

**ENVIRONMENTAL ASSESSMENT**

**FOR**

**Braddock Locks and Dam**

**Hydro Electric Project**

**(DOE/EA-2017)**

**U.S. Department of Energy**

**Office of Energy Efficiency and Renewable Energy**



**October 2015**

## **Environmental Assessment for Braddock Lock and Dam Hydro Electric Project (DOE/EA-2017)**

### **SUMMARY**

The Federal Energy Regulatory Commission (FERC) issued a notice of availability on June 13, 2014 for the Final Environmental Assessment for FERC Project No. 13739-002 - Braddock Locks and Dam Hydroelectric project. The FERC licensed project would include construction of the following facilities: (1) a powerhouse with seven turbine-generators at the left closure weir on the south side (river left) of the Corps' existing Braddock Locks and Dam, having a total installed capacity of 5.25 megawatt (MW); (2) a 0.45-mile-long, 23-kilovolt (kV) transmission line; (3) a switchyard and control room; and (4) appurtenant facilities. The project's average annual electricity generation is estimated to be 32,263 megawatt-hours (MWh). In its Environmental Assessment (EA), FERC analyzed the following environmental resource categories; geologic and soil resources; aquatic resources; terrestrial resources; threatened and endangered species and essential fish habitat; recreation, land use, and aesthetics; and cultural resources. Additionally, the document addressed cumulative impacts.

The U.S. Department of Energy (DOE), through the Wind and Water Power Program, is proposing<sup>1</sup> to provide funding to support fabrication and installation of one of the seven turbine generators identified above, and reviewed in the FERC EA. Specifically, DOE funding would be used for the fabrication and installation of a 0.7 megawatt interchangeable Modular Bulb Turbine (MBT) into the modified Braddock Locks and Dam.

The purpose of DOE's Proposed Action is to demonstrate component or system testing of advanced innovative hydropower technologies that will improve the unit and plant efficiency. Demonstrating small advanced hydropower technologies will promote cost-effective sustainable small hydropower development thereby making previously marginal projects feasible and more sites attractive for hydropower development.

DOE's Proposed Action is intended to address the need for efficient and low cost small hydropower that can be quickly and efficiently deployed in low head/low flow existing

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<sup>1</sup> Prior to the issuance of this FONSI, DOE authorized Hydro Green, LLC to use a percentage of the federal funding for preliminary activities, which include project management, administrative work, design and data analysis activities. These activities are associated with the proposed project and do not significantly impact the environment nor represent an irreversible or irretrievable commitment by the DOE in advance of this analysis for Hydro Green's proposed project.

waterways and constructed waterways. The National Hydropower Association (NHA) recently estimated that more than 60 gigawatt (GW) of new hydropower can be developed in the U.S. by 2025. All types of undeveloped resources must be pursued if our national energy goals are to be met, and the availability of new, more environmentally compatible hydropower technologies will be important in future new developments. To take advantage of the small hydropower potential, DOE is sponsoring research that will ultimately reduce the Levelized Cost of Energy (LCOE) for small hydropower to be competitive with the lowest cost Utility Scale technologies. In the near term the goal is to reduce the Levelized Cost of Energy for small hydropower to less than \$0.07/kWh to be competitive with existing base-load power sources such as coal-powered power plants.

DOE has reviewed the EA for consistency with DOE's NEPA Implementing Procedures. Through that review, DOE has determined that the actions analyzed by the EA and the proposed DOE funding action are substantially the same and the impacts analysis in the EA is thorough and complete; therefore, the EA meets the standards for an adequate environmental assessment under the Council on Environmental Quality (CEQ) regulations (40 CFR 1506.3) and is adequate for DOE adoption.

UNITED STATES OF AMERICA  
FEDERAL ENERGY REGULATORY COMMISSION

Lock+ Hydro Friends Fund XLII, LLC

Project No. 13739-002

NOTICE OF FINAL ENVIRONMENTAL ASSESSMENT

(June 13, 2014)

In accordance with the National Environmental Policy Act of 1969 and the Federal Energy Regulatory Commission's regulations, 18 CFR Part 380 (Order No. 486, 52 FR 447897), the Office of Energy Projects has reviewed the application for an original license for the proposed 5.25-megawatt (MW) Braddock Locks and Dam Hydroelectric Project, which would be located on the U.S. Army Corps of Engineers' Braddock Locks and Dam facility on the Monongahela River in the Borough of West Mifflin and the City of Duquesne, Allegheny County, Pennsylvania. Commission staff prepared a final Environmental Assessment (EA) which analyzes the potential environmental effects of construction and operation of the project and concludes that issuing a license for the project, with appropriate environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

A copy of the final EA is on file with the Commission and is available for public inspection. The final EA may also be viewed on the Commission's website at <http://www.ferc.gov> using the "eLibrary" link. Enter the docket number excluding the last three digits in the docket number field to access documents. For assistance, contact FERC Online Support at [FERCOnlineSupport@ferc.gov](mailto:FERCOnlineSupport@ferc.gov) or toll-free at (866) 208-3676, or for TTY, (202) 502-8659.

You may also register online at <http://www.ferc.gov/docs-filing/esubscription.asp> to be notified via email of new filings and issuances related to this or other pending projects. For assistance, contact FERC Online Support.

For further information contact Andy Bernick at (202) 502-8660.

Kimberly D. Bose,  
Secretary.

FINAL ENVIRONMENTAL ASSESSMENT  
FOR  
ORIGINAL HYDROPOWER LICENSE

Braddock Locks and Dam Hydroelectric Project

FERC Project No. 13739-002

Pennsylvania

Federal Energy Regulatory Commission  
Office of Energy Projects  
Division of Hydropower Licensing  
888 First Street, NE  
Washington, D.C. 20426

June 2014

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## ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
APE	area of potential effects
Braddock Project or project	Braddock Locks and Dam Hydroelectric Project
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
Corps	United States Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
EA	Environmental Assessment
EFH	essential fish habitat
ESA	Endangered Species Act
FPA	Federal Power Act
FWS	United States Fish and Wildlife Service
HPMP	Historic Properties Management Plan
Hydro Friends	Lock+ Hydro Friends Fund XLII, LLC
Lower Monongahela Locks and Dams 2, 3, & 4 Project	Lower Mon Project
mg/L	milligrams per liter
MW	megawatt
MWh	megawatt-hours
MOU	Memorandum of Understanding
MOA	Memorandum of Agreement
MW	megawatt
National Register	National Register of Historic Places
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Units
ORSANCO	Ohio River Valley Water Sanitation Commission
Pennsylvania DCNR	Pennsylvania Department of Conservation and Natural Resources
Pa. Code	Pennsylvania Code
PCB	polychlorinated biphenyl
Pennsylvania DEP	Pennsylvania Department of Environmental Protection
Pennsylvania FBC	Pennsylvania Fish and Boat Commission
Pennsylvania SHPO	Pennsylvania State Historic Preservation Office
RPM	revolutions per minute
WQC	water quality certification

## EXECUTIVE SUMMARY

### Proposed Action

On September 17, 2012, Lock+ Hydro Friends Fund XLII, LLC (Hydro Friends) filed an application for an original license to construct and operate its proposed 5.25-megawatt (MW) Braddock Locks and Dam Hydroelectric Project (project or Braddock Project). The project would be located on the Monongahela River, in the Borough of West Mifflin and City of Duquesne, Pennsylvania, at the United States Army Corps of Engineers' (Corps) Braddock Locks and Dam. The project would occupy 0.28 acre of federally owned Corps land.

### Existing Corps Facilities

The Corps' Braddock Locks and Dam is one of nine navigational structures, collectively known as the Corps' Monongahela River Locks and Dams system, which provide year-round navigation on the Monongahela River between Pittsburgh, Pennsylvania, and Fairmont, West Virginia. The Braddock Locks and Dam is located at river mile (RM) 11.2 within the boroughs of Braddock and West Mifflin, Pennsylvania. The lock chambers and operations buildings are situated along the right bank of the river adjacent to a major steel-making plant. The dam maintains a pool (Braddock pool) for 12.6 miles upstream to Locks and Dam 3 at Elizabeth, Pennsylvania. The Braddock Locks and Dam is operated by the Corps as a run-of-river facility in order to maintain a near-constant upper pool level.

### Proposed Hydropower Facilities and Operation

Hydro Friends proposes to construct the following facilities: (1) a powerhouse with seven turbine-generators at the left closure weir on the south side (river left) of the Corps' existing Braddock Locks and Dam, having a total installed capacity of 5.25 MW; (2) a 0.45-mile-long, 23-kilovolt (kV) transmission line; (3) a switchyard and control room; and (4) appurtenant facilities. The project's average annual generation is estimated to be 32,263 megawatt-hours (MWh).

The proposed project is described in more detail in section 2.2.1, *Proposed Project Facilities*. The project would operate using flows made available by the Corps (run-of-release).

## Proposed Environmental Measures

In addition to operating run-of-release, Hydro Friends proposes to install and maintain a rest area along the existing Great Allegheny Passage's Steel Valley Trail adjacent to the project site.<sup>1</sup> The rest area would include seating, bike racks, and interpretive signs.

## Alternatives Considered

This final Environmental Assessment (EA) analyzes the effects of the proposed action and recommends conditions for any license issued for the project. This final EA considers the following alternatives: (1) Hydro Friends' proposal; (2) Hydro Friends' proposal with staff modifications (staff alternative); and (3) no action.

Under the staff alternative, the project would include Hydro Friends' proposed operation and recreation measures, as noted above, and the following additions:

- an operation compliance monitoring plan to include provisions for documenting compliance with any of the Corps' operating requirements and establishing a schedule for reporting project compliance/non-compliance during normal operation and emergencies;
- an erosion and sediment control plan to minimize construction-related effects; and
- a water quality monitoring plan to include: (1) monitoring of summer water quality parameters prior to construction; (2) continuous, real-time monitoring of water quality parameters during project construction; and (3) continuous, real-time monitoring of summer water quality parameters for 5 years following project construction, and for an additional 5 years if the normal elevation of the Braddock pool increases

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<sup>1</sup> The Great Allegheny Passage is a rail trail in Maryland and Pennsylvania. It is the central trail of a network of long-distance hiker-biker trails covering hundreds of miles through the Allegheny region of the Appalachian Mountains, connecting Washington, D.C. to Pittsburgh, Pennsylvania and beyond.

during the term of the license as a result of the Corps' Lower Monongahela Locks and Dams 2, 3, & 4 Project (Lower Mon Project).<sup>2</sup>

Under the no-action alternative, the project would not be constructed and environmental resources in the project area would not be affected.

### **Public Involvement and Areas of Concern**

Before filing its license application, Hydro Friends conducted pre-filing consultation under the traditional licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission. After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. We distributed an initial scoping document to interested parties on November 5, 2012. Scoping meetings were held in Braddock, Pennsylvania and Monroeville, Pennsylvania on December 5, 2012. On February 15, 2013, we requested comments, recommendations, terms and conditions, and prescriptions in response to a notice that the application was ready for environmental analysis. On February 28, 2013, we issued a revised scoping document.

The Commission issued its draft EA for the proposed licensing of the Braddock Project on January 17, 2014. Staff requested that comments on the draft EA be filed within 30 days from the issuance date. Staff received comments from the Corps on the draft EA.

The primary issues associated with licensing the Braddock Project are impacts to water quality and fisheries resources due to: (1) construction of the proposed powerhouse; and (2) project operation, which would result in flows passing through the project powerhouse that would otherwise be passed through

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<sup>2</sup> The Corps' Lower Monongahela Locks and Dams 2, 3, & 4 Project (Lower Mon Project) was authorized by Congress in 1992 to address conditions at the Corps' three navigation facilities on the Lower Monongahela River. The remaining work includes: (1) removal of Locks and Dam 3; (2) replacement of Locks and Dam 4; (3) pool level changes; (4) substantial dredging; and (5) relocation of multiple shore-side facilities. Although the project was initially scheduled for completion in 2004, the Corps' current estimate for completion of the project is 2030. At present, funding for completion of the project has not been approved.

an environmental gate<sup>3</sup> that the Corps uses to release flows to maintain water quality.

## **Staff Alternative**

### *Geologic Resources*

Constructing the project would disturb about 460 square feet of previously modified upland habitat for construction of the new switchyard and a small area for a single transmission line pole. Also, in-water sediment would be disturbed during placement of cofferdams. An erosion and sediment control plan with site-specific measures, including a provision to specify procedures for disposing of any contaminated sediments encountered during construction, would help limit potential effects to aquatic habitat associated with the construction of the proposed project.

### *Aquatic Resources*

Hydro Friends' *Water Quality Modeling Study* indicates that a shift in some flow releases from the Corps' environmental gate to the project turbines and the depth of the powerhouse intake could result in a decrease in dissolved oxygen (DO) downstream of the Corps' dam. As the predicted magnitude of these decreases is minimal, it is unlikely that biota in the project vicinity would be impacted, or that DO concentrations would fall to levels below those specified by current Pennsylvania State water quality criteria. However, future DO stratification in the Braddock pool due to an extremely hot and/or dry summer, or the completion of the Lower Mon Project cannot be ruled out. If DO stratification does occur in the Braddock pool, the importance of the Corps' existing environmental gate for re-aeration may increase relative to current conditions.

The staff-recommended water quality monitoring plan would help ensure that water quality is maintained during construction and operation of the project. Staff's recommended plan would include monitoring prior to project construction, during project construction, for 5 years following project construction, and for an additional 5 years following the completion of the Lower Mon Project. Water quality monitoring would ensure that the results of the *Water Quality Modeling Study* are confirmed by in-stream, post-installation conditions. Further, water

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<sup>3</sup> In a letter filed January 14, 2013, the Corps states that the environmental gate (also referred to as Gate No. 1 or the water quality gate in the Braddock Project proceedings) is where the Corps has been directing flows to maximize DO levels in the river, particularly during the warm, low-flow season.

quality monitoring would identify whether DO concentrations decrease because of an extremely hot and/or dry summer, or following the completion of the Lower Mon Project. If reductions in DO concentration are detected, flows through the environmental gate could be increased so that DO concentrations below the project are protective of aquatic resources. With a water quality monitoring plan in place, project operation is not likely to adversely affect water quality below the Braddock Project.

Staff's recommended operation compliance monitoring plan would ensure run-of-release operation and continued minimization of impacts to aquatic resources that would otherwise occur under fluctuating impoundment elevations.

### *Terrestrial Resources*

Construction of the project switchyard and a single new transmission line pole would involve clearing about 460 square feet of previously disturbed upland habitat adjacent to active industrial rail lines. The proposed 0.45-mile-long, 23-kV transmission line would largely be placed under an existing elevated railway or on existing poles located below or alongside the elevated tracks, limiting both ground disturbance for construction and the potential for bird collisions with power lines. Therefore, the proposed project would not affect upland habitat, wetlands, or wildlife within the project vicinity.

### *Threatened and Endangered Species*

Five federally endangered mussel species (the fanshell, snuffbox, pink mucket, orange-foot pimpleback, and sheepnose) are listed by the United States Fish and Wildlife Service (FWS) as potentially occurring within Allegheny County and the reach of the Monongahela River where the Braddock Project would be constructed. Hart (2012) observed none of these species during comprehensive field surveys of the lower Monongahela River, and FWS states that it has no significant concerns regarding the Braddock Project, given its location and small footprint. We conclude that licensing the Braddock Project would have no effect on federally endangered freshwater mussel species due to the apparent absence of any of the listed species in the project vicinity.

### *Recreation, Land Use, and Aesthetics*

Construction and operation of the Braddock Project would not adversely affect recreational resources over the long term; however, short-term impacts from construction noise and activity could affect recreation in the project area. Under Hydro Friends' proposal, the installation and maintenance of a rest area with

benches and interpretive signs along the Great Allegheny Passage trail adjacent to the Braddock Project site would enhance recreation opportunities near the project.

### *Cultural Resources*

Construction and operation of the project would not likely affect cultural resources at the Braddock Project because the area has been heavily disturbed and no cultural resources have been identified within the project boundary. On April 17, 2012, the Pennsylvania SHPO concluded that no historic properties would be affected by the federal licensing action. We concur with this finding. As part of any license issued for the project, a license article would be included that requires the applicant to stop all work, consult with the Pennsylvania SHPO, and develop a historic properties management plan if the licensee discovers previously unidentified archaeological or historic properties during the course of constructing, operating, or maintaining project works.

### **Conclusions**

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

In section 4.2 of the EA, we compare the total project cost of obtaining power from a likely alternative source of power in the region, for each of the alternatives identified above. Our analysis shows that during the first year of operation, under the applicant's proposal, the project power would cost \$513,608, or \$15.92/MWh, more than the cost of alternative power. Under the staff-recommended alternative, project power would cost \$518,468, or \$16.07/MWh, more than the cost of alternative power.

We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (32,263 MWh annually); (2) the 5.25 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; and (3) the recommended environmental measures proposed by Hydro Friends, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

On the basis of our independent analysis, we conclude that issuing a license for the project, with the environmental measures that we recommend, would not be a major federal action significantly affecting the quality of the human environment.



## **FINAL ENVIRONMENTAL ASSESSMENT**

**Federal Energy Regulatory Commission  
Office of Energy Projects  
Division of Hydropower Licensing  
Washington, D.C. 20426**

### **Braddock Locks and Dam Hydroelectric Project FERC No. 13739-002 – Pennsylvania**

#### **1.0 INTRODUCTION**

##### **1.1 APPLICATION**

On September 17, 2012, Hydro Friends Fund XLII, LLC (Hydro Friends) filed an application for an original license to construct and operate its proposed 5.25-megawatt (MW) Braddock Locks and Dam Hydroelectric Project (project or Braddock Project). The project would utilize the hydraulic head of the existing United States Army Corps of Engineers' (Corps) Braddock Locks and Dam, which is located at river mile (RM) 11.2 of the Monongahela River, in the Borough of West Mifflin and the City of Duquesne, Pennsylvania (figure 1).<sup>1</sup> The proposed project includes the construction of a powerhouse containing modular turbine and generator units, a new switchyard, and a primary transmission line largely constructed along an existing elevated railway. The project would occupy 0.28 acre of federal land managed by the Corps. The average annual generation of the Braddock Project would be approximately 32,263 megawatt-hours (MWh).

##### **1.2 PURPOSE OF ACTION AND NEED FOR POWER**

###### **1.2.1 Purpose of Action**

The purpose of the proposed Braddock Project is to provide a new source of hydroelectric power. Therefore, the Commission must decide whether to issue a license for the project and what conditions should be placed in any license issued. In deciding whether to issue a license for any hydroelectric project, the

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<sup>1</sup> On the Monongahela River, river miles are designated in miles above Point State Park (the Point) in Pittsburgh, Pennsylvania. See: <http://www.lrp.usace.army.mil/Portals/72/docs/navigation/MonongahelaRiverNavigationChart.pdf>

Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued, such as flood control, irrigation, navigation, or water supply, the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection, mitigation of damage to, and enhancement of fish and wildlife resources (including related spawning grounds and habitat); (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing an original license for the Braddock Project would allow the applicant to construct the project and generate electricity for the term of the license, making electric power from a renewable resource for sales to its customers. This final Environmental Assessment (EA) assesses the environmental and economic effects associated with the construction and operation of the Braddock Project and alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a license for the project, and if so, recommends terms and conditions to become a part of any license issued for the project.

In the final EA, we assess the environmental and economic effects of constructing, operating, and maintaining the Braddock Project: (1) as proposed by Hydro Friends (proposed action) and (2) with our recommended measures (staff alternative). We also consider the effects of the no-action alternative. Important issues that are addressed include construction and operation effects on geology and soils, aquatic resources, terrestrial resources, threatened and endangered species, recreation and land use, and cultural resources.

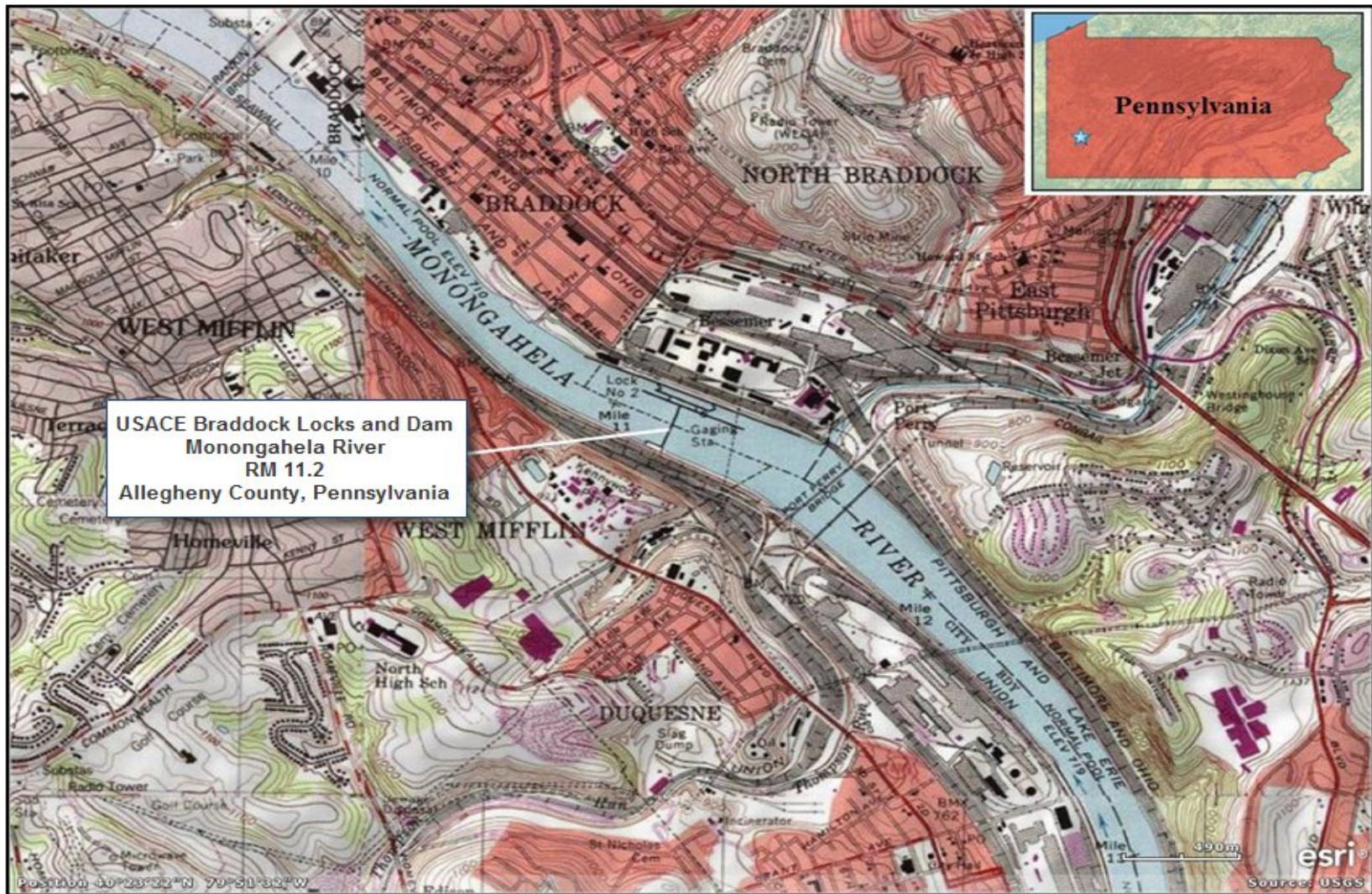


Figure 1. Location of the proposed Braddock Locks and Dam Project (Source: Hydro Friends).



