5 month study) and possibly re-adjust the location of the sondes to ensure they are above and below any thermoclines that develop. As such, we do not recommend that Appalachian be required to conduct bi-weekly depth profiles in the project's forebays as suggested by Virginia DGIF and FWS.

## Project No. 2514-186

*Turbidity Monitoring*Comments on the Study

In comments on the PSP, Virginia DGIF notes the Water Quality Study plan does not provide for assessing the effects of project operation on downstream turbidity. In response, Appalachian proposes to collect monthly surface samples of turbidity at the eight water quality monitoring sites described above. In comments on the RSP, Virginia DGIF and FWS state the inclusion of monthly turbidity sampling is an improvement to the RSP, but that their concern remains regarding the mobilization of impoundment sediment deposits during project operation, which could result in increased turbidity in downstream reaches that disrupts ecological processes and negatively affects angling and recreational use.

Discussion and Staff Recommendation

A drag rake is operated in each forebay (Byllesby and Buck) to remove and pass debris downstream of each development. The drag rake operates by extending outward (via a beam and cable) from each forebay and scraping along the bottom. The rake is then dragged upward along the face of the trashracks and collected debris passes downstream through a trash chute.<sup>4</sup> When the drag rakes are operated, sediment is likely re-suspended from the bottom (due to the scraping action of the rake) and passed downstream through the intakes, which may increase downstream turbidity and affect aquatic and recreation resources.

The frequency of operation of the drag rake depends on debris loading in the forebays, but it generally operates multiple times per day. Therefore, Appalachian's proposal to sample turbidity once per month at each water quality sampling site lacks the sampling frequency needed to properly assess the effects of project operation (drag rake) on downstream turbidity at each development. Accordingly, we recommend that Appalachian install continuously-recording turbidity sensors (with 15-minute measurement intervals) on each of the 10 multiparameter data sondes that would be deployed across the eight sampling sites described above. We also recommend that Appalachian maintain, and provide in the study report, a log of daily drag rake operations (e.g., daily start and stop times for the drag rakes). This operation log would allow upstream and downstream turbidity values to be compared between time periods when the drag rakes are operating and when they are not, which would facilitate an evaluation of the relative role of (natural) high-flow events versus drag rake operations in causing

---

<sup>4</sup> For a more detailed descriptions of the project's drag rakes, see letters filed by Appalachian on July 2, 1997 (Accession No. 19970716-0506) and July 6, 1998 (Accession No. 19980708-0258).

## Project No. 2514-186

turbidity spikes. The results of this study could inform the development of potential license requirements (e.g., the optimal timing of drag rake operation in terms of maintaining desirable turbidity levels during prime angling periods) [section 5.9(b)(5)]. The cost would be minimal and largely depend on whether Appalachian currently has access to additional turbidity sensors or needs to purchase them (the approximate cost of the sensors is \$10,000 to \$15,000). Additional field efforts associated with staff's recommended turbidity monitoring would be minimal because the turbidity sensors would be added to the same sondes that would be used for continuous monitoring of temperature and DO.

*Need for a Second Study Season*

Comments on the Study

In the RSP, Appalachian indicates that if 2020 is not a suitable year for collecting water quality data, then the 2021 field season would be used. In comments on the RSP, Virginia DGIF and FWS state it is unclear what constitutes a "suitable year" for the collection of water quality data. Both entities request that more than one year of water quality data be collected given that water quality is likely to vary significantly with annual flow regimes.

Discussion and Staff Recommendation

If weather conditions in 2020 are unusually wet and cool, then the Water Quality Study may need to be repeated in 2021 as Appalachian notes in its RSP. On the other hand, if summer weather conditions are unusually dry and hot (e.g., a worst-case scenario for water quality parameters) and water quality parameters are consistent with state water quality standards, there would be no need to collect an additional year of data. The need for a potential second study season will be evaluated based upon review of the water quality study results presented in the Initial Study Report (due November 17, 2020). Therefore, at this time, it is premature to recommend a second study season.

