FINAL ENVIRONMENTAL ASSESSMENT
FOR THE COLLEGE HILL HYDROELECTRIC PROJECT

Prepared for

United States Department of Agriculture
Rural Utilities Service
1400 Independence Avenue SW
Washington, DC 2050

Applicant

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June 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

Term	Definition
°F	degrees Fahrenheit
7Q10	lowest stream flow for 7 consecutive days that would be expected to occur once in 10 years
AHA	Appalachian Hydro Associates
APE	area of potential effects
BGEPA	Bald and Golden Eagle Protection Act
BMPs	best management practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
dbh	diameter at breast height
DO	dissolved oxygen
EA	Environmental Assessment
EIS	Environmental Impact Statement
EKPC	East Kentucky Power Cooperative
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPPC	Exotic Pest Plant Council
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
ESCP	Erosion and Sediment-Control Plan
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFP	Free Flow Power
FONSI	Finding of No Significant Impact
GIS	geographic information system
HA	Habitat Assessment Point
HPMP	Historic Properties Management Plan
ICF	ICF Jones and Stokes, Inc.
IPaC	Information for Planning and Consultation
IWG	Interagency Working Group
KDEP	Kentucky Department for Environmental Protection
KDFWR	Kentucky Department of Fish and Wildlife Resources
KFO	Kentucky Field Office
KRA	Kentucky River Authority
kWh	kilowatt-hours

Term	Definition
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MSL	mean sea level
MW	megawatt
NEPA	National Environmental Policy Act of 1969
NERC	North American Electric Reliability Corporation
NO_2	of nitrogen oxides
NPS	National Park Service
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PACE	Powering Affordable Clean Energy
PJM	PJM Interconnection
RD	U.S. Department of Agriculture, Rural Development
RM	river mile
ROC	Region of Comparison
ROI	Region of Influence
RUS	Rural Utilities Service
Rye	Rye Development
SERC	Southeastern Electric Reliability Council
USC	U.S. Code
USCB	U. S. Census Board
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service's
USGS	U.S. Geological Survey

1 PURPOSE AND NEED FOR THE PROJECT

1.1 INTRODUCTION AND PROJECT DESCRIPTION

Lock 11 Hydro Partners plans to submit a loan application to the U.S. Department of Agriculture (USDA) Rural Development's (RD) Rural Utilities Service (RUS) to secure a direct loan to install turbines in the Kentucky River at Lock 11 to generate hydropower (see Figure 1). On behalf of Lock 11 Hydro Partners, ICF Jones and Stokes, Inc. (ICF) prepared this Environmental Assessment (EA) to support RUS's National Environmental Policy Act of 1969 (NEPA) review of the College Hill Hydroelectric Project (hereafter Project). The analysis in this EA has taken place in accordance with NEPA (42 U.S. Code [USC] §§ 4321-4347) and as well as Rural Development's NEPA guidance, particularly RD Instruction 1970-Subpart C. This document provides guidance to the RUS decision-maker regarding any significant Project effects to consider in determining whether the Project requires preparation of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI). If RUS determines that this Project would have "significant" impacts, as defined by RD Instruction 1970-Subpart C, then an EIS would be prepared. If not, then a FONSI would be prepared for the Project.

1.2 PURPOSE AND NEED

1.2.1 Purpose

USDA, Rural Development, is a mission area that includes three federal agencies: (1) Rural Business–Cooperative Service; (2) Rural Housing Service; and (3) RUS. The agencies offer more than 50 programs that provide financial assistance and a variety of technical and educational assistance to eligible rural and Native American Tribal populations, eligible communities, individuals, cooperatives, and other entities with a goal of improving the quality of life, sustainability, infrastructure, economic opportunity, development, and security in rural America. Financial assistance can include direct loans, guaranteed loans, and grants in order to accomplish program objectives. The New Empowering Rural America and Powering Affordable Clean Energy (PACE) programs provide grants and loans to rural electric cooperatives so that they can invest in or own clean and affordable energy.

Lock 11 Hydro Partners is seeking federal financial assistance for the Project from RUS under the PACE program.

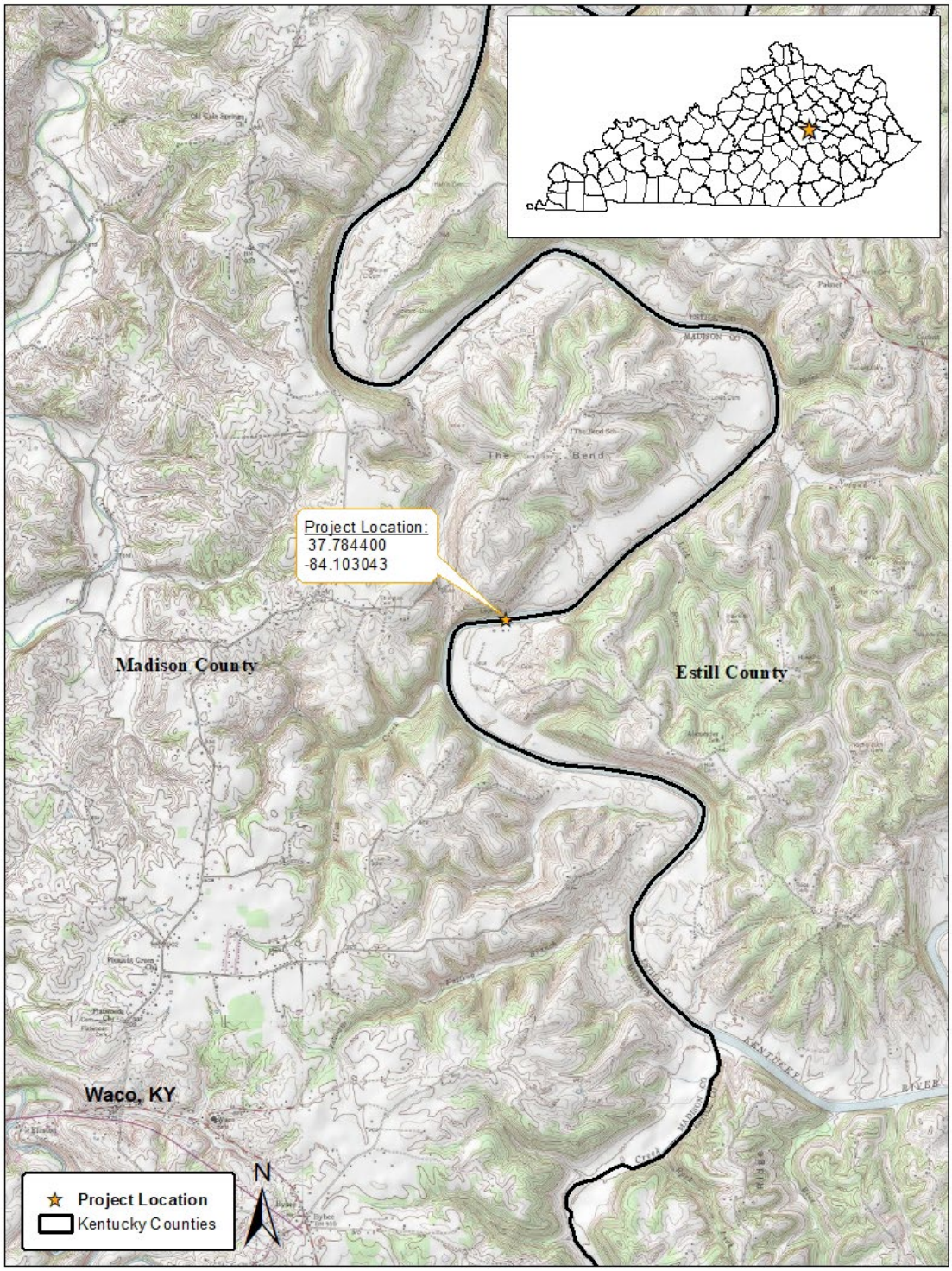


Figure 1. Proposed College Hill Project Location

1.2.2 Need

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Project is located in the Central Subregion of the Southeastern Electric Reliability Council (SERC), which is one of six regional reliability councils of NERC. According to NERC's most recent 2022 forecast for the Central Subregion, the total internal demand is projected to grow at an annual rate of 0.9 percent from 2023 through 2033 (NERC 2022).

The Project would provide hydroelectric generation to meet part of the region's power requirements, resource diversity, and capacity needs. The proposed Project would have an installed capacity of 3.01 megawatts (MW) and generate approximately 13,556 MWh per year. The Project would provide low-cost power that could displace generation from non-renewable sources. Power produced will be put into a Clark Energy Rural Electric Cooperative distribution line, wheeled over to the East Kentucky Power Cooperative (EKPC) Union City substation, and then be put into the EKPC system. EKPC will then sell the power to local cooperatives, primarily to Clark Energy members served by the Union City substation.

1.3 APPLICABLE ENVIRONMENTAL LAWS, STATURES, AND REGULATIONS

The following is a list of federal statues and Executive Orders (EO) that may be applicable to the Proposed Action.

- Archeological Resources Protection Act, 16 U.S.C. §§ 470aa-470mm
- Clean Water Act (CWA), 33 U.S.C. §§ 1251-1389
- Comprehensive Environmental Response, Compensation, & Liability Act, 42 U.S.C. §§ 9601-9675
- Endangered Species Act (ESA), 16 U.S.C. §§ 1531-1544
- Farmland Protection Policy Act, 7 U.S.C. §§ 4201-4209
- NEPA, 42 U.S.C. §§ 4321-4347
- National Historic Preservation Act (NHPA), 54 U.S.C. §§ 300101 – 306108
- Native American Graves Protection and Repatriation Act of November 16, 1990 (P.L. 101-601, 104 Statute 3048; 25 U.S.C. §§ 3001–3013)
- Resource Conservation & Recovery Act, 42 U.S.C. §§ 6901-6992k
- Safe Drinking Water Act, 42 U.S.C. §§ 300f-300j-27
- EO 11514, Protection and Enhancement of Environmental Quality
- EO 11593, Protection and Enhancement of the Cultural Environment
- EO 11988, Floodplain Management
- EO 11990, Protection of Wetlands

- EO 13084, Consultation and Coordination with American Indian Tribes
- EO 13112, Invasive Species
- EO 13212, Actions to Expedite Energy Related Projects
- EO 14154, Unleashing American Energy
- 36 CFR, Part 251, Subpart B 1.2

1.4 AGENCY DECISION TO BE MADE

The proposed federal action is for RUS to decide whether to provide financial assistance to Lock 11 Hydro Partners for construction of the proposed new hydroelectric facility. This EA does not contain the final decision regarding the Proposed Action or No Action Alternatives. The purpose of this EA is to identify and evaluate potential impacts of the Proposed Action on the natural and human environment and inform RUS and the public about reasonable alternatives that would avoid or minimize potential adverse effects.

2 ALTERNATIVES EVALUATED, INCLUDING THE PROPOSED ACTION AND NO ACTION

2.1 ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

Lock 11 Hydro Partners initially considered implementation of the Project as originally licensed by Federal Energy Regulatory Commission (FERC). This would include the construction of new reinforced-concrete intake channel, powerhouse, and intake-and-headgate structure, installation of two 2.5-MW Pit Kaplan turbine generator units, and construction of an electrical substation and the underground transmission line. However, this design was based on outdated turbine technology and would have included substantially more in-water work, tree clearing, transmission requirements, and disturbance than necessary to fulfill the local demand for hydropower. As such, Lock 11 Hydro Partners dismissed this alternative from detailed analysis.

2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, RUS would not finance the Project, and the Project would not be constructed. Lock and Dam Number 11 would continue to exist in their current condition, and no hydropower would be generated. Environmental resources in the Project Area would not be affected from development of hydropower capacity and associated infrastructure.

2.3 PROPOSED ACTION

2.3.1 Project Facilities and Construction

The proposed Project would be located at Lock and Dam Number 11 at river mile (RM) 201.0 on the Kentucky River. Lock and Dam Number 11 is owned by the Commonwealth of Kentucky and operated by the Kentucky River Authority (KRA) for water supply (see Figure 2). The existing 208-foot-long fixed crest concrete dam has a 148-foot-long by 52-foot-wide lock chamber. The 482-acre

reservoir provides approximately 4,820 acre-feet of storage and only operates at run-of-river levels (i.e., does not draw water from below its crest). The existing lock chamber of the structure is abandoned, and a concrete bulkhead has been placed in the lock chamber, below the upper miter gates, to prevent failure and loss of pool.

Lock 11 Hydro Partners would remove the concrete bulkhead and construct a 28.4-foot by 52-foot by 49.5-foot steel and reinforced concrete powerhouse. A 58-foot by 52-foot horizontal trash rack would be installed to sit 3 feet below the normal pool level from the lock chamber upper sill to the back wall of the powerhouse. An inflatable rubber dam would be installed on top of the powerhouse wall to maintain the pool during normal operating conditions.

Lock 11 Hydro Partners would install four 642-kW Voith 14.9 and two 222-kW Voith 8.95 StreamDiver turbine-generators into the existing lock chamber of Lock and Dam Number 11. These submersible units directly couple permanent magnet generators with turbines, eliminating the need for a gearbox and associated oil lubrication. A prefabricated-steel and reinforced 42-foot by 20-foot by 28-foot concrete control building would be installed atop a concrete foundation at the edge of the existing concrete esplanade and would be connected to the powerhouse via an underground cable trench. The control building would house the switchgear, controls, transformers, and the main circuit breaker for the plant. The control building would also serve as the interconnection point to the existing 12.47-kV, three-phase overhead distribution line in Madison County (see Figure 3).

Lock 11 Hydro Partners would also construct a canoe portage path, fishing area, and parking lot within the Project Area to fulfill recreational requirements pursuant to the amended FERC license. These modifications would not receive project financing as part of the PACE program but are included as connected actions in this proposal.

In August 1999, approximately 1.75 acres of the northern riverbank was capped with compacted clay to contain soil contamination caused by lead paint used in the lock tender's houses and other buildings that were formerly located at the proposed Project site. The United States Army Corps of Engineers (USACE) placed this clay cap on the site to mitigate lead exposure before turning the property over to the Commonwealth of Kentucky. Due to potential lead exposure the Kentucky Department for Environmental Protection (KDEP) considers this a state Superfund site. Prior to construction, Lock 11 Hydro Partners would sample for potential contamination. Sampling plans and results would be coordinated with the KRA.

On April 16, 2015, an application (Project Number 14276-002) was filed by Rye Development (Rye), under the project company name Free Flow Power (FFP) Project 92, LLC, with FERC to construct, operate, and maintain a 5-MW hydroelectric project. The proposed Project would be located on the Kentucky River, (37.784400, -84.103043) in Estill and Madison Counties, Kentucky, at the existing Kentucky River Lock & Dam Number 11, which is owned by the Commonwealth of Kentucky and operated by the KRA. The original license for this Project was issued by FERC on May 5, 2016, under Project Number 14276 and was issued to FFP Project 92, LLC. The license was later amended to eliminate structural changes to Lock 11 and reduce Project operating capacity to 2.64 MW.

On July 10, 2023, Appalachian Hydro Associates (AHA) purchased FFP Project 92, LLC, and the associated FERC License for Project Number 14276 from Rye Development. AHA is in the process of transferring the Project Number 14276 FERC License from FFP Project 92, LLC to AHA's

subsidiary, Lock 11 Hydro Partners, LLC, which plans to develop a 3.01 MW hydroelectric plant at the Lock 11 site. The Project Number 14276 license will be amended at FERC with a non-capacity amendment (i.e., less than a 15 percent increase in capacity from 2.64 MW) to accommodate the design currently being constructed at Kentucky River Lock & Dam Number 14 by AHA. The use of the Lock 14 design would generate an average of approximately 13,556 MWh of energy annually at Lock 11. No modifications to the original lock would be made under the amended license. No federal land would be occupied by Project works or located within the Project boundary.