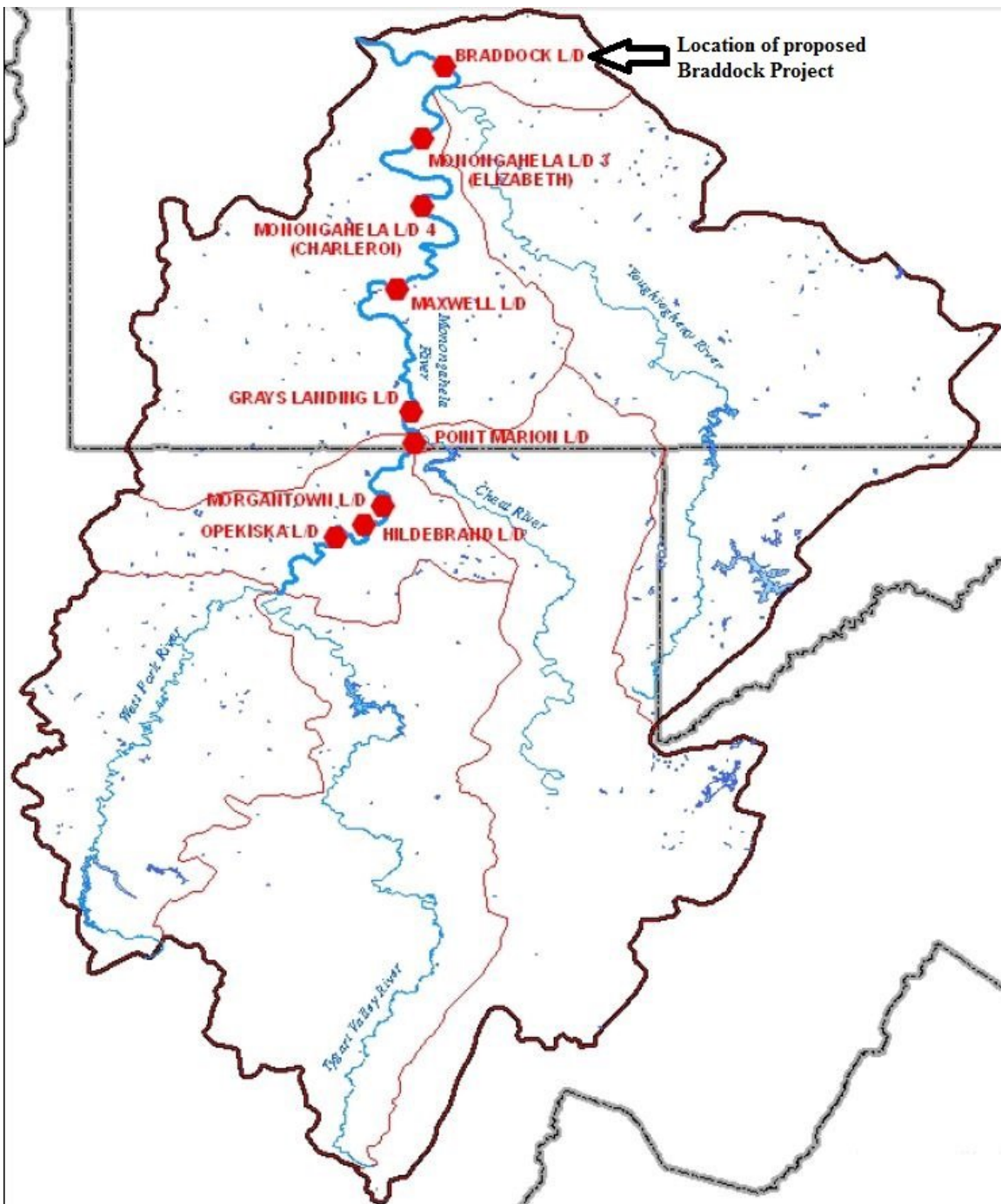


Figure 2. U.S. Army Corps of Engineers locks and dam projects in the larger Monogahela River Basin (Source: Corps 2012).

## 1.2.2 Need for Power

The proposed Braddock Locks and Dam Hydroelectric Project would have an installed capacity of 5.25 MW and generate an estimated 32,263 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period.<sup>5</sup> The NERC prepares seasonal and long-term assessments of the overall reliability and adequacy of the North American bulk power system, which is divided into 26 assessment areas, both within and across eight regional entity boundaries. The proposed project is located within the boundaries of the Reliability First Corporation regional entity of the NERC, but is included in the Pennsylvania-New Jersey-Maryland (PJM) assessment area in the NERC's 2012 Reliability Assessment (NERC, 2012). According to the 2012 forecast, the total internal demand for the PJM region is projected to grow at a compound annual growth rate of 1.36 percent for summer and 1.12 percent for winter during the period from 2013 through 2022 (NERC, 2012).

During the period from 2013 to 2022, PJM estimates that about 47,329 MW of additional capacity will be brought online in the PJM region. Included in the 47,329 MW of new capacity is 312 MW of additional hydropower expected to be brought online during the 10-year period.

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

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<sup>5</sup> The NERC is an international regulatory authority established to evaluate reliability of the bulk power system in North America. NERC develops and

enforces reliability standards; annually assesses seasonal and long-term (10-year)

reliability; monitors the bulk power system through system awareness; and educates, trains, and certifies industry personnel. NERC is the Electric Reliability Organization for North America, subject to oversight by the U.S. Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada (NERC 2012).

### 1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Braddock Project is subject to numerous requirements under the Federal Power Act (FPA) and other applicable statutes. The major regulatory and statutory requirements are summarized in table 1 and described below.

Table 1. Major Statutory and Regulatory Requirements for the Braddock Project (Source: staff).

<b>Requirement</b>	<b>Agency</b>	<b>Status</b>
Section 18 of the FPA (fishway prescriptions)	Department of the Interior (Interior)	Interior has neither prescribed fish passage nor requested reservation of authority to prescribe fish passage.
Section 10 (j) of the FPA	Interior, Pennsylvania Fish and Boat Commission (Pennsylvania FBC), and Pennsylvania Game Commission	No 10(j) recommendations were filed.
Clean Water Act – water quality certification	Pennsylvania Department of Environmental Protection (Pennsylvania DEP)	Hydro Friends filed a request for water quality certification with the Pennsylvania DEP on April 30, 2014.
Endangered Species Act	U.S. Fish and Wildlife Service (FWS)	Staff found that the project would have no effect on federally listed mussel species.
Coastal Zone Management Act Consistency	Pennsylvania DEP	The Braddock Project is not located in Pennsylvania’s Coastal Zones, as confirmed in a letter from Pennsylvania DEP filed December 16, 2011.
Section 106 of the National Historic Preservation Act	Pennsylvania Historical and	As there would be no effects on historic

	Museum Commission (Pennsylvania SHPO)	properties, the Commission's regulatory requirements pertaining to section 106 of the NHPA have been satisfied.
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### **1.3.1 Federal Power Act**

A license for a project is subject to requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described below.

#### **1.3.1.1 Section 18 Fishway Prescriptions**

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the U.S. Department of the Interior (Interior). Neither Commerce nor Interior filed fishway prescriptions for the project.

#### **1.3.1.2 Section 10(j) Recommendations**

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. No section 10(j) recommendations were filed for the Braddock Project.

### **1.3.2 Clean Water Act**

Under section 401(a)(1) of the CWA, a license applicant must obtain either certification from the appropriate state pollution control agency verifying that any discharge from a project would comply with applicable provisions of the CWA or a waiver of certification by the appropriate state agency. The failure to act on a request for certification within a reasonable period of time, not to exceed one year, after receipt of such request constitutes a waiver.

On April 25, 2014, Hydro Friends mailed its application to the Pennsylvania Department of Environmental Protection (Pennsylvania DEP) for a section 401 water quality certification (WQC or certification) for licensing the Braddock Project.<sup>6</sup> Hydro Friends filed a receipt that indicated its WQC application was received by Pennsylvania DEP on April 30, 2014. Hydro Friends filed with the Commission a copy of its WQC request on May 19, 2014, and its receipt of delivery to Pennsylvania DEP on May 20, 2014. Pennsylvania DEP has not yet acted on the certification request. The WQC is due by April 30, 2015.

### 1.3.3 Endangered Species Act

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

Based on staff's review of information available through the United States Fish and Wildlife Service (FWS) and the Pennsylvania Natural Heritage Program, several federally endangered or threatened mussel species have the potential to occur in the project vicinity (i.e., the lower Monongahela River). Our analysis of project impacts on threatened and endangered species is presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

FWS' September 8, 2012, e-mail correspondence with Hydro Friends stated that the FWS had no significant concerns regarding the Braddock Project, given its location and small footprint.<sup>7</sup> In a letter dated November 23, 2011, the Pennsylvania Department of Conservation and Natural Resources (Pennsylvania DCNR) also indicated that no impact to species and resources of concern was likely.<sup>8</sup> Further, no federally listed mussel species were detected during comprehensive mussel surveys in the lower Monongahela River, including the vicinity of the Braddock Locks and Dam (Hart 2012).

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<sup>6</sup> Hydro Friends' WQC application filed with Pennsylvania DEP on April 30, 2014 replaces a prior WQC application filed on November 5, 2013.

<sup>7</sup> A copy of the correspondence was included in the license application.

<sup>8</sup> *Ibid.*



We conclude that licensing the Braddock Project would have no effect on federally listed freshwater mussel species due to their apparent absence in the project vicinity and the small project footprint.

### **1.3.4 Coastal Zone Management Agency**

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 United States Code [U.S.C.] §1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

By letter filed on December 16, 2011, the Pennsylvania DEP stated that the project is not located within Pennsylvania's Coastal Zones, and thus found the project consistent with Pennsylvania's Coastal Resources Management Program.

### **1.3.5 National Historic Preservation Act**

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

In the Commission's February 10, 2012, *Notice of Intent to File License Application, Filing of Pre-Application Document, and Approving Use of the Traditional Licensing Process*, the Commission initiated consultation with the Pennsylvania State Historic Preservation Office (Pennsylvania SHPO), as required by §106 of the NHPA, and the regulations of the Advisory Council on Historic Preservation, 36, CFR, at 800.4, and designated Hydro Friends as the non-federal representative for carrying out consultations pursuant to section 106 of the NHPA. Hydro Friends consulted with the Pennsylvania SHPO to locate, determine National Register eligibility, and assess potential adverse effects to historic properties associated with the project. In a letter dated April 17, 2012, the Pennsylvania SHPO concluded that no historic properties would be affected by the federal licensing action.<sup>9</sup> As a result of the findings that there would be no effect on historic properties, the Commission's regulatory requirements pertaining to section 106 of the NHPA have been satisfied.

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<sup>9</sup> A copy of the correspondence was included in the license application.

### 1.3.6 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with National Oceanic and Atmospheric Administration (NOAA) Fisheries on all actions that may adversely affect Essential Fish Habitat (EFH). EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” EFH is applicable to federally managed commercial species that live out at least one stage of their lifecycle in marine waters (e.g., anadromous fish). The Braddock Project is located outside of the range of anadromous species or any other species with at least one component of their lifecycle in marine waters. Therefore, we conclude that the project would not adversely affect EFH and that no consultation is required.

## 1.4 PUBLIC REVIEW AND COMMENT

The Commission’s regulations (18 Code of Federal Regulations [CFR], section 4.38(2013)) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission’s regulations.

### 1.4.1 Scoping

Before preparing this final EA, we conducted scoping to determine what issues and alternatives should be addressed. The Commission issued an initial scoping document (SD1) to interested agencies and other stakeholders on November 5, 2012. We held two scoping meetings on December 5, 2012, in Pittsburgh, Pennsylvania (afternoon) and Monroeville, Pennsylvania (evening), to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission’s public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

<u>Commenting Entities</u>	<u>Date Filed</u>
Corps	January 14, 2013

Based on comments received during the December 5, 2012, scoping meeting and written comments received during the scoping process, the Commission issued a revised scoping document (SD2) on February 28, 2013.

## 1.4.2 Interventions

On November 2, 2012, the Commission issued a notice that Hydro Friends had filed an application for an original license at the Braddock Locks and Dam. This notice set January 1, 2013, as the deadline for filing protests and motions to intervene. In response to the notice, no entities filed motions to intervene.

## 1.4.3 Comments on the Application

On February 15, 2013, the Commission issued a notice requesting comments, recommendations, terms and conditions, and prescriptions. The following entities responded:

<u>Commenting Entity</u>	<u>Date Filed</u>
Corps	April 1, 2013
Interior	April 17, 2013

Hydro Friends did not file reply comments.

## 1.4.4 Comments on the Draft EA

On January 17, 2014, the Commission issued a draft EA for the Braddock Project. Comments on the draft EA were due by February 18, 2014. Written comments on the draft EA were provided by the following entity:

<u>Commenting Entity</u>	<u>Date Filed</u>
Corps	February 19, 2014

## 1.4.5 Requirements of the U.S. Army Corps of Engineers – Terms and Conditions

Pursuant to a Memorandum of Understanding (MOU) between the Commission and the Department of the Army,<sup>10</sup> licensed hydropower facilities that will be an integral part of or that could affect the structural integrity or operation

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<sup>10</sup> See Memorandum of Understanding between the United States Army Corps of Engineers and the Federal Energy Regulatory Commission on Non-federal Hydropower Projects, March 2011. <http://www.ferc.gov/legal/mou/mou-usace.pdf>.

of a Corps' project are to be designed and constructed in consultation with and subject to the review and approval of the appropriate Corps' District Engineer. Consistent with the MOU, the Commission routinely includes special license articles which do the following:

- (1) require the licensee to submit final plans and specifications for cofferdams and deep excavations to the Corps and Commission for review and approval;
- (2) require the licensee to enter into a comprehensive agreement with the Corps within 90 days after a license is issued. The agreement must assure that (a) studies and construction activities for the licensed project do not interfere with Corps' operations or damage Corps' facilities, and (b) the licensee compensates the Corps for its project-related personnel and construction costs;
- (3) authorize the Corps to (a) inspect the construction, operation, and maintenance of any licensed facilities that may affect the structural integrity or operation of the Corps' project, and (b) order the licensee to stop any activity that may endanger the structural integrity or safety of the Corps' project;
- (4) require the licensee to submit a regulating plan to the Corps for approval at least 60 days prior to the start of construction, and to enter into an operating Memorandum of Agreement with the Corps describing the detailed operation of the power facilities acceptable to the Corps;
- (5) provide that the licensee shall have no claim under the license against the United States arising from any changes made in the structure, operation, or reservoir levels of the Corps' project; and
- (6) require the licensee to provide the Commission's Regional Director two copies of all correspondence between the licensee and the Corps and provide that the Commission's Regional Director shall not authorize construction until the Corps provides final written approval of the project.

## 2.0 PROPOSED ACTION AND ALTERNATIVES

### 2.1 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the project would not be built and environmental resources in the project area would not be affected.

### 2.2 APPLICANT'S PROPOSAL

#### 2.2.1 Proposed Project Facilities

The proposed project would be located at the existing Corps' Braddock Locks and Dam (see figures 1, 2, and 3). The original Monongahela Dam 2, constructed in 1906, was demolished and replaced in 2004 with a floated-in, gated dam positioned on reinforced concrete caissons. Along with the existing locks, which were last replaced in the late 1940's to early 1950's, the facility was renamed Braddock Locks and Dam upon completion of the new dam. The 1,007-foot-long locks and dam includes: (1) a 504-foot-long, gated section (four 110-foot-long gated bays); (2) an 84-foot-long fixed crest weir; (3) a land-side lock that is 110 feet wide by 720 feet long, and a river-side lock that is 56 feet wide by 360 feet long, which provide an 8.7-foot vertical lift (Port of Pittsburgh Commission undated); (4) a 55-foot-long right abutment; and (5) a 133-foot-long, 52-foot-wide left closure weir, constructed of cellular sheeting and tremie concrete (founded on rock at an elevation of 670.0 feet National Geodetic Vertical Datum [NGVD] 29).<sup>11</sup> Elevations of the spillway sill vary from 704.7 feet in gate bays 2 through 4, 714.0 feet at gate bay 1, and 723.7 feet at the fixed weir. The crest of the left closure weir is at 725.0 feet.

The proposed project would be constructed on the south (river left) side of the dam, opposite the location of the existing navigational locks and at the upstream face of the existing left closure weir (figure 2).<sup>12</sup> The proposed project would include the following new facilities: (1) a trash rack at the powerhouse intakes, to be constructed approximately 17 feet below the river surface, with 6-

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<sup>11</sup> In its license application, Hydro Friends provided all elevations as referenced to feet National Geodetic Vertical Datum [NGVD] 29, as we have in this final EA.

<sup>12</sup> For the remainder of this final EA, the Braddock Locks and Dam's left closure weir is referred to as the weir.

inch spacing;<sup>13</sup> (2) a 105-foot-long, 22-foot-wide, and 40-foot-high structural grade steel powerhouse constructed on a concrete foundation on rock that is anchored to the weir; (3) seven low-head, horizontal modular bulb turbine/generator units, each with an installed capacity of 0.75 MW, for a total authorized installed capacity of 5.25 MW; (4) a new 0.45-mile-long, 23-kilovolt (kV) transmission line constructed between the powerhouse and the existing Union Railroad substation; (5) a new approximately 460-square-foot switchyard; (6) a waterway barrier (e.g., Tuff Boom) installed upstream of the project to prevent debris and boats from interacting with the project; and (7) appurtenant facilities.

### *Powerhouse and Tailrace*

The powerhouse would contain generator equipment, backup battery power systems, an operating console, seven low-head, horizontal modular bulb turbines connected to seven generators, and associated control equipment.

The turbines would be installed in a single row, along with flow-control door assemblies that can open and close off flow to the units during an event that would require suspension of generation. Each turbine would have an installed capacity of 0.75 MW based on a design head of 10 feet and an approximate diameter of 7.7 feet, for a total authorized installed capacity of 5.25 MW. The design flow of each unit would be 1,100 cubic feet per second (cfs) with an operating range from a minimum of 440 cfs to a maximum of 1,110 cfs.

Each turbine would drive a 3-phase, 60-cycle, horizontally-oriented, induction generator. Each of the seven generators would have a nameplate rating of 0.8 MW and 4,160 volts at 1,200 revolutions per minute (RPM). The turbine discharge would be directed through seven concrete draft tubes constructed within the existing weir. Each of the 52-foot-long draft tubes would be approximately 8 feet wide and 8 feet high at the turbine, and 10 feet wide and 17 feet high at the tailrace. Flow would be directed into the existing channel to avoid erosion of the riprap-lined riverbanks and to not impede the Corps' operation of the locks and dam.

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<sup>13</sup> The trash rack would be approximately 15 feet tall and 95 feet long. Dimensions are estimated by staff, based on Hydro Friends' Exhibit F, filed November 4, 2013.

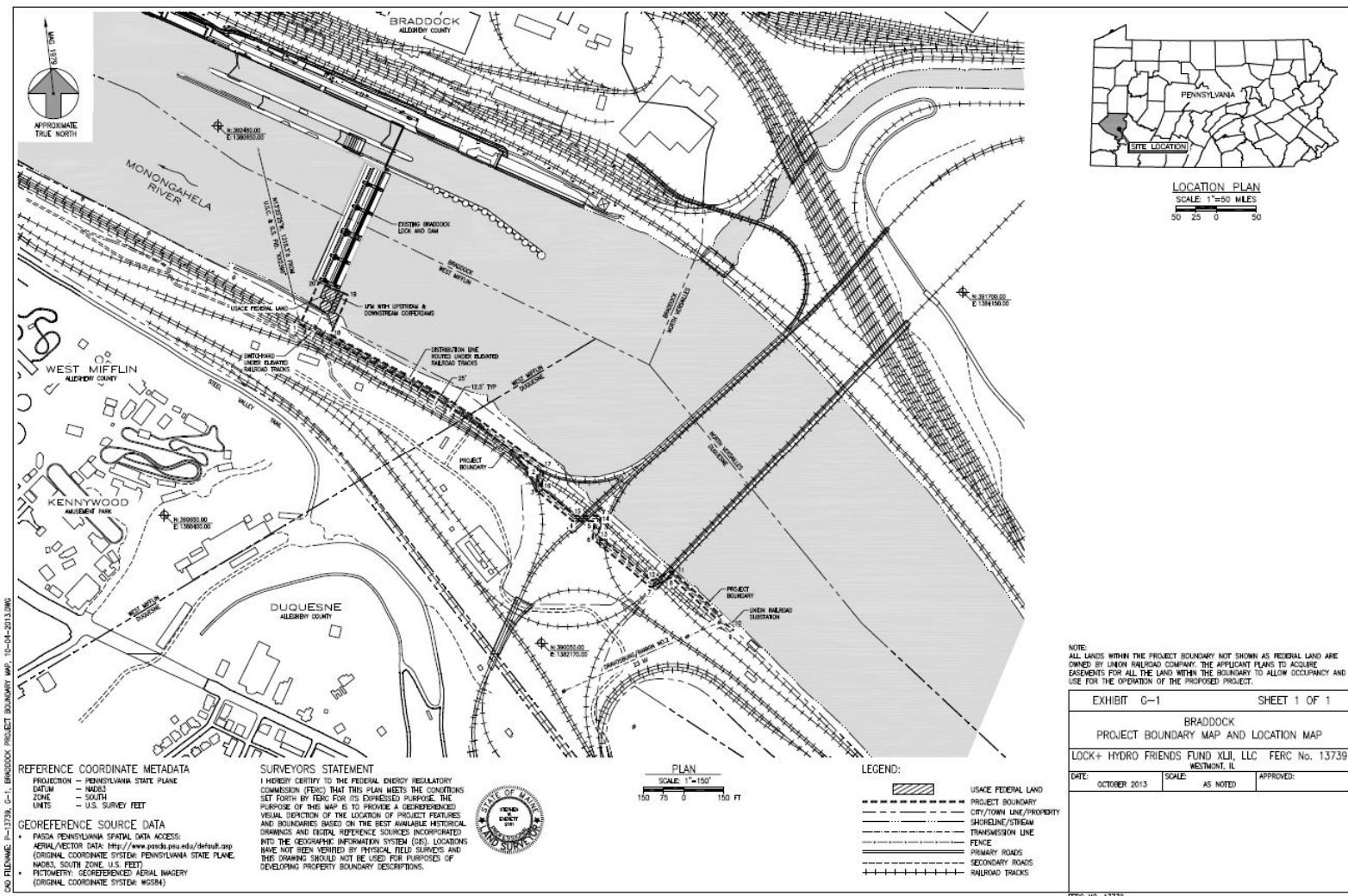


Figure 3. Project facilities for the Braddock Locks and Dam Hydroelectric Project, P-13739 (Source: Hydro Friends)

### *Transmission Line*

Project power would be delivered to the electric grid with the installation of a transformer in a new approximately 460-square-foot switchyard and a new 0.45-mile-long transmission line. The transmission line right-of-way would be approximately 20 feet wide. The distance between the powerhouse and the proposed switchyard would be approximately 100 feet, and would require the construction of one pole less than 50 feet tall. The distance between the switchyard and the proposed interconnection point at the existing Union Railway substation would be 0.45 mile. The voltage of the line would be 4.16 kV between the powerhouse and the proposed switchyard, where it would be stepped up to 23 kV and carried to the Union Railway substation. With the exception of the additional pole, the transmission line would be constructed under the existing elevated railway or on existing poles located below or alongside the elevated tracks.

