DRAFT ENVIRONMENTAL ASSESSMENT
FOR
NEW HYDROPOWER LICENSES

Hawks Nest Hydroelectric Project, P-2512-075

Glen Ferris Hydroelectric Project, P-14439-001

West Virginia

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, N.E.
Washington, DC 20426

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ACRONYMS AND ABBREVIATIONS

Advisory Council	Advisory Council on Historic Preservation
alloy plant	ferroalloy plant, Alloy, West Virginia
APE	area of potential effects
AW	American Whitewater
B.P.	before present
cfs	cubic feet per second
certification	water quality certification
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
EA	environmental assessment
ESA	Endangered Species Act
^{o}F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
Glen Ferris Project	Glen Ferris Hydroelectric Project
Hawks Nest Hydro	Hawks Nest Hydro, LLC
Hawks Nest Project	Hawks Nest Hydroelectric Project
Hz	hertz
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
kV	kilovolt
m^2	square meters
mg/l	milligrams per liter
msl	mean sea level
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act of 1966
NRGV	New River-Greenbrier Valley
PA	Programmatic Agreement
Park Service	National Park Service
PJM	Pennsylvania-New Jersey-Maryland
REA	Ready for Environmental Analysis
RM	river mile
RTE	rare, threatened, and endangered

SD1	scoping document 1
SGCN	species of greatest conservation need
SHPO	State Historic Preservation Officer
TDG	total dissolved gas
USGS	U.S. Geological Survey
West Virginia DNR	West Virginia Division of Natural Resources
West Virginia DEP	West Virginia Department of Environmental Protection
WUA	weighted usable area
WVAM	WVA Manufacturing, LLC
WVPRO	West Virginia Professional River Outfitters

EXECUTIVE SUMMARY

On December 29, 2015, Hawks Nest Hydro, LLC (Hawks Nest Hydro) filed applications for new licenses with the Federal Energy Regulatory Commission (Commission) to continue operating the existing Hawks Nest Hydroelectric Project (Hawks Nest Project) and Glen Ferris Hydroelectric Project (Glen Ferris Project). The 102-megawatt (MW) Hawks Nest Project is located on the New River and the 6.159-MW Glen Ferris Project is located, downstream of the Hawks Nest Project, on the Kanawha River,[1] with both projects located in Fayette County, West Virginia. Currently, both the Hawks Nest and Glen Ferris developments are licensed as a single project under a license issued on December 11, 1987, that expires on December 31, 2017. Hawks Nest Hydro is seeking separate licenses for each project.

Project Description and Operation

Hawks Nest Project

The Hawks Nest Project includes a 948-foot-long concrete-gravity dam located on the New River. The dam has 14 ogee-type spillway bays extending almost the entire length of the dam, with each spillway bay topped by a 25-foot-high by 50-foot-wide Stoney-type[2] steel lift gate and separated by 9-foot-wide concrete piers. The reservoir impounded by the dam extends upstream approximately 6.9 miles in a narrow valley with an average width of approximately 500 feet, and has a surface area of 243 acres and a gross storage capacity of 7,323 acre-feet at a normal pool elevation of 819.0 feet.[3]

Water from the reservoir is conveyed to the powerhouse through a 16,240-foot-long tunnel that extends from an intake near the dam on the right abutment (looking downstream) to a powerhouse downstream on the New River, thus creating an approximately 5.5-mile-long bypassed reach. The tunnel can convey a maximum of about 10,000 cubic feet per second (cfs). At a point approximately 60 percent of the distance from the intake to the powerhouse, the tunnel connects to a 600-foot-long and 170-foot-wide surge basin. At its downstream end, the tunnel is connected by a vertical steel riser to a 116-foot-diameter, 56-foot-high surge tank. The tunnel ends at the powerhouse penstock system that includes a main 30-foot-diameter, 107-foot-long, steel

[1] The New River becomes the Kanawha River after its confluence with the Gauley River immediately downstream of the Hawks Nest Project.

[2] A Stoney-type gate is a type of gate that bears on a train of rollers in each gate guide.

[3] Unless otherwise noted, all elevation data in this draft environmental assessment (draft EA) are given in National Geodetic Vertical Datum of 1929.

penstock connecting to a manifold leading to five steel penstocks, each 14 feet in diameter, and of varying lengths of 42 to 132 feet. Four of the five penstocks are connected to four identical turbines in the powerhouse, while the fifth penstock is closed with a steel and concrete bulkhead.

The 210-foot-long and 74.5-foot-wide powerhouse located on the right bank (looking downstream) of the New River contains four identical turbine-generator units, each with a rated capacity of approximately 25.5 MW. Each of the vertical Francis turbines has a minimum hydraulic capacity of 800 cfs and a maximum hydraulic capacity of 2,540 cfs, with the project having a total maximum hydraulic capacity of approximately 10,000 cfs. There are two recreation sites within the project boundary: the Cotton Hill Bridge Day-Use Area (Cotton Hill site) and the Hawks Nest Powerhouse Fishing Access Site (Hawks Nest Powerhouse site).

The Hawks Nest Project is operated in a run-of-river mode and maintains a normal pool elevation of 819.0 feet under low to moderate inflow conditions. The current license requires a minimum flow of 100 cfs in the bypassed reach (between the dam and the powerhouse). Between March 1 and October 31 when flow in the bypassed reach is less than 2,600 cfs, the project is operated to maintain an upward or downward water level ramping rate not greater than 1 foot per hour in the bypassed reach for the protection of downstream public safety and aquatic resources.

Glen Ferris Project

The Glen Ferris Project includes a concrete dam with varying height of 3 feet to 12 feet above the riverbed, and no spillway gates. On the west side of the river and integral to the dam are two powerhouses connected by a non-overflow section of the dam. The spillway has a crest elevation of 651.0 feet, and there are no spillway flood gates at the Glen Ferris Project.

The project reservoir extends about 1.9 miles from the dam upstream to just below the confluence of the New and Gauley rivers, and has a surface area of 190 acres and a gross storage capacity of 1,500 acre-feet at the normal reservoir elevation of 651.0 feet (i.e., the crest of the spillway).

Of the two powerhouses, the east powerhouse is approximately 54 feet long by 38 feet wide, and contains two identical turbine-generator units, each with a rated capacity of 1.947 MW. The minimum and maximum hydraulic capacities of each vertical Francis turbine are 704 cfs and 957 cfs, respectively. The 64.5-foot-long by 63-foot-wide west powerhouse is located between the east powerhouse and the river bank. The west powerhouse contains six identical turbine-generator units, each with a rated capacity of 0.377 MW, and a fixed hydraulic capacity of 199 cfs. There are no recreation facilities within the project boundary.

The Glen Ferris Project is operated in a run-of-river mode, with minimal reservoir surface elevation fluctuation and inflow to the project approximating outflow. During low to moderate inflows, the project is operated to maintain the surface of the reservoir at the dam crest, and when flow exceeds the maximum capacities of both powerhouses, the excess flow spills over the dam.

Proposed Environmental Measures

In its license application, Hawks Nest Hydro proposes the following environmental measures (unless noted, the following measures apply to both projects):

- Continue to operate the projects in a run-of-river mode, with inflow to the projects approximating outflow.

- Maintain the existing ramping rate for discharges into the Hawks Nest bypassed reach between March 1 and October 31 when river flows into the reservoir are less than 12,600 cfs and when there are flows of 2,600 cfs or less in the bypassed reach, to maintain a water level ramping rate of not greater than 1 foot per hour as measured at the existing United States Geological Survey gage (No. 380649081083301) located downstream of the dam in the vicinity of the Cotton Hill Bridge.

- Continue to release a 100-cfs minimum flow into the Hawks Nest bypassed reach.

- Provide additional seasonal minimum flows of 50 cfs (July-February), 200 cfs (March-April), and 150 cfs (May-June), if available, into the Hawks Nest bypassed reach after releasing the 100-cfs minimum flow into the bypassed reach and passing 1,600 cfs to the powerhouse for generation.

- Develop a streamflow monitoring plan for any new minimum flow targets that may be required for the Hawks Nest bypassed reach.

- Provide an annual fish compensation payment for entrainment losses to the West Virginia Division of Natural Resources (West Virginia DNR) to mitigate for potential turbine induced impacts to fish, and prepare, every 5 years, a resource enhancement plan reporting on activities completed by West Virginia DNR utilizing the annual fish compensation payment.

- Continue to conduct routine right-of-way/transmission corridor maintenance and hazardous tree/vegetation removal in accordance with the U.S. Fish and Wildlife Service's (FWS') May 2007 National Bald Eagle Management

Guidelines. In the event bald eagles are documented at or in the vicinity of either project, consult with the FWS in order to avoid disturbance or other impacts to the species.

- Finalize an updated Running Buffalo Clover Management Plan for the Hawks Nest Project.

- Update the Recreation Management Plan for the Hawks Nest Project by describing recreation facilities and access within and immediately adjacent to the project boundary.

- Provide $25,000 annually to the West Virginia DNR to maintain and enhance recreation facilities on lands deeded to West Virginia DNR, and every 5 years, prepare a report on activities completed by West Virginia DNR during the previous period and anticipated for the next 5 years utilizing the annual recreation funding.

- Identify, design, and construct improvements at the Cotton Hill site, including a seasonal toilet/changing facility, new picnic facilities, and parking and signage improvements.

- Provide a one-time payment of $50,000 to the West Virginia DNR for improvements or enhancements to the Cotton Hill site (on lands owned by West Virginia DNR).

- Provide a one-time payment of $50,000 to the West Virginia DNR for improvements or enhancements to the downstream Kanawha Falls Recreation and Public Access site.

- Maintain the existing Hawks Nest Powerhouse site.

- Provide 8-hour recreational flow releases of 2,000 to 3,000 cfs into the Hawks Nest bypassed reach each Memorial Day Weekend (Saturday, Sunday, and Monday) after maintaining a flow of 1,600 cfs to the powerhouse. Additional amenities during the recreation releases would include:

    - staff the dam access road entrance gate at the Cotton Hill Bridge recreation site;
    - provide transportation for both users and their equipment, from the gate to the existing trail (located approximately 1 mile upstream of the gate), which leads to a put-in area below the dam;
    - provide a portable toilet and trash receptacles at the Cotton Hill site for the 3-day release event; and

- coordinate with the owner of the New River Campground to provide, to the extent practicable, for recreation release user take-out access during the 3-day release event period.

- Develop and maintain a website to provide Hawks Nest bypassed reach flow information to facilitate awareness of whitewater boating opportunities.

- Implement the Historic Properties Management Plan (HPMP) filed with the license application to protect archaeological and historic resources.

Public Involvement and Areas of Concern

Before filing its license application, Hawks Nest Hydro conducted a pre-filing consultation process in accordance with the Commission's integrated licensing process. As part of the pre-filing process, staff conducted scoping to determine what issues and alternatives should be addressed. Staff distributed a scoping document to stakeholders and other interested entities on September 20, 2012. Two scoping meetings were held on October 17 and 18, 2012, in Ansted, West Virginia.

Hawks Nest Hydro filed its license application on December 29, 2015. On April 6, 2016, staff requested comments, recommendations, and terms and conditions, in a notice that the license application was ready for environmental analysis.

Alternatives Considered

This draft environmental assessment (draft EA) analyzes the effects of continued project operation for any new licenses that may be issued for the projects. In addition to Hawks Nest Hydro's proposal, we consider two alternatives: (1) Hawks Nest Hydro's proposal with staff modifications (staff alternative); and (2) no action – continued operation with no changes.

Staff Alternative

Under the staff alternative, the Hawks Nest Project would include most of Hawks Nest Hydro's proposed measures, with the exception of Hawks Nest Hydro's proposed minimum flows and recreation releases. The staff alternative also does not include Hawks Nest Hydro's proposed fish compensation and recreation funding. Under the staff alternative, the Hawks Nest and Glen Ferris projects would include the following additional measures and modifications (unless noted, the following measures apply to both projects):

- Release a minimum flow of 300 cfs into the Hawks Nest bypassed reach.

- Develop a project operation and compliance monitoring plan for the Hawks Nest Project that includes the provisions of the proposed bypassed reach streamflow monitoring plan and monitoring of compliance with run-of-river operation, ramping rate restrictions, and recreation releases.

- Develop a project operation and compliance monitoring plan for the Glen Ferris Project to document compliance with run-of-river operation.

- Conduct any necessary maintenance-related tree removal activities or vegetation clearing for recreation use enhancements between November 15 and March 31 in order to minimize effects on federally listed threatened and endangered bat species or migratory birds.

- Provide 6-hour scheduled recreation flow releases of 2,000-2,500 cfs into the Hawks Nest bypassed reach on 15 weekend days from March through July, as follows:

    - one Saturday release in March of 2,500 cfs (1 day);
    - two weekend releases in April of 2,500 cfs (4 days);
    - two weekend releases in May of 2,500 cfs, one of which is the 3-day Memorial Day Weekend (5 days);
    - two weekend releases in June of 2,000 cfs (4 days); and
    - one Saturday release in July of 2,000 cfs (1 day).

- Construct and maintain a new access trail from the gravel parking area near the Hawks Nest dam to the river with the proper slope and width to accommodate rafting groups.

- Provide signage and trail enhancements at the Hawks Nest Powerhouse site to provide a year-round take-out for recreational boating.

- Include the procedures and protocols related to the scheduled recreation flow releases in the proposed updated Recreation Management Plan for the Hawks Nest Project.

- Execute programmatic agreements that implement the HPMPs filed December 29, 2015.

No-Action Alternative

Under the no-action alternative, the projects would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented.

Environmental Effects of the Staff Alternative

The primary issues associated with licensing the Hawks Nest and Glen Ferris projects are minimum flows and recreation releases in the Hawks Nest bypassed reach. Below we briefly discuss the anticipated environmental effects of issuing a new license for each project under the staff alternative.

Aquatic Resources

Water quality monitoring data indicate that, under the existing minimum flow of 100 cfs, water temperature in the Hawks Nest bypassed reach occasionally exceeds the West Virginia state standard of 87 degrees Fahrenheit (^{o}F). Increasing the minimum bypassed reach flow to 300 cfs would reduce the frequency and magnitude of temperature fluctuations and such exceedances.

In addition to continuing run-of-river operation (both projects), increasing minimum flows in the Hawks Nest bypassed reach to 300 cfs would protect and enhance aquatic resources by providing an additional 70,000 square meters of suitable habitat for adult smallmouth bass, the most sought after sport fish in the project area. Further, continuing the current ramping rate regime in the Hawks Nest bypassed reach from March through October would continue to protect young fish from stranding or being flushed downstream during the times of the year in which these sensitive life stages (fry and early-stage juveniles) are most prevalent in the project area.

The staff-recommended operation and compliance monitoring plans would facilitate Commission administration of the licenses and verify that the operation requirements for the protection and enhancement of aquatic resources (e.g., run-of-river operation) are being met.

Terrestrial Resources

While the run-of-river mode of operation for both projects creates a relatively stable pool elevation that supports a system of wetland and riparian habitat in the projects' reservoirs, the Hawks Nest Project's bypassed reach experiences a wide-range of flow conditions, which can affect the distribution, species composition, and overall health of a project's wetland and riparian habitat. However, both projects' wetland and riparian habitats have developed under the existing operating regime and the Hawks Nest Project's bypassed reach contains species that are tolerant of inundation and water level

changes. As a result, these habitats would not be adversely affected by any increased inundation caused by proposed minimum flow and recreational boating releases. The wildlife and botanical habitats and species in the vicinity of the projects are also generally reflective of the area and have been shaped by long-term operation of both projects. Hawks Nest Hydro does not propose to change operation of either the Hawks Nest Project or Glen Ferris Project, except for the increases in minimum flow and the provision of recreational boating flows at the Hawks Nest Project. Maintenance activities at both projects would be expected to continue similarly to how they have in the past, with vegetation habitats remaining as they currently exist. Bald eagle habitat exists in the vicinity of both projects, but bald eagles have not been documented within the Hawks Nest and Glen Ferris project boundaries. Hawks Nest Hydro's proposal to continue to conduct routine right-of-way/transmission corridor maintenance and minimal hazardous tree/vegetation removal in accordance with the FWS bald eagle guidance would limit disturbance of the species.

Threatened and Endangered Species

Interior's list of federally threatened and endangered species indicates that six aquatic endangered mussel species and five terrestrial endangered species (running buffalo clover, Indiana bat, northern long-eared bat, Virginia big-eared bat, and Virginia spiraea) could be present at the projects.

The six federally endangered mussel species known to occur downstream of the Glen Ferris Project include pink mucket, sheepnose, fanshell, northern riffleshell, snuffbox, and spectaclecase. Four of these species (pink mucket, sheepnose, fanshell, and northern riffleshell) have been recently documented at a large, dense mussel bed at the base of Kanawha Falls, immediately below the dam. However, given this mussel bed is healthy under existing project operation and there is recent evidence that listed species are successfully reproducing at this site, continuing to operate the Glen Ferris Project under the existing operating conditions (with no change in downstream flow patterns) would continue to support healthy mussel populations downstream of the project. Therefore, continuing to operate the projects would have no effect on federally listed mussels.

The endangered Indiana bat and threatened northern long-eared bat have been documented near the projects, and habitats within the projects' boundaries are suitable and potentially occupied by these bat species for foraging and roosting activities during the summer. Habitat for the endangered Virginia big-eared bat also exists within the projects' boundaries, but no Virginia big-eared bats have been documented. Tree clearing for regular maintenance activities or vegetation clearing for the proposed recreation enhancements could negatively affect the habitat of these bat species and could also affect roosting Indiana bats. By limiting tree removal activities to the period from

November 15 to March 31, the projects would not be likely to adversely affect federally listed bats.

One population of running buffalo clover is known to occur at the Hawks Nest Project. With Hawks Nest Hydro's proposal to continue implementing protection and enhancement measures through an updated Running Buffalo Clover Management Plan, the project would not be likely to affect this species. Virginia spiraea has not been documented at either project since 1964. Therefore, the projects would have no effect on this species.

Recreation

The Hawks Nest bypassed reach (New River Dries)[4] contains class III,[5] intermediate level whitewater rapids when inflows to the project exceed approximately 12,000 cfs. Under existing operations, boatable whitewater flows occur about 80 days per year on an unscheduled basis. Providing 15 weekend days of scheduled whitewater flow releases as recommended by staff would increase recreation opportunities for commercial outfitters and individual boaters. Providing scheduled bypassed reach flow releases would allow all river users to plan trips to a stretch of river that does not provide dependable flows during the typical boating season (generally weekends from spring to fall).

Currently, the closest access trail to the river is about 1,200 feet from the gravel parking area near the dam. This gravel parking area is where participants would access the river on scheduled recreation release days. However, there is not a trail from the gravel parking area at the dam to the river below. Staff recommends providing a properly sloped trail wide enough to accommodate rafts as this would create access for all river users during the scheduled recreation flow releases. A put-in access trail would improve the recreation experience for the public.

Currently, there is not a dedicated take-out facility at the lower end of the whitewater reach downstream of the powerhouse. The staff-recommended trail and signage enhancements at the Hawks Nest Powerhouse site would provide year-round dedicated take-out access for river users to park and exit the river at the end of a trip. In conjunction with Hawks Nest Hydro's proposed temporary take-out access at the New

[4] The Hawks Nest bypassed reach is also known as the New River Dries or the Dries.

[5] The International Scale of River Difficulty is a rating system used to compare rivers around the world. It uses a class I (easy) to class VI (expert) ranking depending upon the difficulty of the rapids on the river.

River Campground for the 3-day Memorial Day Weekend release, the Hawks Nest Powerhouse site would provide additional take-out access during that weekend. This site would also provide additional take-out access on the other 12 scheduled release days if Hawks Nest Hydro were to provide take-out access at the campground for all 15 releases.

Hawks Nest Hydro proposes to update the existing Recreation Management Plan to include descriptions of recreational facilities and access within and immediately adjacent to the project boundary. Staff recommends that the Recreation Management Plan also include a schedule of completing facility improvements at the Cotton Hill site and the Hawks Nest Powerhouse site; a schedule of the recreation flow releases; coordination, monitoring, and evaluation guidelines for the first 3 years of releases; provisions for a first-year trial of the shuttle and vehicular access options; designated locations for put-in and take-out parking during the scheduled release events as well as during non-scheduled flows; guidelines for participant safety; protocols for emergency situations; and a flow notification website.

Cultural Resources

Hawks Nest Hydro's HPMPs for the Hawks Nest Project and the Glen Ferris Project, filed December 29, 2015, include measures that would provide protection for known and previously undiscovered cultural and historic resources and provide a consultation process if any discoveries are made during the term of any new license.

Conclusions

Based on our analysis, we recommend licensing the projects as proposed by Hawks Nest Hydro with some staff modifications and additional measures.

In section 4.2 of the draft EA, we estimate the likely cost of alternative power for each of the three alternatives identified above. For the Hawks Nest Project, our analysis shows that during the first year of operation under the no-action alternative, project power would cost $2,467,760, or $4.53 per megawatt-hour (MWh), more than the likely alternative cost of power. Under the proposed action alternative, project power would cost $2,761,150, or $5.13/MWh, more than the likely alternative cost of power. Under the staff alternative, project power would cost $3,079,340, or $5.81/MWh, more than the likely alternative cost of power.

For the Glen Ferris Project, our analysis shows that during the first year of operation under the no-action alternative, project power would cost $257, 950, or $6.22/MWh, more than the likely alternative cost of power. Under the proposed action alternative, project power would cost $299,740, or $7.23/MWh, more than the likely alternative cost of power. Under the staff alternative, project power would cost $258,830, or $6.24/MWh, more than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative because: (1) the projects would provide a dependable source of electrical energy for the region; (2) the generation comes from a renewable resource which does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by Hawks Nest Hydro, and additional measures recommended by staff, would adequately protect and enhance environmental resources affected by the projects. The overall benefits of the staff alternative would be worth the cost of the environmental measures.

We conclude that issuing new licenses for the Hawks Nest and Glen Ferris projects, with the environmental measures we recommend, would not be a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Hawks Nest Hydroelectric Project, P-2512-075
Glen Ferris Hydroelectric Project, P-14439-001
West Virginia

1.0 INTRODUCTION

1.1 APPLICATION

On December 29, 2015, Hawks Nest Hydro, LLC (Hawks Nest Hydro) filed applications for new licenses with the Federal Energy Regulatory Commission (Commission) to continue operating the existing Hawks Nest Hydroelectric Project (Hawks Nest Project) (FERC Project No. 2512) and the existing Glen Ferris Hydroelectric Project (Glen Ferris Project) (FERC Project No. 14439).[6] The 102-megawatt (MW) Hawks Nest Project is located on the New River and the 6.159-MW Glen Ferris Project is located on the Kanawha River, just upstream and downstream of the confluence of the New and Gauley rivers, respectively, with both projects located in Fayette County, West Virginia (figure 1). Neither project occupies any federal lands. The Hawks Nest and Glen Ferris projects generate an average of 544,253 megawatt-hours (MWh) and 41,482 MWh of energy annually, respectively. Hawks Nest Hydro proposes no new capacity and no new construction at either project.

[6] Currently, both the Hawks Nest and Glen Ferris developments are licensed as a single project. The current license was issued on December 11, 1987, and expires on December 31, 2017. Hawks Nest Hydro is seeking separate licenses for each project.

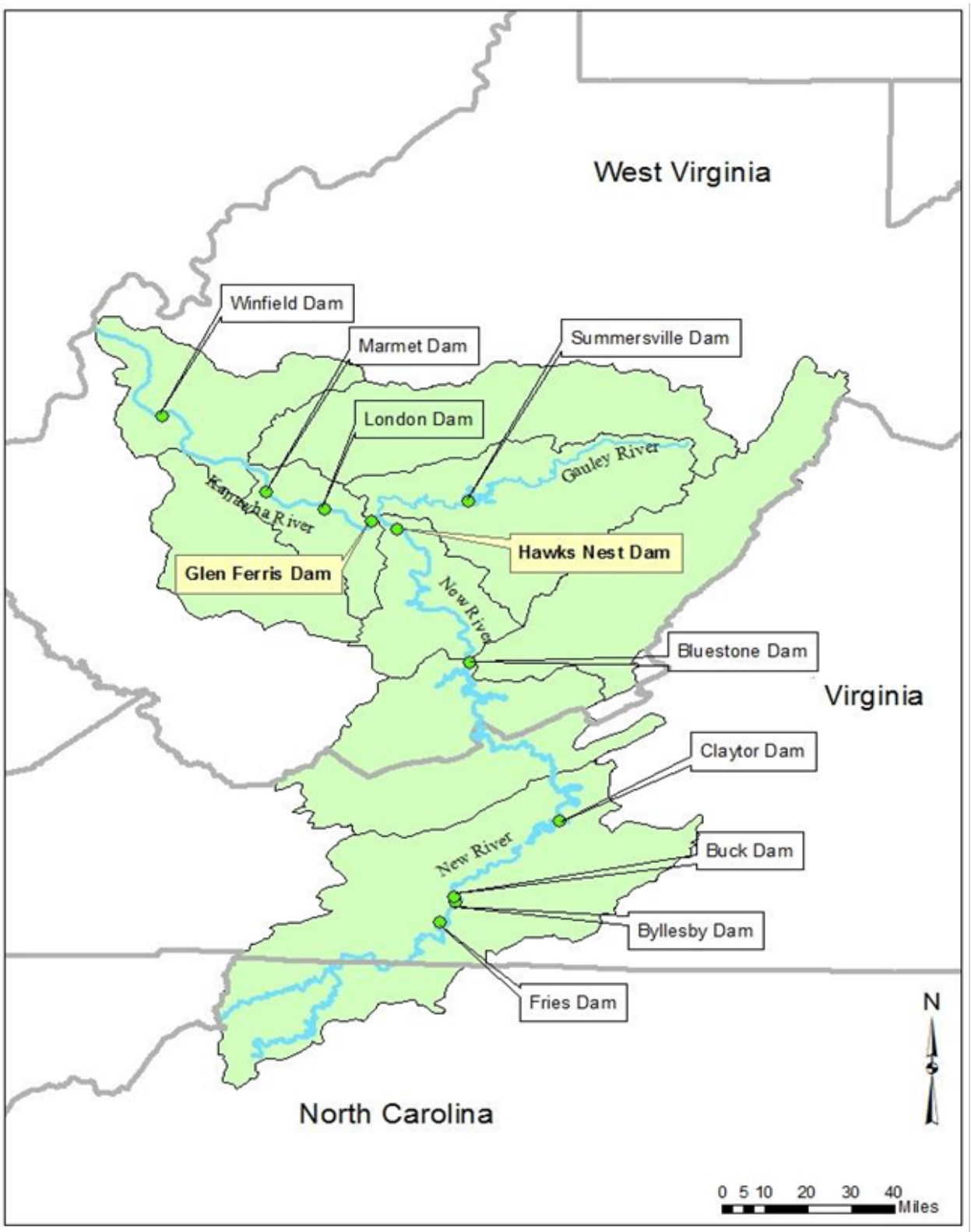

Figure 1. Location of the Hawks Nest and Glen Ferris projects (Source: staff).

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Hawks Nest Project and Glen Ferris Project is to continue to provide a source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue licenses to Hawks Nest Hydro for the Hawks Nest and Glen Ferris projects and what conditions should be placed on any licenses issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing new licenses for the Hawks Nest and Glen Ferris projects would allow Hawks Nest Hydro to generate electricity at the projects for the term of each new license, making electric power from a renewable resource available to their customers.

This multi-project draft environmental assessment (EA) assess the effects associated with operation of the projects, alternatives to the proposed projects , and makes recommendations to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become a part of any licenses issued.

In this draft EA, we assess the environmental and economic effects of continuing to operate the projects: (1) as proposed by Hawks Nest Hydro (proposed action); and (2) with our recommended measures (staff alternative). We also consider the effects of the no-action alternative. Important issues that are addressed include the effects of continued operation on water quality, fish entrainment and impingement, vegetation management, recreation, and cultural resources.

1.2.2 Need for Power

The existing Hawks Nest Project has an installed capacity of 102 MW and generates approximately 544,253 MWh per year. The existing Glen Ferris Project has an installed capacity of 6.159 MW and generates approximately 41,482 MWh per year.

The Hawks Nest Project was built in the 1930s to provide 25-hertz (Hz) power for the smelter furnaces at the Union Carbide's ferroalloy plant (alloy plant) near Alloy, West Virginia. To date, power produced at the Hawks Nest Project remains dedicated to the alloy plant currently owned by WVA Manufacturing, LLC (WVAM), a subsidiary of

Globe Specialty Metals, Inc. The alloy plant contains five submerged arc furnaces, two of which always operate at 25 Hz, one always operates at 60 Hz, and two can switch between 25 Hz and 60 Hz depending on the availability of power from the Hawks Nest Project. The alloy plant can convert a certain amount of 25-Hz power to 60-Hz power and vice versa using frequency converters.

The Glen Ferris Project was commissioned in 1901 to provide power to a ferroalloy facility near the powerhouse. However, the production in the ferroalloy facility was discontinued in 1954. The Glen Ferris Project had gone through multiple rehabilitations over the years. The project currently generates electricity at 60 Hz, and is connected to the regional grid.

The projects are located in the Pennsylvania-New Jersey-Maryland (PJM) region of the North American Electric Reliability Corporation (NERC). NERC annually forecasts electrical supply and demand nationally and regionally for a 10-year period. According to NERC, the peak season (summer) demand for the PJM region is expected to increase at an average rate of 0.9 percent over the 10-year forecast period from 2016-2025 (NERC, 2015).

We conclude that power from the projects would help meet a need for power in the PJM region in both the short- and long-term. The project would provide low-cost power that displaces generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Licenses for the Hawks Nest and Glen Ferris projects are subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the U.S. Department of the Interior (Interior). Interior, by letter filed June 3, 2016, requests that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the projects.

1.3.1.2 Section 10(j) Recommendations

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

Interior timely filed, on June 3, 2016, recommendations under section 10(j), as summarized in table 26, in section 5.3, *Recommendations of Fish and Wildlife Agencies.* In section 5.3, we also discuss how we address the agency recommendations and comply with section 10(j).

1.3.2 Clean Water Act

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

On June 1, 2016, Hawks Nest Hydro mailed applications to the West Virginia Department of Environmental Protection (West Virginia DEP) for a section 401 certification for licensing the Hawks Nest and Glen Ferris projects. West Virginia DEP received the applications on June 2, 2016.[7] West Virginia DEP has not yet acted on the certification requests.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

[7] The applicant filed a copy of the certification requests and receipts of delivery to West Virginia DEP on June 3, 2016.

Based on the U.S. Fish and Wildlife Service (FWS) records,[8] the following threatened or endangered species are known to occur, or are considered to potentially occur, in Fayette County, West Virginia: pink mucket (*Lampsilis abrupta*), sheepnose mussel (*Plethobasus cyphyus*), fanshell mussel (*Cyprogenia stegaria*), northern riffleshell (*Epioblasma t. rangiana*), snuffbox (*Epioblasma triquetra*), spectaclecase (*Cumberlandia monodonta*), running buffalo clover (*Trifolium stoloniferum*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), and Virginia spiraea (*Spiraea virginiana*). No designated or proposed critical habitat for these species is presently found within the proposed project boundaries. Our analysis of project impacts on threatened and endangered species is presented in section 3.3.3, *Threatened and Endangered Species*, and our recommendations are in section 5.1, *Comprehensive Development and Recommended Alternative*.

Six listed freshwater mussel species are known to occur downstream of Kanawha Falls, near the Glen Ferris Project, but not at the Hawks Nest Project. Specifically, four listed species (pink mucket, sheepnose, fanshell, and northern riffleshell) have been found at a large, dense mussel bed at the base of Kanawha Falls, and two other endangered species (snuffbox and spectaclecase) are known to occur in the 16.7-mile section of the Kanawha River between Kanawha Falls and the U.S. Army Corps of Engineer's London locks and dam. The large mussel bed immediately downstream of the Glen Ferris Project appears to be healthy under existing project operation, with recent evidence of successful reproduction and recruitment of listed species. Therefore, we conclude that continuing to operate the Glen Ferris Project as recommended in the staff alternative (with no change in project operation) will have no effect on listed mussel species.

One population of running buffalo clover is known to occur within the Hawks Nest Project boundary, about 1 mile below the Hawks Nest dam near the Cotton Hill Bridge on State Road 16. The existing license requires Hawks Nest Hydro to implement monitoring and protection measures for this population as part of a Running Buffalo Clover Management Plan. Pursuant to the plan, Hawks Nest Hydro coordinates an annual meeting with representatives of West Virginia Division of Natural Resources (West Virginia DNR) and FWS during the running buffalo clover growing season and files annual reports with FERC and the consulting agencies on the activities conducted under the plan. The most recent report, filed July 21, 2016, states that 62 rooted crowns, with about 11 flowering stems, were observed in 2016, a substantial increase from previous years when only one rooted crown was observed in 2012 and 2013, eleven in

[8] Listed species believed to or known to occur in Fayette County, West Virginia. https://ecos.fws.gov/ipac/gettingStarted/map. Accessed October 2016.

2014, and 51 in 2015. West Virginia DNR states in its letter attached to the July 21, 2016 report that Hawks Nest Hydro has not harmed this population of running buffalo clover, but has successfully restored it, with West Virginia DNR's cooperation, to its status when the population was discovered in 1987. Hawks Nest Hydro proposes to continue to implement protection and enhancement measures for running buffalo clover and has developed an updated Running Buffalo Clover Management Plan to be finalized in consultation with West Virginia DNR and FWS. With implementation of the updated Running Buffalo Clover Management Plan, the Hawks Nest Project would not be likely to adversely affect running buffalo clover.

Habitat suitable for federally listed bat species is available within the project boundaries and Hawks Nest Hydro's field studies documented the presence of the Indiana bat and northern long-eared bat in the Hawks Nest and Glen Ferris project vicinities. Although habitat for the Virginia big-eared bat also exists within the project boundaries, no Virginia big-eared bats were documented. Tree clearing for regular maintenance activities or vegetation clearing due to proposed recreation enhancements could negatively affect the habitat of all three bat species and could also result in the direct take (injuring or killing) of roosting Indiana bats. In order to protect federally listed bat species and their habitat, Interior recommends that Hawks Nest Hydro conduct any necessary tree removal activities between November 15 and March 31. Hawks Nest Hydro is not proposing any modifications to existing operations. Therefore, with adherence to FWS' recommended avoidance measures, the Hawks Nest and Glen Ferris projects would not be likely adversely affect federally listed bats or their habitat.

The last documented observation of Virginia spiraea at the site of Hawks Nest dam occurred in 1961 and West Virginia's database lists this species as extirpated. No evidence of Virginia spiraea was observed at either project during Hawks Nest Hydro's field studies. Therefore, the Hawks Nest and Glen Ferris projects would have no effect on Virginia spiraea.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's coastal zone management program, or the agency's concurrence is conclusively presumed by its failure to act within 6 months of its receipt of the applicant's certification.

The state of West Virginia does not have a coastal zone program. The Hawks Nest and Glen Ferris projects, therefore, do not require a coastal zone consistency certification.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA)[9] requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission intends to execute two Programmatic Agreements (PA) for the protection of historic properties from the effects of the operation of the Hawks Nest Project and the Glen Ferris Project. Operation of the Hawks Nest Project and Glen Ferris Project has the potential to adversely affect multiple archaeological sites as well as the Hawks Nest Historic Development Site and the Glen Ferris Historic Development Site, all of which are recommended as potentially eligible for inclusion in the National Register. The terms of each PA would ensure that Hawks Nest Hydro addresses any adverse effects to historic properties identified within the area of potential effects (APE) of each project through implementation of the Historic Properties Management Plan (HPMP) for the Hawks Nest Hydroelectric Project and the HPMP for the Glen Ferris Hydroelectric Project, which were filed with the license applications.

On November 13, 2015, Hawks Nest Hydro distributed draft HPMPs for both projects to the West Virginia State Historic Preservation Office (West Virginia SHPO), ten Native American Tribes, and the National Park Service (Park Service). Hawks Nest Hydro received concurrence on the proposed measures in the draft HPMPs from the West Virginia SHPO on December 15, 2015. On December 29, 2015, Hawks Nest Hydro filed a final HPMP for the Hawks Nest Project and a final HPMP for the Glen Ferris Project with the Commission.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R., §§ 5.1-5.16) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, ESA, NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

[9] 54 U.S.C. § 306108 (2014).

1.4.1 Scoping

Before preparing this draft EA, we conducted scoping for both projects to determine what issues and alternatives should be addressed. A multi-project scoping document (SD1) was issued on September 20, 2012. Scoping meetings were held on October 17 and 18, 2012, to request comments on the projects. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the projects. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
Fayette County Commission	October 10, 2012
West Virginia DNR	November 15, 2012
American Whitewater (AW)	November 19, 2012
Park Service	November 19, 2012
Catawba Indian Nation Tribal Historic Preservation	November 20, 2012
John K. Dubose, III	November 20, 2012
Globe Specialty Metals, Inc.	November 20, 2012
The Nature Conservancy	November 21, 2012
West Virginia Professional River Outfitters (WVPRO)	November 21, 2012
National Committee for the New River	November 21, 2012
Nic Spruill	November 21, 2012
National Parks Conservation Association	November 21, 2012

Based on comments received during the October 17 and 18, 2012, scoping meetings and written comments received during the scoping process, a revised scoping document was issued on January 2, 2013.

1.4.2 Interventions

On April 6, 2016, the Commission issued a notice accepting the application. The notice set June 6, 2016, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed notices of intervention or motions to intervene (none opposed issuance of a license):

Intervenors	Date Filed
Interior	May 23, 2016
AW	May 27, 2016
WVAM	June 6, 2016
WVPRO	June 7, 2016

On November 15, 2016, the Commission granted WVPRO's late motion to intervene.

1.4.3 Comments on the Application

The Commission issued a Ready for Environmental Analysis (REA) notice for the projects on April 6, 2016, and requested comments, recommendations, terms and conditions, and fishway prescriptions. The following entities filed comments, terms and conditions, recommendations, or prescriptions:

Commenting Entity	Date Filed
James F. Holly, Jr.	May 23, 2016
AW	May 27, 2016
Interior	June 3, 2016
WVAM	June 6, 2016
WVPRO	June 7, 2016

Hawks Nest Hydro filed reply comments on July 20, 2016.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the projects would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative as the baseline environmental condition for comparison with other alternatives.

2.1.1 Existing Project Facilities

Figure 2 shows the location and project facilities of the Hawks Nest and Glen Ferris projects.

Hawks Nest Project

The Hawks Nest Project is located upstream of the Glen Ferris Project, on the New River just upstream of the confluence of the New and Gauley rivers. The project is located approximately 2 miles from the Town of Ansted in Fayette County, West Virginia.

The Hawks Nest Project consists of a 948-foot-long concrete-gravity dam located on the New River. The dam has 14 ogee-type spillway bays extending almost the entire length of the dam, with each spillway bay topped by a 25-foot-high by 50-foot-wide Stoney-type steel lift gate and separated by 9-foot-wide concrete piers. An operating deck stretches the entire length of the dam above the spillway and is supported by the concrete piers. The crest of the spillway is at elevation 795.0 feet National Geodetic Vertical Datum (NGVD) of 1929,[10] and the operating deck is at elevation 832.0 feet. The maximum height of the dam from the deepest part of the foundation to the operating deck is about 90 feet.

The spillway lift gates are operated by two gantry cranes on rails running the entire length of the dam. The gates can be latched open at various heights of lift. The two cranes are equipped with electric controls and all 14 gates can be raised or lowered remotely from the control room in the powerhouse.

[10] Unless otherwise noted, all elevation data in this draft EA are given in NGVD of 1929.

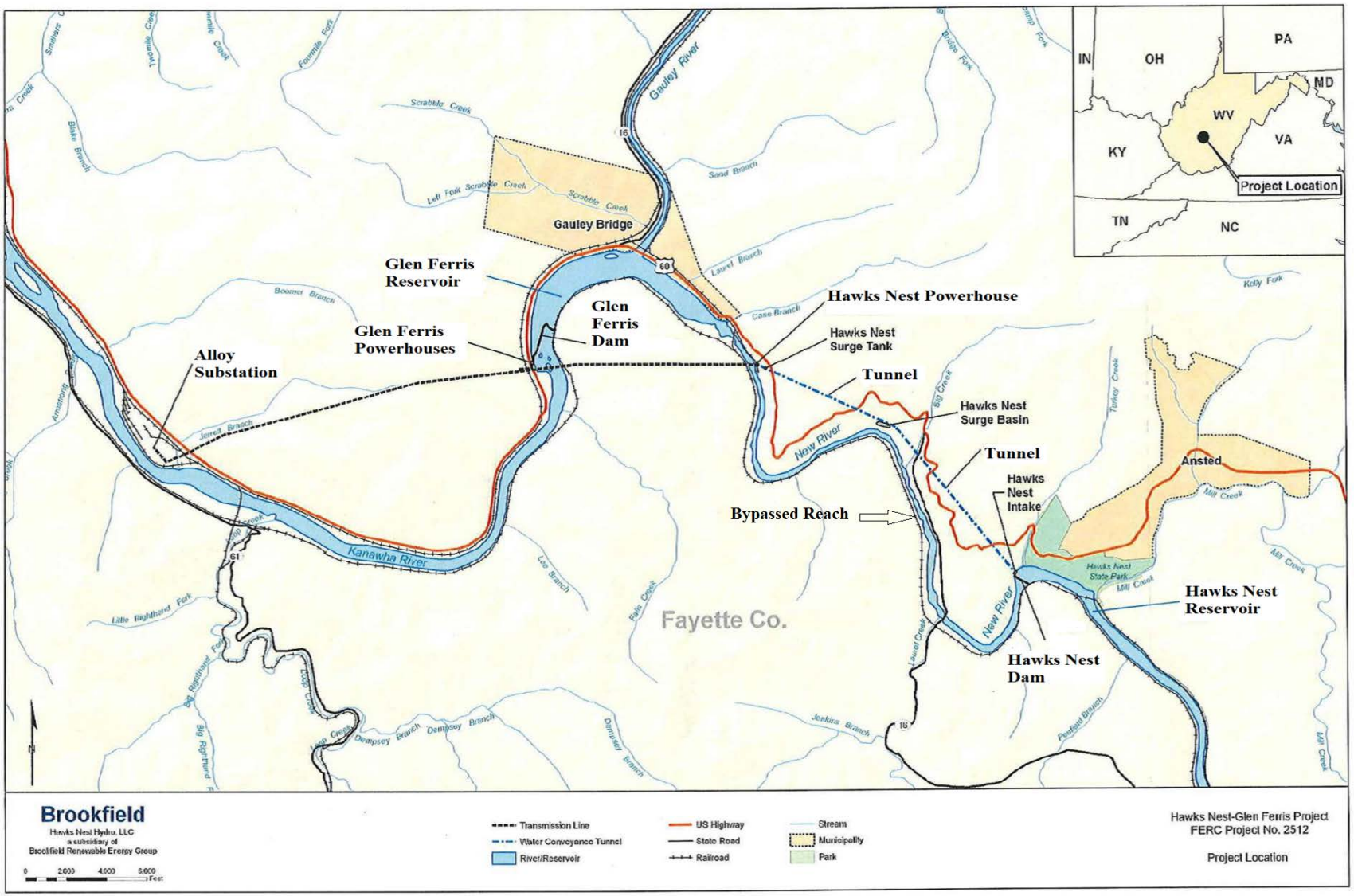

Figure 2. Hawks Nest and Glen Ferris project location and facilities (Source: license application, as modified by staff).

The dam includes a 10-foot-wide trash spillway located between the main spillway section and the right abutment (looking downstream). The spillway is equipped with steel stoplogs ("trash gate") and has a crest elevation of 810.0 feet. The stoplogs are typically operated by an electric motor to pass debris, and to release the 100 cubic feet per second (cfs) minimum flow required by the current license.

The reservoir created by the dam extends upstream approximately 6.9 miles to the Marr Branch confluence, located downstream of the New River Gorge Bridge, in a narrow valley with an average width of approximately 500 feet. The reservoir has a surface area of 243 acres and a gross storage capacity of 7,323 acre-feet at a normal pool elevation of 819.0 feet.

Water from the reservoir is conveyed to the powerhouse through the intake located on the right abutment (looking downstream), and a 16,240-foot-long tunnel that extends from the intake to the powerhouse downstream of the New River. The intake consists of a 110-foot-wide by 51-foot-high trashrack structure and a Stoney-type 42-foot-high by 34.5-foot-wide bulkhead intake gate that sits back approximately 50 feet from the opening where the trashrack is located. The tunnel can convey a maximum of about 10,000 cfs. At a point approximately 60 percent of the distance from the intake to the powerhouse, the tunnel connects to a 600-foot-long and 170-foot-wide surge basin. At its downstream end, the tunnel is connected by a vertical steel riser to a 116-foot-diameter, 56-foot-high surge tank. The tunnel ends at the powerhouse penstock system that includes a main 30-foot-diameter, 107-foot-long, steel penstock connecting to a manifold leading to five steel penstocks, each 14 feet in diameter, and of varying lengths of 42 to 132 feet. Four of the five penstocks are connected to the four turbines in the powerhouse, while the fifth penstock is closed with a steel and concrete bulkhead.

The brick and concrete powerhouse is about 210 feet long and 74.5 feet wide, and is located on the right bank (looking downstream) of the New River. The powerhouse contains four identical turbine-generator units, each with a rated capacity of approximately 25.5 MW. Each of the vertical Francis turbines has a minimum hydraulic capacity of 800 cfs and a maximum hydraulic capacity of 2,540 cfs, with the project having a total maximum hydraulic capacity of approximately 10,000 cfs. Water flowing through the tunnel, the penstock system, and then through the powerhouse is discharged into the excavated tailrace in the New River.

The project's electrical transmission equipment consists of an outdoor substation located next to the powerhouse, containing transformers, circuit breakers, and disconnecting switches. Electricity generated at the project is transmitted by two parallel, approximately 5.5-mile-long, 69-kilovolt (kV) transmission lines that connect the substation at the powerhouse to the Alloy Substation located at the WVAM's alloy plant (figure 2). In addition to an interconnection point for the WVAM's alloy plant, the Alloy Substation is also an interconnection point for the regional grid.

The existing project boundary for the Hawks Nest Project generally encompasses a reach of the New River from approximately the Marr Branch confluence and extending approximately 12.5 miles downstream to a point approximately 2,700 feet downstream of the Hawks Nest powerhouse, including the Hawks Nest reservoir and a 5.5-mile long bypassed reach between the dam and the powerhouse. The project boundary also encloses the Hawks Nest dam, tunnel, penstocks, powerhouse, tailrace, transmission lines, and two recreation facilities: the Cotton Hill Bridge Day-Use Area (Cotton Hill site) and Hawks Nest Powerhouse Fishing Access site (Hawks Nest Powerhouse site).

Glen Ferris Project

The Glen Ferris Project is located on the Kanawha River just downstream of the confluence of the New and Gauley rivers, near the Town of Glen Ferris, West Virginia.

The project consists of a low concrete dam with varying height of 3 feet to 12 feet above the riverbed and is founded on solid rock (figure 3). From left to right (looking downstream), the spillway of the dam includes a 590-foot-long left spillway, a 128-foot-long five-bay stoplog sluice section, and a 2,132-foot-long right spillway that runs diagonally in a downstream direction. To the right and integral to the dam are two powerhouses connected by a non-overflow section of the dam. The spillway has a crest elevation of 651.0 feet, and there are no spillway flood gates at the Glen Ferris Project.

The project reservoir extends about 1.9 miles from the dam up to just below the confluence of the New and Gauley rivers. The reservoir has a surface area of 190 acres and a gross storage capacity of 1,500 acre-feet at the normal reservoir elevation of 651.0 feet (i.e., the crest of the spillway).

Of the two powerhouses, the east powerhouse, which is next to the spillway, is of steel frame and brick construction on a concrete substructure, and is approximately 54 feet long by 38 feet wide. The east powerhouse contains two identical turbine-generator units, each with a rated capacity of 1.947 MW. The minimum and maximum hydraulic capacities of each vertical Francis turbine are 704 cfs and 957 cfs, respectively.

The 64.5-foot-long by 63-foot-wide west powerhouse is of steel frame and brick construction on a cut stone masonry substructure, and is located between the east powerhouse and the river bank. The west powerhouse contains six identical turbine-generator units, each with a rated capacity of 0.377 MW. Each of the vertical Francis turbines has a fixed hydraulic capacity of 199 cfs.

Figure 3. Glen Ferris Dam and Powerhouses (Source: license application, as modified by staff).

Energy generated at the Glen Ferris Project is delivered by a 4-mile-long, 13.4-kV transmission line that connects the Glen Ferris substation, located next to the powerhouses, to the Alloy Substation. The Glen Ferris transmission line runs parallel to the Hawks Nest Project transmission lines.

The project boundary encompasses the dam, powerhouses, the Glen Ferris reservoir, and the transmission line. The Kanawha Falls Recreation and Public Access Site (Kanawha Falls site) is a project recreation facility located immediately downstream of the powerhouses, but is not within the existing project boundary. The West Virginia Division of Natural Resources (West Virginia DNR) is responsible for the maintenance and operation of the Kanawha Falls site pursuant to the deed that transferred the land from the licensee to the West Virginia DNR.

2.1.2 Project Safety

The Hawks Nest and Glen Ferris projects have been operating under the existing license,[11] which was issued for both projects under a single project number P-2512, for almost 29 years. During this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. The Glen Ferris Project was exempted from the requirement to file Part 12 independent consultant safety inspection reports every 5 years. The Hawks Nest Project has been inspected and evaluated every 5 years by an independent consultant and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, the Commission staff would evaluate the continued adequacy of the proposed project facilities under new licenses. Special articles would be included in any license(s) issued, as appropriate. Commission staff would continue to inspect the projects during the new license terms to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

[11] The Commission issued the current license on December 11, 1987, with an effective date of January 1, 1988. 41 FERC ¶62,289 (1987).

2.1.3 Existing Project Operation

Hawks Nest Project

The Hawks Nest Project is operated in a run-of-river mode and maintains a normal pool elevation of 819.0 feet under low to moderate flow conditions. A minimum flow of 100 cfs is released at the dam into the bypassed reach, and a flow of up to approximately 10,000 cfs (maximum hydraulic capacity of the project) is transferred to the powerhouse via the tunnel for power generation. The continuous minimum flow of 100 cfs is typically released through the trash gate at the right end of the spillway, which can discharge up to 333 cfs. The reservoir level is maintained through power generation and release of the required minimum flow from the trash gate, and additional spill through the spillway gates when inflow exceeds powerhouse capacity. The reservoir is not typically operated more than 0.5 foot above the normal pool level.

During low-flow periods, the available powerhouse flow is apportioned to two turbine-generator units. Although this results in a less efficient output generation, the continuous generation of two turbine-generator units is necessary to provide the needed voltage support and reactive power to the 25-Hz power system used by the WVAM alloy plant.

Between March 1 and October 31 when river flows are less than 12,600 cfs, the spillway gates are operated to follow a discharge ramping rate schedule for the protection of downstream public safety and aquatic resources. The ramping rate consists of 0.5-foot gate opening increments with a 45-minute time delay between gate movements, until a gate opening of 2 feet is reached, corresponding to a spillway discharge of approximately 2,600 cfs. The goal is to maintain an upward or downward water level ramping rate not greater than 1 foot per hour, as measured at the existing United States Geological Survey (USGS) gage (No. 380649081083301) located downstream of the dam in the vicinity of the Cotton Hill Bridge, when flow in the bypassed reach is 2,600 cfs or less. However, the ramping rate may be modified, if necessary, to prevent overtopping the dam or spillway gates.[12]

The 14 spillway gates are operated as needed to pass inflow in excess of the powerhouse capacity. At the normal reservoir elevation, each spillway gate has a maximum discharge capacity of about 23,900 cfs. The discharge capacity of the spillway with all the spillway gates fully opened at normal maximum operating level is approximately 334,600 cfs.

[12] Commission's Order Approving and Modifying Ramping Rate Plan and Amending Mode of Operation issued on September 14, 1990.

Glen Ferris Project

The Glen Ferris Project is operated in a run-of-river mode, with minimal reservoir surface elevation fluctuation and inflow to the project approximating outflow. During low to moderate flows up to about 3,100 cfs (the maximum hydraulic capacity), the project is operated by maintaining the surface of the reservoir at the dam crest elevation of 651.0 feet. Under high-flow conditions, all generation units in both powerhouses are operated to their maximum discharge capacity. Because there are no spillway gates, flows in excess of the generation capacity is automatically spilled over the dam.

2.1.4 Existing Environmental Measures

Hawks Nest Project

Under the current license, Hawks Nest Hydro releases a minimum flow of 100 cfs in the bypassed reach and maintains the USGS gage downstream of the dam to document compliance with the minimum flow (Articles 402 and 403). As discussed above in section 2.1.3, *Existing Project Operation*, the project maintains a ramping rate for discharges into the bypassed reach between March 1 and October 31 when river flows are less than 12,600 cfs and when there are flows of 2,600 cfs or less in the bypassed reach to maintain a water level ramping rate not greater than 1 foot per hour at the downstream USGS gauge for the protection of downstream public safety and aquatic resources (Articles 404, as amended, and 405).