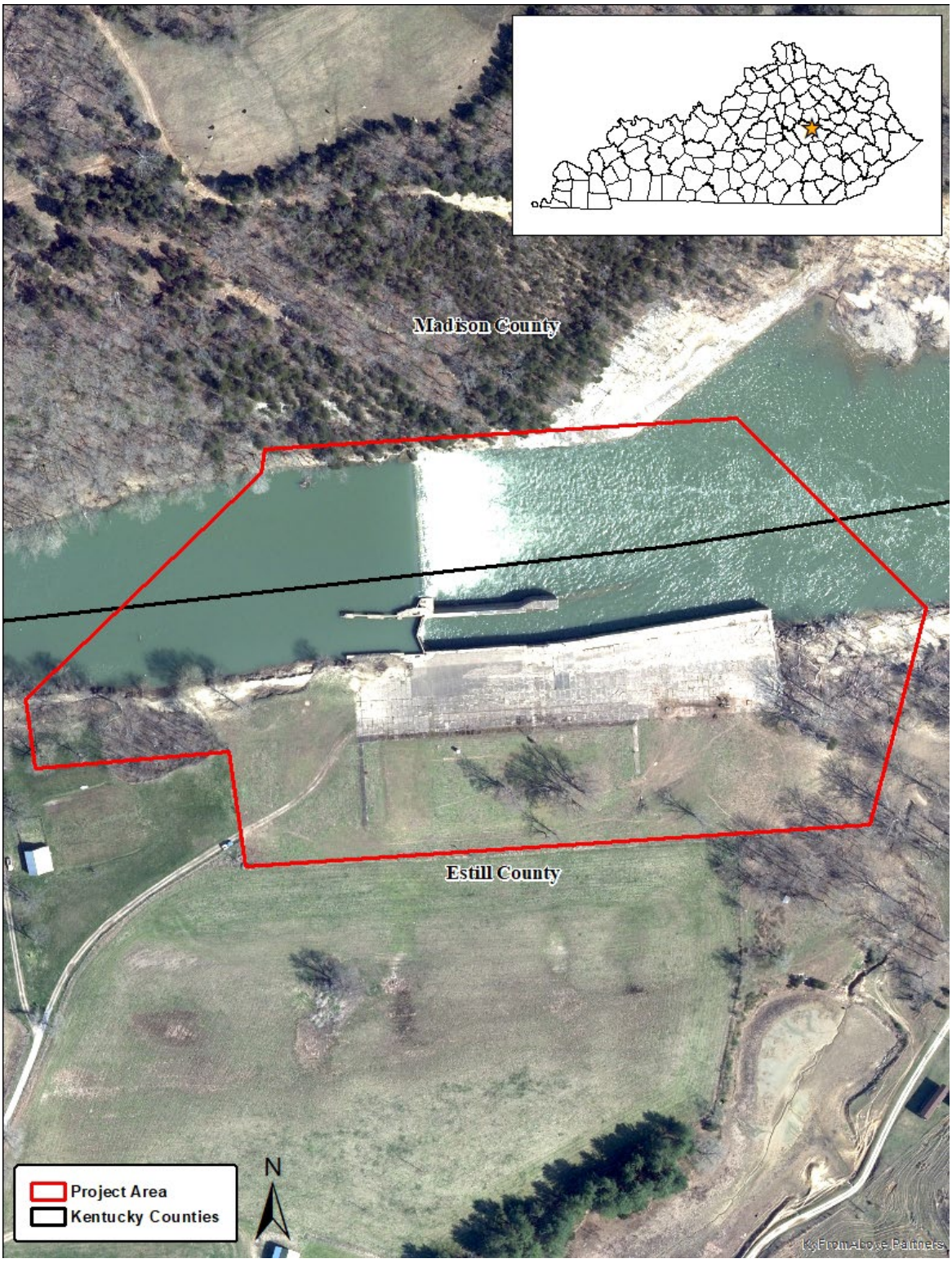
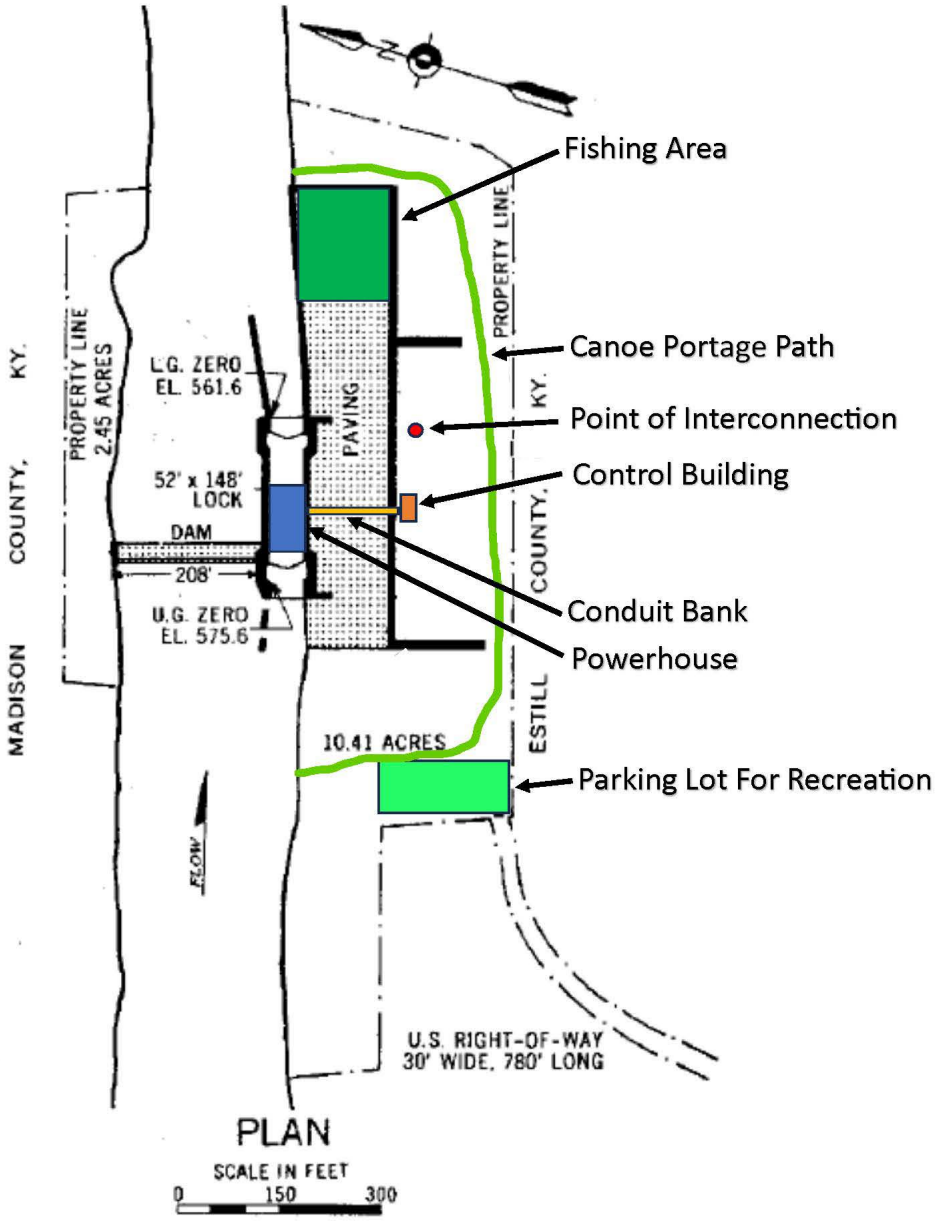


Figure 2. Lock and Dam Number 11 Aerial Location

Lock 11 Hydroelectric Project – Project Features (all on KRA Property)



Source: Lock 11 Hydro Partners, LLC 2023.

Figure 3. Approximate Locations of Proposed College Hill Project Facilities

2.3.2 Project Operations and Maintenance

The proposed Project would operate in run-of-river using flows between 196 cubic feet per second (cfs) and 2,636 cfs for power generation. The turbines would be operated sequentially, based on inflow, and would maintain run-of-river operation levels. Lock 11 Hydro Partners proposes to install monitoring equipment in the lock chamber and headwater pool that is designed to shut down the generating units when water levels in the impoundment fall below 617.38 feet.

The proposed Project would generate 13,556 MWh annually. Power would be transmitted from the powerhouse to the Clark Energy/East Kentucky Power Cooperative Hunt Substation. All power generated would be sold to the East Kentucky Power Cooperative at approved tariff rates based on spot-market pricing.

Trash-rack maintenance would be periodically performed by deflating the rubber dam atop the powerhouse and allowing water to wash accumulated debris downstream. Once the trash rack is cleared of debris, the rubber dam would be re-inflated to restore operating pool levels.

In addition to run-of-river operation, Lock 11 Hydro Partners proposes measures to ensure that the Project does not affect municipal water withdrawals from the Kentucky River. The proposed Project would not operate when flow limits on the Kentucky River are below thresholds required by the KDEP Division of Water, which may occur during severe droughts. Similarly, the Project would not operate if KRA were to implement bypass valve releases in order to increase water levels downstream.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section provides an understanding of the affected environment and potential environmental consequences of the Proposed Action and No-Action Alternatives for the following resources: recreation and land use, floodplains, wetlands, water resources, coastal resources, biological resources, cultural and historic resources, noise, human health and safety, geology, and soils. No substantive issues related to aesthetic resources or socioeconomics associated with the Proposed Action were identified; therefore, these resources are not assessed in the EA.

Federal, state, and local regulations that apply to managing these resources are also discussed in the context of the existing environment.

3.1 GEOGRAPHIC SCOPE

The *geographic scope of analysis* defines the physical limits or boundaries of the Proposed Action's effects on the resources. Geographic scopes for each resource area were determined independently based on the scale of projected Project effects and specific characteristics of the resource in question.

For water quality, the geographic scope of analysis has been identified as the Kentucky River, from Lock and Dam Number 11 downstream to Lock and Dam Number 10, which is located approximately 25 miles downstream from the proposed Project. This geographic boundary encompasses the combined operation of the proposed Project and other hydropower projects.

For fisheries resources, the geographic scope of analysis has been identified as the Kentucky River, from Lock and Dam Number 12 downstream to Lock and Dam Number 10, which are located

approximately 20 miles upstream and 25 miles downstream, from the proposed Project, respectively. Project operations could affect fish in the upstream reservoir through possible entrainment and/or impingement on the trash rack. Entrainment is the passage of fish with intake water through hydroelectric turbines. Impingement is the entrapment of any life stages of fish on the outer part of an intake structure or against a screening device during water intake. Project operations could affect fish in the downstream reservoir because of potential water quality alterations caused by changes in water delivery to the tailrace. The cumulative effects of the proposed Project would not extend upstream of Lock and Dam Number 12, nor downstream of Lock and Dam Number 10.

The geographic scope of analysis for recreational and cultural resources is the entire 260-mile mainstem of the Kentucky River, from the confluence of the North, Middle, and South Forks near Beattyville, Kentucky, to its confluence with the Ohio River at Carrollton, Kentucky. This geographic scope encompasses the full system of locks and dams along the Kentucky River. These locks and dams have been identified by the Commonwealth of Kentucky for both their potential for recreational development, as well as their historic significance.

3.2 RECREATION AND LAND USE

3.2.1 Affected Environment – Regional Recreation

According to the *Kentucky State Comprehensive Outdoor Recreation Plan*, the Kentucky River corridor is a unique recreation, scenic, and historic resource of statewide significance (Kentucky DLG 2019). Historically managed for barge traffic, the KRA now manages the river for water supply and recreation (KRA 2020). Lock Numbers 1, 2, 3, and 4 are operated on a seasonal schedule for recreation, and small motorized boats, canoes, and kayaks are able to recreationally navigate the river using the locks (KRA 2024). The Kentucky River is popular among visitors because of its excellent recreational boating, fishing, and scenic resources.

Since 2012, the National Park Service (NPS), in conjunction with the Commonwealth of Kentucky, local governments, and the Kentucky Riverkeeper (collectively the Kentucky Water Trail partners), has developed plans for improving river access for recreational boating and interpreting the ecology and cultural history along the Kentucky River as part of the Kentucky River Water Trail system (USDOI 2012). Currently, the most intensely developed recreational areas occur downstream from the proposed Project, near populated areas like Frankfort, Kentucky (KRA 2014a).

The Kentucky River basin provides diverse fishing opportunities, ranging from cold-water trout fishing in its tributaries to plentiful warm-water fishing in the mainstem. In most years, anglers can expect quality populations of catfish, black bass, white bass, hybrid striped bass, drum, crappie, sauger, and muskellunge. Natural populations are supported by periodic stocking. Land-based recreational opportunities, such as camping, hiking, biking, horseback riding, and hunting, are also widely available in the region, including at the Daniel Boone National Forest, and at various state parks and recreational areas. Local parks provide additional recreational resources.

3.2.1.1 Recreation

In the 1990s, the U.S. Army Corps of Engineers permanently closed the lock structure at Lock and Dam Number 11 by constructing a concrete bulkhead on the upper gate sill (KRA 2015). With the lock closed, the river at Lock and Dam Number 11 is not passable by boat, and no portage is

provided for recreational boaters. The KRA maintains boat exclusion buoys 300 feet above and 150 feet below the dam. The lock and dam structures are closed to the public, with a locked gate on the access road to the lock and dam and fencing around the site to restrict access. No developed recreational amenities and bank fishing occur at the site because these activities are prohibited on KRA-owned land upstream of the dam.

The Irvine Boat Ramp and Docks at RM 218 and Drowning Creek Access at RM 205 (17 and 4 miles upstream of Lock and Dam Number 11, respectively) provide access to Pool 11. The Irvine Boat Ramp and Docks site is accessed from South Irvine Road off of Kentucky Route 52, which serves as the access road for Rader's River Grill Restaurant. The site consists of a single boat ramp and a dock with floating cabins that provides mooring for 12 boats. The cabins and mooring spaces are leased on an annual (seasonal) basis and are generally at or near capacity. Rader's River Grill Restaurant owns a separate, unimproved parking area adjacent to the boat launch for day-use parking, which is available for a $2 fee. KRA provided funding for construction of the boat launch, but the facilities are currently operated and maintained by the restaurant.

The Drowning Creek Access facility consists of a single boat ramp, with adjacent informal parking on Drowning Creek Road. The facility is located on privately owned land, but is maintained by the Madison County Department of Public Works. Lock and Dam Number 11's tailwaters can be accessed by boat from the College Hill and Red River ramps, which are both located approximately 10 miles downstream on opposite sides of the river (KRA 2014b).

3.2.1.2 Land Use

The proposed Project is located in a rural area where land use is predominantly agricultural (i.e., cropland and pastureland) with large patches of mixed and evergreen forests. Nearby, there are some low-density residential areas, mostly along Kentucky State Highway 977 and Kentucky Route 52.

There are no lands in the immediate vicinity of the Project that are included in the National Trails System or designated as wilderness lands, although it is the intention of the Kentucky River Water Trail Initiative to apply as a National Water Trail (a National Trails System designation) in the future (USDOI 2012). No portion of the Kentucky River is included in the list of wild and scenic rivers. The Project Area does contain some areas classified as Prime Farmland (USDA NRCS 2013); however, no farmland would be converted by the Proposed Action because no areas are currently in production and disturbance would be primarily limited to the existing concrete esplanade. As such, Prime Farmlands were dismissed from detailed analysis.

3.2.2 Environmental Consequences

3.2.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts on recreation or land use at or in the vicinity of the proposed Project. Lock and Dam Number 11 would continue to exist in their current conditions and the canoe portage trail would not be constructed.

3.2.2.2 Proposed Action

Construction of the proposed Project facilities would be unlikely to significantly affect recreation near Lock and Dam Number 11. The KRA currently excludes boats from the area 300 feet upstream and 150 feet downstream from the dam. Although boats may be temporarily excluded from a larger area during construction, the disturbance would be minimal and would not affect the quality of the recreational experience outside of the immediate Project Area.

There are no existing formal recreational opportunities at the lock and dam site. Currently, the KRA prohibits fishing from the lock and dam structures and any KRA-owned land upstream of the dam; however, bank fishing downstream from the dam is permitted. During construction, tailrace access and bank-fishing opportunities may be suspended. These closures would be temporary, and normal recreational access would resume on completion of construction. Fencing and safety signs restricting public access would protect the public from construction activities.

Lock 11 Hydro Partners' proposed recreational enhancements would improve recreational boating access to the Kentucky River in a stretch of the river that has fewer access points than are available in more populous areas downstream. The portage around Lock 11 would make it easier for boaters to through-paddle the Kentucky River, and the picnic tables and composting toilet would encourage use of the site as a waypoint for through-paddlers. The proposed signage directing canoeists to the put-in and take-out locations would improve accessibility and visibility of the site's recreational amenities. These measures would support the continued development of the Kentucky River Water Trail by improving connectivity around the lock and dam.

To provide recreational opportunities at the Project, Lock 11 Hydro Partners proposed to implement a Recreation Resources Management Plan to direct construction, operation, and maintenance of recreational resources at the Project that includes the following.

1. Construct a new portage trail around the lock and dam.
2. Provide designated bank-fishing access to the tailrace.
3. Construct a new parking area for four to six vehicles, adjacent to an existing access road on KRA-owned land.
4. Designate the existing Irvine Boat Ramp and Docks and Drowning Creek Access as Project recreational facilities.

During proposed Project operation, flows (up to the maximum turbine capacity of 4,000 cfs) would pass through the powerhouse and tailrace. Because the lock is not operational, all flows currently spill over the dam. The proposed Project would shift the location of flows to the tailrace of the newly constructed powerhouse, with only excess flow spilling over the dam. This shift in the location of flow could benefit anglers because the flows through the Project may concentrate fish near the tailrace. The proposed designated bank fishing area would help anglers take advantage of the new flows, while maintaining public safety around the Project facilities.

3.2.2.3 Effects of Project Operation on Land Use

Constructing, operating, and maintaining the proposed Project, which is located in a relatively rural, agricultural area, may affect both the intensity of land use and the visual characteristics of the Lock

and Dam Number 11 site. However, development of hydroelectric facilities would be consistent with the history of industrial use along the Kentucky River.

Improved recreational access at the site, including the portage trail, designated bank fishing, and parking area, is likely to attract visitors to an area that is currently off-limits for public recreation. The recreational enhancements and associated change in land use are compatible with the development of the Kentucky River Water Trail and any future designation as a National Water Trail.

3.2.3 Mitigation

No mitigation nor environmental protection and avoidance measures are proposed for this resource area.

3.3 FLOODPLAINS

3.3.1 Affected Environment

The Federal Emergency Management Agency (FEMA) defines floodplains at varying levels based on flood risk and type of flooding. *Special flood-hazard areas* are those that are subject to inundation by a 1-percent annual chance, or a 100-year flood. FEMA also defines areas of minimal flood hazard that are within the 0.2-percent annual chance, or a 500-year flood. Based on a review of the FEMA Flood Insurance Rate Map, the Project is located in an area characterized as a 100-year floodplain. The entire Project boundaries lie within Zone AE, which is identified as a special flood-hazard area regulatory floodway (FEMA 2024).

3.3.2 Environmental Consequences

3.3.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts on floodplains or the designated floodway at or in the vicinity of the proposed Project.

3.3.2.2 Proposed Action – Construction

Project facilities would consist of a submersible powerhouse constructed in the existing abandoned lock chamber and a control building on the top of a human-made plateau that held the old lockmaster buildings. The powerhouse would contain six submersible turbine generators that are unaffected by flooding. The floor of the control building would be above the 500-year flood level. These facilities are interconnected by a concrete-encased cable duct, which runs underneath the existing concrete esplanade. As such, all land development impacts within the floodplain are small, as they are built on/in/under existing human-made structures. Due to construction activities within the river and adjacent floodplain, the Project would require coordination and permitting from both the Kentucky Division of Water, Dam Safety Section, and the Floodplain Management Section. On April 15, 2024, Lock 11 Hydro Partners, LLC received a Floodplain Development Permit from the Estill County floodplain administrator.

