ENVIRONMENTAL ASSESSMENT

JORDAN'S POINT DAM REMOVAL
MAURY RIVER
CITY OF LEXINGTON AND ROCKBRIDGE COUNTY, VIRGINIA

Prepared by:

Department of Game and Inland Fisheries
Richmond, Virginia

In cooperation with:

US Fish and Wildlife Service
Hadley, Massachusetts

November 6, 2018
1.0 INTRODUCTION

The Virginia Department of Game and Inland Fisheries (DGIF) has prepared this Environmental Assessment (EA) to evaluate the potential impacts to the human and natural environment of the proposed removal of Jordan’s Point Dam (Dam) and C&O Railroad Piers (Piers) located in the Maury River in the City of Lexington (City) and Rockbridge County (County), Virginia.

Partial funding support for the project is being provided by the U.S. Fish and Wildlife Service (USFWS) via the National Fish Passage Program and State Wildlife Grant Program. Therefore, this project (Project) must comply with the National Environmental Policy Act (NEPA), (42 United States Code [USC] § 4321-4347), and Section 106 of the National Historic Preservation Act (Section 106)\(^1\). The NEPA requires federal agencies to integrate an interdisciplinary environmental review process to evaluate a range of alternatives including the No-Action alternative and provide an opportunity for public input as part of its decision-making process. The USFWS is the lead federal agency for the proposed action.

The EA will be used to determine whether to provide a Finding of No Significant Impact (FONSI) or if an Environmental Impact Statement (EIS) will be required. If the EA demonstrates that there is no significant impact to the human and/or natural environment, a FONSI will be prepared. If the analysis in the EA indicates that the proposed action is a major federal action that significantly affects the quality of the human and/or natural environment, a notice of intent to prepare a draft EIS will be published in the Federal Register.

1.1 SCOPE OF DOCUMENT

The format of this EA follows the guidelines set forth in the USFWS NEPA Reference Handbook (USFWS 2003). The sections of the document are described as follows:

- “Purpose and Need” provides the reason and justification for the action;
- “Alternatives” provides a description of the No-Action alternative, the proposed action, and other alternatives that were considered;
- “Affected Environment” outlines existing environmental conditions;
- “Environmental Consequences” reviews the potential effects for each of the alternatives considered;
- “Comparison of Environmental Impact” provides a table that summarizes the environmental impacts of all of the alternatives;
- “Cumulative Impact” examines past, current, and future actions on the Maury River for potential positive/negative environmental impacts; and
- “Consultation, Public Involvement, and Coordination” describes the collaboration among technical experts and regulatory agencies, and agency engagement with the public to address concerns and obtain feedback to help shape the proposed action.

Public concerns regarding sediment, aesthetics, recreation, fishing, flooding, expected river conditions

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\(^1\) FWS is conducting the Section 106 compliance process required by the NHPA in accordance with the National Park Service regulations at 36 C.F.R. §§ 800.1-800.16. This Environmental Assessment is not intended to also serve as the Section 106 compliance process, as is permitted by 36 C.F.R. § 800.8(c). Impacts to historic resources are noted throughout this document to better explain the decision-making process. The normal Section 106 compliance process is being followed, and a Memorandum of Agreement is being developed to mitigate adverse impacts to historic resources with consultation from interested parties and tribes.
after Dam removal, and the Dam’s historical significance have been expressed and are addressed in this document.

1.2 LOCATION

The proposed action would occur at the Dam and at the Piers (150 feet downstream of the Dam) (Figure 1). The Dam and Piers are situated adjacent to the City-owned Jordan’s Point Park (Lat. 37, 47, 35.7; Long. -79, 25, 42.3). The Dam is owned by the City, and the Piers appear to be owned by Virginia Military Institute (VMI) based on the Deed of Gift dated May 13, 2010; both are located on state-owned stream bottom and straddle the boundary of the City and the County. Route 11 crosses the Maury River approximately 650 feet downstream of the Dam, and the confluence with the James River is located 20.2 river miles downstream.

![Figure 1. Location of Jordan’s Point Dam and C&O Railroad Piers, Maury River, City of Lexington, Virginia.](image)

1.3 BACKGROUND

Constructed at an undetermined date prior to 1900 to power various mill operations, the now-defunct Dam (also referred to as East Lexington Dam) measures approximately 10-feet high by 185-feet long. This “run-of-the-river,” “low-head” Dam impounds approximately 1.2 miles of the Maury River and is currently classified as “low hazard – special” in the Virginia Department of Conservation and Recreation (DCR) Dam Inventory System. The Dam is structurally compromised and has significant cracks, voids,
and leaks (Brash 2007). On December 15, 2017, DCR issued the City a Notice of Deficiency Report in which they included a Schedule of Compliance to address the Dam’s deficiencies. The Schedule of Compliance stipulates that the City is to submit a plan and schedule to correct the deficiencies to DCR by December 31, 2018. Documentation must be submitted to DCR on or before December 31, 2020, that all work to address deficiencies has been completed in compliance with the Dam’s Alteration Permit.

Public safety with regard to the Dam has been a concern since 2006 when a local teenager drowned after going over the Dam into the recirculating current. More recently, in 2017 and 2018 multiple meetings were held to facilitate discussion within the community regarding the fate of the Dam. On January 4, 2018, Lexington City Council voted unanimously to enter into a partnership agreement with DGIF to pursue removal of a portion of the Dam. In conjunction with the Dam removal, it is also proposed that a number of the Piers located just downstream of the Dam also be removed.

To undertake this project, DGIF is partnering with the USFWS for funding and coordination support through their National Fish Passage Program and State Wildlife Grant funds. USFWS is serving as the lead federal agency for the Section 106 review process.

DGIF is completing this EA consistent with the National Environmental Policy Act of 1969 (P.L. 91-190; 42 U.S.C. §§ 4321, et seq.) to evaluate potential environmental impacts of the alternatives considered for the proposed action.

2.0 PURPOSE AND NEED
This EA was prepared to evaluate the potential impacts of the proposed action and the other alternatives considered on the physical and human environment. The proposed action is comprised of partial removal of the Dam and some of the Piers.

The purposes of this project are to increase complexity of instream habitat; restore riverine-channel hydraulics and sediment transport for 1.2 miles upstream; improve aquatic-habitat connectivity to the headwaters; remove a fish-passage barrier and public safety/boating hazard; and eliminate downstream scour resulting from waterway impoundment.

Currently, the Dam isolates resident fish and freshwater mussel populations in the river upstream of the structure from those in areas downstream. Freshwater mussels rely on fish hosts for upstream dispersal of their young, by carrying larvae on their gills, fins, or body. Isolation due to dams and other fish-passage barriers reduces the gene flow between upstream and downstream populations, potentially reducing their viability.

According to Virginia’s 2015 Wildlife Action Plan (Action Plan) (http://bewildvirginia.org/wildlife-action-plan/), habitat fragmentation is described as one of five major threats to the health of aquatic habitats within this region of the Commonwealth of Virginia. The Action Plan also indicates that restoring aquatic connectivity would enhance the conservation of aquatic Species of Greatest Conservation Need (SGCN). The Virginia Fish and Wildlife Information Service (FWIS) indicates the following SGCN “are known or likely to occur” within a 2-mile radius of the Dam: James spinymussel (FESE; Ia), yellow lance (FT; Ia), green floater (ST, IIa), Atlantic pigtoe (ST, Ia), Virginia pigtoe (Ib), Roughhead Shiner (Ib), elktoe (IIC), notched rainbow (IIa), creeper (IVa), triangle floater (IVA), northern lance/Atlantic
spike (IVb), and Carolina lance (IVc). The Dam is a barrier to aquatic-organism passage, impeding fish migration and negatively impacting mussel species by decreasing the availability and quality of sheltering, spawning, and feeding habitat for host-fish and mussels both upstream and downstream (Watson 2017). The Chesapeake Fish Passage Prioritization tool (http://maps.freshwaternetwork.org/chesapeake/#) provides information on the functional networks of rivers, calculated as the length of sections of river that fish could theoretically access from any other point within that network, including mainstem river and tributaries, ending in another barrier or headwaters. This tool indicates that there are 1,084 miles of functional network upstream of the Dam, and 56 miles of functional network downstream of the Dam, for a total of 1,140 functional network miles.