Hawks Nest Hydro has a plan to protect federally endangered running buffalo clover (*Trifolium Stoloniferum*) located within the project boundary (Article 407). Article 408 of the current license includes provisions to protect cultural resources.

The Hawks Nest Project includes two recreational facilities: the Cotton Hill site[13] and the Hawks Nest Powerhouse site. The Cotton Hill site is a day-use facility that provides opportunities for hiking, wildlife observation, and fishing and boating access. The Hawks Nest Powerhouse site is adjacent to the powerhouse and provides a catwalk fishing platform.

[13] The Cotton Hill site comprises lands owned by the licensee and lands deeded to West Virginia DNR. However, the entire site is operated and maintained by West Virginia DNR.

Glen Ferris Project

The Kanawha Falls site[14] located downstream of the Glen Ferris Project offers a fishing platform, picnic area, and short hiking trails, and also provides opportunities for shoreline fishing and wildlife observation. In addition, the current license includes provisions to protect cultural resources (Article 408).

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

No modifications are proposed for the Hawks Nest and Glen Ferris projects.

2.2.2 Proposed Project Operation and Environmental Measures

Hawks Nest Hydro proposes to continue to operate both the Hawks Nest and Glen Ferris projects according to the existing run-of-river mode.

Hawks Nest Project

Hawks Nest Hydro proposes the following environmental measures at the project:[15]

- Continue to operate the project in a run-of-river mode, with inflow to the project approximating outflow.[16]

[14] The land on which the Kanawha Falls site is located was deeded to West Virginia DNR, and the site is operated and maintained by West Virginia DNR.

[15] Hawks Nest Hydro proposes to release an alternative minimum flow and recreational release schedule in the event the 25-Hz power generated at the project was no longer needed for any industrial end-use purpose. Because our analysis compares the costs and benefits of Hawks Nest Hydro's proposal to the baseline, which is the existing condition, we do not include this potential measure in our description of Hawks Nest Hydro's proposal.

[16] Although Hawks Nest Hydro does not specify reservoir elevations for run-of-river operation, we assume the Hawks Nest reservoir would be maintained at 819.0 feet under low to moderate flow conditions as it is currently operated according to the Commission's Order Approving and Modifying Ramping Rate Plan and Amending Mode of Operation issued on September 14, 1990.

- Maintain the existing ramping rate for discharges into the Hawks Nest bypassed reach between March 1 and October 31 when river flows into the reservoir are less than 12,600 cfs and when there are flows of 2,600 cfs or less in the bypassed reach, to maintain a water level ramping rate of not greater than 1 foot per hour as measured at the existing USGS gage (No. 380649081083301) located downstream of the dam in the vicinity of the Cotton Hill Bridge.

- Continue to release a 100-cfs minimum flow into the Hawks Nest bypassed reach.

- Provide additional seasonal minimum flows of 50 cfs (July-February), 200 cfs (March-April), and 150 cfs (May-June), if available, into the Hawks Nest bypassed reach after releasing the 100-cfs minimum flow into the bypassed reach and passing 1,600 cfs[17] to the powerhouse for generation.

- Develop a streamflow monitoring plan for any new minimum flow targets that may be required for the Hawks Nest bypassed reach.

- Provide an annual fish compensation payment for entrainment losses to the West Virginia DNR to mitigate for potential turbine induced impacts to fish, and prepare, every 5 years, a resource enhancement plan reporting on activities completed by West Virginia DNR utilizing the annual fish compensation payment.

- Continue to conduct routine right-of-way/transmission corridor maintenance and hazardous tree/vegetation removal in accordance with the FWS' May 2007 National Bald Eagle Management Guidelines. In the event bald eagles are documented at or in the vicinity of either project, consult with the FWS in order to avoid disturbance or other impacts to the species.

- Finalize an updated Running Buffalo Clover Management Plan for the Hawks Nest Project.

[17] According to Hawks Nest Hydro, the continuous generation of two turbine-generator units is necessary to provide the needed voltage support and reactive power to the 25-Hz power system used by the WVAM alloy plant. Therefore, a flow of 1,600 cfs is needed to operate two turbine-generator units, as the rated minimum flow capacity of each turbine-generator unit is 800 cfs. Although the Hawks Nest turbines could theoretically operate below their rated minimum flow of 800 cfs per unit, the system planning is based on the rated minimum flow.

- Update the Recreation Management Plan for the Hawks Nest Project by describing recreation facilities and access within and immediately adjacent to the project boundary.

- Provide $25,000 annually to the West Virginia DNR to maintain and enhance recreation facilities on lands deeded to West Virginia DNR, and every 5 years, prepare a report on activities completed by West Virginia DNR during the previous period and anticipated for the next 5 years utilizing the annual recreation funding.

- Identify, design, and construct improvements to the parking area of the Cotton Hill site, including a seasonal toilet/changing facility, new picnic facilities, and parking and signage improvements.

- Provide one-time payment of $50,000 to the West Virginia DNR for improvements or enhancements to the Cotton Hill site (on lands owned by West Virginia DNR).

- Maintain the existing Hawks Nest Powerhouse site.

- Provide 8-hour recreation releases of 2,000 to 3,000 cfs into the Hawks Nest bypassed reach each Memorial Day Weekend (Saturday, Sunday, and Monday) after maintaining a flow of 1,600 cfs to the powerhouse. Additional amenities during the recreation releases to include:

    - Hawks Nest Hydro personnel manning the dam access road entrance gate at the Cotton Hill Bridge recreation site;
    - provide transportation for both users and their equipment, from the gate to the existing trail (located approximately 1 mile upstream of the gate), which leads to a put-in area below the dam;
    - a portable toilet and trash receptacles at the Cotton Hill site for the 3-day release event; and
    - coordinate with the owner of the New River Campground to provide, to the extent practicable, for recreation release user take-out access during the 3-day release event period.

- Develop and maintain a website to provide Hawks Nest bypassed reach flow information to facilitate awareness of whitewater boating opportunities.

- Implement the HPMP filed with the license application to protect archaeological and historic resources.

Glen Ferris Project

Hawks Nest Hydro proposes the following environmental measures at the Glen Ferris Project:

- Continue to operate the project in a run-of-river mode, with inflow to the project approximating outflow.

- Provide an annual fish compensation payment for entrainment losses to the West Virginia DNR to mitigate for potential turbine induced impacts to fish, and prepare, every 5 years, a resource enhancement plan reporting on activities completed by West Virginia DNR using the annual fish compensation payment.

- Continue to conduct routine right-of-way/transmission corridor maintenance and hazardous tree/vegetation removal in accordance with the FWS' May 2007 National Bald Eagle Management Guidelines. In the event bald eagles are documented at or in the vicinity of either project, consult with the FWS in order to avoid disturbance or other impacts to the species.

- Develop an updated Recreation Management Plan describing recreation facilities and access within and immediately adjacent to the project boundary.

- Provide $25,000 annually to the West Virginia DNR to maintain and enhance recreation facilities on lands that had been deeded to West Virginia DNR, and every 5 years, prepare a report on activities completed by West Virginia DNR during the previous period and anticipated for the next 5 years utilizing the annual recreation funding.

- Provide one-time payment of $50,000 to the West Virginia DNR for improvements or enhancements to the downstream Kanawha Falls site.

- Implement the HPMP filed with the license application to protect archaeological and historic resources.

2.2.3 Proposed Modifications to Project Boundary

Hawks Nest Project

Hawks Nest Hydro proposes to remove Highway 16 from the project comprising 12.1 acres, since this public roadway is not necessary for operation of the project. In

addition, adjustments to the project boundary are proposed to correct discrepancies between the existing Exhibit G drawings and the associated boundary descriptions. Specifically, Hawks Nest Hydro proposes to add 2.15 acres on the right (looking downstream) side of the reservoir upstream of Mill Creek and 0.42 acre on the left side of the reservoir across from Mill Creek to encompass the normal operating range of the reservoir (819.5 feet). Hawks Nest Hydro also proposes to remove 4.96 acres and add 0.91 acre at the downstream end of the project boundary to better reflect the land needed and necessary to operate the project. Hawks Nest Hydro possesses property or easement rights to all areas associated with the proposed project boundary.[18]

Glen Ferris Project

Hawks Nest Hydro proposes to add 1.39 acres near the northern shore of the upstream end of the project boundary to encompass the normal operating range of the reservoir (651 feet). In addition, Hawks Nest Hydro proposes to modify the existing project boundary where it crosses the river at the upstream end of the reservoir by removing 16.8 acres, mostly water, so that the boundary crosses the river on a straight line. Hawks Nest Hydro possesses property or easement rights to all areas associated with the proposed project boundary.[19]

2.3 STAFF ALTERNATIVE

Under the staff alternative, both the Hawks Nest and Glen Ferris projects would be operated in a run-of-river mode as proposed and include most of Hawks Nest Hydro's proposed measures, with the exception of Hawks Nest Hydro's proposed minimum flows and recreation releases. As discussed below, the staff alternative also does not include Hawks Nest Hydro's proposed fish compensation and recreation funding. Under the staff alternative, the Hawks Nest and Glen Ferris projects would include the following modifications and additional staff-recommended measures (unless noted, the following measures apply to both projects):

- Release a minimum flow of 300 cfs into the Hawks Nest bypassed reach.

- Develop a project operation and compliance monitoring plan for the Hawks Nest Project that includes the provisions of the proposed bypassed reach streamflow monitoring plan and monitoring of compliance with run-of-river operation, ramping rate restrictions, and recreation releases.

[18] *See* figures G-1 through G-4 in Exhibit G of the license application for maps of boundary adjustments for the Hawks Nest Project.

[19] *See* figure G-1 in Exhibit G of the license application for a map of boundary adjustments for the Glen Ferris Project.

- Develop a project operation and compliance monitoring plan for the Glen Ferris Project to document compliance with run-of-river operation.

- Conduct any necessary maintenance-related tree removal activities or vegetation clearing for recreation use enhancements between November 15 and March 31 in order to minimize effects on federally listed threatened and endangered bat species or migratory birds.

- Provide 6-hour scheduled recreation flow releases of 2,000-2,500 cfs into the Hawks Nest bypassed reach on 15 weekend days from March through July, as follows:

    - one Saturday release in March of 2,500 cfs (1 day);
    - two weekend releases in April of 2,500 cfs (4 days);
    - two weekend releases in May of 2,500 cfs, one of which is the 3-day Memorial Day Weekend (5 days);
    - two weekend releases in June of 2,000 cfs (4 days); and
    - one Saturday release in July of 2,000 cfs (1 day).

- Construct and maintain a new access trail from the gravel parking area near the Hawks Nest dam to the river with the proper slope and width to accommodate rafting groups.

- Provide signage and trail enhancements at the Hawks Nest Powerhouse Fishing Access Site to provide a year-round take-out for recreational boating.

- Include the procedures and protocols related to the scheduled recreation flow releases in the proposed updated Recreation Management Plan for the Hawks Nest Project.

- Execute programmatic agreements that implement the HPMPs filed December 29, 2015.

Although Hawks Nest Hydro proposes to provide fish compensation payments to West Virginia DNR for entrainment losses at both projects, there is no substantial evidence in the record demonstrating that fish entrainment at the projects has an adverse effect on fishery resources. Therefore, we have no justification for recommending entrainment mitigation, including Hawks Nest Hydro's proposal for fish compensation. In addition, the staff alternative does not include Hawks Nest Hydro's proposed annual payment of $25,000 for maintenance and enhancement of recreation facilities on lands deeded to West Virginia DNR or one-time funding of $50,000 to West Virginia DNR for specific recreation sites, because no specific measures have been proposed to address any specific project effects, nor is there any information provided as to how the funds would

be used. Therefore, we are unable to analyze the effectiveness or appropriateness of these measures. Because it is the Commission's strong preference to require specific measures directed towards a specific project effect and/or purpose, where such non-specific measures have been proposed, the Commission might not require them in a license. However, this would not prevent Hawks Nest Hydro and West Virginia DNR from pursuing such measures separate from any license that may be issued.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to the applicant's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are: (1) issuing non-power licenses, (2) federal takeover, and (3) project retirement.

2.4.1 Issuing Non-power Licenses

A non-power license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license and we have no basis for concluding that the projects should no longer be used to produce power. Thus, we do not consider issuing a non-power license a realistic alternative to relicensing in this circumstance.

2.4.2 Federal Government Takeover of the Projects

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

2.4.3 Retiring the Projects

Project retirement could be accomplished with or without dam removal. Either alterative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. The projects provide a viable, safe, and clean renewable source of power to the region, as well as recreational opportunities. The Hawks Nest reservoir is also used as a source of municipal water supply in the area. Thus, dam removal is not a reasonable alternative to

relicensing the projects with appropriate protection, mitigation and enhancement measures.

The second project retirement alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and recommended environmental measures. Sections are organized by resource area (aquatics, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommendations are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.[20]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Hawks Nest and Glen Ferris projects are located within the New-Kanawha River watershed. The Kanawha River and its major tributary , the New River, drain approximately 12,200 square miles in North Carolina, Virginia, and West Virginia (see figure 1). The New River originates in North Carolina at the confluence of the North Fork New River and the South Fork. The New River flows into Virginia where it is joined by the Little River, and then into West Virginia where it is joined by the Bluestone and Greenbrier rivers. The Hawks Nest Project is located on the New River a few miles upstream from its confluence with the Gauley River, where the rivers combine to form the Kanawha River, and the Glen Ferris Project is located on the Kanawha River immediately downstream of the confluence.

The projects are located in the Kanawha section of the Appalachian Plateaus Physiographic Province, a mountainous highland region with a series of long side slopes between narrow ridgetops. The land elevation of the New River watershed varies from 5,400 feet above mean sea level (msl) on Rich Mountain near the southern extreme of the watershed to 800 feet msl at Hawks Nest dam. The relief is characterized by plateau lands, dissected plateau lands, limestone valleys, and mountain ridges. High-gradient streams are dominant within the watershed, and most of the valleys are narrow and flanked by steep hillsides. For approximately 7 miles downstream of the Hawks Nest dam, the New River follows a narrow valley with an average slope of 17 feet per mile to its confluence with the Gauley River.

[20] Unless noted otherwise, the sources of our information are the license applications filed by Hawks Nest Hydro on December 29, 2015, and the response to request for additional information filed on March 30, 2016.

The area surrounding the projects generally experiences cool winters and warm humid summers with an average annual temperature of 54 degrees Fahrenheit (ºF). Average monthly temperature ranges from 32ºF in January to 73ºF in July. Rainfall amounts within the projects' areas average approximately 47 inches and snowfall averages 43 inches annually.

Despite the region's significant industrial history, most of the New, Gauley and upper Kanawha watersheds are forested, with other land uses including grassland, pasture, urban/residential, and mining. Historically, coal mining has had a significant impact on land use and the local economy. There are numerous active underground and surface mine sites throughout the region, including several within Fayette County.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 CFR § 1508.7), a cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we have not identified any resources that may be cumulatively affected by continuing to operate the Hawks Nest and Glen Ferris projects.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

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

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that aquatic, terrestrial, threatened and endangered species, recreation, cultural, and socioeconomic resources may be affected by the proposed action and action alternatives. We have not identified any substantive issues related to land use associated with the proposed action, and therefore, this resource is not addressed in the draft EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.3.1 Aquatic Resources

3.3.1.1 Affected Environment

Water Quantity

Hawks Nest

The Hawks Nest reservoir is 6.9 miles long and has a surface area of 243 acres at a normal pool elevation of 819 feet. The gross storage capacity of the reservoir is 7,323 acre-feet. The project is operated in a run-of-river mode with outflow from the project approximating project inflow with the allowance of minor (0.5 foot) impoundment fluctuations (above or below the target pool elevation of 819 feet) to achieve the seasonal ramping rate (described below) and accommodate load rejections.

Inflows to the Hawks Nest reservoir are highly seasonal. The highest flows occur from late winter through spring (February–April) (table 1) and generally peak in March (figure 4). During the spring high-flow period (February–April), flows often exceed 10,000 cfs (61 percent of the time based on historical flow data). The lowest flows occur from July through October; the overall median flow during this low-flow period is 2,923 cfs. During the low-flow period, flows typically remain above 1,563 cfs (the 90 percent exceedance flow based on historical data); however, in dry (1999) and wet years (2003) the 90 percent exceedance flow can be as low as 1,229 cfs and as high as 4,896 cfs, respectively. The months of May and June represent a transitional period when flows generally decrease, but occasional high-flow events (20,000-60,000 cfs) still occur during these months, especially in wet years (figure 4). During late fall and winter (November–January), flows generally increase, with median monthly flows ranging from 4,057 to 8,526 cfs (table 1).

The current license requires Hawks Nest Hydro to continuously release, via the dam's trash gate, 100 cfs to the bypassed reach year-round. The maximum hydraulic capacity of the project is 10,000 cfs; therefore, when project inflows exceed 10,100 cfs, excess water is released through the spillway gates into the bypassed reach, which is expected to occur 29 percent of the time each year, mainly in spring and winter, based on historical flow data. To ensure the protection of downstream public safety and aquatic resources, the current license requires the licensee to maintain a ramping rate not to exceed 1 foot-per-hour (as measured at Cotton Hill gage 380649081083301) when releasing flows into the bypassed reach from March through October when project

inflows are less than 12,600 cfs and flows in the bypassed reach are equal to or less than 2,600 cfs.[21]

The only consumptive use of project waters is a raw water intake for public water supply. As authorized by the Commission in 1999,[22] the West Virginia-American Water Company operates this intake and associated pump station that has the capacity to withdraw up to 4 million gallons per day from the Hawks Nest reservoir and deliver this water to the New River Water Treatment Plant in Fayetteville, West Virginia (West Virginia American Water, 2016).

Table 1. Historical hydrologic data (1954-2014) for the Hawks Nest reservoir. A USGS gage (no. 03193000) is located near Kanawha Falls on the Kanawha River, 2 miles downstream of the confluence of the New and Gauley rivers. Inflows to the Hawks Nest reservoir were calculated by subtracting daily flows in the Gauley River (measured at USGS gage 03192000, 6.7 miles upstream of the confluence with the New River) from those measured at the Kanawha gage and adjusting for the difference in drainage area between the Hawks Nest dam and Kanawha gage (Source: staff).

	Flow, cfs				
Month	**Minimum**	**90% exceedance**	**Median**	**10% exceedance**	**Maximum**
January	1,290	3,130	8,526	25,186	92,022
February	1,705	4,801	10,898	30,709	89,474
March	2,456	6,458	13,524	40,572	91,336
April	2,822	5,748	11,295	28,325	88,984
May	2,180	4,423	8,700	22,537	68,394
June	1,323	2,564	5,042	13,833	65,366
July	892	2,052	3,681	7,314	63,210
August	806	1,610	2,954	7,066	45,276
September	784	1,453	2,380	6,047	53,900
October	735	1,464	2,723	9,114	66,738
November	1,147	1,895	4,057	14,051	73,304
December	1,295	2,399	6,860	20,972	72,422
Annual	735	2,009	5,841	20,296	92,022

[21] *Elkem Metals Co.*, 52 FERC ¶ 62,244 (1990).

[22] *Elkem Metals Co.*, 88 FERC ¶ 62,192 (1999).

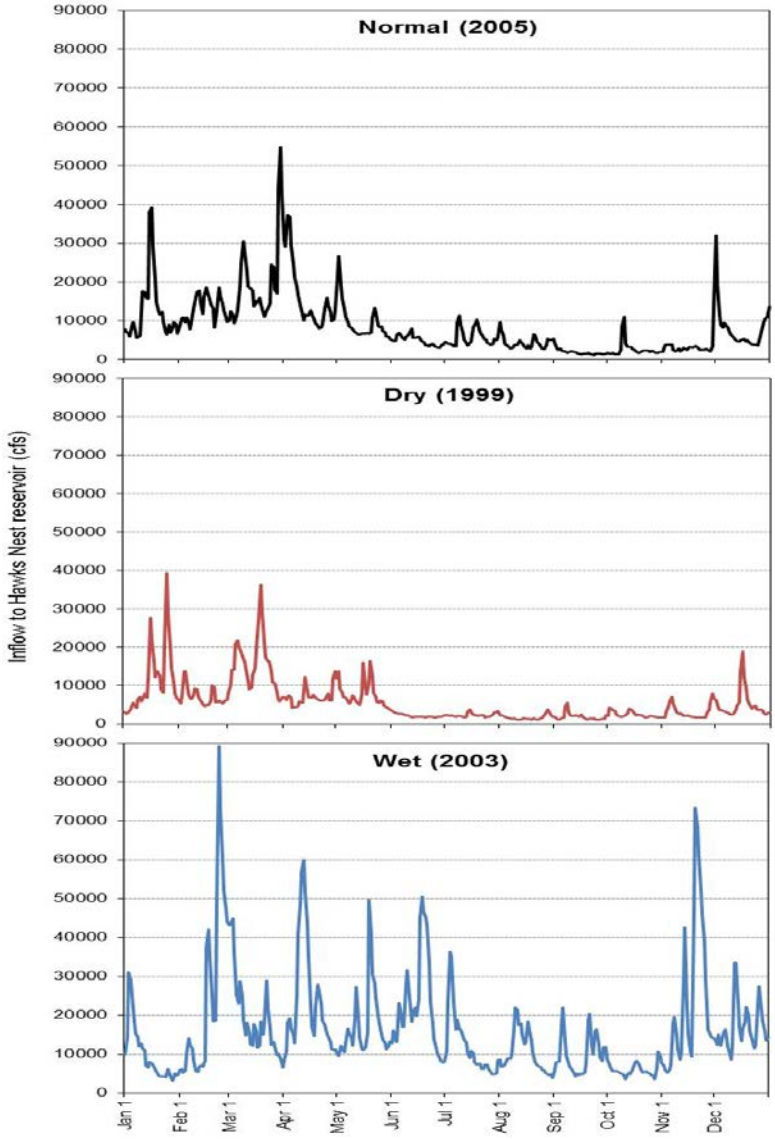

Figure 4. Annual hydrographs of inflow to the Hawks Nest reservoir during representative normal (2005), dry (1999), and wet (2003) years (Source: staff).

Glen Ferris

The Glen Ferris reservoir is 1.9 miles long and has a surface area of 190 acres at the normal maximum surface elevation of 651 feet which is the crest elevation of the dam. The gross storage capacity of the reservoir at the normal maximum surface elevation is 1,500 acre-feet. However, the project has no usable storage capacity as the project is operated in a run-of-river mode with outflow from the project approximating project inflow. In contrast to the Hawks Nest Project, the Glen Ferris spillway is an uncontrolled overflow structure and there is no bypassed reach as the two powerhouses (east and west) are integral with the dam.

Due to their proximity—the Glen Ferris reservoir is less than 8 miles downstream of the Hawks Nest dam—the seasonal flow dynamics at the two projects are similar. Inflows into the Glen Ferris reservoir (table 2) are slightly higher than those at Hawks Nest because of the additional input from the Gauley River. The maximum hydraulic capacity of the Glen Ferris Project is 3,108 cfs. There are no consumptive uses of project waters.

Table 2. Historical hydrologic data (1954-2014) for the Glen Ferris reservoir. Inflows to the Glen Ferris reservoir were considered the same as those measured at USGS gage 03193000 on the Kanawha River because no tributaries enter the river along this 2 mile stretch between the Glen Ferris dam and the USGS gage (Source: staff).

	Flow, cfs				
Month	**Minimum**	**90% exceedance**	**Median**	**10% exceedance**	**Maximum**
January	1,700	4,361	11,400	34,680	111,000
February	1,830	6,454	14,500	40,180	108,000
March	3,240	8,620	17,900	50,000	114,000
April	3,520	6,988	14,000	35,460	106,000
May	2,590	5,349	11,100	30,530	87,900
June	1,800	3,130	6,220	17,920	82,800
July	1,000	2,480	4,560	10,500	89,400
August	1,260	2,110	3,670	10,000	66,400
September	1,030	1,979	3,415	8,512	67,200
October	1,130	2,100	4,080	12,200	86,100
November	1,410	2,588	6,700	20,320	93,700
December	1,510	3,520	9,900	28,900	94,900
Annual	1,000	2,690	7,800	27,130	114,000

Water Quality

Water Quality Standards

The West Virginia DEP (Department of Environmental Protection) implements water quality standards to protect human and aquatic health throughout state waters. Project waters support multiple designated uses including: (1) Category B1-propagation and maintenance of fish and other aquatic life in warm water fishery streams, (2) Category C-water contact recreation, and (3) Category A-public water supply. Categories B1 and C apply to all waters of the Hawks Nest and Glen Ferris projects, whereas Category A applies only to the Hawks Nest reservoir (West Virginia DEP, 2016). Table 3 summarizes applicable water quality criteria for each of the designated use categories.

Table 3. Water quality criteria for project waters. A 'Y' indicates designated uses for which water criteria apply, and a dash indicates those uses for which criteria are not applicable (Source: West Virginia DEP, 2016).

Parameter	Designated Use			
	Aquatic Life (B1)		Human Health	
	Acute	Chronic	C	A
Dissolved oxygen: not less than 5 milligrams per liter (mg/L) at any time	Y	Y	Y	Y
Temperature: not to exceed 87°F during May–November or 73°F during December–April	Y	Y	-	-
pH: no values below 6.0 or above 9.0. Higher values due to photosynthetic activity may be tolerated.	Y	Y	Y	Y
Ammonia, not to exceed (mg/L):	5.6	1.2	-	-
Nitrate, not to exceed (mg/L):	-	-	-	10
Total Phosphorous, not to exceed (microgram/liter):	40	40	40	-

Hawks Nest

Reservoir—Minimal stratification occurs in the Hawks Nest reservoir under current project operating conditions. Continuous monitoring data[23] from temperature loggers placed at 4-foot depth intervals in the forebay indicated surface waters were generally 2 to 4°F warmer than bottom waters (40 feet) during the summer of 2012, which was a warm, low-flow year (median project inflow of 2,787 cfs) compared to the cooler, high-flow summer of 2013 (median inflow of 8,580 cfs), when water column temperatures were vertically homogenous. With one exception (July 10, 2012), surface waters of the reservoir remained below the state's maximum temperature threshold of 87°F during 2012 and 2013.

As expected in a reservoir exhibiting minimal density stratification, dissolved oxygen (DO) values were also fairly homogenous with depth. Nine days of continuous

[23] Unless otherwise noted, all water quality data reported herein are from the water quality study conducted by HDR during the summers (June–September) of 2012 and 2013. The final study report was filed with the Commission on December 29, 2015.

monitoring (September 14–23, 2012) indicated that DO values were very similar (differences less than 0.5 mg/L) at depths of 10 and 38 feet in the forebay; furthermore, that DO levels were well above the state standard as they ranged from 7.8 to 9.5 mg/L. Monthly grab samples (vertical profiles) collected during the summers of 2012 and 2013 also indicate reservoir DO levels exceed state standards as values ranged from 6.5 to 10.6 mg/L.

Other water quality parameters such as pH and nutrient levels were measured in the reservoir and met state standards. Based on summer grab samples in the reservoir, pH ranged from 7.5 to 8.4 and concentrations of ammonia and total phosphorous were below laboratory detection limits of 0.1 and 0.05 mg/L, respectively. Nitrate concentrations in the reservoir ranged from 0.51 to 0.75 mg/L (nutrients were only measured in 2013).

Bypassed Reach—The Hawks Nest bypassed reach experiences large daily fluctuations in water temperature due to its shallow depth under the current minimum flow of 100 cfs. Temperatures in the bypassed reach were continuously monitored during the summers of 2012 and 2013. The warmest air temperatures across years occurred in early July 2012; during this period, water temperatures fluctuated as much as 7°F on a daily basis and exceeded the state threshold of 87°F on five afternoons during July 4–10 (figure 5). Increased spill to the bypassed reach, in excess of 100 cfs, appeared to moderate daily temperature fluctuations to some degree. For example, during spills of 1,500 to 2,000 cfs (which increased water depths at Cotton Hill from 3.5 to 6.5 feet), daily temperature fluctuations were limited to 2-3°F (e.g., July 1–3, July 5, July 9) compared to days when only 100 cfs was released to the bypassed reach and larger fluctuations (up to 7°F) and temperature exceedances occurred (figure 5). There were no exceedances of state temperature standards during the much cooler summer of 2013 as water temperatures remained below 83°F.

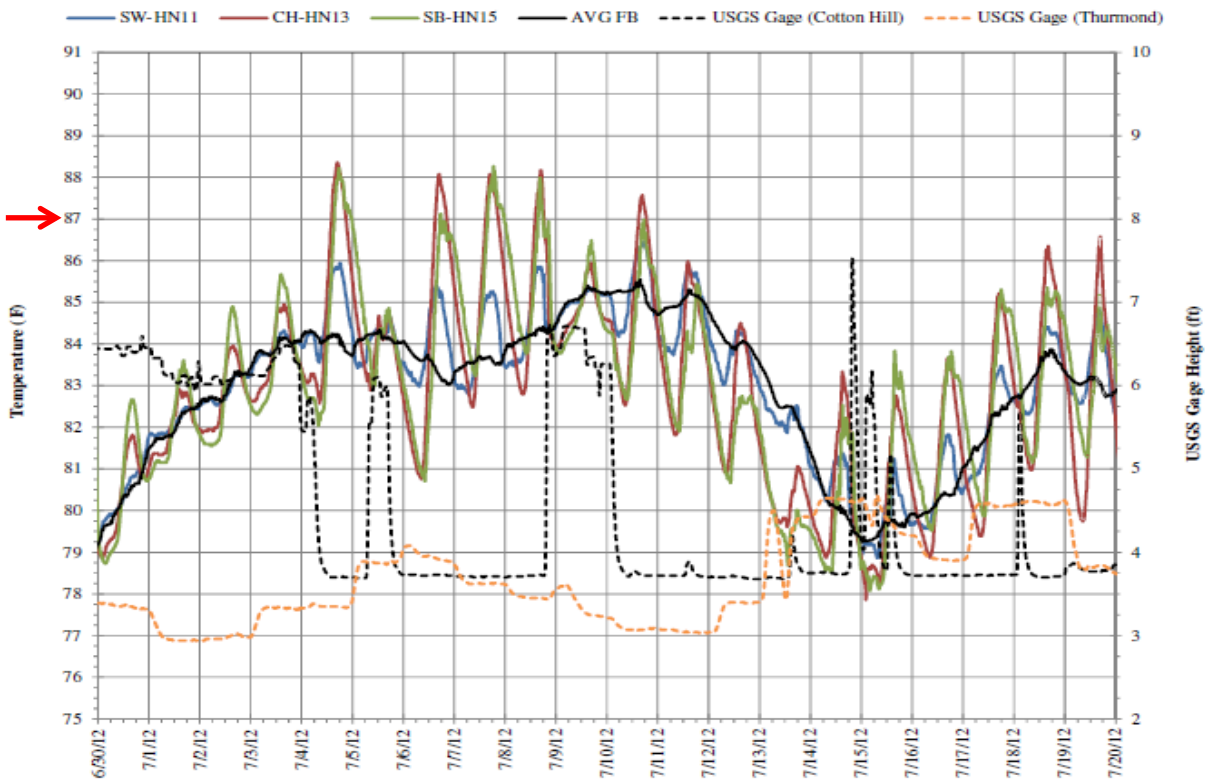

Figure 5. Continuous temperature data from the Hawks Nest bypassed reach during July 2012. The solid lines represent temperatures measured at the following sites: Cotton Hill (red), surge basin (green), and the spillway (blue). The red arrow on the left y-axis denotes West Virginia DEP's maximum summer temperature threshold of 87ºF. The USGS Thurmond gage is approximately 20 miles upstream of the dam; Avg FB=depth-averaged temperature in the Hawks Nest forebay (Source: license application, as modified by staff).

Continuous monitoring data (September 14-23, 2012) and monthly grab samples during the summers of 2012 and 2013 demonstrated that DO and pH in the bypassed reach met state water quality standards. Specifically, DO ranged from 6.0 to 12.7 mg/L and pH ranged from 6.6 to 9.4 across all sampling efforts in the bypassed reach. There was a strong diel trend in DO saturation values indicative of biological activity (photosynthesis and respiration) in the shallow pools of the bypassed reach, which were supersaturated during the day (up to 150 percent) but dropped to 80 percent saturation overnight. During four evenings (September 14-17), pH values exceeded 9.0; however, these exceedances were clearly associated with photosynethic activity (which increases pH throughout the day due to CO_2 consumption) and therefore did not violate state water quality standards (see table 3).

Total dissolved gas (TDG) concentrations were measured in the toe pool below the dam during two controlled releases of 480 and 900 cfs during August 27–30, 2013. During these spill events, TDGs remained below 101 percent, providing evidence that TDGs do not exceed 110 percent saturation[24] when less than 900 cfs is spilled into the bypassed reach.

Tailrace—Water temperatures in the forebay (depth-averaged) were very similar to those measured in the tailrace during both 2012 and 2013, indicating there is essentially no change in temperature as water travels down the 3-mile tunnel and is discharged from the powerhouse. Monitoring of other water quality parameters in the tailrace indicated compliance with state standards as DO ranged from 7.8 to 9.0 mg/L and pH ranged from 7.2 to 9.5 (with pH values above 9 attributed to photosynthetic activity as described above).

Glen Ferris

Although no site-specific water quality data are available for the Glen Ferris Project (there were no study requests made for water quality monitoring at this site), existing data from nearby waters and the configuration and operation of the project suggest there are no water quality issues. The water entering the Glen Ferris reservoir is derived from the New and Gauley rivers, as the project dam is less than 2 miles downstream from the confluence of these rivers. As described above, data from the tailwaters of the Hawks Nest Project (lower New River) met state water quality standards. Furthermore, long-term monitoring data collected in the lower Gauley River (at river mile 8.25) during bi-monthly, year-round sampling by West Virginia DEP, shows these waters comply with state standards as: (1) measured water temperatures did not exceed 84ºF, (2) DO values were above 6.8, and (3) pH values ranged from 6.0 to 8.2 across a 10-year period from 2002 to 2012 (ICPRB, 2015). Given the source waters entering the Glen Ferris Project meet state standards and are unlikely to be modified by stratification processes due to the shallow depth of the Glen Ferris reservoir (less than 12 feet deep), waters upstream of the Glen Ferris dam are likely in compliance with state water quality standards. Also, because the project is operated in run-of-river mode and the dam is an uncontrolled spillway with project inflows exceeding the maximum hydraulic capacity 85 percent of the time in a typical year, waters downstream of the dam likely exhibit water quality characteristics very similar to waters upstream of the project and are therefore also likely in compliance with state water quality standards.

[24] West Virginia has no standard for TDG; however, the states of Washington and Oregon have established a water quality standard of 110 percent saturation for TDG. It is known that TDG levels above 110 percent saturation can cause gas bubble trauma in fish by blocking the flow of blood and respiratory gas exchange.

Fisheries

Habitat

Aquatic habitat at the projects can be broadly categorized as: (1) lentic reservoir habitats, (2) lotic tailwaters, and (3) a relatively shallow bypassed reach (Hawks Nest only). Various habitat types and substrates are present within each of these general habitat categories.

Due to the steep banks of the river valley, the littoral zone along the Hawks Nest and Glen Ferris reservoirs is fairly narrow, but still contains the greatest habitat complexity within the reservoirs. Both reservoirs contain submerged and emergent vegetation (e.g., water willow) and limited woody debris, although there is more shoreline development along the Glen Ferris reservoir in the form of bank stabilization, areas of fill, and homes and businesses.

The Hawks Nest bypassed reach is approximately 5.5 miles long and extends from the Hawks Nest dam to the project powerhouse. At the existing minimum flow of 100 cfs, the wetted width of the bypassed reach ranges from 100 to 220 feet. The bypassed reach has relatively long individual pools that are separated by shorter habitat segments such as runs, shoals, and cascades. Based on habitat mapping conducted by the applicant in August 2011 (at the 100-cfs minimum flow), pools are the most common habitat type as 45.8 percent of the bypassed reach is composed of deep pools (greater than 8 feet deep) and 21.2 percent consists of shallow pools (less than 8 feet deep) (Hawks Nest Hydro, 2012). Shoals, cascades, and runs comprise 12.5 percent, 11.4 percent, and 9.1 percent of the total length of the bypassed reach, respectively. The substrate in pool habitats is varied and consists of submerged bedrock shelves, large boulders, cobble, and pockets of smaller sized substrates including gravel and sand. Shoals are the widest habitat type, often include riffles, and exhibit a mix of substrate types including large exposed boulders as well as cobble, sand, and gravel. Cascades are shallow, fast-flowing habitats with stacked boulders or steep bedrock slabs as substrate. Runs are the narrowest habitat type and are fairly uniform in depth.

Tailwaters at the projects consist of moderately deep (13 to 40 feet) pools that often have swift and turbulent flows, due in part to powerhouse discharges. The Hawks Nest tailrace contains large boulder outcrops. The Glen Ferris tailrace has a rip-rap shoreline and rocky substrate. Kanawha Falls abuts the east powerhouse at Glen Ferris, and the flow over the falls joins with the powerhouse discharge to create various flowing habitats, breaklines, and large eddies (Hawks Nest Hydro, 2015). The 24-foot-high Kanawha Falls serves as a natural impediment to fish movement and constitutes a well-known taxonomic break, below which (Kanawha-Ohio River system) aquatic

communities differ in composition from those above the falls in the New River system (including the Gauley River and its tributaries) (Stauffer et al., 1995).

Fish communities

A total of 64 fish species was collected in the project areas (reservoirs, tailraces, and the Hawks Nest bypassed reach) during electrofishing and gill net surveys conducted during the summer of 2013 (HDR, 2015a). Centrarchids (smallmouth bass, rock bass, various sunfish species) and cyprinids (mimic shiner, whitetail shiner) dominate this warmwater assemblage; however, there are some differences in species composition among habitats (lentic versus lotic) and sampling location (upstream versus downstream of Kanawha Falls). In particular, numerous darter species (variegate, Roanoke, sharpnose, greenside, and rainbow) and central stoneroller were only found in the bypassed reach, which contains the shallow fast-moving waters and substrates these species prefer. Furthermore, some species were either much more common (gizzard shad) or only collected downstream of the Glen Ferris dam and Kanawha Falls (freshwater drum, river redhorse, smallmouth buffalo, longnose gar, and seven other species) (HDR, 2015a). Several game species are common at both projects (reservoirs, tailraces, and the bypassed reach) including self-sustaining populations of smallmouth bass, channel catfish, and rock bass. The West Virginia DNR currently stocks walleye, muskellunge, blue catfish, paddlefish, and shovelnose sturgeon downstream of Kanawha Falls.

The New River supports an exceptional smallmouth bass fishery. Smallmouth bass are the most sought after sportfish in the New River (Copeland et al., 2006) and Bassmaster Magazine recently ranked the New River as one of the top five smallmouth bass rivers in the country (Bassmaster, 2009). Based on electrofishing surveys, smallmouth bass had the highest catch-per-unit effort (CPUE) of any game fish in the Hawks Nest tailrace, Glen Ferris reservoir, and Glen Ferris tailrace; in other areas, smallmouth bass ranked either second (Hawks Nest bypassed reach, Kanawha Falls) or third (Hawks Nest reservoir) in relative abundance, behind rock bass and bluegill (above Kanawha Falls) and freshwater drum (below Kanawha Falls). In addition to their abundance, the broad size distribution of smallmouth bass provides evidence of a healthy fishery as young-of-the-year (YOY) fish were present in all sampled areas, indicative of recent and successful spawning, and fish as large as 18.5 inches (nearing the trophy size of 20 inches) were also sampled. The New River is known for trophy fish and the West Virginia state record for smallmouth bass (length) comes from the New River. Although walleye are a popular sportfish in other parts of the New River (primarily the upper New River, Palmer et al., 2005), only one walleye was captured during the 2013 field surveys, as compared to 338 smallmouth bass, which constitute the most important fishery in the vicinity of the projects.

There are no recent records of the occurrence of diadromous fishes in the project areas (Hawks Nest or Glen Ferris). The American eel is native to the New River drainage, but is currently considered very rare in the basin as the presence of dams on the Ohio, Kanawha, and New rivers likely limits its distribution to areas of considerable distance downstream of the projects. There are no existing management or restoration plans for American eel in the New River. Although one alewife was collected during the 2013 fisheries surveys (in the Hawks Nest Reservoir), alewife populations in the lower New River are non-anadromous and emanate from historical stocking downstream of Claytor dam (Jenkins and Burkhead, 1993).

No federally listed fish species have been documented to occur in the project areas. Pallid sturgeon, *Scaphirhynchus albus*, is a federally endangered species that is found only in portions of the Missouri and Mississippi River basins (FWS, 2010). Due to their similarity in appearance to pallid sturgeon, shovelnose sturgeon (*Scaphirhynchus platorynchus*) has been listed as federally threatened and granted take prohibitions in waters where they are fished and commonly coexist with pallid sturgeon (FWS, 2010). Therefore, although two shovelnose sturgeon were captured downstream of Kanawha Falls in 2013, shovelnose sturgeon is not federally listed in the New and Kanawha River basins because the endangered pallid sturgeon is not found in these systems. The West Virginia DNR stocks shovelnose sturgeon, as well as paddlefish (*Polyodon spathula*, a federal species of concern), in the Kanawha River as part of efforts to restore these species to their historical ranges in West Virginia.

Only one New River endemic, the bigmouth chub, has been documented to occur in the project areas (EA Engineering, 1986; Kleinschmidt, 1990; HDR, 2015a). Despite being an endemic, the bigmouth chub is widespread throughout the New River (Jenkins and Burkhead, 1993) and can be locally abundant (Stauffer et al., 1995). Bigmouth chub is not considered as a Species of Greatest Conservation Need (SGCN) in West Virginia, a list that contains 74 fish species, of which 34 are Priority 1 species (West Virginia DNR, 2015a).

Eastern Hellbender

The eastern hellbender, *Cryptobranchus a. alleganiensis*, is a species of federal concern and listed as a Priority 1 SGCN imperiled species in the state of West Virginia (West Virginia DNR, 2015a). The range of eastern hellbender is fairly extensive and includes the New and Kanawha rivers and their tributaries (Nickerson and Mays, 1973). However, despite their potential to occur in the project areas, surveys targeting hellbender during the summer of 2013 found no evidence of this species (no live specimens or burrows observed) in the littoral zones of project reservoirs or the Hawks Nest bypassed reach.

Freshwater Mussels

Mussel diversity is higher in the Kanawha River (38 reported species) than the New River (10 species) (Jirka and Neves, undated), and the results from recent surveys in the project areas reflected this trend. During qualitative sampling conducted throughout the Hawks Nest bypassed reach in September 2013, only two live mussels were found, one purple wartyback (*Cyclonaias tuberculata*) and one mucket (*Actinonaias ligamentina*). No mussels were found at the five sites sampled in the littoral zone of the Hawks Nest reservoir. Of the 190 live mussels found across seven sites in the Glen Ferris reservoir, all but six mussels were from a single site that contained a mussel bed containing five different species including spike (*Elliptio dilatata*), pocketbook (*Lampsilis ovata*), and pistolgrip (*Quadrula verrucosa*), in addition to the two species listed above for the Hawks Nest reservoir (Alderman Environmental Services Inc., 2013). This mussel bed also contained fresh shells of the green floater (*Lasmigona subviridis*). Although these six mussel species found upstream of the Glen Ferris dam are listed as SGCN by the state of West Virginia, none are federally listed. Meanwhile, surveys conducted by West Virginia DNR immediately downstream of the Glen Ferris dam indicated a diverse mussel fauna that includes several federally listed species. Specifically, a large and dense mussel bed was located immediately downstream (at the base) of Kanawha Falls that contained 28 mussel species, two of which (pink mucket, *Lampsilis abrupta* and sheepnose, *Plethobasus cyphyus*) are federally endangered (Clayton, 2006; Brookfield Renewable Power, 2009). West Virginia DNR established this location as a long-term monitoring site in 2005 and since then has tagged over 4,000 mussels from this bed. In addition, two federally endangered species, the fanshell (*Cyprogenia stegaria*) and northern riffleshell (*Epioblasma t. rangiana*), are stocked at this site by West Virginia DNR for population augmentation purposes. Snuffbox (*Epioblasma triquetra*) and spectaclecase (*Cumberlandia monodonta*) are other federally endangered mussel species known to occur in the upper Kanawha River (i.e., from Kanawha Falls 16.7 miles downstream to the London locks and dam). The tubercled-blossom pearly mussel (*Epioblasma t. torulosa*) was historically known to occur in this area, but is now thought to be extirpated.

3.3.1.2 Environmental Effects

Mode of Operation

The operation of hydropower projects in a run-of-river mode, whereby inflow to a project impoundment equals the outflow from tailwaters, generally provides more stable upstream and downstream environments than other modes of operation. For example, compared to peaking and storage projects, run-of-river operation minimizes the degree of water level fluctuations and associated scour as well as temperature fluctuations in the surface waters of impoundments (due to shorter water residence times).

Hawks Nest Hydro proposes to continue to operate both the Hawks Nest and Glen Ferris projects in a run-of-river mode with minimal reservoir surface fluctuations by maintaining a total project discharge that approximates inflow. Run-of-river operation was also recommended by Interior in its 10(j) letter filed with the Commission on June 3, 2016.

Staff Analysis

Water quality monitoring in the Hawks Nest and Glen Ferris reservoirs and tailraces, conducted under existing run-of-river operations at each project, indicated water quality conditions were generally good in these areas. With the exception of one afternoon (on which maximum temperatures in the Hawks Nest reservoir exceeded 87°F), there were no instances where water temperatures exceeded those specified by state standards in the reservoir or tailrace of either project (as described above in section 3.3.1.1, *Aquatic Resources, Affected Environment- Water Quality*). Therefore, continuing to operate the projects in a run-of-river mode would not negatively affect water quality, even when flows are very low.

Maintaining run-of-river operation, with minimal fluctuations of reservoir surface waters, would reduce the potential for fish stranding and also minimize water level and flow disruption to any spawning and rearing habitat that might exist in the project reservoirs or tailraces. Maintaining relatively stable reservoir levels would also benefit fish and other aquatic organisms that rely on littoral habitat for feeding, spawning, and cover. By operating the projects in a run-of-river mode, habitat in the project reservoirs and tailwaters would be unchanged compared to current conditions.

Ramping Rate at the Hawks Nest Project

Ramping rate is the rate at which water levels rise or fall in association with the release of water through a water control structure. For example, the spillway gates of a dam may be raised or lowered in a specific manner to achieve a target ramping rate (e.g., less than 1 foot-per-hour) during the passage of high flows associated with a heavy rain event. From an environmental perspective, ramping rates are implemented to protect aquatic organisms from rapid changes in water levels. The early life history stages of fishes are particularly susceptible to rapid changes in water levels and flows because of their relatively poor swimming ability. A sudden increase in flows can flush fry or early-stage juveniles downstream and reduce their chances of survival, whereby a sudden decrease in water levels can lead to stranding of early life stages.

Hawks Nest Hydro currently implements a seasonal (March-October) ramping rate at the Hawks Nest Project. When inflows exceed the project's maximum hydraulic capacity (10,000 cfs), excess flow is spilled into the bypassed reach via the spillway gates. During these spill events, the licensee operates the spillway gates to ensure that

water levels in the bypassed reach do not rise (up-ramping) or fall (down-ramping) by more than 1 foot-per-hour. This ramping rate only applies when reservoir inflows are less than 12,600 cfs and flows in the bypassed reach are equal to or less than 2,600 cfs; at higher flows, it is more difficult to achieve the target ramping rate without posing a threat to dam safety as the dam could be overtopped given the limited storage capacity of the Hawks Nest reservoir (Elkem Metals Company, 1989). The licensee proposes to continue to implement the existing seasonal ramping rate, which was approved by the Commission in 1990.

AW recommends the current ramping rate of 1 foot-per-hour be extended to year-round and for down-ramping to commence at higher flows in the bypassed reach—flows less than 8,000 cfs from January through May and less than 5,000 cfs from June through December. In addition, AW recommends that ramping rate restrictions apply to down-ramping only and not up-ramping (i.e., they do not recommend any up-ramping as currently exists). AW argues that because a portion of the bypassed reach remains unwetted at flows above 2,600 cfs, that extending the ramping rate to higher flows would reduce fish stranding as water levels would be lowered more gradually as flows in the bypassed reach recede from 8,000 to 2,600 cfs. The applicant did not reply to AW's ramping rate recommendation. Nor have we received any comments from federal or state fish and wildlife agencies concerning fish stranding in the project area.

Staff Analysis

Most fishes that are present at the Hawks Nest Project spawn in the spring or early summer (March through June). Therefore, by the time the existing (seasonal) ramping rate ends (November 1), YOY fishes would have completed their first season of growth and possess increased swimming abilities (compared to early life stages), which would allow them to more easily escape from habitats in which water levels rapidly drop. Moreover, AW's ramping rate proposal affords no protection from sudden increases in flow in the bypassed reach. For example, under AW's proposal, when the project starts to spill, flows in the bypassed reach could rise rapidly (at an uncontrolled rate) from the minimum flow up to 2,600 cfs, which could flush emergent fry downstream. Meanwhile, the applicant's proposal *does* provide an up-ramping restriction (not to exceed 1 foot-per-hour for flows up to 2,600 cfs) during March through October. Thus, AW's ramping rate proposal would not afford more protection to aquatic resources in the bypassed reach relative to existing conditions, whereby the licensee implements restrictions for both up-ramping and down-ramping during the time of the year in which sensitive early life history stages are most prevalent (spring and summer).

The hydraulic modeling conducted by the applicant demonstrates that only a small portion of the bypassed reach (less than 20 percent) remains unwetted at flows of 2,600 cfs (HDR, 2015b). Given the limited extent of this area, expanding the down-ramping

rate to higher flows of 5,000 or 8,000 cfs, as proposed by AW, would provide little, if any, reduction in fish stranding in the bypassed reach.

Effects of Project Operation on Water Quality in the Hawks Nest Bypassed Reach

With the exception of occasional temperature exceedances in the Hawks Nest bypassed reach during the summer of 2012, monitoring data indicated there were no instances where water quality parameters did not meet those specified by state standards at either project (Hawks Nest or Glen Ferris). Nor did we receive any substantive comments or concerns from stakeholders regarding water quality in response to our REA notice. The summer of 2012 was exceptionally hot compared to 2013, which was an average summer in terms of air temperatures. National Weather service records dating back to 1895[25] show the spring and summer of 2012 are the hottest on record for the state of West Virginia; based on long-term water quality monitoring by the West Virginia DEP from 1976 to 2012, the highest water temperatures in the lower New River, just below the Hawks Nest powerhouse, were observed in 2012 (ICPRB, 2015). Accordingly, 2012 could be considered a 'worst-case' scenario for temperature exceedances in the bypassed reach, especially under any of the proposed minimum flow alternatives (described below), which would increase minimum flows in the bypassed reach (during July–October) from the current 100 cfs to 150 to 476 cfs. Under these higher minimum flows, water depths would increase as much as 1.5 feet (based on the rating curve developed for Cotton Hill) and water residence times would decrease, which should reduce the magnitude of daily temperature fluctuations and frequency of temperature exceedances in the bypassed reach.

Minimum Flow in the Hawks Nest Bypassed Reach

At some hydropower projects, water is diverted around the natural (main) river channel before entering the powerhouse (e.g., through a penstock). At projects with these configurations, such as the Hawks Nest Project, the section of the main river channel between the dam and the powerhouse is referred to as the bypassed reach.

Hawks Nest Hydro currently provides a continuous minimum flow of 100 cfs to the Hawks Nest bypassed reach to promote habitat connectivity and reduce the formation of isolated pools in the bypassed reach, which were found to be most prevalent at very low flows (25 cfs) and exhibited extreme temperature fluctuations under such

[25] https://www.ncdc.noaa.gov/sotc/national/2012/13/supplemental/page-3/#WV

conditions.[26] Hawks Nest Hydro proposes to release additional flow into the bypassed reach, but only when reservoir inflows exceed 1,700 cfs, as this would allow the first 1,600 cfs of flow to be reserved for project generation in support of the alloy plant, while still maintaining the baseline 100 cfs continuous minimum flow. Specifically, when reservoir inflows exceed 1,700 cfs, the applicant would release an additional 50 cfs from July through February, an additional 200 cfs during March and April, and an additional 150 cfs during May and June (table 4). Based on historical hydrology data (see section 3.3.1.1, *Aquatic Resources, Affected Environment- Water Quantity*), these additional flows would be readily available during high-flow months (e.g., 98 to 100 percent of the time from December through April), but not as often during the low-flow period (e.g., 76 and 77 percent of the time in September and October, respectively) (table 5).

[26] Environmental Assessment, Hawks Nest-Glen Ferris Hydroelectric Project, FERC No. 2512. Issued on December 3, 1987.

Table 4. Minimum flow (cfs) recommendations that were proposed and analyzed for the Hawks Nest bypassed reach. All minimum flow proposals and recommendations in the table below include the initial 100 cfs that is provided to the bypassed reach under existing baseline conditions. Beyond this baseline 100 cfs, the first priority for project inflows would be project generation (1,600 cfs) in support of the alloy plant. Once reservoir inflows exceed 1,700 cfs, water would then start being released into the bypassed reach (up to the values listed in the table below). For example, if reservoir inflows were 5,000 cfs during June, then, under the applicant's proposal: (1) the first 100 cfs would be released into the bypassed reach, (2) the next 1,600 cfs would be used for project generation, (3) an additional 150 cfs would be released into the bypassed reach, and (4) 3,150 cfs would remain for further generation. (Source: staff).