3.3.2.3 Proposed Action – Operations

Lock 11 Hydro Partners proposes to install crest gates to maintain the existing spillway capacity and to implement an Operating Plan at the Project that would ensure that there is no adverse change in flood risk as a result of the Project. The control building, located within the 100-year floodplain yet above the 500-year flood level, would be carefully designed and constructed to ensure that it does not obstruct water flow or pose any hazards during flooding events. The Project would be operated in a run-of-river mode utilizing a crest gate to maintain the elevation of the upper pool at its current level while maintaining existing spillway capacity in the event of flood conditions.

3.3.3 Mitigation

No mitigation nor environmental protection and avoidance measures are proposed for this resource area.

3.4 WETLANDS

3.4.1 Affected Environment

A wetland field survey was conducted by ICF on November 22, 2023, to identify and delineate all waters of the United States (e.g., wetlands, rivers, streams, ponds, lakes) within the Project Area. The field identification of wetlands was based on the three-factor approach described in the *Wetland Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)* (USACE 2012). No wetlands or tributary streams were identified within the site, and the only water of the United States is the Kentucky River.

The Kentucky River is a *Navigable Water of the United States,* regulated by USACE under Section 10 of the Rivers and Harbors Act of 1899, which requires authorization from the Secretary of the Army, acting through USACE, for any structure or work in or over any navigable water of the United States.

No wetlands were identified in the Project Area during site surveys, and no wetlands are immediately upstream or downstream from the Project. Construction of the proposed control building and most of the canoe portage would be concentrated around the existing concrete esplanade and lock structure and would not disturb wetland or riparian vegetation. The riprap that Lock 11 Hydro Partners proposes to place next to the stairway would stabilize the riverbank and minimize potential erosion after construction. See Appendix A for Wetland Determination Data Form and High Gradient Bioassessment Stream Visit Sheet and Figure 4 for data point locations.

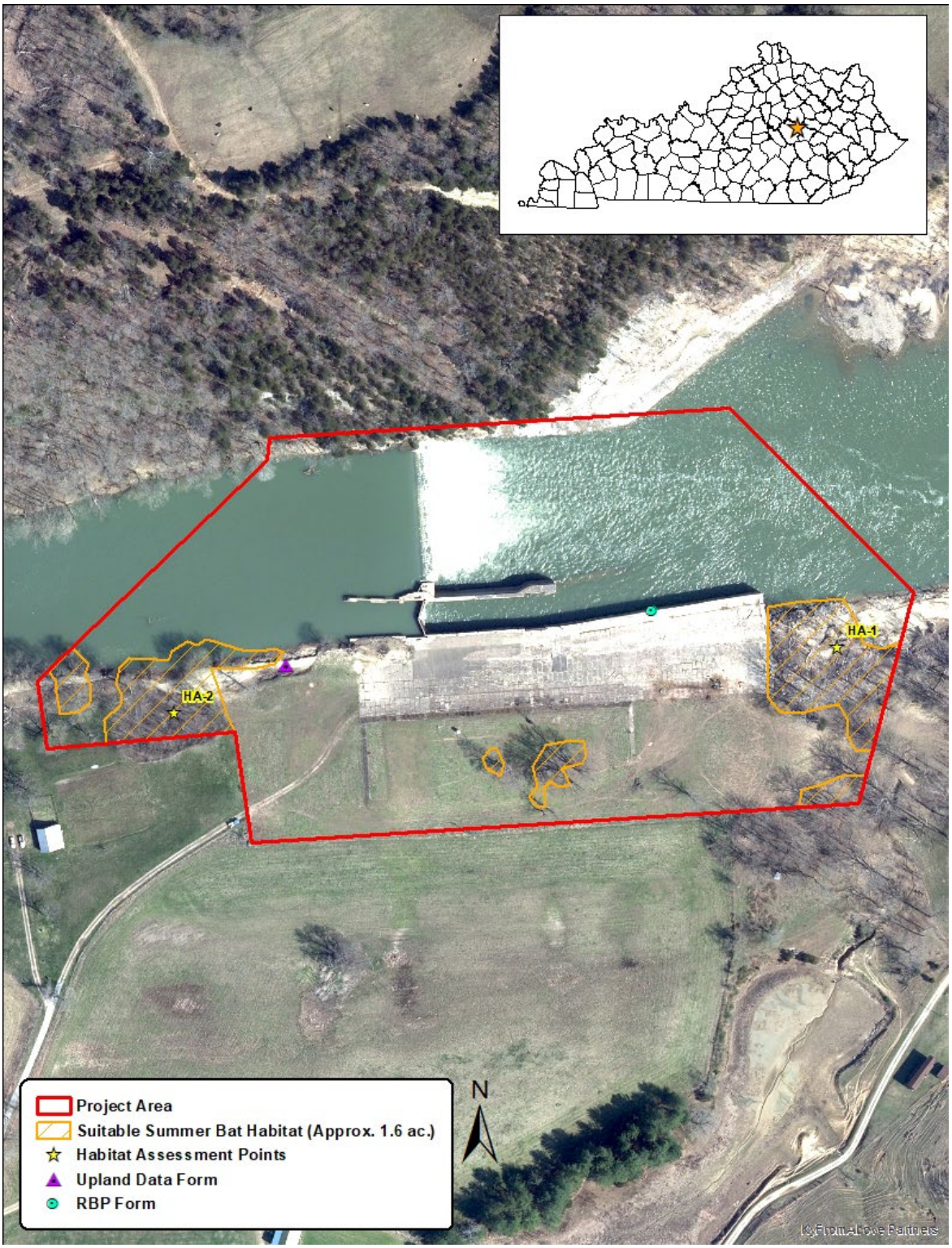


Figure 4. Habitat Assessment Map

3.4.2 Environmental Consequences

3.4.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts to wetlands at or in the vicinity of the proposed Project.

3.4.2.2 Proposed Action – Operations

Operating the Project in a run-of-river mode would maintain reservoir levels at the crest of the dam when inflows are less than the maximum hydraulic capacity of the Project. As a result, the average reservoir elevation would be lower, and there would be less frequent fluctuations in water levels in riparian wetlands and vegetation adjacent to the Project impoundment, but Project operation would maintain the same historical minimum and maximum reservoir elevations. The combined outflows from the Project turbines and spill over the Project dam would not change from the existing flow conditions. Wetland and riparian vegetation along the Kentucky River developed in zones related to the frequency and duration of water depths following the construction and operation of the 14 existing locks and dams. This vegetation is expected to adapt relatively quickly to the minor changes to average elevations during Project operation. As a result, operating the Project in a run-of-river mode would have minimal effect on the distribution and species composition of upstream and downstream wetland communities.

On August 2, 2024, Lock 11 Hydo Partners submitted a Section 404 permit application to the USACE, Louisville District for Project authorization under Nationwide Permit No. 17 (hydropower projects). The USACE has assigned the project number: LRL-2015-00321-mlk.

3.4.3 Mitigation

No mitigation nor environmental protection and avoidance measures are proposed for this resource area.

3.5 WATER RESOURCES

3.5.1 Affected Environment

3.5.1.1 Water Quantity

The Kentucky River has 14 locks and dams, with Lock and Dam Numbers 5 through 14 retired, and all 14 are now conveyed to the Commonwealth of Kentucky. The Commonwealth uses them for domestic water supply, recreation, and hydroelectric power. Municipal water is withdrawn from Pools 3–11 and Pool 14. The College Hill Project's Pool 11 serves as a municipal water source during low-flow and near-drought conditions. KDEP's Division of Water or the KRA may request water releases from Pool 11 discharged through low-level drawdown valves, when necessary.

AHA procured flow data at the project site that were collected by two U.S. Geological Survey (USGS) gages located on the Kentucky River at Lock and Dam Number 11, near College Hill, Kentucky (Gage #03282290), and at Lock and Dam Number 14 at Heidelberg, Kentucky (Gage #03282000), with drainage areas of 3,219 and 2,659 square miles, respectively. Flow data at Lock and Dam Number 11 were only available for the period of 2003 until 2023. In order to establish a

longer-term period of stream flow, AHA prorated the flow data from the USGS gage at Lock and Dam Number 14, based on drainage area to the project site for a period of record from 1963–2002 (1963 was the first year that the flow was partially regulated upstream). When combined, AHA was able to present streamflow in the Kentucky River at the project site from 1963–2023. Table 1 shows the estimated average monthly flow data at Lock and Dam Number 11.

Table 1. Estimated Mean Monthly Flow at Lock and Dam Number 11 from 1963–2023

Month	Average Flow (cubic feet per second)
January	7,282
February	8,669
March	9,732
April	7,693
May	5,702
June	2,826
July	1,768
August	1,387
September	1,145
October	1,427
November	2,870
December	2,870
Annual	4,697

Source: AHA 2024.

The Commonwealth of Kentucky requires that projects that alter stream flows meet certain minimum flow conditions. The Commonwealth requires that all projects that alter natural water quantities provide a 7Q10 (i.e., lowest stream flow for 7 consecutive days that would be expected to occur once in 10 years) minimum flow. The 7Q10 flow is meant to protect aquatic life, water-based recreational and aesthetic resources. The 7Q10 flow at the Kentucky River L&D 11 is 91 cfs.

3.5.1.2 Water Quality

According to the water quality statutes for Kentucky (401 KAR 10:026), the designated uses for the Kentucky River in the vicinity of the proposed Project include: (1) warm-water aquatic life habitat; (2) primary contact recreation; (3) secondary contact recreation; and (4) domestic water supply.

Relevant water-use designations by the Commonwealth of Kentucky are as follows: (1) dissolved oxygen (DO) concentration must meet a minimum of 4.0 milligrams per liter (mg/L) instantaneously and of 5.0 mg/L over a 24-hour average; and (2) water temperature values must never exceed 89ºF (or 31.7ºC).

The KDEP's *2022 Integrated Report* (KDEP 2022) identifies impaired water bodies in the Commonwealth. The Kentucky River main stem was found to be fully supporting all monitored uses, except fish consumption, warm-water aquatic habitat, and primary contact recreation. Fish

consumption in Madison, Clark, and Estill counties was only partially supported, an area encompassing Lock 11.

Very little historical water quality data exists for the Kentucky River in the immediate Project Area. The closest available water quality data is sourced from the operators of the Mother Ann Lee Hydroelectric Station (FERC Number 539), which have been collecting continuous DO and temperature data since 2008. The Mother Ann Lee Hydroelectric Station is located on the Kentucky River at Lock and Dam Number 7 near Harrodsburg, Kentucky, which is 84 miles downstream from the Project Area. Because of the location, scale, and manner of operations at Lock and Dam Number 7, water quality in this area is assumed to be similar to current conditions within the Project Area.

From 2008 to 2014, instantaneous DO concentrations at Lock and Dam Number 7 ranged from approximately 4.0 mg/L to 15.0 mg/L. The 24-hour average DO concentrations ranged from approximately 5.0 mg/L to 15.0 mg/L. DO concentrations were highest at the beginning of the year, declining through approximately day 200 (i.e., mid-July), remaining at the lowest levels observed annually until day 300 (i.e., late October), after which concentrations showed an increasing trend through the end of the year.

From 2008 to 2014, water temperatures at Kentucky River Lock and Dam Number 7 ranged from approximately 2°C to 30°C. Temperatures were cool and relatively consistent from the beginning of the year through day 60 (i.e., the beginning of March), after which they steadily increased to a peak in early to mid-June at approximately day 160. This peak would typically last through day 240–250 (i.e., late August to early September), after which temperatures trended downward steadily until year-end.

3.5.2 Environmental Consequences

3.5.2.1 Water Quantity

3.5.2.2 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts to water quantity at or in the vicinity of the proposed Project.

3.5.2.3 Proposed Action – Construction

Construction of the proposed Project would be completely contained to the closed lock chamber and would have no impacts on the flow of the river. On September 11, 2024 the KDEP issued a "Final" Section 401 Water Quality Certification (WQC2024-142-F) to outline the minimum surface water standards that must be met by the Project. On August 12, 2024, Lock 11 Hydro Partners was issued a "Stream Construction Permit For Construction In Or Along A Stream" from KDEP's Division of Water. The Project has been assigned Agency Interest No.: 51764.

3.5.2.4 Proposed Action – Operations

Under existing conditions, all flows passing the dam are released over the spillway because the lock is not operational. Operating the Project in a run-of-river mode would maintain the existing reservoir water surface elevation no lower than the crest of the dam while the Project is generating. Inflows in the range of 196 cfs to 2,636 cfs, which are typical during the summer months, would be released

through the powerhouse, rather than over the spillway. Diverting up to 2,636 cfs of flow (i.e., the project's maximum hydraulic capacity) to the generating units would reduce the frequency of flows above the crest of the spillway during some low-flow months; however, flows downstream of the Project would remain unchanged. Consequently, the shoreline of the Project reservoir during these months would experience a slightly lower average reservoir elevation than currently, but not less than the height of the crest of the dam. Lock 11 Hydro Partners' proposed measures to monitor and report compliance with run-of-river operation, including reporting any Project shutdowns resulting from KDEP or KRA emergency low-flow declarations and drought conditions, would foster coordinated management of water resources and ensure compliance with the operational requirements of any new license.

The City of Richmond's water supply intake is located on the Project reservoir, approximately 0.3 miles upstream of the dam. The intake structure consists of four separate intake pipes at elevations of 570.5, 575, 580, and 588 feet above mean sea level (MSL). The intake structure requires that the reservoir elevation be at least 572 feet above MSL to operate properly. Under the proposed operating regime, the reservoir elevation would be maintained at 583.2 feet above MSL or higher at all times during operations. This would ensure that the City of Richmond's water supply intake would not be affected by Project operations.

The intake for the municipal water supply for the towns of Irvine and Ravenna is located further upstream, approximately 18 miles from Lock and Dam Number 11. The intake pipe sits at an elevation of 577.2 feet above MSL and the system requires a minimum reservoir elevation of 582 feet above MSL to operate properly. As stated above, the reservoir elevation would be maintained at 583.2 feet above MSL or higher at all times. This reservoir elevation would ensure that the cities of Irvine and Ravenna's water supply intake would not be affected by the proposed Project operations.

3.5.2.5 Water Quality

3.5.2.6 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts on water quality at or in the vicinity of the proposed Project.

3.5.2.7 Proposed Action – Construction

Construction of the proposed Project has the potential to affect water quality in the Kentucky River, both upstream and downstream from the Project Area. Construction of the proposed Project facilities would require in-water construction work (e.g., installation of the turbine pits within the lock) and some limited land-disturbing activities (e.g., staging areas for equipment). Overall, these activities may result in localized increases in turbidity levels within the affected reaches of the Kentucky River.

As discussed in Section 3.12, *Geology and Soil Resources*, the proposed Erosion and Sediment-Control Plan (ESCP) details a number of best management practices (BMPs) to minimize erosion and sedimentation during Project construction. These BMPs include the use of riprap, silt curtains, dust control measures, and reseeding disturbed areas. By implementing AHA's ESCP, disturbed soils would be treated in a manner that would minimize erosion and potential adverse effects on

water quality. The ESCP also includes a provision for sediment sampling and testing for contaminants upstream and downstream from the lock chamber prior to Project construction.

People have long used the Kentucky River for transportation, as well as for shipping coal, agricultural products, and other goods to markets. Metals, polychlorinated biphenyls, and other contaminants are commonly found in the sediments of rivers that have been historically used for transportation and shipping. Therefore, some locations within the Kentucky River, including proposed construction areas, may harbor contaminants within river sediments, which, if present, could be resuspended and require special disposal methods. Sediment sampling and testing prior to Project construction would identify potential contaminated sediments within the Project Area. Disposal procedures would be determined on the basis of the extent and concentration of the contamination in order to minimize the potential adverse effects associated with disturbing, removing, and disposing of contaminated sediments. Disposal of any contaminated sediments at a permitted facility would protect water quality and compliance with the Commonwealth of Kentucky and U.S. Environmental Protection Agency (EPA) requirements.

Construction and operation of the proposed Project could introduce hazardous materials into the Kentucky River or karst features, which could lead to reduced water quality and adverse effects on aquatic resources, such as fish and mussels. Developing and implementing a Spill Prevention, Containment, and Countermeasures Plan would confirm proper measures are in place at the proposed Project to use and store hazardous materials safely, as well as prevent, contain, and clean up hazardous substance spills. Provisions of the plan would include the safe transport, storage, handling, and disposal of oil, fuels, lubricant products, and hazardous liquid substances, as well as the procedures to implement in the event of a spill would provide for the proper containment and cleanup of any substances and minimize effects to water quality and aquatic resources in the Project Area.

3.5.2.8 Proposed Action – Operations

Under existing conditions, water quality in the Project vicinity appears to be good and meets state standards. Lower DO concentrations and higher water temperatures are typically observed from May through October, which is a natural occurrence in southern rivers and streams. Passing river flows through the Project's turbines, instead of over the crest of the dam during this period, would reduce aeration and could result in reduced DO downstream from the powerhouse. However, water quality data for the Mother Ann Lee Project at Lock and Dam Number 7 suggest that the proposed Project operation would not result in violations of the state water quality standards (USGS 2024). As stated above, the Mother Ann Lee Project is also located in the Bluegrass Region and operates in a run-of-river mode. From 2006 to 2014 (with the exception of 2013, due to equipment malfunction), the DO concentration remained above the instantaneous water quality standard of 4.0 mg/L and the 24-hour average of 5.0 mg/L for all years evaluated (USGS 2024). Additionally, instantaneous water temperatures did not exceed the maximum temperature threshold of 31.7 °C during this time period. Project-related effects on DO and water temperature at the proposed Project would be similar to those observed at Lock and Dam Number 7 and would not violate state water quality standards.

Project operations are not expected to affect overall water temperatures because the reservoirs on the Kentucky River are riverine in nature and have moderate turnover rates and short residence times, which likely do not allow for significant stratification to occur. Even though the reservoir does not thermally stratify in the summer, water found deeper in the reservoir would be cooler than surface

water because it would not be subject to solar heating. Project operations could result in the release of cooler water to the tailrace than is currently occurring because the Project would intake water from the entire water column, which would be cooler than the surface water. Release of cooler water to the Project tailrace could make the Kentucky River downstream of the Project less likely to exceed state standards during proposed operations.