**Aquatic Resources Study**

Applicant's Proposed Study

Appalachian proposes to conduct an Aquatic Resources Study that includes four main components or sub-studies,<sup>5</sup> including a: (1) Fish Community sub-study, (2)

---

<sup>5</sup> The term 'sub-study' is used herein by staff to help differentiate and describe the multiple studies contained within the broad Aquatic Resources Study. This term was not used by Appalachian in the RSP.

## Project No. 2514-186

Macroinvertebrate and Crayfish Community sub-study, (3) Mussel Community sub-study, and (4) Impingement and Entrainment Desktop sub-study.

For the Fish Community sub-study, Appalachian proposes to conduct electrofishing surveys at each development during two seasons, in the: (1) late spring/early summer (April-May), and (2) late summer/early fall (August-September) of 2020. During each seasonal survey, daytime boat electrofishing would be conducted at 12 sites in each impoundment and backpack electrofishing would be conducted at 6 riverine (non-impoundment) sites located in riffle/run habitats at each development, including the tailrace and bypassed reach of each development (see figures 6-2 and 6-3 of the RSP). Appalachian does not plan on conducting gill net or hoop net sampling in the project's impoundments, similar to that conducted during fisheries surveys performed as part of the previous re-licensing (May-October 1990) due to concerns over gear fouling and potential theft (of gill nets) and sampling inefficiency (of hoop nets). In the Byllesby impoundment, six of the proposed boat electrofishing sites (below Chestnut Creek) are the same boat electrofishing sites that were used in the 1990 survey, and the remaining six boat electrofishing sites coincide with previous gill net and/or hoop net sites. Appalachian would enumerate, measure (total length), and weigh fish collected at each site and also measure temperature, DO, pH, specific conductance, and record Secchi disk depths at each sampling site.

For the Macroinvertebrate and Crayfish Community sub-study, Appalachian proposes to conduct two field sampling events, one in the spring (March 1 through May 31) and another in the fall (September 1 through November 30) of 2020. Crayfish would be targeted by sampling in appropriate habitats using kick-netting, seine hauling, and dip-netting techniques. Other macroinvertebrates (e.g., mayflies) would be collected according to the Virginia Department of Environmental Quality's "Methods for Habitat Assessment for Streams" protocol and the data analyzed using common indices to evaluate benthic macroinvertebrate community health and similarity (e.g., the Hilsenhoff Biotic Index,<sup>6</sup> percent intolerant species, etc.).

The Mussel Community sub-study would include a desktop literature review to compile and summarize existing mussel data (e.g., abundance and size data) that have been collected in the vicinity of the project. This sub-study would also include a two-phase field survey. The first phase would include a reconnaissance-level habitat survey to identify potentially suitable mussel habitat in the Buck tailrace and stretch of river between the Byllesby and Buck Dams (see figure 6-1 of the RSP)—this 'transition reach' has not been sampled previously but is thought to contain suitable mussel habitat (islands containing mixed sand/gravel substrates). Along the Buck tailrace, surveyors would walk

---

<sup>6</sup> The Hilsenhoff Biotic Index estimates the overall tolerance of the macroinvertebrate community in a sampled area by weighting the relative abundance of various taxonomic groups.

## Project No. 2514-186

the length of the reach while looking for evidence of mussel presence such as live animals or spent valves. Surveyors would visually assess habitat characteristics such as substrate composition and record observations regarding habitat quality. In the transition reach between the dams, field personnel would conduct a reconnaissance-level field habitat assessment to verify or adjust the approximate geographic limits of the hydraulic habitat types (pool, deep shoal, shallow shoal, and side channel) that were preliminarily delineated (see figure 6-1 of the RSP) based on a review of existing aerial imagery. These results from phase one would be used to guide phase two, in which field personnel would survey representative hydraulic habitat types, based on their perceived potential to support mussels, within the geographic extent of each hydraulic habitat type. Mussel sampling (phase two) would be performed using snorkeling, tactile searches and/or viewing scopes in shallow water habitats; via SCUBA or surface supplied air in deeper water habitats (greater than 3 feet deep). Surveyors would conduct wandering timed searches of channel substrates for a minimum of 30 person-minutes per search, with two to three searches expected in each of the four, tentatively defined, hydraulic habitat types (pool, deep shoal, shallow shoal, and side channel; see figure 6-1 and table 6-2 of the RSP).