Month	Baseline (existing)	Applicant proposed	Interior 10(j) recommended	Interior 10(j) minimally acceptable	AW &WVPRO recommended
Jan	100	150	1,250	700	150
Feb	100	150	1,497	800	150
Mar	100	300	1,870	1,100	300
Apr	100	300	1,525	1,000	300
May	100	250	1,201	800	250
Jun	100	250	742	500	250
Jul	100	150	476	300	150
Aug	100	150	412	300	150
Sep	100	150	367	300	150
Oct	100	150	463	300	150
Nov	100	150	669	400	150
Dec	100	150	1,002	500	150

Table 5. The percent of time each month that proposed minimum flows would be achievable based on historical (1954-2014) hydrology data (inflows into the Hawks Nest reservoir) and operational conditions (i.e., flow allocation to the powerhouse vs. the bypassed reach). The recommended minimum flows would not be available at all times because project inflows would sometimes be too low to provide additional water to the bypassed reach (up to the recommended minimum flow values in table 4) after satisfying the operational criterion that the first 1,600 cfs of flow (beyond the baseline minimum flow of 100 cfs) be used for project generation in support of the alloy plant. (Source: staff).

Month	Baseline (existing)	Applicant proposed	Interior 10(j) recommended	Interior 10(j) minimally acceptable	AW & WVPRO recommended
Jan	100	98.0	92.0	95.0	98.0
Feb	100	99.9	97.8	99.6	99.9
Mar	100	100	99.6	99.9	100
Apr	100	100	99.9	100	100
May	100	100	98.6	99.5	100
Jun	100	97.3	92.8	95.0	97.3
Jul	100	95.7	89.3	93.4	95.7
Aug	100	86.4	78.4	81.8	86.4
Sep	100	76.0	66.7	69.1	76.0
Oct	100	77.7	67.6	72.9	77.7
Nov	100	92.7	81.6	88.0	92.7
Dec	100	98.3	88.2	95.0	98.3

Minimum flow recommendations were filed by the following entities: Interior, AW, and WVPRO (see table 4). Similar to the applicant's proposal, additional flow (beyond the baseline 100 cfs, and up to the recommended minimum flow) would only be released into the bypassed reach when reservoir inflows are greater than 1,700 cfs. Table 5 provides the percent of time each month these recommended minimum flows could be achieved.[27]

WVAM, in its comments on the application, discusses the technical requirements needed to operate the alloy plant, and the potential negative effects (i.e., lower efficiency

[27] We also received minimum flow recommendations for scenarios if the 25-Hz power generated by the Hawks Nest Project were no longer needed by the alloy plant or for an industrial end-use purpose. Because our analysis compares the costs and benefits of recommendations to the baseline, which is the existing condition, we did not include those recommendations in our environmental assessment.

or production, or additional costs) of higher minimum flows or any recreation releases in the bypassed reach on the alloy plant. WVAM states that the plant requires 1,600 cfs to operate two powerhouse turbines at all times in order to maintain stability in the 25-Hz electrical system. It states that the next critical level requires flows greater than 3,200 cfs, which enables the alloy plant to generally operate at full-load using a variable combination of 25-Hz and 60-Hz electricity. At flows between 3,200 cfs and 5,600 cfs, the plant has to switch one or both of the furnaces between 25-Hz and 60-Hz depending on the water flow. WVAM states that it would accept the applicant's proposed minimum flow, although the measure would increase costs for the alloy plant. WVAM opposes the minimum flows recommended by Interior (see section 3.3.6.2, *Socioeconomic Resources, Environmental Effects*, for details of WVAM's comments regarding the alloy plant's operation and its economic concerns).

Staff Analysis

Habitat modeling was conducted to evaluate the relationship between the amount of suitable habitat for select fish species and flow in the bypassed reach. Specifically, the River 2D model was used, which combines a two-dimensional hydraulic model with habitat suitability criteria (HSC) of selected species to simulate how a habitat index (weighted usable area, WUA) changes over a range of flows (18 flows from 100 cfs to 2,000 cfs) (HDR, 2015b). A portion of the upper bypassed reach was modeled (0.44 mile in length, with an area of 91,054 square meter (m^2)) and considered to be representative of the bypassed reach as a whole because the study site contained all habitat types present within the 5.5-mile bypassed reach (see section 3.3.1.1, *Aquatic Resources, Affected Environment- Habitat*). Calibration testing at 914 cfs indicated the hydraulic model performed well as water depths and velocities predicted from the model were in good agreement with field data; specifically, the r-square[28] values for depth and velocity were 0.86 and 0.66, respectively. Substrate and cover at the study site (e.g., a cobble riverbed, with overhead vegetation) were determined during habitat mapping conducted in August 2011 and were considered as a fixed variable (termed the 'channel index') in the habitat model. At each simulated flow, the combined HSC value (i.e., product of the HSCs for water depth, velocity, and the channel index) for a given node[29] within the study site was multiplied by the corresponding area of that node; this was repeated for the entire study

[28] R-square values range from 0 to 1, with a value of 1.0 indicating perfect agreement between modeled and observed data.

[29] A "node" is a sub-unit (or modeled cell) within the much larger study site and has a corresponding area and HSC score.

area (all nodes) to calculate the WUA at each flow for each life stage (fry, juveniles, adults, spawning) of the modeled fish species.

Nine fish species were evaluated in the habitat model. These included: smallmouth bass, rock bass, central stoneroller, northern hog sucker, flathead catfish, walleye, bigmouth chub, greenside darter, and common shiner. For some species (bigmouth chub, greenside darter, central stoneroller, and flathead catfish), regional HSC values (from the Elk, New, and Roanoke rivers) were not available for all life stages; WUAs were not calculated for life stages lacking HSC data. In addition, common shiner was used as a surrogate species for shiners due to the lack of regional HSC values for any of the shiner species collected in the 2013 fisheries surveys.

Although the relationships between WUA and flow were highly variable across both species and life stages, three general trends were observed, whereby: (1) WUAs increased with flow from 100 to 2,000 cfs for all modeled life stages of greenside darter, bigmouth chub, and northern hog sucker, (2) WUAs decreased with increasing flow for modeled life stages of rock bass and flathead catfish, or (3) results were life-stage dependent, with higher flows generally better for spawning (higher WUAs) and lower flows better for fry, juveniles, and adults (at least for walleye, central stoneroller, and common shiner; as smallmouth bass WUAs were generally highest at flows of 300 to 600 cfs across life stages) (figures 6-8).

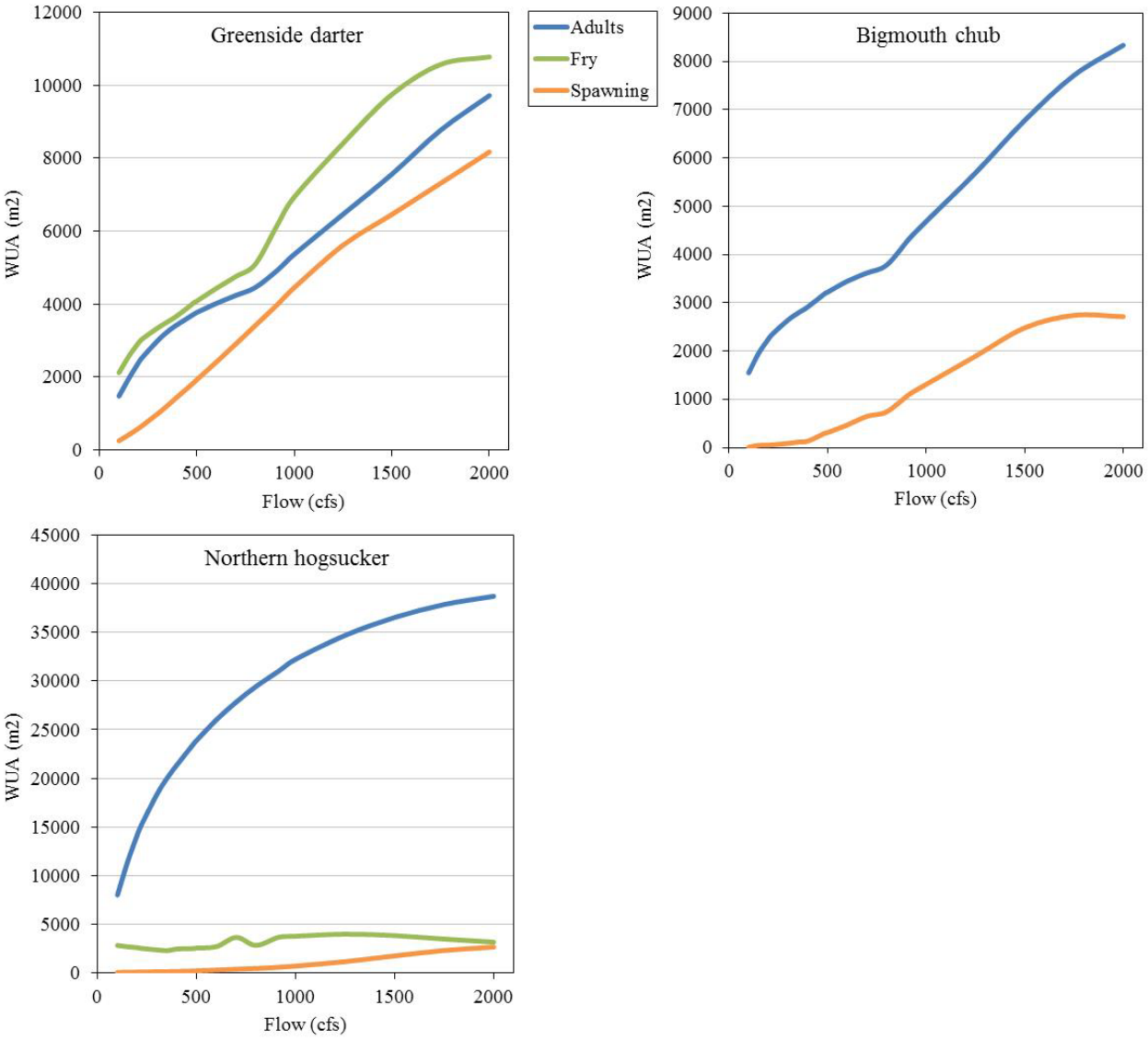

Figure 6. WUA (weighted usable area) plots for species that exhibit a positive relationship between WUA and flow in the Hawks Nest bypassed reach. The total area of the study site is 91,054 m^2 (Source: license application, as modified by staff).

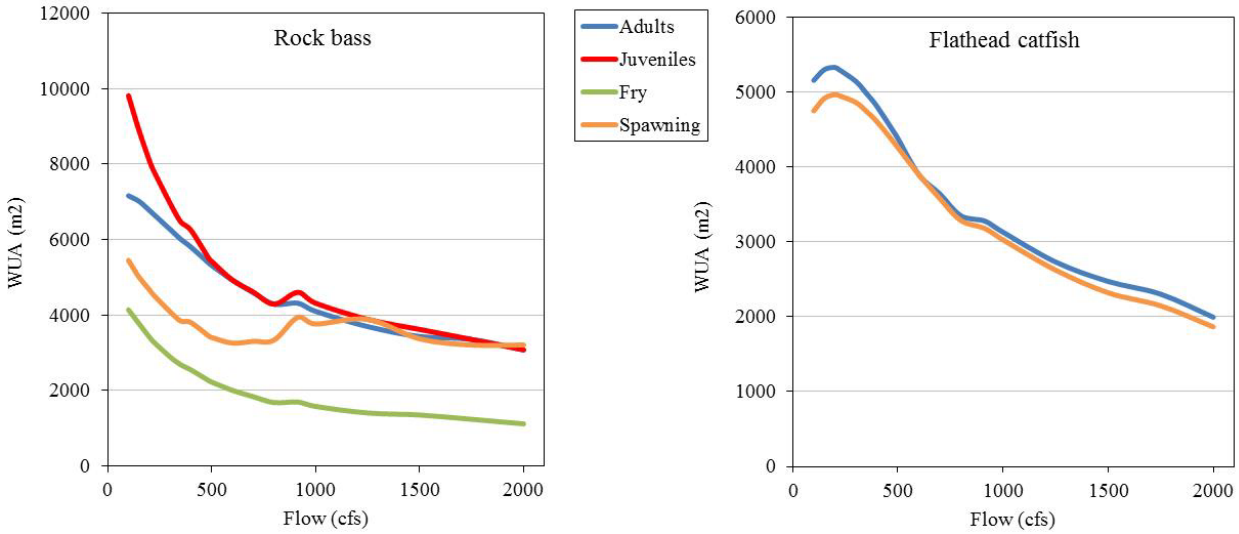

Figure 7. WUA (weighted usable area) plots for species that exhibit a negative relationship between WUA and flow in the Hawks Nest bypassed reach. The total area of the study site is 91,054 m^2 (Source: license application, as modified by staff).

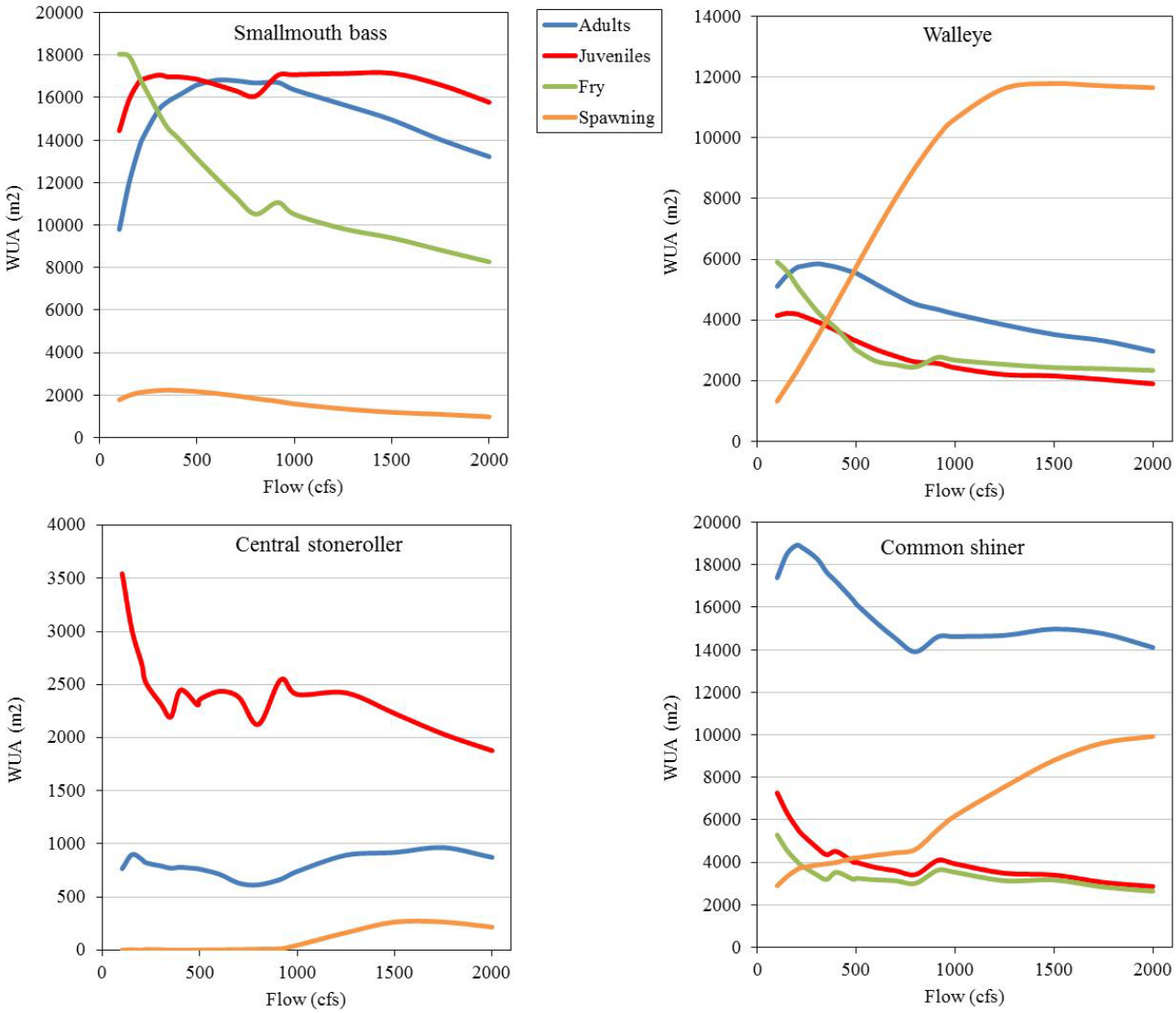

Figure 8. WUA (weighted usable area) plots for species whose habitat vs. flow relationships are life stage dependent. The total area of the study site, located in the Hawks Nest bypassed reach, is 91,054 m^2 (Source: license application, as modified by staff).

The continual increase in WUAs with flow for bigmouth chub (adults, spawning) and greenside darter (fry, adults) is primarily due to the recruitment of side channel habitat that becomes connected to the main channel at flows above 1,000 cfs. This side channel habitat consists of gravel and cobble substrate and is characteristic of the shallow, fast-moving waters these lotic species prefer. When connected to the main channel and accessible to fish, this side channel habitat contains a small amount of suitable spawning habitat (0.4 percent of the total study area) for central stoneroller, which is extremely limited at lower flows (figure 8).

Although habitat connectivity in the bypassed reach increases at flows above 1,000 cfs, the greatest gains in wetted habitat per unit flow occur from 100 to 300 cfs. Specifically, for every one unit increase in flow (i.e., 1 cfs), wetted habitat (or inundated area) increases by 22 to 47 m^2 for flows up to 300 cfs, after which the rate of gain in wetted habitat levels off (15 to 20 m^2 for flows from 300 to 1,000 cfs), then starts to decline above 1,000 cfs (gains of only 6 to 13 m^2 per unit increase in flow) (figure 9).

The largest differences among the proposed minimum flows are for the winter and spring months. Interior's recommended minimum flows for the months of January through May are 950 to 1,570 cfs higher than the applicant's proposed minimum flows (table 4). During the winter and spring, the project frequently spills as reservoir inflows often exceed the project's maximum hydraulic capacity. Under existing operating condition (a continuous minimum flow of 100 cfs), the project spills 41 to 70 percent of the time from January through May (table 6) resulting in flows in the bypassed reach that commonly exceed 1,000 cfs (figure 10). Even under the higher minimum flows recommended by Interior, the project would still spill 36 to 58 percent of the time from January through May. However, during the low-flow period, spilling is infrequent (only around 5 percent of the time from July through October) and is mainly associated with runoff from occasional storm events. Consequently, it is during the low-flow period, when water is most limited, that prescribed minimum flows would have the greatest effect on the amount, and suitability, of aquatic habitat in the bypassed reach. Therefore, we quantified differences in the amount of suitable habitat in the bypassed reach under the various minimum flow alternatives by calculating the change in WUAs under each of the minimum flow alternatives as compared to baseline conditions (100 cfs) for the low-flow period from July through October. Because the low-flow period occurs outside the spawning period for most of the fishes in the project area, we included only adults and juveniles in this analysis.

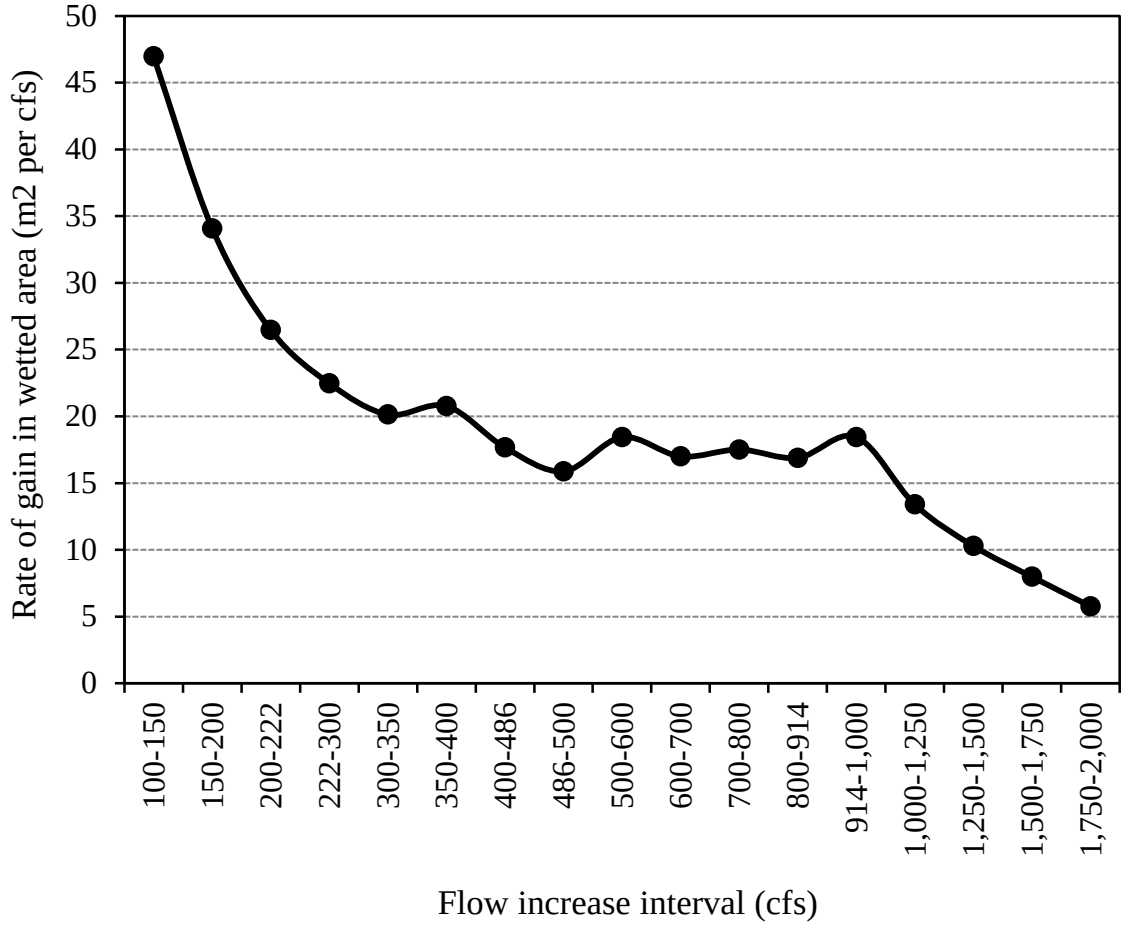

Figure 9. Rate of gain (m^2 per cfs) in wetted (inundated) area in the Hawks Nest bypassed reach for progressive flow increases (x-axis) over the range of modeled flows (100 cfs to 2,000 cfs). For example, as flows increase from 100 cfs to 150 cfs (a 50 cfs increase), an additional 2,348 m^2 of the bypassed reach becomes inundated, corresponding to a rate of 47 m^2 per every 1 unit increase in cfs across this interval (Source: staff).

Table 6. The estimated percent of time each month the Hawks Nest Project would be spilling and releasing more water than the proposed or recommended minimum flows into the bypassed reach under each minimum flow alternative. These calculations were based on historical (1954-2014) reservoir inflows for the Hawks Nest Project and operational considerations (i.e., flow allocation to the powerhouse vs. bypassed reach) for each minimum flow alternative. The maximum hydraulic capacity of the project is 10,000 cfs; therefore, spill would occur once reservoir inflows exceed the sum of the maximum hydraulic capacity and proposed minimum flow (Source: staff).

Month	Baseline (existing)	Applicant proposed	Interior 10(j) recommended	Interior 10(j) minimally acceptable	AW & WVPRO recommended
Jan	40.6	40.6	36.2	38.4	40.6
Feb	54.0	53.6	47.4	50.2	53.6
Mar	69.8	68.3	57.9	62.9	68.3
Apr	57.7	55.6	49.1	51.1	55.6
May	41.2	40.3	35.9	37.5	40.3
Jun	17.2	16.8	15.4	16.1	16.8
Jul	5.6	5.6	5.2	5.3	5.6
Aug	4.6	4.6	4.4	4.4	4.6
Sep	4.8	4.7	4.6	4.6	4.7
Oct	8.6	8.5	8.1	8.3	8.5
Nov	16.8	16.6	15.5	16.0	16.6
Dec	32.6	32.5	29.1	31.2	32.5

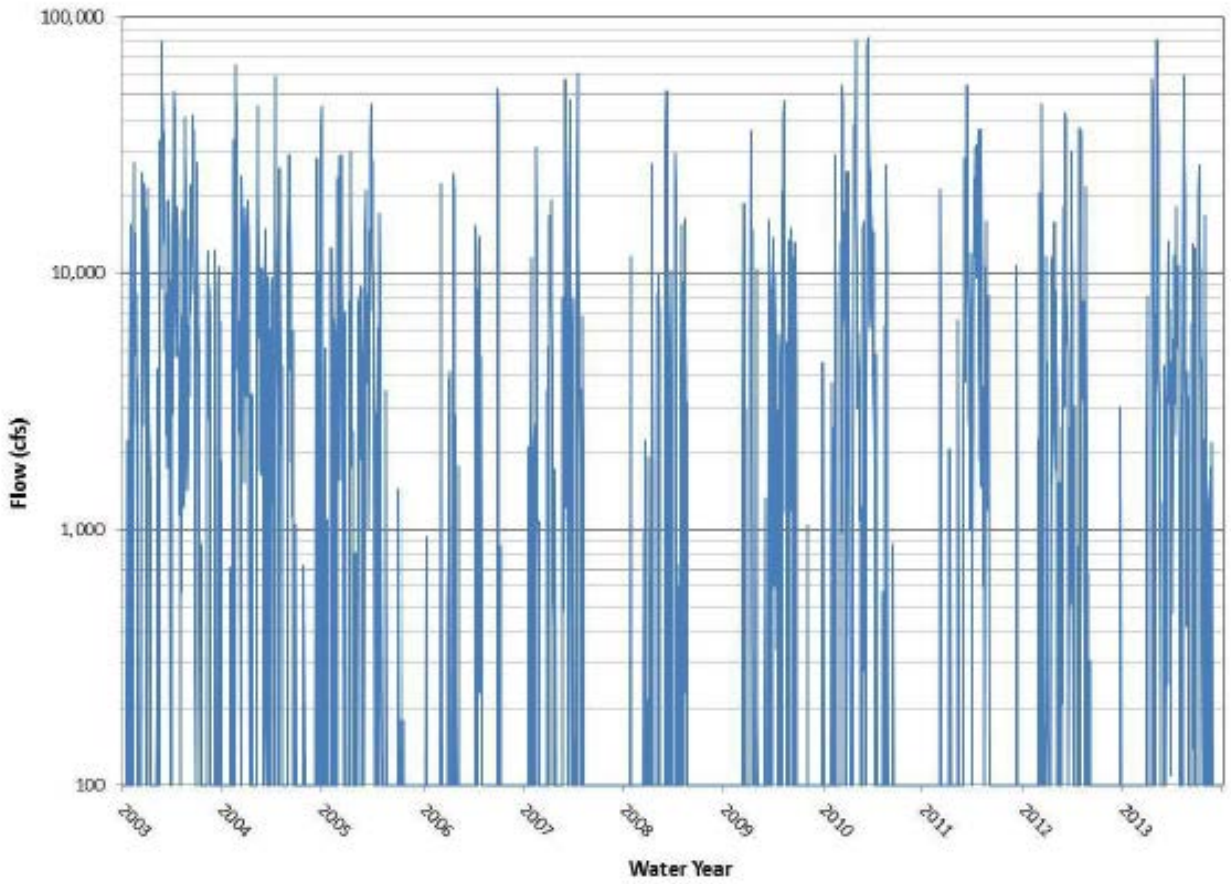

Figure 10. Estimated daily flows in the Hawks Nest bypassed reach under existing project operation (100 cfs continuous minimum flow) during an 11-year period from 2003-2013. The lowest value on the y-axis corresponds to the baseline 100 cfs minimum flow (i.e., flows were never below this value) (Source: license application).

Our above analysis indicates that smallmouth bass and northern hog sucker would experience the greatest increase in suitable habitat in the bypassed reach if minimum flows were increased during the low-flow period (July–October). The largest increase in WUAs for these species (6,440 m^2 for smallmouth bass and 14,097 m^2 for northern hog sucker) would occur under Interior's recommended flow, and the smallest increase (2,190 m^2 for smallmouth bass and 3,337 m^2 for northern hog sucker) would occur under the applicant's proposed flows (table 7). Interior's 'minimally acceptable' flow (300 cfs during the low-flow period) would still provide a 57.2 percent increase in habitat (5,597 m^2 in the study area or approximately 70,000 m^2 throughout the entire bypassed reach) for adult smallmouth bass, which is the most important fishery species in the project area. Juvenile rock bass and shiners would experience the greatest decrease in the amount of suitable habitat under the recommended minimum flows. Specifically, the reduction in WUAs for these species would be 3,838 m^2 and 3,149 m^2, respectively, under Interior's flow recommendation, but only 913 m^2 and 947 m^2 under the applicant's proposed flows (table 7). For all other species and life stages, the differences in WUAs between baseline

conditions and the various minimum flow alternatives would be minimal and generally less than 1,500 m^2 (table 7), which is less than 2.3 percent of the total available (wetted) habitat at a flow of 2,000 cfs.

Table 7. Change in WUA (weighted usable area) under each minimum flow alternative as compared to baseline conditions during the low-flow period (July–October). The top value in each cell is the change in WUA (in m^2) and the bottom parenthetical value in each cell is the percent change in WUA. The largest positive and negative increases (upper and lower 10 percent of the data) are shaded in light green and light orange, respectively. "ND" = no data available for habitat suitability criteria; therefore, WUAs were not modeled for these life stages.

		Adults				***Juveniles***			
Species	Baseline	Applicant proposed	Interior 10(j) recommended	Interior 10(j) minimally acceptable	AW & WVPRO recommended	Applicant proposed	Interior 10(j) recommended	Interior 10(j) minimally acceptable	AW & WVPRO recommended
Smallmouth bass	0	+2,190 (+22.4)	+6,440 (+65.8)	+5,597 (+57.2)	+2,190 (+22.4)	+1,458 (+10.1)	+2,491 (+17.2)	+2,614 (+18.1)	+1,458 (+10.1)
Rock bass	0	-144 (-2.0)	-1,508 (-21.1)	-890 (-12.4)	-144 (-2.0)	-913 (-9.3)	-3,838 (-39.1)	-2,850 (-29.0)	-913 (-9.3)
Flathead catfish	0	+143 (+2.8)	-479 (-9.3)	-12 (-0.2)	+143 (+2.8)	ND	ND	ND	ND
Walleye	0	+375 (+7.3)	+571 (+11.2)	+745 (+14.6)	+375 (+7.3)	+77 (+1.9)	-598 (-14.4)	-195 (-4.7)	+77 (+1.9)
Common shiner	0	+1,124 (+6.5)	-518 (-3.0)	+908 (+5.2)	+1,124 (+6.5)	-947 (-13.0)	-3,149 (-43.3)	-2,569 (-35.4)	-947 (-13.0)
Central stoneroller	0	+133 (+17.3)	+5 (+0.7)	+26 (+3.3)	+133 (+17.3)	-531 (-15.0)	-1,169 (-33.0)	-1,228 (-34.7)	-531 (-15.0)
Bigmouth chub	0	+403 (+26.1)	+1,462 (+94.5)	+1,098 (+70.9)	+403 (+26.1)	ND	ND	ND	ND
Greenside darter	0	+483 (+32.7)	+2,057 (+139.4)	+1,528 (+103.6)	+483 (+32.7)	ND	ND	ND	ND
Northern hog sucker	0	+3,337 (+41.7)	+14,097 (+176.2)	+10,372 (+129.6)	+3,337 (+41.7)	ND	ND	ND	ND

Fish Entrainment and Impingement

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

Hawks Nest Hydro proposes to continue to make fishery compensation payments to West Virginia DNR to mitigate for turbine-induced fish mortality as authorized by a 1992 license amendment.[30] This inflation-adjusted annual payment is the monetary value of all fish that are estimated to suffer entrainment mortality at the projects (Hawks Nest and Glen Ferris) and is based on the 1982 edition of Monetary Values of Freshwater Fishes and Fish Kill Counting Guidelines published by the American Fisheries Society. In 2014, the annual compensation payment was approximately $61,000 (Hawks Nest Hydro, 2015). Most importantly, the fishery compensation plan assumes that all entrained fish are killed by the projects (i.e., compensation is based on an assumed entrainment mortality rate of 100 percent). Interior supports the continuation of this fishery compensation plan.

Staff Analysis

Impingement potential is minimal at the projects given the relatively large trashrack spacing—3.19 inches at Hawks Nest, and 1.75 and 3.12 inches at the west and east powerhouses at Glen Ferris, respectively. While some fish species found in the project areas can attain large sizes (greater than 20 inches long and 3 inches wide) and could be impinged on the trashracks based on their body size alone, this is unlikely because adults of these species (e.g., catfish, bass, and walleye) have burst swimming speeds (of at least 8 feet per second, fps) that are well above the maximum approach velocities measured at the project intakes (2.6 fps at Hawks Nest and 3.12 fps at the Glen Ferris east powerhouse) (HDR, 2015c). Therefore, these large adults can avoid impingement due to their increased swimming ability.

A desktop study was performed to assess fish entrainment and turbine mortality at

[30] 58 FERC ¶ 62,013 issued on January 8, 1992.

the projects (HDR, 2015c). This study used the EPRI (1997) entrainment database, which provides the results of field entrainment studies (full-flow tailrace netting) conducted at 43 hydroelectric facilities east of the Mississippi River. The number of entrained fish was estimated by multiplying the average entrainment rate (fish per sampling hour per 1,000-cfs of project capacity) obtained from the database (for a given species and size class, across the 43 projects) by the monthly generation (1,000-cfs hours) at each project and adjusting this product for the relative species composition in the project areas based on relative abundance data from the 2013 fisheries surveys. These data were then summed across size classes and months to obtain an annual entrainment estimate for each species. The Franke et al. (1997) blade strike model was used to predict the survival of entrained fish based on the characteristics of the turbines at each project (table 8).

Table 8. Physical characteristics of the turbine units at the Hawks Nest and Glen Ferris projects (Source: license application).

Parameter	Hawks Nest	Glen Ferris	
	Units 1-4	West Units 1-6 (New)	East Units 7-8 (New)
Operating Mode	Run-of-River	Run-of-River	Run-of-River
Unit Type	Francis	Francis	Francis
Unit Orientation	Vertical	Vertical	Vertical
Maximum Flow (cfs)	2,540	199	957
Minimum Flow (cfs)	800	199	704
Efficient Flow (cfs)	2,050	199	891
Combined Hydraulic Capacity (cfs)	10,160	1,194	1,914
Runner Diameter (same as diameter at inlet) (ft)	9.8	4.58	8.33
Runner Diameter at Outlet (ft)	10.42	4.64	8.51
Runner Height at Inlet (ft)	5.33	1.82	3.18
Runner Speed (rpm)	150	120	100
Number of Blades	17	16	16
Rated Net Head (ft)	157	27	27
Trashrack Bar Spacing (in)	3.19	1.75	3.12

Entrainment results were fairly similar for the Hawks Nest and Glen Ferris projects. Annual entrainment was estimated at 54,725 fish for Hawks Nest and 32,356 fish for Glen Ferris. Estimated entrainment potential was highest for numerically dominant species such as channel catfish, rock bass, and gizzard shad, which comprised 72 percent of the estimated total entrainment at each project. In regards to fish size, the vast majority of entrained fishes (90 percent at Hawks Nest and 95 percent at Glen Ferris) would be less than 6 inches. Survival of entrained fishes representing this size group (less than 6 inches) is expected to be high—95 percent for Hawks Nest and 93 percent for

Glen Ferris. These survival estimates are in good agreement with those from hydroelectric projects with similarly sized Francis turbines operating at similar flows and rotational speeds as those at the Hawks Nest and Glen Ferris projects (~90 percent).

Given the high head of the Hawks Nest Project (157 feet), some pressure-induced mortality (decompression trauma) may occur as entrained fish pass through the underground tunnel and turbines and are then discharged into a lower pressure environment (tailrace) upon exiting the powerhouse. However, previous tailrace netting studies, which were qualitative in nature and did not involve full-flow tailrace netting, noted that juvenile catfish exiting the Hawks Nest powerhouse showed no visible signs of barotrauma (Kleinschmidt 1990). Moreover, in a laboratory study, Becker et al. (2003) exposed surface-acclimated bluegills to pressure changes expected during passage through Kaplan turbines at a high head hydropower project (100 feet) and found that pressure-induced mortality was less than 2 percent. Bluegills ranked fifth and sixth in terms of numbers entrained at the Hawks Nest and Glen Ferris projects and can be considered a representative centrarchid species. Even though the Becker et al. (2003) study evaluated Kaplan turbines, pressure profiles associated with turbine passage are often similar between Kaplan and Francis turbines (Pracheil et al., 2016). Therefore, results from these studies (Kleinschmidt, 1990; Becker et al, 2003) indicate pressure-induced mortality associated with fish passage through the high head Hawks Nest Project is negligible at the population level.

The desktop entrainment study showed that entrainment survival is expected to be high at the projects and exceed 90 percent. Even if survival were slightly reduced due to latent effects such as barotrauma, survival would still be high and obviously exceed the survival rate assumed in the fishery compensation plan, which assumes all entrained fish die. The fish that *do* suffer entrainment mortality would mostly be the younger individuals in a population, which exhibit high rates of natural mortality even in the absence of hydropower operations. Fish populations have generally evolved to withstand losses of these smaller and younger individuals with little or no effect on long-term population sustainability. Thus, entrainment and turbine mortality of smaller individuals could occur, but it is expected to be very low, exert no appreciable impact or damages to fish populations, nor result in losses to the fishery at the projects.

Project Operation and Compliance Monitoring

Although compliance measures do not directly affect environmental resources, they do allow the Commission to ensure that a licensee complies with the environmental requirements of a license; therefore, operational compliance monitoring and reporting are standard requirements in Commission-issued licenses.

Hawks Nest Hydro proposes to develop a streamflow monitoring plan to ensure compliance with any revised minimum flow targets or requirements for the Hawks Nest

bypassed reach, including details on the mechanisms and structures that would be used and any periodic maintenance and calibrations necessary for installed devices and any recording or reporting of data to resource agencies or to FERC. In its 10(j) letter, Interior also recommended a streamflow monitoring plan to ensure compliance with any revised minimum flow targets for the Hawks Nest Project.

Staff Analysis

While Hawks Nest Hydro proposes to develop a streamflow monitoring plan to ensure compliance with any revised minimum flow targets for the bypassed reach, it does not specify how other resource-related operational measures would be met, including run-of-river operation (Hawks Nest and Glen Ferris projects), ramping rates (Hawks Nest only), and any recreation flow releases (Hawks Nest only). The development of a more broadly encompassing operation and compliance monitoring plan would facilitate Commission administration of the licenses and verify that all operation requirements for the protection and enhancement of aquatic and recreational resources are being met.

3.3.2 Terrestrial Resources

3.3.2.1 Affected Environment

The Hawks Nest and Glen Ferris projects are located within the Central Appalachians ecoregion, which encompasses parts of south-central Pennsylvania, eastern West Virginia, western Maryland, and southwestern Virginia (Woods et al., 1999). The landscape in the Central Appalachians ecoregion is described as "a high, dissected and rugged plateau made up of sandstone, shale, conglomerate, and coal…locally punctuated by a limestone valley and a few anticlinal ridges" (Woods et al., 1999). The majority of lands in the vicinity of the projects are further described by Woods et al. (1999) as Dissected Appalachian Plateau, a subregion of Central Appalachians ecoregion with lands characterized by narrow ridges, deep coves, and narrow valleys with a majority of the area covered in forest. Cool, high-gradient streams with cobble and boulder substrates and extensive riffles are common in this subregion. Additionally, lands near Hawks Nest dam are described as Forested Hills and Mountains, a more rugged and extensively forested subregion with higher stream gradients. Within the largely undeveloped vicinity of both projects, the ecoregion and each subregion support a diverse range of terrestrial wildlife and botanical species and habitats, including wetland, riparian, and littoral habitats. To identify terrestrial resources at both projects, Hawks Nest Hydro conducted a literature review; a Wetland and Riparian Habitat Study; and a Rare, Threatened, and Endangered (RTE) Terrestrial Species Study.

Wetland and Riparian Habitats

To identify the existing wetland and riparian habitats within the project boundaries, Hawks Nest Hydro conducted a Wetland and Riparian Habitat Study in 2013 (HDR 2015d). Prior to conducting fieldwork, wetland scientists examined existing wetland and riparian habitats at both projects using mapping prepared from the National Wetland Inventory data maintained by FWS. During fieldwork, the wetland scientists mapped and described the locations and extent of the wetland habitats within the study areas. Hawks Nest Hydro's field surveys mapped a total of 276 acres of wetland and riparian habitats within the Hawks Nest Project boundary and 24 acres of riparian habitat within the Glen Ferris Project boundary, all in proximity to the New and Kanawha Rivers.

For both the Hawks Nest and Glenn Ferris projects, the overall potential for development of wetland and riparian habitats is limited by adjacent topography bordering the majority of the shorelines surrounding both projects' reservoirs and the Hawks Nest bypassed reach (e.g., steep-walled gorge for Hawks Nest and developed banks for much of Glen Ferris). However, even with the topography limitations, Hawks Nest reservoir's relatively stable pool elevation supports a system of emergent wetlands at the reservoir margins, generally increasing in size as Hawks Nest reservoir's backwater effects become more prominent, and the bypassed reach supports riparian habitat areas that exhibit species richness and diversity generally reflective of natural community expectations for this region (HDR 2015d). No wetland types are located within the Glenn Ferris Project boundary, but the reservoir supports several acres of riparian habitat. Table 9 describes the wetland and riparian habitat types that are found within the projects' boundaries.

Table 9. Wetland and riparian habitats within the Hawks Nest and Glen Ferris project boundaries.

Habitat Type	Hawks Nest Acreage	Glen Ferris Acreage	Description
Wetlands			
Palustrine Emergent Wetland (PEM)	3.8	0	Persistently flooded habitat dominated by erect, rooted, herbaceous hydrophytes (Cowardin et al. 1979). Common species observed include rice cutgrass, American water-willow, softstem club-rush, and duck-potato.
Palustrine Forested Wetland (PFO)	0.1	0	Non-tidal wetland characterized by woody vegetation that is 20 feet or taller (Cowardin et al. 1979).
Riparian			
Sycamore-River Birch Riverscour Woodland	11.7	0	Frequently flooded habitat with boulder, cobble, gravel, and sand substrate. Open canopy is dominated by sycamore, river birch, silver maple, and green ash (Vanderhorst et al. 2007). Common along Hawks Nest bypassed reach.
Riverscour Prairie	7.8	0	Frequently flooded habitat with bedrock, boulder, and cobble substrate. Limited canopy; dominated by flood and scour-tolerant species such as smooth alder, indianhemp, blue wild indigo, river birch, common buttonbush, silky dogwood, and white ash (Vanderhorst et al. 2007). Common along Hawks Nest bypassed reach.
Sycamore-Ash Floodplain Forest	253.0	23.7	Temporarily flooded habitat with alluvium substrate including boulder, cobble, gravel, and sand. Closed canopy is dominated by sycamore, green ash, tuliptree, river birch, and blackgum (Vanderhorst et al. 2007). Common along all New River shorelines.

Hawks Nest Hydro's field surveys found the species richness and diversity of the wetland and riparian habitats present within the project boundaries to generally reflect natural community expectations for the region. Wetland and riparian habitats were found to be dominated by native species, with few instances of non-native weeds. Functional assessments performed on wetland habitats during this study found them to provide fish, wildlife, and other benefits consistent with the generally intact structure and diverse

species composition observed in the field. Additionally, these habitats support a number of occurrences of state-listed plant species, which are described below. Figures 11 through 14 are cover type maps showing all vegetation types, including wetland and riparian habitats, for both projects (HDR, 2015d).

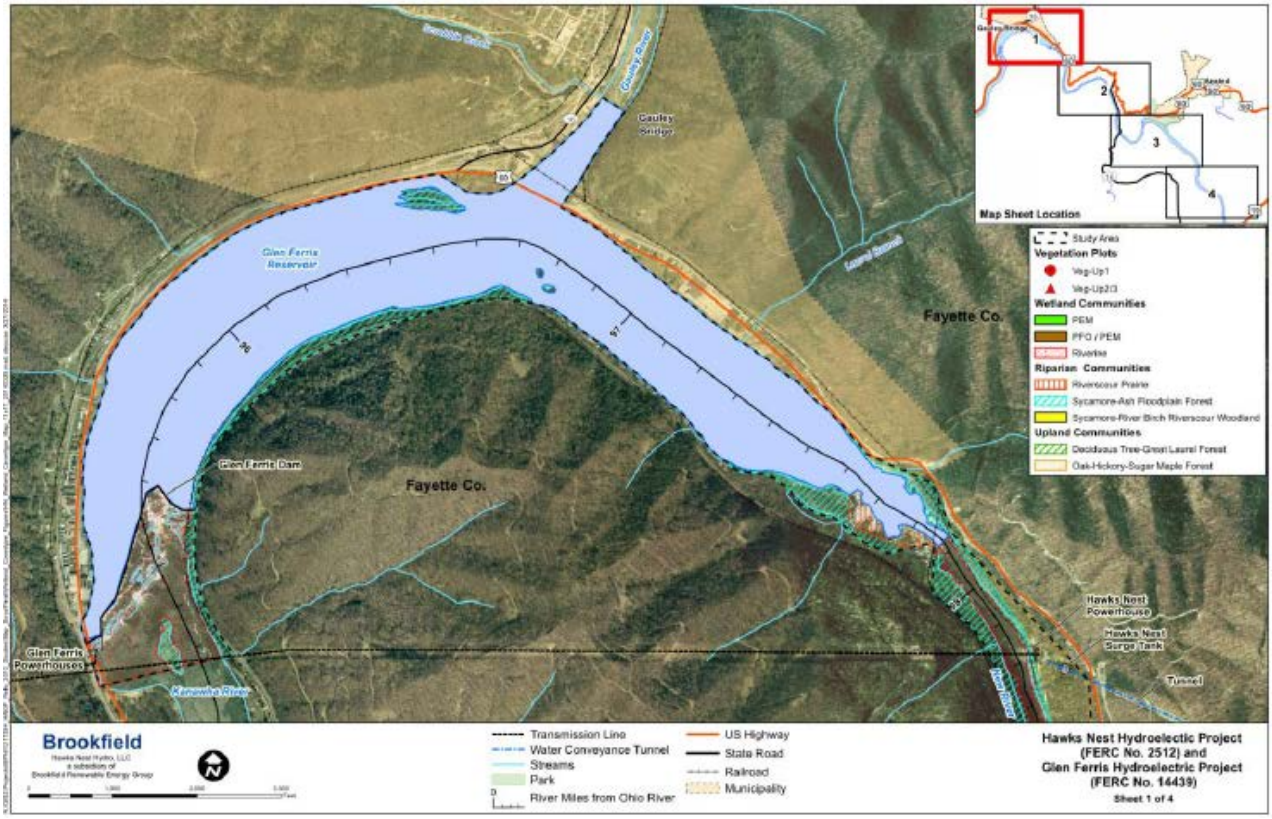

Figure 11. Cover type, map 1 of 4 (Source: license application).

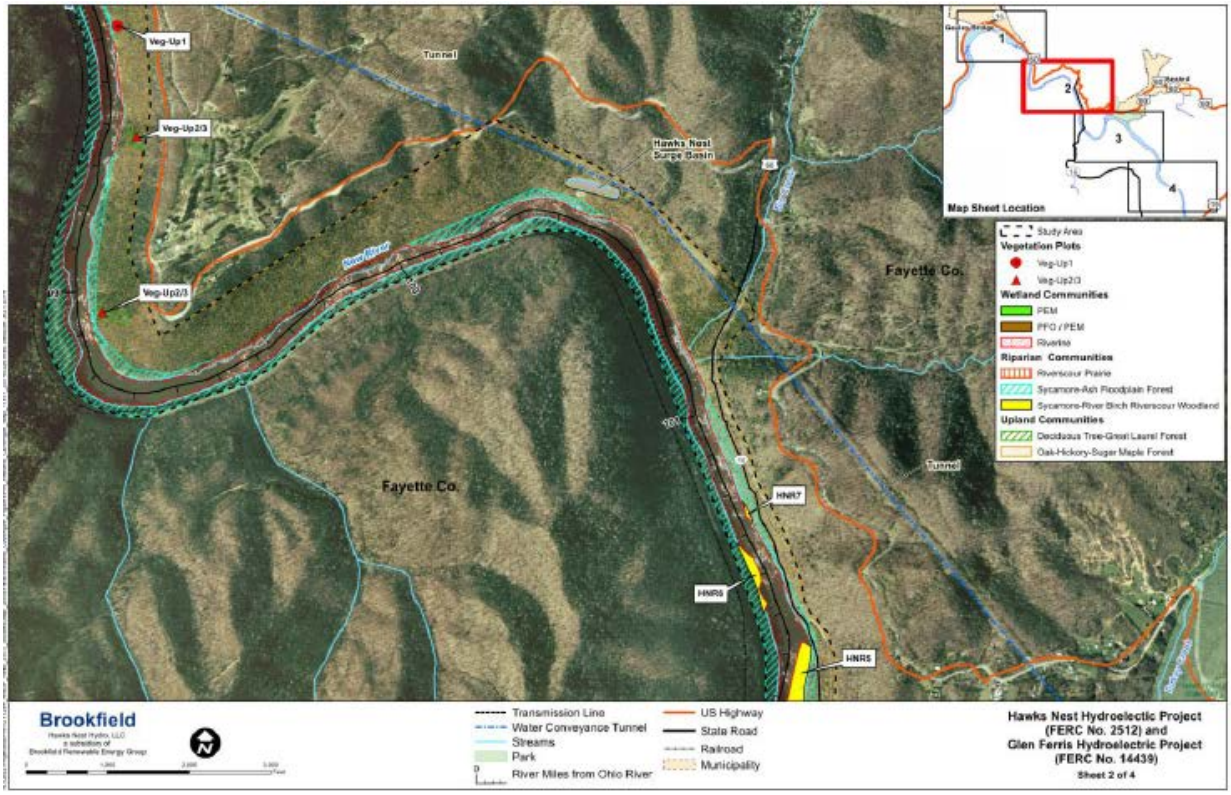

Figure 12. Cover type, map 2 of 4 (Source: license application).

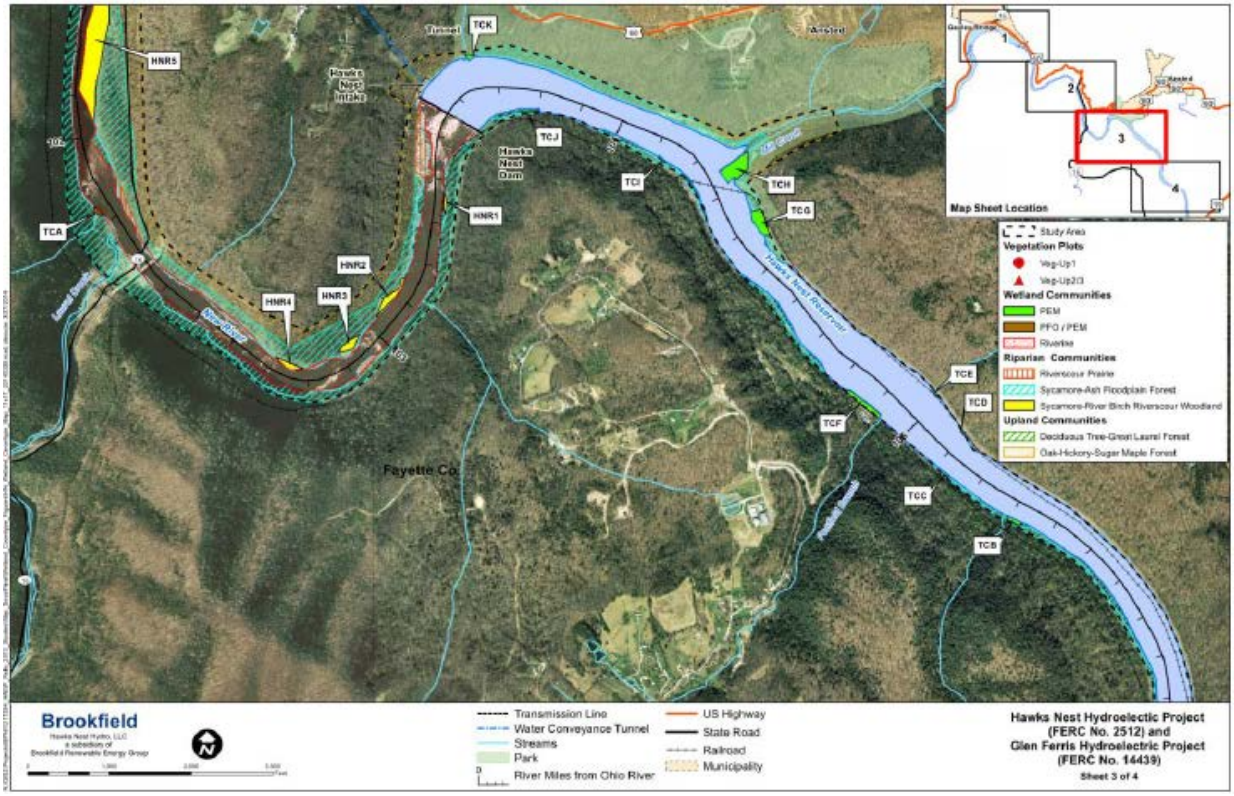

Figure 13. Cover type, map 3 of 4 (Source: license application).