A key purpose and goal of this project is to restore the riffle, run, and glide features that would be present in the 1.2-mile impoundment reach if not for the presence of the Dam. Damming of rivers results in flooding of complex, riverine habitat that is located in riffsles, runs, and glides, impacting the organisms that depend on that habitat for sheltering, spawning, and feeding. The ecological disturbance that occurs immediately upon construction of a dam continues to affect the functional processes of that ecosystem as long as it stands (Hansen and Hayes 2012). By changing the water-surface elevation of a river channel, the presence of a dam creates a reservoir thereby changing the riverine system’s biology; water depth and velocity; riparian habitat; temperature; sediment transport; nutrient flow; and fish, mussel, and aquatic insect (macroinvertebrate) populations (McGee 2008, Stanley and Doyle 2003, Tiemann et al. 2016).

In addition to the ecological impacts of the presence of the Dam, the Piers impact the cross-sectional area (morphology), hydraulics, and stream-bottom habitat of the downstream channel. They are located in a riffle (shallow, fast-moving water) section of the river that would otherwise be occupied by cobble and gravel that provide cover and attachment sites for aquatic macroinvertebrates. Instead, the natural river substrate in this area has been replaced by cement structures with no habitat benefits.

Public-safety issues also result from the presence of the Dam and the Piers. The recirculating current at the base of the Dam is a known drowning hazard, resulting in a death in 2006. The Piers are undercut and could act as entrapment hazards to swimmers or boaters, thereby threatening public safety. The Millrace headgate was identified in the engineering assessment of the Millrace as a “syphon” drowning risk (Brash 2018). The small opening of the headgate culvert, combined with at least 4 feet of head (depth of water at base flow) on the inlet side, creates a strong suction effect at the base of deep, still water.

3.0 ALTERNATIVES
3.1 DEVELOPMENT OF ALTERNATIVES
The project partners considered a range of alternatives and their ability to meet the project’s Purpose and Need. Environmental, social, and cultural factors were considered to identify those alternatives that met the Project’s objectives. The range of alternatives considered were developed utilizing the following information:

2 Endangered Species Status: FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered
Virginia Wildlife Action Plan Tier Ranking: I = Tier I Critical Conservation Need; II = Tier II Very High Conservation Need; III = Tier III High Conservation Need; IV = Tier IV Moderate Conservation Need
Virginia Wildlife Action Plan Conservation Opportunity Ranking: a = On-the-ground management strategies/actions exist and can be feasibly implemented; b = On-the-ground actions or research needs have been identified but cannot feasibly be implemented at this time; c = No on-the-ground actions or research needs have been identified or all identified conservation opportunities have been exhausted
Objectives associated with the project Purpose and Need: (Objectives are not in order of priority)
- Restore riverine hydrology, ecology, sediment transport, and habitat complexity
- Improve habitat connectivity and upstream/downstream passage for fish, mussels, and other aquatic organisms
- Improve public safety by eliminating the recirculating current created by the Dam and the entrapment risk of the Piers
- Field reconnaissance and surveys to identify and assess fluvial geomorphology of the river
- Mussel surveys; macroinvertebrate and temperature data collection
- Review of site-specific conditions for each alternative
- Comments/input from the public

Alternatives Considered

Six alternatives were considered for analysis:

- Alternative 1: Complete Dam and Pier Removal
- Alternative 2: Partial Dam and Pier Removal (Proposed Action)
- Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification*
- Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction
- Alternative 5: Dam Modification and Rock-rapids (“whitewater park”) Construction
- Alternative 6: No Action

*As a result of comments received on the draft EA, Alternative 3 was revised from “Dam Repair and No Pier Removal” to include “Millrace Modification.”

These six alternatives were considered with regard to their ability to meet project Purpose and Need as the table below illustrates.

<table>
<thead>
<tr>
<th></th>
<th>Alternatives</th>
<th>Restores Riverine Hydrology, Ecology, Sediment Transport and Complex Habitat</th>
<th>Removes public-safety hazard</th>
<th>Removes fish-passage barrier</th>
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<td>1</td>
<td>Complete Dam and Pier Removal</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>2</td>
<td>Partial Dam and Pier Removal</td>
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<td>X</td>
<td>X</td>
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<td>Dam Repair, No Pier Removal, and Millrace Modification</td>
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<td>X</td>
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<td>X*</td>
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<td>5</td>
<td>Dam Modification and of Rock-rapids (“whitewater park”) Construction</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>No Action</td>
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</table>

Note: “X*” indicates the possibility of an alternative providing aquatic organism passage depending on design specifications. Conceptual designs (Rock Ramp, Rock-arch Rapids, or Rock Rapids) do not provide a level of detail to definitively determine whether fish passage will be provided for all resident species, and such analysis is beyond the scope of this EA. Alternatives 3, 4, or 5 could each include modification of the Millrace, though. Removing the headgate and the earthen dam that surrounds it would create a nature-like fishway around the fish-passage barrier in the main channel.
3.2 ALTERNATIVES CONSIDERED FURTHER
All six alternatives received further in-depth analysis under this EA to evaluate their ability to meet the Project's Purpose and Need. A brief description of each alternative is provided in this section.

Alternative 1: Complete Dam and Pier Removal
This alternative involves removal of the entirety of the Jordan’s Point Dam from bank-to-bank and the removal of all of the Piers located in the channel just downstream of the Dam. This would allow the river channel to return to conditions prior to the construction of the first Dam (likely wooden) in this location sometime in the early 1800’s.

Removal of all structures would address all project Purposes and Needs. It would restore the habitat, ecology, and connectivity of the river; eliminate the drowning hazards of the recirculating current at the base of the Dam and the undercut Piers, and eliminate the fish-passage barrier.

Of all of the alternatives, this alternative would have the greatest adverse impact on historic resources. It would eliminate any remnants of the Dam, defunct fish ladder, and all of the Piers that could provide opportunities for historic interpretation. It would also reduce the frequency of water flowing into the Jordan’s Point Millrace, a contributing resource to the Jordan’s Point Historic District.

Alternative 2: Partial Dam and Pier Removal (Proposed Action)
This alternative involves the following:
- Removing a significant portion of the Dam’s middle section, though leaving a remnant on both sides of the river (see Figures 2 and 3) as well as the fish ladder, while still providing for adequate bankfull dimension (Keaton et al. 2005), and
- Removing eight railroad Piers in the active channel (leaving four Piers that are located in the non-active channel or in the floodplain on the northern side of the river).

Figure 2. Proposed cross-section, with red line showing proposed extent of removal. The area below the line is proposed to remain.
Figure 3. Proposed Dam cross-section, leaving a portion on both banks, as well as the fish ladder for historic interpretation.

This approach would restore the submerged channel bottom and provide for the appropriate channel dimensions, while retaining a portion of the Dam on both sides of the river and the defunct fish ladder for historic interpretation. Altering the Dam to match appropriate channel morphology would restore riverine hydrology, fish passage, and sediment-transport competency. It also would remove the public-safety hazards of the Dam and the Piers in the active channel and reduce the syphon hazard at the Millrace headgate.