### *Proposed Project Boundary*

The proposed project boundary would enclose the proposed powerhouse and tailrace, switchyard, and transmission line corridor (figure 3). Hydro Friends did not include its proposed rest area along the Great Allegheny Passage trail within the proposed project boundary.

## **2.2.2 Project Safety**

Under a hydropower license, the proposed Braddock Locks and Dam Hydroelectric Project would be subject to the Commission's project safety requirements. As part of the licensing process, Commission staff would evaluate the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Before the project is constructed, engineers from the Commission's New York Regional Office and the Corps would review the designs, plans, and specifications of the proposed generating modules, and other structures. During construction, engineers from the Commission and the Corps would frequently inspect the project to ensure adherence to approved plans and specifications, special license articles relating to construction, operation, and maintenance, and accepted engineering practices and procedures. Once construction is complete and the project enters the operation phase, Commission engineers would inspect it on a regular basis. Because the Braddock Locks and Dam is owned and operated by the Corps, the Commission would coordinate with the Corps to fulfill its obligation to ensure that the project safety requirements are met.

## **2.2.3 Proposed Project Operation**

The Corps currently operates the Braddock Locks and Dam as a run-of-river facility in order to maintain a near constant upper pool, and is operated for navigational



purposes on the Monongahela River (Corps 2012). The facility is manned 24 hours a day. Since 2004, the Corps has held an interim pool elevation at 721.8 feet at Braddock pool. The authorized Braddock pool elevation is 723.7 feet, to be established in the future as part of the completion of the Corps' Lower Monongahela Locks and Dams 2, 3, & 4 Project (Lower Mon Project),<sup>14</sup> concurrent with the removal of Locks and Dam 3. Typical elevation at the downstream Emsworth pool is 710 feet. The Corps periodically opens the Braddock Locks and Dam gates to move debris downstream.

The Corps also directs flows through its environmental gate,<sup>15</sup> which was constructed in Braddock dam in 2004, to maximize dissolved oxygen (DO) levels in the river.<sup>16</sup> In the Corps' 1991 Lower Monongahela River Navigation System Feasibility Study (Corps 1991a), the environmental gate is described as follows:

“A water quality [environmental] gate sill configuration has been developed...[to] permit a steep plunge angle which will create turbulence and maximize entrained bubble contact time in the tailwater. The discharge capacity of the water quality [environmental] gate....will be sufficient to provide water quality benefits throughout low to moderate flow periods which are of principle concern from a water quality perspective, and will aerate a significant portion of the river during higher flow regimes.”

Hydro Friends' proposed project would operate in a run-of-release mode, using the regulated releases that occur under current Corps' guidelines for the Braddock Locks and Dam. The design flow for all seven turbines would be 7,700 cfs; the operating range for

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<sup>14</sup> The Corps' Lower Monongahela Locks and Dams 2, 3, & 4 Project (Lower Mon Project) was authorized by Congress in 1992 to address the severely deteriorated conditions of the Corps' three navigation facilities on the Lower Monongahela River. The remaining work includes: (1) removal of Locks and Dam 3; (2) replacement of Locks and Dam 4; (3) pool level changes; (4) substantial dredging; and (5) relocation of multiple shore-side facilities. Although the project was initially scheduled for completion in 2004 at a cost of \$750 million, due to federal budget constraints, the current estimate for completion of the project is 2030, with a total projected cost of \$1.7 billion. At present, funding for completion of the project has not been approved.

<sup>15</sup> The Corps' environmental gate is also referred to as Gate No. 1 or the water quality gate in the Braddock Project proceedings. For simplicity, we have used the term 'environmental gate' in this document.

<sup>16</sup> In a letter filed January 14, 2013, the Corps states that the environmental gate is where the Corps has been directing flows to maximize DO levels in the river, particularly during the warm, low-flow season.

the units is between 440 cfs to operate a single unit and 10,150 cfs to operate all seven units. If available flows are less than 400 cfs, the project would be offline.

Table 2 below describes Hydro Friends' proposed flow distribution through the proposed project and existing features of the Corps' locks and dam facility. During higher-flow periods, Hydro Friends proposes that flows of up to 7,700 cfs be diverted to the turbines for electricity generation, and the means to pass additional flow would be at the discretion of the Corps. Additional flow would be diverted to the environmental gate up to 9,440 cfs,<sup>17</sup> and excess flow would be passed through a combination of gates 2 through 4. Hydro Friends would coordinate with the Corps regarding the flows upon which the turbines would need to be removed from the water in order to pass higher flows.

During lower-flow periods, Hydro Friends proposes that: (1) a minimum of 1,000 cfs would be passed through the Corps' environmental gate; and (2) up to 7,700 cfs would be diverted to the turbines for electricity generation.

The Braddock Project would not impound additional water, result in additional storage capacity, or affect the Corps' operation. A computerized operating system would assure a consistent run-of-release operation, Hydro Friends' staff would be on-site daily, and Hydro Friends proposes to provide the Corps with operational override capabilities in the event of emergency scenarios.

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<sup>17</sup> In its letter filed on November 27, 2013 regarding Hydro Friends' revised application, the Corps stated that it would maintain a minimum flow of 7,250 cfs through the environmental gate for water quality purposes, and that "[a]ny diversion of this flow, particularly during the low flow summer season, will reduce the functionality of the water quality [environmental] gate." Staff recognizes that the proposed project would operate on flows made available by the Corps, and that designating a minimum flow for the environmental gate would be at the Corps' discretion.

Table 2. Hydro Friends’ proposed monthly average flow distribution at the Braddock Project, based on the period of record from 1943 to 2004 (Source: Hydro Friends).

<b>Hydro Friends’ Proposed Flow Distribution</b>						
<b>Month</b>	<b>Average flow (cfs)</b>	<b>Lock Flow (cfs)</b>	<b>Environmental Gate Flow (cfs)</b>	<b>Environmental Gate Flow (percent)<sup>1</sup></b>	<b>Gates 2-4 (cfs)</b>	<b>Turbine flow (cfs)</b>
January	17,552	250	6,921	40	2,681	7,700
February	20,691	250	8,176	40	4,565	7,700
March	24,266	250	9,440	Maximum	6,876	7,700
April	18,642	250	7,357	40	3,335	7,700
May	14,770	250	4,356	30	2,464	7,700
June	9,216	250	2,690	30	0	6,276
July	6,296	250	1,209	20	0	4,837
August	5,747	250	1,099	20	0	4,398
September	4,980	250	1,000	21	0	3,730
October	5,390	250	1,028	20	0	4,112
November	9,569	250	1,864	20	0	7,455
December	15,496	250	4,574	30	2,972	7,700

<sup>1</sup> Hydro Friends states that environmental gate flow (percent) represents the percentage of water available to be passed through the Braddock dam’s environmental gate. “Maximum” represents the Corps’ current operating practice of a 9,440 cfs maximum flow through the environmental gate. Hydro Friends acknowledge that redistributing excess flow (i.e., flow not dedicated to energy production) between the environmental gate and Gates 2-4 would be at the discretion of the Corps. Lock flow was subtracted from the average flow before allocating flows to the gates and turbines.

## 2.2.4 Proposed Environmental Measures

In order to address potential environmental impacts, Hydro Friends proposes to:

- Operate the project in a run-of-release mode, as directed by the Corps; and
- Install and maintain a rest area along the Great Allegheny Passage's Steel Valley Trail<sup>18</sup> adjacent to the Braddock Project site that includes three benches (possibly with cover), two bike racks, and two interpretive signs (one discussing the project, the existing dam, and renewable energy; the other discussing the Great Allegheny Passage trail).

## 2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would include Hydro Friends' proposed measures as noted above and the following additions:

- develop and implement an operation compliance monitoring plan that includes provisions for documenting compliance with any of the Corps' operating requirements and establishing a schedule for reporting project compliance/non-compliance during normal operation and emergencies;
- develop and implement an erosion and sediment control plan to minimize construction-related effects; and
- develop and implement a water quality monitoring plan upstream and downstream of the Braddock Locks and Dam to include: (1) monitoring of summer water quality parameters prior to construction; (2) continuous, real-time monitoring of water quality parameters during project construction; and (3) continuous, real-time monitoring of summer water quality parameters for 5 years following project construction, and for an additional 5 years if the normal elevation of the Braddock pool increases during the term of the license as a result of the Corps' Lower Mon Project.

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<sup>18</sup> The Great Allegheny Passage is a rail trail in Maryland and Pennsylvania. It is the central trail of a network of long-distance hiker-biker trails covering hundreds of miles through the Allegheny region of the Appalachian Mountains, connecting Washington, D.C. to Pittsburgh, Pennsylvania and beyond.

## **2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY**

We did not identify any other alternatives to Hydro Friends' proposal.

## **3.0 ENVIRONMENTAL ANALYSIS**

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative* of the EA.<sup>19</sup>

### **3.1 GENERAL DESCRIPTION OF THE RIVER BASIN**

The Monongahela River flows through the Waynesburg Hills and into the Pittsburgh Low Plateau sections of the Appalachian Plateau province, where the proposed Braddock Project is located. Flood events are common in the rivers of the Appalachian Plateau due to the region's extreme dissection, high local relief, precipitous slopes, and narrow and discontinuous floodplains. This physiographic region is known as mostly unglaciated uplands with many streams forming a dendritic pattern (Pennsylvania Fish and Boat Commission [Pennsylvania FBC] 2011).

The drainage area of the basin above the Braddock Locks and Dam is 7,337 square miles (U.S. Geological Survey 2011a) and the average annual flow at the project is 12,692 cfs (for the years 1943 to 2004). The temperate climate in the upper Ohio River Basin has a mean minimum temperature range from 9 degrees Fahrenheit (°F) to 19°F, while the maximum mean temperature ranges from 75°F to 84°F. The average annual rainfall ranges from 34 to 53 inches a year (Pennsylvania FBC 2011).

The Monongahela River watershed is predominantly forested or used for agricultural purposes (about 80 percent, or 5,909 square miles). The remaining land uses

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<sup>19</sup> Unless noted otherwise, the sources of our information including cited correspondence are Hydro Friends' license application (September 17, 2012, as amended on September 25, 2013, November 4, 2013, and November 7, 2013) and a clarification regarding the proposed transmission line design filed on November 15, 2013.

are industrial and urban development (about 20 percent, or 1,477 square miles). Due to rough terrain and poor soils in the area, most agricultural lands extend east and west from the Monongahela River, with dairy farming and livestock-rearing being the dominant agricultural use (Pennsylvania DEP 2003).

Industrial and urban development is commonly located along the river valley. Mining of coal, sand, and limestone, and extraction of oil and natural gas are the major industries within the Monongahela River Basin. The proposed project is located in the greater Pittsburgh metropolitan area, which is characterized by urban and industrial development and has a history of extractive mining (Pennsylvania FBC 2011).

The major consumptive water use for the Monongahela River is for industrial and commercial activities. Public water supply is a secondary consumptive source for the river, particularly in the Pittsburgh area.

The primary non-consumptive uses of the Monongahela River include navigation and recreation. Nine navigation locks and dams owned and operated by the Corps are located along the 128 miles of the river and aid with the commercial shipping of products such as coal (Pennsylvania FBC 2011; Corps 2012). Five of the Corps' locks and dams (including Braddock Locks and Dam, located at RM 11.2) are located within the lower Monogahela River watershed, as noted in figure 2. The Braddock pool extends upstream to Locks and Dam 3, located at RM 23.8 in Elizabeth, Pennsylvania.<sup>20</sup> Other non-consumptive uses include water quality enhancements and/or aquatic life protection uses, such as the environmental gate (i.e., Gate 1) controlled by the Corps at the Braddock Locks and Dam, and recreational activities, such as boating, fishing, and some whitewater sports in the river's upper reaches (Anderson et al. 2000).

### **3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS**

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 CFR §1508.7), a cumulative 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 (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions

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<sup>20</sup> Locks and Dam 3 is scheduled to be removed by the Corps in the future. Upon its removal, the new Braddock pool would extend between Braddock Locks and Dam and Locks and Dam 4, located at RM 41.5 in Charleroi, Pennsylvania. The elevation of the future Braddock pool would be 723.7 feet. *See*: <http://www.lrp.usace.army.mil/Portals/72/docs/HotProjects/LMPJune2013.pdf>

taking place over a period of time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified water quality and fisheries resources as having the potential to be cumulatively affected by the proposed project in combination with other past, present, and foreseeable future activities. These resources were selected because the construction and operation of the project, in conjunction with other activities in the lower Monongahela River, may cumulatively affect water quality and fisheries resources.

### **3.2.1 Geographic Scope**

The geographic scope of the analysis defines the physical limits or boundaries of the proposed action's effects on the resources. Based on comments received during scoping, the geographic scope of our cumulative effects analysis extends from Charleroi Locks and Dam (Locks and Dam 4) on the Monongahela River downstream to the Emsworth Locks and Dam on the Ohio River. We chose these geographic bounds because any potential effects of the construction and operation of the proposed project in combination with other developmental activities in the basin, including the Corps' Lower Mon Project,<sup>21</sup> would be expected to occur in this area.

### **3.2.2 Temporal Scope**

The temporal scope of analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on water quality and fisheries resources. Based on the term of the proposed license, we will look 50 years into the future, concentrating on the effects on water quality and fisheries from reasonably foreseeable future actions. The historical discussion is limited, by necessity, to the amount of available information for each resource. We identified the present resource conditions based on the license application, agency comments, and comprehensive plans.

## **3.3 PROPOSED ACTION AND ACTION ALTERNATIVES**

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

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<sup>21</sup>See

<http://www.lrp.usace.army.mil/Missions/Planning,ProgramsProjectManagement/HotProjects/LowerMonProject.aspx>

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this final EA. Based on this, we have determined that geology and soils, aquatic, terrestrial, threatened and endangered species, recreation, and cultural resources may be affected by the proposed Braddock Project. We have not identified any substantive issues related to socioeconomics or navigation; therefore, these resources are not assessed in this final EA. We present our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

### **3.3.1 Geology and Soils**

#### **3.3.1.1 Affected Environment**

The proposed project is located along the Monongahela River in the western Allegheny Plateau, which is a part of the Appalachian Plateau physiographic province (USGS 1995). Geologic formations in the Braddock Project's vicinity are relatively flat-lying, horizontally-bedded sedimentary deposits from the Pennsylvanian age. The proposed project is located within the Casselman Formation, characterized by shale as the primary rock type present, and siltstone or limestone as the secondary rock type (Pennsylvania DCNR undated b). Sedimentary deposits here have a slight westward dip and are generally thin gradually from east to west, and are part of a relatively thick sequence of interbedded sandstone and shale with occasional calcareous shale, limestone, and coal deposits.

Sedimentary beds deposited during the Pennsylvanian age contain large bituminous coal seams in the western half of Pennsylvania, including the project area. Allegheny County is located within the Main Bituminous Field of Pennsylvania, specifically within the area of high volatile bituminous coal (ACED Planning Division 2008).

Soil types within the project area are highly disturbed due to industrial activity, and include Urban land (UB) within low-lying areas along the Monongahela River, an area of Urban land-Rainsboro complex (URB) in gently sloping areas adjacent to the project, and areas of Gilpin-Upshur complex (GQF) along steep slopes to the southwest of the proposed powerhouse (figure 4). In general, soil types along steep slopes are commonly shallow, weakly developed, poorly drained, and have low fertility and high erosion potential, and soil types on gentler slopes or over unconsolidated sediments are often deep, well-drained, and fertile (USGS 1995).



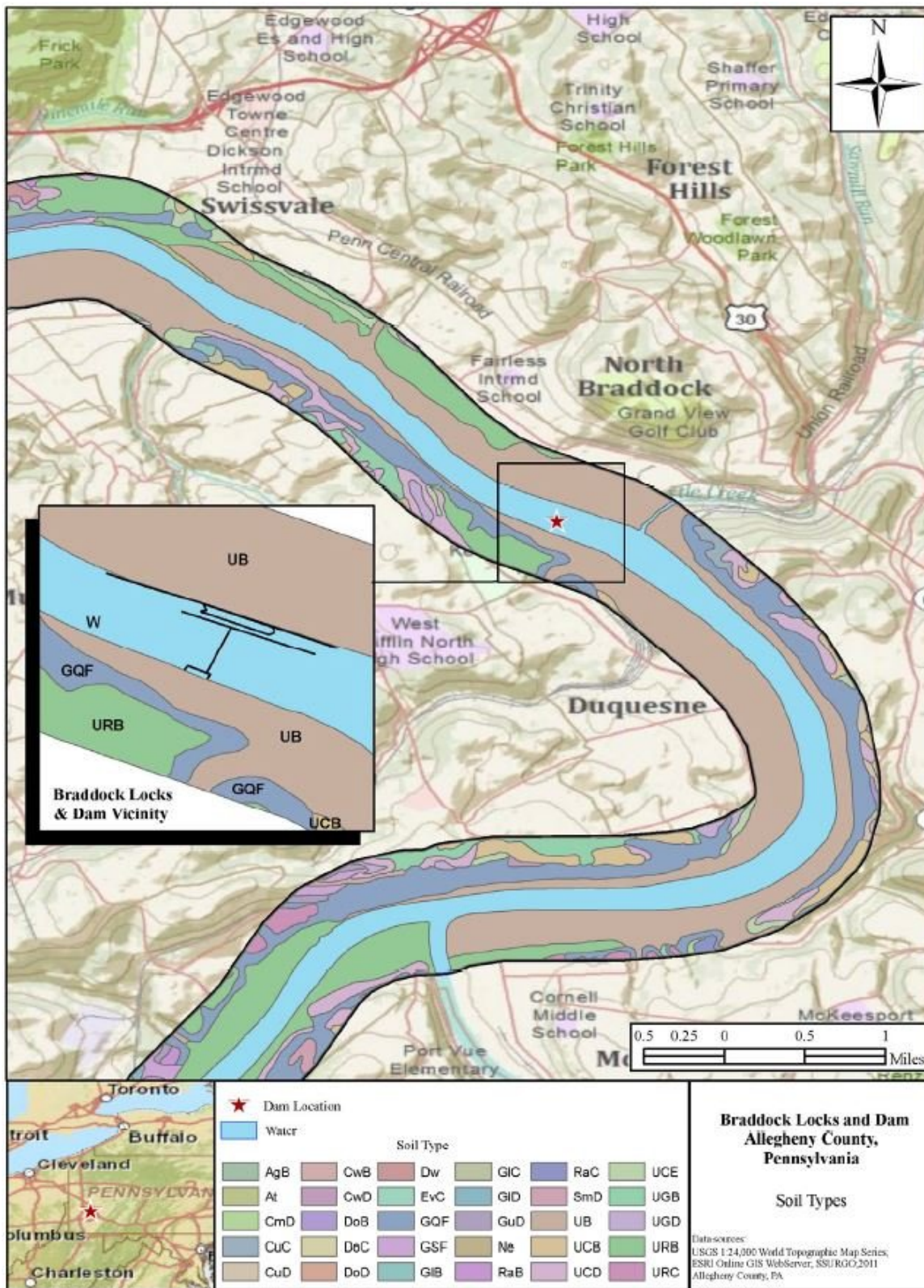


Figure 4. Soil types near Braddock Locks and Dam (Source: Hydro Friends).

### 3.3.1.2 Environmental Effects

Land-disturbing activities required to construct the project would be limited to clearing a small area of previously disturbed upland habitat to construct an approximately 460-square-foot switchyard and a single transmission line pole. Other land-disturbing activities would be minimal, as the project transmission line would otherwise be placed on existing railroad bridge structures or existing poles and terminate at the existing Union Railroad substation, and a staging area (approximately 115 feet by 65 feet) for equipment and materials would be placed on an existing paved or gravel area adjacent to the dam, or on the Corps' weir itself. In-water disturbance would involve construction of a new steel frame powerhouse with seven modular turbine-generator units (as described in section 2.2.1, *Proposed Project Facilities*) that would be affixed to the upstream face of the weir, and drilling downstream of the weir to construct draft tubes. Approximately 565 cubic yards of river-bottom material would be excavated on the upstream side of the weir to construct project facilities. Two cofferdams, each about 105 feet in length, would be placed upstream and downstream of the proposed project, for the construction of the turbines and draft tubes, respectively. Therefore, construction has the potential to cause both land-based and in-water erosion and sedimentation.

Hydro Friends states that it would employ best management practices to minimize effects to riparian and in-water habitat during construction of the project, although they do not describe what specific practices would be used.

In its January 14, 2013, comments on SD1, the Corps stated that fine sediments upstream of Braddock dam are likely to contain heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons, and phenols. No other entities provided comments.

#### *Staff Analysis*

The proposed project construction would result in ground and riverbed disturbance, which could result in sediment (including potentially contaminated sediment) reaching or suspending, respectively, within the Monongahela River. Development of an erosion and sediment control plan would minimize erosion and sedimentation associated with the minimal land-based construction proposed for the project and the disturbance of in-water sediment during placement of cofferdams during project construction. As excavated sediment within the Monongahela River may contain contaminants, inclusion of a provision to specify procedures for disposing of contaminated sediments using appropriate methods, and within an approved landfill, would minimize the potential distribution of contaminated sediments.