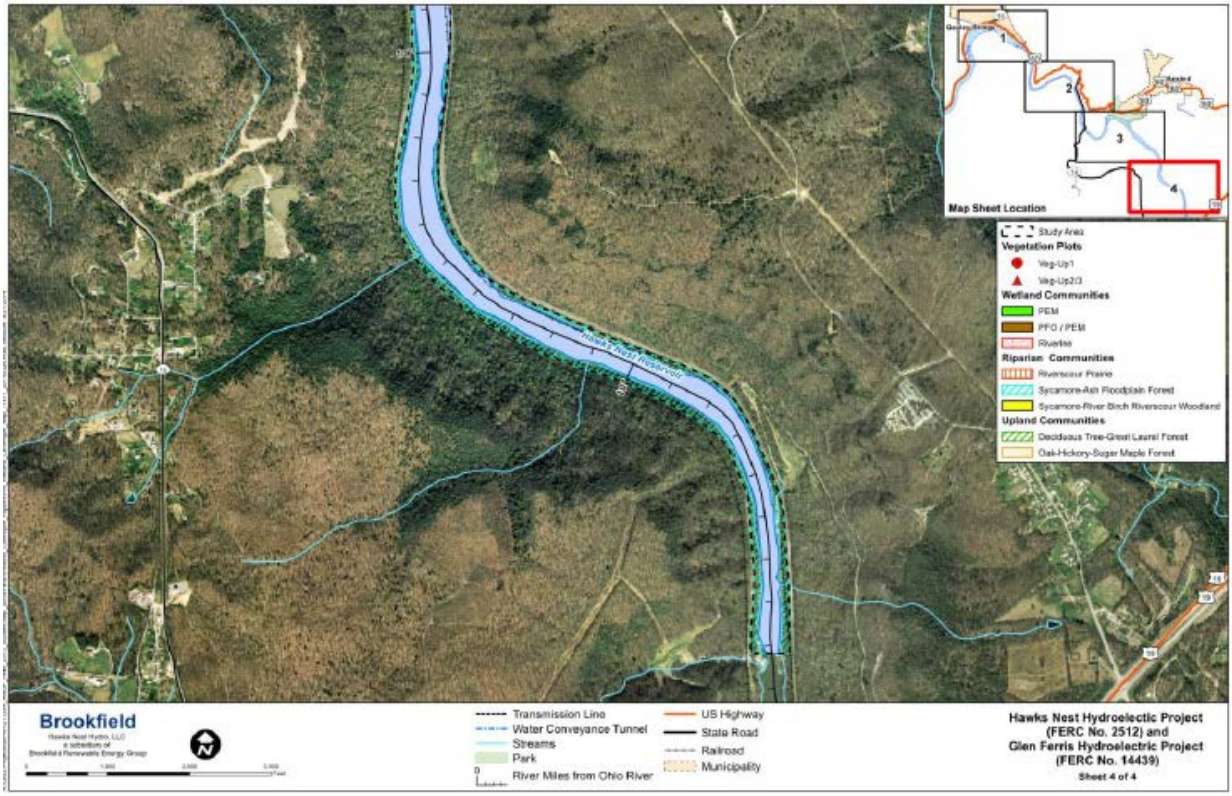

Figure 14. Cover type, map 4 of 4 (Source: license application).

Botanical and Wildlife Resources

Plants

During Hawks Nest Hydro's fieldwork for the Wetland and Riparian Habitat Study, wetland scientists also identified, to the species level when possible, the dominant plants present within a potential wetland habitat. The surveys took place during the growing season to facilitate the accurate identification of the plant species and plant identification was confirmed using field guides, contracted botanical experts, and appropriate literature. Because the Hawks Nest and Glen Ferris project boundaries surround the riparian influence of the New and Kanawha Rivers, the adjacent terrestrial habitats are primarily riparian forest or wetland habitats (as described above). In addition, Hawks Nest Hydro identified two non-riparian upland cover types, using the classification system described by Vanderhorst et al. (2007), within the Hawks Nest Project boundary: Oak-Hickory-Sugar Maple Forest and Deciduous Tree-Great Laurel Forest (HDR, 2015d). Cover-type mapping of all vegetation types from the Hawks Nest Hydro's Wetland and Riparian Habitat Study (HDR, 2015d) is provided above in figures 11 through 14. There are no non-riparian upland cover types identified within the Glen Ferris Project boundary.

Hawks Nest Hydro found Oak-Hickory-Sugar Maple Forest to be the dominant upland vegetative community type occurring throughout the Hawks Nest Project boundary. Of the 256 total acres of upland habitats mapped within the project boundary, approximately 254 of the acres are Oak-Hickory-Sugar Maple Forest. Hawks Nest Hydro mapped most of this habitat along the upper portions of southerly exposed slopes of the Hawks Nest Project's bypassed reach. Dominant canopy vegetation in this habitat type includes sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), northern white oak (*Quercus alba*), and bitter-nut hickory (*Carya cordiformis*). Shrubs observed in this vegetation type include common pawpaw (*Asimina triloba*), cucumber-tree (*Magnolia acuminata*), American holly (*Ilex opaca*), and Carolina silverbell (*Halesia carolina*). Common herbaceous species in this vegetation type include white snakeroot (*Ageratina altissima*), Allegheny blackberry (*Rubus allegheniensis*) and wild yam (*Dioscorea villosa*).

Hawks Nest Hydro's field surveys also identified approximately 2 acres of Deciduous Tree-Great Laurel Forest community at the Hawks Nest Project, with this community located approximately 2,500 feet south of the Hawks Nest powerhouse on the eastern bank of the New River. The understory of this vegetation type is generally dense with small shrubs and forbs. Dominant canopy vegetation includes chestnut oak (*Quercus prinus*), tuliptree (*Liriodendron tulipifera*), sweet birch (*Betula lenta*), and red oak (*Quercus rubra*). Shrubs observed in this vegetation type include great-laurel (*Rhododendron maximum*), sugar maple, and redbud (*Cercis canadensis*). The herbaceous layer consists of Japanese stilt grass (*Microstegium vimineum*), white snakeroot, ground ivy (*Glechoma hederacea*), Christmas fern (*Polystichum acrostichoides*), small-spike false nettle (*Boehmeria cylindrica*), and horsebrier (*Smilax rotundifolia*). Tree canopy and shrub cover observed during the field surveys ranged from 5 to 50 percent. The subcanopy and canopy height classes ranged from 32 feet (10 meters) to 115 feet (35 meters), respectively.

Mammals

Approximately 65 species of mammals are reported to occur in the vicinity of the New River Gorge (Park Service, 2015b). Mammals found throughout West Virginia and the New River Gorge area include the white-tailed deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), Black bear (*Ursus americanus*), and various small rodents. Streamsides provide habitat for muskrat (*Ondatra zibethicus*), American mink (*Neovison vison*), and American beaver (*Castor canadensis*) (Elkem Metals Company, 1984; West Virginia DNR, 2001).

Mammals with a limited range that extend into the New River Gorge include the star-nosed mole (*Condylura cristata*), meadow jumping mouse (*Zapus hudsonius*),

harvest mouse (*Reithrodontomys humulis*), and eastern cottontail (*Sylvilagus floridanus*) (Elkem Metals Company, 1984; Whitaker and Hamilton, 1998). Additional mammals that may occur in the vicinity of the projects are listed in table E.7-22 (page 201) of Hawks Nest Hydro's final license application.

Although Hawks Nest Hydro did not conduct any field surveys specifically related to terrestrial wildlife, the acoustic sampling it used to detect bat species within each project's boundary during the RTE Terrestrial Species Study (HDR, 2015f), detected both ESA-listed bat species (discussed section 3.3.4, *Threatened and Endangered Species*), as well as non ESA-listed bat species. A total of eight bat species were documented in forested habitats within the Hawks Nest and Glen Ferris project boundaries, including five non-special status species (table 10).

Table 10. Non ESA-listed bats documented during Hawk's Nest Hydro's field studies (Source: license application).

Common Name	**Scientific Name**	**Results of Acoustic Surveys**
Little brown bat	*Myotis lucifugus*	Documented at 3 of 23 acoustic survey sites.
Eastern pipistrelle	*Perimyotis subflavus*	Documented at 20 of 23 acoustic survey sites.
Silver-haired bat	*Lasionycteris noctivagans*	Documented at 4 of 23 acoustic survey sites.
Eastern red bat	*Lasiurus borealis*	Documented at 22 of 23 acoustic survey sites.
Big brown bat	*Eptesicus fuscus*	Documented at 12 of 23 acoustic survey sites.

Avian Species

The Hawks Nest and Glen Ferris project areas can support a wide variety of avian species. Some of the most common avian species found in the New River Gorge include red-winged blackbird (*Agelaius phoeniceus*), American crow (*Corvus brachyrhynchos*), mourning dove (*Zenoidura macroura*), gray catbird (*Dumetella carolinensis*), belted kingfisher (*Ceryle alcyon*), chimney swift (*Chaetura pelagica*), and warblers (*Dendroica* spp.). These species are frequently found near the river. Other less-common bird species that are found in the New River Gorge area include green heron (*Butorides virescens*), Cooper's hawk (*Accipiter cooperii*), hairy woodpecker (*Picoides villosus*), killdeer (*Charadrius vociferus*), and cliff swallow (*Petrochelidon pyrrhonota*). Game birds of the forest within the New River Gorge include eastern turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa umbellus*), American woodcock (*Scolopax minor*), and bobwhite quail (*Calinus virginianus*) (Elkem Metals Company, 1984; Sibley, 2003). Additional avian

species that may occur in the vicinity of the projects are noted in table E.7-24 (page 203) of Hawks Nest Hydro's final license application.

Amphibians and Reptiles

Several species of amphibians and reptiles can be found in the New River Gorge, the most common of which are the eastern American toad (*Bufo americanus americanus*), northern spring peeper (*Hyla crucifer crucifer*), green frog (*Rana clamitans melanota*), and the green salamander. Common reptile species include the northern water snake (*Nerodia sipedon sipedon*), black rat snake (*Elaphe obsoleta obsoleta*), eastern hognose (*Heterodon platirhinos*), eastern milk snake (*Lampropeltis triangulum triangulum*), eastern box turtle (*Terrapene Carolina carolina*), stinkpot (*Sternotherus odoratus*), and snapping turtle (*Chelydra serpentine*). The northern copperhead (*Agkistrodon contortrix mokasen*) and timber rattlesnake (*Crotalus horridus*), which inhabit dry upland woods, rocky hillsides, and ledges are the only poisonous reptile species known to occur in the New River Gorge (Elkem Metals Company, 1984; West Virginia DNR, 2003; Conant, 1991). Additional species of amphibians and reptiles that may occur in the vicinity of the Hawks Nest and Glen Ferris projects are noted in table E.7-25 (page 207) of Hawks Nest Hydro's final license application.

Special Status Species

West Virginia's Wildlife Diversity Program and Natural Heritage Program, both administered by West Virginia DNR's Wildlife Resources Section, are responsible for the species listed by the federal government as threatened or endangered, as well as for West Virginia's nongame wildlife, which are species that are not fished, hunted or trapped. The Wildlife Diversity Program's primary responsibility is to conserve the state's nongame wildlife resources through the identification and management of the nongame species and their habitats. Through the Natural Heritage Program, West Virginia conducts an ongoing statewide ecological inventory of rare plant and animal species, wetlands, and other ecological communities. An important component of both programs is the Natural Heritage Database, which West Virginia uses to track the occurrence and status of West Virginia's rare, threatened, and endangered species. Through this database, West Virginia DNR maintains a list of special status species occurring in West Virginia, consisting of both federally listed ESA species and those species considered rare or species of concern in the state of West Virginia.

On this list, in addition to federal status under the ESA, rare species are assigned "State Ranks" by the West Virginia Natural Heritage Program and "Global Ranks" by NatureServe (NatureServe, 2007). These ranks are based on the species' documented occurrences and distributions. Other factors, such as habitat and threats to existing populations, may also affect these rankings (West Virginia DNR, 2015b). State status designations are defined into four categories: 1) Critically Imperiled (S1) means

critically imperiled in the nation or state/province because of extreme rarity (often five or fewer occurrences) or because of some factor(s), such as very steep declines, making it especially vulnerable to extirpation from the state/province; 2) Imperiled (S2) means imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factor(s) making it very vulnerable to extirpation from the nation or state/province; 3) Vulnerable (S3) means vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factor(s) making it vulnerable to extirpation; and 4) Apparently Secure (S4) means uncommon but not rare with some cause for long-term concern due to declines or other factor(s). Species with State Ranks of S1, S2, or S3 are tracked by the West Virginia Natural Heritage Program.

West Virginia, however, does not have state endangered species legislation in place; therefore, species of concern that are not ESA-listed are not afforded statutory protection. The exception to this is the bald eagle (*Haliaeetus leucocephalus*), which has been conferred separate protection under the Federal Bald and Golden Eagle Protection Act (West Virginia DNR, 2015b).

Special Status Plants

Hawks Nest Hydro's 2013 RTE Terrestrial Species Survey identified 23 occurrences (i.e., either a single plant or a distinct geographic population of plants) of four different special status botanical species, all West Virginia species of concern (table 11). Each of these had been previously documented in the New River Gorge and Fayette County. Each of the documented special status plant species are riparian specialists adapted to the periodic natural disturbance that is fundamental to riparian systems. Further, none of the observed special status plant occurrences showed evidence of anthropogenic disturbance or threats. Maps depicting the results of Hawks Nest Hydro's RTE Terrestrial Species study are presented in figures 15-18.

Table 11. Non-ESA special status plants documented during Hawks Nest Hydro's field surveys (Source: license application).

Common Name	Scientific Name	Number of Occurrences	Location Description
McDowell sunflower	Helianthus occidentalis ssp. Occidentalis	5	One occurrence near upstream end of Glen Ferris reservoir; one near Hawks Nest intake; three between Laurel Creek and Hawks Nest surge basin.
Blue wild indigo	Baptisia australis var. australis	15	All occurrences between Hawks Nest surge basin and Hawks Nest dam, including two previously unreported occurrences near Hawks Nest intake.
Flat-stemmed spike-rush	Eleocharis compressa	2	One occurrence near upstream end of Glen Ferris reservoir; one on New River shoreline near Laurel Creek.
Coppery St. John's wort	Hypericum virgatum	1	Near upstream end of Glen Ferris reservoir.

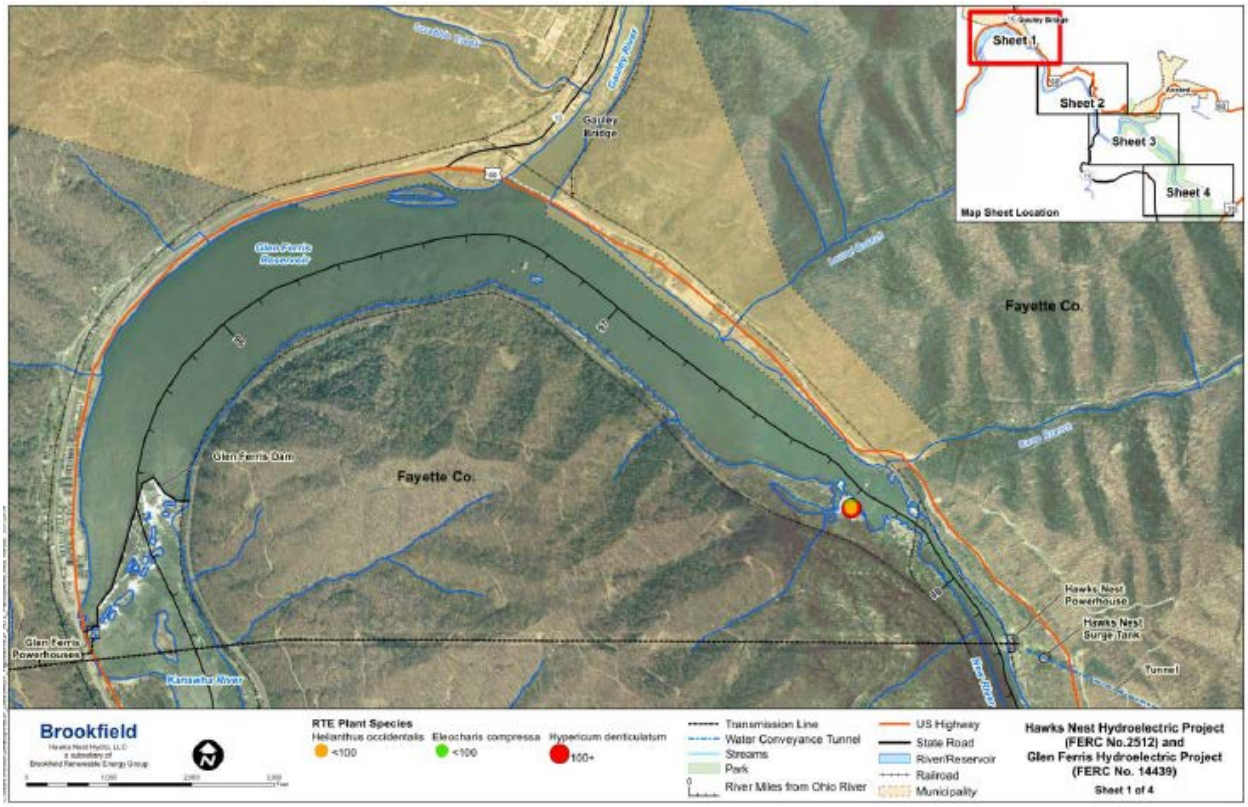

Figure 15. Special status plant species map, 1 of 4 (Source: license application).

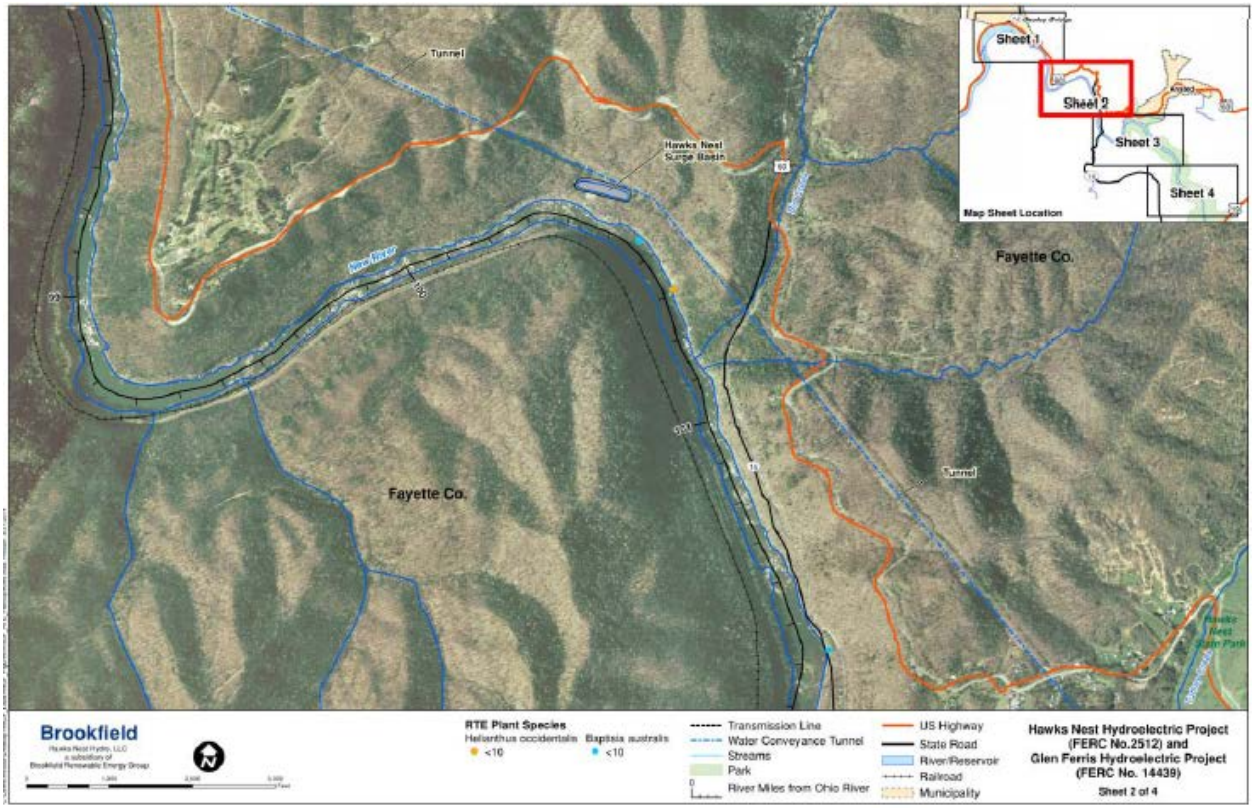

Figure 16. Special status plant species map, 2 of 4 (Source: license application).

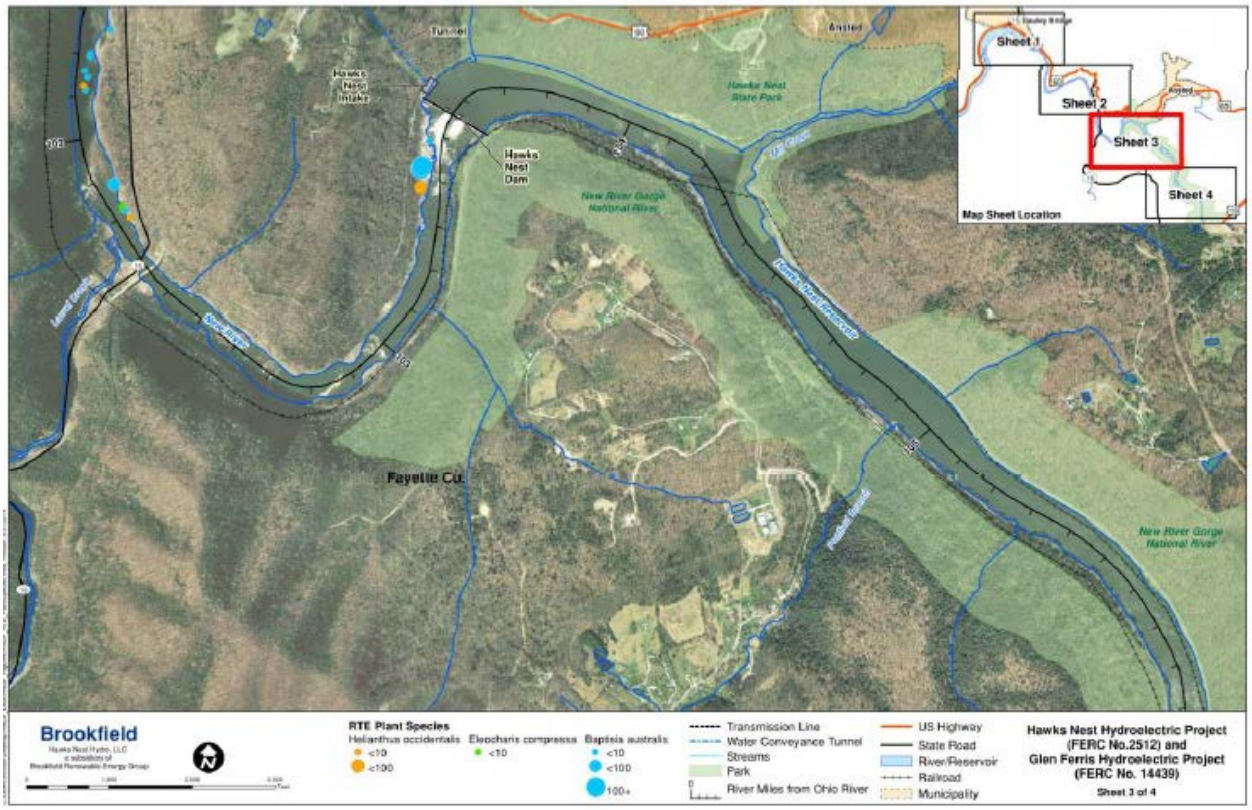

Figure 17. Special status plant species map, 3 of 4 (Source: license application).

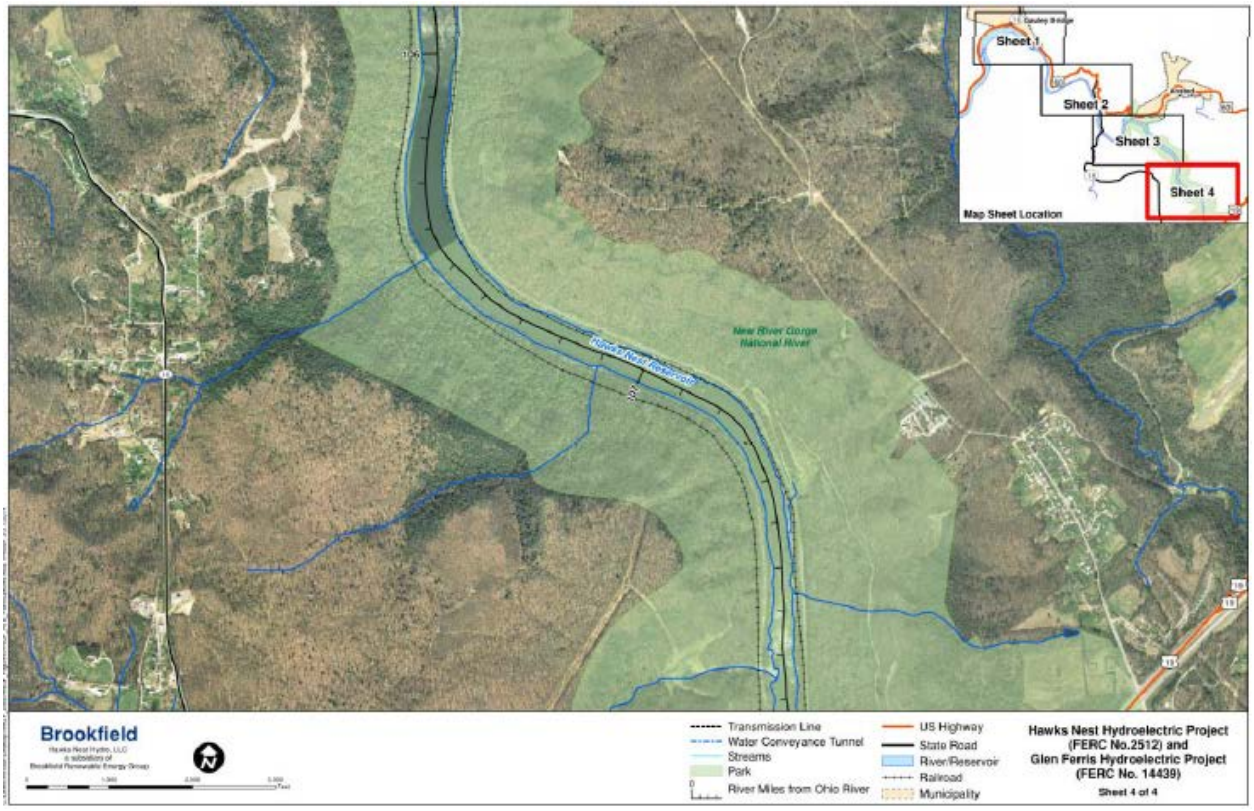

Figure 18. Special status plant species map, 4 of 4 (Source: license application).

Special Status Wildlife

During Hawks Nest Hydro's field surveys, only two special status wildlife species tracked by West Virginia DNR, Allegheny woodrat (*Neotoma magister*) and green salamander (*Aneides aeneus*), were specified during agency consultation as having the potential to occur in the study area. Both are designated S3 species, or species that are vulnerable in West Virginia because they are rare or uncommon, or found only in a restricted range. West Virginia DNR's records indicate two historic records of green salamander in upland habitats near the study area, last observed in 1935 and 1947. More recently, Allegheny woodrat debris and latrines were observed in the study area in 1999 (West Virginia DNR, 2015b).

No Allegheny woodrats were observed during Hawks Nest Hydro's RTE Terrestrial Species Study. However, potential habitat for Allegheny woodrat was documented at seven locations within the study area, along with evidence of one latrine and one potential food cache. All seven instances of potential Allegheny woodrat habitat are located near the New River between the Hawks Nest dam and the powerhouse. Potential woodrat habitat was noted based on the presence of large boulders or exposed rocks, crevices or potential den sites, and an available food source. Habitats were all observed in either the sycamore-ash dominated floodplain forests or oak-hickory, sugar maple forests.

No green salamanders were observed during Hawks Nest Hydro's RTE Terrestrial Species study. However, potential habitat for green salamander was documented at 10 locations within the study area. All 10 instances of potential green salamander habitat are located in or adjacent to the New River between Hawks Nest dam and the surge basin. Potential green salamander habitat was noted based on the presence of moist, rocky areas with suitable crevices. The majority of the documented habitat areas are located in sycamore-ash dominated floodplain forests, but one is located in a boulder field in the open water of the New River.

While no bald eagles were observed during the field surveys, bald eagles are listed as occurring in Fayette County by the FWS (FWS, 2015a) and have previously been observed in the vicinity of both projects. Suitable habitat for bald eagle breeding and foraging is present throughout both projects' boundaries but nesting has not been reported to occur (West Virginia DNR, 2015b). No evidence of current or historic stick nests is present within either project's boundary. A bald eagle pair is reported to nest on Brooks Island, in the New River Gorge National River Area, approximately 36 miles upstream of the projects. Successful breeding was reported in the years 2010-2012, but nesting of this pair was unsuccessful in 2013 (Park Service, 2015a).

Maps depicting the locations of Hawks Nest Hydro's special status terrestrial wildlife species are presented in figures 19-22.

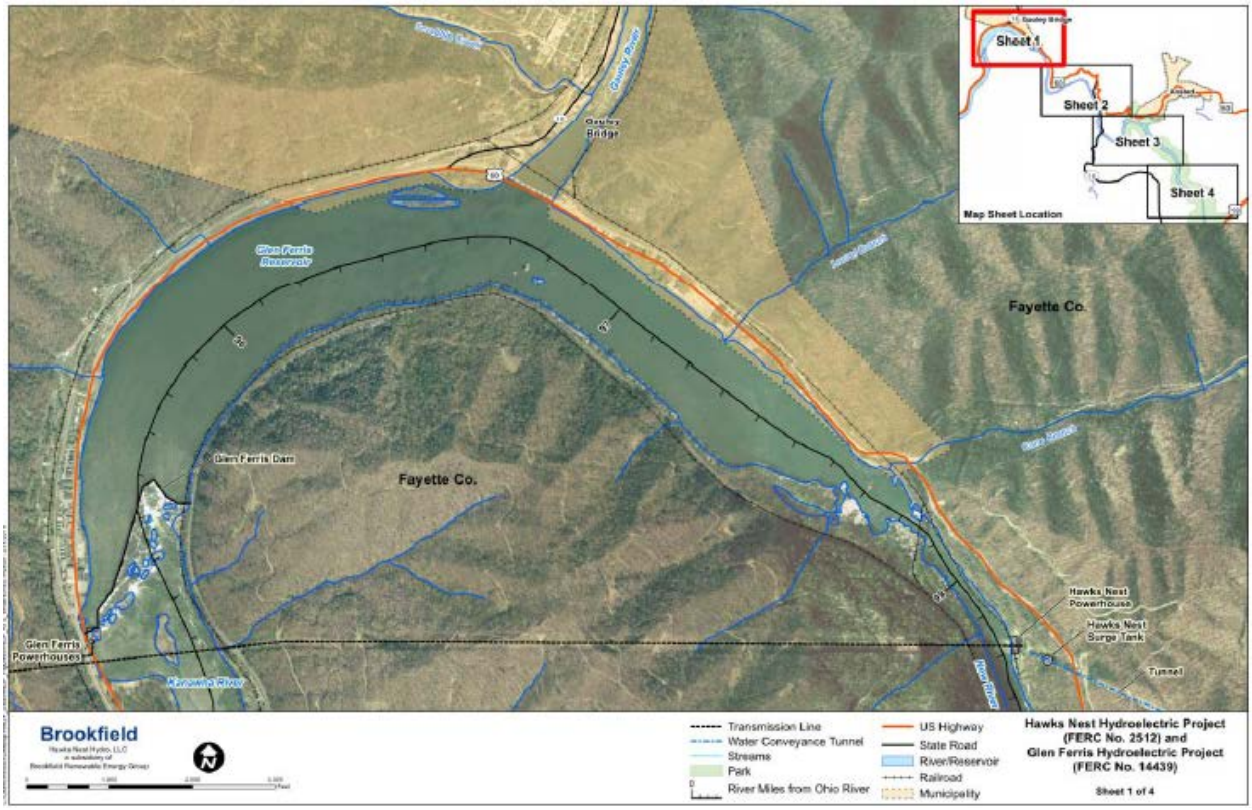

Figure 19. Special status wildlife species, map 1 of 4 (Source: license application).

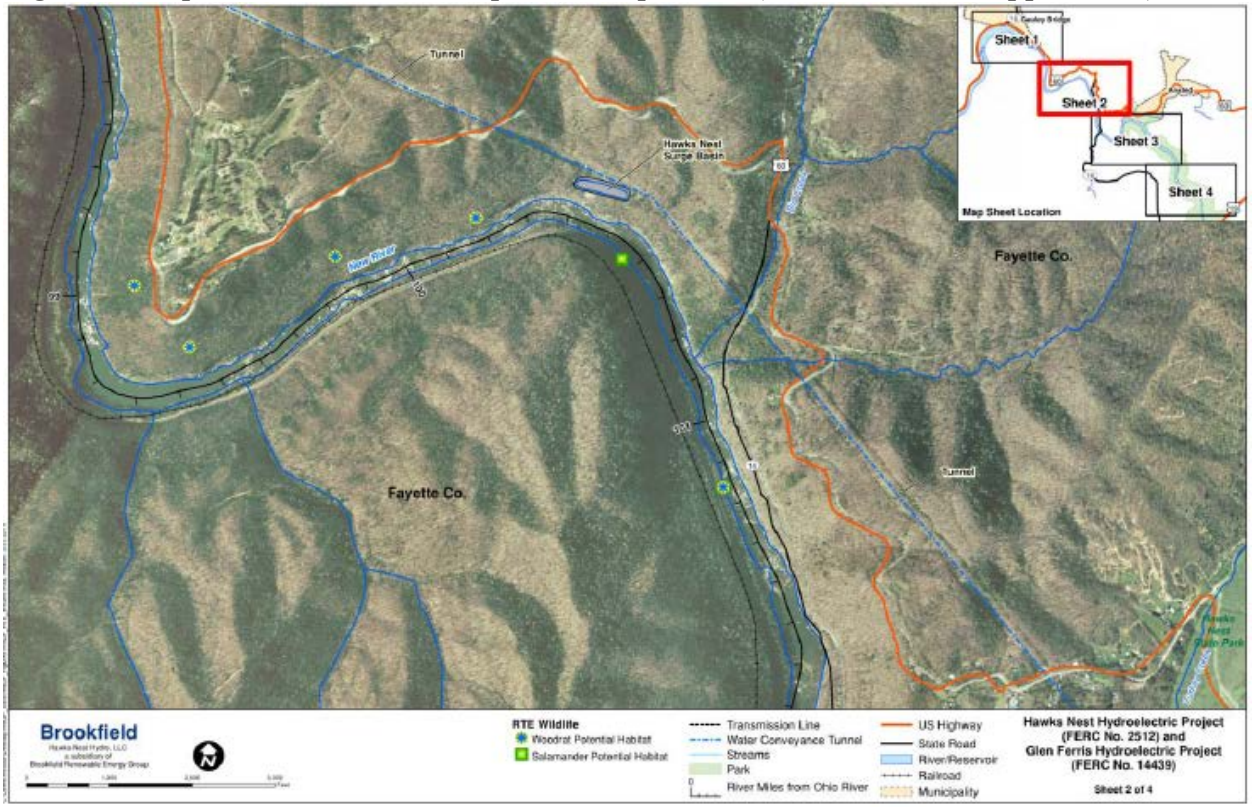

Figure 20. Special status wildlife species, map 2 of 4 (Source: license application).

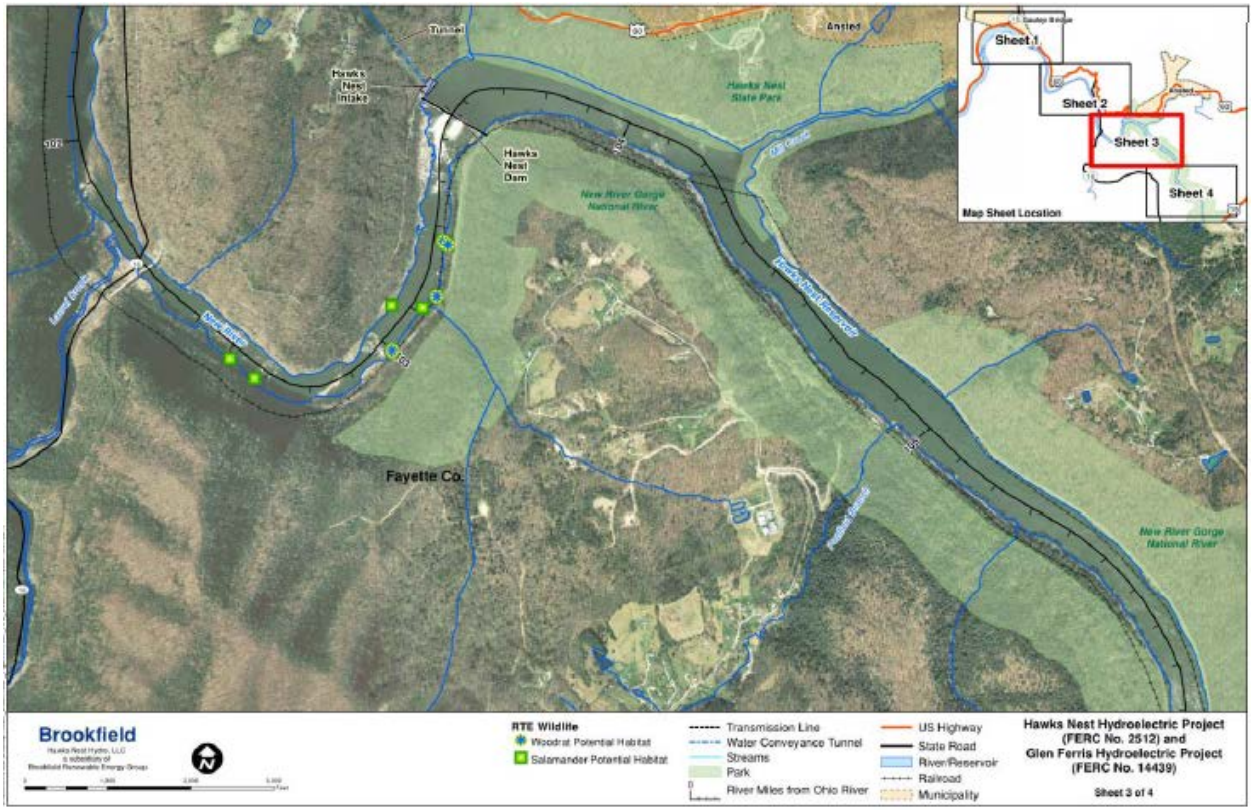

Figure 21. Special status wildlife species, map 3 of 4 (Source: license application).

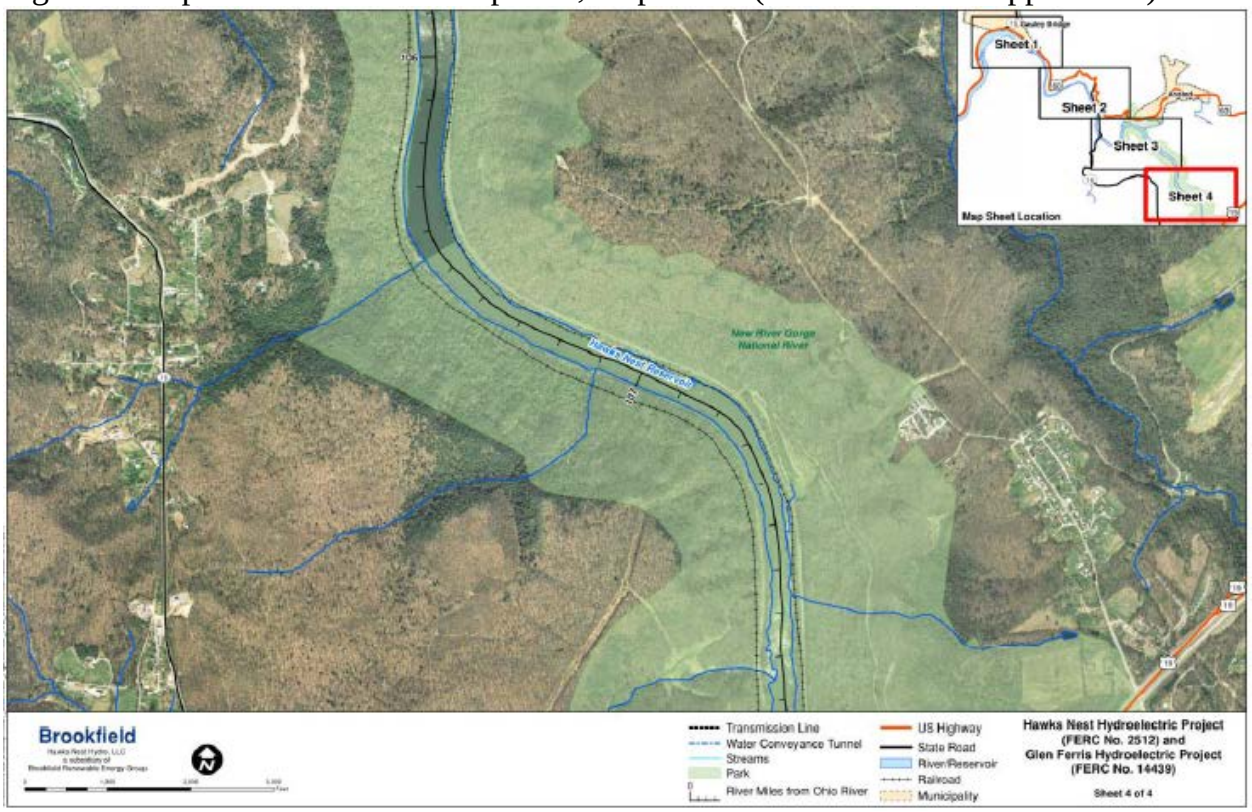

Figure 22. Special status wildlife species, map 4 of 4 (Source: license application).

3.3.2.2 Environmental Effects

Wetland and Riparian Habitats

Wetland and riparian habitats are important for functions such as water quality, habitat for fish and wildlife, regulating flooding, and stream recharge. Project operations, including changes in downstream flows, can affect the distribution, species composition, and overall health of a project's wetland and riparian habitat. While the run-of-river mode of operation for both the Hawks Nest and Glen Ferris projects creates a relatively stable reservoir pool elevation that supports a system of wetland and riparian habitat in the reservoirs, the Hawks Nest Project's bypassed reach experiences a wide-range of flow conditions.

There are no recommended measures specifically related to wetlands or riparian habitats. At the Glen Ferris Project, Hawks Nest Hydro proposes to maintain the existing run-of-river mode of operation. However, at the Hawks Nest Project, while Hawks Nest Hydro proposes to maintain the run-of-river mode of operation, the existing 100 cfs minimum flow, and the existing ramping rates, it also proposes increased flow releases in the bypassed reach in the form of increased seasonal minimum flows when river flow to the project exceeds 1,700 cfs and a recreation flow release provided annually during the Memorial Day 3-day weekend. Interior, AW, and WVPRO, also propose higher minimum flows and scheduled recreation flows for the Hawks Nest Project bypassed reach. Minimum flows and recreation flows are discussed in more detail in section 3.3.1.2, *Aquatic Resources, Environmental Effects* and section 3.3.5.2 *Recreation, Environmental Effects*, but in general, the flow recommendations are for the protection of aquatic species and benefit of recreational boating.

Staff Analysis

Wetland and riparian habitats within each project's boundary are reflective of existing operations. Having been shaped by long-term operation of the projects, these habitats exist because of, and are maintained by, operation of the projects. Continued run-of-river operation of the projects, with relatively stable pool elevations, would maintain the existing emergent wetlands present on the margins of each project's reservoir.

While the overall potential for development of wetland and riparian habitats is limited by the adjacent topography bordering the bypassed reach (i.e., steep-walled gorge), Hawks Nest Hydro's Wetland and Riparian Habitat Study found the riparian habitat areas of the bypassed reach support species richness and diversity generally reflective of natural community expectations for this region (HDR, 2015d). The natural wetland vegetative communities that have developed in the bypassed reach under the existing operating regime of the Hawks Nest Project contain species that are tolerant of inundation and water level changes. As a result, they would not be adversely affected by

any increased inundation caused by the proposed or recommended minimum flow increases or recreation flows. The additional flow releases proposed by Hawks Nest Hydro, and recommended by Interior, AW, and WVPRO for the Hawks Nest Project may actually provide minor enhancement for riparian habitats in the Hawks Nest bypassed reach by increasing permanently wetted area.

Botanical and Wildlife Resources

While no significant construction activities are proposed by Hawks Nest Hydro at either the Hawks Nest Project or Glen Ferris Project, ongoing land and facility maintenance would be performed that have the potential to affect terrestrial resources. These activities include:

- Semi-annual (every other year) inspection of transmission line corridors: crews inspect the entire corridor in vehicles and on foot to document pole conditions and hazardous trees. Hazardous trees identified during inspections are removed during follow-up work by crews using hand tools (felled in place except when affecting road use). Fewer than 10 hazardous trees are typically removed in a treatment year.
- Periodic transmission line corridor vegetation management: transmission corridors are maintained by helicopter spraying of broad-spectrum herbicides every 4-5 years. Spraying is conducted by licensed contractors and in compliance with state regulations (West Virginia Code Title 61 Series 12D).

Hawks Nest states that these activities maintain the projects' transmission corridors in an early-successional state, dominated by grasses, shrubs, and small trees and supporting terrestrial wildlife species typical of these habitats.

Staff Analysis

Wildlife and botanical habitats and species in the vicinity of the projects are generally reflective of current project operations. The periodic vegetation management Hawks Nest Hydro proposes to continue likely results in short-term displacement of some common wildlife from these habitats, as existing shrubs are killed off and grasses and herbaceous plants replace them. This effect, and the small number of hazard trees removed in a given year, however, is a discountable effect in the largely undeveloped landscape in which the projects are situated because similar habitats are widely available, and the effects of these operation and maintenance procedures occur infrequently and temporarily. As a result, continued operation and maintenance of the Hawks Nest Project and Glen Ferris Project is not expected to have an effect on habitat for terrestrial wildlife or botanical resources.

Special Status Species

For special status plants, four species (McDowell sunflower, blue wild indigo, flat-stemmed spike-rush, and coppery St. John's wort) were identified during Hawks Nest Hydro's RTE Terrestrial Species Study (HDR, 2015e). These species had previously been documented in the area and are riparian specialists adapted to the periodic natural disturbance that is fundamental to riparian systems.

For special status species wildlife, Allegheny woodrat is confirmed to occur in the Hawks Nest Project boundary, and potential habitat for the species is located in multiple places that include rocky upland habitats unaffected by Hawks Nest or Glen Ferris Project operations and transmission corridor maintenance. Green salamander was not located during Hawks Nest Hydro's RTE Terrestrial Species Study (HDR, 2015e), and the species was last observed in the area in 1947. However, potential habitat for green salamander is documented in multiple locations between Hawks Nest dam and the surge basin, in riparian forested habitat, and in the riparian boulder field.

Staff Analysis

Habitats used by special status wildlife and botanical species are reflective of current operations and have been shaped by long-term operation of both projects. Hawks Nest Hydro does not propose to change operation of either the Hawks Nest or Glen Ferris Project, except for the increases in minimum flow at the Hawks Nest Project. Project maintenance at both projects would be expected to continue similarly to how it has in the past, with vegetation habitats remaining as they exist currently. As a result, continued operation and maintenance of the Hawks Nest Project and Glen Ferris Project is not expected to have an effect on special status plant or wildlife species.

Bald Eagle

Even though the bald eagle was delisted under the Endangered Species Act on August 8, 2007, they continue to be protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The Bald and Golden Eagle Protection Act, originally passed in 1940, provides for the protection of the bald eagle and the golden eagle (as amended in 1962) by prohibiting the take, possession, sale, purchase, barter; offer to sell, purchase or barter; transport, export, or import of any bald or golden eagle, alive or dead, including any part, nest, or egg unless allowed by permit (16 U.S.C. 668(a); 50 CFR 22). The Migratory Bird Treaty Act prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests except as authorized under a valid permit (50 CFR 21.11).

The FWS developed National Bald Eagle Management Guidelines (May 2007) that recommend the following to avoid disturbing nesting bald eagles:

- keeping a distance between the activity and the nest (distance buffers);
- maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers); and
- avoiding certain activities during the breeding season.

Hawks Nest Hydro proposes to continue to conduct routine right-of-way/transmission corridor maintenance and minimal hazardous tree/vegetation removal in accordance with the above FWS guidelines. In the event that a bald eagle nest is observed within the Hawks Nest or Glen Ferris Project boundary in the future, and activities are proposed or ongoing that are in the vicinity of the nest, Hawks Nest Hydro proposes and Interior recommends that Hawks Nest Hydro consult with the FWS on management measures that should be taken to avoid disturbance or other impacts to the species.

Staff Analysis

Operation and maintenance of the Hawks Nest and Glen Ferris projects do not currently affect bald eagles, because no nests have been observed or are believed to occur in or adjacent to either project's boundary. Given current population trends for the species, however, future use of both project areas by bald eagles is likely, as suitable habitat is widespread throughout each project's boundary. Bald eagles typically use large trees adjacent to waterbodies as forage perches and nest substrate. The existing suitable habitats are reflective of current activities, having been shaped by long term operation of the projects. Under Hawks Nest Hydro's proposal, neither Hawks Nest Project nor Glen Ferris Project operation will change during the term of new licenses for the projects, except for the increases in minimum flow proposed at the Hawks Nest Project and it would continue to conduct routine right-of-way/transmission corridor maintenance and minimal hazardous tree/vegetation removal in accordance with the FWS's 2007 bald eagle guidelines. In addition, Hawks Nest Hydro's proposal and Interior's recommendation to consult with FWS in the event bald eagles are documented within either project's boundary would ensure protection of the species if it uses either project area in the future. As a result, continued operation and maintenance of the Hawks Nest Project and Glen Ferris Project is not expected to have an effect on bald eagles.

3.3.3 Threatened and Endangered Species

3.3.3.1 Affected Environment

Listed Freshwater Mussels

There are six federally listed mussel species known to occur in the upper Kanawha River, four of which are found immediately downstream of the Glen Ferris Project (see section 3.3.1.1, *Aquatic Resources, Affected Environment- Freshwater Mussels*). No

federally listed mussel species are known to occur in the vicinity of the Hawks Nest Project. Nor is there any designated critical habitat in either of the project areas (Hawks Nest or Glen Ferris).

Pink mucket

The pink mucket (*Lampsilis abrupta*) is found primarily in the Tennessee, Cumberland, and Ohio River drainages, with occasional records from the Mississippi River drainage (FWS, 1985). Although it has a widespread distribution with at least 25 river systems listed as historically supporting pink mucket populations, it has never been found in large numbers at any one location (FWS, 1985). Present populations of the pink mucket are known from 16 different rivers representing three major geographic regions, the Tennessee River, Cumberland River, and Osage and Meramec rivers (FWS, 1985). Since the publication of the recovery plan, additional river systems have been identified; however, it has mostly disappeared from the upper and middle stretches of the Tennessee River and populations have become small and localized in the Cumberland River (Parmalee and Bogan, 1998).

A medium-sized mussel (up to four inches) with a thick, ovate shell, the pink mucket occurs in medium to large rivers in substrate ranging from silt to boulders, rubble, gravel, and sand. They seem to prefer moderate to fast-flowing water at depths of 1.5 to 26 feet but are also found in standing water (FWS, 1985). The pink mucket is usually associated with a diverse assemblage of other freshwater mussels (FWS, 1985).

Little is known of the basic life history requirements of this mussel, but it most likely follows the general habits of most freshwater mussels which have a parasitic larval stage (glochidia) that requires a fish host to metamorphose to juveniles. The fish hosts identified for the pink mucket include black bass (smallmouth, largemouth, and spotted bass) and walleye (Barnhart et al., 1997; Missouri DOC, 2007). Available information suggests they spawn from August to September and release glochidia the following year from May through July (Missouri DOC, 2007).