To minimize bank disturbance, the site would be accessed via an existing, gravel access route at the City-owned Jordan’s Point Park on the southern bank just downstream of the Dam. A trackhoe-mounted hydraulic hammer would be used to break-up eight of the concrete railroad Piers starting on the southern side of the channel and moving northward. After demolition, this material (approximately 184 cubic yards) would be loaded into trucks and hauled to an approved, off-site disposal facility.

Depending on river flow during construction, approximately 135-cubic yards of Class II rock may be placed by trackhoe between the southern bank and the downstream base of the Dam to serve as a temporary 12 ft. x 75 ft. causeway for the equipment to access the Dam. Working from the causeway, the hydraulic hammer would be used to demolish the targeted section of the Dam. A portion of the Dam on both sides of the river would be left intact to provide for historical interpretation. The defunct fish ladder on the northern end of the Dam would not be altered, also to provide for historic interpretation. The Dam material (approximately 170-cubic yards of rock and mortar) would be moved by trackhoe to the access path, loaded in trucks, and hauled to an off-site disposal facility. All causeway material would be removed from the active channel and placed on the southern, scoured bank above ordinary high water (OHW) just downstream of the Dam.

In order to provide flow as often as possible to the Millrace that originally directed water to one or more mills (which no longer exist), approximately 20 cubic yards of accumulated sediment would be
excavated by trackhoe at the entrance to the Millrace at the upstream end of the park to match the Millrace-headgate invert elevation.

There would be no erodible material stockpiled in the active channel or in the floodplain area. Excess sediment in the upstream channel would be transported downstream, depositing in excessively scoured and/or over-widened areas resulting from the Dam.

Because this alternative would fulfill all aspects of the project purpose while still providing for historic-resource interpretation, it was determined to be the preferred approach for achieving the project purpose and goals and, thus, is referred to in this EA as the “Proposed Action.”

**Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification**

This alternative involves repairing the Dam to meet current dam-safety requirements, not removing any of the downstream Piers, and modifying the Millrace to create a nature-like fishway by removing the headgate culvert and earthen dam. This alternative would maintain 1) the impoundment’s flatwater recreational value and associated effects on ecology, hydrology, and habitat and 2) the recirculating current downstream of the Dam and the entrapment risk of the Piers. This alternative would continue to provide river flow into the historically significant Millrace and remove the syphon hazard of the headgate. However, increased and unregulated flow into the Millrace could have other implications on the Millrace structures (Brash 2018).

This alternative does not fully address the Project Purpose and Need, which includes restoration of the hydrology, ecology, sediment transport, and habitat complexity of the river as well as removal of the public-safety hazards of the Dam and Piers.

**Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction**

This alternative would involve repairing the existing Dam to meet dam-safety requirements, and filling the channel immediately downstream of the Dam with rock and/or concrete/mortar. The fill would start at the top of the Dam and gradually taper down to meet the existing stream bottom 150 feet or more downstream, depending on the design specifications (see Figure 4.). The Piers would likely be covered or removed.
This alternative would eliminate the drowning hazard of the recirculating current downstream of the Dam and eliminate the entrapment risk of the Piers. The rock placed below the Dam would spread out the hydraulic drop that currently occurs at the base of the Dam across a longer distance, thus reducing its drowning potential.

If appropriately designed, it is possible that a Rock Ramp or Rock-arch Rapids could provide passage for fish. To provide the greatest fish-passage opportunity, it would need to be long enough to provide the appropriate slope, velocity, and other key factors for resident fish species to pass (See Section 4.6 FISH).

The Rock-arch Rapids approach would impact the historic-resource value of the Dam by covering the visible face of the Dam with rock and, possibly, concrete. It would also negatively impact the natural stream bottom by permanently covering it with fill material. It would maintain the upstream impoundment for flatwater recreation and resultant river flow into the historically significant Millrace.

A key purpose and goal of this project is to restore the riffle, run, and glide features that would be present in the 1.2-mile impoundment reach if not for the presence of the Dam. These features provide sheltering, spawning, and feeding habitat upon which riverine species depend. This alternative, regardless of the design-approach, maintains the impoundment of 1.2 miles of river and, thus, does not accomplish this goal. Natural, downstream sediment transport would remain disrupted, preventing restoration of downstream habitat features such as riffles and point bars. Dam Repair and Rock Ramp or Rock-arch Rapids Construction does not fully address the Project Purpose and Need, which includes restoration of the hydrology, ecology, sediment transport, and habitat complexity of the river.
Alternative 5: Dam Modification and Rock-rapids Construction

This alternative, also referred to as the “whitewater park,” involves the following (or some variation thereof):

- Removing at least 4 feet of height across the top of the Dam*,
- Filling the stream channel immediately downstream of the remaining 6-feet tall Dam with large boulders and possibly mortar,
- Constructing two, new grade control structures upstream (approximately 5- or 6-feet tall) also of large boulders and possibly mortar**,
- Constructing one or more similar structures downstream, (approximately 2- to 4-feet tall),
- Removing the Piers, and
- Opening the Millrace to unregulated flow.

*to possibly bring the Dam elevation below the threshold for dam-safety regulatory compliance, though this would need to be determined by DCR

**in order to maintain the original water-surface elevation of the impoundment

The “whitewater park” concept (Lacy 2008) was first presented to the City of Lexington at a Community Forum on April 2, 2008. The original plan called for maintenance of the existing Dam height and construction of three whitewater features, all downstream of the Dam. A revised design, involving a greater linear footage of construction to accommodate the desired slope, is described above and shown below in Figure 5.

Figure 5. Conceptual Design for Rock Rapids Alternative (Lacy 2008).

This alternative would eliminate the public-safety hazards of the Dam, the Piers and the Millrace headgate. The multiple structures built upstream and downstream of the Dam would spread out the hydraulic drop that currently occurs just downstream of the Dam across a longer distance, thus reducing its drowning potential.
If each of the structures were appropriately designed (e.g., slope, velocity, turbulence, etc.) or if the Millrace modifications include complete removal of the headgate and earthen dam, this alternative could provide aquatic-organism passage. There are many factors to take into consideration in order to provide fish passage for all resident-fish species (See Section 4.6 FISH).

This approach would visually and structurally impact the historic-resource value of the Dam by removing the upper 4 feet and covering what remains of the Dam with rock and concrete. This alternative would preserve the upstream impoundment for flatwater recreation and resultant river flow into the historically significant Millrace, as long as the structures are maintained. However, increased and unregulated flow into the Millrace could have other implications on the Millrace structures (Brash 2018).

A key purpose and goal of this project is to restore the riffle, run, and glide features that would be present in the 1.2-mile impoundment reach if not for the presence of the Dam. These features provide sheltering, spawning, and feeding habitat upon which riverine species depend. This alternative, regardless of the design-approach, maintains the impoundment of 1.2 miles of river and, thus, does not accomplish this goal. Natural, downstream sediment transport would remain disrupted, preventing restoration of downstream habitat features such as riffles and point bars. The Dam Modification and Rock-rapids Construction alternative does not fully address the project Purpose and Need because it does not restore the hydrology, ecology, and habitat complexity of the river.

**Alternative 6: No Action**

Under this alternative, no alterations to the Dam or Piers would take place. The Dam would continue to impound and impact 1.2 miles of river upstream, inhibit passage of aquatic organisms, and pose a drowning hazard adjacent to a public park. The risk of structural failure would also persist. The historic value of the Dam and flow into the Millrace would be preserved until such failure occurs. Meanwhile the Dam owner would continue to bear the maintenance, repair, and liability costs and risks associated with the Dam. Similarly the Piers and the Millrace headgate would persist as public-safety hazards.