### 3.3.2 Aquatic Resources

#### 3.3.2.1 Affected Environment

##### Water Quantity

The Monongahela River begins at the confluence of the West Fork River and the Tygart Valley River at Fairmont, West Virginia. The river then flows north for approximately 130 miles to its confluence with the Allegheny River in Pittsburgh, Pennsylvania, forming the Ohio River. The river has a drainage area of 7,386 square miles and includes portions of northern West Virginia, western Maryland, and southwestern Pennsylvania. The entire length of the Monongahela River is controlled and maintained for navigation by a series of nine locks and dams owned and operated by the Corps.

The proposed project would be located at the Braddock Locks and Dam (also known as Locks and Dam No. 2), in the boroughs of Braddock and West Mifflin, Pennsylvania. The Corps operates the Braddock Locks and Dam for the primary purpose of maintaining a constant upper pool depth for navigation. The Braddock pool extends 12.6 miles upstream to Locks and Dam 3 at Elizabeth, Pennsylvania, and has a normal pool elevation of 721.8 feet. The Braddock Locks and Dam is composed of a 721-foot-long gated spillway, a land-side lock that is 110 feet wide and 720 feet long, and a river-side lock that is 56 feet wide and 360 feet long. The Corps operates one of the spillway gates (Gate 1 or the “environmental gate”) to enhance water quality and to maintain or enhance suitable environmental conditions for many species. The lock chambers also pass fish and other aquatic organisms upstream and downstream of the dams during scheduled lockages that have been conducted since 2009 specifically for allowing fish passage during the spring spawning period. Other project uses include fishing, navigation, and resource protection (i.e., the environmental gate).

The gross storage capacity and surface area of the Braddock Locks and Dam at an elevation of 721.8 feet is 18,937 acre-feet and 1,191 acres, respectively. However, there is no usable storage capacity given the Corps current operating conditions. The drainage area of the basin above the Braddock Locks and Dam is 7,337 square miles (U.S. Geological Survey 2011a). Table 3 provides the monthly minimum, maximum, and average flows recorded at U.S. Geological Survey Gage 03085000 at Braddock, Pennsylvania between 1943 and 2004. Table 4 provides average monthly flows through the locks, the environmental gate, and the other combined flow through the remaining gates and the weir where the project would be constructed. The average annual flow at the Braddock Locks and Dam is 12,692 cfs. Average monthly flows at the dam range between 4,980 cfs in September to 24,266 cfs in March. Minimum and maximum flows observed at the Braddock gage were 703 and 188,000 cfs, respectively.

Table 3. Braddock Locks and Dam hydrologic data (cfs) based on data from U.S. Geological Survey Gage 03085000 at Braddock, Pennsylvania (1943 to 2004).

Month	Average Flow	Minimum Flow	Maximum Flow	10 percent Exceedance	90 percent Exceedance
January	17,552	1,290	188,000	35,500	4,209
February	20,691	1,300	135,000	39,600	5,554
March	24,266	2,170	171,000	44,810	8,427
April	18,642	2,650	140,000	33,800	6,169
May	14,770	1,710	121,000	32,310	3,929
June	9,216	1,340	158,000	20,810	2,310
July	6,296	1,180	88,100	13,200	1,880
August	5,747	1,040	144,000	11,810	1,820
September	4,980	703	117,000	9,396	1,710
October	5,390	828	162,000	10,600	1,750
November	9,569	720	154,000	19,700	2,229
December	15,496	1,000	112,000	30,520	3,834
Annual	12,692	703	188,000	29,500	2,300

Table 4. Braddock monthly average flow (cfs) data based on data from U.S. Geological Survey Gage 03085000 at Braddock, Pennsylvania (1943 to 2004) and flow distribution at the existing Braddock Locks and Dam.

Month	Average Flow	Lock Flow	Environmental Gate Flow	Gates 2-4 and/or Weir Flow
January	17,552	250	9,440	7,862
February	20,691	250	9,440	11,001
March	24,266	250	9,440	14,576
April	18,642	250	9,440	8,952
May	14,770	250	9,440	5,080
June	9,216	250	8,966	0
July	6,296	250	6,046	0
August	5,747	250	5,497	0
September	4,980	250	4,730	0
October	5,390	250	5,140	0
November	9,569	250	9,319	0
December	15,496	250	9,440	5,806

### Water Quality

Municipal and industrial activities in the Monongahela River Basin have resulted in the introduction of pathogens, organic contaminants (e.g., detergents, petroleum hydrocarbons, and volatile organic compounds) from urban runoff and inadequate waste

water treatment, inorganic contaminants (e.g., iron, manganese, aluminum, zinc, arsenic, barium, cadmium, cobalt, copper, and silver), and unnaturally low pH levels (EPA 2002). Mining has been identified as having the single greatest impact on surface water quality of any single land use in the basin (Anderson et al. 2000). In the 1960s, the river was occasionally too acidic to support a diverse aquatic community. Since that time, water quality has improved as a result of reductions in industrial discharge, improvements in wastewater treatment (FERC 1998), improvements in mine drainage treatment (Anderson et al. 2000), and low-flow augmentation. Despite improvements, acid- and mineral-laden mine drainage still presents one of the most serious threats to water quality in the Monongahela River Basin (Anderson et al. 2000).

According to 25 Pennsylvania Code (Pa. Code) §93.9(o), minimum use designations that apply to all Pennsylvania surface waters include Warm Water Fishes, Potable/Industrial/Livestock/Wildlife Water Supply, Irrigation, Boating, Fishing, Water Contact Sports, and Esthetics. Protected water uses in the proposed project area include Warm Water Fishes and navigation. Specific Pennsylvania water quality standards applicable to the Braddock Locks and Dam Project waters are listed in tables 5 and 6. Water quality conditions are expected to meet these criteria at least 99 percent of the time under 25 Pa. Code §96.3(c). When this is not achieved due to natural water quality conditions, as determined by the Pennsylvania DEP, the natural quality that is achieved at least 99 percent of the time shall be the applicable water quality criterion for protection of fish and aquatic life, according to 25 Pa. Code §96.3(e).

The Corps maintains its own antidegradation policy (Corps 1991b), which states:

“In all cases, the existing instream water uses and the water quality necessary to protect them will be maintained. This national policy is founded on the overall objective established in the Clean Water Act to restore and maintain the chemical, physical and biological integrity of the nation’s waters. The thrust of this policy is to protect all existing and future water uses including aquatic life, assimilative capacity, water supply, recreation and future hydropower development. As steward of project resources, the Corps cannot allow water quality to be degraded below its current state except as noted above.”

The Corps has set a target minimum DO concentration of 7.5 mg/L downstream of the Braddock Locks and Dam under current pool conditions since the environmental gate was installed in 2004 (Corps 2012). However, the *Water Quality Study Report* indicated that DO concentrations downstream of the Braddock Locks and Dam were occasionally lower than the Corps’ target of 7.5 mg/L.

Table 5. Pennsylvania water quality standards applicable to the Braddock Locks and Dam Project waters. (Source: 25 Pa. Code § 93.7).

Parameter	Objective/Standard
DO	Minimum daily average 5.0 mg/L; minimum 4.0 mg/L.
pH	From 6.0 to 9.0 inclusive.
Turbidity	Maximum of 40 Nephelometric Turbidity Units [NTUs] from May 15 through September 15 and 100 NTUs from September 16 to May 14.

Table 6. Pennsylvania maximum allowable water temperature standards applicable to the Braddock Locks and Dam Project waters. (Source: 25 Pa. Code § 93.7).

Period	Maximum Allowable Temperature		Period	Maximum Allowable Temperature	
	°F	°C		°F	°C
Jan 1-31	40	4	Aug 1-15	87	31
Feb 1-29	40	4	Aug 16-30	87	31
Mar 1-31	46	8	Sept 1-15	84	29
Apr 1-15	52	11	Sept 16-30	78	26
Apr 16-30	58	14	Oct 1-15	72	22
May 1-15	64	18	Oct 16-31	66	19
May 16-30	72	22	Nov 1-15	58	14
June 1-15	80	27	Nov 16-30	50	10
June 16-30	84	29	Dec 1-31	42	6
July 1-31	87	31			

Hydro Friends examined existing conditions and temporal trends in water quality in its September 25, 2013, *Water Quality Study Report*. Four water quality parameters were identified as being important to assessing potential impacts of hydropower: water temperature, DO, pH, and turbidity. Temperatures exceeded state water quality criteria by up to 6.3 degrees Celsius (°C), but typically exceeded criteria by less than 2°C. Approximately 18percent of the water temperature data (1990 to 2011) exceeded state criteria, most frequently in August. DO concentrations (1990 to 2011) were almost always greater than the minimum daily average criteria (5.0 milligrams per liter [mg/L]) with the exception of periods in late August 2002 and late September 2004. Approximately 0.3 percent of pH measurements (1990 to 2011) were outside the state criteria (6.0 to 9.0). Turbidity levels (1990 to 2002) were typically below 20 NTUs, only

exceeding the state criteria of 40 NTUs on six occasions. Although high turbidity is often associated with high flow events, flow did not appear to substantially influence turbidity.

### Fishery Resources

Decades of mining, agricultural, commercial, and industrial practices have impacted the aquatic resources in the Monongahela River, with a near loss of fish and invertebrate communities by the mid-20th century (Pennsylvania FBC 2011; Anderson et al. 2000; Hart 2012). Substantial water quality improvement over the past several decades has led to improvements in aquatic community composition such that the Monongahela River now supports a diverse array of fish and macroinvertebrate resources. Lock chamber and nighttime pool electrofishing surveys and other fishery sampling events conducted by the Pennsylvania FBC and available data in the Ohio River Valley Water Sanitation Commission (ORSANCO) database from 1967 to 2010 have shown a steady recovery of fish assemblages (ORSANCO 2009; Pennsylvania FBC 2009, 2010). Dramatic increases (2.6 to 12.7 fold) in the biomass of forage species at several locks in the Monongahela River was also observed from 2003 to 2010. Overall, the fish population in the Monongahela River at Braddock Locks and Dam has greatly improved in health, diversity, and abundance (Pennsylvania FBC 2010).

The lower Monongahela River near the Braddock Project is a low-gradient, seventh-order, large river with a wetted width of approximately 900 feet at its confluence with the Allegheny River in Pittsburgh. The river is widest (1,150 feet wide from bank to bank) near the mouth of Turtle Creek located just upstream of the Braddock Locks and Dam at RM 11.6. The nine locks and dams along the Monongahela River result in a series of pool habitats that are deeper and provide less habitat complexity than occurs in unregulated rivers. Dredging to maintain a minimum navigational channel depth of 9 feet primarily occurs just downstream of the locks where the river is typically the shallowest. The pools above each of the locks and dams, which impound waters, typically contain deeper waters. The general macrohabitats of the navigation pools consist of tailwaters, main channel habitat, and back channel habitat. Shallow water habitats include river shorelines, tributary mouths, and embayments typically containing sand, gravel, and some cobble substrates. In addition to locks and dams, several other manmade habitats exist within this highly industrialized region, including bridges, piers, and other hardened shoreline features (e.g., rip rap). Due to the developed nature of this river, little riparian habitat (i.e., wetlands, littoral zones, riparian forests, and floodplains) is present. The Three Rivers Management Plan (Pennsylvania FBC 2011) provides a comprehensive description of aquatic habitat within the Allegheny, Monongahela, and Ohio rivers. There is no essential fish habitat (EFH) designated in the project area.

The waters of the Monongahela River near the Braddock Project support a diverse population of warm water game- and non-game fish species. A total of 48 fish species



were collected in the Braddock pool/Elizabeth Locks and Dam tailwaters,<sup>22</sup> the Braddock lock chambers,<sup>23</sup> and the Braddock Locks and Dam tailwaters.<sup>24</sup> Minnow species and gizzard shad dominate the fish community in the Braddock Project vicinity. Other common species include bluegill, channel catfish, common carp, freshwater drum, rock bass, smallmouth bass, spotted bass, and white bass. The smaller non-game fish (e.g., minnows) provide the forage base for predatory fish and play an important role as hosts for glochidial (i.e., larval) stages of mussels.

Recreational angling opportunities are relatively limited near the Braddock Project due to the highly industrialized nature of the area. However, fishing access is available on the Monongahela River at 11<sup>th</sup> Street in the Town of Braddock, Pennsylvania, at a town-owned public boat ramp area. Tailwaters tend to attract anglers and provide some of the best year-round fishing opportunities on the lower Monongahela River because game fish are known to congregate there (Pennsylvania FBC 2012b). Smallmouth bass, walleye, and white bass tend to be the species preferred by anglers in the area (Pennsylvania FBC 2011). In addition to these three species, bluegill, pumpkinseed, muskellunge, tiger muskellunge, common carp, hybrid striped bass, channel catfish, flathead catfish, freshwater drum, and rock bass provide angling alternatives. Due to PCB contamination, there are consumption advisories for common carp, freshwater drum, and channel catfish in the Braddock Locks and Dam area.

The majority of the fish species found in the Braddock Project vicinity have self-sustaining populations. However, sporadic Pennsylvania FBC stocking of select sportfish species has occurred in the project vicinity. Walleye fry and fingerlings, muskellunge fingerlings, and tiger muskellunge fingerlings, have been stocked in the Braddock pool, but not since 2006.<sup>25</sup> Below Braddock Locks and Dam, past stocking events have included walleye fry and fingerlings, muskellunge fingerlings, tiger muskellunge fingerlings, and hybrid white bass X striped bass fingerlings, but this has not occurred

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<sup>22</sup> A nighttime electrofishing survey was conducted in the Braddock pool/Elizabeth Lock and Dam tailwaters by Pennsylvania FBC in 2012 (Pennsylvania FBC 2012a).

<sup>23</sup> Combined results of electrofishing surveys conducted in the Braddock lock chambers by Pennsylvania FBC in 2003 and 2010 (Pennsylvania FBC 2003, 2010).

<sup>24</sup> Survey of the Braddock tailwaters in 2009.

<sup>25</sup> Pennsylvania FBC Historical stocking records. [Online] URL: [http://pfbc.state.pa.us/pfbc\\_webgis/WWCWStockingDetails\\_historical.aspx](http://pfbc.state.pa.us/pfbc_webgis/WWCWStockingDetails_historical.aspx). Accessed May 6, 2013.



since 2009. However, a fingerling size white bass X striped bass hybrid stocking was planned below the Braddock Locks and Dam in 2013.<sup>26</sup>

In its letter dated November 23, 2011, Pennsylvania DCNR indicated that no impact to species and resources of concern was likely. However, five fish species listed as either endangered, candidates for listing, or extirpated within the Commonwealth of Pennsylvania are known, or have the potential, to occur within the project area based on information from the Pennsylvania Natural Heritage Program (2012; table 7).

Table 7. Federally and state-listed threatened and endangered fish and mussel species within the vicinity of the Braddock Project (Source: FWS<sup>27</sup> and Pennsylvania Natural Heritage Program<sup>28</sup>)

Scientific Name	Common Name	Federal Status	State Status
<b>Fish species</b>			
<i>Chaenobryttus gulosus</i>	Warmouth		Endangered
<i>Lampetra aepyptera</i>	Least Brook Lamprey		Candidate
<i>Notropis blennioides</i>	River Shiner		Endangered
<i>Notropis burchanani</i>	Ghost Shiner		Endangered
<i>Polyodon spathula</i>	Paddlefish		Extirpated
<b>Mussel species</b>			
<i>Cyprogenia stegaria</i>	Fanshell	Endangered	
<i>Epioblasma triquetra</i>	Snuffbox	Endangered	Endangered
<i>Lampsilis abrupta</i>	Pink Mucket	Endangered	
<i>Obovaria subrotunda</i>	Round Hickorynut		Endangered
<i>Plethobasus cooperianus</i>	Orange-foot Pimpleback	Endangered	
<i>Plethobasus cyphus</i>	Sheepnose Mussel	Endangered	Threatened
<i>Quadrula cylindrica</i>	Rabbitsfoot	Candidate	Endangered
<i>Quadrula verrucosa</i>	Pistolgrip Mussel		Endangered
<i>Simpsonaias ambigua</i>	Salamander Mussel		Endangered

<sup>26</sup> Pennsylvania FBC current stocking records. [Online] URL: [http://pfbc.state.pa.us/pfbc\\_webgis/WWCWStockingDetails\\_current.aspx](http://pfbc.state.pa.us/pfbc_webgis/WWCWStockingDetails_current.aspx). Accessed May 6, 2013.

<sup>27</sup> FWS listings and occurrences for Pennsylvania. [Online] URL: [http://ecos.fws.gov/tess\\_public/pub/stateListingAndOccurrenceIndividual.jsp?state=PA&s8fid=112761032792&s8fid=112762573902](http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=PA&s8fid=112761032792&s8fid=112762573902). Accessed May 6, 2013.

<sup>28</sup> Pennsylvania Natural Heritage Program. [Online] URL: <http://www.naturalheritage.state.pa.us/Species.aspx>. Accessed May 6, 2013.

Ghost shiner (*Notropis buchanani*), a species listed as endangered by the Commonwealth of Pennsylvania, was captured in relatively large numbers in electrofishing surveys of the Braddock lock chambers (Pennsylvania FBC 2003a, 2010). The ghost shiner is a small (adults: 1.5 to 2.0 inches long), short lived ( $\leq 3$  years) minnow species (Pflieger 1997). Their preferred habitats include backwaters and large pools protected from swift currents within low gradient sections of large moderately clear-water streams. This species is commonly found in mid-water column schools associated with other shiners (e.g., mimic shiners). Spawning takes place in spring and early summer in slow riffles with sand or fine gravel substrates.

River shiner (*Notropis blennioides*) are also listed as an endangered fish species in Pennsylvania and were collected in the Braddock pool in 1977, and in the Emsworth pool just downstream of the Braddock Project area as recently as 2007 (ORSANCO 2009). River shiner is a short lived, summer spawning minnow species that prefers sand and gravel bar habitat (Hudson and Buchanan 2001).

Warmouth (*Lepomis gulosus*) are listed as endangered by the Commonwealth of Pennsylvania and have the potential to occur near the proposed Braddock Project. Although not collected in the project area, warmouth have been found in the Morgantown pool in West Virginia (ORSANCO 2009). Warmouth are a sunfish species somewhat similar in shape to the rock bass. Warmouth typically range in size from 2–7 inches, although some individuals are larger. They prefer to inhabit slow-moving waters with soft sediments and aquatic vegetation. Males build and guard nests in shallow water from late spring through early summer (Smith 1985).

Least brook lamprey is a candidate for listing as endangered by the Commonwealth of Pennsylvania. Least brook lamprey have not been documented in the project area but are present in the Haymaker Run portion of the Turtle Creek watershed (Turtle Creek Watershed Association 2002), which flows into Braddock pool approximately 1,000 feet upstream of the Braddock Locks and Dam. Least brook lamprey is a non-parasitic lamprey species that complete their entire life cycle in headwater streams. The habitat requirements of the least brook lamprey consist of pools of small, sand or silt bottomed streams for the ammocoetes (larvae) and clean gravel riffles and runs of high gradient streams for adults (Cooper 1983).

Although paddlefish are listed as extirpated in Pennsylvania, several paddlefish (*Polyodon spathula*) have been captured in the Monongahela River since 1970 (Pennsylvania FBC 2011), most recently in 2003 and 2005 (Pennsylvania FBC 2005, Pennsylvania FBC 2011). These fish are likely of stocked origin as there are active stocking programs in the Ohio, Allegheny, and Monongahela watersheds. In 1991, Pennsylvania FBC initiated a paddlefish stocking program in an attempt to reestablish self-sustaining populations in the Allegheny River and Ohio River (Lorson 1991 and

2008). Paddlefish are also being stocked upstream of the Braddock Project in West Virginia as part of a reintroduction/restoration effort. The Pennsylvania FBC is currently implementing a paddlefish restoration program through a combination of stocking, research, and working with the Corps to provide passage of fish through navigational locks (Pennsylvania FBC 2003b).

Paddlefish are a large, long-lived (Smith 1985), cartilaginous, filter feeding (primarily on zooplankton) species native to the Mississippi drainage (Henely et al. 2001). They are highly migratory with adult paddlefish typically undertaking upstream spawning migrations to swift, rocky, riffle habitats in late winter and early spring (Jenkins and Burkhead 1993). Paddlefish were a common component of fish communities in the large rivers of the Mississippi River drainage before 1900. Overharvest and human alteration of rivers have resulted in significant declines in paddlefish populations throughout their range. Construction of dams on rivers has especially affected paddlefish by altering traditional river habitats and disrupting spawning migrations and other movements. Paddlefish are currently harvested both recreationally and commercially in some states in the Mississippi drainage. However, paddlefish have been extirpated from four states and Canada, and 11 of 22 states within the remaining species range now list the paddlefish as endangered, threatened, or as species of special concern.

### Freshwater mussels

Freshwater mussels are one of the most diverse groups of aquatic organisms and nearly 300 species have been reported in North America (Williams et al. 1993). However, mussels have declined dramatically over the past century. Declines have been attributed to many factors, but are primarily related to habitat degradation resulting from land use practices (deforestation, farming, livestock, construction); stream channelization; dredging; pollution; invasive species; commercial harvesting; loss of host fish; and construction of impoundments (Bogan 1993a; Watters 2000). Freshwater mussels are particularly sensitive to physical and chemical habitat alterations, which can result from impoundment dredging and channelization (Williams et al. 1993).

Freshwater mussels exhibit a unique life history in that the larvae have a parasitic life stage. The typical life cycle consists of males discharging sperm into the surrounding water, which are then dispersed by water currents. The females draw in sperm through their incurrent siphon during feeding and respiration activities. Following fertilization the eggs in the outer gills of the females develop into larval forms referred to as glochidia. Glochidia are generally released in spring or summer although a few species are known to release in winter. Glochidia need to attach to a suitable host fish, either on the gills or fins. Some mussel species are host-specific, while others can use a wide variety of fishes as hosts. After metamorphosis, juvenile mussels drop from the host fish and settle to the river bottom, burying themselves in the substrate to continue their life

cycle. Juveniles must settle on substrate suitable for the adult life stage as they have limited mobility.

Mussels, like fish species, have historically suffered from degraded water quality and habitat in the Monongahela River. In the early 1900s, freshwater mussels were rare or absent in the river and these conditions persisted up to the 1960s, with some improvements in the 1970s and 1980s, and significant improvements over the past two decades (Anderson et al. 2000). Historically, the Monongahela River supported as many as 25 different species of mussels based on live specimens, plus an additional three species based on shell material (Hart 2012). However, nine of these species are presumed extirpated from Pennsylvania (Bogan 1993b).

Hart (2012) conducted a comprehensive field survey for mussels in the Monongahela River in 2008, covering 31 locations over 91 river miles. Five sites were surveyed for mussels in the Emsworth pool, resulting in the collection of 19 live mussels representing six species: pink heelsplitter (14), fluted shell (1), fragile papershell (1), giant floater (1), maple leaf (1), and fatmucket (1). Six sites were surveyed in the Braddock pool, resulting in the collection of 71 mussels: pink heelsplitter (70), and maple leaf (1). In addition to native freshwater mussels, the invasive zebra mussel (*Dreissena polymorpha*) was found in very low numbers in both pools.