Vegetation along the Kentucky River has been established since the lock and dam system was constructed, and it is adapted to the frequency and duration of water depths under current Project operation. This vegetation is expected to adapt relatively quickly to the minor changes to average elevations during Lock 11 Hydro Partners' proposed run-of-river operation. Given that the flow patterns through the Project would mimic the current hydroperiod, and the impoundment shorelines and downstream riverbanks are well vegetated, operation of the Project would not affect the stability of riverbanks and impoundment shorelines. Sediment transport and deposition patterns would also remain unchanged from current conditions.

Lock 11 Hydro Partners states that ongoing maintenance of the site would include periodic mowing and care of the proposed picnic area, parking area, fishing-access area, and the canoe take-out, put-in, and portage (Rye 2015b). Gravel access roads would be used to perform access, and ongoing activities are not expected to noticeably increase erosion or compaction of Project-area soils.

To address uncertainties regarding potential adverse effects on water quality during Project operation, Lock 11 Hydro Partners proposes to implement a Water Quality Monitoring Plan. This plan includes provisions to monitor hourly water temperature and DO concentrations in the Project tailrace when the Project is operating. In addition, if low DO concentrations were observed in the tailrace after the Project begins operating, then Lock 11 Hydro Partners would shut down the Project turbines, incrementally, or all turbines, as needed, to release inflow over the spillway until discharges met the state standard for DO. Lock 11 Hydro Partners would submit the monitoring data to resource agencies annually.

3.5.3 Mitigation

The following environmental protection and avoidance measures are proposed for water resources.

- Develop and implement an ESCP to minimize the effects of Project construction on the Kentucky River. The conceptual ESCP would include site-specific provisions to perform the following.
    1. Conduct sediment sampling upstream and downstream from the lock chamber, and test for contaminants prior to beginning Project construction.
    2. Dispose of Project-generated dredged sediments and solid waste at permitted facilities, treating the sediment as contaminated if testing, as specified in Item 1 above, proves necessary.
    3. Develop and implement a groundwater protection plan for review and authorization by KDEP's Division of Water.
    4. Implement BMPs) to prepare the Project site for construction (e.g., minimize disturbance to soil, vegetation, and existing drainage systems, install erosion- and sediment-control measures before land clearing and grading, establish temporary and

permanent soil disposal areas, haul roads, construction staging areas, and an access point with cleaning station to control offsite mud/debris tracking).

5. Stabilize, temporarily seed, and mulch disturbed land surfaces during construction.
6. Install cofferdams around the Project to minimize turbidity increases associated with dredging and construction activities.
7. Inspect and maintain erosion-control measures during the construction period.
8. After construction, regrade, add topsoil, reseed with native grass, shrubs, and trees, and install erosion-control geo-fabric and/or mulch in the disturbed areas.
9. Re-establish 25- to 50-foot riparian buffer zones in the construction area along the Kentucky River.

- Conduct water temperature and DO monitoring upstream and downstream from the Project from June through September, both prior to construction and after post-construction, to verify compliance with water quality standards.
- Operate the Project in a run-of-river mode to maintain the upper pool elevation to ensure that City of Richmond and Irvine–Ravenna Municipal water supply needs are met.
- Implement a Water Quality Monitoring Plan that includes the following provisions.
    1. Monitor water temperature and DO concentrations in the tailrace from May 1 through October 31.
    1. Report monitoring results annually by March 31 of the following year.
    2. Shut down Project turbines incrementally, to total shutdown as needed, if DO levels fall below 5.0 mg/L over a 24-hour average period, or 4.0 mg/L instantaneously.
- Implement an Operations Compliance Monitoring Plan that includes provisions to cease generation during low-flow restricted periods, as declared by the KDEP's Division of Water.

3.6 COASTAL RESOURCES

3.6.1 Affected Environment

The Project Area is located in College Hill, Kentucky. The Commonwealth of Kentucky does not have a coastal zone regulated by the Coastal Zone Management Act.

3.6.2 Environmental Consequences

3.6.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts to coastal resources.

3.6.2.2 Proposed Action

The Proposed Action would have no short-term or long-term impacts to coastal resources.

3.6.3 Mitigation

No mitigation measures are proposed for coastal resources.

3.7 BIOLOGICAL RESOURCES

3.7.1 Federally Listed Species

3.7.1.1 Affected Environment

The U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) website was used to obtain an official list of species and critical habitats (USFWS Project Code: 2024-0023535) that may occur within the vicinity of the proposed Project (USFWS 2025). The official species list fulfills the requirements of USFWS under Section 7(c) of the ESA to provide information about whether proposed or listed species may be present within the vicinity of the Project. As summarized in Table 2, the review identified seven federally listed species and two proposed species that may occur in the Project Area (Appendix B). Per the request of the USFWS KFO (KFO), the sheepnose and snuffbox mussels were added to the list of mussels to be addressed (Table 2). No designated Critical Habitat for any species was identified within the vicinity of the Project.

Table 2. Federally Listed Species with the Potential to Occur in the Project Vicinity

Scientific Name	Common Name	Federal Status	Suitable Habitat
Mammals			
Myotis grisescens	Gray bat	Endangered	Yes
Myotis sodalis	Indiana bat	Endangered	Yes
Corynorhinus townsendii virginianus	Virginia big-eared bat	Endangered	Yes
Mussels			
Obovaria subrotunda	Round hickorynut	Threatened	Yes
Simpsonaias ambigua	Salamander mussel	Proposed Endangered	Yes
**Plethobasus cyphyus*	*Sheepnose	Endangered	Yes
**Epioblasma triquetra*	*Snuffbox	Endangered	Yes
Insects			
Danaus plexippus	Monarch butterfly	Proposed Threatened	Yes
Plants			
Physaria globosa	Short's bladderpod	Endangered	No

Source: USFWS 2025. *Mussel species added to proposed Project list by KFO.

The USFWS Kentucky Field Office maintains maps of known habitat for the Indiana bat (*Myotis sodalis*) in the Commonwealth of Kentucky. According to the known habitat maps, the proposed Project is located within "potential" habitat for the Indiana bat (USFWS KFO 2019).

Species Accounts

The following subsections present life-history information for the four mussel species that could potentially be affected by the proposed Project: round hickorynut (*Obovaria subrotunda*), salamander mussel (*Simpsonaias ambigua*), sheepnose (*Plethobasus cyphyus*), and snuffbox (*Epioblasma triquetra*).

Round Hickorynut

The round hickorynut (Rafinesque 1820) is a small- to medium-sized mussel up to 3 inches (75 millimeters) in size, which lives up to 15 years. It is found in small streams to large rivers, and prefers a mixture of sand, gravel, and cobble substrates. The round hickorynut mussel is a wide-ranging species, historically known from 12 states, though now occurs in 9, as well as the Canadian Province of Ontario. It is currently found in five major basins: Great Lakes, Ohio (where it is most prevalent), Cumberland, Tennessee, and Lower Mississippi (where it is most rare). The number of known populations in the U.S. has declined by 77 percent, from 301 populations documented historically to 69 today (USFWS 2022).

The round hickorynut exhibits a preference for sand and gravel in riffle, run, and pool habitats in streams and rivers, but also may be found in sandy mud. They can be found in shallow habitats with gentle flows at less than one foot with abundant American water-willow, but in larger rivers are commonly found up to depths of 6.5 feet. The round hickorynut and other adult freshwater mussels within the genus *Obovaria* are suspension-feeders, consuming food filtered from the water. Their diet consists of a mixture of algae, bacteria, detritus, and microscopic animals.

Round hickorynut adults are greenish-olive to dark or chestnut brown, sometimes blackish in older individuals, and may have a yellowish band. The shell is thick, solid, and up to three inches long, but usually is less than 2.4 inches. A distinctive characteristic is that the shell is round, nearly circular. The foot can be pale tan to pale pinkish orange.

Salamander Mussel

The USFWS proposes to list the salamander mussel, a freshwater mussel species from the United States (Arkansas, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, West Virginia, and Wisconsin) and Canada (Ontario), as an endangered species under the Endangered Species Act of 1973, as amended (Act), on August 22, 2023 (Federal Register 88 FR 57224 57290). Additionally, the USFWS propose to designate critical habitat for the salamander mussel under the Act. In total, approximately 2,012 river miles (3,238 kilometers) in Indiana, Kentucky, Michigan, Minnesota, New York, Ohio, Pennsylvania, Tennessee, West Virginia, and Wisconsin fall within the boundaries of the proposed critical habitat designation.

Salamander Mussel is the only living member of the genus *Simpsonaias*. The salamander mussel is a small freshwater mussel with thin, yellow or brown shells that reach approximately 48–51 mm (1.5–2 inches) long. The species relies on the common mudpuppy salamander (*Necturus maculosus*, hereafter "mudpuppy") during its larval stage, making it the only known freshwater mussel species to use a non-fish host. Salamander mussel larvae are parasitic and consume nutrients from the mudpuppy's body until reaching the juvenile stage. Because the salamander mussel has an obligate

parasitic relationship with the mudpuppy, the salamander mussel's survival is dependent on that of the mudpuppy (McDaniel et al., 2009).

Historically, the species has been found across 14 states (Arkansas, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, West Virginia, and Wisconsin). The species populations are considered extirpated within Iowa (although the species is found within the Mississippi River along the eastern border of the State) and Lake Erie and severely diminished in Illinois.

The salamander mussel occupies rivers, streams, creeks, or lakes, under flat rocks in areas of moderate flow, with varying substrate including bedrock, sand, gravel, or mud.

Sheepnose

The sheepnose was listed as endangered under the ESA on April 12, 2012 throughout its entire range in Alabama, Illinois, Indiana, Iowa, Kentucky, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin (USFWS 2012). Historically, the sheepnose was known to occur throughout much of the Mississippi River system (NatureServe 2020); however, this species has been extirpated from over 65 percent of its historical range (25 streams currently from 77 streams historically), including thousands of miles of the Mississippi, Wisconsin, Illinois, Ohio, Cumberland, and Tennessee Rivers and their tributaries. Of the 25 extant populations, nine are thought to be stable and eight are considered to be declining. The Allegheny River in Ohio and the Green River in Kentucky are the only locations where the species is considered to be improving in population status. Six other populations are considered extant; however, the status of these populations is unknown. In Kentucky, populations exist in the Ohio, Licking, Kentucky, and Green Rivers (USFWS 2012).

The sheepnose is generally considered a large-river species; however, it also inhabits medium-sized rivers. The species is typically found in deep water (greater than two meters) with slight to swift currents and mud, sand, or gravel bottoms. The sheepnose may also inhabit riffles with gravel/cobble substrates and appears capable of surviving in reservoirs (NatureServe 2020).

Snuffbox

The snuffbox was listed as endangered by the USFWS on February 14, 2012. The snuffbox historically occurred in 210 streams and lakes in 18 States and 1 Canadian province: Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Mississippi, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin; and Ontario, Canada. The major watersheds of historical streams and lakes of occurrence include: the upper Great Lakes sub-basin (Lake Michigan drainage), lower Great Lakes sub-basin (Lakes Huron, Erie, and Ontario drainages), upper Mississippi River sub-basin, lower Missouri River system, Ohio River system, Cumberland River system, Tennessee River system, lower Mississippi River sub-basin, and White River system. Extant populations of the snuffbox are known from 79 streams in 14 States and 1 Canadian province, representing a 62% decline in occupied streams. In Kentucky, the snuffbox is associated with the following river systems: Licking, Green, Tygarts, Kinniconick, Little Sandy, Red(s), Barren, Cumberland, Salt, Rolling Fork, and parts of the Rockcastle River. Distribution is sporadic and nearly statewide.

The shape of the shell is somewhat triangular (females), oblong, or ovate (males), with the valves solid, thick, and very inflated. The umbos are located somewhat anterior of the middle, and are swollen, turned forward and inward, and extended above the hinge line. The anterior end of the shell is rounded, and the posterior end is truncated, highly so in females. The posterior ridge is prominent, being high and rounded, while the posterior slope is widely flattened. The posterior ridge and slope in females is covered with fine ridges and grooves, and the posterioventral shell edge is finely toothed. The shell is yellow or yellowish-green and covered with dark green rays or chevrons. The nacre is white or with a slightly iridescent bluish-white. Cardinal teeth are relatively large and serrated; lateral teeth are thick and short.

The snuffbox is usually found in small streams to medium-sized rivers, inhabiting areas with a swift current, although it is also found in Lake Erie and some larger rivers. Adults often burrow deep in sand, gravel or cobble substrates, except when they are spawning, or the females are attempting to attract host fish. They can be found in water as shallow as 2 inches to 2 feet, usually in shallower areas of moderate to swiftly flowing streams.

Habitat Assessment Methodology

An assessment was conducted within the Project Area to determine if suitable habitat is present for the identified federally listed species (Appendix A). The assessment included an in-house review of available resources, including USGS topographic and geologic quadrangle maps, karst potential maps, land use maps, and aerial photographs. Field surveys took place on November 22, 2023, to delineate the extent of each habitat and assess its potential for use by the identified species. Suitable habitat for federally listed species was assessed based on known life-history and habitat preferences for each species.

Bats

Potential hibernacula for the gray (*Myotis grisescens*), Indiana, and Virginia big-eared (*Corynorhinus townsendii virginianus*) bats, including caves, abandoned mine portals, sinkholes, and other underground features, were evaluated during the in-house review, per the *Range-wide Indiana Bat Survey Guidelines* (USFWS 2023). Identified features were mapped utilizing ArcView geographic information system (GIS) software to determine their location relative to the Project. Based on the localized impacts associated with the Project and the lack of blasting, a search for previously unidentified features within 0.5-mile of the Project was not warranted; however, a search for features was performed within the Project Area during the field survey.

Potential foraging and commuting habitat for the gray bat was identified using USGS topographic maps and aerial photographs to locate streams, lakes, and other water bodies within the Project Area. During the field survey, potential foraging and commuting habitat identified within the Project Area was further assessed based on observed stream flow, in-stream habitat, and riparian canopy closure. Suitable summer habitat for the Indiana bat was considered to be forested areas comprised of trees that have a diameter at breast height (dbh) of 5 inches or greater. Isolated trees were considered to be suitable roosting habitat if they exhibited the characteristics of a suitable roost tree for either species and were located within 1,000 feet of other suitable habitat. During the field survey, summer habitat identified for each species within the Project Area was marked on field maps that were generated

from recent aerial photographs and Project plans. These marked areas were then entered into a GIS program to calculate the acreage of summer habitat for both species within the Project Area.

Mussels

Potential habitat for the listed mussel species was identified using USGS topographic maps and aerial photographs to locate perennial streams within the Project Area. During the in-house review, the Kentucky River was identified as a perennial stream, and a cursory habitat assessment of the stream was conducted during the field survey. The lock chamber, riverbed, and right bank were visually inspected to characterize the active bed substrate and observe any live or remnant mussels.

Monarch Butterfly

ICF biologists conducted a pedestrian survey of suitable habitat for the monarch butterfly (*Danaus plexippus*) within the land-based portion of the Project Area occurring along the right descending bank of the Kentucky River. Any areas containing characteristics associated with the monarch butterfly (i.e., milkweed plants) were deemed suitable habitat for the species.

Short's Bladderpod

ICF biologists also conducted a pedestrian survey of suitable habitat for Short's bladderpod (*Physaria globosa*) within the land-based portion of the Project Area occurring along the right descending bank of the Kentucky River. Any areas containing characteristics associated with Short's bladderpod (i.e., steep, rocky slopes) were deemed suitable habitat for the species.

Habitat Assessment Results

Bats

No caves, abandoned mine portals, sinkholes, or other underground features that could provide potential winter habitat (hibernacula) for the gray, Indiana, or Virginia big-eared bat were identified within the Project Area. As a result, no potential hibernacula for these species are present. The Kentucky River is considered suitable foraging and commuting habitat for the gray bat. The wooded habitat present within the Project Area was identified as suitable summer roosting, foraging, and commuting habitat for the Indiana bat. No cliffs or rock shelters are located within the Project Area; therefore, no summer roosting habitat for the Virginia big-eared bat exists in the Project Area. No gray, Indiana, or Virginia big-eared bats or signs of use were observed during the habitat assessment. No snags or trees with exfoliating bark, cracks, crevices, or hollows were observed in assessment areas. Two assessment points were assessed for Indiana bat summer habitat (Figure 4). Phase 1 Summer Habitat Assessment Forms are included (Appendix A) and contain detailed information related to each assessed area.

- **Habitat Assessment Point (HA) 1** is located just downstream of Lock 11, along the right bank. This area consists of a riparian, early-mid successional forest dominated by sycamore and red maple. The size composition of live trees is approximately 10 percent 3- to 8-inch dbh trees and shrubs, 80 percent 9- to 15-inch dbh trees, and 10 percent >150inch dbh trees. No snags or trees with exfoliating bark, cracks, crevices, or hollows were observed in this assessed area. The

adjacent Kentucky River provides travel and foraging habitat for listed bats, and HA-1 provides marginal roosting potential for Indiana bats.

- **HA-2** is just upstream of Lock 11, along the right bank of the Kentucky River. This area consists of a riparian, early successional forest. The low-lying floodplain is dominated by red maple, sycamore, and black willow. The size composition of live trees is approximately 90 percent 3- to 8-inch dbh trees and saplings, and 10 percent 9- to 15-inch dbh trees. No snags or trees with exfoliating bark, cracks, crevices, or hollows were observed in this assessed area. HA-2 also provides marginal roosting potential for Indiana bats.

Mussels

The Kentucky River downstream of Lock and Dam 11 was determined by the KFO to be suitable habitat for listed mussels. On September 9, 2024, the KFO provided ICF with a map of Lock and Dam 11 showing areas that appear to be suitable habitat for mussels (stable sandy gravel). Similar areas within the Kentucky River were found to have round hickorynut mussels. As such, the KFO recommended a mussel survey take place.