The Impingement and Entrainment desktop sub-study would include a standard desktop evaluation of entrainment and impingement risk, including blade strike mortalities, of selected target species—the list for which would be based on the results of the Fish Community sub-study (i.e., species common in the impoundments) and those species of conservation and management interest based on consultation with the resource agencies. In addition, approach velocities would be measured in front of each development's intakes with an Acoustic Doppler Current Profiler (transect sampling approach) when each development is operating at its maximum hydraulic capacity and when operating at their most efficient gate setting (as feasible based on project conditions).

*Start Date of Spring Fish Sampling*

Comments on the Study

In comments on the PSP, Virginia DGIF requests that spring fish collection efforts be commenced in April to ensure that the data collected are representative of the resident walleye population downstream of Buck Dam. In response to this comment, Appalachian shifted the sampling window for the late spring/early summer survey from May-June (in the PSP) to April-May in the RSP. In comments on the RSP, Virginia DGIF acknowledges Appalachian's change to the spring sampling schedule.

Project No. 2514-186

### Discussion and Staff Recommendation

Appalachian does not explicitly state that it will commence sampling for the late spring/early summer survey in April, only that sampling for the spring/late summer seasonal survey would be conducted sometime during “April-May.” In the RSP, Appalachian states that specific sampling dates within this timeframe would be determined based on factors including (but not limited to) weather conditions, water temperatures, river flows and impoundment elevations, and safety of field staff and the general public.

Walleye in the New River are known to start congregating at spawning areas (including just below Buck Dam) by mid-March and remain on or near spawning sites until late April, depending on water temperatures.<sup>7</sup> If spring sampling does not start until May, walleye may have dispersed from the spawning site, in which case sampling would occur too late to obtain representative information on the relative abundance and size structure of the walleye population that congregates downstream of Buck Dam in the spring and is sought after by recreational anglers. Therefore, we recommend that Appalachian commence sampling as early in April as possible, and choose sampling dates in consultation with Virginia DGIF, to ensure that representative data is collected for walleye, which is a focal management species in this portion of the New River.

#### *Walleye Sampling in the Byllesby Impoundment*

### Comments on the Study

In its comments on the RSP, Virginia DGIF states that boat electrofishing (as proposed by Appalachian) is not an adequate means to assess the walleye population in the Byllesby impoundment. Virginia DGIF notes that it stocks walleye upstream of the Byllesby impoundment and that these fish seasonally use the impoundment. Virginia DGIF states that gill nets are a standard methodology for assessing reservoir walleye populations and should be used to assess the walleye population in the Byllesby impoundment. It also notes that gill nets would be effective in sampling resident catfish populations (flathead and channel catfish).

### Discussion and Staff Recommendation

Virginia DGIF does not state why it believes daytime boat electrofishing would be an ineffective method for sampling walleye in the Byllesby impoundment, which is the

---

<sup>7</sup> Palmer, G.C., Murphy, B.R., and E.M. Hallerman. 2005. Movements of walleyes in Claytor Lake and the Upper New River, Virginia, indicate distinct lake and river populations. *North American Journal of Fisheries Management* 25:1448-1455.



## Project No. 2514-186

most lentic-type environment in the project area, with a maximum depth of 35 feet. Virginia DGIF's rationale may stem from the fact that walleye have been shown, at least in lakes with relatively low turbidity (Secchi depths greater than 3 feet) to undergo diel vertical migrations, moving up in the water column at night to feed and down in the water column during the day to avoid high light levels,<sup>8,9</sup> thus rendering them less susceptible to capture during the day by electrofishing, which is most effective in shallow littoral zones along the shoreline rather than deeper habitats.<sup>10</sup> Accordingly, adding gill net sampling, which is standard sampling gear for walleye in lentic environments,<sup>11</sup> [section 5.9(b)(6)] would provide more accurate information on the current walleye population in the Byllesby impoundment than daytime boat electrofishing alone. Information obtained from gill net sampling would also inform Appalachian's impingement and entrainment sub-study and aid staff's analysis of project effects (e.g., entrainment mortality) [section 5.9(b)(5)] for this focal management species.