Six state-listed threatened and endangered mussel species (snuffbox, round hickorynut, sheepnose, rabbitsfoot [also a candidate for protection under the ESA], pistolgrip, and salamander mussel) have the potential to occur in Allegheny County, Pennsylvania (table 7). None of these species was observed by Hart (2012) during his comprehensive field surveys of the Monongahela River. In its letter dated November 23, 2011, Pennsylvania DCNR indicated that no impact to species and resources of concern was likely. Federally listed mussel species are discussed in section 3.3.4, *Threatened and Endangered Species*.

### **3.3.2.2 Environmental Effects**

#### Construction effects on water quality and quantity

Construction of the proposed project is expected to take about 12 weeks,<sup>29</sup> and would involve temporary placement of cofferdams in proximity to the existing dam. As noted in section 3.3.1, *Geology and Soils*, cofferdams would be placed upstream of the weir for construction of the concrete pedestal to support the proposed turbines, and

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<sup>29</sup> In the license application, Hydro Friends states that construction of the Braddock Project would begin within 3 months of the issuance of required authorizations for the project, and the construction would be completed in about 12 weeks.

downstream during draft tube construction. The areas would be dewatered once the cofferdams are in place. Excavation of approximately 565 cubic yards of material would occur prior to the installation of the concrete pedestal to support the proposed turbines, and no excavation should be required for draft tube construction. Cofferdam placement would likely result in temporary disturbance to river bottom substrates, alteration of flow distribution across the dam spillway, and a temporary increase in turbidity.

The Corps, in its January 14, 2013 comments on Hydro Friends' water quality modeling and monitoring studies, requested that Hydro Friends conduct continuous, real-time water quality monitoring above and below Braddock Locks and Dam during project construction. In response to Hydro Friends' September 24, 2013 revisions to its application, the Corps stated that its comments remain unchanged.

### *Staff Analysis*

The construction of the project is likely to result in temporary increases in turbidity and altered flow distribution resulting from the installation of the proposed cofferdams. These changes and their effects on water quality and instream biota should be minor, short-term, and highly localized because of the small project footprint and the short, 12-week construction schedule.

In order to ensure that water quality is maintained during all stages of the project, Hydro Friends could develop a water quality monitoring plan in consultation with the Corps that includes continuous, real-time water quality monitoring above and below the Corps' Braddock Locks and Dam during project construction. Real-time water quality monitoring during construction would provide a means for detecting certain water quality parameters that are at levels inconsistent with those specified by the current Pennsylvania State criteria or conditions harmful to aquatic biota, and allow corrective measures to be established in an expeditious manner. The plan could include monitoring of water quality parameters likely to be affected by construction activities such as turbidity and DO concentration. With a water quality monitoring plan in place, project construction is not likely to adversely affect water quality in the Braddock Project vicinity.

### Operational effects on water quality and quantity

Hydro Friends proposes to operate the project in a run-of-release mode. Project operation would not affect the current water surface elevations of the lower Monongahela River or the net quantity of water being passed downstream. However, the addition of the seven proposed bulb turbines within the overflow section of the existing dam would result in higher flows on the western side of the river. Hydro Friends relied on a modified application of the Tennant Method to justify the quantity of flow that the Corps' would continue to release through the environmental gate(see section 2.2.3, *Proposed*

*Project Operation*).<sup>30</sup> Based on Hydro Friends' calculations, a minimum of 20 percent of available flow (1,209 cfs based on the average flow for July) and up to the maximum flow of 9,440 cfs would pass through the environmental gate, with the balance passing through the proposed turbines or over the weir or other gates. However, in a letter filed November 27, 2013, the Corps stated that it would maintain a minimum flow of 7,250 cfs through the environmental gate for water quality purposes, and that any diversion of this flow would reduce the functionality of the environmental gate.

The Corps, during the December 5, 2012 afternoon scoping meeting and in its January 14, 2013 comments on Hydro Friends' water quality modeling and monitoring studies, expressed concerns about the effect of the proposed project operation on water quality, particularly DO concentration, downstream of the Braddock Locks and Dam. The Corps stated that the proposed shifting of downstream releases from its environmental gate to the proposed powerhouse could result in decreased DO concentrations downstream of the project, and thus be inconsistent with its antidegradation policy. The Corps was also concerned that the eventual completion of the Lower Mon Project could cause an increase in summer DO stratification in the Braddock pool resulting in decreases in DO downstream of the project. Due to the potential for changing conditions because of the Lower Mon Project, the Corps contends that the present function and efficiency of the environmental gate should not be interpreted as being representative of its future need and effectiveness. Therefore, the Corps recommended that Hydro Friends conduct continuous, real-time water quality and quantity monitoring upstream and downstream of Braddock Dam prior to construction, during construction, and throughout the duration of the license.

#### *Staff Analysis*

If the project is constructed and operated in the manner which is being proposed, the Corps' ability to operate the Braddock Locks and Dam for navigational purposes would not be adversely affected. Project operation would not result in a net change in the quantity of water being passed downstream because of the proposed run-of-release operating mode. Hydro Friends' *Water Quality Modeling Study* indicates that project operation, due to a shift in some flow releases from the Corps' environmental gate to the project turbines and the depth of the powerhouse intake, could result in a decrease in DO

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<sup>30</sup> The Tennant Method (Tennant 1975) was developed for setting instream and bypass flow recommendations, whereby a minimum percentage of total flow is allocated to a stream reach to preserve available habitat for aquatic species. The use of the Tennant Method for setting minimum flows through individual crest gates (e.g. the Corps' environmental gate) is not typical.

downstream of the Corps' dam. This is especially true during hot and/or dry years when the potential for DO stratification in the Braddock pool increases. The potential for DO stratification in the Braddock pool would be further increased when the normal elevation of the Braddock pool rises due to the completion of the Lower Mon Project.

In order to evaluate the effects of the proposed project on water quality downstream of Braddock Locks and Dam, Hydro Friends conducted a *Water Quality Modeling Study*. The modeling study used a hydrodynamic model and a water quality model to analyze the potential effects of proposed project operation on DO concentrations during summer low-flow conditions. The results indicated that the proposed project operation would result in modest decreases in DO concentrations below the environmental gate (0.07 to 0.32 mg/L) and the proposed turbine locations (0.14 to 0.35 mg/L) relative to simulated baseline conditions. The results also indicate that there is little evidence for strong DO stratification upstream of the Braddock dam based on vertical DO profiles.

Based on the predicted magnitude of these decreases, it is unlikely that biota in the project vicinity would be impacted, or that DO concentrations would fall to levels below that specified by the current Pennsylvania State water quality criteria (table 5). However, future DO stratification in the Braddock pool due to an extremely hot and/or dry summer, or the completion of the Lower Mon Project cannot be ruled out. If DO stratification does occur in the Braddock pool, the importance of the Corps' environmental gate for aeration may increase relative to current conditions, increasing the importance of having adequate flows through the environmental gate. Regardless of Hydro Friends' proposed project operation, the Corps would retain control of the flow distribution at the Braddock Locks and Dam.

In order to ensure that water quality is maintained during all stages of the project, Hydro Friends could develop a water quality monitoring plan in consultation with the Corps (potential aspects of the plan during project construction are discussed above). The plan could include DO monitoring prior to project construction, and continuous, real-time DO monitoring for 5 years following project construction, and for an additional 5 years following the completion of the Lower Mon Project. Monitoring for 5 years should result in a high likelihood of capturing an extremely hot and/or dry year that could lead to DO stratification above Braddock Dam, given the frequency of summer conditions that may cause DO stratification. Although the Corps recommended continuous DO monitoring for the length of the license, 5 years of monitoring would be adequate to establish whether project operation would result in reductions in DO concentrations downstream of the project. Monitoring could be conducted during the summer months upstream of the Braddock Locks and Dam to identify DO stratification in the Braddock pool, and downstream from the environmental gate and turbines to identify project impacts on downstream water quality. Pre-construction monitoring could be used as additional baseline information to evaluate the impacts of project operation on water

quality. Water quality monitoring would ensure that the results of the *Water Quality Modeling Study* are confirmed by in-stream, post-installation conditions. Further, water quality monitoring would ensure that if DO concentrations decrease because of an extremely hot and/or dry summer or because of the completion of the Lower Mon Project, flows to the environmental gate could be increased so that DO concentrations below the project are protective of downstream aquatic resources.

With a water quality monitoring plan in place, project operation is not likely to adversely affect water quality below the Braddock Project. This plan would also aid in the Corps' ability to maintain suitable DO concentrations downstream of the project using its environmental gate.

#### Operation compliance monitoring

Hydro Friends has proposed to operate the project in a run-of-release mode, but has not proposed specific measures for documenting its compliance with its proposed run-of-release mode of operation. Implementation of an operation compliance monitoring plan would provide a mechanism for Hydro Friends to collect and record data needed to document compliance with run-of-release operation. Generally, Commission licenses for non-federal projects at Corps' dams require the licensee to develop an operating plan and a Memorandum of Agreement (MOA) with the Corps.<sup>31</sup> The operating plan describes the mode of hydropower operation, impoundment flow diversion and regulation requirements for the Corps' project and integration of operation of the hydroelectric facility in the Corps' emergency action plan. The MOA describes the detailed operation of the project acceptable to the Corps and any restrictions needed to protect the purposes of the Corps' project for navigation. Development of an operation compliance monitoring plan would incorporate this MOA and include provisions for documenting compliance with any Corps' operating requirements and establishing a schedule for reporting project compliance/non-compliance during normal operation and emergencies. Operation of the Braddock Project in accordance with an MOA with the Corps and implementation of an operation compliance monitoring plan would ensure run-of-release operation and continued minimization of impacts to aquatic resources and water quality that would otherwise occur under fluctuating impoundment elevations.

#### Construction effects on fish and mussels

Construction activities associated with the project have the potential to adversely affect resident fish, mussel, and invertebrate populations through temporary displacement or through mortality associated with cofferdam construction, dewatering, or excavation.

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<sup>31</sup> See MOU between the Commission and the Corps of Engineers on Non-federal Hydropower Projects, dated March 2011.



For a description of the construction activities as they relate to aquatic resources, see section 3.3.2, *Water Quantity and Quality*.

### *Staff Analysis*

Fish species in the vicinity of the construction area may be temporarily displaced due the construction of the cofferdams, boat traffic associated with construction, and increases in turbidity associated with cofferdam construction, dewatering, and excavation. These disturbances should be temporary and should not result in a substantial or permanent impact on the fish population in Braddock pool or the Braddock dam tailwaters. Fish trapped within the cofferdams could suffer mortality. Given the small footprint of the proposed cofferdams, mortality due to fish becoming trapped within the cofferdams should be minimal. However, if live fish are observed within the cofferdams during dewatering, Hydro Friends should make a reasonable attempt to relocate them.

The placement of cofferdams and associated excavation and dewatering of the areas within the cofferdams are likely to result in mortality of mussels in the immediate vicinity if they are present. No state-listed mussel species were encountered in Emsworth or Braddock pools during surveys conducted in 2008 (Hart 2012). Although sampling did not occur in proximity to Braddock Locks and Dam, the apparent lack of state-listed mussel species in the project vicinity and the small area that would be impacted by cofferdam construction make it unlikely that the construction activities associated with the project would have an impact on state-listed mussel populations in either Braddock pool or the Braddock dam tailwaters.

### Operational effects on fish entrainment and impingement

Operation of the proposed project has the potential to cause impingement or entrainment of fish resulting in potential injury or death. Hydro Friends has proposed to install seven low head bulb turbines embedded in a large frame module, which would be deployed on the southern, downstream side of the existing Braddock dam. Each turbine would be 7.7 feet in diameter, consist of four blades without gaps, and have a maximum rotation speed of 150 RPM. Maximum calculated project intake velocities would be approximately 2 feet per second, with the proposed 6-inch clear trash rack spacing.

No agency commented on the potential for fish entrainment or impingement at the project.

### *Staff Analysis*

Entrainment could occur when fish are unable to overcome the approach velocity at the trash racks and pass through the turbines during project operation. The proposed 6-

inch trash rack spacing would allow all but the largest fish to pass through the trash racks and into the large frame module where they would be subject to injury or mortality, or at the very least be lost from the Braddock pool fishery. Calculated intake velocities would allow fish in the project vicinity with burst swimming speeds less than 2 feet per second to become entrained. Entrainment may occur regardless of swimming performance if flow through the trash racks represents an attraction for downstream movement. However, at Braddock Locks and Dam, attractant flow is also created by the locks and the environmental gate, potentially reducing entrainment due to deliberate downstream fish movement.

The *Fish Entrainment Survival Assessment* conducted by Hydro Friends indicated that approximately 67,900 (range: 53,300 to 97,400) fish would become entrained annually, and that entrainment rates would likely be highest in the summer and fall months. Juvenile life stages would account for the vast majority of fish entrained. The study indicated that the total number of individuals entrained annually would be highest for rock bass (22,980), bluegill (10,886), gizzard shad (10,293), and smallmouth bass (7,592). Estimated annual turbine-related mortality due to entrainment would be approximately 4,264 fish (or 6 percent mortality).

Most of the fish entrained by the project would be small juveniles, a life stage which is often exposed to high natural mortality rates. The species most likely to be entrained by the project also exhibit high fecundity and relatively rapid maturation. Therefore, the small number of juvenile fish expected to be killed due to entrainment is not likely to result in any measurable impact on fish populations in Braddock pool or in the Braddock dam tailwaters.

In addition to entrainment, fish can become impinged on the trash racks if they are unable to overcome the approach velocity and are too large to pass through the trash racks. Due to the proposed 6-inch trash rack spacing, only very large fish would be susceptible and these large individuals would be expected to easily escape the relatively low proposed intake velocities. Therefore, impingement at the project should be minimal and is not expected to have an adverse impact on fish populations in the project area.

#### Operational effects on fish and mussels

Operation of the proposed project has the potential to adversely affect fish and mussel species in the Braddock dam tailwaters through altered habitat conditions and reductions in water quality. Under proposed operating conditions, the west bank of the river would receive increased flows, and flow through the environmental gate would decrease. This would result in changes to the cross-sectional flow pattern and could result in habitat changes and reduced water quality immediately downstream of the dam.

The Corps expressed concern that redistributing a portion of the downstream flow releases from its environmental gate to the proposed powerhouse could affect current velocities and flow direction downstream of the dam, with potential effects on aquatic habitat and biota.

### *Staff Analysis*

Changes to the cross-sectional flow pattern and the resulting changes in habitat could cause species assemblages immediately downstream of the turbine outflows to be dominated by species that are better adapted to higher flows. Species that prefer slower pool-type environments may also be displaced. This change in species composition should be highly localized and would not result in a significant change in the community composition in Emsworth pool or the Braddock tailwater.

There is potential for the change in flow distribution from the environmental gate to the turbines to reduce the DO concentrations immediately downstream of Braddock dam, resulting in the episodic displacement of species sensitive to reduced DO concentrations. These events would be most likely to occur in the summer months during periods of low flow.

The results of the *Water Quality Modeling Study* indicated that the proposed project operation would result in minimal decreases in DO concentrations below the environmental gate (0.07 to 0.32 mg/L) and the proposed turbine locations (0.14 to 0.35 mg/L) relative to simulated baseline conditions. Based on these predicted magnitudes of the decreases in DO concentration, it is unlikely that biota in the project vicinity would be impacted, or that the DO concentration would fall to a level below that specified by current Pennsylvania water quality criteria. Developing a plan for continuous DO monitoring directly downstream from the environmental gate and the turbines during the summer months, would ensure that the results of the *Water Quality Modeling Study* are confirmed under project operating conditions.

### **3.3.2.3 Cumulative Effects**

Water quality and fisheries are resources that could be cumulatively affected by the construction and operation of the Braddock Project, in light of future developmental activities that could occur in the lower Monongahela River. The Corps' Lower Mon Project and the future development of hydrogeneration facilities on additional Corps' navigational facilities were identified as reasonably foreseeable actions that, when combined with the proposed action, could result in cumulative effects on the environment.

Hydro Friends proposes to operate its proposed project in run-of-release mode, thereby maintaining the Corps' existing run-of-river operation, where outflow closely

approximates inflow. Operating in a run-of-release mode is likely to have no project-related effects to water quality downstream of the Corps' Braddock Locks and Dam because the timing and quantity of flows would be controlled by the Corps. However, developing a water quality monitoring plan (as discussed above) in consultation with the Corps would further ensure that changes to water quality as a result of project operations could be addressed if they occur. Because the pool level would remain in the control of the Corps, project operation would not affect water quality in the reservoir. Project-related effects would be limited to those caused by construction-related activities. Contaminated sediments documented to be present within the vicinity of proposed excavation sites may be disturbed and re-suspended into the water column during construction of the proposed project. Developing and implementing an erosion and sediment control plan would help to reduce any cumulative effects to water quality in the Monongahela River.

The future removal of Locks and Dam 3 in Elizabeth, Pennsylvania, as part of the Lower Mon Project, would create a single pool (Braddock pool) between Braddock and Charleroi, and result in a net increase in the Braddock pool elevation. The completion of the Lower Mon Project would result in a longer, deeper Braddock pool. The Braddock pool is currently being maintained at the "interim" elevation of 721.8 feet, as compared to the previous pool elevation of 718.7 feet. Therefore, the eventual raise (potentially by 2030) of the Braddock pool to 723.7 feet will result in an additional raise of 1.9 feet.

The primary concern associated with the Lower Mon Project is that an increase in pool elevation would cause the project intake to be located in deeper water with lower DO concentration, resulting in negative effects on downstream biota, or DO concentrations below that specified by the current Pennsylvania water quality standards. There is little evidence for strong DO stratification upstream of the Braddock dam based on vertical DO profiles. However, the potential for increased DO stratification and reduced DO concentrations immediately downstream of the project as a result of the completion of the Lower Mon Project cannot be ruled out. If the Corps' Lower Mon Project is fully implemented during any license term issued for the Braddock Project, resulting in increased pool depth, developing a water quality monitoring plan that includes 5 years of DO monitoring downstream of the installed turbines upon completion of the Lower Mon Project, would ensure that, if DO concentrations downstream of the project approached levels that would threaten biota or would fall below levels specified by the current Pennsylvania water quality standards, appropriate action could be taken in a timely manner.

No hydropower generation facilities are currently proposed on the Monongahela River between the Charleroi Locks and Dam and Emsworth Locks and Dam (i.e., the geographic scope of the cumulative effects analysis). Given the predominantly resident (i.e., non-migratory) fish community, future hydrogeneration facilities associated with

existing navigational dams are not likely to have a measurable impact on the fish community.

Issuing an original license for the Braddock Project with the recommended environmental measures, including run-of-release operation, a water quality monitoring plan, and an erosion and sediment control plan, would not be expected to result in a cumulative effect to water quality and fisheries on the Monongahela River between the Charleroi Locks and Dam and Emsworth Locks and Dam.

### 3.3.3 Terrestrial Resources

#### 3.3.3.1 Affected Environment

Upland habitat in the vicinity of the project has been modified heavily by human activity, particularly industrial practices, as discussed below in section 3.3.5, *Land Use*. Upland habitat within the proposed project area is typical of disturbed industrial areas, and includes plant species such as tree-of-heaven, Amur honeysuckle, sumac species, Asiatic bittersweet, and various herbaceous weeds.<sup>32</sup>

Wetland habitat present in the vicinity of the project is limited to the riverine habitat of the Monongahela River, classified by the FWS as permanently flooded, lower perennial riverine habitat with an unconsolidated bottom (R2UBH).<sup>33</sup> Due to the degree of industrial development along the shoreline, including the placement of rip rap, concrete walls, and other shoreline augmentation, little riparian or bottomland habitat exists in the vicinity of the project. A narrow band of sycamores and other tree species are present along the shore of the Monongahela River in the vicinity of the project, although none appear to be present within the area to be disturbed by project construction.

Wildlife species expected to use the edge habitat available within the immediate project area would be those tolerant of human development and activity (i.e., raccoon, Virginia opossum, eastern gray squirrel, and various passerine bird species) and those that would use aquatic habitat within the Monongahela River (i.e., waterfowl, muskrat, and beaver).

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<sup>32</sup> Other than Amur honeysuckle, plant species have been described by staff from site photographs provided by Hydro Friends.

<sup>33</sup> See <http://www.fws.gov/wetlands/Wetlands-Mapper.html>

### **3.3.3.2 Environmental Effects**

As discussed in section 3.3.1, *Geology and Soils*, land-disturbing activities for project construction would be limited to about 460 square foot area for construction of a new switchyard and a small area for placement of a single transmission line pole. No riparian habitat or wetlands, other than the Monongahela River (discussed above in section 3.3.2, *Aquatic Resources*) would be affected by construction or operation of the project.

Hydro Friends did not propose any measures to protect terrestrial resources, and no entities provided comments.

#### *Staff Analysis*

Since a small area of previously disturbed land would be removed during construction of the proposed switchyard and transmission line pole, no clearing would be required to develop the storage or lay-down areas, and the primary transmission line would be placed under an existing elevated railway or on existing poles located below or alongside the elevated tracks (thereby limiting both ground disturbance for construction and the potential for bird collisions with power lines), we find that the proposed project would have a minimal effect on upland resources. As project operation would result in no additional fluctuation of water levels in the vicinity of the project other than those occurring as part of existing Corps operation of the locks and dam or due to natural events (i.e., flooding), there would be no effect expected to riparian habitat within the project area.

### **3.3.4 Threatened and Endangered Species**

#### **3.3.4.1 Affected Environment**

##### Freshwater Mussels

Five federally endangered mussel species (the fanshell, snuffbox, pink mucket, orange-foot pimpleback, and sheepnose) are listed by the FWS as potentially occurring within Allegheny County and the reach of the Monongahela River in the vicinity of the Braddock Project (see table 7 above). None of these species were observed by Hart (2012) during comprehensive field surveys of the Monongahela River, including the vicinity of the Braddock Project.

#### **3.3.4.2 Environmental Effects**

The placement of cofferdams and associated excavation and dewatering of the areas within the cofferdams could result in mortality of federally listed mussels in the

immediate vicinity of the project if they were present. Changes to the cross-sectional flow pattern and the resulting changes in habitat could cause mussel species assemblages immediately downstream of the turbine outflows to be dominated by species that are better adapted to higher flows, displacing species that prefer pool-type environments. There is also potential for the change in flow distribution from the environmental gate to the turbines to reduce the DO concentrations immediately downstream of Braddock dam.

Hydro Friends states that during an August 30, 2012 meeting at the FWS State College Field Office, FWS stated that no federally listed species were of concern within the proposed project area. Subsequent e-mail correspondence received by Hydro Friends on September 8, 2012, indicated that the FWS had no significant concerns regarding the Braddock Project, given its location and small footprint.