Note: DCR has issued the City, as the Dam owner, a Deficiency Report with an associated Schedule of Compliance in order to satisfy Virginia dam-safety regulations. Thus, the no-action alternative is not acceptable in this case given the dam-safety regulations, but its inclusion in the alternatives analysis is required by National Environmental Policy Act (NEPA) policy and provides the baseline for comparison of the other alternatives.

**4.0 AFFECTED ENVIRONMENT**

**4.1 GENERAL**

The Maury River watershed at the City of Lexington in Rockbridge County encompasses approximately 500-square miles and is located in the Valley and Ridge Physiographic Province. Comprising part of the Chesapeake Bay watershed, the Maury River is a 42.8-mile-long tributary to the James River, with the confluence approximately 20.2-river-miles downstream of Lexington at the Town of Glasgow. This freshwater basin encompasses rural uplands, woodlands, forests, farms, and small cities and towns. The dominant land-use is woodland with the remaining acreage mostly in farmland, predominantly livestock grazing and hay production (USDA 2014). It is an area steeped in both history and natural beauty.
The immediate project site is centered around Jordan’s Point Dam on the Maury River adjacent to City-owned Jordan’s Point Park. The Dam creates a 1.2- mile impoundment upstream; an area with public-safety concerns just above and below the Dam; and a downstream reach that is hydraulically scoured and depleted of sand and gravel. There is general disruption to the natural state of the riverine system in the project area due to the presence of a Dam and associated impoundment since the early 1800’s.

4.2 WATER QUALITY
Water quality in the Maury River watershed varies depending on subwatershed or location on the mainstem. Downstream of Lexington, in certain subwatersheds (Buffalo Creek, Colliers Creek, and Cedar Creek) and in the mainstem, there are water quality violations of bacteria standards and/or benthic impairment (due to sediment) that warrant development of improvement plans (DEQ 2013). Additionally, polychlorinated biphenyl (PCB) contamination has been documented in the Maury River downstream of Moomaw’s Dam in Buena Vista to the confluence with the James River at Glasgow (DEQ 2005). Moomaw’s Dam is located 7.5 miles downstream of Jordan’s Point Dam.

Low-head dams negatively affect water quality and reduce biodiversity (Ohio EPA 2013; Santucci et al. 2005; Bernacsek 2001). The quality of water deteriorates towards the reservoir bed and also upstream and downstream of the reservoir due to several factors such as duration of storage, the nutrient load, the depth of reservoir, the turbidity and temperature (Sharma 2015). Potential effects include thermal stratification, dissolved oxygen depletion, and nutrient-cycling alteration (Zaidel 2018; Tuckerman and Zawiski 2007).

Temperature data collected by Bernard et al. (2017) in the Maury River along the impoundment of the Jordan’s Point Dam and upstream of the impoundment indicates that the presence of the Dam increases the water temperature in the impoundment. Though the data were collected during a short period of time (September-October 2017) and the thermal influence was non-linear, the data (Appendix 1) suggest that the Dam has some warming effect on the Maury River. The highest temperatures were measured at the site closest to the Dam, so this thermal influence is likely transferred downstream of the structure, as well.

Macroinvertebrates are often used as indicators of water quality. Data collected by Horan et al. (2017) (Appendix 2) found that, though the stream-condition index (as measured by the macroinvertebrates present) in the Maury downstream of the Dam reflects generally good stream health, the types of insects that are present likely reflect a lack of sediment due to scour effects from the Dam.

4.3 HYDROLOGY AND FLOODING
An approximately 500-square mile watershed drains to the Maury River at the Dam location. The structure is a “run-of-river” dam which means that all of the water in the river at that location goes over the Dam at all times. Run-of-river dams have minimal water storage capacity and thus do little to alter downstream flow timing or magnitude. The floodplain model (Hurt & Proffitt 2018a) determined that at the 100-year flood return frequency, the flood elevation is approximately 30 feet above the stream channel-invert elevation in the vicinity of the Dam (Appendix 3). Approximately
3,500 feet upstream of the Dam, Furrs Mill Road closely parallels the river and this portion of the roadway experiences periodic flooding as Virginia Department of Transportation (VDOT) warning signs indicate.

The hydrology of the river for 1.2 miles upstream of the Dam reflects that of a reservoir – deep, slow-moving water – whereas the hydrology downstream of the Dam reflects that of a free-flowing riverine system – alternating shallow, fast-moving water in “riffles” and “runs” with deeper, slower-moving water in “pools” and “glides.”

4.4 GEOLOGY/SEDIMENT
The immediate vicinity of the Dam includes a bedrock outcropping on the northern bank. The outcrop consists of limestone with a generally north-south orientation and dip approximately 75 – 80 degrees. Similar outcrops are visible to the rear of nearby homes on Furrs Mill Road as well as along the roadway embankment in areas of concentrated soil erosion and steeper slopes (Hurt & Proffitt 2018b). The area is underlain by the Edinburg Formation (Oe) consisting of fine to coarse-grained limestone (DMME 2007).

The riverbanks are notably different immediately downstream and upstream of the Dam as the former commonly exhibit cobble- to boulder-sized limestone and a greater frequency of exposed outcrops. Upstream, the riverbanks generally have several feet of soil cover with the shallow portion identified as sandy lean clay (CL) alluvium and no indications of moisture seepage or redoximorphic coloration. The handheld probe typically could penetrate 2.5 – 5 feet prior to refusal on likely cobbles and boulders. On the northern side, limestone outcrops were infrequent and most would not be categorized as competent (Hurt & Proffitt 2018b).

At roughly 1,500 feet upstream, similar soil conditions are present. Soils remain alluvial in nature on the northern bank while the southern boundary of the river is a nearly vertical rock face consisting of limestone (Hurt & Proffitt 2018b).

Sediment is an integral part of a river ecosystem. Sediment occurs naturally on streambanks, river bottoms, and in the water column, and it contains nutrients that riverine species require to survive and thrive. Dynamic river flows redistribute small and large sediments, gravel, cobble, and boulders that provide diverse habitat for aquatic biota (Ohio EPA 2013). Though influenced by many variables such as geology, valley type, dam height, etc., dams typically alter the movement of sediment within a river and cause sediment to be deposited upstream of a dam, thus “starving” the reach downstream of sediment (Petts 1984; Poff et al., 1997). This alters the habitat both upstream and downstream of a dam.

The bathymetric survey data collected by DGIF and compiled by Hurt & Proffitt shows that within the impoundment immediately upstream of the Dam, there is a <100-feet long sediment wedge (shown in Figure 6).
Though taller dams in different geologic settings tend to fill completely with sediment over time, low-head, run-of-river dams, such as Jordan’s Point Dam, often do not (Csiki and Rhoads 2010). Much of the sediment (cobble, gravel, and sand/silt) accumulation tends to get flushed periodically. That being said, due to the reservoir hydrology, a thin layer of fine sediment covers a majority of the impoundment area. The bed material immediately downstream of the Dam, on the other hand, is lacking gravels and fine sediments due to the scouring energy of the water after it goes over the Dam.

Concerns were raised during public meetings about possible release of contaminated sediments during or after Dam removal. Specific reference was made to polychlorinated biphenyl (PCB) contamination that has been documented in the Maury River downstream of Buena Vista to the confluence with the James River. Virginia Department of Environmental Quality (DEQ) has no data indicating the presence of PCBs in the Maury River upstream of Moomaw’s Dam.