The pink mucket was listed as endangered in 1976 and a recovery plan was prepared in 1985 (FWS, 1985). Critical habitat has not been designated for this species. Reasons for decline are listed as construction of impoundments, which altered or eliminated stream habitat, siltation from coal mining activities, dredging, farming, logging, road construction, and pollution.

Sheepnose

The sheepnose mussel (*Plethobasus cyphyus*) is found across the Midwest and Southeast portion of the United States, including West Virginia. Declines throughout its distributional range have reduced populations of this mussel species to only one-third of

its historically known streams (FWS, 2012a). Most populations of sheepnose are small, geographically isolated, and susceptible to extirpation.

The sheepnose is a medium-sized mussel that grows to approximately 5 inches in length, with a thick and solid shell and is slightly longer than wide and somewhat inflated in appearance. Sheepnose live in larger rivers and streams and prefer shallow areas of coarse sand and gravel with moderate to swift currents, but has also been found in areas of mud, cobble, and boulders, as well as deep run habitats in large rivers (FWS, 2012a). Sheepnose mussels are reported to live as long as 30 years (FWS, 2012a).

Similar to other freshwater mussels, the life cycle of the sheepnose is complex and includes a parasitic larval stage (glochidia) that requires a host fish species to metamorphose to juveniles. Sheepnose glochidia are expelled in jellylike masses of mucus called conglutinates. Conglutinates are narrow, red or pink in color, and in a continuous line or worm-like in appearance. Upon being eaten by a fish, the glochidia are exposed to, and attach to, the fish's gills. The attached glochidia mature into juveniles within a few weeks, then drop off and find suitable habitat to grow and mature into adults. Sauger is the only confirmed wild fish host, while laboratory studies indicated sheepnose glochidia have successfully attached and transformed to juveniles on fathead minnow, creek chub, central stoneroller, and brook stickleback (FWS, 2012a).

Sheepnose mussel was listed as endangered in 2012. No recovery plan, critical habitat, or conservation plans have been developed for this species (FWS, 2015b). Increases in sedimentation, pollution, channelization from dredging, habitat changes and fragmentation, and invasion of nonnative species, such as the zebra mussel, have contributed to the decline of sheepnose throughout its range (FWS, 2012a).

Fanshell

The fanshell mussel (*Cyprogenia stegaria*) is an endemic species of the Ohio, Cumberland, and Tennessee River drainages (Jones and Neves, 2002). Current reproducing populations are known from only three rivers: the upper Clinch River in Tennessee and Virginia, and the Green and Licking rivers in Kentucky (FWS, 1991; Jones and Neves, 2002). Relict, but non-reproducing populations may exist in the Muskingum and Walhonding rivers in Ohio, Kanawha River in West Virginia, Wabash River in Illinois and Indiana, Barren River and Tygarts Creek in Kentucky, and the Tennessee and Cumberland rivers in Tennessee (FWS, 1991; Jones and Neves, 2002).

The fanshell is a medium-sized mussel that grows to approximately 3.2 inches in length and is sub-circular in appearance (FWS, 1991). The fanshell inhabits medium to large rivers in moderate current with a preference on shoals of coarse gravel and sand (Gordon and Layzer, 1989; Jones and Neves, 2002). Fanshell mussels are known to live up to 26 years (Jones and Neves, 2002).

A gravid fanshell produces reddish conglutinates that resemble oligochaetes in texture, shape, and color (Jones and Neves, 2002). Laboratory studies conducted by Jones and Neves (2002) indicate suitable host fish include mottled sculpin, banded sculpin, greenside darter, snubnose darter, banded darter, tangerine darter, blotchside logperch, Roanoke darter, and logperch.

Fanshell mussel was listed as endangered in 1990. In 2007, the fanshell populations in portions of the French Broad and Holston rivers in Tennessee were listed as experimental, non-essential populations (FWS, 2015c). The fanshell has recently been translocated to the Kanawha River at Kanawha Falls in West Virginia. The fanshell recovery plan was prepared in 1991 and the spotlight species action plan was prepared in 2009 (FWS, 2015c). No critical habitat or conservation plans have been developed for this species (FWS, 2015c). Construction activities such as impoundments, channel dredging, sand and gravel mining, and coal mining, as well as water pollution and sewage waste disposal have contributed to the decline of fanshell throughout its range (FWS, 1991; Jones and Neves, 2002).

Northern riffleshell

The taxonomy of the northern riffleshell (*Epioblasma t. rangiana*) has been debated and often confused with other closely related taxa (*E. t. torulosa*, *E. t. gubernaculum*, and *E. obliquata perobliqua*) such that some historical records may not be accurate (FWS, 1994, NatureServe, 2007). The northern riffleshell historically had an extensive distribution throughout the eastern and mid-western United States, including the Ohio, Tennessee, and St. Lawrence River drainages, and portions of southern Ontario, Canada. It has declined significantly throughout its range but is thought to still occur in the Kanawha and Elk rivers in West Virginia.

A small species, the northern riffleshell rarely exceeds 2 inches, has an irregular ovate, elliptical, or obovate shape and is shiny yellowish green with fine green rays. Shells are sexually dimorphic, with defined sulcus and torulus knobs on the posterior slope. As the name implies, northern riffleshell typically inhabits riffle areas with swift currents and coarse sand and gravel substrate (Parmalee and Bogan, 1998). Based on external annuli, this species may live for more than 15 years (FWS, 1994).

Very little is known regarding the reproductive strategy for this species, though it has been described as bradytictic (Ortmann, 1919 as cited in FWS, 1994). O'Dee and Watters (2000) collected gravid females in May and based on laboratory testing, determined potential fish hosts to include banded darter, bluebreast darter, and brown trout.

The northern rifflesheIl was listed as endangered in 1993 following substantial declines in abundance and a nearly 95 percent decrease in its range. A recovery plan was published by the FWS in 1994. Critical habitat has not been designated for this species. Past and continued threats are primarily linked to habitat degradation, including channelization, dredging, impoundments, cool water discharge from dams, sources of water pollution (runoff from agricultural areas as well as untreated wastewater and industrial effluents), and streambank erosion (FWS, 1994; NatureServe, 2007).

Snuffbox

The snuffbox (*Epioblasma triquetra*) historically occurred in 210 streams and 18 lakes across the United States, but has experienced a 62 percent range-wide decline and is now only found in 79 streams and lakes in 14 states including Alabama, Arkansas, Illinois, Indiana, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia (FWS, 2012b). Most populations are small and geographically isolated from one another, which increases their risk of extinction.

The snuffbox is a small- to medium-sized mussel that has a yellow, green, or brown shell interrupted with green rays, blotches, or chevron-shaped lines (FWS, 2012b). Shells are sexually dimorphic, as males have oblong or ovate shells and grow to slightly larger sizes (2.8 inches) than females (1.8 inches), which have triangular shells. The snuffbox is usually found in small- to medium-sized creeks, inhabiting areas with swift currents (FWS, 2012b). Adults prefer a mix of sand, gravel, and cobble substrate.

Similar to other freshwater mussels, the life cycle of the snuffbox is complex and includes a parasitic larval stage (glochidia) that requires a host fish species to metamorphose to juveniles. Snuffbox have lures that attract a host fish, and when the fish is close enough, the mussel clamps shut on the fish's head in an attempt to ensure successful infestation of glochidia onto the gills of the host fish. Logperch and Roanoke darter are known host fish for the snuffbox (Williams et al. 2008).

The snuffbox was listed as endangered in 2012. No critical habitat or conservation plans have been developed for this species. Increases in sedimentation, pollution, channelization from dredging, habitat changes and fragmentation, and invasion of nonnative species, such as the zebra mussel, have contributed to the decline of snuffbox throughout its range (FWS, 2012b).

Spectaclecase

The spectaclecase (*Cumberlandia monodonta*) historically occurred in at least 44 streams of the Mississippi, Ohio, and Missouri River basins in 14 states, but has been extirpated from three states and is currently found in only 20 streams and 11 states including Alabama, Arkansas, Illinois, Iowa, Kentucky Minnesota, Missouri, Tennessee,

Virginia, West Virginia, and Wisconsin (FWS, 2012c). Spectaclecase populations are usually fragmented and restricted to short stream reaches.

Spectaclecase are a large mussel species that can grow up to 9 inches in length, with an elongate shell that is often curved and somewhat inflated. Spectaclecase mussels are found in large rivers where they prefer sheltered areas away from the main river channel. They are often found in firm mud substrate in sheltered areas beneath rock slabs, between boulders, or under tree roots (FWS, 2012c).

Similar to other freshwater mussels, the life cycle of spectaclecase is complex and includes a parasitic larval stage (glochidia) that requires a host fish species to metamorphose to juveniles. Shorthead redhorse and bigeye chub are thought to be host fish for spectaclecase (Williams et al., 2008).

The spectaclecase was listed as endangered in 2012. No critical habitat or conservation plans have been developed for this species. Increases in sedimentation, pollution, channelization from dredging, habitat changes and fragmentation, and invasion of nonnative species, such as the zebra mussel, have contributed to the decline of spectaclecase throughout its range (FWS, 2012c).

Listed Terrestrial Species

There are five federally listed terrestrial species known to occur or having the potential to occur in the vicinity of the Hawks Nest and Glen Ferris projects. No critical habitat has been designated in either of the project areas (Hawks Nest or Glen Ferris).

Running Buffalo Clover

FWS listed running buffalo clover as endangered on July 6, 1987 and approved a revised recovery plan for the species on June 8, 1989. FWS has not designated any critical habitat for this species. Running buffalo clover is endangered because of habitat loss, competition from non-native species, unfavorable land practices, and the extirpation of bison from native habitat (as bison were eliminated, vital habitat and a means of seed dispersal were also lost).

Running buffalo clover is a perennial species with leaves divided into three leaflets and flowers from late spring to early summer. It derives its name from its production of runners (i.e., stolons) that extend from the base of erect stems and run along the surface of the ground. These runners are capable of rooting at nodes and expanding the size of small clumps of clover into larger ones. The flower heads are about 1-inch wide, white, and grow on stems that are 2 to 8 inches long. Each flower head has two large opposite leaves below it on the flowering stem (FWS, 2015d).

Running buffalo clover is found in Indiana, Kentucky, Missouri, Ohio, and West Virginia, but has been extirpated from Arkansas, Illinois, and Kansas. Running buffalo clover requires periodic disturbance and a somewhat open habitat to successfully flourish, but it cannot tolerate full-sun, full-shade, or severe disturbance. Historically, running buffalo clover was found in rich soils in the ecotone between open forest and prairie. Those areas were probably maintained by the disturbance caused by bison. Today, the species is found in partially shaded woodlots, mowed areas (lawns, parks, cemeteries), and along streams and trails.

One population of running buffalo clover is known to occur within the Hawks Nest Project boundary, near Cotton Hill. Hawks Nest Hydro's existing license requires the licensee to implement monitoring and protection measures for this population of running buffalo clover, which has been the subject of species management activities by West Virginia DNR and FWS. Pursuant to the plan, Hawks Nest Hydro coordinates an annual meeting with representatives of the West Virginia DNR and the FWS during the running buffalo clover growing season, and files annual reports on activities conducted under the plan with FERC and the consulting agencies. The most recent report detailing the 2016 monitoring of the Cotton Hill site was filed with FERC on July 21, 2016. As stated in the report, 62 rooted crowns with about 11 flowering stems were observed. This is a substantial increase from previous years when a single rooted crown was observed in each 2012 and 2013, eleven rooted crowns (with two flowering stems) were observed in 2014, and 51 rooted crowns (with 12 flowering stems) were observed in 2015.

Indiana Bat

The Indiana bat is a federally listed endangered species that is known to occur in Fayette County, West Virginia. The FWS listed the Indiana bat as endangered on March 11, 1967. Critical habitat for the Indiana bat was designated on September 24, 1976 and consisted of 11 caves and two mines in six states. The original recovery plan for the species was published in 1983 and a revised version was released in 2007. In winter, the species hibernates colonially in limestone and sandstone caves, cliff lines, and abandoned mine shafts from October through April. The non-hibernation season (April 1 through November 15) includes spring emergence and migration, summer reproduction in maternity roosts, and fall migration, swarming, and mating. Loss, degradation, and fragmentation of roosting habitat in hibernacula or maternity colonies are major factors in their decline.

No critical habitat is designated within the Hawks Nest and Glen Ferris project boundaries. Hellhole Cave in Pendleton County, which is more than 100 miles northeast of the projects is a Priority 1 hibernacula (≥10,000 bats) and is designated as critical habitat for the Indiana bat. Indiana bat populations at Hellhole Cave had been increasing

since 2001 to about 15,000 individuals. However, since white-nose syndrome[31] was confirmed at Hellhole Cave in 2009, Indiana bat populations have declined by about 90 percent (Stihler, 2013).

In summer, most reproductive Indiana bat females occupy roost sites under the exfoliating bark of dead trees that retain large, thick slabs of peeling bark. Primary roosts usually receive direct sunlight for more than half the day. Roost trees are typically within canopy gaps in a forest, in a fence line, or along a wooded edge. Habitats in which maternity roosts occur include riparian zones, bottomland and floodplain habitats, wooded wetlands, and upland communities. Indiana bats typically forage in semi-open to closed (open understory) forested habitats, forest edges, and riparian areas (FWS, 2007). The Indiana bat is known from winter and summer non-reproductive records in Fayette County, West Virginia, and has also been documented using abandoned mine portals in the New River Gorge National River area (FWS, 2015e; Gates and Johnson, 2007). Castleberry et al. (2007) documented Indiana bats at 12 percent of acoustic survey sites in the New River Gorge, and Indiana bats have been captured during fall mine portal surveys in the New River Gorge (Johnson et al., 2003; Gates and Johnson, 2007). Hawks Nest Hydro's field studies also documented Indiana bat use of the Hawks Nest Project vicinity with the probable presence of Indiana bats recorded at two acoustic survey locations in 2013 (9 percent of all survey sites).

Additional winter records in the region are known from Greenbriar, Mercer, Monroe, and Pocahontas counties. A maternity colony is known from Boone County, located two counties to the west of Fayette County (Beverly et al. 2009). Habitat suitable for Indiana bat is available within the project boundaries. Hawks Nest Hydro surveyed 19 forest stands for potential Indiana bat roosting and/or foraging habitat during the 2013 relicensing studies. Potential roosting habitat was identified as "low," "moderate," or "high" based on the following stand characteristics: (1) size and relative abundance of large trees and snags that potentially serve as roost trees; (2) canopy closure; and (3) understory clutter/openness. Two stands were identified as having high roosting potential for Indiana bats, 12 had low potential, and the remaining five had no potential roosting habitat. Forty-five potentially suitable Indiana bat roost trees were identified within the Hawks Nest project boundary; these trees are generally available within the surrounding landscape as well and are assumed to occur within the Glen Ferris project boundary. Potential Indiana bat foraging habitat within the Hawks Nest project boundary was identified as "low," "moderate," or "high" based on the following stand characteristics: (1) amount of forested edge and/or shrubby old field present; (2) size and relative abundance of trees; (3) understory clutter/openness; and (4) distance to water.

[31] White-nose syndrome is a fungal infection that agitates hibernating bats, causing them to rouse prematurely and burn fat supplies. Mortality results from starvation or, in some cases, exposure.

Five stands were identified as having moderate foraging potential for Indiana bats, 11 stands had low foraging potential, and the remaining three had no foraging potential. Figures 23 through 26 depict habitat suitable for Indiana Bat.

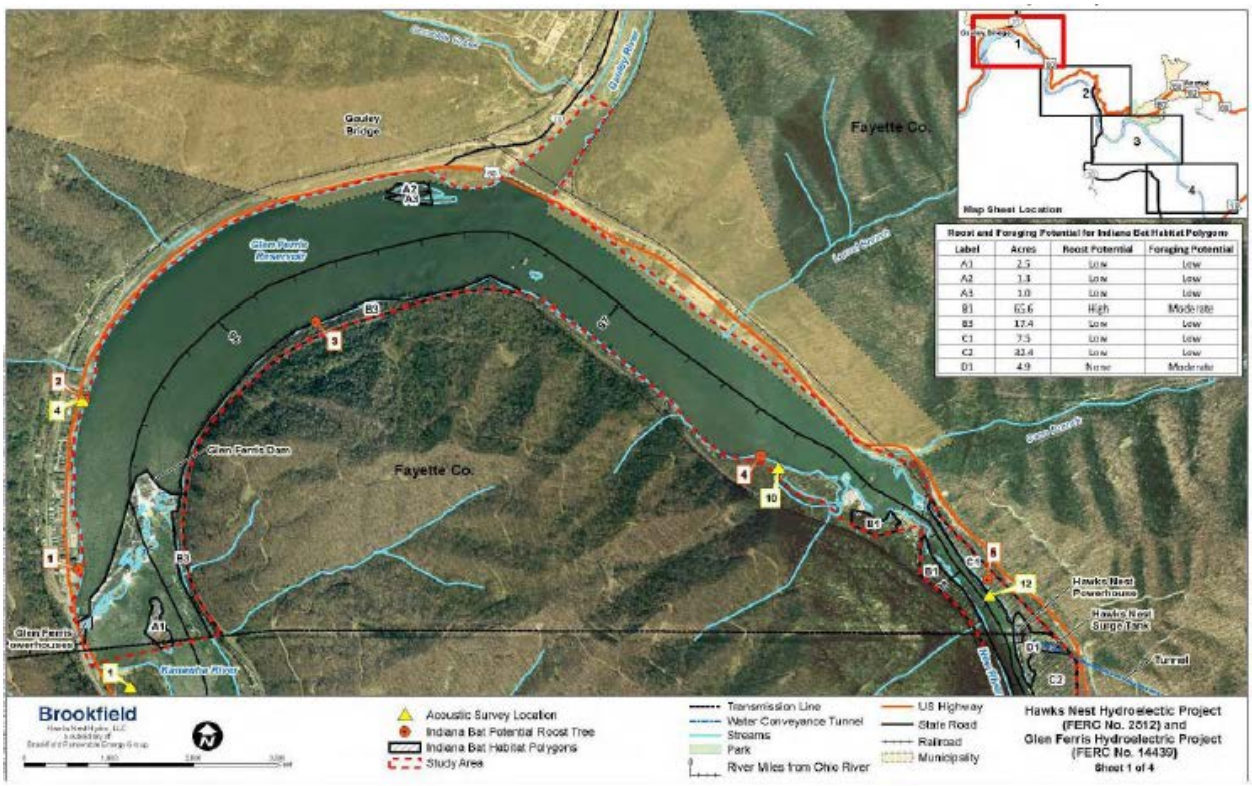

Figure 23. Suitable and potential habitat for Indiana bat, map 1 of 4 (Source: license application).

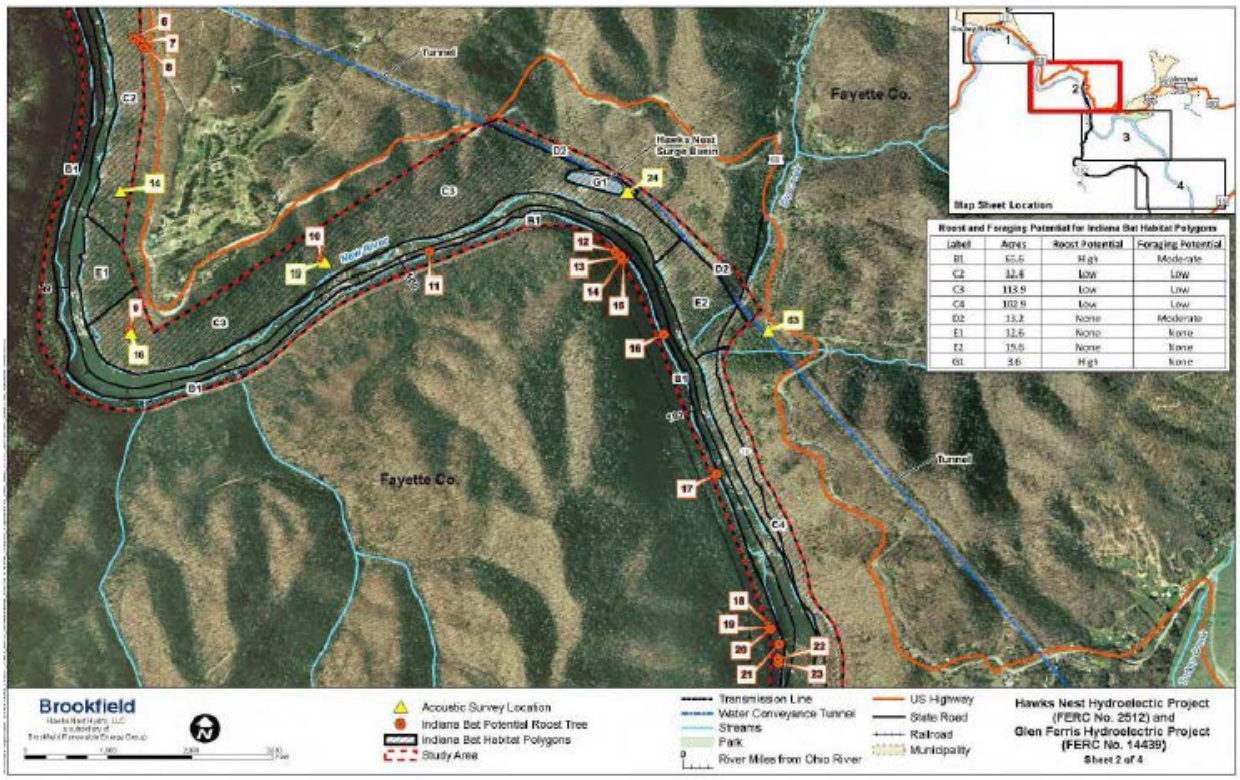

Figure 24. Suitable and potential habitat for Indiana bat, map 2 of 4 (Source: license application).

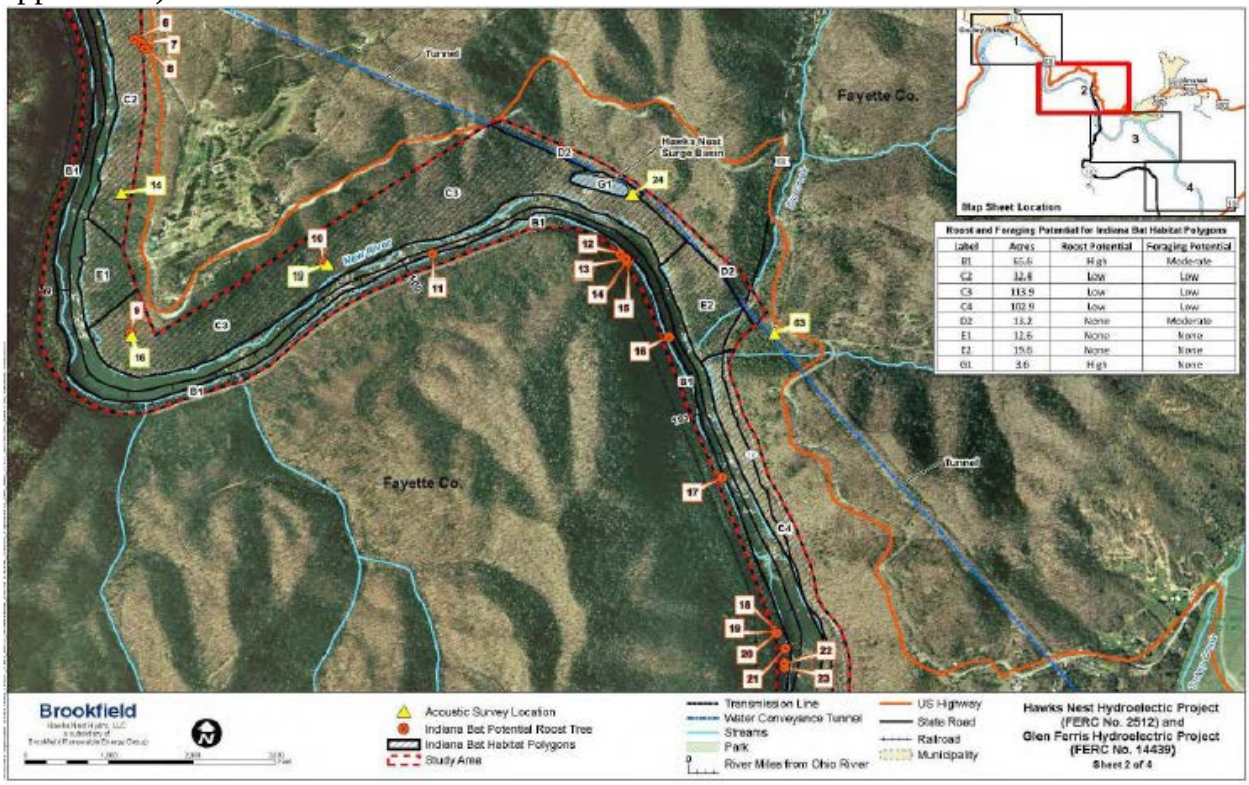

Figure 25. Suitable and potential habitat for Indiana bat, map 3 of 4 (Source: license application).

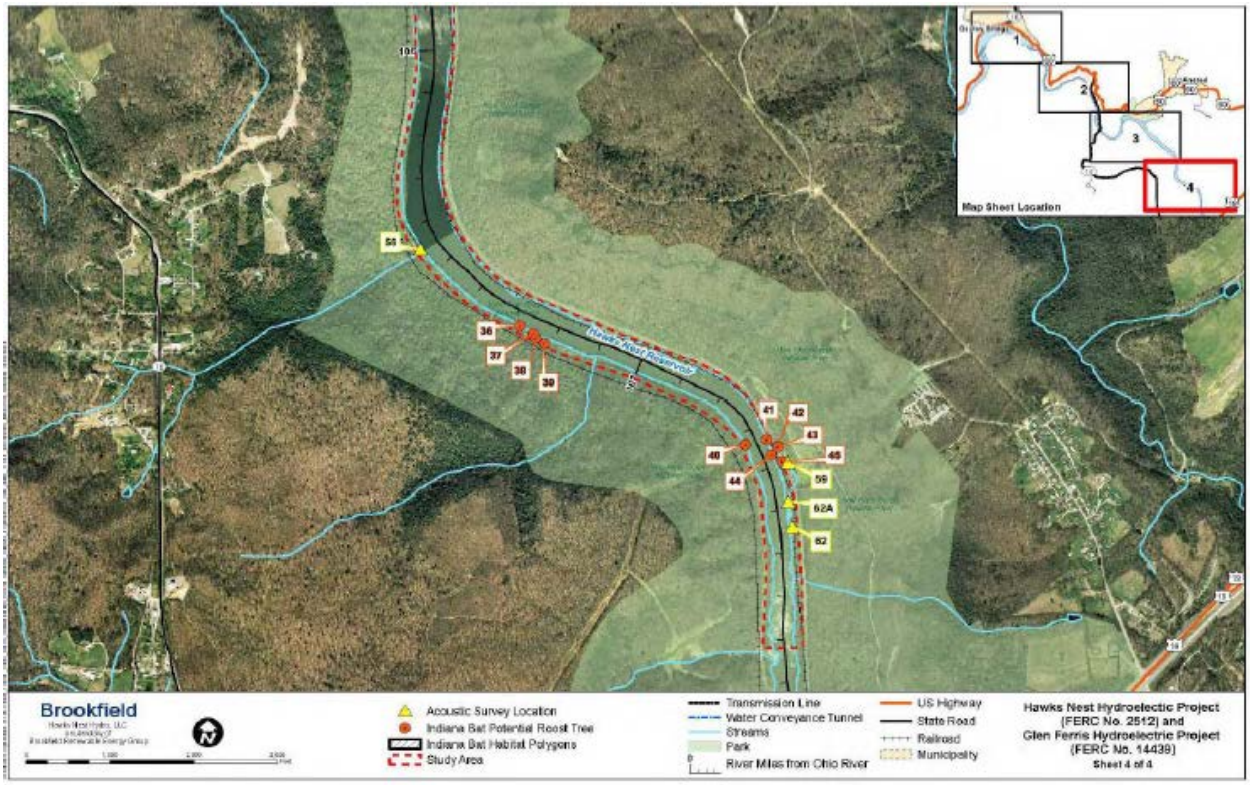

Figure 26. Suitable and potential habitat for Indiana bat, map 4 of 4 (Source: license application).

Northern Long-Eared Bat

FWS listed the northern long-eared bat as threatened on May 4, 2015 and has not determined or designated any critical habitat for the species.

The northern long-eared bat is a medium-sized bat that is distinguished by its long ears. The species' range includes 37 states. As with Indiana bats, northern long-eared bats use caves or mine portals for winter hibernation between November 15 and March 31. These species also use the hibernacula and the areas around them for fall-swarming and spring-staging (August 15 to November 14 and April 1 to May 14, respectively).

White-nose syndrome is currently the predominant threat to this bat, especially throughout the Northeast where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites (FWS, 2016a). White-nose syndrome was first observed in New York in 2006 and has since spread throughout the Northeast and into the Midwest. Within the past several years, federal and state wildlife agencies have taken measures to protect hibernacula through signage and other means. FWS most recently finalized 4(d) rules for this species in January 2016, focusing on preventing effects on bats in hibernacula associated with the spread of white-nose

syndrome and effects of tree removal on roosting bats or maternity colonies (FWS, 2016d). In the rule, FWS concludes that take incidental to certain activities conducted in accordance with the following habitat conservation measures, as applicable, would not be prohibited (i.e., excepted from the take prohibitions): (1) occurs more than 0.25 mile (0.4 kilometer) from a known, occupied hibernacula; (2) avoids cutting or destroying known, occupied maternity roost trees during the pup season (June 1–July 31); and (3) avoids clearcuts within 0.25 mile (0.4 kilometer) of known, occupied maternity roost trees during the pup season (June 1–July 31).

The northern long-eared bat was the third most-common species recorded during Hawks Nest Hydro's field study, documented at 12 of 23 acoustic survey sites. The northern long-eared bat was the second most-common species in summer mist netting surveys (Castleberry et al., 2007) and the third most-common species captured during fall portal trapping (Gates and Johnson, 2007) by other researchers in the New River Gorge. Northern long-eared bats have been found in over 40 abandoned coal mines during winter surveys conducted from 2002 to 2011 in the New River Gorge (FWS, 2015f). This species can be found throughout much of the eastern and north-central U.S. and southern Canada, and is one of the most common species captured throughout much of the Appalachian Mountains (Ford et al., 2011; Timpone et al., 2011). However, acoustic studies have reported that this species is often under-sampled due to the low intensity echolocation calls it produces (Broders et al., 2004; Owen et al., 2004).

Virginia Big-Eared Bat

Virginia big-eared bat is a medium-sized bat with distinctive long ears (over 2.5 centimeters) and facial glands on either side of its snout. The species is known to occur in Kentucky, North Carolina, Tennessee, Virginia, and West Virginia (FWS, 2016b). FWS listed Virginia big-eared bat as endangered on December 31, 1979 and approved a recovery plan May 5, 1984. Although not detected during Hawks Nest Hydro's studies, Virginia big-eared bat may occur in Fayette County, West Virginia and within the projects' boundaries.

Virginia Spiraea

Virginia spiraea is found in the Appalachian Plateaus or the southern Blue Ridge Mountains in Alabama, Ohio, West Virginia, Virginia, Tennessee, North Carolina, Kentucky, and Georgia. Mature plants reach a height of three to ten feet and the roots form a complex system. Young stems are greenish-yellow to dark brown and mature stems are dark gray. The plant has creamy white flowers that are in tightly packed bunches and most of the existing populations consist of only a few clumps (FWS, 2016c).

FWS listed Virginia spiraea as threatened on June 15, 1990 and approved a recovery plan on November 13, 1992. FWS has not designated any critical habitat for

this species. West Virginia DNR has record of one historic occurrence of Virginia spiraea at the site of Hawks Nest dam; this occurrence was last observed in 1961 and is listed by the agency as extirpated. No evidence of Virginia spiraea was observed during Hawks Nest Hydro's field studies.

3.3.3.2 Environmental Effects

Listed Freshwater Mussels

Federally listed mussel species have been documented in the Kanawha River downstream of the Glen Ferris Project. Federally listed mussels were not documented in the Glen Ferris reservoir or at the Hawks Nest Project (see section 3.3.1.1, *Aquatic Resources, Affected Environment- Freshwater Mussels*). Hawks Nest Hydro proposes to continue operating the Glen Ferris Project in a run-of-river mode, with outflows from the powerhouses (which are integral with the dam) approximating inflows to the reservoir. In their 10(j) letter filed with the Commission on June 3, 2016, Interior did not identify any new effects that would result from continued operation under the existing license conditions and stated that if project operation changes, consultation with it may be required.

Staff Analysis

Mussel populations immediately downstream of the Glen Ferris Project appear to be thriving. Monitoring of the mussel bed located at the base of Kanawha Falls found that translocated fanshell mussels are successfully reproducing as evidenced by untagged (newly recruited) juveniles at the mussel bed (Brookfield Renewable Power, 2009). In addition, monitoring results indicate the mussel community in this area is maintaining its high diversity and density, with evidence of increased recruitment of numerous species, all of which are indicative of healthy populations (Brookfield Renewable Power, 2009). Given that mussel populations, including the four federally listed species documented from Glen Ferris, are healthy under the existing project operating conditions, continuing to operate the Glen Ferris project under the applicant's proposal (with no change in project operation) would have no effect on listed mussel species.

Listed Terrestrial Species

Wildlife habitats and species in the vicinity of the projects are reflective of current project operations. Having been shaped by long-term operation of the projects, these habitats exist because of, and are maintained by, operation of the projects. At the Glen Ferris Project, Hawks Nest Hydro proposes to maintain the existing run-of-river mode of operation. At the Hawks Nest Project, while Hawks Nest Hydro proposes to maintain the run-of-river mode of operation, the existing 100-cfs minimum flow, and the existing ramping rates, it also proposes increased flow releases in the bypassed reach in the form

of increased seasonal minimum flows when river flow to the project exceeds 1,700 cfs and a recreation flow release provided annually during the Memorial Day 3-day weekend. Interior, AW, and WVPRO, also propose higher minimum flows and scheduled recreation flows for the Hawks Nest Project bypassed reach.

While no significant construction activities are proposed by Hawks Nest Hydro, ongoing land and facility maintenance performed by Hawks Nest Hydro has the potential to affect terrestrial habitats for special status species. These activities maintain each project's transmission corridors in an early-successional state, dominated by grasses, shrubs, and small trees, and support terrestrial wildlife species typical of these habitats.

Running Buffalo Clover

One occurrence of running buffalo clover is known to occur in upland forest near Cotton Hill, within the Hawks Nest Project boundary on lands owned and managed by West Virginia DNR. This occurrence is outside the influence of typical Hawks Nest Project operations and is not in the vicinity of any transmission corridor maintenance. Under the Running Buffalo Clover Management Plan approved as part of the existing license, Hawks Nest Hydro coordinates an annual meeting and inspection with West Virginia DNR and FWS during the running buffalo clover growing season and files a report with the Commission that summarizes the meeting and any recommendations from the agencies for the protection and recovery of the species.

The running buffalo clover population at the Hawks Nest Project is subject to biological competition and has been subjected to anthropogenic disturbance in the past, though based on consultation with West Virginia DNR in association with the 2015 and 2016 annual inspection, the population remains intact and viable. When it occurred, the disturbance was identified and immediately reported to the consulting agencies through processes and practices established by the existing management plan. As a result, the existing plan provides protection for this species/occurrence. For the relicensing, Hawks Nest Hydro has developed an updated Running Buffalo Clover Management Plan (Appendix B of the final license application) and, pursuant to this plan, proposes to continue to monitor and maintain the Cotton Hill population in cooperation with West Virginia DNR and FWS. Interior also recommends, pursuant to section 10(j), that Hawks Nest Hydro continue to implement running buffalo clover protection and management activities in accordance with an approved Running Buffalo Clover Management Plan and in consultation with West Virginia DNR and FWS.

Staff Analysis

Under Hawks Nest Hydro's and the agencies' management, the single known population of running buffalo clover at the Hawks Nest Project has increased substantially over the past four years. In its letter providing Hawks Nest Hydro with the

results of its 2016 running buffalo clover survey (filed by Hawks Nest Hydro on July 21, 2016), FWS states that the licensee has not harmed the population of running buffalo clover and with the agencies' cooperation, has successfully restored the population to the status it had when it was first discovered in 1987. With Hawks Nest Hydro's continued implementation of its running buffalo clover protection and management measures through an updated Running Buffalo Clover Management Plan and because Hawks Nest Hydro is not proposing any operational changes to the Hawks Nest Project, the Hawks Nest Project would not be likely to adversely affect running buffalo clover.

Indiana Bat, Northern Long-Eared Bat, and Virginia Big-Eared Bat

Both projects are within the range of Indiana bat, northern long-eared bat, and Virginia big-eared bat. Project maintenance, such as clearing trees during the routine transmission line inspections, and any vegetation clearing done for proposed recreation use enhancements could affect the ESA-listed bat species by removing potential roosting habitat or causing direct mortality during roosting season.

Hawks Nest Hydro does not propose any measures directly related to ESA-listed bat species. Interior, pursuant to section 10(j), recommends that Hawks Nest Hydro conduct any necessary tree removal activities between November 15 and March 31 in order to avoid the injuring or killing of federally listed bat species or migratory birds known to be present within the vicinity of the two projects.

Staff Analysis

Indiana bat and northern long-eared bat are known from Fayette County, West Virginia, and are confirmed to occur within the Hawks Nest Project boundary and likely in the Glen Ferris Project boundary, as well. While not detected during Hawks Nest Hydro's field surveys, Virginia big-eared bat may also occur in Fayette County and within the projects' boundaries. The acoustic survey data from the RTE Terrestrial Species Study (HDR, 2015e) did not discern which type of Indiana bat population (e.g., bachelor vs. maternity colony) is present in the study area. No known Indiana bat hibernacula exist in the immediate vicinity of the projects, and currently there are no maternity colony records from Fayette County (Sargent, 2014). Therefore, it is likely that the calls recorded during this study are from males and/or non-reproductive female Indiana bats.

Suitable foraging and potential roosting habitat for bats, including the species listed above, is common in the project areas, which support a range of upland, riparian, wetland, and open-water habitats, as well as local potential habitat features such as mines. While maintenance-related tree removal activities or vegetation clearing for the proposed recreation enhancements could affect bat habitat, the proposed activities for both projects

are minor and would not have adverse effects on overall habitat quality or availability. Furthermore, implementing Interior's recommendation to conduct any tree removal between November 15 and March 31, would help to avoid killing or injuring bats or any migratory birds using the project area. Therefore, the Hawks Nest and Glen Ferris projects would not be likely to adversely affect Indiana bat, northern long-eared bat, and Virginia big-eared bat.

Virginia Spiraea

Hawks Nest Hydro did not locate any occurrences of Virginia spiraea within the project boundaries during its RTE Terrestrial Species Study. The one occurrence of Virginia spiraea known from the vicinity was last observed in 1961 and is listed by West Virginia DNR as extirpated (West Virginia DNR, 2015b).

Staff Analysis

Because the species does not occur in the project boundaries, the Hawks Nest and Glen Ferris projects would have no effect on Virginia spiraea.

3.3.4 Recreation

3.3.4.1 Affected Environment

Local and Regional Recreation Opportunities

Recreation opportunities including hiking, climbing, kayaking, rafting, camping, and hunting abound locally and regionally due to the wild and rugged nature of the region. The defining physical characteristics of the area include heavily forested lands, deep valleys, steep mountain slopes, and high plateaus. Recreation and public access are provided locally at the Hawks Nest State Park, New River Gorge Campground, New River Gorge Bridge, and the Summit Bechtel Family National Scout Reserve. Recreation opportunities include access to the New River, boating, camping, fishing, and BASE jumping[32] off the New River Gorge Bridge on the annual Bridge Day celebration in October.

Regionally, there are six state parks, three wildlife management areas, and three federally designated recreation areas within a 50-mile radius of the projects. The state parks within the region include Babcock State Park, Bluestone State Park, Pipestem

[32] BASE stands for Building, Antenna (tower), Span (arch or bridge), and Earth (cliff or natural formation), the four categories of fixed objects from which one can jump.

Resort State Park, Camp Creek State Park, Carnifex Ferry Battlefield State Park, and Little Beaver State Park. The state parks offer a variety of lodging options including primitive camping, tent camp sites, RV sites, cabins, and lodges. Recreation opportunities include playgrounds, picnic shelters, picnic tables, grills, boat ramps, game courts, horseback riding, horse trails, hiking and biking trails, swimming, and amphitheaters. The Bluestone Wildlife Management Area, Plum Orchard Wildlife Management Area, and the Summersville Lake Wildlife Management Area encompass a total of 26,807 acres; each management area provides access for hunting, fishing, hiking, camping, and picnicking.

The Park Service has three National Park System units within an hour's drive of the projects: the New River Gorge National River, the Gauley River National Recreation Area, and the Bluestone National Scenic River. The New River Gorge National River provides whitewater paddling, rock climbing, hiking, camping, hunting, picnicking, wildlife observation, motor boating, and fishing opportunities. The New River Gorge National River offers a variety of experiences through recreational pursuits, the culture and history of the area, and sightseeing opportunities. The proximity of the New River Gorge National River to major metropolitan centers has increased its popularity as a tourist destination. Table 12 lists several metropolitan areas within about 5 hours of the New River Gorge National River.

Table 12. Distances from the New River Gorge National River (Source: license application and Google Maps).

Metropolitan Area	Approximate Distance (Miles)	Approximate Drive Time
Charleston, West Virginia	70	1:30
Morgantown, West Virginia	175	3:00
Winston-Salem, North Carolina	180	3:00
Greensboro, North Carolina	210	3:30
Columbus, Ohio	230	4:00
Charlotte, North Carolina	230	3:45
Lexington, Kentucky	245	4:00
Pittsburgh, Pennsylvania	250	4:15
Richmond, Virginia	262	4:20
Knoxville, Tennessee	275	4:20
Washington, D.C.	309	5:15

The Gauley River National Recreation Area is primarily known for its whitewater boating opportunities, especially for the six weekends of whitewater releases after Labor Day known as "Gauley Season." The Bluestone National Scenic River is a day-use area that offers hiking, biking, equestrian trails, picnicking, hunting, fishing, and boating

opportunities.

The Kanawha Falls site provides public access to the Kanawha River near the Glen Ferris Project (figure 27, but is not a project recreation site. Prior to the development of the Kanawha Falls site, the land existed as an undeveloped parcel adjacent to the existing project boundary. A previous licensee developed the Kanawha Falls site several decades after the hydroelectric project was built.[33] While the Kanawha Falls site provides the only recreation access near the Glen Ferris Project, the site is not considered a project recreation site because it is outside of the project boundary and it was built after the project was constructed.

The Kanawha Falls site is located on a peninsula about 500 feet downstream of the Glen Ferris dam. The site includes a boat ramp, a parking area for approximately 50 vehicles including boat trailers, a fishing platform, picnic area, and short hiking trails. Visitors are able to enjoy views of the Glen Ferris dam and Kanawha Falls, fish from the shoreline, and observe wildlife at this site. The site and its facilities are owned and operated by the West Virginia DNR.

[33] As a condition of the September 9, 1986 water quality certification issued by the West Virginia DNR, the undeveloped parcel near the Glen Ferris Project was required to be deeded to the West Virginia DNR. The water quality certification included a condition that the West Virginia DNR would provide developments to facilitate public fishing access in the vicinity of the Glen Ferris Project (which became the Kanawha Falls site).

Figure 27. Recreation sites at the Hawks Nest and Glen Ferris projects (Source: staff).

Project Recreation

Within the Hawks Nest project boundary, the Cotton Hill site[34] and the Hawks Nest Powerhouse site provide public access to the New River (figure 27). The Cotton Hill site is located on the northeast side of the Cotton Hill Bridge as State Route 16 crosses the New River. The Cotton Hill site includes a 10-acre parcel of land downstream of the Cotton Hill Bridge as well as land upstream between the Cotton Hill Bridge and the Hawks Nest dam (figure 28).

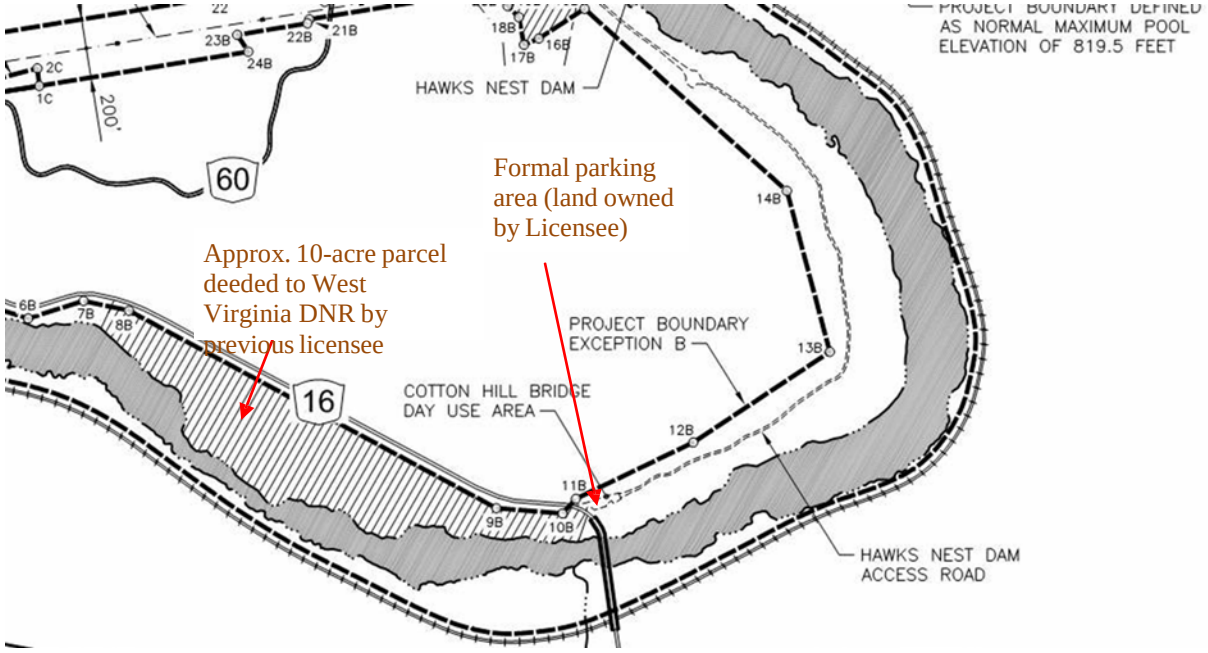

Figure 28. Cotton Hill site land ownership (Source: Hawks Nest Hydro).

The Cotton Hill site is a day-use facility with a gravel parking lot for up to 12 vehicles and includes access to multiple informal trails that provide hiking, fishing, and boating access to the bypassed reach. The site also provides access in the upstream direction, along the dam access road, to a point approximately 0.1 mile from the dam. While the access road is closed to public vehicular traffic by a locked gate, the access

[34] As a condition of the September 9, 1986 water quality certification issued by the West Virginia DNR, the Cotton Hill site was required to be deeded to the West Virginia DNR. The 1988 deed agreement required that the Cotton Hill site remain compatible with Hawks Nest Project recreational use and that the construction, operation, and maintenance of structures or facilities on the property would protect the scenic, recreational, and environmental values of the Hawks Nest Project.

road is open for pedestrian access. Between the Cotton Hill site and the dam, there are seven trails from the access road that lead to the river (figure 29). Paddlers can walk about 1 mile beyond the locked gate along the access road to the uppermost trail (feature 1 of figure 29) that leads to the river. The site comprises lands owned by the licensee and land that has been deeded to the West Virginia DNR.

There are also multiple informal access areas downstream of the Cotton Hill site. Along State Route 16, which parallels the New River for about 1.5 miles, there are 10 informal access trails to the bypassed reach including 5 informal gravel parking turnouts which provide access for fishing, boating, bouldering, sightseeing, hiking, and swimming (figure 29). The informal access areas are located on the land that was deeded to the West Virginia DNR.

The Cotton Hill site is maintained and operated by the West Virginia DNR through funding from Hawks Nest Hydro's annual recreation payments, pursuant to the water quality certification issued by the West Virginia DNR on September 9, 1986. Included in the water quality certification is a requirement for Hawks Nest Hydro to provide $50,000 annually to the West Virginia DNR for road and trail construction and maintenance, or other public hunting and fishing development or maintenance measures deemed necessary by the West Virginia DNR on lands deeded to the West Virginia DNR. In addition to the payment of $50,000, the licensee provides annual funds to develop and improve recreation and public access sites through its Resource Enhancement Plans, which are filed for Commission approval every 5 years. The funding provided by the licensee has allowed the West Virginia DNR to install courtesy docks, repair and expand parking areas, construct fishing platforms and boat launches, install lighting at recreation areas, perform studies on different species, and stock the river with various fish species. [35]

The second formal project recreation site within the project boundary is the Hawks Nest Powerhouse site, a day-use facility adjacent to the Hawks Nest powerhouse. The site includes a paved parking area for approximately 17 vehicles, steps leading to the New River for angler access, and a fenced walkway to a tailrace catwalk fishing platform. Hawks Nest Hydro owns, maintains, and operates the Hawks Nest Powerhouse site.

[35] *See* pp. 240-241 of the license application for a listing of annual enhancements since 1994.

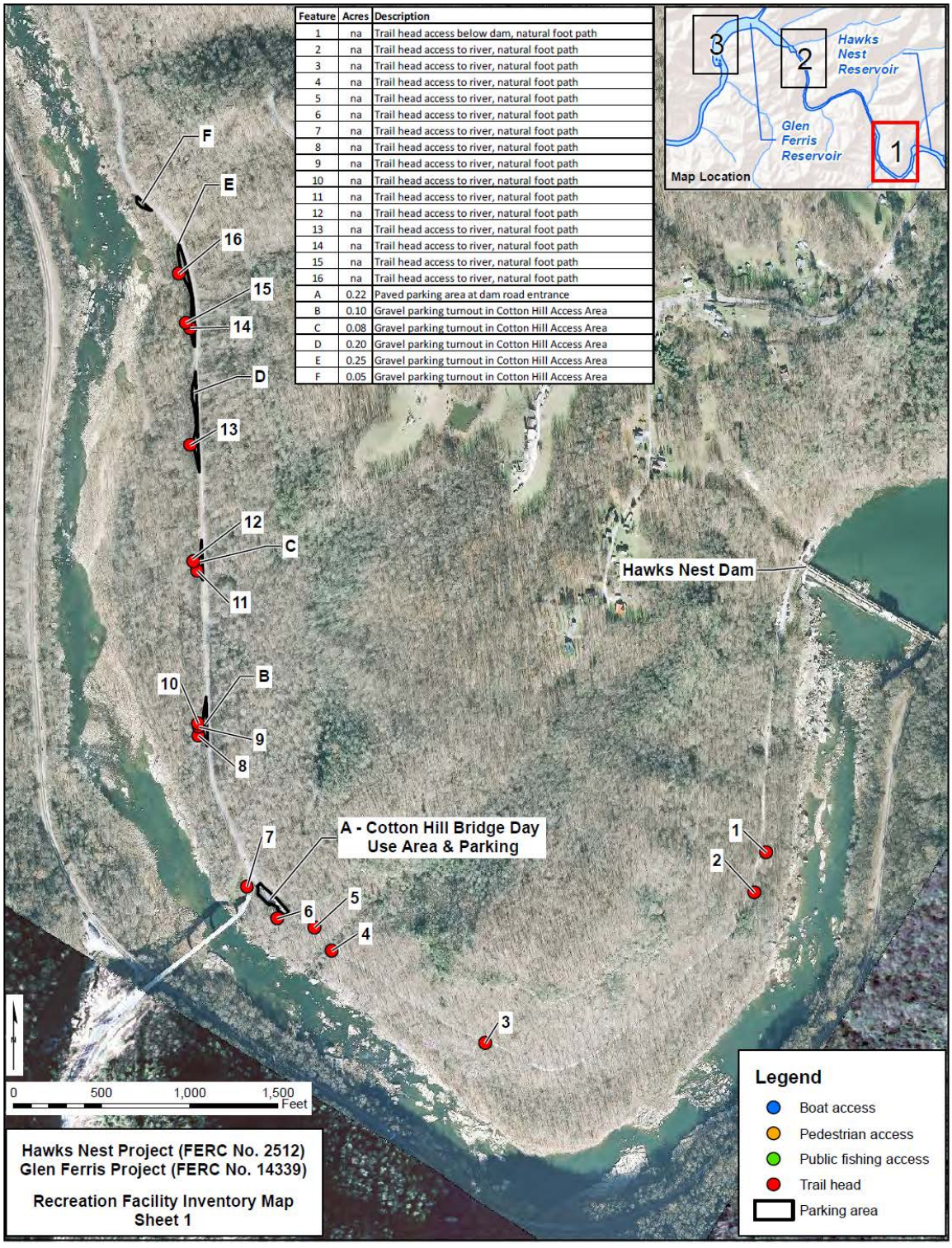

Figure 29 Cotton Hill and Hawks Nest Dam Access Trails (Source: license application).