Virginia DGIF does not provide any specific recommendations for a gill net sampling methodology, such as the: (1) number and location of gill net samples, (2) frequency of sampling, (3) duration of sampling (i.e., gill net soak times), or (4) physical dimensions and specifications of the gill nets that would be used (e.g., panel mesh sizes, float line heights, etc.). Consequently, staff recommends that 6 of the 12 boat electrofishing sites proposed by Appalachian in its Fish Community sub-study be converted to gill net sites that would be sampled during each of the two seasonal surveys (described above). Specifically, the six gill-netting sites should coincide with sites at which gill nets and/or hoop nets were previously deployed (during the aforementioned 1990 fisheries survey). Appalachian should consult with Virginia DGIF to ensure the gill nets it deploys are of the appropriate dimensions and fished for sufficient durations to ensure representative sampling of the walleye population in the Byllesby impoundment.

---

<sup>8</sup> Ryder, R. 1977. Effects of ambient light variations on behavior of yearling, subadult, and adult Walleyes (*Stizostedion vitreum vitreum*). Journal of the Fisheries Board of Canada 34:1481-1491.

<sup>9</sup> Kelso, J.R.M. 1978. Diel rhythm in activity of Walleye, *Stizostedion vitreum vitreum*. Journal of Fish Biology 12:593-599.

<sup>10</sup> Reynolds, J.B., and A.L. Kolz 2012. Electrofishing. Pages 305-361 in Zale, A.V., Parrish, D.L., and T.M. Sutton, editors. Fisheries Techniques, 3<sup>rd</sup> edition. American Fisheries Society, Bethesda, Maryland.

<sup>11</sup> Bonar, S.A., Hubert, W.A., and D.W. Willis, editors. 2009. Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland.

## Project No. 2514-186

The addition of gill net sampling would result in minimal additional cost or effort because the same total number of samples would be collected in the study, the only difference being that 6 of the 12 sampling sites in the Byllesby impoundment would be collected with a different gear type (gill nets instead of boat electrofishing).

*Candy darter*Comments on the Study

Appalachian does not propose to conduct targeted sampling for candy darter<sup>12</sup> because this species is only known to occur in tributary streams and is therefore not anticipated to occur within the mainstem of the New River near the project. Nevertheless, Appalachian notes that should a candy darter specimen be collected, sampling would be halted and Virginia DGIF and FWS would be notified, with sampling being reinitiated only after consultation with the agencies and receipt of the necessary protected species permits.

In comments on the RSP, Virginia DGIF and FWS note that the species account for candy darter given in the book *Freshwater Fishes of Virginia*<sup>13</sup> suggests that candy darter habitat use "...extends into the large New River..." where it occupies runs, riffles, and swift pockets. Given the federally endangered status of the candy darter and unknowns regarding its distribution in the mainstem New River downstream from the project, both entities recommend that exploratory sampling be conducted downstream from Buck Dam in areas determined in discussion with the agencies' respective resource specialists. Virginia DGIF and FWS state that the river reach downstream from Buck Dam contains potential candy darter habitat and could be affected by project flows and downstream water quality and quantity impacts.

Discussion and Staff Recommendation

It is unclear what is meant by the "exploratory sampling" recommended by Virginia DGIF and FWS. As described above, Appalachian proposes to conduct backpack electrofishing at six riffle/run sites at each development. Candy darter are known to be habitat specialists and primarily occupy riffle habitats (especially as adults)

---

<sup>12</sup> Candy darter is a federally endangered species; one area in which critical habitat has been designated for this species is the Cripple Creek tributary of the New River, which is 5 miles downstream of the Buck Dam.