### *Staff Analysis*

No federally endangered mussel species were encountered in Emsworth or Braddock pools during surveys conducted in 2008 (Hart 2012). Although Hart did not sample within the project footprint, both the thorough surveys conducted by Hart in the vicinity of the project, and consultation with FWS indicating a lack of potential effects on listed mussel species, are strong evidence that no federally endangered mussels are likely to exist within the proposed Braddock Project area. Therefore, we conclude that project construction and operation would have no effect on federally endangered or threatened mussel species.

## **3.3.5 Recreation, Land Use, and Aesthetics**

### **3.3.5.1 Affected Environment**

#### **Recreation**

Pennsylvania offers a variety of outdoor recreational opportunities through federal, state, and local agencies, as well as through the private sector. Public outdoor recreational areas within the project vicinity include state parks, scenic rivers, state forests, trails and greenways, local parks, campgrounds, golf courses, and amusement parks. While the project area is highly industrialized and there are no formal recreational facilities located within the proposed project boundary, a national scenic trail, the Great Allegheny Passage of the Potomac Heritage National Scenic Trail, passes nearby.

#### Regional Recreation Opportunities

There are 10 county parks in Allegheny County and three state forests in the southwestern Pennsylvania region. Kennywood Amusement Park, which is a National Historic Landmark, is the closest recreational use area to the proposed project and is

Table 8. Recreational Opportunities at Allegheny County parks (Source: Hydro Friends).

Recreation Facility	Kennywood Amusement Park	North Park	South Park	Boyce Park	Round Hill Park	Deer Lakes Park	Harrison Hills Park	Hartwood Acres Park	Settlers Cabin Park	White Oak Park
Address	4800 Kennywood Blvd. West Mifflin, PA 15122	Pearce Mill Road Allison Park, PA 15101	Buffalo Drive South Park, PA 15129	675 Old Frankstown Road Pittsburgh, PA 15239	651 Round Hill Road Elizabeth, PA 15037	1090 Bailey Run Road Tarentum, PA 15084	5200 Freeport Road Natrona Heights, PA 15065	200 Hartwood Acres Pittsburgh, PA 15238	1225 Greer Road Oakdale, PA 15071	3 Muse Lane McKeesport, PA 15131
Acreage	--	3,075	2,013	1,096	1,101	1,180	500	629	1,610	810
Amphitheater			X					X		
Cabins		X	X						X	
Groves/ Shelters		X	X		X	X	X		X	X
Hiking/ Trails		X	X		X	X	X	X	X	X
Picnicking			X	X						
Fishing		X								
Vistas		X					X			
Swimming		X	X	X					X	
Golf Course		X	X			X				
Playground		X	X		X	X	X			X
Ball Fields/ Tennis Courts		X	X	X		X				
Other	Amusement park rides and concession stands	Horseshoe pits, ice skating, nature center, wildfowl reserve, dog park	Ice skating, theatre, gardens, horse show rink, café, dog park, bike rental, model airplane field, BMX track	Four-season activity center, nature center, action park, skiing and snow tubing, model airplane field, log house tours	Visitor center, day on the farm program	Visitor center, day on the farm program	Environmental learning center, wildlife observation blind, birding area, guided walks and nature camps	Mansion/stable complex, guided tours	Log cabin	Ash-grove, garden, dog park





Figure 5. Allegheny County parks recreational facilities (Source: Hydro Friends).

located 0.2 mile southwest of the Braddock Locks and Dam in the Borough of West Mifflin, Pennsylvania. The park was originally built in 1898 and offers a variety of rides and concessions.

#### *Allegheny County Parks*

Ten county parks within Allegheny County are located within approximately 25 miles of the proposed project. A summary of these parks, which provide a mixture of day-use and camping facilities, is shown on table 8. Figure 5 provides a map indicating each park's location in relation to the proposed project.

#### *Regional State Forests*

There are three state forests regionally located in southwestern Pennsylvania. Gallitzin State Forest provides recreation opportunities such as:

51 miles of trails and roads suitable for hiking, one developed state forest picnic area, primitive backpack camping, six designated campsites, hunting and fishing, horseback riding, and mountain biking (Pennsylvania DCNR 2011). Clear Creek State Forest provides recreation opportunities such as: 35 miles of trails and roads suitable for hiking, permitted camping, hunting and fishing, vistas, horseback riding, and mountain biking (Pennsylvania DCNR 2011). Forbes State Forest provides numerous recreation opportunities, such as: 250 miles of trails and roads suitable for hiking, two developed state forest picnic areas, primitive backpack camping, six designated motorized campsites, hunting and fishing, scenic vistas, horseback riding, and mountain biking (Pennsylvania DCNR 2011).

### *The Great Allegheny Passage Trail System*

The Great Allegheny Passage is part of the Potomac Heritage National Scenic Trail, which is a diverse network of trails that covers five geographic areas from the Northern Neck of Virginia up through Pittsburgh, Pennsylvania. The 150-mile-long Great Allegheny Passage was primarily developed along abandoned rail corridors and runs along the western side of the Monongahela River, past the proposed project. The trail runs from Pittsburgh, Pennsylvania, to Cumberland, Maryland, where it connects with the 184.5-mile C&O Canal Towpath to create a 334.5-mile traffic and motorized vehicle-free route between Pittsburgh and Washington, DC (The Allegheny Trail Alliance 2013). Figure 6 presents a map of the trail's location in relation to the proposed project (adjacent to Kennywood Amusement Park).

The portion of the Great Allegheny Passage trail that passes through the vicinity of the Braddock Project is called the Steel Valley Trail. The Steel Valley Trail predominantly consists of a packed, crushed limestone surface. Bicycling and hiking are the two most popular activities that occur along the trail, and sections of the trail system are open to equestrians. The entire trail system is accessible between dawn and dusk, and the winter snow allows for cross-country skiing and snowshoeing. Fishermen can take the trail to access fishing locations, and bird watching is another popular activity that occurs along the trail (The Allegheny Trail Alliance 2011).

### Existing Recreation Facilities and Opportunities

As discussed in section 3.3.2, *Aquatic Resources*, angling opportunities are limited near the project due to the industrialized nature of the area, but fishing opportunities do exist downstream of the Braddock dam and along accessible shoreline areas. Downstream of the Braddock Locks and Dam facility, fishing access is available on the Monongahela River at 11<sup>th</sup> Street in the Town of Braddock, Pennsylvania, at a town-owned public boat ramp area. The

Pennsylvania FBC has identified Braddock Locks and Dam as one of the state’s “fishing hotspots” for recreational anglers (Pennsylvania FBC 2012c). Common species targeted by anglers include smallmouth bass, white bass, sauger, walleye, sunfish, common carp, freshwater drum, and channel catfish; however, due to PCB contamination, there are consumption advisories for common carp, freshwater drum, and channel catfish in the project area.

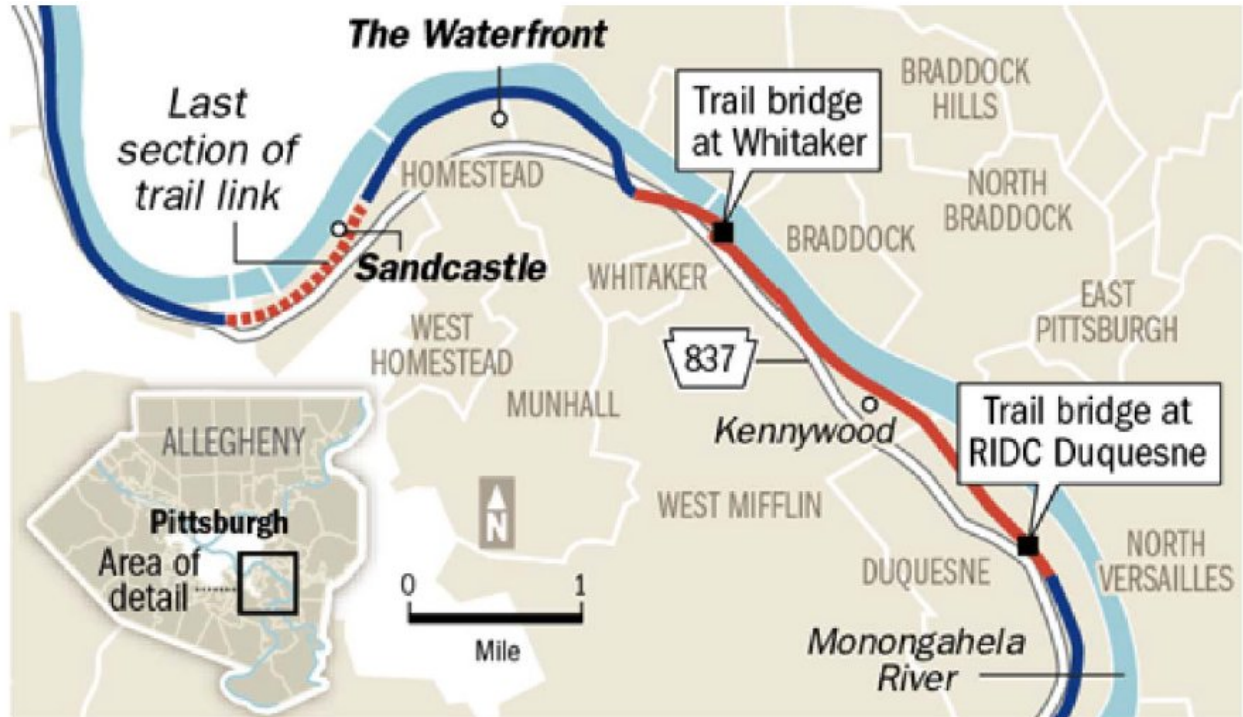


Figure 6. Great Allegheny Passage trail within vicinity of project (Source: Allegheny Trail Alliance).

#### Recreational Use and Needs

As discussed above, no formal recreational facilities are located within the proposed project and no focused study of recreational use was conducted in the project vicinity because of the current industrial landscape and limited recreational resources. The Pennsylvania State Comprehensive Outdoor Recreation Plan (SCORP) also does not identify any specific planning issues or recommendations related to the proposed Braddock Project lands or the installation or operation of the proposed project. The Pennsylvania SCORP, which Pennsylvania is required to update every 5 years, is a statewide plan that addresses outdoor recreation. The National Park Service requires that each plan assess outdoor recreation resources, identify the current challenges of recreation providers, analyze the current recreational needs of residents, and outline a course of action to improve and enhance the state of outdoor recreation over the next 5 years (Pennsylvania DCNR 2009).

The SCORP contains 28 programmatic and five funding recommendations to enhance outdoor recreation facilities and services throughout the state. These recommendations are organized under four major goals of the plan: (1) strengthen connections between outdoor recreation, healthy lifestyles, and economic benefits in communities; (2) reconnect people to the outdoors and develop a stewardship ethic through outdoor recreation; (3) develop a statewide land and water trail network to facilitate recreation, transportation, and healthy lifestyles; and (4) enhance outdoor recreation through better state agency cooperation (Pennsylvania DCNR 2009). Several surveys were conducted for the development of the SCORP. Two of those surveys, the Resident Survey and the Trail Gap Survey, provide general information on the recreation needs in the project vicinity.

The Resident Survey identified resident's desires for increased recreational facilities and improvements. The majority of respondents (61 percent) indicated a desire for more bicycle paths. The Trail Gap Survey found that among geographic issues, respondents assigned the highest importance to providing connections between existing trails, closing a gap within an existing trail, and building trails that connect communities to each other (Pennsylvania DCNR 2009). Additionally, respondents assigned less importance to: building trails that access open space (parks, forests, game lands, etc.); providing trails that connect neighborhoods, shopping areas, and workplaces within communities; providing convenient trailheads and access points; building trails that provide access to remote areas; providing trails within walking distance of users' homes; and connecting neighborhoods to schools (Pennsylvania DCNR 2009).

The Braddock Locks and Dam facility is one of nine navigational structures that provides year-round navigation on the Monongahela River. According to the Corps' Navigation Data Center, around 20,000 vessels and barges pass through the locks and dam facility each year. In 2008, a total of 26,519 vessels and barges were recorded at the Braddock Locks and Dam, the highest number recorded during the period of record (2008-2011). In 2011, 19,583 vessels traveled through the facility. Loaded barges comprised more than half of the traffic at the facility and most vessels were commercial. Of the 26,519 vessels that passed through in 2008, only 1,071 were recreational. Between 2009 and 2011, there were approximately 1,500 recreational vessels that passed through the Braddock Locks and Dam (Corps 2012b).

### **Land Use**

The lands surrounding the Braddock Locks and Dam are primarily industrial, vacant, or unclassified. The Braddock Project is bordered by railroad corridors parallel to the river on both sides, which transition into industrial or

vacant land. The Kennywood Amusement Park, which is addressed in more detail above, is located approximately 0.2 mile southwest of the proposed project.

In the vicinity of the proposed project there are several brownfields<sup>34</sup> where industrial facilities once existed, including the Port Perry - North Versailles brownfields, just east of the proposed project in Braddock; the Duquesne brownfield, approximately 0.7 mile southwest of the proposed project; and the Carrie Furnace brownfield, approximately 1.2 miles downstream of the proposed project. None of these three brownfields have been redeveloped. Partially redeveloped brownfields include the Regional Industrial Development Corporation City Center of Duquesne, approximately 1.0 mile upstream of the Braddock Project, and the Steel Valley Area - Warehouse sites, approximately 2.5 miles downstream of the Braddock Project. Fully redeveloped brownfields in the proposed project vicinity include the Waterfront site, approximately 3.2 miles downstream of the proposed project and the Keystone Commons site, approximately 1.5 miles east of the proposed project, in Braddock (ACED Planning Division 2008).

There are several greenways in the vicinity of the Braddock Project that are a part of the Allegheny Land Trust GREENPRINT. Allegheny County has proposed additional greenways to be considered for development in the region. These proposed greenways are not located within the project area (ACED Planning Division 2008).

### **Aesthetics**

The area of the Braddock Project is a mixture of industrial/vacant lands, brownfields, and nearby parks. The visual landscape in the vicinity of the project area is defined by the abandoned industrial facilities that once supported a much larger population nearby and the current remnants of those facilities.

The Great Allegheny Passage's Steel Valley Trail runs along the western bank of the Monongahela River adjacent to the proposed project location. The Steel Valley Trail traces the shores of the Monongahela River and runs through historic battlefields and former steel mill sites in Homestead, Braddock, Duquesne, McKeesport, Glassport, and Clairton. These former steel mill sites and interpretive signage add interest to the surrounding area and the retail area called

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<sup>34</sup> According to the United States Environmental Protection Agency (EPA), "Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (EPA 2013).



The Waterfront. The Waterfront, which is a redeveloped brownfields area, is now a retail center with offices, restaurants, and entertainment that was rebuilt to reflect characteristics of the early 20th century and the industrial past of the area (Rails to Trails 2011).

### **3.3.5.2 Environmental Effects**

#### **Recreation**

In order to increase recreational opportunities in the area, Hydro Friends intends to provide a recreational enhancement to the local community. Hydro Friends, based on feedback from local residents, proposes to install and maintain a rest area along the Great Allegheny Passage's Steel Valley Trail near the Braddock Project site. The rest area is expected to include three benches (possibly with cover), two bike racks, and two interpretive signs (one discussing the project, the existing dam, and renewable energy; the other discussing the Great Allegheny Passage trail). Hydro Friends intends to work closely with the Allegheny Trail Alliance regarding the location and layout of the rest area.<sup>35</sup> No agencies provided comments on Hydro Friends' recreation proposal.

#### *Staff Analysis*

The Braddock Project area is industrial in nature and little recreation occurs near the proposed project. While few recreational developments are located close to the project, the region offers many recreational opportunities, including numerous state and county parks and a link to the Great Allegheny Passage trail. The Town of Braddock also provides and maintains a boat ramp that allows boat fishing downstream of the Braddock Locks and Dam facility. The Braddock Project would be located either within the Corps' security zone or on private property where public access is currently prohibited; however, anglers can access

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<sup>35</sup> At the scoping meeting, Hydro Friends indicated that the Corps already installed a new rest bench and interpretive sign along the Steel Valley Trail adjacent to the project area. As such, Hydro Friends was considering other recreational improvement options along the trail, including the installation of a bicycle tune-up kit near the Historic Pump House located at 880 East Waterfront Drive, Munhall, Pennsylvania. This Pump House location, which is approximately 2 miles from the project, serves as the Great Allegheny Passage trailhead and includes parking, restrooms, a beverage vending machine, bike racks, benches, and a picnic table. Hydro Friends never filed an update to its recreation proposal, so in this EA, staff considers the proposal described in the final license application to be the current proposal.

the shoreline for bank fishing in various places along the Monongahela River. Construction and operation of the proposed project would have no long-term adverse impacts on existing recreation at the project area.

As discussed in more detail in section 3.3.2.2, *Aquatic Resources*, operation of the project would cause changes to the cross-sectional flow pattern. The resulting changes in fish habitat could cause species assemblages immediately downstream of the turbine outflows to be dominated by species that are better adapted to higher flows. The project's tailrace would increase flows downstream of the weir adjacent to Gate 4 of the locks and dam facility. This increased localized flow may attract a greater number of game fish, such as smallmouth bass, sauger, and walleye downstream of the project tailrace that anglers can access by boat. Increasing habitat for game species would improve angling opportunities at the project.

While the project would not adversely affect recreation resources over the long-term, short-term impacts from construction noise and equipment might impact the enjoyment of people using the Great Allegheny Passage trail system and anglers fishing downstream of the dam. As indicated by the Pennsylvania SCORP, residents desire more bicycle paths and connections between existing trails. Hydro Friends' proposal to install and maintain a rest area along the Great Allegheny Passage's Steel Valley Trail near the project would enhance an existing recreational opportunity in an area with limited local recreational resources. Including the rest area within the project boundary would ensure continued public enjoyment of this recreational enhancement over the term of any license issued for the Braddock Project.

### **Land Use**

Hydro Friends does not propose any protection, mitigation, or enhancement measures for land use.

### *Staff Analysis*

The proposed facilities associated with the Braddock Project would be integrated into the existing Braddock Locks and Dam facility and there would be no significant changes to the upstream and downstream shoreline conditions that would alter current land use. As the proposed project would be built at an existing locks and dam facility, the construction and operation of the Braddock Project would not change any of the existing land uses within or adjacent to the project boundary.

## **Aesthetics**

Hydro Friends is not proposing any specific measures to enhance the existing aesthetic resources associated with the Braddock Project area. Post-construction site restoration after project construction is completed would likely improve the current aesthetics at those temporarily impacted areas.

### *Staff Analysis*

The addition of the project's facilities and transmission conveyance system would visually alter the local area. As the project is being constructed at an existing locks and dam facility, however, no adverse visual impacts are expected due to the region's existing industrial development visual character. The location of the existing dam would remain unchanged and Braddock Project facilities would be visually integrated into the current locks and dam configuration. The river elevation and shoreline conditions associated with the operation of the proposed project would not be altered significantly from current conditions and would have no impact on the waterfront views in the area. A new powerline connecting to a new switchyard would be present, but would be placed largely along existing structures and is not expected to contrast significantly from the existing utility facilities and train tracks that are present at the site. Construction activities may temporarily disrupt both aural and visual resources in the project vicinity, especially for visitors along the Steel Valley Trail, although these impacts are expected to be minimal due to the existing industrial nature of the area and the presence of the existing locks and dam. Proposed project operation is not expected to greatly change the character of the landscape post-construction.

## **3.3.6 Cultural Resources**

### **3.3.6.1 Affected Environment**

#### **Area of Potential Effect**

Section 106 of the NHPA, as amended, requires the Commission to take into account the effects of the licensing of a hydropower project on any historic properties and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment if any adverse effects to historic properties are identified within the project's Area of Potential Effect (APE). The APE is defined as the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. In order to fully address indirect impacts on cultural resources, the APE for the Braddock Project includes the lands enclosed by the proposed project boundary.



## Previous Cultural Resources Investigations

As part of its responsibilities for managing the locks and dams along the Monongahela River, the Corps has undertaken extensive surveys and inventories for the purpose of locating, identifying, and assessing historic and archaeological resources within the vicinity of the Braddock Locks and Dam facility. These studies were primarily undertaken in association with the Corps' Lower Mon Project to modernize Locks and Dams 2 (the new Braddock dam), 3, and 4 on the Monongahela River in Allegheny, Washington, and Westmoreland counties, Pennsylvania. According to the Corps, Locks and Dams 2, 3, and 4 are the three oldest, currently operating navigation facilities on the Monongahela River. These locks experience the highest volume of commercial traffic on the entire Monongahela River Navigation System and the pools created by these facilities provide industrial and municipal water and are popular with recreational boaters. In 2004, as part of the Lower Mon Project, the Corps replaced the nearly 100-year-old (1906), fixed-crest Monongahela Dam 2 with a gated dam. Upon completion of the new dam, the new facility, which included the existing locks, was renamed Braddock Locks and Dam. Cultural resource studies conducted by the Corps for the Lower Mon Project included:

- A literature review and preliminary field reconnaissance of the shoreline of Monongahela River pools Nos. 2 and 3, upstream from the Braddock Locks and Dam;
- Archaeological investigations of sites selected for the relocation of municipal facilities potentially impacted by the Lower Mon Project;
- A high-resolution, side-scan sonar investigation of Monongahela River pool 3, upstream of the Braddock Locks and Dam;
- Documentation of timbers and stones removed from the Monongahela River during 2006 dredging operations;
- Phase I and II submerged cultural resources investigations in Monongahela River pool 3, upstream of the Braddock Locks and Dam;
- Geomorphological investigations along the lower Monongahela River;
- A historical engineering evaluation of the Monongahela River Navigation System;
- Historic American Engineering Record documentation of the Braddock Locks and Dam; and
- Development and submission of a National Register Multiple Property thematic nomination for the historic resources of the Monongahela River Navigation System in Pennsylvania and West Virginia, 1838-1960.

In addition to these studies conducted by the Corps, archaeological investigations have been conducted in the project's vicinity in association with the Pennsylvania Turnpike Commission's proposed Monongahela/Fayette Expressway Project. These investigations included Phase I background research, field testing, and Phase II site evaluations.

### **History of Region**

The earliest evidence for human occupation in the Upper Ohio River Valley dates to the Late Pleistocene. While direct contact between Native Americans and Europeans in the Trans-Appalachian region did not occur until the 17th century, European trade items were obtained by indigenous coastal groups from European fishing and whaling fleets and made their way inland through trading intermediaries during the 16th century (Quiggle 2008; Grumet 1995). By the 1680s, William Penn had established a colony in the eastern portion of Pennsylvania on land granted to him by the King of England. Notwithstanding the success of Penn's colony near Philadelphia, the European presence west of Pennsylvania's Appalachian Mountains remained transitory throughout most of the 17th century.