River Recreation Use

Available flows that provide a class III[36] boating experience in the bypassed reach are reported to occur at least 80 days per year by Hawks Nest Hydro. These boatable flows are unscheduled and unmonitored; therefore, usage data has not been collected and is unavailable. Other rivers with extensive whitewater recreation use within 5 hours of the project include the: class II-III Shenandoah River about 5 hours northeast of the project; class III Youghiogheny River (Pennsylvania) about 3.5 hours north; class III-IV Cheat River, about 3 hours north; class IV-V Gauley River about 30 minutes north; and multiple sections of the New River ranging from class II-IV upstream of the project (AW, 2016a).

Since 1995, the West Virginia DNR Whitewater Commission (Whitewater Commission) has tracked the number of individuals that have participated in guided whitewater paddling trips on the New, Gauley, Cheat, and Shenandoah Rivers. The Whitewater Commission's 2015 River Usage Report showed a total of 134,082 individuals that participated in guided whitewater paddling trips in West Virginia (West Virginia, 2016). On the Shenandoah River, the Whitewater Commission reported 26,085 individuals participated in guided trips. On the Cheat River, the Whitewater Commission reported a total of 3,004 individuals that participated in guided trips. The Gauley and the New River received the most use with 104,978 individuals participating in guided whitewater paddling trips. At the Gauley River, where guided whitewater trips are only held during the six weekend fall releases known as Gauley Season, total 2015 usage was 19,642 individuals. On the free-flowing New River, which includes three sections of the Upper New River and the New River Gorge, the Whitewater Commission recorded 85,336 individuals. The majority of individuals (70,718) paddled the New River Gorge, which is the closest whitewater reach to the project.

Recreation Studies

Hawks Nest Hydro completed two recreation studies in preparing its license application: a Recreation Use and Needs Assessment and a Recreation Flow Assessment. The studies provided information that characterizes how the public uses the recreation areas at the projects and included recommendations from the public for improvements at the projects.

[36] The International Scale of River Difficulty is a rating system used to compare rivers around the world. It uses a class I (easy) to class VI (expert) ranking depending upon the difficulty of the rapids on the river.

Recreation Use and Needs Assessment

The objectives of the Recreation Use and Needs Assessment were to: (1) assess the need for enhancing existing or developing new recreation access at the projects; (2) gather information on existing and potential uses of the river corridor in the project areas; and (3) evaluate the impacts of existing or recommended project operations on recreation facilities and opportunities. A working group consisting of AW, ACE Adventure Resort, New River Conservancy, the Park Service, New River Alliance of Climbers, private river users, USGS, WVAM, West Virginia DNR, WVPRO, and Commission staff was created to assist in the development and execution of the study.

The assessment included a Recreation Facility Inventory, vehicle counts, recreation survey drop boxes, a County Resident User Survey, a Recreation Activities and Facilities Survey, and an Area Event Survey. The Recreation Facility Inventory identified designated and informal access areas surrounding the project area. The vehicle counts were conducted at the Cotton Hill site and the Kanawha Falls site on six days during the summer of 2013 (two weekdays, two weekend days, and two holidays from 9 a.m. to 5 p.m.). The general recreation surveys and drop boxes were located at the Cotton Hill site and the Kanawha Falls site from July 2013 through February 2014; there were 570 surveys collected from the drop boxes. The County Resident User Survey was distributed to 2,000 Fayette County residents and 276 responses were received. The Recreation Activities and Facilities Survey was distributed to 42 local, state, federal, non-governmental, and commercial recreation representatives who had knowledge of the recreational opportunities at the projects; seven responses were received. The Area Event Survey was distributed to attendees of the New River Rendezvous rock climbing festival in May 2013; 76 surveys were completed.

Recreation Flow Assessment

Experienced whitewater kayakers are drawn to the bypassed reach when flows in the bypassed reach exceed 10,000 cfs. These flows, which occur after extensive periods of heavy rain, create waves and holes that make the Dries a kayaking destination for wave surfing and playboating. The character and features of the Dries at high flows are widely known in the whitewater community (AW, 2016b). However, prior to this relicensing, information on minimally acceptable or optimal flows in the context of a controlled release has not been documented. Therefore, Hawks Nest Hydro conducted a study to analyze the project's ability to enhance whitewater boating opportunities over a range of boatable flows. During the study, varying flow levels were released into the bypassed reach to allow whitewater boaters to experience and evaluate these flows. Study participants completed surveys assessing their on-water experience at each flow.

The objectives of the flow assessment were to: (1) assess a range of flows for

recreational and commercial whitewater paddling and rafting to determine the minimally-acceptable and optimal flows; (2) determine the number of days per month that minimally-acceptable and optimal flows for whitewater boating are available under the current operation and would be available under alternative modes of operation; (3) assess the limitations and feasibility of providing scheduled releases to the bypassed reach and estimate the number of annual whitewater boating user days the resource would attract over the range of flows studied; (4) explore methods of providing flow information to the general public; (5) assess impacts of releases to other resources including other recreational users (e.g., anglers), aquatic resources, water quality, and generation; and (6) identify existing and potential future put-in and take-out sites.

The study area was the 5.5-mile bypassed reach. Participants evaluated six flow releases from 500 cfs to 3,000 cfs by completing a pre-run information form, a single flow evaluation form after each run, and a comparative flow evaluation form after all runs were completed. The 500- and 1,000-cfs whitewater boating flow releases occurred concurrently with the aquatic flow study releases on August 28-29, 2013. The 1,500-cfs, 2,000-cfs, 2,500-cfs, and 3,000-cfs whitewater releases occurred on May 6-7, 2014. The actual flow releases were 500 cfs, 936 cfs, 1,555 cfs, 1,994 cfs, 2,306 cfs, and 3,101 cfs, as verified by the USGS gage at Cotton Hill and the licensee's preliminary stage-discharge curve developed for the USGS gage specifically for this study. Participants possessed intermediate through expert whitewater skill levels, included private and commercial users, and used a variety of watercraft for the evaluation. Approximately 40-50 individuals participated in the study. Hawks Nest Hydro also gave expert kayakers the opportunity to submit individual evaluations of flows above 10,000 cfs from August 1, 2013 through September 30, 2014, using the same recreation flow evaluation forms; one response was received.

3.3.4.2 Environmental Effects

Hawks Nest Hydro proposes the following recreation protection measures: (1) Provide the West Virginia DNR $25,000 for each of the Hawks Nest and Glen Ferris projects ($50,000 total) for maintenance and enhancement of recreation facilities on lands deeded to the West Virginia DNR; (2) identify, design, and construct improvements to the Cotton Hill site; (3) maintain the existing Hawks Nest tailrace site; (4) provide one-time funding of $50,000 to the West Virginia DNR for improvements at the Cotton Hill site; (5) provide one-time funding of $50,000 to the West Virginia DNR for improvements to the Kanawha Falls site; (6) update the Recreation Management Plan for each project; (7) prepare a report every 5 years on activities completed by West Virginia DNR that were funded through the licensee; (8) develop a website containing pertinent flow information about the Hawks Nest bypassed reach; and (9) provide a 3-day whitewater recreation release each Memorial Day Weekend.

Funding to West Virginia DNR for Recreation Enhancements

Hawks Nest Hydro proposes three funding measures to enhance recreation amenities at the Hawks Nest and Glen Ferris projects. Funding measures 1, 4, and 5 described above would be used for maintenance and enhancement of recreation facilities on the land deeded to the West Virginia DNR and to provide improvements to existing amenities at the Cotton Hill and Kanawha Falls sites. In addition, Hawks Nest Hydro proposes to file a report every 5 years on activities completed by the West Virginia DNR with the funds.

Staff Analysis

Past funding activities have provided multiple improvements to maintain and enhance recreation facilities on lands deeded to the West Virginia DNR over the life of the current license. West Virginia DNR has used the funding provided by Hawks Nest Hydro to construct fish habitat, boat ramps, fishing piers, courtesy docks, and parking improvements. West Virginia DNR also conducted multiple fish studies and mussel surveys since 1994 when the funding measures were first implemented.

In general, when funds are proposed to be paid to a non-licensee entity for a measure, staff would analyze the actual measure itself to determine whether the measure addressed an identified project effect or would enhance a resource affected by the project. In this case, no specific measures have been proposed nor is there any information provided as to how the funds would be used. While the licensee keeps track of and reports how such funds have been used in the past, there are no specific measures described for future use of the funds. Therefore, staff is unable to analyze the effectiveness or appropriateness of these measures. It is also the Commission's strong preference to require specific measures directed towards a specific project effect and/or purpose. Therefore, where such measures have been proposed, the Commission might not require them in a license. However, this would not prevent Hawks Nest Hydro and West Virginia DNR from pursuing such measures separate from any license that may be issued.

Recreation Facility Improvements

To address recreation facility needs at the projects, Hawks Nest Hydro proposes to identify, design, and construct improvements at the Cotton Hill site. The improvements at the Cotton Hill site would be on licensee-owned land that is managed by the West Virginia DNR. The licensee proposes to consult with the West Virginia DNR to identify the improvements but expects that a seasonal restroom/changing facility, new picnic facilities, parking improvements, and signage improvements would address the stated needs of recreation users.

Hawks Nest Hydro proposes to continue maintenance of the Hawks Nest Powerhouse site. Facility enhancement measures at the Hawks Nest Powerhouse site were not identified by users nor proposed by Hawks Nest Hydro. Hawks Nest Hydro also proposes to update the Recreation Management Plan[37] for the Hawks Nest and Glen Ferris projects by including descriptions of recreational facilities and access within and immediately adjacent to the project boundaries. No additional details for updating the Recreation Management Plan were provided.

Staff Analysis

The Recreation Use and Needs Assessment indicates that recreation users used the formal and informal sites near the projects in all seasons with the summer and fall having the highest use levels (69 percent and 60 percent, respectively). Activities with the highest participation levels included sightseeing, bouldering, and fishing. Over 80 percent of local residents surveyed indicated that access and the condition of the existing facilities was adequate. Parking was generally reported to be sufficient (78 percent); however, the remaining 22 percent identified the Cotton Hill site and the Hawks Nest Powerhouse site as two of the top three sites near the projects that most lacked adequate parking. General responses from the surveys indicate that crowding is not an issue (with the exception of parking at peak times such as holidays or weekends), existing facilities meet current and forecasted demand, recreation opportunities in the bypassed reach exist at low flows and high flows, and recreation facilities need a greater level of maintenance and upkeep.

Specific responses from the surveys indicated that facility improvements including restrooms, parking, and trail maintenance were needed at the Cotton Hill site. The measures proposed by Hawks Nest Hydro for the Cotton Hill site would be useful for travelers driving through the project area and for whitewater boaters and climbers to have privacy when changing into the appropriate gear for their activity. New picnic facilities at Cotton Hill would benefit those interested in hiking, nature observation, and relaxing so that they might have a place to sit, enjoy a snack or a meal, and take in the surrounding views.

Neither the licensee nor stakeholders identified or proposed improvements for the Hawks Nest Powerhouse site; therefore, continued maintenance of the site should be adequate. The proposal to update the Recreation Management Plan would guide Hawks

[37] The most recent recreation report providing construction, maintenance, and operation responsibilities for the Hawks Nest Project was approved by the Commission on April 3, 1992.

Nest Hydro's management of the existing Cotton Hill and Hawks Nest Powerhouse sites for the term of any license issued. The Recreation Management Plan could also include: management policies for the Cotton Hill and Hawks Nest Powerhouse sites; provisions for ongoing operation and maintenance of the sites; an inventory of amenities at project recreation sites; and maps depicting project recreation sites showing existing facilities and proposed enhancements.

Recreation Flow Releases

To enhance recreation opportunities at the project, Hawks Nest Hydro proposes: (1) to develop and maintain a website with information relevant to flows in the bypassed reach and links to available gages, applicable conversions or calculations to derive real-time flow information, and forward-looking operational information; and (2) recreation releases over the 3-day Memorial Day Weekend, as described in table 13 below.[38]

[38] Hawks Nest Hydro also proposes an additional 3-day release for recreational boating in the event that its current end-use customer, the alloy plant, no longer requires the 25-Hz power generated by the Hawks Nest Project. Because our analysis compares the costs and benefits of Hawks Nest Hydro's proposal to the baseline, which is the existing condition, we did not include this potential measure in our description of Hawks Nest Hydro's proposal.

Table 13. Hawks Nest Hydro's proposal for recreation flow releases (Source: license application).

Timing	• One 8-hour recreation release between 9:00 a.m. – 5:00 p.m. on each day of the Memorial Day Weekend (Saturday, Sunday, and Monday).
Flow Parameters	• Recreation releases would be provided at levels between 2,000 cfs to 3,000 cfs. • A minimum of 1,600 cfs of each day's river flow would be dedicated to 25-Hz generation for WVAM; therefore, recreation releases between 2,000 cfs to 3,000 cfs would be as follows: o If river flow is less than 3,600 cfs, the recreation release for that day would be cancelled. o If river flow is between 3,600 cfs and 4,600 cfs, the recreation release would be the difference between river flow and 1,600 cfs, up to a maximum of 3,000 cfs. o If river flow is between 4,600 cfs and 13,000 cfs, the recreation release would be maintained at approximately 3,000 cfs. o If river flow is greater than 13,000 cfs, the recreation release would become the difference between river flow and 10,000 cfs. • There would be no make-up for, or banking, of day(s) that may be
Additional Amenities	• During the recreation releases, the gate to the dam at Cotton Hill Bridge would be operated by Hawks Nest Hydro personnel. • Hawks Nest Hydro would provide for transportation, for both users and their equipment, from the gate to the existing trail (located approximately 1 mile upstream of the gate), which leads to the access area below the dam. • A portable toilet and trash receptacles would be provided at the Cotton Hill Day-Use Area for this 3-day period. • Hawks Nest Hydro would coordinate with the owner of the New River Campground to arrange, to the extent practicable, for boater takeout during each day's release period.

Hawks Nest Hydro states that its release proposal incorporates the following key features and benefits. The first benefit described by Hawks Nest Hydro is that the flow priorities and safeguards would reduce impact to the alloy plant. Another feature is that by centering the recreation releases on Memorial Day Weekend and providing the additional amenities described in table 14 above, interested parties would have the opportunity to plan for the event. In addition, the proposed flows of 2,000 to 3,000 cfs

are consistent with the range identified in the controlled whitewater release study and in comments provided by stakeholders. Hawks Nest Hydro also states that historical flow information indicates a greater than 90 percent chance that flows will be sufficient for the proposed release schedule each year. A benefit to this recreation release is that it would serve as an early summer regional event and would add to the existing local and regional whitewater opportunities provided on the New, Gauley, Meadow, Cheat, Shenandoah, and Youghiogheny rivers. Lastly, Hawks Nest Hydro states that the proposed flow notification website would facilitate awareness of the whitewater conditions within the bypassed reach both during the scheduled flow release and spill events that occur.

AW recommends 28 scheduled recreation releases of 2,500 cfs from June through October (10 in June, 7 in July, 5 in August, 3 in September, and 3 in October). In a letter filed on October 13, 2016, in response to a phone call from Commission staff, AW explains its recommendation and requests that its 2,500-cfs recreation flows be released into the bypassed reach before reserving or passing any flows to the powerhouse. AW clarifies that if inflows exceed 2,500 cfs, then flows over 2,500 cfs may be diverted to the powerhouse for generation. WVPRO recommends the same 28 recreation releases, as well as a request for boatable spring flows in the bypassed reach every day during March and April, and for part of May. WVPRO did not propose a specific flow or range of flows for the every-day spring releases.

As discussed in section 3.3.1, *Aquatic Resources*, WVAM, in its comments on the application, discusses the technical requirements needed to operate the alloy plant as well as the potential negative effects (i.e., lower efficiency or production, or additional costs) of higher minimum flows and recreational releases in the bypassed reach on the alloy plant. WVAM states that it would accept the applicant's proposed recreation releases even though it would increase costs for the alloy plant. WVAM opposes the recreation releases recommended by AW and WVPRO (see section 3.3.6.2, *Socioeconomic Resources, Environmental Effects,* for details of WVAM's comments regarding the alloy plant's operation and its economic concerns).

Staff Analysis

During the Recreation Flow Assessment, participants assessed the level of difficulty of the river for recreational use. Participants indicate that the minimum acceptable whitewater flow in the bypassed reach is 1,500 cfs, and that flows from 2,000 to 3,000 cfs are considered acceptable. The results indicate that participants experience anywhere from 6-20 rapids throughout the 5-mile stretch of the bypassed reach. Additional comments from the study include: levels between 2,000 cfs and 3,000 cfs are acceptable for a variety of watercraft, an intermediate whitewater skill level is necessary to navigate the bypassed reach, safety concerns (undercut rocks, possible foot entrapment, and lack of evacuation areas) need to be addressed, and improvements to

river access locations are needed.

In the license application, Hawks Nest Hydro provides the frequency in which flows at varying levels are available in the bypassed reach under current project operation (table 14). Table 14 shows that minimum acceptable flows of 1,500 cfs in the bypassed reach occur nearly 90 days per year with 19 of those days occurring in the general boating season from May-October. A flow of 1,500 cfs was considered the minimum flow for self-bailing rafts that outfitters and private rafters typically use. A majority of study participants indicated that they would at least probably return if 1,500 cfs were available. Flows of at least 2,000 cfs occur in the bypassed reach approximately 84 days per year with 18 days in the general boating season; while 3,000 cfs, the highest flow studied, occurs almost 75 days per year with over 14 days occurring during the May-October boating season.

Table 14. Average number of days per month that flows suitable for recreation are exceeded in the bypassed reach under existing project operation (Source: license application).

Flow (cfs)	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
100	31.0	28.0	31.0	30.0	31.0	30.0	31.0	31.0	30.0	31.0	30.0	31.0	365
1,000	11.5	13.7	19.5	15.6	11.2	4.5	0.9	0.9	1.2	2.2	4.5	9.0	94.7
1,500	10.9	13.4	18.6	14.7	10.9	3.9	0.9	0.9	1.2	1.9	4.2	8.4	89.9
2,000	10.2	12.6	17.7	14.1	9.9	3.6	0.6	0.9	0.9	1.9	4.2	7.7	84.3
2,500	9.6	12.0	16.7	13.2	9.3	3.6	0.6	0.9	0.9	1.5	3.9	7.4	79.6
3,000	9.0	11.2	16.1	12.3	8.7	3.3	0.6	0.6	0.9	1.5	3.6	6.8	74.6
5,000	7.4	9.2	13.3	9.9	6.8	2.4	0.3	0.6	0.6	1.2	2.7	5.6	60.0

Recreational boating flows in the bypassed reach can range from 1,000 cfs to upwards of 70,000 cfs. This range of flows provides boaters with intermediate skill levels up to an extreme/professional kayaker level the opportunity to paddle the New River Dries. High flows typically occur early in the year during and after late winter and spring high-flow events. Whereas under current project operation, flows that are suitable for class III whitewater recreation in the bypassed reach occur more often throughout the year, but on an unscheduled basis.

The licensee-proposed flow levels and parameters specify the amount of water to be released into the bypassed reach for the Memorial Day Weekend releases. The proposal of 3 days of 8-hour recreation releases per year would provide an opportunity for scheduled boating at the 2,000 to 3,000 cfs flow levels, which does not currently

exist. The development of scheduled recreation releases has been a recurring stakeholder request because it would allow raft companies, customers, and private boaters[39] to plan trips around dependable and known release times.

A schedule of flow releases would need to take into consideration year-round availability of flows in the New River Dries. Staff calculated the number of days per month that flows of 2,000 cfs and 2,500 cfs[40] would be available for the bypassed reach using historical daily flows from 1954 to 2014 (table 15). The calculations are based on the percent of time each month the target flow was available in the bypassed reach during the historical daily flow period. Table 15 represents the number of days per month that acceptable flows would be available for recreational use in the bypassed reach before diverting flows to the Hawks Nest powerhouse for generation. If inflows were allocated for recreation before meeting generation needs, flows of 2,000 cfs would be available for about two-thirds of August, September, and October to almost every day of the month for the remainder of the year, or nearly 329 out of 365 days. Flows of 2,500 cfs would be available approximately 301 days out of the year.

Table 15. Historical average number of days per month that flows would be available for the bypassed reach (Source: staff).

Flow (cfs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2,000	30	28	31	30	31	28.9	28.3	24.4	19.6	21.6	26.4	29.8
2,500	29.2	27.9	31	30	30.8	27.3	24.4	19.4	13.8	17	23.1	27.6

Using the historical daily flows from 1954 to 2014, staff calculated the number of days per month that flows of 2,000 cfs and 2,500 cfs would be available in the bypassed reach after 100 cfs was diverted to the bypassed reach and 1,600 cfs was diverted to the Hawks Nest powerhouse for generation (table 16). This division of flows incorporates the same thresholds that Hawks Nest Hydro's proposal for a 3-day recreation release includes. For two-thirds to nearly every day of December through June, up to 2,500 cfs could be released into the bypassed reach after 1,600 cfs was diverted to the powerhouse.

[39] A private boater is a person or group of people who are not paying a commercial outfitter to guide them down the river. Private boaters use their own personal gear and boat to paddle the river.

[40] Flows of 2,000 cfs and 2,500 cfs were the lower and middle range of preferred flows for study participants and the licensee's proposed flows as well as recommended flow levels from AW and WVPRO. Thus, staff focused on recreation releases at these two flow levels.

From July through November, the amount of water available for recreation and generation drops and regular recreation releases of 2,500 cfs and 1,600 cfs for power generation cannot be maintained without reducing one or the other. August, September, and October have the least amount of days, generally less than a third of each month, with inflows that could accommodate 1,600 cfs to the powerhouse and up to 2,000 cfs to the bypassed reach.

Table 16. Average number of days per month that flows would be available for recreation use in the bypassed reach after passing 100 cfs to the bypassed reach and 1,600 cfs to the powerhouse (Source: staff).

Flow (cfs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2,000	27	26.9	30.8	29.7	29.7	22.1	16.1	11.8	7.3	11.1	17	24
2,500	25.7	26.4	30.6	29.2	28.6	19.8	13.1	9.6	5.9	9.5	14.9	22.4

Historically, if flows for recreation were to receive the first allocation of inflows, table 15 shows that there has been enough water to accommodate AW's 28 recommended whitewater releases. Table 16 shows that providing the 100-cfs minimum flow to the bypassed reach and 1,600 cfs to the powerhouse for generation prior to whitewater release flows between 2,000 cfs and 2,500 cfs for recreation, would be feasible in March, April, and May, possible in June and July, but would be more of a challenge during August, September, and October, because there is less inflow during those months.

Tables 15 and 16 both show that for nearly every day of March, April, and May, WVPRO's request of spring boatable flows up to 2,500 cfs could be accommodated. If flows were used for recreation before generation, WVPRO's request of spring boatable flows and 28 releases from June through October could be accommodated (table 15). If flows for generation were given the priority (table 16), recreation flows of 2,000 cfs or 2,500 cfs would be available generally less than a third of the days during August, September, and October.

Before we evaluate the costs and benefits of Hawks Nest Hydro's whitewater release proposal and the recommendations of AW and WVPRO, we look at how the whitewater resource in the bypassed reach (the New River Dries) compares to other whitewater rivers (Shenandoah River, Upper New River, New River Gorge, and Cheat River) in the region in terms of the difficulty of the paddling experience. The difficulty level of a whitewater river is based on the International Scale of River Difficulty, where each river has a rating that is determined not only by the flow magnitude, but also by the number and challenge of the rapids. The Shenandoah River and Upper New River offer easier class I-III whitewater paddling experiences. AW describes the Shenandoah River (Millville to Harper's Ferry) as a superb training ground for the beginner paddler to hone

their skills (AW, 2016c). This stretch of the Shenandoah River is about 7 miles long with three class II rapids and three class III rapids. The combination of class II and class III rapids allows a confident class II boater (which would be an advanced beginner) the opportunity to challenge their personal abilities on limited class III rapids while remaining confident that they are on a river that is still within their personal skillset. The National Park Service describes the Upper New River (Hinton to Thurmond) as consisting primarily of long pools and moderate rapids. While this stretch of the New River contains six class II rapids and five class III rapids, they are spread out over 36 miles (Park Service, 2003). This equals about 1 rapid every 3.3 miles, which means there is a significant amount of flat water along the Upper New River. This mixture of long flatwater stretches between rapids would provide beginner paddlers the opportunity to gain confidence in their whitewater skills.

On the other end of the whitewater spectrum, the Cheat River and New River Gorge offer a more challenging class III-IV whitewater paddling experience, where the rapids may succeed each other in a stair-step fashion such that the river elevation drops quicker from rapid to rapid. In addition, the majority of the rapids on the Cheat River and New River Gorge are at the upper level of class III difficulty mixed with class IV rapids (which can become class V at high flows). These rivers provide challenging whitewater to advanced intermediate as well as advanced boaters. There is potential for significant consequences if a boater does not possess the skills to handle technical maneuvers required on the Cheat River and New River Gorge.

The New River Dries contains anywhere from one to four rapids per mile, which a class III paddler would likely enjoy; however, that number of rapids might prove overwhelming for newer, less-experienced boaters. Thus, paddlers boating the Dries would need to possess the skills necessary to paddle a river that contains primarily class III rapids.

The nearest rivers to the project that offer a similar class III paddling opportunity with whitewater flows that are dependent on scheduled releases, are the Pigeon River (Tennessee), Upper Nantahala River (North Carolina), and the Ocoee River (Tennessee). Similar to the New River area, an online search reveals that these rivers have multiple rafting companies that provide guided whitewater trips from the spring through the fall. A total of 229,542 visitors reportedly rafted the Ocoee River in 2012 (Morse, 2012). Visitor numbers for the Pigeon River have not been quantified but AW's website describes the Pigeon as quite busy on release days, especially Saturdays when there is a line of busses waiting to unload passengers and rafts (AW, 2016d). Releases on the Upper Nantahala began in 2012 and visitor numbers have not been collected. Private

boaters are also known to paddle these rivers frequently.[41] Table 17 includes the difficulty or class level ranking, distance from the Hawks Nest Project, the number of releases provided each year, and a description of the release schedule of the Pigeon, Upper Nantahala, and the Ocoee Rivers.

[41] Data on private boaters using these rivers has not been quantified but is evidenced by the description of rapids, multiple photos, put-in and take-out directions, and incidents for each river on AW's website (https://www.americanwhitewater.org).

Table 17. Rivers with scheduled whitewater releases and similar difficulty level as the New River Dries (Source: staff).

River	Distance from the Dries	Number of Releases	Schedule of Releases
Pigeon River, TN Class II-III+ 4.2-mile stretch	4:10	About 70	• 4-hour release, three times per week for the first 4 weeks preceding Memorial Day Weekend • 6-hour release every Tue, Wed, Thu, Sat, from Memorial Day Weekend to Labor Day Weekend[42]
Upper Nantahala River, NC Class III+ 3-mile stretch	5:30	8	• 6-hour release one Spring Sat and Sun • 3-hour release on four Summer afternoons • 7-hour release one Fall Sat and Sun[43]
Ocoee River, TN Class III+ 5-mile stretch	6:00	About 114	• 6-8 hour releases on last 2 weekends of March, every weekend of April and May • 6-10 hour releases 5 times a week Memorial Day Weekend through Labor Day Weekend • 6-10 hour releases every weekend of September plus every day the last week of September • 6-8 hour releases on weekends in October[44]

[42] Schedule found at: https://www.duke-energy.com/pdfs/Walters-Rafting-Release.pdf accessed on October 11, 2016.

[43] Schedule found at: https://www.duke-energy.com/pdfs/Nant-Release-Bypass-Flow-Schedule-2016.pdf accessed on October 11, 2016.

[44] Schedule found at: https://www.tva.gov/file_source/TVA/Site%20Content/Environment/Recreation/pdf/2016%20Ocoee%202%20Schedule.pdf accessed October 11, 2016.

Table 17 lists the rivers nearest to the project that provide a solid class III whitewater experience similar to the Dries. A solid class III whitewater experience means the majority of the rapids on the river are class III, are concentrated over a relatively short stretch of river, and require a strong intermediate skill level. Class III scheduled whitewater releases are not available within a 4-hour drive of the project.

The Pigeon, Upper Nantahala, and Ocoee rivers offer a wide range of scheduled releases that allow recreational boaters from all over the United States to plan weekend or extended trips. Providing scheduled recreation flows in the Dries would provide a new recreation opportunity that would complement existing recreation and boating opportunities in the New River area. The whitewater experience of the Dries would provide a different level of difficulty (strictly class III) that offers a solid intermediate stretch of river to boaters that does not currently exist in the area. The ability for companies, customers, and private boaters to plan trips around releases would likely increase recreational use of the river. Paddling the Dries would also provide the opportunity for advanced beginners and intermediate paddlers to gain solid class III boating skills.

In an effort to balance the whitewater release proposals from Hawks Nest Hydro, AW, and WVPRO, staff analyzed the provision of recreation releases throughout the boating season. Staff evaluated the costs and benefits of providing 15 days of spring to mid-summer recreation releases, when the river is generally at its highest levels and, therefore, would have less of an effect on generation and alloy plant operation compared to the boating flows recommended by AW and WVPRO. Providing whitewater flows from August to October could significantly affect generation and alloy plant operation. In order to reduce such impacts during the typical low-flow periods of late summer and fall, staff did not analyze the provision of recreation releases from August to October. Spring flows of 2,500 cfs and early summer flows of 2,000 cfs in the bypassed reach would provide recreation flows at levels deemed acceptable by study participants.

Providing spring to mid-summer weekend flow releases would allow boaters to enjoy the recreational benefits of the New River Dries for multiple scheduled days out of the year. Under current operations, recreational flows of 2,500 cfs occur approximately 80 days per year; however, these flows are unscheduled and while they may occasionally occur on weekend days, flows may also occur during the week, overnight, or in harsh, winter weather conditions. The uncertainty of when acceptable boating flows are available in the bypassed reach limits the chances that recreational boaters have to paddle the Dries. The reliability of a release schedule would give the public the opportunity to plan trips in advance which would likely increase use of the resource.

We recognize, however, that there will be circumstances when inflow conditions could jeopardize the scheduled releases or affect participation numbers. As such,

changes in the scheduled flows may be necessary in order to adapt to extreme high or low inflows as well as overwhelming or underwhelming participation numbers. During low inflow periods, if total inflow falls below 2,500 cfs, Hawks Nest Hydro could still provide scheduled recreation releases at inflows down to 1,500 cfs. Since 1,500 cfs is the minimum acceptable flow for paddling the Dries and for overall whitewater experience, releases of 1,500 cfs would still provide a desired paddling experience. In order to mutually decide on any schedule changes due to flow or participation, Hawks Nest Hydro could hold pre-release coordination meetings and post-release evaluation meetings with the West Virginia DNR, AW, and WVPRO for the first few years of any scheduled releases. These meetings would provide Hawks Nest Hydro with direct input from the interested parties in order to make any necessary changes for future releases (i.e., dates or release start times, parking locations, or traffic flow).

Access at the put-in and take-out areas

Hawks Nest Hydro proposes additional access and amenities to facilitate its proposed 3-day scheduled recreation flow release. This includes providing transportation for paddlers and their boats from the Cotton Hill parking lot to the access area below the dam, portable restrooms and trash receptacles during the 3-day release period, and coordination with the New River Campground to arrange for use of its property as a takeout for all river users during the scheduled releases.

AW recommends that Hawks Nest Hydro provide year-round, free, vehicular river access immediately below the Hawks Nest dam (a put-in site) and a take-out site within a reasonable distance of the powerhouse. AW states that both the put-in and take-out sites should include parking, a trail to the river sufficient for carry-in raft and kayak access, and portable restroom facilities as needed. AW suggests the installation of a raft slide at the put-in to facilitate lowering rafts to the river. AW says that this section contains outstanding rapids and that it is unreasonable to expect the public to carry rafts, canoes, and kayaks 1.25 miles on a perfectly good road to reach the put-in.

Hawks Nest Hydro responded that upwards of $2 million would be needed for improvements and upgrades to facilitate public vehicular use of the access road. It states that the access road is an unpaved, single-lane road cut into the hillside that is bordered by a nearly vertical, rocky hillside on the right and a steep drop to the bypassed reach on the left (looking downstream). Hawks Nest Hydro states that such improvements would include widening the road to allow for two-way public access, guardrails, additional parking, and a new turn-around area. In addition, widening the road could only happen by cutting into the existing cliff face, which would require extensive rock containment and slope stabilization measures as well as the removal of woody debris.

Staff Analysis

Currently, Hawks Nest Hydro's access road is open to the public for pedestrian access; however, the road is closed to vehicular access. River users who choose to access the put-in area below the dam must carry their boat (i.e., canoe, raft, kayak, inflatable kayak, stand-up paddleboard) and all necessary gear (i.e., paddle, helmet, life jacket, drinking water, etc.) for about one mile from the Cotton Hill parking area along the access road to the dam. However, by accessing the bypassed reach at the base of the dam, paddlers gain an additional 1.25 miles of river to enjoy compared to accessing the river directly at the Cotton Hill site. Providing a shuttle system to transport paddlers from the Cotton Hill parking lot to the put in during the proposed 3-day release period would assist all river users who would like to begin their river trips at the dam. Under this access option, the shuttle would be the only vehicle on the dam access road.

The shuttle system would require river users to park in the Cotton Hill parking area, which can accommodate 10-12 vehicles. If the parking area filled up near the beginning of the daily releases, other boaters may arrive at Cotton Hill and discover that there is no place to park at Cotton Hill. This could create a situation where boaters find that they are unable to participate in the recreation release that day. The size limitations of the parking area at Cotton Hill could become a deterrent for participation in recreation releases. It is not clear from the license application if additional parking exists along State Route 16 in the vicinity of Cotton Hill. If parking along State Route 16 was an available option, it is possible that boaters walking from their cars to the Cotton Hill site to catch the shuttle could endanger not only themselves but also other vehicles and passengers passing by while travelling at high speeds.

It is unknown if a shuttle system would be able to accommodate an influx of river users at any one time. Commercial outfitters often use busses to transport customers. For example, if 60 rafting customers were required to use a shuttle system and the shuttle was a 15-passenger van (typically used for this type of activity), customer waiting times of 30 minutes or more could occur while the shuttle makes multiple trips from the parking area to the dam and back. If multiple outfitters arrived at Cotton Hill at the same time, the wait time would increase significantly. If the shuttle system was a bus, it is unclear if the Cotton Hill parking lot could accommodate the outfitter bus, the shuttle bus, and up to 12 parked cars at one time. A possible solution could be to allow commercial outfitters to drive along the dam access road to drop off customers, rafts, and equipment at the put-in. Commercial access would eliminate not only a one-mile walk to the put-in but also customers having to exit their outfitters' bus at Cotton Hill to load onto a shuttle vehicle for a one-mile ride.

Allowing private vehicular access beyond the gate at the Cotton Hill site would provide all users with the most direct access to the put-in. Vehicular access to the dam

could potentially eliminate pedestrian traffic on State Route 16 and the access road as well as users having to carry gear to the river. Allowing private boaters the opportunity to drive on the access road would offer all river users the same benefit. However, the access road could quickly become congested with commercial busses and private vehicles driving in and out at the same time. One way to alleviate congestion could be to establish communication between the dam parking area and the Cotton Hill parking lot in order to direct traffic coming in and going out. This option plus strict speed limits might eliminate the need to create a two-way access road. However, based on observations made by staff during the project site visit and scoping meetings, if vehicles were to meet on the road, the shoulders could be used as pull-offs for letting vehicles pass by without impeding bus or emergency vehicle traffic.

There is a level, gravel area at the put-in that measures about 300 feet in length and 60 feet at the widest point (as measured using Google Earth). There appears to be room for cars to park and for busses to maneuver in this area. The shuttle vehicle and trailer or shuttle bus would have to turn around in the area at the dam; thus, it is likely that the area could accommodate a commercial bus turning around as well. Allowing cars to park in a designated section of the gravel area at the dam could provide additional parking for private boaters. If the existing gravel area could not provide significant additional parking for private boaters, creating additional parking at or near the project may become necessary. Parking rules and regulations would have to be created in order to make a solution possible.

The shuttle system option and the public vehicular access option to reach the put-in both provide solutions as well as issues to overcome. Although the shuttle system would eliminate vehicle congestion on the access road, it may create parking limitations at Cotton Hill and long wait times for river users. The public vehicular access option affords all river users the opportunity to access and possibly park near the dam, but could create congestion along the access road. While the shuttle system prevents Hawks Nest Hydro from having to make expensive improvements to accommodate vehicular access to the put-in, traffic coordination and parking regulations associated with the public vehicular access option could also eliminate the need for improvements at the dam.

After participants have reached the end of the access road (i.e., near the dam), they would need a well-marked, wide trail to carry equipment and boats down to the river. The closest trail to the dam appears to be about 1,200 feet downstream of the gravel parking area (figure 29). Hawks Nest Hydro would need to create a new access trail from the gravel parking area to the river or create a connecting trail from the parking area to the existing trail so participants are not walking along the main access road while vehicles are entering and exiting the put-in area. Improving and widening the put-in access trail or creating a new put-in access trail within the vicinity of the gravel parking area would provide all river users with safer, enhanced access to the river.

In the license application, Hawks Nest Hydro does not describe a public take-out access area within the project boundary. Private boaters paddling the Dries do not currently have a designated take-out site. Without designated parking and take-out access, boaters could end up parking in unsafe areas on the highway adjacent to the river and could encounter high-speed traffic while loading or unloading equipment from their car. During the recreation flow assessment, take-out access was provided for participants at the New River Campground on Route 60 near the town of Gauley Bridge. Before each release began, participants were able to park vehicles at the campground and load equipment onto a shuttle vehicle for a ride to the put-in. At the end of their river trip, participants had direct access to their vehicles that were parked at the campground. Hawks Nest Hydro proposes a similar arrangement during its proposed 3-day flow release event. A designated take-out area with public parking is a vital part of any whitewater experience. If the public cannot safely park near the end of the whitewater portions of a river, the section is essentially inaccessible.

Take-out access would be provided at the New River Campground during the Memorial Day weekend releases, however, the campground does not offer year-round public take-out access. In order to provide year-round take-out access, Hawks Nest Hydro could enhance its Hawks Nest Powerhouse site (features 18, 19, and G on figure 30). This site includes a paved parking lot and two trails leading to the water's edge. Use of the Hawks Nest Powerhouse site as a take-out, would provide increased access and safe parking options for river users. The Hawks Nest Powerhouse site is on the same side of the river as the New River Campground and is about two-thirds of a mile closer to the end of the rapids.

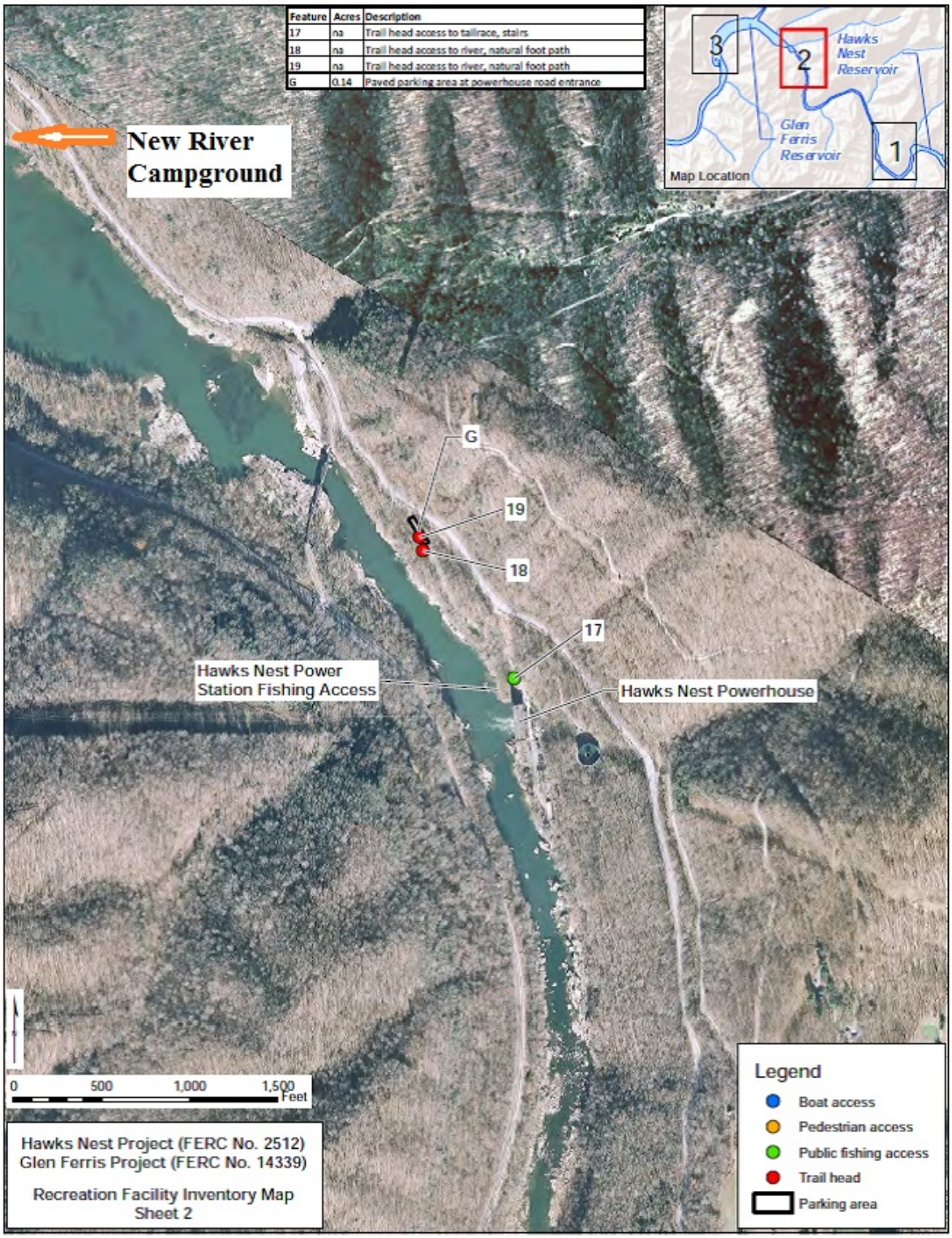

Figure 30 Take-out access below the powerhouse (Source: license application).

From the pictures provided of the trailheads at the Hawks Nest Powerhouse site,[45] the trails appear to be overgrown and narrow. These trails could provide take-out access with improvements such as widening and clearing of brush and trees. Signage designating the take-out at the water's edge as well as at the entrance to the parking lot would improve and enhance the public's knowledge of where to park before their trip (to condense multiple paddlers into one or two cars that would drive to the put-in) and where to exit the river at the end of their trip.

Online Flow Information

Currently, stage (i.e., height of the water) in the bypassed reach is measured at the USGS gage located near the Cotton Hill Bridge.[46] During the scoping meeting held on October 18, 2012, WVPRO commented on the need for a gage that measures the river flow (in cfs) in the bypassed reach. WVPRO said that outfitters and recreational boaters need accurate flow information in the bypassed reach, which would help users determine the best levels for recreation and fishing. ACE Adventure Resort also stated that a gage for measuring river flow was important for outfitters because the degree of difficulty of the river changes dramatically as the water levels go up and down. In scoping comments and comments on the proposed study plan, WVPRO reiterated that accurate flow information could be gathered by Hawks Nest Hydro and provided to the public.

Hawks Nest Hydro proposes to develop and maintain a website providing information on flows in the bypassed reach in order to assist river users' understanding of the appropriate boating levels in the bypassed reach. This would include links to available gages, applicable conversions or calculations to derive real-time flow information, and relevant forward-looking operational information. Hawks Nest Hydro states that this flow notification would facilitate awareness of and access to the whitewater flow conditions occurring in the bypassed reach, which are not readily known because of limited resources providing this type of information.

Staff Analysis

Public access to accurate flow information within the bypassed reach would benefit outfitters and private boaters using the river on both scheduled recreation release days as well as on days when excess flows are diverted to the bypassed reach. Providing

[45] Photos are on pages C-15 and C-16 of Exhibit E, Appendix C of the license application.

[46] Real-time stage measurements from the Cotton Hill Bridge can be found at: http://waterdata.usgs.gov/usa/nwis/uv?380649081083301

real-time flow information on the website could be a determining factor for boaters when deciding whether or not to paddle the Dries that particular day. Private boaters and outfitters could also use the flow information to plan trips that could happen with short notice or to cancel trips if flows in the bypassed reach were too high.

On its website, Hawks Nest Hydro could provide the dates, times, and flow levels of the scheduled recreation releases. Hawks Nest Hydro could also provide a range of forecasts for river levels from 1- to 3-days out on the website. Providing this information to the public allows river users to know what is occurring in the bypassed reach. This in turn would help river users to make well-informed decisions on whether the river level is optimal, too high, or too low to safely and responsibly boat. The flow notification website would provide river users with a central location for flow information that is currently not available.

3.3.5 Cultural Resources

3.3.5.1 Affected Environment

Section 106 of the NHPA requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register prior to an undertaking. In this case, the undertaking is the issuance of new licenses for the Hawks Nest Project and the Glen Ferris Project. Project-related effects could be associated with the operation and maintenance of the existing projects.

Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Traditional cultural properties are a type of historic property eligible for the National Register because of their association with cultural practices or beliefs of a living community that are: (1) rooted in that community's history or (2) important in maintaining the continuing cultural identity of the community. In this EA, we also use the term cultural resources to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register.

Section 106 also requires that the Commission seek concurrence with the West Virginia SHPO on any finding involving effects or no effects on historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, section 106 requires that the Commission consult with interested Native American Tribes that might attach religious or cultural significance to such properties.

On September 20, 2012, the Commission designated Hawks Nest Hydro as the non-federal representative for carrying out day-to-day consultation regarding the licensing efforts pursuant to section 106 of the NHPA. However, the Commission remains largely responsible for all findings and determinations regarding the effects of the proposed projects on any historic property, pursuant to section 106.

Area of Potential Effect

Pursuant to section 106 of the NHPA, the Commission must take into account whether any historic property could be affected by a new license within the project's area of potential effect (APE). The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE for these projects is all lands within the Hawks Nest and Glen Ferris project boundaries and any lands outside of the Hawks Nest and Glen Ferris project boundaries where cultural resources may be affected by project-related activities that are conducted in compliance with the license. In a letter dated July 8, 2013, Hawks Nest Hydro consulted with the West Virginia State Historic Preservation Office (West Virginia SHPO), Tribes,[47] and the Park Service regarding the APEs for the projects. In a letter dated August 9, 2013, the West Virginia SHPO concurred with Hawks Nest Hydro regarding the APEs. No other responses were received by Hawks Nest Hydro.

History of the Region

The earliest cultural material identified within the region is associated with the Paleoindian Clovis culture and dates to approximately 12,500 Before Present (B.P.). Paleoindian Clovis components have been identified at two sites upstream of the projects along the New River in Summers County, West Virginia. The age of Paleoindian deposits, subsequent landscape modifications, and associated ground-disturbing activities make the likelihood of encountering intact Paleoindian sites relatively low. The Archaic Period (10,000 to 3,000 B.P.) brought new technologies better suited to locally available game. Projectile points began to develop during the Early Archaic period. The seasonal availability of game animals, aquatic resources, and wild plant foods continued to make hunting and foraging successful resource procurement strategies, and Early Archaic sites along the New, Kanawha, and Gauley River valleys have been classified as small,

[47] Tribes consulted include the Absentee-Shawnee Tribe of Indians of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Seneca-Cayuga Tribe of Oklahoma, Shawnee Tribe, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians, Catawba Indian Nation, Tuscarora Nation, Cherokee Nation, and Delaware Nation.

temporary campsites and have been found on rock shelters, terraces, benches, and hilltops.

The Middle Archaic brought the introduction of new tools including groundstone implements used for processing plant foods. The population in the Upper Ohio River Valley likely adopted projectile point styles and cultural patterns radiating from the Kanawha River Valley and points south and west. Populations in the New, Kanawha, and Gauley River valleys retained a preference for rockshelters, which reflects a population of highly mobile hunter-gatherers living in relatively small groups. The Late Archaic period saw the introduction of projectile point types in to the New River Valley that are associated with the Southeast, possibly reflecting a movement of populations for Virginia, Tennessee, North Carolina, and South Carolina. The Terminal Archaic period bridges the Archaic and Woodland periods; in the Hawks Nest and Glen Ferris project areas, this period is characterized by the appearance of steatite and sandstone bowls at sites along the Kanawha River. This transitional period is also marked by a greater typological diversity in lithic tools and projectile points.

The transition into the Woodland period (3,000 B.P. through 1,550 A.D.) is defined by the manufacture and use of ceramic vessels. Traditions similar to the Archaic period continued and intensified and the emergence of the Adena ceremonial complex, which focused on mortuary ceremonialism emerged. An increased reliance on developing horticulture to augment hunting and gathering subsistence practices grew in the Middle Woodland period. With greater cultivation came a trend toward more sedentary villages and intensified seasonal foraging. However, populations of the Late Woodland period in the New, Kanawha, and Gauley Rivers continued to occupy seasonal camps, rockshelters, and small farmsteads.

By the end of the Late Prehistoric period, populations appear to have abandoned the New, Upper Kanawha, and Gauley River drainages and consolidated into large villages along the floodplains of the Ohio River. The 1671 Batts and Fallam expedition was the first European incursion into present-day West Virginia, however, the European presence remained ephemeral and transitory throughout most of the following century. Local conflicts between Europeans and Native Americans occurred as settlers pushed into aboriginal hunting lands and territories claimed by competing European powers and continued across the region until the late 1700s. In 1744, Virginia officials purchased the Iroquois title of ownership to what would become West Virginia in the Treaty of Lancaster. These conflicts culminated in the 1774 Battle of Point Pleasant between 1,200 Virginia militiamen and an equal force of Shawnee, Delaware, Mingo, Wyandotte, and Cayuga warriors at the confluence of the Kanawha and Ohio Rivers. The English victory at Point Pleasant opened up present-day West Virginia to European settlement.

In 1773, the first European settler, Walter Kelly, arrived in what would become

Fayette County; however, he was killed by Native Americans shortly after his arrival for trespassing on their lands. In 1774, William Morris, Sr. became the first permanent English settler in the county and built a cabin at Cedar Grove at the mouth of Kelly's Creek. Additional settlers arrived in Fayette County in 1790 and the first county court was held in the present-day town of Ansted in 1831. Throughout the Civil War, Fayette County's location at the headwaters of the Kanawha River and the confluence of the New and Gauley Rivers was viewed as strategically important by both Union and Confederate forces. For the duration of the war, Fayette County was the center of military action in western Virginia. The formal separation of West Virginia from Virginia occurred in the summer of 1863. On May 3, 1864, 7,000 Union troops marched from Fayetteville to successfully destroy the Virginia and Tennessee Railroad facilities in southern West Virginia, which disrupted Confederate communications and hastened the end of the Civil War.

Following the Civil War, the Kanawha, New, and Gauley River valleys played a pivotal role in the industrialization of the U.S. as several new coal mines were established in the region during the 1870s. Coal mines in Fayette County fueled the mills and the industrial growth of the Pittsburgh region through the early 1900s. In 1899, John Motley Morehead, Jr. harnessed the flow of the Kanawha River to power a ferro-alloy plant constructed at Kanawha Falls. In 1918, Union Carbide completed upgrades to the original facility, which included constructing the Glen Ferris dam and a new powerhouse. Union Carbide then initiated plans to construct a new hydroelectric facility that could power a proposed metallurgical facility in nearby Mount Carbon. A central component would be a diversion tunnel under Gauley Mountain that would carry water from the Hawks Nest dam to the powerhouse.

Construction of the Hawks Nest Tunnel was been called the worst industrial disaster in the history of the U.S. because of the estimated death toll ranging from 700 to 2,000 individuals, with many more becoming sick or permanently disabled. Workers drilled and blasted through high-grade, silica-rich sandstone in an underground, confined space without proper ventilation, dust control, or dust masks. Workers quickly fell ill with silicosis, a deadly accumulation of silica particles in the lungs. The total death toll will never be known, as many of the Depression-era migrant workers moved on to other jobs after the tunnel was completed or after they were replaced at the site.

By the late 1920s, the landscape around Hawks Nest had been extensively disturbed by mining operations, clear-cutting, forest fires, and droughts. Federal programs established as part of President Franklin D. Roosevelt's New Deal provided the opportunity for Depression-era work relief and natural resources conservation. The State of West Virginia leveraged these federal programs to create a state park system, including Hawks Nest State Park. Park planning was conducted by the Park Service and development was undertaken by the Civilian Conservation Corps, which operated two

camps and constructed a picnic shelter, museum building, concession building, restrooms, and other facilities between 1934 and 1942. A major construction and improvement campaign in the late 1960s and early 1970s expanded and enhanced park facilities, and the original 31-acre park was expanded to include over 276 acres.