<sup>13</sup> Jenkins, R.E., and N.M. Burkhead. 1993. *Freshwater Fishes of Virginia*. American Fisheries Society, Bethesda, Maryland. 1079 pp.

## Project No. 2514-186

in the New River Basin.<sup>14,15</sup> Furthermore, backpack electrofishing has been shown to: (1) be an effective technique for determining the presence of this rare species, (2) not result in mortalities of candy darter, and (3) be superior to snorkeling in the shallow, fast habitats and turbid conditions expected at Appalachian's proposed riffle sampling sites.<sup>16</sup> Therefore, because Appalachian's sampling efforts would occur in the principal habitat of candy darter (riffles) using sampling gear (backpack electrofishing) that has been shown to be effective for detecting this species from spring through fall,<sup>17</sup> Appalachian's Fish Community sub-study, as proposed, should be adequate for determining the presence of candy darter in the project area and staff does not recommend the exploratory sampling recommended by Virginia DGIF and FWS.

*Field Surveys for Mussels*

Comments on the Study

In comments on the RSP, Virginia DGIF and FWS request that Virginia DGIF's mussel biologist be consulted regarding study design parameters if Appalachian determines that a survey is not needed based on the results of the phase one habitat assessment, that the agencies be consulted before a final decision is made as to whether to conduct phase two.

Discussion and Staff Recommendation

The agencies' requests for mussel field surveys contain little information regarding a suggested sampling methodology. The two-phase study protocol proposed by Appalachian is a reasonable and sufficient approach that uses generally accepted practices in the scientific community [section 5.9(b)(6)]; as such, we have no reason to modify Appalachian's proposed sub-study at this time. Therefore, although consultation could be beneficial, we do not recommend requiring Appalachian to consult with the agencies regarding the design of the study, because ideally such discussions pertaining to

---

<sup>14</sup> Dunn, C.G., and P.L. Angermeier. 2016. Development of habitat suitability indices for the candy darter, with cross-scale validation across representative populations. *Transactions of the American Fisheries Society* 145:1266-1281.

<sup>15</sup> Dunn, C.G. 2013. Comparison of habitat suitability among sites supporting strong, localized, and extirpated populations of candy darter (*Etheostoma osburni*). Final Report submitted to Virginia DGIF. October 2013. 74 pp.

<sup>16</sup> *Ibid.*

<sup>17</sup> *Ibid.*

Project No. 2514-186

study design should have occurred prior to, or in concert with, the development and filing of the RSP under the ILP study plan development process. After the first year of studies are completed, following the Initial Study Report, entities may file requests for modifications of ongoing studies (such as the Mussel Community sub-study) pursuant to section 5.15(d) of the Commission's regulations.

### **III. Studies Requested but Not Adopted by Appalachian**

#### **Comprehensive Sediment Study to Develop Sediment Management Plan (Sediment Study)**

##### Study Request

Virginia DGIF requests that Appalachian conduct a Sediment Study to assess the current sediment transport condition at the project to support the formulation of a sediment management plan to mitigate for the effects of sedimentation on fisheries and other aquatic life (e.g., macroinvertebrates and mussels) managed by the agency. Specific goals and objectives of the study include determining the volume of sediment deposited in the project's impoundments to date (i.e., since emplacement of the dams in 1912) and estimating annual sediment deposition rates (via topographic differencing)<sup>18</sup> to predict the remaining lifespan of the impoundments. In addition, the study would assess the extent of the coarse-substrate deficit in the project's bypassed reaches and mainstem channels downstream of the dams and powerhouses via comparisons to the historic rate of sediment transport and sediment-size distributions prior to construction of the project dams. Virginia DGIF indicates the study would inform the development of a sediment management plan for the project that could include activities such as scheduled dredging in the impoundments and coarse substrate (e.g., gravel) augmentation downstream of the project dams.