In many ways, the European colonial expansion in the 18th century was driven by the fur trade (Grumet 1995; Wolf 1982). By the early 1700s, both the French and English had established trading posts in Pennsylvania, south of Lake Erie. The construction of Fort Niagara in 1726 allowed the French to expand their control over the region, and by the mid-18th century they had established a string of fortifications along the Niagara Frontier and along the southern shore of Lake Erie to present-day Erie, Pennsylvania (Quiggle 2008). While the French presence was established in the Great Lakes region, competing interest from the British increased across southwestern Pennsylvania. Both nations struggled to control trade and to win support of the powerful Iroquois Tribes that dominated the region.

The site of the present-day City of Pittsburgh was still a frontier area during the mid-18th century when hostilities erupted between the French and the English. During the French and Indian War, southwestern Pennsylvania became the primary battleground for control of the continent (Commager 1999). The French established Fort Duquesne at the confluence of the Allegheny, Ohio, and Monongahela rivers as part of a string of fortifications designed to protect their access to critical inland waterways. The initial attempts by the British to seize control of the region from the French and their Indian allies failed dramatically (Commager 1999). By the late 1750s, however, the cost of the conflict and the mounting number of military defeats became more than the French could bear. By the time the British captured Fort Duquesne in 1758 (renaming it Fort Pitt), the

conflict was nearing its end, and the British had emerged as the dominant colonial power in the New World (Commager 1999).

As a result of its relatively isolated location along the western frontier, southwestern Pennsylvania escaped direct conflict during the American Revolution. With the cessation of hostilities between the British and the Americans in 1783, however, the Pittsburgh region became the gateway to the American west (Lorant 1999). Goods and cargo flowing through the inland port of Pittsburgh provided the stimulus for economic development throughout the late 1700s and early 1800s.

The natural coal fields of western Pennsylvania spurred the growth of the iron and steel industry. Following the invention of the Bessemer process for the mass production of steel, the Pittsburgh region became one of the largest steel-producing centers in the world (Handlin 1999). Pittsburgh's industries blossomed during the Civil War, and by the 1900's steel mills crowded the city's waterfront. One of the largest of these steel mills was the Edgar Thomson Works of the Carnegie Steel Company, located on the shores of the Monongahela River in North Braddock. Coal mines across southwestern Pennsylvania fueled the mills and the industrial growth of the region through the early 1900s. Employment in the steel mills and coal mines attracted waves of immigrants to the Pittsburgh region during this period (Handlin 1999). Despite this economic growth, however, the poor wages, dangerous working conditions, long hours, and exhausting labor led to bitterly contested labor disputes that rippled through the coal fields and steel mills of southwestern Pennsylvania during the 19th and early-20th centuries (David 1999). Notwithstanding this labor unrest, the region's proximity to inland waterways, the availability of steel and coal, and the large immigrant workforce made Pittsburgh and southwestern Pennsylvania one of the principal industrial and manufacturing hubs in the country by the mid-20th century. The demand for steel and the industrial growth of the Pittsburgh region continued until after World War II, when production in wartime industries declined.

Hydro Friends conducted a search of the Pennsylvania Historical and Museum Commission's Cultural Resources Geographic Information System (GIS) to identify known archaeological and historic resources within the proposed project vicinity, including those properties listed in or eligible for inclusion in the National Register. Hydro Friends reviewed the Cultural Resources GIS data to identify archaeological and historic resources within approximately 1,500 feet of the Braddock Locks and Dam. This review was undertaken to better characterize the nature and types of known resources in the proposed project vicinity.

No known archaeological resources listed in or eligible for inclusion in the National Register have been reported within the APE; however, one

archaeological resource has been identified upstream of the Braddock Locks and Dam. The Monongahela Navigation Company (MNC) Lock and Dam 2 (36AL0542) was constructed by the MNC between 1838 and 1841. The lock and dam was operated by the MNC between 1841 and 1906 when the original structure was replaced by the Corps' Locks and Dam 2. As noted above, the Corps' Monongahela Dam 2 was replaced in 2004, and along with the existing locks last replaced in the late 1940s to early 1950s, was renamed Braddock Locks and Dam. The submerged archaeological remains of the original MNC Lock and Dam 2 are located more than 2,900 feet upstream from the Braddock Locks and Dam.

Known historic resources within the proposed project vicinity include buildings, structures, and districts listed in or eligible for inclusion in the National Register. The Braddock Locks and Dam, which was returned to service in 2004 (Weiser 2010), is a component of the National Register-eligible Monongahela River Navigation System.<sup>36</sup> Table 9 summarizes other known historic resources within approximately 1,500 feet of the proposed project. None of the historic properties described in table 9 are located within the APE.

Additionally, as noted in table 9, a National Historic Landmark district is located within the vicinity of the proposed Braddock Project. Kennywood Amusement Park, which was founded in 1898, is an historic amusement park located near the left shoreline of the Monongahela River near the Braddock Locks and Dam. The park is one of the oldest amusement parks in America and still has rides dating back to the early 1900s. Kennywood Amusement Park was designated a National Historic Landmark in 1987.

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<sup>36</sup> In its February 19, 2014, comments, the Corps states that it has prepared an individual National Register of Historic Places nomination form for listing the Braddock Locks and Dam under a Multiple Property Documentation Form (MPDF) for the Monongahela River Navigation System in Pennsylvania and West Virginia (1838-1960). The MPDF and individual nomination have been endorsed by the Pennsylvania SHPO and are being processed through the Corps for submittal to the National Park Service.

Table 9. Historic resources within approximately 1,500 feet of the Braddock Project (Source: Hydro Friends).

Resource Name	Resource Type	Description	National Register Status	Notes
Braddock Locks and Dam	Historic Structure	Locks and dam	Eligible	Component of the National Register-eligible Monongahela River Navigation System
Pittsburgh & Lake Erie Railroad (Port Perry to Rankin)	Historic District	Linear resource	Eligible	
Baltimore & Ohio Railroad: Pittsburgh Division (Maryland Line to City of Pittsburgh)	Historic District	Linear resource	Eligible	
Union Railroad (Dravosburg Borough to Monroeville Borough)	Historic District	Linear resource	Eligible	
Pennsylvania Railroad: Monongahela Line	Historic District	Linear resource	Eligible	
Edgar Thomson Works of the Carnegie Steel Company	NA	Historic manufacturing facility	Eligible	
Kennywood Amusement Park	Historic District	Historic amusement park	Listed	National Historic Landmark
Union Railroad Trestle	Historic Structure	Railroad bridge	Eligible	

### 3.3.6.2 Environmental Effects

After reviewing the Pennsylvania Historical and Museum Commission's Cultural Resources GIS and previous cultural resources investigations, Hydro Friends did not locate any National Register-eligible properties within the APE of the proposed project. Based on this finding, Hydro Friends determined that there would be no effects to cultural resources within the project's APE. As such, Hydro Friends does not propose any mitigation measures for cultural resources.

In its letter dated April 17, 2012, the Pennsylvania SHPO determined that although a high probability exists that archeological resources are located in the project area, the proposed project would have no effects on any archeological sites. The letter also stated that should the scope of the project be amended to include additional ground-disturbing activity, the Pennsylvania SHPO should be contacted immediately and a Phase I Archaeological Survey may be necessary to locate all potentially significant archeological resources. In regard to the historic structures, the Pennsylvania SHPO determined that the plans and specifications for the proposed project conform to the Secretary of the Interior's *Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*. As a result, the Pennsylvania SHPO concluded the project would have no adverse effect upon the National Register-eligible Monongahela River Navigation System.

A total of 12 tribes with a potential interest in the project have been identified, including: the Oneida Tribe of Indians of Wisconsin, the St. Regis Mohawk Tribe, the Stockbridge-Munsee Community of Wisconsin, the Oneida Nation of New York, the Shawnee Tribe, the Seneca-Cayuga Tribe of Oklahoma, the Onondaga Nation of New York, the Seneca Nation of Indians, the Cayuga Nation of New York, the Eastern Shawnee Tribe of Oklahoma, the Tonawanda Band of Seneca Indians, and the Tuscarora Nation of New York. Hydro Friends initiated information consultation with the identified Indian Tribes with the distribution of the Pre-Application Document Questionnaire on October 11, 2011, seeking existing information on known historic properties in the project area. On January 6, 2012, Commission staff sent letters to the identified Indian Tribes notifying them of Hydro Friends' request to use the Traditional Licensing Process, inviting these Tribes to participate in the licensing process for the proposed project, and asking whether they intended to participate. No responses have been received from any of the tribes at this time.

#### *Staff Analysis*

Construction and operation of hydropower projects have the potential to effect cultural resources. The movement, displacement, or loss of archaeological and historic resources resulting from project construction and operation may

reduce the scientific and cultural value of these resources. Archaeological sites are often found immediately adjacent to water bodies and the proposed project is located within the National Register-eligible Monongahela River Navigation System.

Most of the area within the APE was disturbed during construction of the Corps' Locks and Dam 2 facilities and reconstruction of Braddock Locks and Dam in 2004. Even with this heavy disturbance, however, deeply buried archaeological materials or materials associated with the original construction of the locks and dam could become exposed during project construction. While there are no known surface or sub-surface archaeological resources, the possibility always exists that unknown archaeological resources may be discovered in the future as a result of the proposed project's construction, operation, or project-related activities. To ensure the proper treatment of any archaeological resources that may be discovered, a condition could be included in any license issued for the project requiring Hydro Friends to notify the Pennsylvania SHPO of any such discoveries, follow the Pennsylvania SHPOs' guidance regarding the evaluation, and, if the site would be eligible for the National Register and adversely affected, implement ways to avoid, lessen, or mitigate for any adverse effects. A condition also could be included requiring Hydro Friends to notify the Commission of any such discoveries, and implement any proposed measures to avoid, lessen, or mitigate for any adverse effects, if applicable. These measures would ensure protection of any historic or archaeological sites discovered during project construction and operation.

Regarding the historic resources located within the project vicinity, most are located well outside the APE and construction and operation of the proposed project is not expected to have any effects on these resources. While the Braddock Locks and Dam facility is a component of the National Register-eligible Monongahela River Navigation System, the dam was replaced in 2004 and construction of the proposed project would not adversely affect this structure. Kennywood Amusement Park, a National Register-listed facility and a designated National Historic Landmark, is located in the project vicinity; however, it is separated from the Monongahela River by extensive rail lines and associated railway infrastructure. Project construction and operation is not expected to affect this site.

### **3.4 NO-ACTION ALTERNATIVE**

Under the no-action alternative (denial of the application), the project would not be constructed and would not generate an estimated average annual generation of 32,263 MWh. Under this alternative, environmental resources in the project area would not be affected by the proposed project.

## 4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the proposed Braddock Project's use of the flow of the Monongahela River for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,<sup>37</sup> the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

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

### 4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 10 summarizes the assumptions and economic information we use in our analysis. This information was provided by Hydro Friends in the license application. We find that the values provided by Hydro Friends are reasonable for the purposes of our analysis. Cost items common to all action alternatives include

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<sup>37</sup> See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.



taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); estimated future capital investment required to maintain and extend the life of plant equipment and facilities; normal operation and maintenance cost; and Commission fees.

Table 10. Parameters for the economic analysis of the Braddock Project (Source: Hydro Friends and staff).

Parameter	Value
Period of analysis (years) <sup>a</sup>	30
Federal income tax rate (%) <sup>b</sup>	34
State and local tax rate (%) <sup>b</sup>	3.5
Estimated first year of operation <sup>c</sup>	2015
Project cost (\$) <sup>d</sup>	14,688,500
Cost of developing FERC license application (\$) <sup>d</sup>	650,000
Operation and maintenance (\$/year) <sup>e</sup>	237,000
Annual fee for use of a government dam (\$) <sup>h</sup>	32,263
Alternative energy value (\$/MWh) <sup>f</sup>	31.32
Dependable capacity value (\$/kW-year) <sup>b</sup>	158
Interest rate (%) <sup>b</sup>	8.0
Discount rate (%) <sup>b,g</sup>	8.0
Installed Capacity (MW) <sup>b</sup>	5.25
Average Annual Generation (MWh)	32,263

Notes:

- <sup>a</sup> Regardless of the potential license term (30, 40, or 50 years), consistent with *Mead*, we perform a 30-year economic analysis.
- <sup>b</sup> Estimated by staff.
- <sup>c</sup> Consistent with *Mead* (for an unconstructed project), the first year of the analysis is the year the project is expected to become operational.
- <sup>d</sup> Cost was provided by Hydro Friends.
- <sup>e</sup> The future operation and maintenance cost was provided by Hydro Friends.
- <sup>f</sup> Consistent with *Mead*, the value of energy is based on the current energy values. The energy value was obtained from the Annual Energy Outlook 2013 published by the Energy Information Administration, April 2013.
- <sup>g</sup> Assumed by staff to be the same as the interest rate.
- <sup>h</sup> Estimated annual charges based on section 10(e)(2) of the Federal Power Act and the estimated average annual generation of the project.

## 4.2 COMPARISON OF ALTERNATIVES

Table 11 compares the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for the two action alternatives considered in this final EA: Hydro Friends' proposal and the staff alternative.

Table 11. Summary of the annual power values and annual production costs for the action alternatives for the Braddock Project. (Source: Staff)

	<b>Hydro Friends' Proposal<sup>a</sup></b>	<b>Staff Alternative</b>
Installed capacity (MW)	5.25	5.25
Annual generation (MWh)	32,263	32,263
Dependable capacity (MW)	2.27	2.27
Annual cost of alternative power including dependable capacity (\$/MWh)	1,369,242 42.44	1,369,242 42.44
Annual project cost (\$/MWh)	1,882,850 58.36	1,887,710 58.51
Difference between cost of alternative power and project power (\$/MWh)	(513,608) (15.92)	(518,468) (16.07)

<sup>a</sup> A number in parentheses denotes that the difference between the power value and production cost is negative.

### **4.2.1 Hydro Friends' Proposal**

Hydro Friends proposes to build a project that has an installed capacity of 5.25 MW, generates an average of 32,263 MWh of electricity annually, and has a dependable capacity of 2.37 MW. The average annual power value of the project would be \$1,369,242, or \$42.44/MWh. In total, the average annual cost of producing power would be \$1,882,850, or about \$58.36/MWh. Overall, the project would produce power at a cost which is \$513,608, or \$15.92/MWh, more than the cost of alternative power.

### **4.2.2 Staff Alternative**

The staff alternative includes the same development proposal as Hydro Friends and, therefore, would have the same capacity and energy attributes. Table 12 shows the staff-recommended additions, deletions, and modifications to Hydro Friends' proposed environmental protection and enhancement measures, and the estimated cost of each.

Based on a total installed capacity of 5.25 MW, an average annual generation of 32,263 MWh, and dependable capacity of 2.37 MW, the project would have an average annual power value of \$1,369,242, or about \$42.44/MWh. The average annual cost of producing power would be \$1,887,710, or about \$58.51/MWh. Overall, the project would produce power at a cost which is \$518,468, or \$16.07/MWh, more than the cost of alternative power.

## **4.3 COST OF ENVIRONMENTAL MEASURES**

Table 12 gives the cost of each of the environmental enhancement measures considered in our analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 12. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of the Braddock Locks and Dam Project (Source: Hydro Friends, Corps, and Staff).

<b>Enhancement/Mitigation Measures</b>	<b>Entities</b>	<b>Capital Cost (2013\$)</b>	<b>Annual Cost (2013\$)</b>	<b>Levelized Annual Cost (2013\$)</b>
<b>Geology and Soils</b>				
1. Develop and implement an erosion and sediment control plan.	Staff	4,250	0	340
<b>Aquatic Resources</b>				
2. Operate the project in a run-of-release mode.	Hydro Friends, Staff	0	0	0 <sup>1</sup>
3. Develop and implement an operation compliance monitoring plan that includes provisions for documenting compliance with any Corps' operating requirements and establishing a schedule for reporting project compliance/non-compliance during normal operation and emergencies.	Staff	10,000	4,500	3,770
4. Conduct real-time water quality and quantity monitoring upstream and downstream of Braddock dam prior to construction, during construction, and throughout the duration of the license.	Corps	17,500	1,500 <sup>2</sup>	2,390

<b>Enhancement/Mitigation Measures</b>	<b>Entities</b>	<b>Capital Cost (2013\$)</b>	<b>Annual Cost (2013\$)</b>	<b>Levelized Annual Cost (2013\$)</b>
<p>5. Develop and implement a water quality monitoring plan upstream and downstream of the Braddock Locks and Dam to include: (1) monitoring of summer water quality parameters including prior to construction; (2) continuous, real-time monitoring of water quality parameters during project construction; and (3) continuous, real-time monitoring of summer water quality parameters for 5 years following project construction and for an additional 5 years if the Lower Mon Project is completed during the license term (projected completion date: 2030).</p>	Staff	17,500	790 <sup>3</sup>	1,920
<b>Recreation</b>				
<p>6. Recreational enhancements to potentially include the installation of three benches, two bike racks, and two public signs along the Great Allegheny Passage trail.</p>	Hydro Friends, Staff	10,500	500	1,170

Notes:

<sup>1</sup> The proposed project does not presently exist, and could only operate using flows made available to it by the Corps (run-of-release). As there is no proposed change in operation from an existing hydropower project, an estimated cost is not required.

<sup>2</sup> Continuously monitor water quality upstream of the Braddock dam and downstream from the environmental gate and the turbines for the duration of the license, including before and during construction. The cost of monitoring would be \$1,500 annually. One year of monitoring is assumed prior to construction.

<sup>3</sup> In the summer, continuously monitor water quality upstream of the Braddock dam and downstream from the environmental gate and the turbines before construction, during construction, for 5 years after start of operation, and for 5 years after the completion of the Lower Mon Project. One year of monitoring is assumed prior to construction. The cost of monitoring for years 1 through 4 would be \$1,500 and the monitoring cost in year 5 would be \$2,500; additional monitoring pending the Lower Mon Project completion (estimated in 2030) would be \$1,500 for years 15 through 18 and \$2,500 for year 19.

## 5.0 CONCLUSION AND RECOMMENDATIONS

### 5.1 Comparison of Alternatives

In this section, we compare the developmental and non-developmental effects of Hydro Friends' proposal, Hydro Friends' proposal as modified by staff, and the no-action alternative.

We estimate the annual generation of the project under the three alternatives identified above. Our analysis shows that the annual generation would be 32,263 MWh for the proposed action and the staff alternative. Under the no-action alternative, the project would not generate power.

We summarize the environmental effects of the different alternatives in table 13.

Table 13. Comparison of Alternatives for the Braddock Project. (Source: Staff)

<b>Resource</b>	<b>No-Action Alternative – existing conditions, no hydro project</b>	<b>Proposed Action</b>	<b>Staff Alternative</b>
Geology and Soils	N/A – project would not be constructed.	No proposed measures were identified by Hydro Friends; however, short-term increases in erosion due to construction of the project would be expected.	An erosion and sediment control plan, including a measure addressing disposition of any contaminated sediments encountered during excavation, would minimize the potential for erosion and sedimentation at the project.



<b>Resource</b>	<b>No-Action Alternative – existing conditions, no hydro project</b>	<b>Proposed Action</b>	<b>Staff Alternative</b>
Aquatic Resources – Water Quantity	N/A – project would not be constructed.	<p>Operation of the proposed project would increase flows on the west bank of the river, and flow through the environmental gate would decrease. However, the effect of this change should be highly localized and would not result in a significant change in the composition of the fish and mussel communities in Emsworth pool or the Braddock dam tailwaters.</p> <p>The project would be operated in run-of-release mode, whereby flows are made available by the Corps and project operation would not affect the current water surface elevations of the lower Monongahela River or the net quantity of water being passed downstream.</p>	<p>Same as proposed action.</p> <p>An operation compliance monitoring plan would ensure run-of-release operation and continued minimization of impacts to aquatic resources that would otherwise occur under fluctuating impoundment elevations.</p>

<b>Resource</b>	<b>No-Action Alternative – existing conditions, no hydro project</b>	<b>Proposed Action</b>	<b>Staff Alternative</b>
Aquatic Resources – Water quality	N/A – project would not be constructed.	No proposed measures were identified by Hydro Friends; however, a slight decrease in DO concentration downstream of the project may occur due to project operation. Turbidity may temporarily increase during construction, but turbidity would not likely reach a level above that specified by current state water quality standards.	A water quality monitoring plan developed in consultation with the Corps to monitor water quality parameters including DO concentration upstream and downstream of the project would ensure that the results of the <i>Water Quality Modeling Study</i> are confirmed by in-stream conditions and that if DO concentrations approached levels that would threaten biota or fall to levels below that specified by current state water quality standards, appropriate action could be taken. Monitoring would occur during the summer months prior to project construction, on a continuous, real-time basis during project construction, and

<b>Resource</b>	<b>No-Action Alternative – existing conditions, no hydro project</b>	<b>Proposed Action</b>	<b>Staff Alternative</b>
			on a continuous real-time basis during the summer months for the first 5 years of project operation, and for an additional 5 years if the Corps' Lower Mon Project is completed during the license term.
Aquatic Resources – fish and mussels	N/A – project would not be constructed.	Although construction may result in mortality or temporary displacement of fish and mussels in the immediate vicinity of the cofferdams, these effects should be minor and short-term. Entrainment mortality of mainly juvenile fish life stages would occur, but is not likely to significantly affect adult fish populations due to the high fecundity and early maturation of the species likely to be entrained. Habitat changes associated with altered cross-sectional flow may alter the species composition immediately below	Same as proposed action.

<b>Resource</b>	<b>No-Action Alternative – existing conditions, no hydro project</b>	<b>Proposed Action</b>	<b>Staff Alternative</b>
		the dam, but this effect should be highly localized and would not result in a significant change in the community composition in Emsworth pool or the Braddock tailwater.	
Terrestrial Resources	N/A – project would not be constructed.	Due to the small project footprint within existing disturbed habitat, use of existing disturbed areas for staging, and development of a transmission line that is not likely to result in bird collisions, no effect would be expected on terrestrial resources.	Same as proposed action.
Threatened and Endangered Species	N/A – project would not be constructed.	No effect – there is no evidence of federally endangered mussels in the project area.	Same as proposed action.
Recreation, Land Use, and Aesthetics	N/A – project would not be constructed.	Construction of the project would cause a short-term increase in traffic and noise, but	Including the rest area within the project boundary would ensure

<b>Resource</b>	<b>No-Action Alternative – existing conditions, no hydro project</b>	<b>Proposed Action</b>	<b>Staff Alternative</b>
		the addition of recreational enhancements to potentially include the installation and maintenance of a rest area with benches and interpretive signs along the Allegheny Passage trail would enhance recreational opportunities near the project.	continued public enjoyment of this recreational enhancement over the term of any license issued for the Braddock Project.
Cultural Resources	N/A – project would not be constructed.	No effect, as no cultural resources have been identified within the project boundary.	Consultation with the Pennsylvania SHPO and development of an historic properties management plan if newly discovered properties are eligible for listing on the National Register and adversely affected by the project would ensure protection of historic resources.