In 2007, when the fate of the Dam was being discussed, several sediment samples were collected just upstream of the Dam and analyzed for heavy metals and a suite of toxins (EnviroCompliance Laboratories, Inc. 2007). All parameters were found to be “Below Detection Limit” (BDL) other than barium (likely a natural geologic source) that was approximately one-half of the Environmental Protection Agency’s maximum contaminant level (MCL) of 2 mg/L. DEQ has recommended that additional sediment testing for contaminants in the Dam impoundment is not warranted.

4.5 RIVERINE HABITAT
The Maury River has a generally healthy riparian corridor despite areas of livestock and other agricultural land-use. The riparian forest vegetation is primarily sycamore, box elder, and red maple in the vicinity of Jordan’s Point. The majority of the riparian area along the southern bank of the impounded reach upstream of the Dam is either bedrock cliff or mature, hardwood forest.
Much of the riparian area immediately upstream of the Dam on the northern bank is primarily grass with a narrow band of mature, hardwood trees.

Riffle-pool complexes that support a diverse aquatic community dominate the in-stream habitat in non-impounded reaches of the Maury River. The substrate is primarily cobble with gravel and silt/sand. Based on field measurements of the Dam and Piers and an estimate of the base width of the Dam, these structures combined, replace approximately 2,370-square feet of natural stream-bottom habitat.

In-stream habitat throughout the Dam impoundment varies depending on location. Along the northern bank throughout the impoundment and the southern bank downstream of the boat ramp, the habitat is primarily silt, clay and woody debris. Upstream of the boat ramp along the southern bank, the habitat is primarily bedrock and cobble. Throughout the rest of the impoundment, the habitat varies from cobble, to bedrock to a mix of sand, gravel and cobble. Most areas have a layer of silt, likely caused by the altered hydrology (water depth and velocity) with some areas covered by a layer of algae.

As would be expected due to high turbulence and shear stress, in the deeply scoured area immediately downstream of the Dam, habitat is comprised of mostly larger cobble. From the Piers to about 150 feet downstream of the Route 11 bridge, the flows are relatively swift and the substrate, dominated by cobble, is lacking sand, gravel, and interstitial spaces. Downstream of this area, the southern half of the river is primarily a deeper run and pool, and the substrate is dominated by bedrock as it emanates from the rocky cliff along the bank. The northern half of the river is comprised of sand, gravel, pebble, and cobble and is a low-velocity run.

4.6 FISH

There are 15-20 species of fish commonly found throughout the Maury River. The most frequently observed, with the highest relative abundance, are as follows: Smallmouth Bass, Redbreast Sunfish, Rock Bass, Northern Hogsucker, White Sucker, Fallfish, Bluehead Chub, Margined Madtom, Common Shiner, Central Stoneroller, and Green Sunfish. Some species like Common Carp and Largemouth Bass are mainly found in localized areas harboring some of the longest, deepest pools in the river, such as the impoundment reach upstream of the Dam (Reeser 2018).

While fish populations are currently robust in the Maury River, maintaining water quality, physical habitat and connectivity are essential to maintaining the health of these populations. Obstructions like dams could block certain species from locating suitable spawning areas, limit genetic transfer between sub-populations, and alter natural riverine processes that create complex habitats. Each of these scenarios could suppress certain fish populations from reaching their fullest potential. Studies have consistently shown that species richness decreases with upstream presence of dams on rivers (Cumming 2004; Porto 1999) as well as downstream presence of dams (Pringle 1997).

A “fishway” is any structure or modification to a natural or artificial structure for the purpose of providing fish passage. A fishway can be nature-like (such as a “rock ramp”) or a bypass structure. Designing for fish passage is complex and involves many considerations: the species and ages of fishes that need to pass, the timing of that passage need (seasonal or continuous), flow requirements, depth and frequency of pools, turbulence, and slope (Washington Department of
Fish and Wildlife 2000). Maximum velocities for upstream passage are based on the prolonged swimming speed (medium energy, sustainability in minutes) of the target fish, and passage should be designed for the weakest fish in the system (Natural Resources Conservation Service 2010).

The slope of any in-stream structure has a direct effect on the velocity of the water flowing over it and, thus, its efficacy for fish-passage. The slope, in turn, drives the length (and the impact to the natural stream bottom) of the structure required for fish to pass a given river impediment. Recommended slopes to provide resident fish migration are 3%-5% (USFWS 2017). Based on that slope, to overcome a 10-foot-tall barrier would require at least a 200- to 300-foot-long nature-like fishway or bypass fish structure.

**4.7 MUSSELS**

Freshwater mussels are among the most imperiled groups of organisms in the world (Bogan 1993; Lydeard et al. 2004; Strayer et al. 2004). In North America, nearly 74% of the approximate 300 species are listed as endangered, threatened, or in need of conservation (Tiemann et al. 2016). The presence of dams often inhibit or disrupt dispersal of fish hosts which results in fragmented mussel populations and declines in species richness and diversity (Watters 1996; Tiemann et al. 2016).

Mussels are known to be good indicators of substrate and water quality, as they rely on a particular bed material that allows for burrowing but that is neither too mobile nor too imbedded. They filter the water, serve as attachment sites for algae and insect larvae, and provide food for wildlife. Their distribution is partially dependent on the presence of host species for a portion of the mussels' life cycle. The majority of mussels have a parasitic larval stage (glochidia) in their life cycle in which the larvae attach to the gills, bodies, or fins of specific species of fish to feed for a short period of time. Later in their development, the juvenile mussel drops off the fish, ideally in an area with suitable habitat for the juvenile to grow to an adult mussel.

The Maury River has harbored upwards of 10 freshwater mussel species including James spinymussel (*Parvospina collina*), dwarf wedgemussel (*Alasmidonta heterodon*), and green floater (*Lasigmona subviridis*). Historically, the federally listed endangered James spinymussel has been documented in the Maury River over 18 miles upstream of the town of Lexington at two sites approximately 1 mile apart, and in the James River approximately 1.9 miles apart and 6.8 miles upstream of the confluence with the Maury River. These records are from the University of Michigan’s Museum of Zoology, the Ohio State University’s Museum of Biological Diversity, and The Smithsonian Institution. None of the records have collection dates, but likely date back to at least the mid-1960s when Clench and Boss surveyed the James River, which was the last time the James spinymussel was found live in the James River. The federally listed endangered dwarf wedgemussel has been documented in the Maury River at Lexington but the collection record has no date and likely is a historic record from the early 1900s. The state-threatened green floater has been documented in the Maury River at a single site at Buena Vista. The date of this record is also unknown, though, and likely a historic record (Watson 2017).

More recently, DGIF surveyed the Maury River upstream and downstream of the VA 130 bridge in Glasgow in 2012 and 2016, respectively. No live mussels were found and no evidence of relic shells was observed. Prior to this survey, the Maury River was surveyed near the confluence with the James River at SR 684 in 1992 and at VA 130 in 1997 by Virginia Tech and no live mussels
were found, just a lone relic shell of notched rainbow (*Villosa constricta*). Additional surveys have been conducted from 3.7 – 9 miles upstream of Glasgow from 1984-1992 and at all sites but one, no live mussels or relic shells were found. At the lone site, two live eastern Elliptio (*Elliptio complanata*) were found, the most common mussel in the Atlantic Slope. In 2017, DGIF conducted a multi-day mussel survey downstream of the Dam and throughout the Dam pool. Throughout the impoundment, a total of four(4) live and one(1) relic shell of Atlantic spike (*Elliptio producta*) were found, and a single relic shell of Atlantic spike was found at the edge of the channel upstream of the Route 11 bridge (Watson 2017).

4.8 WILDLIFE
Wildlife habitat along the river includes riparian areas that support raptors, songbirds, bats, deer, amphibians, insects, and small mammals; open-water areas for ducks, geese, heron, and small mammals; and riverine areas for shorebirds, small mammals, ducks, geese, heron, and others.