Mussel Survey and Hydraulic Study

A presence/probable absence survey for listed mussel was conducted on October 7-8, 2024, documenting the presence of a diverse mussel bed extending from the end of the esplanade wall downstream approximately 875 feet. The survey yielded a total of 180 live mussels representing 12 species, including 17 federally threatened round hickorynut and a weathered dead federally endangered sheepnose shell. Most mussels, including federally listed species, were collected on the right descending half of the channel in sandy bed material. No snuffbox or salamander mussels were found. See Appendix C for further details of the mussel survey.

Based on results of the mussel survey, there were concerns raised by the KFO regarding the downstream impact from the planned hydro Projects operation on federally listed mussels. To better understand the potential change in flow conditions, Lock 11 Hydro partners contracted Kleinschmidt Associates to prepare a hydraulic analysis to evaluate and compare the existing and proposed flow conditions (operation) at Lock and Dam No. 11. The results of the hydraulic model and the evaluation of the potential impacts of flow condition changes on the federally listed mussel species and their host fish was used to provide a prediction of where downstream changes in flow and water velocity will occur. The results of the hydraulic study indicate that the installation and operation of the turbines could create changes in flow that may adversely affect listed mussel species occurring downstream of the proposed Project or their host fish. See Appendix D for further details of the hydraulic study.

Monarch Butterfly

The portion of the Project Area along the right bank of the Kentucky River is highly disturbed and consists mainly of open, grazed grassland, a concrete esplanade, and two small, riparian forest blocks. As previously mentioned, nonnative pasture grasses are the dominant cover within this area, and numerous species of invasive plants also occur. Although small amounts of nectar-bearing plants that could be a potential food source for the monarch butterfly occur, no species of milkweed

(*Asclepias* spp.), which the monarch requires for reproduction, were observed during the habitat assessment.

Short's Bladderpod

The portion of the Project Area along the right bank of the Kentucky River is highly disturbed and consists mainly of open, grazed grassland, a concrete esplanade, and two small riparian forest blocks. No limestone outcroppings, rocky/talus areas, or cliffs are present. Based on these factors, no habitat exists within the Project Area for the species.

3.7.1.2 Environmental Consequences

No-Action Alternative

The No-Action Alternative would have no effect on rare, threatened, or endangered species at or in the vicinity of the proposed Project.

Proposed Action

Some marginally suitable traveling and foraging habitat for gray, Indiana, and Virginia big-eared bats occurs within the Project boundary, however no potential bat hibernacula, cave-like features, cliffs, or rock shelters are located in the Project Area. The Project would not require the use of blasting, extensive excavation, tree or riparian-habitat removal and no bats, nor evidence of bat use, were observed during habitat surveys. Due to these factors, direct effects on protected bats and their habitat are not expected. Furthermore, indirect effects as a result of disturbance and removal or modification of swarming habitat are unlikely because no caves or cave-like features were identified within the Project Area, and no tree removal or blasting is anticipated. No limestone outcroppings, rocky/talus areas, or cliffs that could provide suitable habitat for Short's bladderpod are present within the Project Area.

On April 8, 2025, potential adverse effects to federally listed species that may result from activities associated with proposed Project were evaluated via the USFWS's IPaC system assisted Kentucky Determination Key (Dkey) (USFWS Project Code: 2024-0023535). Based on the IPaC results, USDA determined that the proposed project would have "no effect" on the gray bat, Indiana bat, northern long-eared bat, Virginia big-eared bat, and short's bladderpod and submitted it to the USFWS for concurrence. There is no requirement to request concurrence with a "no effect" determination; however, the KFO acknowledged the determination in an informal consultation letter dated May 27, 2025, and had no additional comments or concerns regarding those species (Appendix E).

Additionally, the USDA determined that the proposed project has the potential to affect the federally proposed endangered salamander mussel. Given the fact that the species was not found alive or as dead shell material and the habitat appears unsuitable for its host, the mudpuppy, the KFO considered the impacts to this species as insignificant. As a result, the KFO agreed that the proposed project "may affect, but is not likely to adversely affect" the salamander mussel.

On December 12, 2024, the USFWS published a proposal to list the monarch butterfly as threatened under the ESA and designate critical habitat. Potentially suitable habitat for the monarch butterfly occurs statewide and may be present within the Project Area. However, USDA RUS determined Section 7 conference to be unwarranted for the monarch butterfly due to the scope of the action and the range and distribution of this species and determined the proposed Project is ***not likely to jeopardize the continued existence*** of the monarch butterfly. If a final listing determination is published prior to Project construction, USDA RUS will evaluate the Project in the context of the final listing and, if necessary, coordinate with USFWS to conduct consultation under the ESA.

A mussel survey conducted in October of 2024 yielded 17 federally threatened round hickorynut and a weathered dead federally endangered sheepnose shell, documenting the presence of these species within the Project Area. No snuffbox were encountered during the survey; however, the species co-occurs with the round hickorynut in the tributaries of the Kentucky River.

Although the presence of this species has not been confirmed, it could potentially occur in this portion of the river and is likely to be present. As such, the presence of snuffbox within the Project Area is being assumed. No salamander mussels or shells of the species were observed during the mussel survey that took place in 2024 and this species either has never been documented in this portion of the river or are only known from historic records. Based on these factors, the salamander mussel is unlikely to be present in the Project Area.

A Biological Assessment (BA) was developed by ICF to address potential adverse effects to listed mussel species as a result of the proposed Project (Appendix B). At the direction of the KFO, and based on the presumed absence in the Project Area, informal Section 7 consultation was requested for the salamander mussel. Due to their documented or assumed presence within the Project Area, formal Section 7 consultation was requested for the round hickorynut, sheepnose, and snuffbox mussels. The BA concluded that effects to the salamander mussel will be discountable and that the proposed Project ***may affect, is not likely to adversely affect*** the species. The BA concluded that potential impacts to the round hickorynut, sheepnose, and snuffbox will be minimized to the extent possible through the use of conservation measures but that adverse effects to these mussel species are expected as a result of the proposed Project. Changes in flow during operation of the Project could cause sediment transport through the lock or scouring of sediment in the immediate vicinity of the Project that may deposit and bury the existing mussel beds and disrupt mussel metabolic processes such as respiration and feeding. Changes in flow conditions could also cause dislodgement of existing mussels and/or alter the likely presence of host fish species. As a result, the effects determination for these three mussel species is ***may affect, likely to adversely affect***.

On May 27, 2025, the USFWS issued a Biological Opinion (BO) for the sheepnose, round hickorynut and snuffbox mussels and concluded that the proposed Action could expose the three mussel species to a number of stressors evaluated in the BO (Appendix E). Anticipated adverse effects to the three mussel species are caused by: sediment disturbance, changes to flow, and displacement of individuals in the Action Area downstream of the work area (powerhouse) during hydropower operations under normal flow conditions.

Under the terms of ESA §7(b)(4) and §7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered prohibited, provided that such taking is in compliance with the terms and conditions of an incidental take statement (ITS). Through a series of evaluations and calculations, the Service concluded that a take of 1225 for the round hickorynut, and 69 for the

sheepnose and snuffbox each was a reasonable assumption. To ensure the amount of incidental take is not exceeded, the Service is requiring that the applicant monitor the square meters of suitable habitat within the Action Area. Incidental take is considered exceeded if the Action impacts more than the proposed 43,301 m^2 of downstream suitable habitat. The Service's monitoring requirements and procedures for this Action can be found in the Biological Opinion, Appendix E.

The BO fulfills the requirements applicable to the Action for completing consultation under §7(a)(2) of the ESA of 1973, as amended.

3.7.1.3 Mitigation

Several conservation measures were identified in the BO to avoid and minimize effects from Project activities to listed species and their habitats. Incidental taking of listed species as measured by up to 43,301 square meters of suitable mussel habitat is exempted from the prohibitions against taking under the ESA, provided the Action is implemented consistent with the manner identified in the BO.

- Implement ESCP measures, including but not to:

    1. Stabilization of disturbed areas as soon as practicable but no more than seven (7) days after construction activities have temporarily or permanently ceased in any portion of the work area. At a minimum, interim and permanent practices implemented to stabilize disturbed areas will include: temporary and/or permanent seeding, erosion control matting, mulching, and/or sodding.

    2. Implementation of BMPs when operating machinery on the lock chamber or within the riparian area to avoid and minimize the potential for accidental spills and implementation of a spill response plan, should an accidental spill occur.

- Mussel relocation survey and future monitoring to reduce take.

    1. Prior to Project operation, mussels will be salvaged from the zone of predicted highest impact and relocated downstream of the Project Area.

    2. Prior to relocation efforts a baseline mussel survey will be conducted. Survey methods and survey extent will follow the October 2024 mussel survey.

    3. Mussel monitoring will be conducted in years 1, 3, and 5 post Project operation. Monitoring methods and survey extent will follow the October 2024 mussel survey for direct comparison of any changes.

    4. For diver health and safety concerns mussel relocation and survey efforts will only take place when river conditions allow. Surveys must be conducted in low to moderate flows, with water temperature greater than 50°F, and air temperature greater than 32°F.

These measures will be implemented throughout the work area during construction, as necessary and appropriate. The conservation measures are anticipated to help avoid and minimize adverse effects to the mussel species and their habitat; however, these measures are not expected to eliminate all adverse effects that may result from the proposed Action.

3.7.2 Aquatic Biological Resources

3.7.2.1 Affected Environment

Fish and Mussel Communities

The mainstem of the Kentucky River has more than 70 species of freshwater fish, of which the Kentucky Department of Fish and Wildlife Resources (KDFWR) has documented 52 species in the reservoir behind Lock and Dam Number 11. These species are listed in Table 3.

Table 3. Fish Species Present in Kentucky River Pool Number 11

Common Name	Scientific Name
Family: Petromyzontidae	
Ohio Lamprey	*Ichthyomyzon bdellium*
Silver Lamprey	*Ichthyomyzon unicuspis*
Family: Acipenseridae	
Shovelnose Sturgeon	*Scaphirhynchus platorynchus*
Family: Polyodontidae	
Paddlefish	*Polyodon spathula*
Family: Lepisosteidae	
Longnose Gar	*Lepiosteus osseus*
Family: Hiodontidae	
Mooneye	*Hiodon tergisus*
Family: Anguillidae	
American Eel	*Anguilla rostrata*
Family: Clupeidae	
Gizzard Shad	*Dorosoma cepedianum*
Family: Cyprinidae	
Central Stoneroller	*Campostoma anomalum*
Goldfish	*Carassius auratus*
Spotfin Shiner	*Cyprinella spiloptera*
Steelcolor Shiner	*Cyprinella whipplei*
Common Carp	*Cyprimus carpio*
Silver Chub	*Macrhybopsis storeriana*
Emerald Shiner	*Notropis atherinoides*
Ghost Shiner	*Notropis buchanani*
Bluntnose Minnow	*Pimephales notatus*
Family: Catostomidae	
River Carpsucker	*Carpiodes carpio*
Quillback	*Carpiodes cyprinus*
Highfin Carpsucker	*Carpiodes velifer*

Common Name	Scientific Name
Smallmouth Buffalo	*Ictiobus bubalus*
Bigmouth Buffalo	*Ictiobus cyprinellus*
Spotted Sucker	*Minytrema melanops*
Silver Redhorse	*Moxostoma anisurum*
Smallmouth Redhorse	*Moxostoma breviceps*
River Redhorse	*Moxostoma carinatum*
Black Redhorse	*Moxostoma duquesnei*
Golden Redhorse	*Moxostoma erythrurum*
Family: Ictaluridae	
Yellow Bullhead	*Ameiurus natalis*
Channel Catfish	*Ictalurus punctatus*
Flathead Catfish	*Pylodictis olivaris*
Family: Esocidae	
Muskellunge	*Esox masquinongy*
Family: Atherinopsidae	
Brook Silverside	*Labidesthes sicculus*
Family: Moronidae	
White Bass	*Morone chrysops*
Striped Bass	*Morone saxatilis*
Family: Centrarchidae	
Green Sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
Bluegill	*Lepomis macrochirus*
Longear Sunfish	*Lepomis megalotis*
Smallmouth Bass	*Micropterus dolomieu*
Spotted Bass	*Micropterus punctulatus*
Largemouth Bass	*Micropterus salmoides*
White Crappie	*Pomoxis annularis*
Black Crappie	*Pomoxis nigromaculatus*
Family: Percidae	
Greenside Darter	*Etheostoma blennioides*
Rainbow Darter	*Etheostoma caeruleum*
Fantail Darter	*Etheostoma flabellare*
Logperch	*Percina caprodes*
Blackside Darter	*Percina maculata*
Sharpnose Darter	*Percina oxyrhynchus*
Sauger	*Sander canadensis*
Walleye	*Sander vitreus*

Common Name	Scientific Name
Family: Sciaenidae	
Freshwater Drum	*Aplodinotus grunniens*

Source: FFP 2015.

KDFWR stocks largemouth bass, sauger, muskellunge, and white bass in the Kentucky River Pool Number 11 to enhance the warmwater fishery. Other species that are commonly targeted by anglers include walleye (*Sander vitreus*), striped bass (*Morone saxatilis*), catfish (*Ictalurus* spp.; *Pylodictis* spp.), sunfish (*Lepomis* spp.), and crappie (*Pomoxis* spp.).

Thirty-three species of freshwater mussels are currently known to exist in the Kentucky River (Table 4). Seven species are federally listed as Threatened, Endangered, or proposed within the Kentucky River: round hickorynut (*Obovaria subrotunda*), spectaclecase (*Cumberlandia monodonta*), snuffbox (*Epioblasma triquetra*), clubshell (*Pleurobema clava*), salamander mussel (*Simpsonaias ambigua*), sheepnose (*Plethobasus cyphyus*) and fanshell (*Cyprogenia stegaria*). Eight species are considered Species of Greatest Conservation Need by the Commonwealth of Kentucky: slippershell (*Alasmidonta viridis*), fanshell, butterfly (*Ellipsaria lineolata*), snuffbox, round hickorynut, round pigtoe (*Pleurobema sintoxia*), little spectaclecase (*Villosa lienosa*), and spectaclecase (KDFWR 2023). As discussed in Section 3.7.1, three ESA listed mussel species are known from or likely to exist in the Project Area.

Table 4. Mussel Species Found in the Kentucky River

Common Name	Scientific Name
Mucket	*Actinonaias ligamentina*
Slippershell Mussel	*Alasmidonta viridis*
Threeridge	*Amblema plicata*
Asian Clam	*Corbicula fluminea*
Spectaclecase	*Cumberlandia monodonta*
Fanshell	*Cyprogenia stegaria*
Butterfly	*Ellipsaria lineolata*
Spike	*Elliptio dilatata*
^Snuffbox	*^Epioblasma triquetra*
Wabash Pigtoe	*Fusconaia flava*
Plain Pocketbook	*Lampsilis cardium*
Wavyrayed Lampmussel	*Lampsilis fasciola*
Fatmucket	*Lampsilis siliquoidea*
Yellow Sandshell	*Lampsilis teres*
Flutedshell	*Lasmigona costata*
Fragile Papershell	*Leptodea fragilis*
Black Sandshell	*Ligumia recta*
Washboard	*Megalonaias nervosa*
Threehorn Wartyback	*Obliquaria reflexa*

Common Name	Scientific Name
*Round Hickorynut	**Obovaria subrotunda*
*Sheepnose	**Plethobasus cyphyus*
Round Pigtoe	*Pleurobema sintoxia*
Pink Heelsplitter	*Potamilus alatus*
Pink Papershell	*Potamilus ohiensis*
Kidneyshell	*Ptychobranchus fasciolaris*
Giant Floater	*Pyganodon grandis*
Pimpleback	*Quadrula pustulosa pustulosa*
Mapleleaf	*Quadrula quadrula*
Pistolgrip	*Quadrula verrucosa*
Creeper	*Strophitus undulatus*
Lilliput	*Toxolasma parvus*
Deertoe	*Truncilla truncata*
Little Spectaclecase	*Villosa lienosa*
Painted Creekshell	*Villosa taeniata*

Source: FFP 2015. *Documented from Project Area ^Assumed Present in Project Area

3.7.2.2 Environmental Consequences

No-Action Alternative

The No-Action Alternative would have no effect on aquatic biological resources at or in the vicinity of the proposed Project.

Proposed Action

Construction

Construction activities have the potential to affect the reproductive success of many aquatic species. Physical disturbance in the river could deter fish species from attempting to spawn or block access to preferred spawning habitat. Mussels, fish eggs or larval fish that reside in the sediment or shallow areas could be crushed by the presence of heavy machinery or buried by excess sediment. Construction could require the dewatering of areas resulting in the desiccation of mussels, fish eggs, larvae, or fry that inhabit shallow habitats along streambanks.

Fish are most likely to be negatively affected by construction activities that occur at the spawning, egg larvae, and fry life stages. Juvenile and adult fish are sufficiently mobile to escape the Project Area during construction disturbance. The majority of species found in the Project Area spawn between March and July annually. Also, the majority of eggs, larval fish, and fry were found in the Project Area between April and August annually (FFP 2015). Lock 11 Hydro Partners would avoid instream work from April through June to prevent disturbance of fish populations in the Project Area during much of the spawning season. However, under this proposal, some spawning could be disrupted in March and July.

Operation

Reservoir fluctuations have been shown to adversely affect the quantity and quality of littoral habitat present within reservoirs. Rapid changes in reservoir levels can reduce the production of macroinvertebrates, lead to fish stranding, and desiccate fish spawning habitat, as well as any eggs, larval fish, or freshwater mussels that may be present within the substrates. Such changes in reservoir levels can also have adverse effects on aquatic vegetation, which provides important forage, rearing, and shelter habitat for juvenile fish species. Changes to the timing and quantity of downstream flows can lead to fish and mussel stranding, a reduction in macroinvertebrate production, and a reduction in habitat used for the various life-cycle functions of resident aquatic species.

As discussed above, Lock 11 Hydro Partners proposes, and the certification requires, that the Project be operated in a run-of-river mode whereby outflows would approximate inflows and the impoundment water levels would be maintained at the crest of the dam when the Project is operating. The Project would shut down generating units as needed during drought to maintain existing flow conditions. Any flows in excess of the maximum hydraulic capacity of the Project would be discharged over the existing spillway, as occurs under existing conditions.