Archaeological Resources

Pursuant to the approved Cultural Resources Study, Hawks Nest Hydro conducted background research and cultural resources field investigations of the Hawks Nest and Glen Ferris APEs. Hawks Nest Hydro conducted a Phase I archaeological identification survey within the Hawks Nest and Glen Ferris APEs to identify archaeological sites that may be affected by the Commission's issuance of new licenses for the projects. The Phase I archaeological identification survey included a review of available cultural resource reports, secondary literature, historic maps, and site files pertinent to the APEs. Field activities associated with the Phase I archaeological identification survey consisted of a visual inspection of the projects' APEs, including previously reported archaeological sites. The Phase I archaeological identification survey also included a geo-archaeological analysis of the projects' APEs, including the shoreline of reservoirs and the Hawks Nest bypassed reach.

The Phase I archaeological identification survey identified 12 archaeological sites within the APEs, which included two pre-contact period resources identified during previous cultural resources studies that were not associated with the projects. A third pre-contact period archaeological site was identified during the cultural resources survey conducted by Hawks Nest Hydro in 2013. Of these three pre-contact archaeological sites, one was previously recommended as ineligible for inclusion in the National Register and the eligibility of the remaining two pre-contact period archaeological sites has not been evaluated. Hawks Nest Hydro concluded that none of the identified archaeological sites are being affected by ongoing project operations.

As part of the Phase I archaeological identification survey, a geomorphological investigation was conducted to assess the potential for pre-contact and historic buried archaeological deposits within the APE. This investigation identified areas possessing a potential for surface and buried archaeological sites or moderate to high probability for containing additional subsurface archaeological deposits (collectively, "archaeologically sensitive areas"). Maps of identified archaeological resources and archaeologically sensitive areas within the Hawks Nest and Glen Ferris APEs and a table presenting relevant information regarding these resources are presented in Volume IV of the license applications.

Historic Architectural Resources

In addition to the archaeological field survey, Hawks Nest Hydro conducted an architectural reconnaissance survey to identify and evaluate the significance and National Register eligibility of buildings, structures, and other built resources 50 years of age or older within the APEs, including the projects' facilities. The architectural reconnaissance survey included a review of available cultural resource reports, secondary literature, and historic maps pertinent to the APEs. Fieldwork associated with the architectural reconnaissance survey included systematic survey and mapping of all buildings, structures, and objects 50 years of age or older in the APEs in order to identify those with National Register eligibility potential.

The results of the architectural reconnaissance survey identified one previously recorded historic property within the Hawks Nest APE: a portion of the New Deal Resources of the Hawks Nest State Park Historic District. The West Virginia SHPO concurred that the project would not affect this previously recorded site. Three additional architectural resources within the Hawks Nest APE were recommended as eligible for the National Register: Hawks Nest State Park Gondola Landing, Hawks Nest State Park Nature Center, and the C&O Railroad Bridge at Hawks Nest. None of these resources are owned or operated by Hawks Nest Hydro, project facilities, or associated with project operations.

Hawks Nest Hydro conducted a review of property records in relation to the project boundary; Hawks Nest Hydro determined that neither the Hawks Nest State Park Gondola Landing nor the Hawks Nest State Park Nature Center are located within the project boundary for the Hawks Nest Project. There are no identified project-related direct or indirect effects on these properties; therefore, project operations would not adversely affect these properties. The West Virginia SHPO concurred that the project would not affect the Gondola Landing or the Nature Center. The C&O Railroad Bridge at Hawks Nest spans the reservoir upstream of the dam but is not a Hawks Nest Project facility or otherwise associated with or necessary for project purposes. The West Virginia SHPO determined that the C&O Railroad site was not eligible for inclusion in the National Register.

Hawks Nest Hydro identified two historic sites within the APEs that are recommended as eligible for the National Register:

- the Hawks Nest Development Historic Site including the Hawks Nest dam, surge basin, surge tank, intake, tunnel, and powerhouse; and
- the Glen Ferris Development Historic Site including the Glen Ferris dam, east powerhouse, west powerhouse, filter building, and the remnant foundation of the west powerhouse.

Hawks Nest Hydro stated that the projects are not adversely affecting the Hawks Nest State Park Historic District, the Hawks Nest State Park Gondola Landing, the Hawks Nest State Park Nature Center, the C&O Railroad Bridge at Hawks Nest, the Hawks Nest Development Historic Site, or the Glen Ferris Development Historic Site. However, project operations may have the potential to adversely affect the Hawks Nest Development Historic Site and the Glen Ferris Development Historic Site. The West Virginia SHPO concurred with Hawks Nest Hydro's proposal to develop an HPMP for each project to protect the Hawks Nest Development Historic Site and the Glen Ferris Development Historic Site.

Traditional Cultural Properties

By letter issued on October 26, 2011, the Commission initiated consultation with the Absentee-Shawnee Tribe of Indians of Oklahoma, Shawnee Tribe, Cherokee Nation, Eastern Band of Cherokee Indians, Catawba Indian Nation, Saint Regis Mohawk Tribe, Eastern Shawnee Tribe of Oklahoma, Delaware Nation, United Keetoowah Band of Cherokee Indians in Oklahoma, Seneca-Cayuga Tribe of Oklahoma, Tuscarora Nation of New York, Oneida Nation of New York, Onandaga Nation of New York, Tonawanda Band of Seneca Indians of New York, Cayuga Nation of New York, and Seneca Nation of New York on the Hawks Nest and Glen Ferris projects.

No responses to these letters were received and no consulted Tribes have reported any known traditional cultural properties within the APE of either project.

Consultation and Recommendations

Hawks Nest Hydro distributed the Phase I Survey Report and the Cultural Historical Survey Report to the West Virginia SHPO, Tribes, and the Park Service. On March 30, 2015, the West Virginia SHPO provided written comments on the reports to Hawks Nest Hydro. The West Virginia SHPO recognized that Hawks Nest Hydro was not proposing to undertake any development activities that would result in an impact to archaeological sites, architectural resources, or areas that have been identified as having moderate to high potential for containing archaeological sites. As a result, the West Virginia SHPO concurred that the projects would have no adverse effect on archaeological sites within the Hawks Nest or Glen Ferris APEs. The West Virginia SHPO did concur with Hawks Nest Hydro's recommendation that the Hawks Nest Historic Development Site and the Glen Ferris Historic Development Site do have the potential for being affected by project operations. Further, the West Virginia SHPO concurred with Hawks Nest Hydro's recommendations regarding the National Register eligibility of identified archaeological and historic resources and concurred that Hawks Nest Hydro should develop HPMPs to provide for the continued management of

archaeological and historic resources within the APEs.

3.3.5.2 Environmental Effects

Effects on Historic Properties

Currently, project operation does have not have an effect on the archaeological sites and the historic resources located within the APEs. However, continued operation and maintenance of the projects have the potential to adversely affect archaeological and historic resources during the terms of any new licenses issued. Project maintenance, use and maintenance of the project access road, recreation, vandalism, and mitigation measures associated with other project resources could affect cultural resources located within the APEs of the projects. Project effects are adverse when an activity directly or indirectly alters the characteristics of a historic property that qualifies it for inclusion in the National Register. Any adverse effects must be resolved in consultation with the West Virginia SHPO. Two archaeological sites were found ineligible for inclusion in the National Register. The eligibility of the remaining ten sites has not been evaluated. Therefore, Hawks Nest Hydro and the West Virginia SHPO recommended that these sites should be treated as though they were eligible for listing in the National Register. The Hawks Nest Historic Development Site and the Glen Ferris Historic Development Site are eligible for listing in the National Register.

Management of Historic Properties

To address project-related effects, Hawks Nest Hydro developed draft HPMPs in accordance with the *Guidelines for the Development of Historic Properties Management Plans for FERC Projects* established by the Advisory Council and the Commission. The draft HPMPs included measures for the management of identified archaeological resources and historic sites within the projects' APEs and procedures for unanticipated discoveries of archaeological materials or human remains. The draft HPMPs also included protocols for proposed future actions, as well as implementation measures that included designation of an HPMP coordinator, training requirements, standards for cultural resources investigations, requirements regarding the use of qualified cultural resources professionals, consultation requirements, categorical exclusions from further review, and a dispute resolution process.

The draft HPMPs were developed in consultation with the West Virginia SHPO, Tribes, and the Park Service to describe appropriate measures for avoiding and resolving any adverse effects on archaeological and historic resources during the course of any new licenses issued. Hawks Nest Hydro distributed the draft HPMPs to the consulting parties, received concurrence from the West Virginia SHPO regarding the proposed management measures, and filed the final HPMPs with the license applications on December 29, 2015.

Hawks Nest Hydro included measures for managing the archaeologically sensitive areas in the HPMPs based on the results of the archaeological and geomorphological investigations. The measures include avoidance of ground-disturbing activities and consultation with the West Virginia SHPO and other parties prior to initiating activities that have the potential to affect buried archaeological deposits, should any be present.

Hawks Nest Hydro included measures in the HPMPs to provide for the protection and management of historic architectural resources within the Hawks Nest and Glen Ferris APEs based on the results of the architectural reconnaissance survey. While project operations are not currently affecting the Hawks Nest Development Historic Site or the Glen Ferris Development Historic Site, continued operation and maintenance of the projects could adversely impact their National Register eligibility. Therefore, the HPMPs provide measures to protect these two National Register eligible sites.

Staff Analysis

In accordance with section 106, Hawks Nest Hydro has consulted with the West Virginia SHPO, Tribes, and the Park Service to determine the effects of project operation on cultural resources. Current operations do not affect cultural resources; however, there is a potential for adverse effects on historic properties throughout the terms of any licenses issued. In order to protect cultural resources that are eligible for the National Register, Hawks Nest Hydro developed HPMPs to mitigate any adverse effects that may arise over the term of any license issued. The measures provided in the HPMPs provide direction for the licensee's management of historic properties. Hawks Nest Hydro's goals for managing historic resources within the APEs are: (1) to support continued normal operation of the projects while maintaining and preserving the integrity of historic properties within the APEs for the Hawks Nest and Glen Ferris projects; and (2) to the fullest extent possible, avoid, minimize, or mitigate adverse effects on historic properties within the APEs. The HPMPs provide measures that are consistent with the Advisory Council and Commission's 2002 guidelines.

To meet the section 106 requirements, the Commission intends to execute a PA for the Hawks Nest Project and a PA for the Glen Ferris Project that would implement the corresponding HPMP for each project.

3.3.6 Socioeconomics

3.3.6.1 Affected Environment

Population and Housing

The Hawks Nest and Glen Ferris projects are located in Fayette County, West Virginia. Founded in 1831, Fayette County contains more than 661 square miles of land on the Allegheny Plateau. The population of Fayette County was estimated to be 44,997 in 2015, with a population density of 68 persons per square mile. Table 18 shows an overview of population and housing units in Fayette County over the years. Fayette County experienced a population decrease of 3.24 percent between 2000 and 2010 according to the 2010 census, whereas the state of West Virginia experienced a population increase of 2.47 percent during the same period. Between 2010 and 2015, Fayette County lost about 2.26 percent of the population, with the state of West Virginia also showing a decrease in population during this period (U.S. Census Bureau, 2016**)**. Although the number of total housing units in Fayette County remained about the same between 2000 and 2010, it was estimated to be 21,494 in 2015, a decrease of 0.57 percent since 2010.

Table 18. Population and housing units in Fayette County, as well as population in the state of West Virginia (Source: license application and U.S. Census Bureau, 2016).

Year	Population (Fayette County)	Total Housing Units (Fayette County)
2015*	44,997	21,494
2010	46,039	21,618
2000	47,579	21,616
1990	47,952	20,841

*Population and housing unit data has been estimated by the U.S. Census Bureau based on 2010 census data.

Employment and Income

Table 19 shows employment along with unemployment rates in Fayette County over the last several years. Employment in Fayette County represented about 2.24 percent of total employment in the state of West Virginia in 2015. In 2015, the unemployment rate in Fayette County was 8.5 percent compared to 6.7 percent for the state of West Virginia (U.S. Bureau of Labor Statistics, 2016).

Table 19. Employment and unemployment numbers in Fayette County (Source: license application, and U.S. Bureau of Labor Statistics, 2016).

Description	2015	2014	2013	2012
Civilian Labor Force	16,354	16,654	17,005	17,593
Total Employment	14,956	15,275	15,548	16,075
Total Unemployment	1,398	1,379	1,457	1,518
Unemployment as Percent of Labor Force	8.5	8.3	8.6	8.6

The primary sources of employment in West Virginia are government, followed by trade, transportation and utilities; education and health services; and leisure and hospitality (West Virginia University, 2016). The sources of employment in Fayette County are similar to the state of West Virginia. Top employers include Fayette County Board of Education, Mount Olive Correctional Center, Plateau Medical Center, West Virginia University Institute of Technology, WVAM, Global Contact Services, and the whitewater rafting industry (Hawks Nest Hydro, 2015).

For the period 2010-2014, the median household income in the state of West Virginia was estimated as $41,576, whereas in Fayette County it was $34,914. Per capita income in Fayette County was 18,928 compared to $23,237 for the state of West Virginia during this period (U.S. Census Bureau, 2016**)**. The percentage of people living below poverty in Fayette County was slightly higher (i.e., 21.4 percent) than in the state of West Virginia (i.e., 18.3 percent).

Recreation and Tourism

Recreation and tourism are important components of the state and project area economies. As described in section 3.3.4, *Recreation*, resources in the New River-Greenbrier Valley (NRGV) region provide a range of activities from water-related sports and activities such as fishing, boating, and whitewater rafting to land-based hiking, rock climbing, hunting, camping, horseback riding and sightseeing. The recreational resources of the projects contribute to the local and regional recreation setting and currently offer recreational opportunities that are common to other facilities in the region. A West Virginia Division of Tourism study evaluated the impact of tourism on the economy of the NRGV region during the period of 2000-2012, including impacts of expenditures by visitors and earnings and employment information of service providers, as well as local and state taxes. According to the study, total destination spending was $694 million in 2012. Total industry earnings generated by travel spending in the region in 2012 were $170.9 million, with slightly more than half of these earnings ($88.9 million) for accommodation and food services and $56.8 million for the category “Arts, Entertainment, and Recreation.” In 2012, travel to the NRGV region also generated

$55.1 million in state and local taxes, and 6,400 jobs (Dean Runyan Associates, 2013).

According to West Virginia DNR, a total of 81,297 and 19,849 individuals participated in guided whitewater rafting trips on the New and Gauley rivers in 2014, respectively. WVPRO estimates that the total economic impact of whitewater boating on the New and Gauley Rivers is more than $40 million that supports more than 1,600 fulltime and seasonal employees annually. According to WVPRO, annual employee payroll for New and Gauley River outfitters exceeds $8.4 million, with over $7.5 million spent with local and out-of-state vendors (Hawks Nest Hydro, 2015). In 2011, there were 1,226,000 visitors to the New River Gorge National River, Bluestone National Scenic River, and Gauley River National Recreation Area, who spent $53 million in communities surrounding the parks supporting 717 jobs in the local area (Park Service, 2013).

WVAM's Alloy Plant

The WVAM's alloy facility located in Alloy, West Virginia, is a major industrial facility in Fayette County. As described in section 1.2.2, *Need for Power*, the alloy facility depends on the power produced at the Hawks Nest Project, and according to WVAM (2016), employed approximately 242 personnel with an annual payroll of roughly $17.8 million in its previous fiscal year. WVAM purchases energy and raw materials totaling approximately $58 million from West Virginia-based suppliers and an additional $7 million on services from local vendors and contractors (WVAM, 2016).

Project Employment

The Hawks Nest and Glen Ferris projects employ approximately 25 full-time employees. The annual payroll for the Hawks Nest Project is approximately $2.5 million per year, with annual spending of local suppliers of approximately $1 million. The annual payroll for the Glen Ferris Project is approximately $100,000 per year (Hawks Nest Hydro, 2015).

3.3.6.2 Environmental Effects

The Hawks Nest and Glen Ferris projects have a beneficial effect on socio-economic resources in the region by proving employment and recreational opportunities. However, minimum and recreation flow release alternatives proposed by Hawks Nest Hydro and other entities for the bypassed reach of the Hawks Nest Project could affect socioeconomic resources. The proposed minimum flows and recreation releases would require additional flows to the bypassed reach resulting in a loss in generation at the project compared to the existing level. As described in section 1.2.2, *Need for Power*, all power generated at the Hawks Nest Project is transmitted to the Alloy Substation located

at the alloy plant and used in the operation of the plant under an agreement between Hawks Nest Hydro and WVAM. WVAM also purchases 60-Hz power from the grid, and can convert up to a certain amount to 25-Hz power using frequency converters. Moreover, WVAM can convert 25-Hz power to 60-Hz power depending on the availability of 25-Hz power at the project.

In comments on the license application, WVAM discusses the technical requirements needed to operate the alloy plant, the costs associated with purchasing alternative power, applicant-proposed minimum flow conditions, applicant-proposed recreation releases, the economic importance of the alloy facility, and the potential effects (i.e., lower efficiency or production or higher production costs) of higher minimum flows or recreation releases. WVAM states that a minimum level of generation is always needed at the Hawks Nest Project to sustain operation of the WVAM's frequency converters at the alloy plant such that WVAM can even have the ability to purchase 60-Hz power from the grid and convert it to 25 Hz. It states that due to intricacies of the integrated system between the Hawks Nest Project and the alloy plant, generation from two of the Hawks Nest Project's turbine-generator units is necessary, with one unit providing the sustaining generation and the other unit providing the sustaining voltage support to meet 25-Hz reactive power demand of the 25-Hz power system. WVAM states that this would require a flow of at least 1,600 cfs be diverted to the powerhouse at all times to operate two generation units at their minimum capacity (minimum hydraulic capacity of each unit is 800 cfs). WVAM states that when flow to the powerhouse starts to go below 3,200 cfs, electrical furnace loading starts to decline due to reaching the maximum contract capacity for purchasing 60-Hz electricity and limited ability to convert enough 60-Hz electricity to 25-Hz, the alloy plant starts to experience reduction in efficiency. According to WVAM, the alloy facility is generally able to operate at full-load using a variable combination of 25-Hz and 60-Hz power when flow to the powerhouse is more than 3,200 cfs, but would still incur some production loss at flows between 3,200 and 5,600 cfs (WVAM, 2016). WVAM also states that it currently purchases the 25-Hz power from the project at a much lower rate than it pays for the 60-Hz power from the grid. WVAM comments that additional minimum flows or recreation releases would cause economic losses for the alloy plant.

In addition to recommending minimum flows and recreation releases as discussed in section 3.3.1, *Aquatic Resources* and section 3.3.4, *Recreation*, AW and WVPRO also recommend that the Commission consider options of requiring Hawks Nest Hydro to compensate WVAM, the owner of the alloy plant, to allow for higher minimum flows and recreation releases. However, because any economic effects of project-related flow releases specifically on WVAM is a private matter between Hawks Nest Hydro and WVAM, we do not evaluate this alternative in this draft EA.

For the Glen Ferris Project, no issues that would have any socioeconomic effects

were identified. Other recreational amenities provided at the projects would continue under the proposed action, including providing associated socioeconomic benefits.

Staff Analysis

The bypassed reach minimum flow alternatives proposed by the applicant, Interior, AW, and WVPRO, and recreation flow releases proposed by the applicant would allow 1,600 cfs to be diverted to the powerhouse before any proposed additional minimum flow or any proposed recreation releases. In other words, these alternatives would require maintaining two generation units in operation at their minimum hydraulic capacity before the proposed releases. However, the recreation release alternatives proposed by AW and WVPRO would not require any flow diversion to the powerhouse before the proposed releases. There would be a loss in generation at the project under all these alternatives. The recreation release alternatives proposed by AW and WVPRO may sometimes require the project to operate at flows less than 1,600 cfs. Although currently the project has to operate at flows less than 1,600 cfs at times during very low-flow periods, it could happen more frequently under AW's and WVPRO's proposed alternatives. These alternatives could have an effect on the alloy plant as it may need to supplement any reduced generation at the project with additional 60-Hz power from the regional grid, increase its frequency conversion capacity or retool the frequency converters to operate on 60-Hz power.

Recreation releases at the project bypassed reach would be an addition to the various whitewater rafting opportunities on the lower New River, where an approximately 10.5-mile-long-reach upstream of the project is advertised as the "classic" West Virginia whitewater experience. In 2014, commercial whitewater trips on the lower New River accounted for 53 percent of all commercial whitewater trips in West Virginia. Economic effects of recreational visitors would include both direct and indirect benefits resulting in increased local employment, sales, and taxes. The economic effect associated with the proposed recreation flow releases would be a positive one in the vicinity of the Hawks Nest Project and in the region by providing a new whitewater rafting experience.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative the projects would continue to operate as they have in the past. None of the licensee's proposed measures or the resource agencies' recommendations would be required. Aquatic resources would not be enhanced as a result of increased minimum flow in the Hawks Nest bypassed reach, and no scheduled recreation flows would be released in the bypassed reach.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Hawks Nest and Glen Ferris projects' use of environmental resources for hydropower purposes to see what effect various environmental measures would have on the projects' costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*, [48] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

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

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS

Tables 20 and 21 summarize the assumptions and economic information we use in our analysis for the Hawks Nest and Glen Ferris projects, respectively, based on information provided by Hawks Nest Hydro in its license application. We find that the values provided by Hawks Nest Hydro are reasonable for the purposes of our analysis.

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

For each project, cost items common to all alternatives include: taxes and insurance costs; net investment; estimated future capital investment required to maintain and extend the life of plant equipment and facilities; relicensing costs; normal operation and maintenance costs; and Commission fees.

Table 20. Parameters for Economic Analysis of the Hawks Nest Project (Source: staff and Hawks Nest Hydro).

Parameter	Value[a]
Period of analysis (years)	30
Term of financing (years)	20
Federal income tax rate,[b] (%)	35.00
Local tax rate,[b] (%)	3.00
Net investment	$123, 925,300 (2015)
Operation and maintenance,[c] $/year	$5,448,400 (2015)
Licensing cost	$2,000,000 (2015)
Interest rate,[b] (%)	8.00
Discount rate,[b](%)	8.00
Dependable capacity, MW	16.40
Energy value, $/MWh[d]	30
Capacity value, $/MWh[d]	0
Commission fees, $/year[e]	$572,000

[a] Values provided by Hawks Nest Hydro in the license application, unless otherwise noted.

[b] Assumed by Staff.

[c] Includes insurance and general expenses.

[d] Based on a flat rate of $30/MWh for project power provided by Hawks Nest Hydro for selling the 25-Hz power to the alloy plant, and we assume this includes both energy and capacity components. However, if the 25-Hz project power were converted to 60-Hz and were available to the regional grid, the project would realize an energy and capacity value of $39.18/MWh based on an energy rate of $33.45/MWh and a capacity rate of $190/kilowatts-year as obtained from the Energy Information Administration's 2016 Annual Energy Outlook. The project would also realize additional ancillary benefits.

[e] Estimated by staff.

Table 21. Parameters for Economic Analysis of the Glen Ferris Project (Source: staff and Hawks Nest Hydro).

Parameter	Value[a]
Period of analysis (years)	30
Term of financing (years)	20
Federal income tax rate,[b] (%)	35.00
Local tax rate,[b] (%)	3.00
Net investment	$19,620,000 (2015)
Operation and maintenance,[c] $/year	$262,600 (2015)
Licensing cost	$750,000 (2015)
Interest rate,[b] (%)	8.00
Discount rate,[b](%)	8.00
Dependable capacity, MW	2.49
Energy and capacity value,[d] $/MWh	51.03
Commission fees, $/year[e]	$18,000

[a] Values provided by Hawks Nest Hydro in the license application, unless otherwise noted.

[b] Assumed by Staff.

[c] Includes insurance and general expenses.

[d] Based on an energy rate of $33.45/MWh and a capacity rate of $190/kilowatts-year obtained from the Energy Information Administration's 2016 Annual Energy Outlook, and ancillary services value of $256,000 per year provided by Hawks Nest Hydro. Although Hawks Nest Hydro provided an energy value of $40/MWh, it was not consistent with the projected energy rate of $33.45/MWh from the Energy Information Administration's 2016 Annual Energy Outlook. Therefore, staff used the 2016 alternative energy value as projected by EIA.

[e] Estimated by staff.

4.2 COMPARISON OF ALTERNATIVES

Tables 22 and 23 summarize, for the Hawks Nest and Glen Ferris projects, respectively, the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for each of the alternatives considered in this draft EA: no action, the applicant's proposal, and the staff alternative.

Table 22. Summary of the annual cost of alternative power and annual project cost for three alternatives for the Hawks Nest Project (Source: staff).

	No Action	Hawks Nest Hydro's Proposal	Staff Alternative
Installed capacity (MW)	102	102	102
Annual generation (MWh)	544,253	538,761	529,804
Dependable Capacity (MW)	16.40	16.40	16.40
Annual cost of alternative power ($/MWh)	$16,327,590 30.00	$16,162,830 30.00	$15,894,120 30.00
Annual project cost ($/MWh)	$18,795,350 34.53	$18,923,980 35.13	$18,973,460 35.81
Difference between the cost of alternative power and project cost ($/MWh)	($2,467,760) (4.53)	($2,761,150) (5.13)	($3,079,340) (5.81)

Table 23. Summary of the annual cost of alternative power and annual project cost for three alternatives for the Glen Ferris Project (Source: staff).

	No Action	Hawks Nest Hydro's Proposal	Staff Alternative
Installed capacity (MW)	6.159	6.159	6.159
Annual generation (MWh)	41,482	41,482	41,482
Dependable Capacity (MW)	2.49	2.49	2.49
Annual cost of alternative power ($/MWh)	$2,116,670 51.03	$2,116,670 51.03	$2,116,670 51.03
Annual project cost ($/MWh)	$2,374,620 57.24	$2,416,410 58.25	$2,375,500 57.27

	No Action	Hawks Nest Hydro's Proposal	Staff Alternative
Difference between the cost of alternative power and project cost ($/MWh)	($257,950) (6.22)	($299,740) (7.23)	($258,830) (6.24)

4.2.1 No-action Alternative

Under the no-action alternative, the Hawks Nest and Glen Ferris projects would continue as currently constructed and operated.

The Hawks Nest Project has an installed capacity of 102 MW and generates an average of 544,253 MWh of electricity annually. The average annual cost of alternative power is $16,327,590, or about $30.00/MWh. The estimated annual project cost is $18,795,350, or about $34.53/MWh. Therefore, under a no-action alternative, the project would produce power at a cost of$2,467,760, or $4.53/MWh, more than the cost of alternative power.

The Glen Ferris Project has an installed capacity of 6.159 MW and generates an average of 41,482 MWh of electricity annually. The average annual cost of alternative power is $2,116,670, or about $51.03/MWh. The estimated annual project cost is $2,374,620, or about $57.24/MWh. Therefore, under a no-action alternative, the project would produce power at a cost of $257, 950, or $6.22/MWh more than the cost of alternative power.

4.2.2 Applicant's Proposal

Hawks Nest Hydro's proposed environmental measures are listed in section 4.3, tables 24 and 25.

As proposed by Hawks Nest Hydro, the Hawks Nest Project would have an authorized installed capacity of 102 MW, a dependable capacity of 16.40 MW, and would generate an average of 538,761 MWh of energy annually. The average annual cost of alternative power would be $16,162,830, or $30.00/MWh. In total, the average annual project cost would be $18,923,980, or $35.13/MWh. Overall, the project would produce power at a cost that is $2,761,150, or $5.13/MWh, more than the cost of alternative power.

Under Hawks Nest Hydro's proposal, the Glen Ferris Project would have an authorized installed capacity of 6.159 MW, a dependable capacity of 2.49 MW, and would generate an average of 41,482 MWh of energy annually. The average annual cost of alternative power would be $2,116,670, or $51.03/MWh. In total, the average annual project cost would be $2,416,410, or $58.25/MWh. Overall, the project would produce power at a cost that is $299,740, or $7.23/MWh, more than the cost of alternative power.

4.2.3 Staff Alternative

The staff alternative includes staff-recommended additions, deletions, and modifications to Hawks Nest Hydro's proposed environmental protection and enhancement measures. For the Hawks Nest and Glen Ferris projects, tables 24 and 25 show the respective staff-recommended additions, deletions, and modifications to Hawks Nest Hydro's proposed environmental protection and enhancement measures, and the estimated cost of each.

For the Hawks Nest Project, based on a total installed capacity of 102 MW, a dependable capacity of 16.40 MW, and an average annual generation of 529,804 MWh (loss of 14,449 MWh compared to no action alternative), the cost of alternative power would be the same as for the applicant's proposal: $16,162,830, or $30.00/MWh. The average annual project cost would be $18,973,460, or $35.81/MWh. Overall, the project would produce power at a cost that is $3,079,340, or $5.81/MWh, more than the cost of alternative power.

For the Glen Ferris Project, based on a total installed capacity of 6.159 MW, a dependable capacity of 2.49 MW, and an average annual generation of 41,482 MWh, the cost of alternative power would be the same as for the applicant's proposal: $2,116,670, or $51.03/MWh. The average annual project cost would be $2,375,500, or $57.27/MWh. Overall, the project would produce power at a cost that is $258,830, or $6.24/MWh, more than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Tables 24 and 25 give the cost of each of the environmental enhancement measures for the Hawks Nest and Glen Ferris projects considered in our analysis, respectively. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 24. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of continuing to operate the Hawks Nest Project (Source: staff and Hawks Nest Hydro).

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
Aquatic Resources				
1. Continue to operate the project in a run-of-river mode, with inflow to the project approximating outflow and minimal reservoir surface elevation fluctuation.	Hawks Nest Hydro, Staff, Interior	$0	$0	$0[c]
2. Continue to maintain a ramping rate of not greater than 1 foot per hour as measured at the existing USGS gage located downstream of the dam in the vicinity of the Cotton Hill Bridge between March 1 and October 31 when river flows into the project are less than 12,600 cfs and when there are flows of 2,600 cfs or less in the bypassed reach.	Hawks Nest Hydro, Staff	$0	$0	$0[c]
3. Continue to provide a continuous minimum flow of 100 cfs into the bypassed reach.	Hawks Nest Hydro	$0	$0	$0[c]
4. Provide additional seasonal minimum flows into the bypassed reach (July- February: 50 cfs; March-April: 200 cfs; and May-June: 150 cfs) only after passing 100 cfs to the bypassed reach and 1,600 cfs to the powerhouse for generation.	Hawks Nest Hydro, AW	$5,000	$140,000	$91,370[d]
5. Release a minimum flow of 300 cfs into the bypassed reach at all times.	Staff	$0	$349,470	$227,155[e]

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
6. Release to the Hawks Nest bypassed reach available flow in excess of 1,700 cfs (continuous minimum flow to bypassed reach of 100 cfs plus 1,600 cfs allocated to two of the four project turbines) up to the proposed monthly minimum flows, which represent 10 percent of the monthly flow averages for the period 1954 through 2014. (Interior's recommended minimum flow).	Interior	$0	$1,235,700	$803,205[f]
7. Release no less than the following flows into the Hawks Nest bypassed reach each month, if available flows exceed 1,700 cfs: January (700 cfs), February (800 cfs), March (1,1,00 cfs), April (1,000 cfs), May (800 cfs), June (500 cfs), July-October (300 cfs), November (400 cfs), and December (500 cfs). Note these values include the baseline flow of 100 cfs that would be provided to the bypassed reach at all times. (Interior's minimally acceptable minimum flow)	Interior	$0	$689,610	448,247[g]
8. Develop a bypassed reach streamflow monitoring plan for any revised minimum flow targets.	Hawks Nest Hydro, Interior	$10,000	$8,000	$5,940
9. Develop a project operation and compliance monitoring plan, including provisions of the proposed bypassed reach stream flow monitoring plan.	Staff	16,000	$8,000	6,384

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
10. Provide an annual fish compensation payment to West Virginia DNR.	Hawks Nest Hydro, Interior	$0	$30,000	$19,500
11. Prepare a resource enhancement plan, every 5 years, reporting on activities completed by West Virginia DNR utilizing the annual fish compensation payment during the previous period.	Hawks Nest Hydro, Interior	$0	$2,000[h]	$222
Terrestrial Resources				
12. Finalize an updated Running Buffalo Clover Management Plan.	Hawks Nest Hydro, Staff, Interior	$5,000	$5,000	$3,620
13. Limit tree removal activities to between November 15 and March 31 to avoid adverse effects on federally listed threatened and endangered bat species or migratory birds known to be present within the vicinity of the project.	Staff	$0	$0	$0
Recreation				
14. Update the project recreation management plan.	Hawks Nest Hydro	$10,000	$1,000	$1,390
15. Provide $25,000 annually to West Virginia DNR for maintenance and enhancement of recreation facilities.	Hawks Nest Hydro	$0	$25,000	$16,250

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
16. Provide on-time payment of $50,000 to West Virginia DNR for improvements and enhancements to the Cotton Hill Bridge site.	Hawks Nest Hydro	$50,000	$0	$3,699
17. Prepare a report, every 5 years, on activities completed by West Virginia DNR utilizing the annual recreation funding proposed in the application during the previous period and anticipated for the next 5 years.	Hawks Nest Hydro	$0	$2,000[i]	$222
18. Continue to maintain the existing Hawks Nest Powerhouse Fishing Access site.	Hawks Nest Hydro, Staff	$0	$5,000	$3,250
19. Identify, design, and construct improvements to the Cotton Hill Bridge Day-Use Area (on lands owned by Hawks Nest Hydro).	Hawks Nest Hydro, Staff	$50,000	$5,000	$6,949
20. Annually provide scheduled recreation flow releases of 2,000 cfs to 3,000 cfs for a 3-day period each Memorial Day Weekend.	Hawks Nest Hydro	$0	$45,000	$29,250[j]
21. Annually provide 28 scheduled recreation flow releases of 2,500 cfs between June and October (10 in June, 7 in July, 5 in August, 3 in September, and 3 in October).	AW	$0	$266,000	$172,900[k]

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
22. Annually provide 28 scheduled recreation flow releases of 2,500 cfs between June and October (10 in June, 7 in July, 5 in August, 3 in September, and 3 in October), as well as boatable flows every day of March, April, and May.	WVPRO	$0	$351,320	$228,358[l]
23. Annually provide 15 scheduled 6-hour recreation flow releases between March and July (1 day in March - 2,500 cfs; 4 days in April – 2,500 cfs; 5 days in May – 2,500 cfs; 4 days in June – 2,000 cfs; and 1 day in July – 2,000 cfs).	Staff	$0	$114,000	$74,100[m]
24. Provide a website for information related to flows in the bypassed reach.	Hawks Nest Hydro, Staff	$10,000	$5,000	$3,990
25. Include in the proposed update to the Recreation Management Plan procedures and protocols related to the 15 scheduled recreation flow releases.	Staff	$10,000	$1,000	$1,390
26. Provide vehicle-based river access and parking at the Hawks Nest dam.	AW	$2,000,000[n]	$0	$147,951
27. Construct and maintain a new put-in boating access trail from near the dam to the river.	Staff	$10,000	$1,000	$1,390
28. Purchase or lease a suitable and long-term take-out area downstream of the powerhouse.	AW	$150,000	$0	$11,096

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
29. Provide signage and trail enhancements at the Hawks Nest Powerhouse Fishing Access Site to provide year-round take-out for recreational boating.	Staff	$4,000	$1,000	$946
Cultural Resources				
30. Implement the HPMP filed with the Commission on December 29, 2015.	Hawks Nest Hydro, Staff	$0	$1,000	$650
31. Execute a programmatic agreement (PA) that requires Hawks Nest Hydro to manage historic properties according to the HPMP.	Staff	$0	$0	$0[o]

[a] Annual costs typically include operational and maintenance costs and any other costs which occur on a yearly basis.
[b] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing costs.
[c] Staff estimates no additional costs because this is a continuing measure.
[d] Cost based on a loss of 4,592 MWh in generation as provided in the license application.
[e] Cost based on a loss of 11,649 MWh in generation estimated by staff for providing additional 200-cfs minimum flow.
[f] Cost based on a loss of 41,190 MWh in generation as provided by Hawks Nest Hydro in its reply comments filed on July 20, 2016.
[g] Cost based on a loss of 22,987 MWh in generation as provided by Hawks Nest Hydro in its reply comments filed on July 20, 2016.
[h] Staff assumes a cost of $2,000 for preparing the report every 5 years on activities utilizing the fish compensation fund.
[i] Staff assumes a cost of $2,000 for preparing the report every 5 years on activities utilizing the recreation funding.
[j] Cost based on a loss of 900 MWh in generation as provided in the license application.
[k] Cost based on a loss of 7,000 MWh in generation estimated by staff, and assuming $2,000 per day for coordination and providing shuttle during the release event (i.e., 2 people for coordination for an 8-hour day at $75/hour and $800 for a shuttle per day).
[l] Cost based on a loss of 9,844 MWh in generation estimated by staff, and assuming $2,000 per day for coordination and providing shuttle during the release event. For March, April and May releases, staff assumes a boatable flow of 2,500 cfs would be released.
[m] Cost based on a loss of 2,800 MWh in generation estimated by staff, and assuming $2,000 per day for coordination and providing shuttle during the release event.

[n] Cost provided by Hawks Nest Hydro and it assumes that it would require widening the existing road between the Cotton Hill parking area and the dam to provide 2-way access, including installing guard rails, construction of a new turnaround area and additional parking area at various points along the road.

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

Table 25. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of continuing to operate the Glen Ferris Project (Source: Staff and Hawks Nest Hydro).

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
Aquatic Resources				
1. Continue to operate the project in a run-of-river mode.	Hawks Nest Hydro, Staff, Interior	$0	$0	$0[c]
2. Develop a project operation and compliance monitoring plan.	Staff	$3,000	$0	$222
3. Provide an annual fish compensation payment to West Virginia DNR.	Hawks Nest Hydro, Interior	$0	$30,000	$19,500
4. Prepare a resource enhancement plan, every 5 years, reporting on activities completed by West Virginia DNR utilizing the annual fish compensation payment during the previous period.	Hawks Nest Hydro, Interior	$0	$2,000[d]	$222
Terrestrial Resources				
5. Conduct tree removal activities between November 15 and March 31 to avoid killing of federally listed threatened and endangered bat species or migratory birds known to be present within the vicinity of the project.	Hawks Nest Hydro, Staff	$0	$0	$0

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
Recreation				
6. Update the recreation management plan.	Hawks Nest Hydro	$8,000	$1,000	$1,242
7. Provide $25,000 annually to West Virginia DNR for maintenance and enhancement of recreation facilities.	Hawks Nest Hydro	$0	$25,000	$16,250
8. Provide on-time payment of $50,000 to West Virginia DNR for improvements and enhancements to the Kanawha Falls site.	Hawks Nest Hydro	$50,000	$0	$3,699
9. Prepare a report, every 5 years, on activities completed by West Virginia DNR utilizing the annual recreation funding proposed in the application during the previous period and anticipated for the next 5 years.	Hawks Nest Hydro	$0	$2,000[e]	$222

Enhancement/Mitigation Measure	Entity	Capital Cost (2015$)	Annual Cost[a] (2015$)	Levelized Annual Cost[b] (2015$)
Cultural Resources				
10. Implement the HPMP filed with the Commission on December 29, 2015.	Hawks Nest Hydro, Staff	$0	$1,000	$650
11. Execute a programmatic agreement (PA) that requires Hawks Nest Hydro to manage historic properties according to the HPMP.	Staff	$0	$0	$0[f]

[a] Annual costs typically include operational and maintenance costs and any other costs which occur on a yearly basis.
[b] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing costs.
[c] Staff estimates no additional costs because this is a continuing measure.
[d] Staff assumes a cost $2,000 for preparing the report every five years on activities utilizing the fish compensation fund.
[e] Staff assumes a cost $2,000 every five years for preparing the report every five years on activities utilizing the recreation funding.
[f] Staff assumes no additional cost to implement this measure.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. The section contains the basis for, and a summary of, our recommendations for relicensing the Hawks Nest and Glen Ferris projects. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on these projects and our review of the environmental and economic effects of the proposed projects and their alternatives, we selected the proposed action with staff-recommended modifications as the preferred alternative. We recommend this alternative because: (1) issuing a new license for each of the projects would allow Hawks Nest Hydro to continue to operate the projects and provide a beneficial and dependable source of electric energy; (2) generation from the Hawks Nest and Glen Ferris projects, with total installed capacities of 102 MW and 6.159 MW, respectively, comes from a renewable resource that does not contribute to atmospheric pollution; and (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance fish resources and would improve public recreation opportunities at the projects.

In the following section, we make recommendations as to which environmental measures proposed by Hawks Nest Hydro or recommended by agencies or other entities should be included in any licenses issued for the projects. In addition to Hawks Nest Hydro's proposed environmental measures, we recommend additional staff-recommended environmental measures to be included in any new licenses issued for the projects, and we describe these requirements in the draft license articles in appendices A and B.

5.1.1 Measures Proposed by Hawks Nest Hydro

Based on our environmental analysis of Hawks Nest Hydro's proposal, as discussed in section 3, and the costs discussed in section 4, we recommend including the following environmental measures proposed by Hawks Nest Hydro in any license issued for the Hawks Nest and Glen Ferris projects:

- Operate both projects in a run-of-river mode, with inflow to the projects approximating outflow.

- Maintain the existing ramping rate for discharges into the Hawks Nest bypassed reach between March 1 and October 31 when river flows into the reservoir are less than 12,600 cfs and when there are flows of 2,600 cfs or less in the bypassed reach, to maintain a water level ramping rate of not greater than 1 foot per hour as measured at the USGS gage (No. 380649081083301) located downstream of the dam in the vicinity of the Cotton Hill Bridge.

- Continue to conduct routine right-of-way/transmission corridor maintenance and hazardous tree/vegetation removal in accordance with the FWS' May 2007 National Bald Eagle Management Guidelines. In the event bald eagles are documented at or in the vicinity of either project, consult with the FWS in order to avoid disturbance or other impacts to the species.

- Finalize an updated Running Buffalo Clover Management Plan for the Hawks Nest Project.

- Update the Recreation Management Plan for the Hawks Nest Project by describing recreation facilities and access within and immediately adjacent to the project boundary.

- Identify, design, and construct improvements to the parking area of the Cotton Hill site, including a seasonal toilet/changing facility, new picnic facilities, and parking and signage improvements.

- Maintain the existing Hawks Nest Powerhouse site.

- Develop and maintain a website to provide Hawks Nest bypassed reach flow information to facilitate awareness of whitewater boating opportunities.

- Implement the HPMP filed with the license application to protect archaeological and historic resources at both projects.

5.1.2 Additional Staff-Recommended Measures

Under the staff alternative, the projects would be operated with Hawk Nest Hydro's proposed measures, as identified above, and the following additions or modifications:

- Provide a 300-cfs minimum flow into the Hawks Nest bypassed reach to enhance aquatic habitat.

- Develop a project operation and compliance monitoring plan for the Hawks Nest Project that includes the provisions of the proposed bypassed reach streamflow monitoring plan and monitoring of compliance with run-of-river operation, ramping rate restrictions, and recreation releases.

- Develop a project operation and compliance monitoring plan for the Glen Ferris Project to document compliance with run-of-river operation.

- For the protection and enhancement of migratory birds and federally listed bat species, and their habitats, conduct any necessary tree removal activities between November 15 and March 31 in order to minimize effects on federally listed threatened and endangered bat species or migratory birds.

- Provide 6-hour scheduled recreation flow releases of 2,000-2,500 cfs into the Hawks Nest bypassed reach on 15 weekend days from March through July, as follows to enhance whitewater boating opportunities:

    - one Saturday release in March of 2,500 cfs (1 day);
    - two weekend releases in April of 2,500 cfs (4 days);
    - two weekend releases in May of 2,500 cfs, one of which is the 3-day Memorial Day Weekend (5 days);
    - two weekend releases in June of 2,000 cfs (4 days); and
    - one Saturday release in July of 2,000 cfs (1 day).

- Construct and maintain a new access trail from the gravel parking area near the Hawks Nest dam to the river with the proper slope and width to accommodate rafting groups.

- Provide signage and trail enhancements at the Hawks Nest Powerhouse Site to provide a year-round take-out for recreational boating.

- Include the procedures and protocols related to the scheduled recreation flow releases in the proposed updated Recreation Management Plan for the Hawks Nest Project.

- Execute programmatic agreements that implement the HPMPs filed December 29, 2015.

We discuss the rationale for the measures we are recommending or not recommending below.

Minimum Flows in the Hawks Nest Bypassed Reach

Hawks Nest Hydro proposes to release an additional 50 cfs to the bypassed reach from July through February, an additional 200 cfs during March and April, and an additional 150 cfs during May and June. Interior, AW, and WVPRO provided minimum flow recommendations for the Hawks Nest bypassed reach. AW's and WVPRO's monthly minimum flows were the same as those proposed by the applicant. In its 10(j) letter, Interior provided two sets of monthly minimum flows: (1) a set of higher minimum flows we considered as its 'recommended flows' and (2) a set of lower minimum flows we considered as its 'minimally acceptable' flows (see table 4 above). Under each of the minimum flow proposals/recommendations, additional water would only be released to the bypassed reach (in excess of the existing baseline flow of 100 cfs and up to the proposed minimum flow) at reservoir inflows greater than 1,700 cfs. This is because under each minimum flow proposal, the first 1,600 cfs of inflow (beyond the 100-cfs baseline flow) would be allocated to the powerhouse (not the bypassed reach) for project generation.

During the low-flow period (July-October), reservoir inflows would sometimes be insufficient to meet the target minimum flows proposed by Hawks Nest Hydro, AW, WVPRO, and Interior because not enough water would remain if the first 1,600 cfs of flow is allocated to the powerhouse before releasing any water (beyond the baseline flow of 100 cfs) into the bypassed reach. Specifically, based on staff's analysis, the above minimum flow recommendations could only be achieved 67 to 78 percent of the time during the months of September and October. On the other hand, a flow of 300 cfs provided to the bypassed reach at all times, before any water is used for generation purposes, should be available at all times in the foreseeable future (i.e., over the term of a new license) as instantaneous minimum flows in the Hawks Nest reservoir over a 61-year monitoring period (1954-2014) were never less than 735 cfs. Therefore, staff recommends a continuous minimum flow of 300 cfs as this would provide a more stable aquatic environment in the bypassed reach (at least 300 cfs at all times during the low-flow period) as compared to the other minimum flow proposals we received, under which flows in the bypassed reach would fluctuate more and occasionally (~10 to 20 percent of the time) be as low as 100 cfs.

Our environmental analysis suggests that, besides northern hog sucker, the species that would benefit the most under the proposed minimum flows is smallmouth bass, which is the most sought after gamefish in the project area. Compared to the applicant's proposal, our recommended minimum flow would increase the amount of suitable habitat for adult smallmouth bass by 34.8 percent (nearly 43,000 m^2) in the bypassed reach. Meanwhile, Interior's recommended minimum flows would either result in no increase in adult smallmouth bass habitat (their 'minimally acceptable' flow regime) as compared to our recommended minimum flow, or at most, an 8.6 percent increase (their

'recommended' flow regime) compared to our recommended minimum flow of 300 cfs. Furthermore, our environmental analysis demonstrated the greatest gains in total wetted habitat (per unit increase in flow) in the bypassed reach occurs from 100 cfs to 300 cfs, after which the rate of habitat gain levels off (300 cfs to 1,000 cfs), then declines (above 1,000 cfs). For these reasons, we conclude that the benefits of our continuous 300-cfs minimum flow are worth the additional levelized annual cost of $135,785 in lost generation relative to the applicant's proposal, but that Interior's recommended minimum flows, which would cost the applicant up to $576,050 more in annual lost generation compared to our flow recommendation, would not be worth the cost given the diminishing returns of aquatic habitat in the bypassed reach at flows higher than 300 cfs.

Project Operation and Compliance Monitoring Plans

Hawks Nest Hydro proposes to develop a streamflow monitoring plan to ensure compliance with any revised minimum flow targets or requirements for the Hawks Nest bypassed reach, including detail of the mechanisms and structures that would be used, including any periodic maintenance and calibrations necessary for any installed devices and any recording or reporting of data to resource agencies or to FERC. However, Hawks Nest Hydro did not specify how it would document compliance with run-of-river operation (both projects), ramping rate restrictions (Hawks Nest Project only), or recreation flows (Hawks Nest Project only).

Therefore, we recommend that any license issued for the projects require Hawks Nest Hydro to develop a more broadly encompassing operation and compliance monitoring plan in consultation with the West Virginia DNR and Interior. In addition to the applicant's proposed streamflow monitoring plan for the Hawks Nest bypassed reach (described above), the operation and compliance monitoring plan for the Hawks Nest Project should explain the monitoring methods and devices (including calibration procedures) that would be used to ensure compliance with run-of-river operation, seasonal ramping rate restrictions, and recreation flows. The operation and compliance monitoring plan for the Glen Ferris Project should explain the monitoring methods and devices (including calibration procedures) that would be used to ensure run-of-river operation at the project.

Upon implementation of the plans, an operation compliance monitoring report would be filed with the Commission for each project on an annual basis. Staff's recommendation for Hawks Nest Hydro to develop operation and compliance monitoring plans for each project would facilitate Commission administration of the licenses and verify that the operational constraints for the protection and enhancement of aquatic and recreational resources are working as intended. We estimate the levelized annual cost to develop a plan with these compliance monitoring procedures would be $6,384 for the Hawks Nest Project (which includes provisions of the Hawks Nest Hydro's proposed

streamflow monitoring plan for the bypassed reach) and $222 for the Glen Ferris Project, and conclude the compliance benefits of ensuring the protection and enhancement of aquatic and recreation resources would be worth the cost.

Bald Eagle Protection Measures

No bald eagles have been documented at the Hawks Nest and Glen Ferris projects, but suitable habitat can be found within the project boundary. As a result, operation and maintenance of the Hawks Nest and Glen Ferris projects do not currently affect bald eagles, because no nests have been observed or are believed to occur in or adjacent to either project's boundary. However, given current population trends for the species, future use of the project area by bald eagles is likely, as suitable habitat is widespread throughout each project's boundary. Hawks Nest Hydro proposes to continue to conduct routine right-of-way/transmission corridor maintenance and minimal hazardous tree/vegetation removal in accordance with the FWS' May 2007 bald eagle guidelines. In the event that a bald eagle nest is observed within the Hawks Nest or Glen Ferris Project boundary in the future, and activities are proposed or ongoing that are in the vicinity of the nest, Hawks Nest Hydro proposes, and Interior recommends, that Hawks Nest Hydro consult with FWS on management measures that should be taken to avoid disturbance or other impacts to the species.

The project's existing suitable habitat is reflective of current activities, having been shaped by long-term operation of the project and Hawks Nest Hydro does not propose any changes to operation except for the increases in minimum flow and the scheduled 3-day boating releases. Our analysis in section 3.3.3.2, *Terrestrial Resources, Environmental Effects*, indicates that continued operation and maintenance of the Hawks Nest Project, in conjunction with Hawks Nest Hydro's proposal and Interior's recommendation to consult, would have no effect on bald eagles. We estimate the costs associated with consulting are minimal and conclude the benefits of protecting the bald eagle, should it be documented at the Hawks Nest and Glen Ferris projects in the future, justify the cost.

Running Buffalo Clover Management Plan

One occurrence of running buffalo clover is known to occur in upland forest near Cotton Hill, within the Hawks Nest Project boundary on lands owned and managed by West Virginia DNR. Hawks Nest Hydro currently manages the population pursuant to a Running Buffalo Clover Management Plan required by the current license. Hawks Nest Hydro has updated the Running Buffalo Clover Management Plan (Appendix B of the final license application) and, pursuant to the updated plan, proposes to continue to monitor and maintain the population in cooperation with West Virginia DNR and FWS. Interior also recommends, pursuant to section 10(j), that Hawks Nest Hydro continue to

implement running buffalo clover protection and management activities in accordance with an approved Running Buffalo Clover Management Plan and in consultation with West Virginia DNR and FWS. Under Hawks Nest Hydro's and the agencies' management, the single known population of running buffalo clover at the Hawks Nest Project has increased substantially over the past 4 years. Our analysis in section 3.3.4.2, *Threatened and Endangered Species, Environmental Effects*, indicates implementation of Hawks Nest Hydro's updated Running Buffalo Clover Protection Plan would benefit running buffalo clover by continuing to enact protection and management measures. We estimate that the levelized annual cost of the updated Running Buffalo Clover Protection Plan would be $3,620 and conclude that the benefits of protection to the federally listed running buffalo clover justify the cost.

Federally Listed Bat Protection Measures

Indiana bat and northern long-eared bat are known from Fayette County, West Virginia, and are confirmed to occur within the boundaries of the Hawks Nest and Glen Ferris projects. While not detected during Hawks Nest Hydro's field surveys, Virginia big-eared bat may also occur in Fayette County and within the projects' boundaries. Suitable foraging and potential roosting habitat for bats, including the species listed above, is common in the project area, which supports a range of upland, riparian, wetland, and open-water habitats, as well as local potential habitat features such as mines. Our analysis in section 3.3.3.2, *Terrestrial Resources, Environmental Effects*, indicates that the upland forested habitats used by these species would not be affected by normal or proposed project operation or maintenance activities and with implementation of Interior's recommendation to conduct any necessary tree or brush removal activities related to maintenance or recreation facility enhancements between November 15 and March 31, Hawks Nest Hydro will avoid killing or injuring federally listed bats. This measure also would help prevent the killing or injury of migratory bird species using the project area.