## 5.2 Comprehensive Development and Recommended Alternative

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the

Commission's judgment would be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Braddock Locks and Dam Hydroelectric Project. We weigh the costs and benefits of our recommended alternatives against other proposed measures.

#### **A. Recommended Alternative**

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we recommend the proposed action with additional staff-recommended measures as the preferred alternative.

We recommend this option because: (1) issuance of an original hydropower license by the Commission would allow Hydro Friends to operate the project as a dependable source of electrical energy for its customers; (2) the 5.25 MW of electric energy generated from the project would come from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended environmental measures would protect fish, geologic resources, water quality, and historic properties.

In the following section, we make recommendations as to which environmental measures proposed by Hydro Friends or recommended by agencies and other entities should be included in any license issued for the project. In addition to Hydro Friends' proposed environmental measures, we recommend additional staff-recommended environmental measures be included in any license issued for the project.

#### **Measures Proposed by Hydro Friends**

Based on our environmental analysis of Hydro Friends' proposal, as discussed in section 3, and the costs discussed in section 4, we recommend including the following environmental measures proposed by Hydro Friends in any license issued for the Braddock Project:

- operate the project in a run-of-release mode, as directed by the Corps; and
- install and maintain a rest area along the Great Allegheny Passage's Steel Valley Trail adjacent to the Braddock Project site that includes three benches (possibly with cover), two bike racks, and two interpretive signs (one discussing the project, the existing dam, and

renewable energy; the other discussing the Great Allegheny Passage trail).

## **B. Additional Measures Recommended by Staff**

We recommend the measures described above, along with the following additional measures:

- develop and implement an operation compliance monitoring plan that includes provisions for documenting compliance with any Corps' operating requirements and establishing a schedule for reporting project compliance/non-compliance during normal operation and emergencies;
- develop and implement an erosion and sediment control plan to minimize construction-related effects; and
- develop and implement a water quality monitoring plan upstream and downstream of the Braddock Locks and Dam to include: (1) monitoring of summer water quality parameters prior to construction; (2) continuous, real-time monitoring of water quality parameters during project construction; and (3) continuous, real-time monitoring of summer water quality parameters for 5 years following project construction, and for an additional 5 years if the normal elevation of the Braddock pool increases during the term of the license as a result of the Corps' Lower Project.

### *Run-of-release Operation*

Hydro Friends proposes to operate the Braddock Project in run-of-release mode. Hydro Friends would only be able to generate from flows made available to it from the Corps. Project operation would not affect the current water surface elevations of the lower Monongahela River or the net quantity of water being passed downstream. There would be no additional cost associated with operating the project in run-of-release mode. Staff recommends this proposed mode of operation.

### *Operation Compliance Monitoring Plan*

Hydro Friends proposes to operate the Braddock Project in a run-of-release mode, meaning that the project would operate using flows established by and made available by the Corps. Hydro Friends' proposal, however, did not specify how it would document compliance with the run-of-release operation or how it would coordinate its operations with the Corps.

Generally, Commission licenses for non-federal projects at Corps' dams require the licensee to develop an operating plan and a MOA with the Corps.<sup>38</sup> The operating plan describes the mode of hydropower operation, impoundment flow diversion, and regulation requirements for the Corps' project, and integration of operation of the hydroelectric facility in the Corps' emergency action plan. The MOA describes the detailed operation of the project acceptable to the Corps and any restrictions needed to protect the purposes of the Corps' project for navigation.

Therefore, we recommend that any license issued for this project require Hydro Friends to develop an operation compliance monitoring plan in consultation with the Corps, and enter into an operating MOA with the Corps. Such a plan should include provisions for documenting compliance with any Corps' operating requirements and establish a schedule for reporting project compliance/non-compliance during normal operation and emergencies. An operation compliance monitoring plan would ensure run-of-release operation and continued minimization of impacts to aquatic resources that would otherwise occur under fluctuating impoundment elevations. We estimate that the levelized annual cost of developing an operation compliance monitoring plan would be \$3,770 for the Braddock Project and conclude that the benefits of this measure outweigh the costs.

#### *Erosion and Sediment Control Plan*

The proposed project construction would result in ground and riverbed disturbance, which could result in sediment (including potentially contaminated sediment) reaching or suspending within the Monongahela River. Development and implementation of an erosion and sediment control plan would minimize erosion and sedimentation associated with construction-related activities. Minimizing sediment transport from construction areas to the Monongahela River would help preserve water quality in the river and protect fish and other aquatic life. Further, including a measure to address the handling, removal, and disposition of any contaminated sediment encountered during project construction would further protect water quality and aquatic life within the river. We estimate that the levelized annual cost to develop an erosion and sediment control plan would be \$340, and conclude that the benefits of the measure would outweigh the costs.

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<sup>38</sup> See MOU between the Commission and the Corps of Engineers on Non-federal Hydropower Projects, dated March 2011.



### *Water Quality Monitoring Plan*

Hydro Friends has not proposed to conduct any water quality monitoring following the construction of the Braddock Project. The Corps has expressed concerns that the proposed shifting of downstream releases from its environmental gate to the proposed powerhouse could result in decreased DO concentrations downstream of the project. Additionally, the Corps has expressed concern that the increase in pool elevation associated with the potential completion of the Corps' Lower Mon Project would cause the Braddock Project intake to be located in deeper water, thereby lowering DO concentration downstream of the project. Therefore, the Corps recommends water quality monitoring throughout the license term.

As discussed in section 3.3.2, *Aquatic Resources*, operation of the Braddock Project would not likely result in biologically significant decreases in DO concentration, or decreases that fall below the levels specified by the current Pennsylvania water quality standards. However, to verify the water quality modeling results that project operation would not significantly affect DO concentrations downstream of the proposed project, we recommend that Hydro Friends develop a water quality monitoring plan to include: (1) monitoring summer water quality parameters, including DO, prior to construction; (2) continuous, real-time monitoring of water quality parameters during project construction; and (3) continuous, real-time monitoring of summer water quality parameters for 5 years following project construction and for an additional 5 years if the Lower Mon Project is completed during the license term.

Such a plan would ensure that, if project operation caused DO concentrations downstream of the project to approach levels that would threaten biota or fall below levels specified by the current Pennsylvania water quality standards, appropriate action could be taken in a timely manner. The plan would also require the collection of additional baseline water quality data in the form of pre-construction monitoring. Additionally, the construction portion of the plan would ensure that construction activities would not result in reductions in water quality. We estimate the levelized annual cost of the proposed monitoring to be \$1,920. We conclude that the benefits of the proposed monitoring outweigh the cost and recommend that a water quality monitoring plan be included in any original license that may be issued for the project. Further, we conclude that the cost of water quality monitoring for the license term, as recommended by the Corps, is not justified given that the effect of project operation on water quality should be adequately characterized with 5 years of monitoring.

### *Great Allegheny Passage Rest Area*

For recreational enhancements, Hydro Friends proposes to install and maintain a rest area along the Great Allegheny Passage's Steel Valley Trail that would include three benches (possibly with cover), two bike racks, and two interpretive signs (one discussing the project, the existing dam, and renewable energy; the other discussing the Great Allegheny Passage trail). As discussed in section 3.3.5, *Recreation, Land Use, and Aesthetics*, the Braddock Project area is industrial in nature and little recreation occurs near the proposed project. The Great Allegheny Passage's Steel Valley Trail, however, runs along the Monongahela River and visitors along the trail would have views of the project area. While the project would not adversely affect recreation resources over the long-term, short-term impacts from construction noise and equipment might impact the enjoyment of people using the Steel Valley Trail and anglers fishing downstream of the dam. In addition, as indicated by the Pennsylvania SCORP, residents desire more bicycle paths and connections between existing trails. As such, Hydro Friends' proposal for recreational improvements, including a rest area with benches and an interpretive sign or bike tune-up kit, along the Steel Valley Trail adjacent to the project would enhance an existing recreational opportunity located within an area with limited local recreational resources. Hydro Friends would be responsible for the maintenance and upkeep of the rest area for the term of any license issued for the project, which would ensure continued public enjoyment of this recreation enhancement. We estimate the levelized annual cost of the proposed recreational improvements along the Steel Valley Trail to be \$1,170. We conclude that the benefits of the proposed improvements outweigh the cost and recommend that the Great Allegheny Passage rest area be included in any original license that may be issued for the project.

### **5.3 Unavoidable Adverse Effects**

Hydro Friends estimates that construction of the project would take approximately 12 weeks to complete. There is a chance that erosion could occur during construction; however, it should be minimized with the development and implementation of an erosion and sediment control plan.

Temporary, localized increases in turbidity would result from the placement, excavation, and dewatering of the cofferdams. A temporary loss of aquatic habitat would occur within the cofferdam area. Construction activities such as cofferdam placement, excavation, and boat traffic in the immediate project area could displace fish, representing a minor, short-term effect during the construction period.

The project would result in some fish mortality due to entrainment and impingement. Most of the fish entrained by the project would be juveniles and the expected mortality is not likely to result in any measurable impact on adult fish populations in Braddock pool or in the Braddock dam tailwaters.

The presence of and noise created by construction equipment at the project would only be a short-term consequence of Hydro Friends receiving a license to operate the project.

#### **5.4 Fish and Wildlife Agency Recommendations**

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

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

No recommendations were received by the Commission.

#### **5.5 Consistency with Comprehensive Plans**

Section 10(a)(2) of the FPA, 16 U.S.C. §803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed nine comprehensive plans that are applicable to the Braddock Locks and Dam Hydroelectric Project, located in Pennsylvania. No inconsistencies were found. The plans include:

National Oceanic and Atmospheric Administration. 1980. Pennsylvania Coastal Zone Management Program. Department of Commerce, Washington, D.C. August 1980.

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Pennsylvania Historical and Museum Commission. 2006. Honoring the Past, Planning for the Future: Pennsylvania's Historic Preservation Plan 2006-2011.

Pennsylvania Fish and Boat Commission. 2011. Three Rivers Management Plan – A Strategy for Managing Fisheries Resources of the Allegheny, Monongahela and Ohio Rivers.

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## **6.0 FINDING OF NO SIGNIFICANT IMPACT**

If the Braddock Project is licensed as proposed with the additional staff-recommended measures, the project would operate while providing protective measures for water quality, fish, wildlife, terrestrial, and cultural resources in the project area.

Based on our independent analysis, issuance of a license for the Braddock Project, as proposed with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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## **APPENDIX A: STAFF RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT**

The Commission staff issued its draft environmental assessment (EA) for the proposed licensing of the Braddock Project on January 17, 2014. Staff requested comments on the draft EA be filed within 30 days from the issuance date, or by February 18, 2014. The following entities filed comments on the draft EA.

<b>Commenting Entity</b>	<b>Date Filed</b>
Corps	February 19, 2014

Below, we summarize the Corps' substantive comments, provide responses to those comments, and explain how we modified the text of the draft EA, as appropriate, to address the comments. We've grouped issues by topic for convenience, and have made minor or editorial comments directly to the final EA without a detailed discussion below. Comments regarding desired license conditions that are administrative in nature (e.g., license term) are not discussed here, but will be addressed, as appropriate, in the license order.

### **Memorandum of Agreement**

*Comment:* The Corps states that it agrees with the Commission that the operating Memorandum of Agreement would include provisions for the Corps' operating requirements, flow distributions, and protection of project purposes, but that there would be no guarantee that the licensee would receive the flows it anticipates to justify this project.

*Response:* As we state in both the draft and final EA, regardless of Hydro Friends' proposed project operation, we acknowledge that the Corps would retain control of the flow distribution at the Braddock Locks and Dam. The project would only be able to operate using flows made available to it by the Corps, as stipulated in the operating agreement to be developed between the licensee and the Corps should a license be issued.

### **Water quantity and quality**

*Comment:* The Corps stresses the importance of the environmental gate<sup>39</sup> in maximizing DO levels downstream of the Braddock dam, and states that the full benefit of the environmental gate would not be realized until the completion of the Lower Mon Project. The Corps is concerned that Hydro Friends' proposed project operation would divert water from the environmental gate during the majority of the year, and that the diverted water would not be adequately re-aerated. Further, the Corps states that Hydro Friends must demonstrate that the project will not be injurious to the public interest or impair the usefulness of the Corps' facility in order to receive a section 408 permit.

*Response:* As stated in section 3.3.2.2 of this EA, project operation should result in minimal changes in DO concentrations. Nevertheless, staff's recommended water quality monitoring plan would provide additional assurances that water quality is not being degraded downstream of the project. The results of the 5-year monitoring program would be evaluated by the Corps and Pennsylvania DEP. If these results indicate that project operation is causing DO concentrations to fall below levels that are acceptable to the Pennsylvania DEP, the Corps, or the Commission, the operating agreement could be amended by the Corps or additional measures could be required by the Commission. Furthermore, staff's recommendation for water quality monitoring included a provision for additional monitoring after completion of the Lower Mon Project. As with the first 5-year monitoring period, if the results indicate that water quality conditions are being negatively affected by the project, the Corps could make changes to the project's operating agreement or other measures could be required by the Commission.

Although staff conclude that Hydro Friends' proposed project operation and staff's water quality monitoring plan would be adequate to protect water quality, flows made available to the project would ultimately be determined by the Corps following any license the Commission may issue for the Braddock Project.

During a May 30, 2014 teleconference to discuss the Corps' comments on the Braddock Project draft EA, the Corps and Hydro Friends' consultant discussed a tentative agreement on a water quality monitoring plan that would allow for continuous water quality monitoring during the months of June through November for each year of the license term. Hydro Friends has not changed its proposal by

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<sup>39</sup> As noted in the final EA, the Corps' environmental gate is also referred to as Gate No. 1 or the water quality gate in the Braddock Project proceedings. For simplicity, we have used the term 'environmental gate' in both the draft and final EAs.

filing the alternative water quality monitoring plan discussed during the teleconference. If such a plan were to be filed prior to the issuance of any license for the Braddock Project, we would consider the plan in the license order.

### **Continuous monitoring**

*Comment:* The Corps states that it does not believe that any 5-year monitoring period would be adequate to satisfactorily address the long-term extremes in flow and water quality, and recommends continuous water quality monitoring for the length of the license. It also notes that continuous monitoring is a routine requirement for hydropower plants operating at its other projects.

*Response:* As stated in section 3.3.2.2 of this EA, monitoring for 5 years would result in a high likelihood of capturing an extremely hot and/or dry year that could lead to DO stratification above Braddock dam, given the frequency of summer conditions that may cause DO stratification. The goal of staff's recommended water quality monitoring would be to characterize variability in water quality as it relates to the Braddock Project operation, and to verify the results of the *Water Quality Modeling Study*. The possibility that an even hotter and/or dryer year may occur outside the recommended 5-year monitoring window does not alone justify the need for continuous monitoring. As we noted previously, if results of the 5-year monitoring period indicate that project operation is causing DO concentrations to fall below levels that are acceptable to the Pennsylvania DEP, the Corps, or the Commission, the operating agreement could be amended by the Corps or additional measures could be required by the Commission.

As noted above, during a May 30, 2014 teleconference the Corps and Hydro Friends discussed an alternative water quality monitoring plan that would allow for continuous monitoring during the months of July through November. Hydro Friends has not changed its proposal by filing the alternative water quality monitoring plan discussed during the teleconference. If such a plan were to be filed prior to the issuance of any license for the Braddock Project, we would consider the plan in the license order.

### **Use of Tennant method for environmental gate flow setting**

*Comment:* The Corps states that Hydro Friends' use of the Tennant method to justify flows through the environmental gate is not consistent with the traditional application of the method. The Corps further states that staff adopted Hydro Friends' flow proposal based on the Tennant method without further justification.

*Response:* In section 3.3.2.2 of this EA, we acknowledge that use of the Tennant method for setting minimum flows through the environmental gate is not typical.

As such, staff evaluated the effects on water quality of Hydro Friends' proposed minimum flow regime through the environmental gate based on the *Water Quality Modeling Study*. Based on the minimal predicted decreases in DO concentration downstream of the dam relative to baseline conditions, staff determined that the proposed minimum flow regime would be adequate to protect water quality. The Tennant method was not used by staff to evaluate the effects of Hydro Friends' proposal.

**Water quality recommendations in the Commission's 1988 'Hydroelectric development in the upper Ohio River Basin' Final Environmental Impact Statement**

*Comment:* The Corps states that Commission staff based its water quality impact evaluation on maintaining current Pennsylvania minimum water quality standards without reference to the higher DO standards recommended in the Commission's 1988 'Hydroelectric development in the upper Ohio River Basin' Final Environmental Impact Statement (final EIS), or the Corps' congressionally authorized purpose of saturating DO levels in the dam's outflow.

*Response:* The Commission's 1988 final EIS addressed hydropower development in the entire Upper Ohio River Basin under four alternatives. The preferred alternative in the final EIS recommended minimizing water quality effects of selected projects analyzed within the basin by requiring a minimum DO concentration of 6.5 mg/L within any licenses issued for certain projects. Two projects at the Corps' dams, which were analyzed in the 1988 final EIS and subsequently licensed (i.e., Willow Island Project No. 6902 and Belleville Project No. 6939), contained license articles requiring only adherence to the state minimum DO criteria of 5.0 mg/L, because the 1988 final EIS' preferred alternative did not recommend specific water quality measures for these two projects.

In this final EA, we have not specifically discussed Commission staff's preferred alternative in the 1988 final EIS, as the Braddock Project was not one of the proposed projects analyzed in that document. Nevertheless, in the case of the Braddock Project, our analysis considers current conditions as informed by Hydro Friends' water quality monitoring and modeling studies and conditions that are likely to result from project operation, and not conditions as they were broadly described for the Upper Ohio River Basin in 1988. The current evidence provided during the Braddock Project license proceedings indicates that the impact on DO due to the project would be very minor and highly localized.

As the Corps indicated during a May 30, 2014 teleconference, it has been monitoring DO and temperature since September 2013 at U.S. Geological Survey

gage 03085002, located at the Braddock Locks and Dam lower pool. Although further review of DO concentration data during low-flow months between June and November would be informative, we note that lowest DO concentration observed at this gage during the period from September 24, 2013 to June 4, 2014 was 7.8 mg/L (on October 8, 2013) and that the mean DO concentration during September and October 2013 was approximately 9.2 mg/L. As of the date of this final EA, the Corps has not provided other documentation of the functionality of the environmental gate during low-flow months, or that reducing flows to the environmental gate would negatively impact water quality downstream of Braddock dam.

Based on the results of Hydro Friends' *Water Quality Modeling Study*, we find that the project would likely cause a negligible decrease in existing DO concentrations. Under staff's recommended water quality monitoring plan, these expectations would be field tested prior to construction, during the first 5 years of project operation, and for 5 years following the completion of the Lower Mon Project.

### **Cumulative effects**

*Comment:* The Corps states that it does not agree with limiting the geographic scope of the cumulative effects analysis to the Monongahela River between its Charleroi and Emsworth Locks and Dams projects, as this would fail to fully consider the potential cumulative effects of the five hydropower projects currently proposed for navigation dams upstream of Charleroi dam, particularly as they relate to DO concentrations.

*Response:* We chose the geographic bounds from Charleroi to Emsworth because any potential effects of the construction and operation of the proposed project in combination with other developmental activities in the basin, including the Lower Mon Project, would likely be limited to this area. We were also guided to this decision by the Corps' January 14, 2013 scoping comments: "[t]he study area should include the pools upstream and downstream of Braddock Dam (Braddock and Emsworth Pools, and also the Elizabeth Pool anticipating the future removal of Elizabeth Dam)."

Based on the water quality modeling and fish entrainment studies conducted by Hydro Friends, there is no evidence that Braddock Project operation would have an effect on water quality or fisheries beyond the project boundary. Operation effects on water quality and fisheries are expected to be minimal and highly localized. Additionally, staff's recommended water quality monitoring plan would ensure that the results of Hydro Friends' *Water Quality Modeling Study* are confirmed by *in situ* conditions.

In reference to the cumulative effects on water quality of the Braddock Project with other proposed hydroelectric projects within the watershed, Free Flow Power Corporation recently simulated the DO impacts of nine existing and proposed hydroelectric projects between Monongahela River mile 130 to 0.<sup>40</sup> This simulation included the existing Braddock Locks and Dam facility. While Free Flow Power's analysis was based on modeled data from one low-flow summer season (June to September 1999), and some of the proposed projects were shown to result in DO decreases, this preliminary analysis suggested that average DO concentrations at Braddock Locks and Dam, with the proposed projects in operation, would remain similar to existing conditions.

### **Climate change**

*Comment:* The Corps states that the effects of climate change over the life of the project will result in more extreme conditions than have been historically experienced, and the effects of climate change have not been addressed in the draft EA.

*Response:* When the Lower Mon Project is completed, it will result in a longer and deeper Braddock pool with the potential for greater temperature and DO stratification during high temperature and low-flow conditions than currently exists. The effects of the Lower Mon Project on water quality in and around the project are likely to overshadow any effects of global climate change on water quality. Therefore, staff recommended 5 years of monitoring following the completion of the Lower Mon Project. If extreme conditions due to global climate change become apparent at some point in the future, licenses include a standard fish and wildlife reopener condition whereby appropriate entities would be able to identify the need for additional monitoring or other measures during the term of any license issued for the Braddock Project.

### **Cost of environmental measures**

*Comment:* The Corps states that table 12 in section 4.3, *Cost of Environmental Measures* does not provide an environmental mitigation cost for operating in a run-of-river mode. Also, the Corps states that Hydro Friends' proposal assumes a

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<sup>40</sup> Opekiska Lock & Dam, P-13753; Morgantown Lock & Dam, P-13762; Point Marion Lock & Dam, P-13771; Grays Landing Lock & Dam, P-13763; Maxwell Lock & Dam, P-13766; Monongahela Lock & Dam No. 4 (*i.e.* Charleroi), P-13767; Final License Application Volume II, Appendix C1, *Water quality, hydraulics, aquatic habitat study report*.

substantial change in the current Corps' operation, one that would pass flows through the hydropower project that are currently released through the environmental gate.

*Response:* As a hydroelectric project does not presently exist at Braddock Locks and Dam, and the only proposal before us is Hydro Friends' proposal to operate the project in a run-of-release mode based on flows made available by the Corps, an estimated cost for run-of-release operation is not required. In section 4.3 above, we have clarified this issue. Regardless of Hydro Friends' proposed project operation, we acknowledge in this final EA that the Corps would retain control of the flow distribution at the Braddock Locks and Dam.



Document Content(s)

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