Under Lock 11 Hydro Partners' proposed run-of-river operations, the quantity and timing of flows downstream of the dam would not be drastically altered compared to the existing conditions. Although the average elevation of the reservoir would be lower, fluctuations would be minimized and within the current naturally occurring water levels. Therefore, Project-related effects on aquatic habitat would be limited to minor changes but has the potential to affect mussel species through the movement and deposition of sediment that could smother mussels or make habitat unsuitable, causing individuals to move to other areas

Fish Impingement, Entrainment, and Turbine Mortality

Operation of the proposed Project has the potential to cause fish mortality from possible impingement on the trash racks, especially for larger fish that cannot easily fit through the openings in the trash racks and are not able to overcome the approach velocity. The ability of various fish species to avoid impingement or entrainment is based largely on swimming ability, size, form, and behavior, and the physical characteristics of the Project (e.g., trash rack bar spacing, approach velocity, intake location).

Operation of the Project would have a low probability of potential impingement. Most of the fish species in the Kentucky River that grow to a size large enough to potentially become impinged on a trash rack with 1-3/8-inch bar spacing have sufficient burst swimming speeds to maintain their position upstream of the trash rack and avoid impingement. The swimming speed capability data presented in Electric Power Research Institute (EPRI 2000) indicate that the fish species in the Kentucky River, including common carp (*Cyprimus carpio*), largemouth bass (*Micropterus salmoides*), and catfish species, are able to maintain swimming speeds of between 4 and 7 body lengths per second for 15 minutes or more and are capable of higher burst speeds. Fish of these species commonly exceed 12 inches in length and should be able to overcome the maximum approach velocity of 1.0 foot per second at the trash racks. Smaller fish that approach the racks are able to pass through the trash racks with little or no risk of impingement.

Entrainment of fish at the Project could occur when fish are unable to escape water flowing into the intakes and could result in injury or mortality to fish that pass through the Project's turbines. Lock 11 Hydro Partners conducted a desktop fish entrainment study at the downstream Lock 12 and 14 projects to determine the types and sizes of fish likely to be entrained at those projects and probable survival rates of entrained fishes (Lock 11 Hydro Partners 2023). Data from those projects were extrapolated to the College Hill Project. Lock 11 Hydro Partners used EPRI's database (1997) on fish entrainment and mortality trends at other hydroelectric projects to establish correlative (i.e., similar turbine types) entrainment and mortality information for the proposed Project's operation.

As stated above, smaller fish would have the potential to pass between the trash rack bars and therefore be subject to entrainment. Studies at other projects have generally concluded that small fish (i.e., less than 4 inches) account for the majority of fish entrained (EPRI 1997). However, the survival of these entrained smaller fish is expected to be relatively high compared to larger fish because they are less prone to mechanical injury from turbine passage (i.e., turbine blade strike) and less prone to injury resulting from shear stresses and rapid pressure changes created by spinning turbines. Based on monthly and seasonal entrainment rates (Kleinschmidt 2011), the total number of entrained fish would approach 11,500 fish per year. The Project would entrain approximately 5,700 fish in the spring, representing approximately 50 percent of the total number of fish expected to be entrained annually. A summer estimate of 4,000 entrained fish represents approximately 35 percent of the total number of fish that would be entrained annually. Entrainment would be substantially lower during fall and winter, with estimates of 3 percent and 14 percent, respectively. Table 5 describes seasonal entrainments by fish family.

Table 5. Estimated Seasonal Fish Entrainment by Family and Total Seasonal and Annual Entrainment

Family	Winter	Spring	Summer	Fall	Total Individuals
Centrarchidae (sunfish)	663	1,709	1,311	112	3,795
Ictaluridae	423	1,093	2,111	158	3,784
Cyprinidae	54	183	235	12	484
Anguillidae	0	5	3	0	8
Catostomidae	224	1,952	135	14	2,324
Clupeidae	144	109	0	7	260
Percidae	12	23	7	0	43
Centrarchidae (bass)	15	422	101	2	541
Salmonidae	0	2	0	0	2
Moronidae	16	57	40	3	116
Escocidae	32	113	80	6	232
Total Individuals	**1,582**	**5,670**	**4,024**	**314**	**11,590**

Source: Kleinschmidt 2011.

Lock 11 Hydro predict that *Centrarchidae* (sunfishes) would have the highest rate of entrainment at just under 3,800 fish, followed by *Ictaluridae* (catfishes), and *Catostomidae* (suckers). Among these latter groups, a marked increase in entrainment during the spring and summer was anticipated, which

may reflect peak dispersal of early life stages. *Clupeidae* (herring and mooneyes) rarely would be entrained because of their low abundance. Based on research at other hydroelectric projects, the majority of the entrained fish would be juveniles. High percentages of the fish entrained in spring and summer have been attributed to dispersal of large numbers of young-of-year and small fishes to downstream habitats. Based on estimated seasonal and annual mortality of fishes by family, the vast majority of mortalities, nearly 73 percent, are expected to be juvenile *Centrarchidae* (sunfishes) and *Catostomidae* (suckers) that would be killed primarily during the spring and summer. Most of the other fish killed would be expected to be juvenile *Cyprinidae* and bass, which would number approximately 500 fish annually each.

To minimize impacts on fish from impingement, entrainment, and turbine mortality, Lock 11 Hydro Partners proposes to install a trash rack at a 5.8-degree angle to keep inlet speeds low, with a 1 3/8-inch clear spacing and maximum approach velocity of 1 foot per second.

3.7.3 Terrestrial Biological Resources

3.7.3.1 Affected Environment

The Project is located within the Interior Plateau ecoregion, which encompasses much of central and southern Kentucky, and in the Outer Bluegrass subregion, which is a transitional area marking the change from the Western Allegheny Plateau and Central Appalachians in the east to the Inner Bluegrass region of central Kentucky. The Outer Bluegrass region is defined physiographically by rolling and hilly upland areas that contain ravines, sinkholes, springs, and many ephemeral or intermittent streams with moderate to high gradients. Larger streams and rivers are often deeply entrenched.

Historically this region had open woodland savannas with large Kentucky coffee trees (*Gymnocladus dioicus*), black walnut (*Juglans nigra*), bur oak (*Quercus macrocarpa*), and blue ash (*Fraxinus quadrangulata*), as well as oak-hickory upland forests, with mixed forests of oaks, maples, ash, Virginia pine (*Pinus virginiana*), poplar (*Liriodendron tulipifera*), and eastern red cedar (*Juniperus virginiana*) along river drainages and gorges. In addition, closed-canopy forests covered the slopes and ravines along the Kentucky River, which has served as a migratory route for plants and animals. Cane (*Arundinaria gigantea*) was also present along much of the ecoregion's riparian corridors prior to European settlement and was especially common in the eastern section, where the Project is located (KDFWR 2023).

The Project Area is mostly open, grazed by livestock, and dominated by nonnative pasture grasses. Dominant grass species include fescue (*Schedonorus arundinaceus*), orchard grass (*Dactylis glomerata*), and hairy crabgrass (*Digitaria sanguinalis*) (Appendix A). Small amounts of native grasses, including beaked panic grass (*Panicum anceps*), broom-sedge (*Andropogon virginicus*), and redtop grass (*Tridens flavus*), are also scattered within the Project Area. Dominant flowering forbs within the Project Area include frost aster (*Symphyotrichum pilosum*), Canada goldenrod (*Solidago canadensis*), common blue violet (*Viola sororia*), common ragweed (*Ambrosia artemisiifolia*), ironweed (*Vernonia gigantea*), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), frostweed (*Verbesina virginica*), and cocklebur (*Xanthium strumarium*). Somewhat intact, early to mid-successional forest patches occur on the eastern and western ends of the Project Area and are dominated by eastern sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), black locust (*Robinia pseudoacacia*), black willow

(*Salix nigra*), and black walnut. Additionally, a few large scattered black walnut and silver maple trees are located in the central portion of the Project Area (Appendix A).

Migratory Bird Treaty, Bald and Golden Eagle Protection Act

In addition to the protected species list generated from the IPaC review, the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) offer protection for native birds from Project-related impacts. The MBTA prohibits the *take* (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior, USFWS (16 U.S.C. 703-712). The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior, from *taking* bald (*Haliaeetus leucocephalus*) or golden (*Aquila chrysaetos*) eagles, including their parts (including feathers), nests, or eggs (16 U.S.C. 668–668d). The Act defines *take* as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Neither bald nor golden eagle nests or individuals were observed during field surveys. Golden eagles are unlikely to occur in the Project Area, and no known bald eagle nests occur in the Project Area. The Proposed Action would not require tree or riparian-habitat removal and would therefore not impact migratory bird species or bald eagle habitat.

Invasive Species

Numerous nonnative invasive plant species, including trees, shrubs, vines, and herbaceous species occur in Kentucky. Invasive plant species, including Japanese stiltgrass *(Microstegium vimineum*), Japanese knotweed (*Polygonum cuspidatum*), hairy jointgrass (*Arthraxon hispidus*), bush honeysuckle (*Lonicera maackii*), sericea lespedeza (*Lespedeza cuneata*), tree-of-heaven (*Ailanthus altissima*), Kentucky 31 fescue, and Japanese hops (*Humuls japonicus*), were observed within the Project Area during site surveys (Appendix A).

All observed invasive species, other than Japanese hops, have been classified by the Kentucky Exotic Pest Plant Council (EPPC) as "severe threats" because they spread easily into native plant communities and displace native vegetation. The Kentucky EPPC classifies Japanese hops, among other nonnative invasive plants, as a "significant threat" because it may have the capacity to invade natural communities along disturbance corridors or spread from stands in disturbed sites into undisturbed areas but has fewer characteristics of invasive species than species ranked as severe threats (Kentucky EPPC 2013). Among these nonnative species, herbaceous species are prolific producers of tiny seeds (Evans et al. 2012; Kurtz and Hansen 2017; Gucker 2010; USDA NRCS 2002) that are commonly spread by wind, water, and/or wildlife, as well as on tires, equipment, and the soles of shoes during construction, maintenance, and recreational activities (Fryer 2011; Ohlenbusch et al. 2007; USDA NRCS 2002).

3.7.3.2 Environmental Consequences – Terrestrial Biological Resources

No-Action Alternative

The No-Action Alternative would have no effect on terrestrial biological resources at or in the vicinity of the proposed Project.

Proposed Action

The areas surrounding the proposed powerhouse and substation would be temporarily disturbed by the staging of materials and equipment, as well as from construction activities such as vegetation clearing, excavation, stock piling soil, and regrading. Construction of the powerhouse, control building, parking area, and extension of Lock 11 Road would permanently disturb approximately 0.47-acre of mostly maintained grass and herbaceous species. Additional areas near the proposed Project facilities may be temporarily disturbed (e.g., staging areas, soil stockpile and disposal areas). Additionally, approximately 28 square feet of non-woody, riparian vegetation may be permanently cleared at the take-out location (approximately 390 feet upstream of the crest of the dam) to build concrete or stone steps for access from the water to the shoreline and portage. The steps would be flanked by riprap to minimize the potential effects of installing the stairs on adjacent riparian vegetation. In places where roads or pathways do not exist along the proposed canoe portage route, Lock 11 Hydro Partners would remove grasses and build a gravel path to connect the put-in/take-out points.

Project operation and maintenance could include mowing and/or trimming of tree branches to keep vegetation clear from the proposed control building, overhead transmission lines, access road, and recreational amenities. These vegetation-management activities would maintain the current conditions at the Project and would not be expected to affect vegetation in undeveloped areas adjacent to the proposed Project boundary. Lock 11 Hydro Partners does not anticipate the need to use herbicides or tree trimming/removal. However, any necessary tree trimming/removal would only occur in the period between November 16 and March 31 to minimize Project effects on wildlife habitat.

Overall effects on vegetation during Project construction and operation are expected to be minimal because the removal of vegetation would be limited. The majority of the Project Area has already been disturbed, so the extent of new intrusions on vegetation communities would be minimized. Specifically, staging materials and equipment, construction or modification of Project roads and canoe portage, vegetation-clearing, excavation, and stockpiling and regrading soil could damage or remove vegetation. Project construction and maintenance may also lead to localized areas of erosion and the introduction or spread of nonnative invasive plants (e.g., inadvertent transport of seeds and other plant material by construction and maintenance equipment). The risk of erosion and introduction of nonnative invasive plant species is the greatest immediately following ground-clearing activities, when soils are exposed, and native plants have not had the opportunity to establish dense ground cover. Nonnative invasive plants can rapidly colonize new areas and out-compete and displace native species, thereby reducing biodiversity and altering compositions of existing native plant and animal communities.

The effects on botanical resources during Project construction, operation, maintenance, and Project-related recreation are expected to be minimal because the Project Area has been previously disturbed, maintained as mostly open lawn, and the proposed removal and disturbance of vegetation would be limited.

3.7.4 Mitigation

No mitigation nor environmental protection and avoidance measures are proposed for this resource area.

3.8 CULTURAL AND HISTORIC RESOURCES

3.8.1 Affected Environment

Section 106 of the NHPA requires USDA RUS to consider the effects of its actions on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking (i.e., funding and subsequent construction of the proposed Project). Historic properties are those that are listed or eligible for listing in the National Register of Historic Places (NRHP). The regulations implementing Section 106 of the NHPA require the USDA RUS to consult with the SHPO and Native American Tribes or Native Hawaiian Organizations on the effects of its undertakings on historic properties. In this document, we also use the term *cultural resources* for properties that have not been determined eligible for listing in the NRHP. Cultural resources represent things, structures, places, or archaeological sites that can be either prehistoric or historic in origin. In most cases, cultural resources less than 50 years old are not considered historic.

3.8.1.1 Area of Potential Effects

Pursuant to Section 106, RUS must consider whether any historic property could be affected by the issuance of a proposed license within a Project's APE. The APE is determined in consultation with the SHPO and 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 archaeological resources was defined as areas of direct effect, including the area surrounding the existing lock and dam, where the powerhouse, control building, the route of the underground cable, the point of interconnection, and the construction areas would be located. The APE also includes a 1000-foot radius within which the control house could affect the setting of adjacent historic properties,if present. The area within the Project boundary upstream of the lock and dam was not included in either APE because the Project would be operated in run-of-river mode, and the USDA RUS anticipates no effects on cultural resources upstream of Lock and Dam Number 11. Comments on the proposed APE were solicited from consulting parties in a letter dated March 13, 2024. The SHPO indicated agreement with the proposed APE and the adequacy of previous historic properties identification surveys in comments dated May 10, 2024. No comments were received from other consulting parties concerning the adequacy of the proposed APE or previous identification efforts.

3.8.1.2 Cultural History Overview

The prehistory and history of eastern Kentucky can be divided into five broad cultural periods: the Paleoindian (10,500–7500 BC), Archaic (7500–800 BC), Woodland (800 BC–AD 1000), Fort Ancient (AD 1000–AD 1750), and Historic (AD 1750–present). The following cultural history overview is adapted from discussions included in Creswell and Pritchard (2015), Stallings and Owens (2015), and Mabelitini (2013).

The earliest documented human habitation in North America is often referred to as the Clovis cultural tradition. Clovis and other Paleoindian peoples were nomadic hunters who relied on large game supplemented with smaller game and birds, fish, and a variety of wild plants. About 200 sites from this time period have been recorded in Kentucky, the majority of which are represented by isolated Clovis (i.e., fluted lanceolate projectile) points.

At the end of the Pleistocene, subsistence strategies and technology changed as populations adapted to a warming climate. During the Archaic Period, groups were still relatively mobile, but there is evidence of more sedentary life as populations sought smaller game, gathered plant resources, and developed specialized tools. Archaic peoples constructed large base camps along major rivers or river confluences, with short-term camps on minor streams and upland ridges. In eastern Kentucky, Archaic settlements were generally small, short-term base camps situated on the narrow floodplains of entrenched rivers and streams, smaller floodplain and upland open sites, and rockshelters.

The first appearance of ceramics generally marks the beginning of the Woodland Period, which was characterized by domestication and cultivation of plants, a greater tendency toward territorial permanence, and more-elaborate ceremonial and mortuary rituals. By the end of the Woodland Period, permanent villages were established along terrace and bluff base locations within major river valleys. Both upland and bottomland sites would be used on a seasonally interchangeable basis. Bottomlands were used during the summer for cultivation. After harvest, these sites were temporarily abandoned for hunting camps in nearby forests.

The Fort Ancient culture represents hunting and gathering societies that developed from the earlier Woodland traditions. During this time, populations increased in density and concentration. Villages developed in proximity to major drainages or aboriginal trail systems. Circular villages, surrounding a central plaza, were occupied year-round by farmers who supplemented their diet by hunting, fishing, and gathering wild floral resources.

At the time of European contact, the three main indigenous groups occupying eastern Kentucky were the Shawnee, Cherokee, and Iroquois. Eastern Kentucky was the traditional homeland for the Shawnee, who lived in permanent towns and villages and interacted with European traders. The Cherokee also inhabited the region at the time, living primarily in the mountainous region to the south, but claiming lands as far north as the Ohio River. The Iroquois frequented the Central Bluegrass region of Kentucky and raided Shawnee villages; however, their traditional lands were primarily located further north. Other smaller groups in the area included the Delaware, Miami, Mingo, Tutelo, and Wyandot. Many of these smaller groups had been driven out of their traditional homelands and settled or camped for short periods of time within the region prior to being forced west by European and American settlers (Brockington and Associates 2015).

The earliest European explorers to eastern Kentucky came by way of the complex and heavily used trail system of these indigenous groups. The Central Bluegrass region of Kentucky was settled by colonists of English descent, with the first permanent settlements established in 1775. Because of the dangers associated with frontier settlement, most of the early Euro-American settlements were located in or around forts or defensible stations. Following the Revolutionary War, settlement rates increased dramatically, and fortified settlements, such as Lexington and Georgetown, began to develop into substantial towns. The influx of immigrants to the area included members of all socioeconomic classes. Early gentry entered the region and established large agricultural plantations that incorporated slave labor.