##### Discussion and Staff Recommendation

Appalachian does not propose to conduct the Sediment Study. It states that significant sedimentation does not appear to be occurring behind the Byllesby Dam because the river channel, which is 35 feet deep in the forebay, appears to be aligned with the spillway gates and that sediment removal via dredging has not been necessary since the installation of the drag rakes at the project, which in conjunction with the run-of-river operation of the project, appear to pass adequate amounts of fine and coarse-grained sediment downstream of the dams. Appalachian also notes that maintaining a supply of coarse sediment in the bypassed reaches is not feasible due to the turbulent and high

---

<sup>18</sup> Topographic differencing uses differences in bed topography and bathymetry between time periods of interest (e.g., pre-dam versus post-dam construction) to estimate sediment deposition rates in a waterbody.

## Project No. 2514-186

velocity hydraulic conditions that occur as a result of the high gradient of the natural streambed in the vicinity of the project and periodic high-flow events. Appalachian believes that any gravel added to the system would likely be moved downstream during the next high-flow event under present-day conditions and that adding sediment in one-time, large volume applications has the potential to smother substrates that support mussels, macroinvertebrates, and provide spawning substrates for fish. Lastly, Appalachian does not believe that aquatic resources are being significantly impacted by current project operation.

As to Virginia DGIF's request that the sediment study be conducted, in part, to document the extent of the coarse-substrate deficit in the project's bypassed reaches and mainstem channels downstream of the dams and powerhouses relative to pre-project conditions, the Commission's long-standing baseline for the environmental effects analysis during relicensing is the existing conditions, not pre-project conditions.

Information to be collected as part of Appalachian's Flow Study—Wolman pebble counts in each bypassed reach—will be sufficient to describe the current sediment conditions at the project such that a sedimentation study is not needed; therefore, we do not recommend the Sediment Study.

## **Fish Protection and Downstream Passage Studies**

### Study Request

FWS states that because Appalachian has not proposed additional measures (other than its existing trash racks)<sup>19</sup> to ensure safe, timely, and effective downstream fish passage, it is requesting that downstream passage protection studies be undertaken. FWS indicates these studies should include a literature search of available passage designs for species of concern, such as smallmouth bass, walleye, white sucker, and northern hog sucker, as well as information on the relative effectiveness of each design. FWS also recommends that site-specific data (flows, velocities, water depths, and substrates) be collected to aid in the design of protection and passage facilities.

Appalachian states the potential for fish entrainment or impingement will be evaluated as part of the Aquatic Resources Study (Impingement and Entrainment Desktop sub-study, described above). Appalachian notes that, based on the results of that study, additional fish protection measures may be considered, but are not being proposed at this time.

---

<sup>19</sup> The existing trash racks at each development have 2.28-inch clear-bar-spacing and are inclined 15 degrees.

Project No. 2514-186

### Discussion and Staff Recommendation

Once completed, the proposed desktop entrainment and impingement study would provide information on the magnitude of impingement and entrainment mortality of resident fishes<sup>20</sup> at the project. In addition, the information collected from the fish sampling survey would inform potential population-level effects of the project (e.g., a lack of particular size or age classes suggestive of reduced spawning success and/or failed recruitment of resident fishes). Therefore, until that study has been completed, it is premature, at this time, to explore additional downstream fish protection and passage options. As such, we do not recommend that Appalachian be required to conduct the Fish Passage and Downstream Protection Studies requested by FWS.

### **PCB Contamination and Pollution Minimization Plan (PCB Study)**

#### Study Request

Virginia Tech requests a study to determine the PCB<sup>21</sup> concentrations of sediment accumulated behind the project dams. Virginia Tech indicates the study is needed because these sediments may be disturbed during potential maintenance dredging in the project impoundments, and the information gained from the study would help develop a plan for the removal and safe disposition of these dredged materials.

Appalachian states the following reasons for not adopting the PCB study: (1) a draft Total Maximum Daily Load (TMDL) developed for the New River in September 2018 indicates that PCB impairment occurs downstream of the project, (2) no dredging of impoundment sediment is proposed at this time, and (3) any future dredging and disposal would be coordinated with the U.S. Army Corps of Engineers and Virginia Department of Environmental Quality.