While resident and migratory waterfowl do use the current impoundment upstream of the Dam, DGIF's waterfowl management biologists have not identified this portion of the Maury River as critical habitat for any of Virginia's migratory waterfowl populations.

4.9 THREATENED AND ENDANGERED SPECIES
James spinymussel (a federally listed endangered freshwater mussel species) is listed in the DGIF FWIS as “occurring or potentially occurring” in the Maury River within two miles of the Dam. A mussel survey has determined, though, that no James spinymussels or any other federally threatened or endangered mussel species are currently present for 1.2 miles upstream of the Dam and for 0.5 miles downstream of the Dam.

The Dam is not located within close proximity of any documented hibernacula or roosts known to support federally threatened northern long eared bats (NLEB). According to the USFWS database, the closest documented NLEB hibernaculum is greater than 12 miles from the site.

Based on project review and site surveys, it has been determined that federally listed species are not present in the project area (DGIF 2018).

4.10 WETLANDS
A jurisdictional determination by the Corps of Engineers, found that there are no wetlands located within the project area (USACE 2018).

4.11 NOISE
The water passing over the Jordan’s Point Dam creates a certain amount of ambient or background sound that neighbors say drowns out much of the highway noise from the nearby, downstream Route 11 highway. Varying sound levels from the Dam are dependent on the volume of water flowing over the structure at any given time. There is little noise in the vicinity other than automobile traffic and the occasional sporting event at the park.

4.12 CULTURAL AND HISTORIC RESOURCES
From the late 18th to the late 19th century, the Maury River (known until 1968 as “North River”) formed a portion of an all-water route from the Atlantic ports of Virginia upstream to Lexington.
The North River Navigation Company Canal connected to the James River and Kanawha Canal at Glasgow. A series of canals, locks, and dams allowed James River bateaux to travel the shallow, rocky river carrying passengers, agricultural products, and pig iron. The first canal boat reached Lexington in 1860 (Trout and deVos 2014).

The era of the canal along the river ended around 1880, when the Richmond and Alleghany Railroad and later Shenandoah Valley Railroad both built rail lines that offered improved transportation along major portions of the river (Rockbridge Area Conservation Council 2009). Numerous artifacts from the canal along the Maury remain, including several lock and dam ruins. Jordan’s Point Dam is one of two dams from the canal era that remain and impound water. The second is Moomaw’s Lock and Dam below the US Route 60 bridge in Buena Vista (Trout and deVos 2014).

Virginia Board of Public Works sketches (dated 1837) identify a Jordan’s Mill Bridge and Dam spanning the river. John Jordan owned and operated a variety of different mills in the area and constructed a dam to harness the power of the river (Pezzoni 2015). When the Maury River is low and the water clear, possible remnants of this earlier (likely wooden) dam are visible in the water just upstream of the current Dam (Clarke 2018).

The current Dam at Jordan’s Point, also known as East Lexington Dam, Jordan’s Mill Dam, or Lexington Mills Dam, is a stone and mortar Dam with a concrete cap that measures approximately 185-feet long and 10-feet tall. The Dam spans the Maury River from the Jordan’s Point area on the south bank, now called Jordan’s Point Park, to the north bank of the river. A defunct, concrete fish ladder is visible on the north end of the Dam. The Dam was originally constructed to provide power to the various milling operations in the Jordan’s Point area, a practice that started in the early-nineteenth century. The exact construction date of the extant Dam is unknown, but based on the use of concrete, construction likely occurred in the late-nineteenth or early-twentieth centuries (Clarke 2018). The construction type and use are consistent with the first period of the evolution of dam design and construction in Virginia. Dams of this time are typically constructed of local stone; however concrete became the building material of choice in the early-twentieth century (Louis Berger & Associates 1990).

The Jordan’s Point Millrace, probably extant by 1808, diverted river water from the river to power the Point’s industries. Maps, photographs, and a nineteenth century painting show intensive industrial development along the tailrace (the lower end of the Millrace) and scattered brick and log domestic buildings on the remaining acreage. In addition, at the lower end of the tailrace are remnants of a gauge dock (ca. 1860) and canal wharf. In earlier history, the Jordan’s Point area was largely open in character, a river bottomland used for agriculture (National Park Service 2016). Today, it is a City park that includes playing fields, river-access points, a river-observation deck, a picnic area, and a walking trail.

When the Historic Lexington Foundation submitted the National Register of Historic Places (NRHP) nomination form for Jordan’s Point Historic District to the National Park Service in 2016, the Jordan’s Point Dam, the headrace (upstream end of the Millrace), and the C&O railroad-bridge Piers were mentioned, but not included as contributing resources. In order to identify historic resources in the proposed project area, a senior architectural historian with Hurt & Proffitt, Inc.
completed an Intensive-Level Architectural Survey of these properties. The survey was reviewed and accepted by the State Historic Preservation Office (SHPO) in June 2018 (Clarke 2018).

Based on the results of the survey, the architectural historian recommended that the Jordan’s Point Dam, located adjacent to the Jordan’s Point Historic District, could be a contributing resource to the District if the boundary for the District was adjusted; however, this resource was not recommended individually eligible for the NRHP. The Dam speaks to the commercial and industrial history of the Jordan’s Point area and falls within the period of significance for the historic district (Clarke 2018). SHPO concurred with these recommendations (VCRIS 2018).

Though considered separately in the Architectural Survey, SHPO determined that the Jordan’s Point Headrace should be combined with the already documented Tailrace to form the Jordan’s Point Millrace (VCRIS 2018). Both the Headrace and the Tailrace speak to the commercial and industrial history of the Jordan’s Point area and fall within the period of significance for the historic district (Clarke 2018). The Millrace is a contributing resource to the Jordan’s Point Historic District, however, this resource was not recommended individually eligible for the NRHP. SHPO concurred with these recommendations (VCRIS 2018).

The Piers are also documented in the architectural survey, but they were not recommended as a contributing resource to the Jordan’s Point Historic District given the likely period of their construction, nor were they recommended individually eligible for the NRHP (Clarke 2018). SHPO concurred with these recommendations (VCRIS 2018).

4.13 RECREATION AND PUBLIC SAFETY
Jordan’s Point Park includes several river-access points and a railed, river-viewing platform on the southern bridge abutment. The impoundment upstream of the Dam provides a popular site for flatwater recreation within the community. This includes fishing, rowing, kayaking, stand-up paddleboarding, tubing, swimming, and jumping from ropes and platforms. The presence of the Dam creates a mandatory portage for kayakers, canoeists, and tubers travelling downstream.

Downstream of the Piers, the river is a series of riffle-pool complexes running between cliffs and tree-lined banks. This section of the Maury is used by anglers, canoeists, kayakers, tubers, and swimmers.

Creel-survey data were collected by Washington & Lee University faculty and DGIF staff between May 4, 2004 and September 4, 2004 along five reaches of the Maury River between Rockbridge Baths and Glasgow, including Alone Mills Road to Jordan’s Point Dam (Appendix 4). Of the 83 anglers that responded, a majority (53) stated that their preferred target-fish species was Smallmouth Bass (a riverine species), 25 stated "anything," and 5 stated other species such as trout, carp, or panfish.

Low-head dams are defined as engineered structures that span the full width of the waterway and create a pool of backwater that flows downstream over the face of the dam. Low-head dams are usually less than fifteen-feet high although there is no regulatory distinction for the height of a low-head dam. Drowning deaths near low-head dams occur every year in the United States as a
result of the recirculating current ("hydraulic roller") (Figure 7) at the downstream face of dams that traps the person underwater (Aadland 2010).