Statehood was granted to Kentucky in 1792. Madison County, where much of the proposed Project would be located, was established in 1798; Estill County was formed in 1808. Both counties grew steadily as a result of the agriculture-based economy. During and after the Civil War, the Bluegrass Region suffered less economically than other areas of Kentucky because of the importance of raising livestock. By the turn of the twentieth century, modern utilities (e.g., gas, electric, telephone) were

brought to the region, and agriculture became more mechanized. Government investment through New Deal programs and industrial and military buildup during World War II also bolstered the local economy, as compared to other areas of the state.

History of the Kentucky River Locks and Dams

The Kentucky River served as a major transportation route from the time of the state's founding. Flatboats transported tobacco, whiskey, and other early agricultural products down the Ohio and Mississippi rivers to markets as far away as New Orleans. The river's natural character was relatively narrow and meandering, subject to periods of both floods and low water. Pools of deep water, impounded by sand and gravel bars or rocky shoals, existed every few miles along the length of the river. River transportation became increasingly important to the state's economy, and plans were made for a system of locks and dams along the river. The Commonwealth of Kentucky constructed the first five locks on the river between 1836 and 1842 (Mabelitini 2013).

As railroads pushed into the region, river transportation declined. When USACE took over the system of locks in 1880, many of the existing structures were in poor condition and unusable. USACE rebuilt Lock and Dam Numbers 1 through 5, and, by 1917, a total of 14 locks and dams were complete, and a 6-foot-deep channel stretched nearly 255 miles, from Beattyville at the confluence of the North and South Forks to Carrollton, near the confluence with the Ohio River. The purpose of building the locks and dams was to ship coal; however, by the time the system was completed, they were already obsolete and unable to compete with railroads (Creswell and Pritchard 2015; Mabelitini 2013; Stallings and Owens 2015).

Following World War II, improvements in rail and highway transportation ended any potential use of the Kentucky River for transportation. At mid-century, river management shifted from navigation to flood control and, later, water quality and supply, recreation, and fish and wildlife resources. Operation and maintenance costs for the locks became cost-prohibitive by the 1970s, and USACE permanently closed Locks 5 through 14 (Creswell and Pritchard 2015; Stallings and Owens 2015). Subsequently, KRA assumed responsibility for all 14 lock and dam structures along the Kentucky River and currently manages them for recreation and water supply.

Prehistoric and Historic Archaeological Resources

Creswell and Pritchard (2015) conducted a Phase I archeological study of the Kentucky River Lock and Dam 11 Project's archeological APE, which includes the area surrounding the existing lock and dam. As part of the Phase I investigation, Creswell and Pritchard conducted background literature reviews to identify any previously recorded archeological sites and subsequently performed visual surface inspections and shovel testing of the survey area on a 20-meter grid for each survey parcel.

Based on literature reviews, no previously recorded archaeological sites occur within the APE. During the Phase I investigation, Creswell and Pritchard identified one previously unidentified archeological site (15ES123), a small, multicomponent site representing early twentieth-century domestic activities and ephemeral nondiagnostic prehistoric activities. The site was recommended as not eligible for listing on the NRHP because of disturbance and lack of subsurface features.

Historic Properties

Stallings and Owens (2015) conducted a Historical Architectural Survey of the Kentucky River Lock and Dam 11 Project's architectural APE, which includes a 1,500-foot buffer around the lock and dam site and a 1,000-foot buffer around a transmission line right of way that is no longer included in the project. The survey consisted of an archival review of previously recorded properties within the APE, windshield reconnaissance, and intensive pedestrian inspection of individual properties within the APE.

Stallings and Owens (2015) identified nine two previously documented historic architectural resources within the Project's APE, Lock and Dam Number 11, and the Kentucky River Navigation System (Locks and Dams 10-14). USACE originally recorded Lock and Dam Number 11 in 1987 as site ES-9. At that time, the site contained not only the extant lock and dam, but also two frame dwellings, an office building, two wash houses, a chicken house, and storage shed. At the time, the lock and dam was considered eligible under Criterion A for its association with the history of transportation and commerce on the Upper Kentucky River and under Criterion C as a good, intact example of early twentieth-century reinforced-concrete lock and dam facilities. Stallings and Owens (2015) reevaluated the site and found that Lock and Dam Number 11 is still eligible under Criteria A and C, despite some degradation to the integrity of the overall site over since its identification as NRHP-eligible in 1987 (i.e., removal of the ancillary structures). In addition to being individually eligible for the NRHP, Lock and Dam Number 11 is a contributing property to the Kentucky River Navigation System (Locks and Dams 1-14), a non-contiguous historic district determined eligible for the NRHP.

3.8.2 Environmental Consequences

3.8.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts on cultural and historic resources in the vicinity of the proposed Project.

3.8.2.2 Proposed Action

Under the Proposed Action, Lock 11 Hydro Partners would construct, operate, and maintain hydropower facilities and associated recreational amenities at NRHP-eligible Lock and Dam Number 11. The structure is associated with the history of transportation along the Kentucky River and is a good, intact example of an early twentieth-century reinforced-concrete lock and dam facility. Construction of the proposed Project, which would enclose a portion of the lock chamber, would likely adversely affect the eligibility of the resources and diminish the integrity of design, materials, feel, and association of the site (Stallings and Owens 2015).

The RUS initiated consultation with the Kentucky State Historic Preservation Officer (SHPO) and other stakeholders, including the U.S. Army Corps of Engineers (USACE), Federal Energy Regulatory Commission (FERC), Kentucky River Authority, and five federally recognized Tribes: the Cherokee Nation, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, the Osage Nation, and the United Keetoowah Band of Cherokee Indians of Oklahoma. The Area of Potential Effects (APE) was defined to include both construction zones and a 1,000-foot visual buffer surrounding the proposed control house. The Kentucky River Lock and Dam Number 11 (ES

9) was identified as individually eligible for the National Register of Historic Places (NRHP) and as a contributing element to the Kentucky River Navigation System historic district.

The RUS, in consultation with SHPO, determined that while the broader Navigation System would not be adversely affected, the installation of the powerhouse within the lock chamber and construction of a new control house would result in direct adverse effects to Lock and Dam Number 11 under Criteria A and C of the NRHP. RUS acknowledged that FERC had previously issued a license for the project in 2016 and executed a Programmatic Agreement (PA) that stipulated the development of a Historic Properties Management Plan (HPMP) to incorporate measures to treat adverse effects that would result to Kentucky River Lock and Dam #11 from the installation of hydropower generating equipment. RUS confirmed that the current license holder remains bound by that agreement. Accordingly, the RUS made a finding of adverse effect pursuant to 36 CFR § 800.5(d)(2) and executed a Memorandum of Agreement to resolve adverse effects. This Agreement indicates that the scope of adverse effects resulting from the RUS's undertaking is similar to those already identified during the FERC's consultation in 2016, and include measures to install three permanent historical interpretive panels that would describe (1) the history of commerce and transportation along the Kentucky River, including early attempts at navigational improvements; (2) the history and construction of Kentucky River Lock and Dam Number 11, and; (3) a discussion of how hydropower works and how it qualifies as "green energy".

3.8.3 Mitigation

Mitigation will include the design, fabrication, and installation of three permanent historical markers/interpretative panels. The panels will be of a durable quality similar to those used by the National Park Service and will be installed at a publicly accessible spot at the proposed Lock and Dam portage trail. Proposed subject material for each panel includes:

- History of commerce and transportation along the Kentucky River, including early attempts at navigational improvements.
- History and construction of Kentucky River Lock and Dam No. 11.
- Discussion of how hydropower works and how it qualifies as "green energy."

3.9 NOISE

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that interferes with or disrupts normal activities. Prolonged exposure to high noise levels has been demonstrated to cause hearing loss; however, the principal human response to environmental noise is annoyance. The perceived importance of noise depends on the setting, the time of day, the activity creating the noise, and the sensitivity of the individual. Sensitive receptors may include school settings, churches, nursing homes, and medical facilities.

As a result of the Noise Control Act of 1972, the EPA developed standards for noise levels that would protect public health and welfare with an adequate margin of safety. The EPA determined that outdoor day-night average sound levels less than or equal to 55 A-weighted decibels are sufficient to protect public health and welfare in residential areas (EPA 1974). Job-related noise is regulated by the U.S. Occupational Safety and Health Administration.

According to the Kentucky Noise Related Statutes, all vehicles on highways "shall be equipped as to make a minimum of noise, smoke, or other nuisance," and persons operating automobiles and

bicycles “shall not sound the horn or sound device unnecessarily.” Additionally, “every motor vehicle with an internal-combustion, steam, or air motor shall be equipped with a suitable and efficient muffler,” and “no person shall modify the exhaust system of a motor vehicle or an off-highway vehicle in a manner which would amplify or increase the noise emitted by the motor of such vehicle above that emitted by the muffler originally installed” (Kentucky Noise Related Statutes 2022). College Hill, the closest municipality to the Project Area, is an unincorporated community and does not have any specific noise ordinances.

3.9.1 Affected Environment

The Project Area is located in a rural portion of Estill County and is largely undeveloped. Only 23 residences are present within 1 mile of the Project Area, and no sensitive receptors are present (Google Earth 2024). Lock 11 Road, which leads to the Project Area, and Bent Road are the predominant noise sources within 1 mile of the Project Area, however transportation noise estimates for these roads are not available from the Department of Transportation (DOT 2020).

3.9.2 Environmental Consequences

3.9.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts related to noise in the vicinity of the proposed Project.

3.9.2.2 Proposed Action

The construction of the Proposed Action would result in short-term, transitory noise from the operation of trucks, cranes, dozers, and workers. Construction activities would be conducted in accordance with local noise ordinances during normal working hours. Construction noise would likely be perceptible in residences up to 1 mile from the Project Area but would not pose more than a minor annoyance at the greatest. No construction noises would persist beyond the duration of the construction period.

Operations would not result in perceptible noise beyond the construction period. The submersible turbines operate completely underwater and do not generate any above-ground noise. Noise emissions associated with the operation period would be limited to transitory maintenance noise from routine maintenance activities. These noises (e.g., limited vehicle traffic and lawnmower operation) would not likely be perceptible beyond the Project Area and are relatively common within the Project Area.

3.9.1 Mitigation

No mitigation nor environmental protection and avoidance measures are proposed for this resource.

3.10 HUMAN HEALTH AND SAFETY

The Proposed Action would be conducted in accordance with all federal, state, and local regulations for workplace and public safety. No member of the public would be exposed to potential health impacts from the Project. Site plans include a safety fence that would separate the public from the concrete esplanade and submersible turbines. A public safety plan would be drafted in order to

minimize any potential health and safety risks associated with the Project. Furthermore, FERC would conduct annual safety inspections, as conditioned by the operating license. Lock 11 Hydro Partners would also conduct monthly safety inspections. Therefore, Human Health and Safety were dismissed from further analysis in this EA.

3.11 GEOLOGY AND SOIL RESOURCES

3.11.1 Affected Environment

The proposed Project is located within the Bluegrass Region of Kentucky, which contains mostly sedimentary rock, consisting of cyclic sequences of limestone, sandstone, siltstone, coal, dolostone, and shale of the Ordovician, Silurian, and Devonian ages. These rocks were formed by accumulated rock fragments, shell fragments, plant material, muds, and sands transported by water, air, wind, or ice to their current locations. The upland soils of Estill County are underlain by interbedded sandstone, siltstone, shale, limestone, and dolomite of the Pennsylvanian, Mississippian, Devonian, Silurian, and Ordovician geologic systems. Soils on floodplains and stream terraces, such as Allegheny and Nolin soils, formed in quaternary alluvial sediments. The eastern part of Madison County consists of narrow ridgetops separated by steep drainageways and rough, black shale hills with soils underlain with Devonian and Lower Mississippian acid shales. The mountains have narrow floodplains and long, steep slopes with soils underlain by Mississippian siltstone, shale, and limestone and Pennsylvanian sandstone. Although karst topography is common in Kentucky, and sinkholes are found within a few miles of the proposed powerhouse in Madison County (Davidson and Carey 2004), the area within and immediately adjacent to the proposed Project boundary in both Madison and Estill Counties has a low potential for the development of karst features (KGS 2015). The potential for seismic hazard in the area also is low.

Mineral resources in Kentucky include coal, limestone, dolomite, oil, natural gas, clay materials, sand, and gravel. Kentucky has been among the top three coal-producing states for more than 50 years, and its remaining coal deposits, estimated at 90 billion short tonnes (i.e., 2,000-pound increments), are also among the largest in the United States. Limestone and dolomite are mined for a variety of products, including construction aggregate, lime, cement, and agricultural limestone. Oil and natural gas are also produced in central and eastern Kentucky. Common clay, ceramic and ball clays, refractory clay, and shale are used as industrial absorbents and lightweight aggregate. Sand and gravel are used extensively as construction materials.

Alluvial soils are found along most of the Kentucky River and its tributaries. The steep and very steep hillsides typically have loamy or clayey soils that contain varying amounts of clay, sand, and rock fragments. Floodplain soils are usually loamy or sandy. Only the soils on alluvial fans at the mouths of drainageways contain significant amounts of rock fragments. The banks of rivers and streams accumulate sand during floods and eventually build up small levees as the coarse sediment, mostly sand, falls out during overbank flow. The finer sediment, the *fine-earth fraction*, is carried toward the sides of the valley and settles out over time in standing backwater. Some of the low-lying stream terraces along the Kentucky River are also influenced by silty sediment and include areas of loamy soils. In the northwestern part of Estill County, where limestone and calcareous shales are common, soil pH ranges from moderately acidic to slightly alkaline. Soils in the proposed Project Area are mostly well-drained floodplains with moderately-high to high capacity to transmit water (Table 6).

Table 6. Select Characteristics of Mapped Soil Units at the Proposed Kentucky River Lock and Dam Number 11 Project

Soil Type	Slope	Landform	Drainage Class	Flooding	Capacity to Transmit Water[1]	Erosion Hazard Rating,[2] and Kf Surface[3]
Northern Riverbank						
Brassfield Silt Loam	30–50%	Hills	Well drained	None	Moderately High to High	Severe, 0.43
Alluvial Land, Steep (Wheeling)	12–40%	Floodplains	Well drained	Rare	Moderately High to High	Severe, 0.43
Southern Riverbank						
Grigsby–Chavies–Yeager Complex	2–55%	Floodplain steps, natural levees	Well drained	Frequent	High	Moderate, 0.10
Chagrin–Grigsby Complex	0–6%	Floodplains	Well drained	Occasional	Moderately High to High	Moderate, 0.10

Source: USDA NRCS 2013; Kentucky Division of Geographic Information 2015.
[1] Measured as Ksat, or saturated hydraulic capacity, as an indicator of seepage potential in the upper 60 inches.
[2] Erosion hazard ratings (i.e., values and classes), which are based on slope, soil-erosion K factor (Kf), and the content of rock fragments, indicate the hazard of soil loss from both on- and off-road/trail areas after disturbance activities that expose the soil surface. For off-road/trail areas, *slight* indicates that erosion is unlikely under ordinary climatic conditions, *moderate* indicates that some erosion is likely and that erosion-control measures may be needed, and *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised. For on- road/trail areas, *slight* indicates that little or no erosion is likely, *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed, and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed (USDA NRCS 2013).
[3] Kf is a measurement of soil erodibility representing the susceptibility of soil to erosion and the rate of runoff. Kf surface quantifies detachment of only the fine-earth fraction of soils (i.e., particles less than 2.0 millimeters), but K is equivalent to Kf for most soils. Kfs range from 0.02 to 0.69 and may increase from those cited here if the subsoil is exposed, organic matter depleted, or the soil's structure has been destroyed or has reduced permeability because of compaction (Institute of Water Research, Michigan State University 2002).

Soils in the Project Area are generally protected by the existing lock and dam structures, vegetative cover, and/or bank steepness. The southern riverbank within the immediate area of the Project is currently protected by the lock wall, the esplanade, and bulkhead within the lock chamber. From either end of the lock wall, the riverbank has some vegetative cover on shallow and moderately sloping terrain into the river on the lock side. Along the northern riverbank is moderate-to-high sloping terrain into the river, with thick vegetative cover upstream of the dam and some herbaceous vegetation and scoured areas immediately downstream from the dam. Although there is a low incidence/moderate susceptibility of landslides within the Project Area, the erosion potential in the vicinity of the Project varies greatly. On the northern riverbank, downstream from the dam, as well

as upstream from Lock and Dam Number 11 on the Madison County side of the river, erosion hazard values are higher (i.e., severe and moderate-to-severe, respectively).

Approximately 1.75 acres of the northern riverbank is capped with compacted clay to contain soil contamination caused by lead paint used in the lock tender's houses and other buildings that were formerly located at the proposed Project site. In August 1999 the USACE placed this clay cap on the site to mitigate lead exposure before turning the property over to the Commonwealth of Kentucky. KDEP, Division of Waste Management, manages the site with respect to the clay cap. Specifically, this agency limits use of the property to nonresidential purposes, restricts groundwater use to nondomestic purposes, requires approval for disturbances to soil coverings and changes in land use, reserves the right to require further characterization or remedial measures, and reviews the site every 5 years to determine whether additional action is necessary to protect human health and the environment.

3.11.2 Environmental Consequences

3.11.2.1 No-Action Alternative

The No-Action Alternative would have no short-term or long-term impacts on geology and soils in the vicinity of the proposed Project.

3.11.2.2 Proposed Action

As discussed above in Section 2.3.1, *Project Facilities and Construction*, construction activities at the Project would generally consist of constructing a powerhouse, control building, access road and parking lot, and recreational facilities. Additionally, on the southern bank, a temporary sediment-settling basin would be constructed, and portions of the existing lock and concrete esplanade would be removed to accommodate the installation of the proposed powerhouse, underground cable trench, and control building.