---

<sup>20</sup> No diadromous fishes (i.e., those fishes that must move between freshwater and saltwater for the purposes of reproduction to complete their life cycle, such as salmon and eels) are present in the project area.

<sup>21</sup> PCBs, or polychlorinated biphenyls, are an industrial contaminant whose use was banned in 1979 but are still present as legacy contaminants in some aquatic systems, where they associate with, and are bound to, sediments.

Project No. 2514-186

### Discussion and Staff Recommendation

The Total Maximum Daily Load for PCBs developed for the New River<sup>22</sup> indicates that PCB-impairment is limited to the portion of the river downstream of the Interstate 77 Bridge crossing, which is approximately 10 miles downstream of the project. Thus, even if maintenance dredging were conducted at the project intakes (e.g., on an as-needed basis to remove accumulated sediment that could reduce generation potential), there is no reason to believe that such dredging would liberate or contain harmful levels of PCBs.<sup>23</sup> As such, there appears to be no nexus between project operation and potential effects (of PCBs) on aquatic resources [section 5.9(b)(5)]. Therefore, we do not recommend requiring the PCB Study.

### **Water Willow Propagation, Rehabilitation, and Water Level Plan**

#### Study Request

Virginia Tech states that aerial photos provided in the Pre-Application Document (PAD) do not include vegetation mapping that sufficiently indicates current locations of American water willow. As such, Virginia Tech requests a survey to identify shoreline habitats within the project boundary that would be suitable for propagating and planting water willow. Specific goals and objectives include stabilizing banks from erosion, reducing sediment additions to the New River, creating nursery habitat for shoreline fish and other aquatic life, and enhancing fish and wildlife productivity and biological diversity. Public interest considerations include enhanced habitat for wildlife viewing and fishing and increasing water clarity in the New River. This request also calls for a water-level management plan to address concerns that water-level fluctuations and long periods of inundation will cause mortality of water willow.

Appalachian does not propose to conduct this study, but its planned Wetland and Riparian Habitat Characterization Study will include surveys for existing water willow within the study area and its planned Shoreline Stability Assessment Study will include surveys for shorelines that can potentially benefit from vegetative plantings (to reduce erosion).

---

<sup>22</sup> <https://www.deq.virginia.gov/Programs/Water/WaterQualityInformation/TMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspx>

<sup>23</sup> Appalachian states in the RSP that it does not plan to conduct routine maintenance dredging at the project.

Project No. 2514-186

### Discussion and Staff Recommendation

Once completed, the Wetland and Riparian Habitat Characterization Study and Shoreline Stability Assessment Study will identify current water willow locations and areas where future propagation and planting measures could provide potential erosion control benefits. The results from the Wetland and Riparian Habitat Characterization Study will also be used to evaluate the potential for project effects on study habitats, and the Shoreline Stability Assessment Study will be used to identify areas where remedial action or further assessment may be needed. Therefore, the information requested by Virginia Tech will be obtained from studies proposed by Appalachian. Therefore, we do not recommend Virginia Tech's requested study.

### **Target biological community in the two bypass reaches and rehabilitation of the foundational plant, riverweed**

#### Study Request

Virginia Tech states that the aquatic community in the bedrock-dominated bypassed reaches of the project has been lost and needs to be rehabilitated. To support this effort, Virginia Tech requests a study to define the metrics for restorable biological communities in the bypassed reaches, develop minimum instream flow requirements for the bypassed reaches, and to propagate and replant the bypassed reaches with the foundational plant, Hornleaf riverweed. Appalachian did not adopt this study because bypassed reach flows and associated aquatic habitat would be evaluated as part of its Flow Study, and rehabilitation via plantings is not planned at this time.