![Diagram of recirculating current](image)

**Figure 7.** Graphic depicting the recirculating current that typically occurs downstream of low-head dams (Wright et al. 1995).

In 2006, a local teenager drowned in the powerful, recirculating current at Jordan’s Point Dam (Supreme Court of Virginia 2011). There are now signs posted and buoys located in the channel to warn of the danger, though after large storm events, the buoys are often detached or missing.

The Piers that are located 150 feet downstream of the Dam span the width of the river with approximately fifteen feet between each pier. The high-energy water flowing over the Dam has scoured out the cobble from under the upstream end of many of the Piers. These undercut Piers pose a risk of "entrapment" - trapping a boat, child, or adult, resulting in drowning. They also could accumulate woody debris and create an additional drowning hazard referred to as a "strainer."

There is also a public-safety risk at the Millrace headgate due to conditions that result in the syphon effect of high-pressure flow through a small opening at the bottom of deep, calm water even at base flow (Brash 2018). This high-pressure flow is created by a headgate culvert and earthen dam located immediately adjacent to the boat loading/unloading area and river-access point creating a potential hazard for the public.

5.0 ENVIRONMENTAL CONSEQUENCES
5.1 GENERAL

**Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)**

The general environmental consequences for both Alternatives 1 and 2 are similar. They would both return the currently impounded reach to a free-flowing system with hydrology, sediment transport, and habitat that reflects the condition of the Maury River in non-impounded reaches. The currently flooded riffles, runs, and glides upstream of the Dam would be restored. The removal of the structure would allow for passage of all aquatic organisms. Complete Dam and Pier Removal (Alternative 1) would restore approximately 2,370-square-feet of natural stream-bottom habitat that is currently covered by concrete/stone/mortar. Partial Dam and Pier Removal
(Alternative 2) would restore approximately 1,896-square-feet of natural stream-bottom habitat that is currently covered by concrete/stone/mortar. Both alternatives would remove the public-safety hazards of the Dam and Piers and reduce the public-safety risk of the Millrace headgate.

**Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification**
Alternative 3 would maintain the 1.2 mile impoundment upstream of the Dam and its associated reservoir hydrology, sediment transport, and ecology. The drowning hazard at the recirculating current downstream of the Dam and at the Piers would remain. The 2,370-square-feet of natural stream-bottom habitat that is currently covered by the rock/mortar/cement of the Dam and the Piers would also remain impacted. If the Millrace could be modified to provide appropriate velocity and slope by removing the headgate culvert and earthen dam, it is possible that aquatic-organism passage around the Dam could be achieved, and the public-safety risk of the Millrace headgate would be removed.

**Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and Alternative 5: Dam Modification and Rock-rapids Construction**
The general environmental consequences for Alternatives 4 and 5 are similar. They would both maintain the 1.2 mile impoundment upstream of the Dam and its associated reservoir hydrology, sediment transport, and ecology. Though they could both be designed in such a way so as to provide appropriate velocity and slope for aquatic organism passage, they would result in habitat impacts to the natural stream bottom due to the placement of fill material (boulders/concrete/mortar) over at least 2/3 of an acre. Both alternatives would remove the public-safety hazards of the Dam and Piers, and Alternative 5 would remove the public-safety risk of the Millrace headgate.

**Alternative 6: No Action**
The “no-action” alternative would result in no change in the general environmental conditions. The barrier to aquatic-organism-passage and the impoundment that floods 1.2 miles of complex riverine habitat upstream impacting hydrology and sediment transport would remain. The drowning hazard at the recirculating current downstream of the Dam and at the Piers would remain, as would the public-safety risk at the Millrace headgate. The 2,370-square-feet of natural stream-bottom habitat that is currently covered by the rock/mortar/cement of the Dam and the Piers would also remain impacted.

**5.2 WATER QUALITY**
**Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)**
Either Alternatives 1 or 2 would be anticipated to improve water quality in the 1.2-mile-long reservoir area. Removing a portion of or the entire Dam would result in increased velocity and decreased depth, likely resulting in decreased temperature and increased dissolved oxygen in the previously impounded reach due to mixing and turbulence. Any adverse impact to downstream water quality would be short-term, immediately following removal and during the first several high-flow events. Long-term water quality benefits upstream and downstream of the Dam as a result of restoration of the hydrology, nutrient cycling, sediment transport, and physical parameters in the reservoir area to that of a free-flowing system would be anticipated (American Rivers 2002).
Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
No water-quality changes would be anticipated as a result of this alternative. It would maintain the reservoir and its associated temperatures, dissolved oxygen, nutrient cycling, sediment transport, and ecology.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
No water-quality changes would be anticipated as a result of either the Rock Ramp/Rock-arch Rapids alternative or the Rock-rapids alternative. Both result in maintenance of the reservoir and its associated temperatures, nutrient cycling, dissolved oxygen, sediment transport, and ecology.

Alternative 6: No Action
No change in water quality would be anticipated with the “no-action” alternative.

5.3 HYDROLOGY AND FLOODING
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
Complete or partial removal of the Dam would lower the 100-year flood elevation in the upstream vicinity of the Dam (Hurt & Proffitt 2018a), but would not change flood elevations downstream of the Dam. Either of these alternatives would lower the Ordinary High Water (OHW) elevation and, thus, reduce frequency of flooding of Furr’s Mill Road where it parallels the river in close proximity (approximately 3,500 feet upstream of the Dam). In that location, the model predicts approximate lowering of the OHW by 4.2 feet.

Riverine hydrology would be restored to pre-Dam conditions. This would result in the velocity, depth, sediment transport, and ecology that more closely reflect that of other sections of the Maury River that are free-flowing.

Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
Alternative 3 would also maintain the reservoir-like hydrology, velocity, and depth of the impoundment. It would also maintain the existing water-surface and floodplain elevations, including along Furr’s Mill Road. It would increase the magnitude and duration of flow in the Millrace due to removal of the headgate culvert and earthen dam.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
The Rock Ramp/Rock-arch Rapids or the Rock-rapids (“whitewater park”) alternatives would maintain the current reservoir-like hydrology upstream of the Dam. The temperatures, dissolved oxygen, sediment transport, and ecology that are associated with reservoir-like hydrology (deep, slow-moving, and low-energy water) would also persist.

Under these alternatives, existing water-surface elevation in the impoundment and current flood elevations, including along Furr’s Mill Road, would remain essentially unchanged. If either of these alternatives includes modification of the Millrace, they would increase the magnitude and duration of flow in the Millrace due to removal of the headgate culvert and earthen dam.
Alternative 6: No Action
The Dam has been determined to be structurally compromised (Brash 2007), and the “no-action” alternative is likely to result in eventual Dam failure that could result in a moderate flood surge downstream, depending on the flow in the river at the time of the failure. A partial failure may result in the formation of a narrow breach, and high exit velocities may result in a trapping/drowning hazard. Until such a failure, the hydrology would remain unchanged with this alternative.

5.4 GEOLOGY/SEDIMENT
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
The limited geologic survey of the project area (Hurt & Proffitt 2018b) noted that “while groundwater seepage along the upper interface of bedrock is common, the high angle dip of local geology and stepped topographic relief to the north would tend to redirect and concentrate drainage. Lowering the river surface by approximately 7 feet at the Dam would correspondingly drop the elevation of soil saturation, but this would occur at least 20 feet beneath the roadway surface. Seepage from the roadway embankment is unlikely in the immediate vicinity of the Dam due to its slope while the lateral offset between road and river increases upstream as the vertical relief decreases.” The survey also suggested that removal of the Dam would likely result in greater river turbulence upstream and scour of the upstream banks would be possible. In order to address this concern, also voiced by several members of the public, riparian planting of newly exposed streambanks would be offered on a voluntary basis to interested landowners as part of the Proposed Action. Revegetation of nutrient-rich, previously flooded stream channel areas would be expected to occur rapidly (Foley et al. 2017). In addition, leaving terminal portions of the Dam, should reduce this effect immediately upstream of the Dam (Hurt & Proffitt 2018b). The same survey examined the roadway embankment downstream of the Dam, and determined that scour would not be sufficient to affect the stability of the roadway.