Construction of the proposed Project would cause temporary effects on soil erosion, sedimentation, and streambed-material transport. Installation and removal of cofferdams, excavation of the streambed and southern bank, demolition of the lock and esplanade (noted above), excavation for the buried segment of transmission line, construction of the proposed access roads/parking lots, and disposal of excavated materials during construction of the proposed Project would have the potential to cause localized soil erosion, sedimentation, and streambed-material transport. Soil eroded from upland construction sites and disturbance of the riverbed have the potential to adversely affect water quality, resident aquatic species, and their respective instream habitats.

Soils in the Project Area, where most of the new Project facilities would be built, are generally protected from erosion by the existing Project structures, vegetative cover, and/or level topography. The southern riverbank within the immediate Project Area is relatively flat and currently covered by the concrete lock wall, esplanade, and bulkhead within the lock chamber. Grasses and other herbaceous vegetation cover much of the clay-capped soils adjacent to the esplanade. From either end of the lock wall, riparian vegetation covers much of the riverbank, which slopes moderately to steeply to the river. The northern riverbank slopes moderately to the river, with riparian vegetative cover present both upstream and downstream of the dam.

During construction, Lock 11 Hydro Partners would access the site using the existing Lock 11 Road and install cofferdams at the upstream and downstream ends of the lock on top of the existing gate sills to dewater the lock. Prior to dewatering, a barge-mounted excavator would be used, if necessary, to clear the lock floor of sediment and debris. However, the primary substrate identified within the lock chamber is existing concrete; therefore, excavation is expected to be limited to removing loose and weathered material to provide a sound surface of foundation rock on which to cast the new concrete for the powerhouse.

The concrete esplanade would be the primary staging area for the heavy equipment (e.g., 60-ton crane) needed to construct the powerhouse and install the turbine-generator units. Limiting use of heavy equipment to this area would avoid the disturbance of the clay-capped soils during construction. Avoiding the clay-capped soil areas for all construction activities, including for staging materials and equipment, would ensure that lead-contaminated soils would not be exposed or mobilized (e.g., transported on construction equipment or eroded by wind or stormwater runoff).

Lock 11 Hydro Partners would implement an ESCP to minimize erosion, including on the riverbanks and impoundment shorelines, during Project construction. The ESCP would be developed in consultation with KDEP's Division of Water and Division of Waste Management, which would ensure that appropriate BMPs would be used during construction. BMPs include, but are not limited to, avoiding the use of heavy equipment in the stream channel, minimizing disturbance to channels, banks, and riparian vegetation to the extent practicable, and avoiding disturbance of lead-contaminated soils. The ESCP would also include a provision to consult the KDEP's Division of Waste Management again if field conditions during construction made disturbance of the clay-capped soils unavoidable.

3.11.3 Mitigation

The following mitigation or environmental protection and avoidance measures are proposed for geology and soil resources.

- Develop and implement an ESCP to minimize the effects of Project construction on the Kentucky River. The conceptual ESCP would include site-specific provisions to perform the following.
    1. Conduct sediment sampling upstream and downstream from the lock chamber and test for contaminants prior to beginning Project construction.
    2. Dispose of dredged sediments and solid waste generated by the Project at permitted facilities, treating the sediment as contaminated if testing, as specified in item (1) above, proves necessary.
    3. Develop and implement a groundwater protection plan.
    4. Implement BMPs) to prepare the Project site for construction (e.g., minimize disturbance to soil, vegetation, and existing drainage systems, install erosion and sediment control measures before land clearing and grading, establish temporary and permanent soil disposal areas, haul roads, construction staging areas, and an access point with cleaning station to control offsite mud/debris tracking).
    5. Stabilize, temporarily seed, and mulch disturbed land surfaces during construction.

6. Install cofferdams around the Project to minimize turbidity increases associated with dredging and construction activities.
7. Inspect and maintain erosion-control measures during the construction period.
8. After construction, regrade, topsoil, reseed with native grass, shrubs, and trees, and install erosion-control geo-fabric and/or mulch in the disturbed areas.
9. Re-establish 25- to 50-foot riparian buffer zones in the construction area along the Kentucky River

4 CUMULATIVE EFFECTS ANALYSIS

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on recreation and land use, water resources, biological resources, and cultural and historic resources. The temporal scope of analysis was generally bounded based on the term of the proposed license, or 30 years. Resource-specific analyses were further bounded based on the timescale of expected effects from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource.

A *cumulative effect* 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 (i.e., federal or nonfederal) 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.

4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Past and present actions that have affected resources within the College Hill and Estill County region include the following.

- Construction of hydroelectric generation facilities at Kentucky River Lock and Dam No.s 9, 10, 12, 13 and 14.
- Residential and commercial development in the College Hill area
- Construction of urban water distribution systems, sewer lines, and other associated utilities
- Clark Energy Cooperative plans to reconductor (upgrade)1.5 miles of single-phase transmission line from Clark Energy/East Kentucky Power Cooperative Hunt Substation to the point of interconnection near the proposed Lock 11 control building.

4.1.1 Recreation and Land Use

As discussed previously, the Commonwealth of Kentucky has focused significant resources on developing the Kentucky River Water Trail and promoting recreational use of the river corridor. To date, projects include rehabilitating and opening Lock Numbers 1, 2, 3, and 4 for recreational navigation and developing plans for recreational enhancements at the series of locks and dams for the length of the Kentucky River. When viewed in combination with the pending improvements at other FERC-licensed projects (i.e., Ravenna Project Number 13214 and Heidelberg Project Number 13213) at Lock and Dam Numbers 12 and 14, as well as the recreational improvements proposed by

the NPS and Kentucky Riverkeeper, the proposed recreational-enhancement measures have the potential to be cumulatively beneficial. This potential addition to the series of portage trails around the lock and dam structures would improve recreational connectivity. Improved parking and restroom facilities would improve accessibility and comfort for recreationists using the Kentucky River Water Trail. Over the term of a license, the proposed recreational enhancement measures at the College Hill Project would contribute to the Kentucky Water Trail partners' long-term vision for recreational use of the Kentucky River.

Land-use patterns would not be appreciably affected by the establishment of additional hydroelectric facilities. These developments would all occur within the footprint of existing, obsolete transportation locks and dams. Prevailing land uses within Estill County would continue to be characterized by light-residential development, agriculture, and natural cover. Farmland would not be converted for any hydroelectric developments, and these developments would not additively contribute to any cumulative land use effects.

4.1.2 Water Resources (Surface Waters, Floodplains, Wetlands)

Water quality within the Kentucky River is currently affected by municipal and industrial wastewater discharges, agriculture, residential, and commercial development, and reservoirs along the length of the river. Construction of the proposed Project and the considered other hydroelectric projects may disturb and suspend sediments within the vicinity of the proposed projects, potentially resulting in increased turbidity levels within the affected reach of the Kentucky River. However, the development and implementation of an ESCP, a Sediment-Contaminant Testing and Disposal Plan, a Spill Prevention, Containment, and Countermeasures Plan, and a Riverbank Stabilization and Monitoring Plan for the Project would reduce the potential for the Project construction to contribute to cumulative effects on water quality in the Kentucky River Basin.

Operation of the proposed projects could potentially reduce DO concentrations downstream from the dams, as compared to existing conditions. However, operating the projects in run-of-river mode, as well as developing and implementing Water Quality Monitoring Plans that includes monitoring of DO and water temperature in the Project Area, both prior to construction and after operations begin, would reduce any adverse effects on water quality downstream from the Project. Overall, any contribution of Project operations to cumulative effects on water quality should be minimal.

Cumulatively, the considered hydroelectric projects would operate primarily in run-of-river modes and would not result in changes to the overall flow regime of the Kentucky River. As such, cumulative effects would not occur to floodplains, wetlands, or water quantity anywhere throughout the Project Area.

4.1.3 Biological Resources

Turbine-related injuries and mortality resulting from operation of the proposed projects could contribute to cumulative effects on fishery resources. However, the results from entrainment studies conducted (EPRI 1997) at hydropower projects similar to the proposed projects indicate that entrainment and entrainment-related mortality at the proposed Project would be relatively low. Considering the size, speed, and proposed operation of the turbines, as well as the high fecundities of the warmwater fish species that would most likely be subject to impingement and entrainment, the overall effects of impingement and turbine entrainment at the projects on resident fish populations

are expected to be minimal. Furthermore, installation of a trash rack with 1-3/8-inch clear-bar spacing with maximum intake velocity of 1 foot per second would help to limit any entrainment- and impingement-related fish mortality that may occur.

Future activities, such as increased residential or commercial development, agricultural practices, increased traffic, or tourism in the area are not reasonably certain to occur as a result of the Action. Based on these factors, no cumulative effects as a result of the proposed Project are anticipated for ESA listed species or terrestrial biological resources.

4.1.4 Cultural and Historic Resources

The Kentucky River locks and dams, which were constructed between 1836 and 1917, are representative of the history of commercial barge navigation from the Eastern Coalfields and Bluegrass regions of Kentucky to the Ohio and Mississippi rivers. Although their use has changed over time, the locks and dams and their contributing resources (e.g., lock houses, other ancillary structures) maintain sufficient integrity to be considered historic resources.

The modifications to historic locks and dams, including use of the navigational lock for construction of the Project's powerhouse, would adversely affect an NRHP-eligible property (Lock and Dam Number 11). However, the proposed mitigation measures at Lock and Dam Numbers 12, 13, and 14, and educational efforts as part of the Kentucky River Water Trail have the potential to provide greater public accessibility to information about the history of the Kentucky River and lessen any negative effects of development of the Kentucky River for hydropower.

5 ENVIRONMENTAL PROTECTION MEASURES AND MITIGATION

5.1 ENVIRONMENTAL PROTECTION MEASURES

Lock 11 Hydro Partners would implement the following environmental protection measures:

- Develop and implement an ESCP to minimize the effects of Project construction on the Kentucky River. The conceptual ESCP would include site-specific provisions to perform the following.
    1. Conduct sediment sampling upstream and downstream from the lock chamber and test for contaminants prior to beginning Project construction.
    2. Dispose of dredged sediments and solid waste generated by the Project at permitted facilities, treating the sediment as contaminated if testing, as specified in Item 1 above, proves necessary.
    3. Develop and implement a groundwater protection plan for review and authorization by KDEP's Division of Water.
    4. Implement BMPs) to prepare the Project site for construction (e.g., minimize disturbance to soil, vegetation, and existing drainage systems, install erosion and sediment control measures before land0clearing and grading activities occur, establish temporary and permanent soil-disposal areas, haul roads, construction staging areas, and an access point with cleaning station to control offsite mud/debris tracking).
    5. Stabilize, temporarily seed, and mulch disturbed land surfaces during construction.

6. Install cofferdams around the Project to minimize turbidity increases associated with dredging and construction activities.
7. Inspect and maintain erosion-control measures during the construction period.
8. After construction, regrade, topsoil, reseed with native grass, shrubs, and trees, and install erosion-control geo-fabric and/or mulch in the disturbed areas.
9. Re-establish 25- to 50-foot riparian buffer zones in the construction area along the Kentucky River.

- Conduct water-temperature and DO monitoring upstream and downstream from the Project from June through September, both prior to construction and after post-construction, to verify compliance with water quality standards.
- Sequence construction activities to minimize impacts on spawning fish.
- Operate the Project in a run-of-river mode to maintain the upper pool elevation to ensure that City of Richmond and Irvine–Ravenna Municipal water supply needs are met.
- Implement a mussel relocation survey and future monitoring to reduce take of listed species.

1. Prior to Project operation, in mid-April, mussels will be salvaged from the zone of predicted highest impact and relocated downstream of the Project Area.
2. Prior to relocation efforts a baseline mussel survey will be conducted. Survey methods and survey extent will follow the October 2024 mussel survey.
3. Mussel monitoring will be conducted in years 1, 3, and 5 post Project operation. Monitoring methods and survey extent will follow the October 2024 mussel survey for direct comparison of any changes.

- To prevent the spread of nonnative invasive plants during Project construction and operation, revise the conceptual Invasive Species and Noxious Weed Control Plan to include site-specific provisions to accomplish the following.

1. Conduct a preconstruction survey to identify and map any nonnative invasive plants.
2. Minimize soil disturbance.
3. Stabilize soils as soon as possible after disturbance with native species and/or using mulch, hay, riprap, or gravel that is free of nonnative invasive plants.
4. Use BMPs during construction to minimize the transport of, and render nonviable, nonnative invasive plant material that may occur within the Project Area.
5. Monitor for nonnative invasive plants for a minimum of 2 years after Project construction, and extend the monitoring period to 5 years, if necessary, to effectively treat and control identified nonnative invasive plants.

- Implement a Water Quality Monitoring Plan that includes the following provisions.

1. Monitor water temperature and DO concentrations in the tailrace from May 1 through October 31.
2. Report monitoring results annually by March 31 of the following year.

3. Shut down Project turbines incrementally, to total shutdown as needed, if DO levels fall below 5.0 mg/L over a 24-hour average period, or 4.0 mg/L instantaneously.

- Implement an Operations Compliance Monitoring Plan that includes provisions to cease generation during low-flow restricted periods, as declared by the KDEP's Division of Water or KRA.
- Implement a Recreation Resources Management Plan to direct construction, operation, and maintenance of recreational resources at the Project, which includes the following.
    1. Construct a new portage trail around the lock and dam.
    2. Provide designated bank-fishing access to the tailrace.
    3. Construct a new parking area for four to six vehicles, adjacent to an existing access road on KRA-owned land.
    4. Designate the existing Irvine Boat Ramp and Docks and Drowning Creek Access as Project recreational facilities.
- Design the powerhouse and other ancillary structures to blend with the existing structures at the site to minimize effects on aesthetic resources.

5.2 MODIFICATIONS TO THE APPLICANT'S PROPOSAL – MANDATORY CONDITIONS

KDEP issued a Final water quality certification pursuant to Section 401 of the CWA with conditions. The certification is included in its entirety in Appendix F. Lock 11 Hydro Partners would implement the following conservation measures under the Proposed Action.

- Develop and implement an ESCP to minimize the effects of Project construction on the Kentucky River.
- Avoid disturbing clay-capped, lead-contaminated soils adjacent to the concrete esplanade during Project construction.
- Operate the Project in run-of-river mode.
- Implement the *Operations Compliance Monitoring Plan*, filed on July 1, 2019, that includes provisions to cease generation during low-flow restricted periods, as declared by the KDEP, Division of Water, or KRA (Rye 2015a).
- Implement the *Water Quality Monitoring Plan*, filed on August 13, 2020, that includes the following provisions: (1) monitor temperature and DO concentrations in the tailrace May 1 through October 31; (2) report monitoring results annually by March 31 of the following year; and (3) shut down Project turbines incrementally, to total shutdown as needed, if DO levels fall below 5.0 mg/L over a 24-hour average period, or 4.0 mg/L instantaneously (Rye 2015b).
- Implement the *Trashrack Design and Maintenance Plan*, filed on February 7, 2020, that includes the following provisions: (1) install a horizontal trashrack to keep inlet speeds low; and (2) use 1-3/8-inch bar spacing with a maximum approach velocity that does not exceed 1.0 foot per second to minimize potential for fish entrainment and impingement (Lock 11 Hydro Partners 2020).

- Implement the *Recreation Plan*, filed on October 27, 2020, with provisions for providing recreational facilities at the Project, including a canoe portage, bank fishing-access area, picnic tables, toilet, gravel drive, and parking area (Rye 2015c).
- Implement the HPMP, filed January 29, 2021, for the protection of historic properties within the Project's APE (Stallings 2016).
- Implement the USFWS Biological Opinion, issued on May 27, 2025, conservation measures.

5.3 COORDINATION, CONSULTATION, AND CORRESPONDENCE

FERC's regulations (18 CFR § 4.38) require that applicants consult with appropriate resource agencies, Native American 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, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to FERC's regulations.

The following is a listing of federal and state agencies consulted for the Proposed Action.

- FERC, Washington, D.C.
- KDFWR, Frankfort, Kentucky
- Kentucky Division of Water, Frankfort, Kentucky
- Kentucky Energy and Environment Cabinet, Dam Safety, Frankfort, Kentucky
- Kentucky Heritage Council, State Historic Preservation Office, Frankfort, Kentucky
- Kentucky River Authority, Frankfort, Kentucky
- Office of Kentucky Nature Preserves, Frankfort, Kentucky
- USACE, Louisville District, Kentucky
- USDA–Natural Resources Conservation Service, Lexington, Kentucky
- USDA–NRCS, Owensboro, Kentucky
- EPA, Atlanta, Georgia
- USFWS, Kentucky Ecological Services Field Office, Frankfort, Kentucky

5.4 TRIBAL NATIONS

The list below includes the Native American Tribal Nations that were consulted for the Proposed Action.

- Cherokee Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Osage Nation
- United Keetoowah Band of Cherokee Indians of Oklahoma

5.4.1 Scoping

Lock 11 Hydro Partners initiated scoping with interested parties and relevant federal and state agencies to solicit input on the considered alternatives and pertinent resource concerns. Scoping letters were distributed on February 19, 2024, and responses were catalogued for a 30-day scoping period.

The following entities provided written responses.

- Kentucky Heritage Council, SHPO
- KDEP
- KDFWR
- Kentucky Department of Dam Safety
- USDA–NRCS

Scoping responses did not indicate the need for additional resource considerations other than those already included in this Draft EA. Comments generally acknowledged that the proposed Project would not significantly affect the human environment and notified Lock 11 Hydro Partners of permitting requirements for the Project.

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APPENDIX A: U.S. DEPARTMENT OF AGRICULTURE, RURAL DEVELOPMENT ENVIRONMENTAL ASSESSMENT FOR LOCK 11 COORDINATION – HABITAT ASSESSMENT

APPENDIX B: BIOLOGICAL ASSESSMENT REPORT

APPENDIX C: COLLEGE HILL HYDRO PROJECT ON THE KENTUCKY RIVER - MUSSEL SURVEY REPORT

APPENDIX D: TECHNICAL MEMORANDUM – LOCK AND DAM NO. 11 MUSSEL HYDRAULIC REVIEW

APPENDIX E: USFWS BIOLOGICAL OPINION and INFORMAL CONSULTATION LETTER

APPENDIX F: 401 WATER QUALITY CERTIFICATION KENTUCKY RIVER LOCK & DAM 11