For northern long-eared bats, both projects are subject to adhering to the FWS final 4(d) rule, which states that incidental take of northern long-eared bats resulting from tree removal is prohibited if it: (1) occurs within a 0.25-mile radius of known northern long-eared bat hibernacula; or (2) cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius from the known maternity tree during the pup season (June 1 through July 31). These projects conform to the final 4(d) rule because there are no known hibernacula or maternity roost trees in either project area. Furthermore, any activities involving bat and habitat disturbance would be conducted outside of pup season and in accordance with the recommended avoidance guidelines.

We estimate the costs associated with this measure are minimal and conclude the benefits of protecting the federally listed Indiana bat, northern long-eared bat, and Virginia big-eared bat justify the cost.

Scheduled Recreation Flow Release

Hawks Nest Hydro proposes 8-hour scheduled recreation releases between 2,000 cfs and 3,000 cfs for the 3-day Memorial Day Weekend of every year, but only after 1,600 cfs is diverted to the powerhouse for generation. AW and WVPRO recommend 28 scheduled recreation flow releases from June through October that would prioritize up to 2,500 cfs to the bypassed reach before any flows were diverted to the powerhouse.

Based on staff's analysis, if whitewater opportunities are given the priority of flows, there are historically 329 days of the year when flows of 2,000 cfs and 301 days when flows of 2,500 cfs would be available in the bypassed reach. Currently, generation is given the priority of flows, which creates approximately 80 days of unscheduled recreation flows at 2,500 cfs throughout the year. Flows between 2,000 and 2,500 cfs were determined to be acceptable boating flows by the participants in Hawks Nest Hydro's Recreation Flow Assessment.

After reviewing the Recreation Flow Assessment, stakeholder comments, and applicant-proposed measures, we recommend that Hawks Nest Hydro provide a total of 15 recreation flow releases beginning the first spring after put-in and take-out access improvements are constructed. The flows would take place during the spring through mid-summer season when flows in the New River are generally high enough to reduce effects on generation and the alloy plant. However, on the 15 release days, flows to the bypassed reach for recreation purposes would receive priority over flows for generation. We recommend the following release schedule:

- one Saturday release in March of 2,500 cfs (1 day);
- two weekend releases in April of 2,500 cfs (4 days);
- two weekend releases in May of 2,500 cfs, one of which is the 3-day Memorial Day Weekend (5 days);
- two weekend releases in June of 2,000 cfs (4 days); and
- one Saturday release in July of 2,000 cfs (1 day).

Based on an evaluation of other rivers with scheduled flow releases, we recommend a 6-hour release for each release day. Multiple trips (if desired by boaters) should be achievable within this smaller timeframe compared to Hawks Nest Hydro's proposed 8-hour releases. A 6-hour release period would also provide multiple start time options for commercial outfitters to offer rafting trips to their customers. The 6-hour release would provide enough time for all recreational river users to enjoy the river at a

leisurely pace without the concerns of running out of water.

Flows of 1,500 cfs are generally considered the minimum acceptable level for navigability and overall whitewater experience. Should inflows drop below 2,500 cfs for the March through May scheduled recreation release days or less than 2,000 cfs for the June through July scheduled releases, Hawks Nest Hydro could release inflows down to a minimum flow of 1,500 cfs in the bypassed reach. Thus, if inflows to the project are 1,500-2,500 cfs from March through May or 1,500-2,000 cfs from June through July, the scheduled releases could still occur. Available flows for each day of the scheduled release events should be evaluated independently and should not be determined based on prior flows available for release events. Even during low inflow periods and reduced whitewater flow releases, recreation would still receive the first allocation of flows. If inflows fall below 1,500 cfs, Hawks Nest Hydro could cancel the release for that specific day. We recommend that cancelled releases due to inflows below 1,500 cfs would not need to be rescheduled. We also recommend that Hawks Nest Hydro provide immediate notification and justification of the cancelled release on its flow notification website and submit a letter to the Commission explaining the cancellation.

Hawks Nest Hydro proposes to monitor use during the recreation releases as part of their 3-day recreation release proposal. We agree that monitoring use would provide quantitative information on participant usage of the bypassed reach area during the recreation releases; such information could be used to justify changes to user access, parking locations, or traffic flow. In addition to the monitoring, we recommend for the first 3 years of recreation releases, that Hawks Nest Hydro coordinate a pre-release meeting before March 1st and a post-release meeting after the final release in July. We recommend that West Virginia DNR, AW, and WVPRO be invited to participate in both meetings. The pre-release coordination meeting should be used to set the upcoming release schedule, to discuss and prepare for potential conflicts that might arise during the releases, set participant rules and regulations for parking, transportation, and safety, and to provide a collaborative forum for successful recreation releases. The post-release meeting would provide the opportunity to discuss challenges that occurred on release days, evaluate access at the put-in and take-out, evaluate participation numbers, and the opportunity to discuss and decide if new measures (e.g., such as the raft slide proposed by AW) are warranted.

Hawks Nest Hydro estimated the average cost per day for a recreational release to be $12,000. This included $7,500 for lost generation, $3,500 for planning and coordination (forecasting flow, coordinating operations and restrictions with the alloy plant), and $1,500 for additional operations labor. Staff recommends a 6-hour release rather than an 8-hour release, which would result in shorter periods of reduced generation on a daily basis. Planning and coordination costs per release day would decrease in two ways: 1) measures and calculations to forecast flow would exist on the flow notification

website Hawks Nest Hydro proposes to establish and 2) coordination with the alloy plant would require less planning as Hawks Nest Hydro would inform the alloy plant of the generation available for that day, much as it would be for any other low-flow day of the year. However, there would be additional labor costs for coordinating the traffic between the Cotton Hill parking area and the dam and a cost for the shuttle system. We anticipate that the scheduled releases would attract anywhere from 50-200+ users per release day based on the use numbers at the Ocoee River and descriptions of use at the Pigeon River. We consider that a levelized annual cost of $74,100 would be worth the recreational value of providing the recreation releases into the Hawks Nest bypassed reach. We find that a solid class III whitewater river with scheduled recreation releases is not available within several hours of the Dries; therefore, providing this unique experience for the public justifies the cost.

Project Recreation Access

Hawks Nest Hydro proposes to identify, design, and construct improvements at the Cotton Hill site that would include a seasonal restroom/changing facility, picnic facilities, parking improvements, and signage improvements. In addition, Hawks Nest Hydro proposes to continue maintaining and operating the Hawks Nest Powerhouse site

Hawks Nest Hydro proposes to provide a shuttle service for the proposed 3-day recreation release to transport whitewater boaters from the Cotton Hill parking lot to the put-in area at the dam. Hawks Nest Hydro also proposes to coordinate with the New River Campground owners to arrange for take-out access on the New River Campground property for river users during the releases. AW requests year-round open vehicular access on the road from Cotton Hill to the dam and recommends that Hawks Nest Hydro purchase or lease lands for a take-out site downstream of the powerhouse.

Providing recreation users access to the dam by eliminating a 1-mile walk with boats and gear would improve existing access to the bypassed reach and would likely encourage use of the bypassed reach on release days. The shuttle system and the vehicular access options can both provide improved access without requiring major access road improvements. In order to accurately assess the shuttle and vehicular access options, we recommend that Hawks Nest Hydro operate its proposed shuttle system for the March, April, and the first May releases. For the second May release, and the June and July releases, we recommend that Hawks Nest Hydro arrange for vehicular access for all river users. This option would incorporate use of the gravel parking area at the dam and include traffic communication (i.e., employees with walkie talkies) to allow ingress and egress for emergency vehicles and while controlling the flow of vehicles on the access road. The first year of access would not require any improvements to the road or the parking area at the dam, but rather would provide insight as to the positive and negative aspects of each option.

We recommend this split access option only for the first year of recreation releases because it would provide an opportunity to monitor and evaluate the two options with actual experience and feedback from participants. The evaluation would provide Hawks Nest Hydro, commercial outfitters, private boaters, and the Commission with accurate information regarding the costs, benefits, and challenges of each option. When providing flows to the public for the length of a license, providing the best and most reasonable access option would benefit everyone involved. The costs associated with the shuttle system for the 3-day Memorial Day weekend are incorporated into Hawks Nest Hydro's proposal for recreation flow releases. The annual costs associated with providing shuttle access, vehicular access, or a combination of the two options for 15 scheduled releases is not exactly known. We do believe that evaluating both options would be worth the time, planning efforts, and results produced.

Prior to the first year of scheduled recreation flow releases, we recommend that Hawks Nest Hydro improve put-in access by developing a new trail from the gravel parking area at the dam to the riverbed. The new trail should be properly sloped and wide enough to carry rafts, kayaks, and personal equipment to the bottom. Due to the steep terrain and possible length of the trail, we estimate the levelized annual cost of a put-in trail would be $1,390. We conclude that the access benefits that a new trail would provide outweigh the costs.

We also recommend that Hawks Nest Hydro use its existing Hawks Nest Powerhouse site as a year-round take-out location for private boaters. Prior to the first year of scheduled recreation flow releases, we recommend that Hawks Nest Hydro install signage at the entrance to the parking lot and at the water's edge designating the take-out access area for river users. To improve access for the public, Hawks Nest Hydro would need to widen and clear one of the currently existing trails that exist from the river's edge to the parking lot in order to accommodate paddlers carrying their equipment and boats. We estimate the levelized annual costs of take-out trail improvements would be $946 and conclude that the benefits of this measure outweigh the costs.

In addition to the staff-recommended put-in and take-out improvements, we recommend that Hawks Nest Hydro provide a seasonal restroom facility, picnic facilities, parking improvements, and signage improvements at the Cotton Hill site. These improvements would enhance the recreation experience for all visitors to the site. These improvements would be on licensee-owned land but should be made after consultation with the West Virginia DNR, who is responsible for maintenance of the Cotton Hill site. We estimate that the levelized annual cost of these improvements would be $6,949 and conclude that the benefits of this measure outweigh the costs.

Recreation Management Plan

There are multiple components to providing recreation releases, put-in and take-out access, and bypassed reach flow information. In order to provide these accommodations for the public, Hawks Nest Hydro should update the Recreation Management Plan to delineate license requirements of Hawks Nest Hydro and protocols for the public. The plan should include descriptions of the following measures:

- a schedule of completing project recreation access improvements near the dam, at the Cotton Hill site, and at the Hawks Nest Powerhouse site;
- a schedule of release dates and timing, determined in consultation with the West Virginia DNR, AW, and WVPRO to include:
  - one Saturday release in March of 2,500 cfs (1 day);
  - two weekend releases in April of 2,500 cfs (4 days);
  - two weekend releases in May of 2,500 cfs, one of which is the 3-day Memorial Day Weekend (5 days);
  - two weekend releases in June of 2,000 cfs (4 days); and
  - one Saturday release in July of 2,000 cfs (1 day);
- pre-release coordination meetings, monitoring, and post-release evaluation meetings during the first 3 years of releases;
- first-year trial of the shuttle access option for the March, April, and the first May release;
- first-year trial of the vehicular access option for the second May release and the June and July releases;
- designated locations for put-in and take-out parking during the scheduled release events as well as during non-scheduled flows;
- guidelines for participant safety;
- protocols for emergency situations that participants could encounter within the project vicinity both on and off the river; and
- a flow notification website.

The plan should also include: management policies for the project recreation sites; provisions for ongoing operation and maintenance of the sites; an inventory of amenities at project recreation sites; and maps depicting project recreation sites showing existing facilities and proposed enhancements.

Hawks Nest Hydro should submit a Recreation Management Plan within one year of license issuance. This plan should be submitted after consultation with West Virginia DNR, AW, and WVPRO. A revision of the plan addressing the access determination for the scheduled recreation flow releases should be submitted within 6 months after the first year of releases. If revisions to the plan at the conclusion of the three-year evaluation and monitoring period are necessary, a revised plan should be submitted within 6 months

after the third year of releases. We find that the plan would be worth the levelized annual cost of $1,390.

Historic Properties Management Plan

To ensure that adverse effects on known and potential historic properties, and to any as yet unidentified archaeological resources are satisfactorily resolved over the term of a new license, we intend to execute PAs with the West Virginia SHPO for the Hawks Nest Project and the Glen Ferris Project. The PAs would require Hawks Nest Hydro to implement the approved HPMPs. Hawks Nest Hydro and the Park Service would be invited to participate as concurring parties. The PAs would incorporate the final HPMPs filed on December 29, 2015. The HPMPs for the projects contain the principles and procedures to address identification, management, and protection of historic properties; mitigation and resolution of unavoidable adverse effects; compliance with laws and regulations governing human remains; discovery of previously unidentified resources; and consultation procedures during HPMP implementation over the term of any license issued. We recommend that Hawks Nest Hydro implement the HPMPs. The protection afforded to historic properties justifies the annual estimated cost of $650 for the HPMPs.

Project Boundary

As described in section 2.2.3, *proposed modifications to project boundary*, Hawks Nest Hydro proposes to remove Highway 16 from the Hawks Nest Project comprising 12.1 acres, since this public roadway is not necessary for operation of the project. In addition, adjustments to the Hawks Nest project boundary are proposed to correct discrepancies found between the existing Exhibit G drawings and the associated boundary descriptions. Specifically, Hawks Nest Hydro proposes to add 2.15 acres on the right (looking downstream) side of the reservoir upstream of Mill Creek and 0.42 acre on the left side of the reservoir across from Mill Creek to encompass the normal operating range of the reservoir (819.5 feet). Hawks Nest Hydro also proposes to remove 4.96 acres and add 0.91 acre at the downstream end of the Hawks Nest project boundary to better reflect the land needed and necessary to operate the project. For Glen Ferris Project, Hawks Nest Hydro proposes to add 1.39 acres near the northern shore of the upstream end of the project boundary to encompass the normal operating range of the reservoir (651 feet). In addition, Hawks Nest Hydro proposes to modify the existing project boundary where it crosses the river at the upstream end of the reservoir by removing 16.8 acres, mostly water, so that the boundary crosses the river on a straight line. Because Hawks Nest Hydro possesses property or easement rights to all areas associated with the proposed project boundary, adjustments of the project boundary for each of the projects would be consistent with Commission policy.

5.1.3 Measures Not Recommended by Staff

American Whitewater's Bypassed Reach Flow Ramping

Hawks Nest Hydro proposes to continue its current practice of maintaining a seasonal ramping rate of less than 1-foot-per-hour from March through October when flows in the bypassed reach are 2,600 cfs or less. AW recommends that a 1-foot-per-hour down-ramping rate be implemented on a year-round basis -- from January through May when flows in the bypassed reach are less than 8,000 cfs and from June through December when flows in the bypassed reach are less than 5,000 cfs. Our environmental analysis indicates that AW's proposed ramping rate would not afford more protection for resources than the applicant's proposed (existing) ramping rate. Because the applicant's ramping restrictions would be applied to both up-ramping and down-ramping, it would ensure the protection of both recreation and aquatic resources at times of the year when the sensitive stages of young fishes are most prevalent and susceptible to sudden changes in flow and also when recreation activity is highest (spring and summer) in the bypassed reach. Therefore, staff does not recommend AW's year-round ramping plan.

Fishery Compensation Plan

Both the applicant and Interior support the continuation of the Fishery Compensation Plan, which requires the applicant to pay West Virginia DNR annual, inflation-adjusted compensation that equates to the replacement value of all fishes assumed to suffer entrainment mortality at the projects (the current plan assumes all entrained fishes are killed).

In section 3, we found that entrainment and turbine mortality is low (less than 10 percent) and is not expected to exert appreciable impact or damages to fish populations at the projects. For this reason, we have no justification for requiring entrainment mitigation, including compensation payments for entrainment mortality and a related provision to prepare and file, in consultation with West Virginia DNR and Interior, a Resource Enhancement Plan every 5 years that would describe how anticipated funds would be spent.

Consideration of Fish Passage

Interior recommends that, pursuant to section 10(a) of the FPA, the applicant considers the provision of fish passage at the projects in order to allow the safe, timely and effective upstream and downstream passage of fish, namely American eel and skipjack herring, at the projects. However, we found no recent evidence that American eel, or other native populations of diadromous fishes, are present in the project areas (section 3.3.1, *Aquatic Resources*). Furthermore, in a letter filed with the Commission on

October 5, 2016 (filed after its 10(j) letter), Interior stated that "providing passage for skipjack herring is a moot point given its status as introduced above Kanawha Falls." Therefore, we do not recommend requiring Hawks Nest Hydro to consider provisions for fish passage at the projects given the current lack of native migratory fish populations in the immediate vicinity of the projects.

Funding for Recreation

Hawks Nest Hydro proposes two separate funding measures for each project. At the Hawks Nest Project, Hawks Nest Hydro proposes: 1) a one-time payment of $50,000 to the West Virginia DNR for improvements to the Cotton Hill site and 2) annual funding of $25,000 to the West Virginia DNR for maintenance and enhancements to recreation facilities on lands that have been deeded to the West Virginia DNR. At the Glen Ferris Project, Hawks Nest Hydro proposes: 1) a one-time payment of $50,000 to the West Virginia DNR for recreation improvements to the Kanawha Falls site and 2) annual funding of $25,000 to the West Virginia DNR for maintenance and enhancements to recreation facilities on lands that have been deeded to the West Virginia DNR.

We do not recommend these four funding measures because they are not associated with specific measures that describe the types of improvements, enhancements, and maintenance needs to which the funds would be allocated. Therefore, we are unable to analyze the effectiveness or appropriateness of these measures. Because it is the Commission's strong preference to require specific measures directed towards a specific project effect and/or purpose, where such non-specific measures have been proposed, the Commission might not require them in a license. However, this would not prevent Hawks Nest Hydro and West Virginia DNR from pursuing such measures separate from any license that may be issued

Recreation Management Plan for the Glen Ferris Project

Hawks Nest Hydro proposes to file a recreation management plan for the Glen Ferris Project for Commission approval. The plan would describe recreational facilities within and immediately adjacent to the project boundary. The Commission requires recreation management plans for all sites within a project boundary when significant changes to recreation sites are proposed by an applicant and recommended by the Commission. When specific measures are proposed, the Commission may approve the measures without the development of a plan.

We do not recommend that Hawks Nest Hydro file a recreation plan for the Glen Ferris Project because the Kanawha Falls site is outside of the Glen Ferris project boundary. Therefore, we find that a recreation management plan is not necessary for the Glen Ferris Project.

Year-Round, Public Vehicular Access near the Dam

AW recommended that Hawks Nest Hydro provide year-round, free, vehicle-based river access below the Hawks Nest dam. We do not recommend AW's proposal because safety measures provided with the shuttle system or the vehicular access option on release days would not be available on days when scheduled releases were not occurring. The provision of access on release days should meet the majority of demand for vehicle access to the dam. We believe the pedestrian access that is currently available and that would remain open on non-release days is sufficient to meet the public use and demand of the put-in area.

Raft Slide at the Put-In

AW recommended that Hawks Nest Hydro consider installing a raft slide at the put-in to provide assistance to rafters as they lower their rafts from the gravel parking area near the dam to the bedrock at the river's edge. At this time, we do not recommend a raft slide at the put-in area because we do not yet know actual use levels of the river on release days until regular, planned releases occur in the bypassed reach. Monitoring and evaluations of river use would help determine whether rafters would benefit from a raft slide or whether existing access trails would provide adequate access to the river's edge. The need for a raft slide or other access improvements could be discussed at the coordination meetings.

Spring Boatable Flows

WVPRO recommended that Hawks Nest Hydro release boatable flows to the bypassed reach every day of March, April, and part of May. We presume this means levels of up to 3,000 cfs should be made available every day during the spring. We do not recommend WVPRO's proposal because the staff-recommended recreation release schedule provides opportunities for the public to paddle intermediate whitewater flows in the bypassed reach during the spring to mid-summer. In addition, with the flow notification website, river users would be able to check on flows in the Dries at any time throughout the year in order to paddle this stretch of river. Currently from March through May, there are about 37 days where flows of 3,000 cfs and 42 days where flows of 2,000 cfs are available in the bypassed reach. Daily spring boating releases would cost $55,458 (levelized) in annual lost generation and would not outweigh the benefits to recreation users.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Continued operation of the Hawks Nest and Glen Ferris projects would result in some unavoidable fish impingement and entrainment. However, given the relatively

large trash rack spacing at the projects (1.75 to 3.19 inches), most fish susceptible to impingement would be large and could therefore avoid impingement due to their increased swimming ability. Most fishes entrained at the projects would be small (less than 6 inches) and therefore experience low blade strike mortality. Furthermore, the younger individuals in a population generally have high rates of natural mortality, even in the absence of hydropower operations, and fish populations have generally evolved to withstand losses of these smaller and younger individuals with little or no impact to long-term population sustainability. Thus, entrainment and turbine mortality of smaller individuals could occur, but it is expected to be very low and have minimal consequences to the sustainability of the fish communities and associated fisheries at the projects.

Providing higher minimum flows and/or recreation releases in the Hawks Nest bypassed reach could negatively affect socioeconomic resources in the area because such releases may require the alloy plant to supplement reduced generation at the project with additional 60-Hz power from the regional grid and/or increase its frequency conversion capacity or retool the frequency converters to operate on 60-Hz power. However, because the alloy plant at times operates under such limitations under very low-flow conditions and the staff recommended recreation releases would be mostly during high to moderate flow conditions, the extent of the effect of the staff-recommended minimum flow and recreation releases would not be significant.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the projects.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

In response to the Commission's REA notice, Interior filed 10(j) recommendations on June 3, 2016. Table 26 lists each of Interior's recommendations and whether they are adopted under the staff alternative. Environmental recommendations that we consider outside the scope of section 10(j) are considered under section 10(a) and addressed in the specific resource sections of this document and the previous section.

Table 26. Fish and wildlife agency recommendations for the Hawks Nest and Glen Ferris projects (Source: staff).

Recommendation	Agency	Within the scope of section 10(j)?	Annualized Cost	Adopted? and basis for preliminary determination of inconsistency
1. Maintain run-of-river operation at both projects (Hawks Nest and Glen Ferris).	Interior	Yes	$0	Adopted.
2(a). The licensee shall release to the Hawks Nest bypassed reach available flow in excess of 1,700 cfs (continuous minimum flow to bypassed reach of 100 cfs plus 1,600 cfs allocated to two of the four project turbines) up to the proposed monthly minimum flows, which represent 10 percent of the monthly flow averages for the period 1954 through 2014.	Interior	Yes	$803,205	Not adopted.[a]

Recommendation	Agency	Within the scope of section 10(j)?	Annualized Cost	Adopted? and basis for preliminary determination of inconsistency
2(b). The licensee shall release no less than the following flows into the Hawks Nest bypassed reach each month, if available flows exceed 1,700 cfs: January (700 cfs), February (800 cfs), March (1,1,00 cfs), April (1,000 cfs), May (800 cfs), June (500 cfs), July-October (300 cfs), November (400 cfs), and December (500 cfs). Note these values include the baseline flow of 100 cfs that would be provided to the bypassed reach at all times.	Interior	Yes	$448,247	Not adopted.[a]
3. Streamflow monitoring plan to ensure compliance with any revised minimum flow targets or requirements for the Hawks Nest bypassed reach.	Interior	Yes	$0	Adopted as part of the Operation and Compliance Monitoring Plan for the Hawks Nest Project.
4. Continue to provide annual compensation payments to the West Virginia DNR for fish lost due to entrainment impacts.	Interior	No. Funding is not a specific measure to protect fish and wildlife.	$61,000[b]	Not adopted.

Recommendation	Agency	Within the scope of section 10(j)?	Annualized Cost	Adopted? and basis for preliminary determination of inconsistency
5. For the protection and enhancement of freshwater mussels found below Kanawha Falls, including several federally listed endangered species, if Glen Ferris Project operations cause changes to flow patterns across established mussel beds, or if license amendments are proposed which might authorize such changes, or if new species become listed or critical habitat is designated, the licensee shall consult with the FWS on measures to avoid impacts to federally listed mussel species.	Interior	No. Consultation is an administrative matter, not a fish and wildlife measure.	$0	Adopted to the extent that future consultation under the ESA could be required if any proposed license amendments would affect federally listed species.
6. For the protection and enhancement of migratory birds, federally listed bat species, and their habitats, Hawks Nest Hydro shall conduct any necessary tree removal activities between November 15 and March 31.	Interior	Yes	$0	Adopted

Recommendation	Agency	Within the scope of section 10(j)?	Annualized Cost	Adopted? and basis for preliminary determination of inconsistency
7. For the protection and enhancement of the federally listed endangered running buffalo clover, Hawks Nest Hydro shall continue to implement the Running Buffalo Clover protection and management activities in accordance with an approved management plan, under the direction of West Virginia DNR and in consultation with the FWS.	Interior	No. Plants are not considered under the definition of fish and wildlife and running buffalo clover does not provide fish and wildlife habitat (including value as forage) nor would it affect plant species that do provide fish and wildlife habitat.	$3,620	Adopted.

[a] Preliminary findings that recommendations found to be within the scope of section 10(j), but inconsistent with the comprehensive planning standard of section 10(a) of the FPA, including the equal consideration provision of section 4(e) of the FPA, are based on staff's determination that the costs of the measures outweigh the expected benefits.

[b] This payment has been adjusted annually for inflation over the term of the existing license. In 2014, the annual payment was approximately $61,000.

Minimum Flows in the Hawks Nest Bypassed Reach

We are making a preliminary determination that Interior's section 10(j) minimum flow recommendation for the Hawks Nest bypassed reach (recommendation no. 2 in table 26 above) is inconsistent with the comprehensive development and public interest standards of sections 10(a) and 4(e) of the FPA.

In its 10(j) letter, Interior states that its recommended minimum flows, which are 10 percent of mean monthly reservoir inflows and range from 367 to 1,870 cfs, (see table 4), would be considered as providing the minimum protection of aquatic resources according to the Tennant method. Interior further states that although its 'minimally acceptable' monthly flows, which range from 300 to 1,100 cfs across months (see table 4), are an improvement over the minimum flows proposed by the applicant, that these 'minimally acceptable' flows would still fail to provide for the minimum protection of aquatic resources in the bypassed reach.

The rate of increase in total wetted habitat in the bypassed reach peaks at 300 cfs and declines at higher flows. There is also little increase in WUAs for important fishery species such as smallmouth bass at flows higher than 300 cfs. For instance, WUAs for adult and juvenile smallmouth bass at 300 cfs were 92 and 99 percent of the maximum WUAs, respectively, over the range of flows evaluated. Based on these findings from our analysis, we recommend a continuous 300-cfs minimum flow for the Hawks Nest bypassed reach. Moreover, our minimum flow would always be available because flows would only be allocated to the powerhouse *after* the prescribed minimum flow is satisfied, which differs from Interior's recommended flow regime of only providing additional flow (beyond the baseline 100 cfs) to the bypassed reach when reservoir inflows exceed 1,700 cfs (as 1,600 cfs would be used for generation in support of the alloy plant).

Increasing minimum flows above 300 cfs would not provide incremental improvements to habitat conditions worth the cost of $803,205 and $448,247 in lost generation, for Interior's recommended and 'minimally acceptable' minimum flows, respectively. Maintaining a continuous year-round minimum flow of 300 cfs would provide comparable habitat at a levelized annual cost of $227,155.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing or conserving waterways affected by the projects. We reviewed eight qualifying comprehensive plans that are applicable to the Hawks Nest and Glen Ferris projects, located in West Virginia. No inconsistencies were found. The plans include:

West Virginia

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

West Virginia Department of Natural Resources. 1983. New River Basin plan. Charleston, West Virginia.

West Virginia Department of Natural Resources. 1984. Gauley River Basin plan. Charleston, West Virginia.

West Virginia Division of Natural Resources. 2015. 2015 West Virginia State Wildlife Action Plan. Charleston, West Virginia.

West Virginia Governor's Office of Community and Industrial Development. West Virginia State Comprehensive Outdoor Recreation Plan (SCORP): 1988-1992. Charleston, West Virginia.

United States

Atlantic States Marine Fisheries Commission. 2000. Interstate fishery management plan for American eel (Anguilla rostrata). Report No. 36. April 2000.

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National Park Service. 1993. The nationwide rivers inventory. Department of the Interior, Washington, D.C. 1993.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Hawks Nest and Glen Ferris projects are relicensed as proposed with the additional staff-recommended measures, the projects would operate while providing enhancements to aquatic resources and recreational facilities and opportunities, and protection of terrestrial, cultural and historical resources in the project area.

Based on our independent analysis, we find that the issuance of new licenses for the Hawks Nest and Glen Ferris projects, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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APPENDIX A: LICENSE ARTICLES RECOMMENDED BY STAFF FOR THE HAWKS NEST PROJECT NO. P-2512

Draft Article 2XX. *Administrative Annual Charges*. The licensee must pay the United States annual charges, effective the first day of the month in which the license is issued, and as determined in accordance with provisions of the Commission's regulations in effect from time to time, for the purposes of:

(a) reimbursing the United States for the cost of administration of Part I of the Federal Power Act. The authorized installed capacity for that purpose is 102 megawatts.

Draft Article 2XX. *Exhibit Drawings*. Within 45 days of the date of issuance of this license, as directed below, the licensee must file two sets of the approved exhibit drawings and geographic information system (GIS) data in electronic file format on compact disks.

(1) Digital images of the approved exhibit drawings must be prepared in electronic format. Prior to preparing each digital image, the FERC Project-Drawing Number (i.e., P-2512-1001 through P-2512-1004) must be shown in the margin below the title block of the approved drawing. The licensee must file two separate sets of exhibit drawings in electronic format on compact disks with the Secretary of the Commission, ATTN: OEP/DHAC. Exhibit F drawings must be segregated from other project exhibits, and identified as Critical Energy Infrastructure Information (CEII) material under 18 C.F.R. §388.113(c). Each drawing must be a separate electronic file, and the file name must include: FERC Project-Drawing Number, FERC Exhibit, Drawing Title, date of this License, and file extension in the following format [P-2512-####, G-1, Project Boundary, MM-DD-YYYY.TIF]. All digital images of the exhibit drawings must meet the following format specification:

IMAGERY – black & white raster file
FILE TYPE – Tagged Image File Format (TIFF) CCITT Group 4 (also known as T.6 coding scheme)
RESOLUTION – 300 dots per inch (dpi) desired, (200 dpi minimum)
DRAWING SIZE FORMAT – 22” x 34” (minimum), 24” x 36” (maximum)
FILE SIZE – less than 1 megabyte desired

Each Exhibit G drawing that includes the project boundary must contain a minimum of three known reference points (i.e., latitude and longitude coordinates, or state plane coordinates). The points must be arranged in a triangular format for GIS georeferencing the project boundary drawing to the polygon data, and must be based on a standard map coordinate system. The spatial reference for the drawing (i.e., map projection, map datum, and units of measurement) must be identified on the drawing and each reference point must be labeled. In addition, each project boundary drawing must

be stamped by a registered land surveyor.

(2) The licensee must file two separate sets of the project boundary GIS data on compact disks with the Secretary of the Commission, ATTN: OEP/DHAC. The data must be in a georeferenced electronic file format (such as ArcView shape files, GeoMedia files, MapInfo files, or a similar GIS format). The filing must include both polygon data and all reference points shown on the individual project boundary drawings. An electronic boundary polygon data file(s) is required for each project development. Depending on the electronic file format, the polygon and point data can be included in single files with multiple layers. The georeferenced electronic boundary data file must be positionally accurate to ±40 feet in order to comply with National Map Accuracy Standards for maps at a 1:24,000 scale. The file name(s) must include: FERC Project Number, data description, date of this License, and file extension in the following format [P-2512, boundary polygon/or point data, MM-DD-YYYY.SHP]. The data must be accompanied by a separate text file describing the spatial reference for the georeferenced data: map projection used (i.e., UTM, State Plane, Decimal Degrees, etc.), the map datum (i.e., North American 27, North American 83, etc.), and the units of measurement (i.e., feet, meters, miles, etc.). The text file name must include: FERC Project Number, data description, date of this License, and file extension in the following format [P-2512, project boundary metadata, MM-DD-YYYY.TXT].

Draft Article 2XX. *Amortization Reserve.* Pursuant to section 10(d) of the Federal Power Act, a specified reasonable rate of return upon the net investment in the project must be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves. The licensee must set aside in a project amortization reserve account at the end of each fiscal year one half of the project surplus earnings, if any, in excess of the specified rate of return per annum on the net investment. To the extent that there is a deficiency of project earnings below the specified rate of return per annum for any fiscal year, the licensee must deduct the amount of that deficiency from the amount of any surplus earnings subsequently accumulated, until absorbed. The licensee must set aside one-half of the remaining surplus earnings, if any, cumulatively computed, in the project amortization reserve account. The licensee must maintain the amounts established in the project amortization reserve account until further order of the Commission.

The specified reasonable rate of return used in computing amortization reserves must be calculated annually based on current capital ratios developed from an average of 13 monthly balances of amounts properly included in the licensee's long-term debt and proprietary capital accounts as listed in the Commission's Uniform System of Accounts. The cost rate for such ratios must be the weighted average cost of long-term debt and preferred stock for the year, and the cost of common equity must be the interest rate on 10-year government bonds (reported as the Treasury Department's 10-year constant maturity series) computed on the monthly average for the year in question plus four

percentage points (400 basis points).

Draft Article 2XX. *Headwater Benefits.* If the licensee's project was directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extensions of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the licensee must reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this new license. The benefits will be assessed in accordance with Part 11, Subpart B, of the Commission's regulations.

Draft Article 3XX. *Licensee's Project Safety Program*. Within 90 days from the issuance date of the license, the licensee must submit to the Commission's Division of Dam Safety and Inspections (D2SI) – New York Regional Engineer, a Project Owner's Dam Safety Program which, at a minimum, must demonstrate a clear acknowledgement of the project owner's responsibility for the safety of the project, an outline of the roles and responsibilities of the dam safety staff, and access of the dam safety official to the Chief Executive Officer. For guidance on preparing a Project Owner's Dam Safety Program, the licensee should reference the information posted on the FERC website.

Draft Article 3XX. *Project Modification Resulting From Environmental Requirements.* If environmental requirements under this license require modification that may affect the project works or operations, the licensee must consult with the Commission's Division of Dam Safety and Inspections (D2SI) – New York Regional Engineer. Consultation must allow sufficient review time for the Commission to ensure that the proposed work does not adversely affect the project works, dam safety, or project operation.

Draft Article 4XX. *Run-of-River Operation.* The licensee must operate the project in a run-of-river mode for the protection of fish and wildlife resources in the New River. The licensee must at all times act to minimize the fluctuation of the reservoir surface elevation by maintaining a discharge from the project so that, at any point in time, the sum of project outflows approximate the sum of inflows to the project reservoir. If run-of-river operation is temporarily modified, the licensee must notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 4XX. *Minimum Flow in the Bypassed Reach.* The licensee must release from the Hawks Nest dam at all times a continuous minimum flow of 300 cubic feet per second (cfs), or reservoir inflow if less, into the Hawks Nest bypassed reach. Any deviations from the 300-cfs minimum flow should be reported to the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 4XX. *Seasonal Ramping Rate.* For the protection of aquatic resources and public safety in the Hawks Nest bypassed reach, the licensee must operate the project from March 1 to October 31 such that water levels in the Hawks Nest bypassed reach are up-ramped and down-ramped no more than 1-foot-per-hour as measured in the New River below the Hawks Nest dam, West Virginia at U.S. Geological Survey Gage No. 380649081083301 when reservoir inflow is less than 12,600 cubic feet per second (cfs) and flow in the bypassed reach is less than or equal to 2,600 cfs. The ramping rate may be modified, as necessary, to prevent overtopping of the project dam or the dam gates.

Draft Article 4XX. *Operation and Compliance Monitoring Plan*. Within six months of the issuance date of this license, the licensee must file with the Commission, for approval, an Operation and Compliance Monitoring Plan for the project. The plan must include, but not necessarily be limited to, the following:

(a) provisions to monitor compliance with the operational requirements of the license, including operating the project in a run-of-river mode (Article 4XX); providing a minimum flow of 300 cubic feet per second in the Hawks Nest bypassed reach (Article XXX); maintaining the ramping rate restrictions (Article 4XX); and ensuring that recreation flow releases are of the appropriate magnitude and duration (Article XXX);

(b) a description of the steps the licensee will take to ensure run-of-river operation continues during planned and emergency shutdowns;

(c) a description of all gages or recording devices that will be used to monitor operation compliance, including the method of calibration of each gage and/or measuring device, and the frequency of recording;

(d) a provision to maintain a log of project operation; and

(e) a schedule of reporting project compliance/non-compliance during normal operation and in the event of an emergency.

The licensee must include with the plan, documentation of consultation with the U.S. Fish and Wildlife Service, U.S. Geological Survey, and the West Virginia Division of Natural Resources; copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies; and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the plan is approved by the Commission. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Reservation of Authority to Prescribe Fishways.* Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior pursuant to section 18 of the Federal Power Act.

Draft Article 4XX. *Bald Eagle Protection.* To minimize impacts to bald eagle habitat, the license will conduct routine right-of-way/transmission corridor maintenance and minimal hazardous tree/vegetation removal in accordance with U.S. Fish and Wildlife Service's (FWS') National Bald Eagle Management Guidelines (May 2007, or most recent version of the document, available at *http://www.fws.gov/northeast/ecologicalservices/eaglenationalguide.html*) guidelines. In the event bald eagles are documented at the project, at least 60 days prior to maintenance activities that may affect the documented bald eagle or its habitat (such as non-routine noise, human activity, or tree removal that would disturb an active nest), the licensee must consult with the FWS' West Virginia Field Office and the West Virginia Division of Natural Resources to develop measures to protect the bald eagle or its habitat. If the licensee and the resource agencies are unable to reach agreement on measures, the licensee must file, for Commission approval, a plan describing the licensee's activity, a description of the inconsistency between its activity and the National Bald Eagle Management Guidelines, alternative measures to protect the bald eagle or its habitat, and the licensee's record of consultation with the resource agencies.

The Commission reserves the right to require changes to such a plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Running Buffalo Clover Management Plan.* Within six months of the issuance date of this license, the licensee must file, for Commission approval, an updated Running Buffalo Clover Management Plan that finalizes the draft plan filed with its license application on December 29, 2015.

The plan must be finalized after consultation with the U.S Fish and Wildlife Service and the West Virginia Department of Natural Resources. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies; and specific descriptions of how the agencies' comments are accommodated by

the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. The plan must not be implemented until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Timing of Tree Clearing During Maintenance.* To minimize impacts to federally listed bat species, including the Indiana bat, northern long-eared bat, and Virginia big-eared bat, and migratory bird species, the licensee must limit tree clearing associated with maintenance activities and vegetation clearing associated with recreation use enhancements to between November 15 and March 31.

Draft Article 4XX. *Recreation Management Plan.* Within one year of license issuance, the licensee must file, for Commission approval, a recreation management plan that includes management policies for the Cotton Hill Bridge Day Use Site and the Hawks Nest Powerhouse Fishing Access Site. The plan should include provisions for ongoing operation and maintenance of the sites, an inventory of amenities at the sites, and maps showing existing facilities and any proposed enhancements. The plan should include the following provisions:

- a schedule of completion for the following recreation amenities:
  - Cotton Hill Bridge Day-Use Area: (1) a seasonal restroom/changing facility, (2) picnic facilities, (3) parking improvements, and (4) signage improvements. This site is managed by the West Virginia Division of Natural Resources; therefore, improvements must be agreed upon through consultation with the West Virginia Division of Natural Resources;
  - Hawks Nest Dam put-in area: a new trail to connect the gravel parking area near the dam to the riverbed that can accommodate varying sizes of groups carrying small personal boats up to large commercial rafts; and
  - Hawks Nest Powerhouse Fishing Access Site: (1) take-out access signage at the entrance to the site from the road and at the river's edge and (2) trail improvements to accommodate a variety of boat sizes;

- a schedule of release dates and timing, determined in consultation with the West Virginia Division of Natural Resources, American Whitewater, and West Virginia Professional River Outfitters to include:
    - one Saturday release in March of 2,500 cfs (1 day);
    - two weekend releases in April of 2,500 cfs (4 days);
    - two weekend releases in May of 2,500 cfs, one of which is the 3-day Memorial Day Weekend (5 days);
    - two weekend releases in June of 2,000 cfs (4 days); and
    - one Saturday release in July of 2,000 cfs (1 day);
- pre-release coordination meetings, monitoring, and post-release evaluation meetings with West Virginia Division of Natural Resources, American Whitewater, and West Virginia Professional River Outfitters during the first 3 years of releases;
- first-year trial of the shuttle access option for the March, April, and the first May release;
- first-year trial of the vehicular access option for the second May release and the June and July releases;
- designated locations for put-in and take-out parking during the scheduled release events as well as during non-scheduled flows;
- guidelines for participant safety;
- protocols for emergency situations that participants could encounter within the project vicinity both on and off the river; and
- a flow notification website.

Within 90 days of completion of the recreation improvements at the Cotton Hill Bridge Day-Use Site and the Hawks Nest Powerhouse Fishing Access Site, the licensee must file with the Commission documentation showing the completed facilities as built and must include site plan drawings showing a revised Exhibit G incorporating these facilities into the project boundary. The licensee is responsible for the operation and maintenance of these facilities for the term of the license.

Within 6 months after providing the first year of releases, a revised plan with the final put-in access determination must be submitted to the Commission for approval. If revisions to the plan at the conclusion of the three-year evaluation and monitoring period are necessary, a revised plan should be submitted within 6 months after the third year of releases.

If project inflows cannot fulfill the required flow levels as described above, scheduled flows may be reduced to actual inflows down to a minimum of 1,500 cfs in the bypassed reach. If inflows range from 1,500 cfs to 2,500 cfs during the March, April, and May scheduled releases or 1,500 cfs to 2,000 cfs during the June and July releases, bypassed reach flow levels would equal the inflow level down to a minimum of 1,500 cfs. Scheduled flows may only be cancelled if inflows fall below 1,500 cfs. Any

reduction or cancellation of scheduled flows must be posted on the flow notification website.

For the duration of this license, the licensee must post the schedule of flows for the upcoming season on its flow notification website 1 month prior to the start of the scheduled releases. The licensee must post a range of 1- to 3-day forecasts of flow levels in the bypassed reach when flows are not scheduled for recreation. The flow notification website must include links to relevant upstream and downstream gages in the vicinity of the project, conversion applications to derive real-time flow information, and relevant forward-looking operational information. The flow notification website must be user-friendly, accessible to persons of all abilities, and up-to-date.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Programmatic Agreement*. The licensee must implement the "Final Programmatic Agreement Among the Federal Energy Regulatory Commission and the West Virginia State Historic Preservation Officer for Managing Historic Properties that may be Affected by a License Issuing to Hawks Nest Hydro, LLC for the Continued Operation and Maintenance of the Hawks Nest Hydroelectric Project in Fayette County, West Virginia," executed on XXX, and including but not limited to the approved Historic Properties Management Plan (HPMP), filed December 29, 2015, for the project. In the event that the Programmatic Agreement is terminated, the licensee must continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 4XX. Use and Occupancy. (a) In accordance with the provisions of this article, the licensee must have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee must also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee must take any lawful action necessary to correct the violation. For a permitted use or

occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee must require multiple use and occupancy of facilities for access to project lands or waters. The licensee must also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee must: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee must file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee must consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee must determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed must not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee must take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner

that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee must not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project must be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article must not apply to any part of the public lands and reservations of the United States included within the project boundary.

APPENDIX B: LICENSE ARTICLES RECOMMENDED BY STAFF FOR THE GLEN FERRIS PROJECT NO. P-14439

Draft Article 2XX. *Administrative Annual Charges*. The licensee must pay the United States annual charges, effective the first day of the month in which the license is issued, and as determined in accordance with provisions of the Commission's regulations in effect from time to time, for the purposes of:

(a) reimbursing the United States for the cost of administration of Part I of the Federal Power Act. The authorized installed capacity for that purpose is 6.159 megawatts.

Draft Article 2XX. *Exhibit Drawings*. Within 45 days of the date of issuance of this license, as directed below, the licensee must file two sets of the approved exhibit drawings and geographic information system (GIS) data in electronic file format on compact disks.

(1) Digital images of the approved exhibit drawings must be prepared in electronic format. Prior to preparing each digital image, the FERC Project-Drawing Number (i.e., P-14439-1001) must be shown in the margin below the title block of the approved drawing. The licensee must file two separate sets of exhibit drawings in electronic format on compact disks with the Secretary of the Commission, ATTN: OEP/DHAC. Exhibit F drawings must be segregated from other project exhibits, and identified as Critical Energy Infrastructure Information (CEII) material under 18 C.F.R. §388.113(c). Each drawing must be a separate electronic file, and the file name must include: FERC Project-Drawing Number, FERC Exhibit, Drawing Title, date of this License, and file extension in the following format [P-14439-####, G-1, Project Boundary, MM-DD-YYYY.TIF]. All digital images of the exhibit drawings must meet the following format specification:

IMAGERY – black & white raster file
FILE TYPE – Tagged Image File Format (TIFF) CCITT Group 4 (also known as T.6 coding scheme)
RESOLUTION – 300 dots per inch (dpi) desired, (200 dpi minimum)
DRAWING SIZE FORMAT – 22” x 34” (minimum), 24” x 36” (maximum)
FILE SIZE – less than 1 megabyte desired

Each Exhibit G drawing that includes the project boundary must contain a minimum of three known reference points (i.e., latitude and longitude coordinates, or state plane coordinates). The points must be arranged in a triangular format for GIS georeferencing the project boundary drawing to the polygon data, and must be based on a standard map coordinate system. The spatial reference for the drawing (i.e., map projection, map datum, and units of measurement) must be identified on the drawing and

each reference point must be labeled. In addition, each project boundary drawing must be stamped by a registered land surveyor.

(2) The licensee must file two separate sets of the project boundary GIS data on compact disks with the Secretary of the Commission, ATTN: OEP/DHAC. The data must be in a georeferenced electronic file format (such as ArcView shape files, GeoMedia files, MapInfo files, or a similar GIS format). The filing must include both polygon data and all reference points shown on the individual project boundary drawings. An electronic boundary polygon data file(s) is required for each project development. Depending on the electronic file format, the polygon and point data can be included in single files with multiple layers. The georeferenced electronic boundary data file must be positionally accurate to ±40 feet in order to comply with National Map Accuracy Standards for maps at a 1:24,000 scale. The file name(s) must include: FERC Project Number, data description, date of this License, and file extension in the following format [P-14439, boundary polygon/or point data, MM-DD-YYYY.SHP]. The data must be accompanied by a separate text file describing the spatial reference for the georeferenced data: map projection used (i.e., UTM, State Plane, Decimal Degrees, etc.), the map datum (i.e., North American 27, North American 83, etc.), and the units of measurement (i.e., feet, meters, miles, etc.). The text file name must include: FERC Project Number, data description, date of this License, and file extension in the following format [P-14439, project boundary metadata, MM-DD-YYYY.TXT].

Draft Article 2XX. *Amortization Reserve.* Pursuant to section 10(d) of the Federal Power Act, a specified reasonable rate of return upon the net investment in the project must be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves. The licensee must set aside in a project amortization reserve account at the end of each fiscal year one half of the project surplus earnings, if any, in excess of the specified rate of return per annum on the net investment. To the extent that there is a deficiency of project earnings below the specified rate of return per annum for any fiscal year, the licensee must deduct the amount of that deficiency from the amount of any surplus earnings subsequently accumulated, until absorbed. The licensee must set aside one-half of the remaining surplus earnings, if any, cumulatively computed, in the project amortization reserve account. The licensee must maintain the amounts established in the project amortization reserve account until further order of the Commission.

The specified reasonable rate of return used in computing amortization reserves must be calculated annually based on current capital ratios developed from an average of 13 monthly balances of amounts properly included in the licensee's long-term debt and proprietary capital accounts as listed in the Commission's Uniform System of Accounts. The cost rate for such ratios must be the weighted average cost of long-term debt and preferred stock for the year, and the cost of common equity must be the interest rate on 10-year government bonds (reported as the Treasury Department's 10-year constant

maturity series) computed on the monthly average for the year in question plus four percentage points (400 basis points).

Draft Article 2XX. *Headwater Benefits.* If the licensee's project was directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extensions of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the licensee must reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this new license. The benefits will be assessed in accordance with Part 11, Subpart B, of the Commission's regulations.

Draft Article 3XX. *Licensee's Project Safety Program*. Within 90 days from the issuance date of the license, the licensee must submit to the Commission's Division of Dam Safety and Inspections (D2SI) – New York Regional Engineer, a Project Owner's Dam Safety Program which, at a minimum, must demonstrate a clear acknowledgement of the project owner's responsibility for the safety of the project, an outline of the roles and responsibilities of the dam safety staff, and access of the dam safety official to the Chief Executive Officer. For guidance on preparing a Project Owner's Dam Safety Program, the licensee should reference the information posted on the FERC website.

Draft Article 3XX. *Project Modification Resulting From Environmental Requirements.* If environmental requirements under this license require modification that may affect the project works or operations, the licensee must consult with the Commission's Division of Dam Safety and Inspections (D2SI) – New York Regional Engineer. Consultation must allow sufficient review time for the Commission to ensure that the proposed work does not adversely affect the project works, dam safety, or project operation.

Draft Article 4XX. *Run-of-River Operation.* The licensee must operate the project in a run-of-river mode for the protection of fish and wildlife resources in the New River. The licensee must at all times act to minimize the fluctuation of the reservoir surface elevation by maintaining a discharge from the project so that, at any point in time, the sum of project outflows approximate the sum of inflows to the project reservoir. If run-of-river operation is temporarily modified, the licensee must notify the Commission as soon as possible, but no later than 10 days after each such incident.

Draft Article 4XX. *Operation and Compliance Monitoring Plan*. Within six months of the issuance date of this license, the licensee must file with the Commission, for approval, an Operation and Compliance Monitoring Plan for the project. The plan must include, but not necessarily be limited to, the following:

(a) provisions to monitor compliance with the operational requirements of the license, including operating the project in a run-of-river mode as required by Article 4XX.

(b) a description of the steps the licensee will take to ensure run-of-river operation continues during planned and emergency shutdowns;

(c) a description of all gages or recording devices that will be used to monitor operation compliance, including the method of calibration of each gage and/or measuring device, and the frequency of recording;

(d) a provision to maintain a log of project operation; and

(e) a schedule of reporting project compliance/non-compliance during normal operation and in the event of an emergency.

The licensee must include with the plan, documentation of consultation with the U.S. Fish and Wildlife Service, U.S. Geological Survey, and the West Virginia Division of Natural Resources; copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies; and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the plan is approved by the Commission. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Reservation of Authority to Prescribe Fishways.* Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of the Interior pursuant to section 18 of the Federal Power Act.

Draft Article 4XX. *Bald Eagle Protection.* To minimize impacts to bald eagle habitat, the license will conduct routine right-of-way/transmission corridor maintenance and minimal hazardous tree/vegetation removal in accordance with U.S. Fish and Wildlife Service's (FWS') National Bald Eagle Management Guidelines (May 2007, or most recent version of the document, available at *http://www.fws.gov/northeast/ecologicalservices/eaglenationalguide.html*) guidelines. In the event bald eagles are documented at the project, at least 60 days prior to maintenance

activities that may affect the document bald eagle or its habitat (such as non-routine noise, human activity, or tree removal that would disturb an active nest), the licensee must consult with the FWS' West Virginia Field Office and the West Virginia Division of Natural Resources to develop measures to protect the bald eagle or its habitat. If the licensee and the resource agencies are unable to reach agreement on measures, the licensee must file, for Commission approval, a plan describing the licensee's activity, a description of the inconsistency between its activity and the National Bald Eagle Management Guidelines, alternative measures to protect the bald eagle or its habitat, and the licensee's record of consultation with the resource agencies.

The Commission reserves the right to require changes to such a plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 4XX. *Timing of Tree Clearing During Maintenance.* To minimize impacts to federally listed bat species, including the Indiana bat, northern long-eared bat, and Virginia big-eared bat, and migratory bat species, the licensee must limit tree clearing associated with maintenance activities to between November 15 and March 31.

Draft Article 4XX. *Programmatic Agreement*. The licensee must implement the "Final Programmatic Agreement Among the Federal Energy Regulatory Commission and the West Virginia State Historic Preservation Officer for Managing Historic Properties that may be Affected by a License Issuing to Hawks Nest Hydro, LLC for the Continued Operation and Maintenance of the Glen Ferris Hydroelectric Project in Fayette County, West Virginia," executed on XXX, and including but not limited to the approved Historic Properties Management Plan (HPMP), filed December 29, 2015, for the project. In the event that the Programmatic Agreement is terminated, the licensee must continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 4XX. Use and Occupancy. (a) In accordance with the provisions of this article, the licensee must have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee must also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and

enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee must take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee must require multiple use and occupancy of facilities for access to project lands or waters. The licensee must also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee must: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee must file three copies of a report briefly describing for each conveyance made under this

paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee must consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee must determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed must not endanger health, create a

nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee must take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee must not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project must be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article must not apply to any part of the public lands and reservations of the United States included within the project boundary.