#### Discussion and Staff Recommendation

Information from the Flow Study (described above) would be used to develop minimum flow recommendations and inform the development of potential license requirements [section 5.9(b)(5)] for the project's bypassed reaches that consider agency management goals (especially for the seasonally dewatered Buck bypassed reach). Thus, requiring an additional minimum flow study would be redundant. Regarding Hornleaf riverweed plantings, the Flow Study and Wetlands, Riparian, and Littoral Habitat Characterization Study will provide sufficient information to assess the feasibility of potential mitigation measures such as Hornleaf riverweed plantings. For these reasons, we do not recommend requiring the study.



Project No. 2514-186

## Survey of rare dragonflies and multi taxa survey

### Study Request

Virginia Tech requests a study to compare the occurrence and abundance of dragonflies and other taxa (crayfish and small fishes) in the project area to upstream and downstream reference locations. Virginia Tech recommends that species occurrence of dragonflies be inferred during adult, nymph, and exuviae<sup>24</sup> surveys. More specifically, Virginia Tech proposes the use of several metrics<sup>25</sup> that can be used as indicators of dragonfly residency in an area, including: (1) finding adults during at least four surveys, (2) finding teneral<sup>26</sup> on two or more surveys, and (3) counting more than 20 adults on at least one survey.

Appalachian did not adopt this study because its proposed Aquatic Resources Study (Macroinvertebrate and Crayfish Community sub-study) would include fish and macroinvertebrate sampling; and information on dragonfly habitat (wetlands and riparian habitat) would be provided by its proposed Wetlands, Riparian, and Littoral Habitat Characterization Study.

### Discussion and Staff Recommendation

Virginia Tech does not establish a clear connection between project operation and the resources (namely dragonflies) to be studied or explain how the study results would inform the development of license requirements. Therefore, the study results would not inform the development of license requirements [section 5.9(b)(5)], and we do not recommend requiring the study.

---

<sup>24</sup> Exuviae are exoskeletons that remain intact after molting; as such can be used to document presence of dragonfly species of interest in a study area.

<sup>25</sup> Survey metrics defined further in: Bried, J.T., A.M. Dillon, B.J. Hager, M.A. Patten, and B. Luttbeg. 2015. Criteria to infer local species residency in standardized adult dragonfly surveys. *Freshwater Science* 34:1105-1113.

<sup>26</sup> A teneral insect is one that has recently molted and its exoskeleton has not hardened and is pale with little coloration.

Project No. 2514-186

## **Recreational Value and Access Development Mitigation**

### Study Request

Virginia Tech states that access to the New River is a principal barrier to participation in water-based recreation and requests that Appalachian determine what barriers exist that may inhibit access to the New River.

### Discussion and Staff Recommendation

Appalachian proposes a Recreation Study to gather recreation-related information to describe current public use of six recreation sites that provide access to the New River.<sup>27</sup> The study includes a recreation facility inventory and condition assessment, a site visit with stakeholders, an online recreation visitor use survey, and recreation use documentation. These four study tasks are designed to help Appalachian gather information on recreation use, needs, and trends at the project facilities, including at both canoe portage trails. With this information, Appalachian could identify barriers affecting public access, water-based recreation in the New River, and portage use.

Appalachian recently installed trail cameras at both portages (and other locations) to begin data collection and document participant use at these facilities. The trail cameras continue taking time-stamped photos until movement at the portages is no longer detected. Images collected will show how often the portages are used and whether entrance/exits from the New River appear easy or challenging. The photos taken of each participant group will document how long it takes a person or group to enter/exit the water. This information will inform the current use of and potential need for improvements to the portages, which would satisfy Virginia Tech's study request. Therefore, we do not recommend an additional recreation access study at the project.

---

<sup>27</sup> The Byllesby Canoe Portage, the Buck Canoe Portage, and the New River Canoe Launch are owned and operated by Appalachian. The Byllesby Virginia DCR Boat Launch, New River Trail Picnic Area, and the Buck Dam Picnic Area are operated by the Virginia DCR; these facilities are outside of the project boundary but provide public access to the lands and waters near the project.

Document Content(s)

P-2514 SPD for Nov 18 2019 (003).PDF.....1-26