Furr’s Mill Road, in the area in the closest proximity to the impoundment, should not be adversely affected by the Dam removal, a concern expressed by some in the public. Lowering the river surface would lessen the likelihood of road flooding as well as variable saturation of shallower soils, and there are no indications of stability issues or settlement to the river-side shoulder (Hurt & Proffitt 2018b).

Removal of all or a portion of the Dam to the pre-Dam channel-bottom elevation would restore the natural sediment transport in this portion of the river. Free-flowing rivers continually move sediment of various sizes, depending on the magnitude of the flow at any given time. Even at base flows, sands and gravels shift in an unimpounded, riverine system, resulting in a dynamic stream bottom necessary for burrowing mussels, small fishes, and other aquatic organisms. In a reservoir-like setting lacking this dynamic, a portion of the sediment in the stream settles out and is less likely to be transported downstream. Though there is not a significant amount of sediment accumulated upstream of the Dam, the processes which drive sediment transport throughout the impoundment and immediately downstream of the Dam are disrupted. These processes would be restored to pre-Dam function under either Alternatives 1 or 2 and enhance aquatic habitat as a result.
Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
This alternative would maintain the existing, disrupted sediment transport processes characteristic of an impoundment on a perennial waterway resulting from reduced shear stress upstream and increased shear stress immediately downstream of the Dam.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and Alternative 5: Dam Modification and Rock-rapids Construction
Both of these alternatives would maintain the existing, disrupted sediment transport and associated habitat impacts that are characteristic of an impoundment on a perennial waterway, though they would reduce the scour potential that currently exists due to high shear stress immediately downstream of the Dam.

Alternative 6: No Action
This alternative would maintain the existing, disrupted sediment transport processes characteristic of an impoundment on a perennial waterway resulting from reduced shear stress upstream and increased shear stress immediately downstream of the Dam.

5.5 RIVERINE HABITAT
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
With Complete Dam and Pier Removal, an estimated 750-square-feet of natural, subaqueous bottom as habitat for aquatic organisms would replace the Dam footprint. An estimated 162-square-feet of natural, subaqueous bottom as habitat for aquatic organisms would replace each of the Pier footprints for a total of 1,620-square-feet if all Piers in the channel were removed. This results in an overall total of 2,370-square-feet of restored stream bottom with its associated benefits for aquatic organisms that rely on such habitat to attach, shelter, feed, burrow, and reproduce.

With Partial Dam and Pier Removal, an estimated 600-square-feet of natural, subaqueous bottom as habitat for aquatic organisms would replace the Dam footprint. An estimated 162-square-feet of natural, subaqueous bottom as habitat for aquatic organisms would replace each of the Pier footprints for a total of 1,296-square-feet if eight Piers were removed, as proposed. This results in an overall total of 1,896-square-feet of restored stream bottom with its associated benefits for aquatic organisms that rely on such habitat to attach, shelter, feed, burrow, and reproduce.

Either Alternative 1 or Alternative 2 would result in 1.2 miles of stream channel upstream of the Dam and hundreds of feet downstream developing more diverse and complex habitat features. These features include instream bars, vegetated benches, riffles, runs, glides, backwaters, woody debris, and a deeper, narrower primary channel that would develop as a result of restored sediment transport and riverine hydraulics (American Rivers 2002). These features provide sheltering, feeding, and spawning habitat for fish, macroinvertebrates, and mussels. The increase in velocities in the reservoir reach are anticipated to regularly flush fine sediment and algae currently coating the substrate, leading to an increase in surface area for attachment by macroinvertebrates.
Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
The current river conditions would persist with the Alternative 3. The riverine habitat is flooded for 1.2 miles upstream of the Dam which results in impacts to the substrate. Sections of the river that would otherwise be shallow, with fast-moving, highly oxygenated water ("riffles") are slow-moving, deep, and do not provide adequate velocity, fine sediment, and oxygen to support abundant insects, mussels, and fish that would naturally shelter, feed, and spawn in these areas. The 2,370-square-feet of natural stream bottom that is covered by the Dam and Piers would remain impacted.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
These two alternatives would have adverse impacts on the riverine habitat as the natural streambed of cobble and gravel would be covered with fill material consisting of boulders and possibly mortar or cement. The square footage of impact to the stream channel would be determined at the final-design stage of either alternative, but to achieve the necessary stability and slope of the features, both alternatives would require at least 150-linear-feet of river bottom to be filled from bank to bank for both alternatives. Given a 185-feet average-channel width, this results in 27,750 square feet (or almost 2/3 of an acre) of impact to the natural riverbed.

The current river conditions would persist with the Alternatives 4 and 5. The riverine habitat is flooded for 1.2 miles upstream of the Dam which results in impacts to the substrate. Sections of the river that would otherwise be shallow, with fast-moving, highly oxygenated water ("riffles") are slow-moving, deep, and do not provide adequate velocity, fine sediment, and oxygen to support abundant insects, mussels, and fish that would naturally shelter, feed, and spawn in these areas.

Alternative 6: No Action
The current conditions would persist with the “no-action” alternative. The riverine habitat is flooded for 1.2 miles upstream of the Dam which results in impacts to the substrate. Sections of the river that would otherwise be shallow, with fast-moving, highly oxygenated water are slow-moving, deep, and do not provide adequate velocity, fine sediment, and oxygen to support abundant insects, mussels, and fish that would naturally shelter, feed, and spawn in these areas. The 2,370-square-feet of natural stream bottom that is covered by the Dam and Piers would remain impacted.

5.6 FISH
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
Removal of a portion or all of this second-to-last dam on the mainstem of the Maury River would open 21.8 miles from the Dam up to the confluence of the Calpasture River and the Little Calpasture River, thereby restoring resident-fish migration and benefitting aquatic species for 1,140 functional-network miles of the mainstem and tributaries. The increase in natural, subaqueous stream bottom as a result of removal of these man-made structures (referred to in 5.5 above) would provide feeding and spawning habitat for riverine fish that currently does not exist. In addition, 1.2 miles of stream channel upstream of the Dam and hundreds of feet downstream are anticipated to develop more diverse and complex habitat features consisting of instream bars, vegetated benches, riffles, runs, glides, backwaters, woody debris, and a deeper, narrower primary
channel as a result of restored sediment transport and riverine hydraulics. These features provide sheltering, feeding, and spawning habitat for fish, mussels, and aquatic macroinvertebrates.

There would likely be a shift in species composition in the impounded reach from reservoir species, such as Common Carp and Largemouth Bass, to riverine species, such as Smallmouth Bass (Poulos et al. 2014).

**Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification**
Modification of the Millrace could benefit resident-fish migration between the areas upstream and downstream of the Dam. Since this alternative would maintain the upstream impoundment for 1.2 miles, it would not result in an increase (upstream or downstream) in complex habitat features like riffles, runs, glides, instream bars, and a narrow, primary channel that fish depend on for feeding and spawning.

Fish species composition upstream and downstream would not likely change, as the reservoir-like conditions upstream would be maintained.

**Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and Alternative 5: Dam Modification and Rock-rapids Construction**
These two alternatives, if specifically designed to accommodate aquatic-organism passage (not just to remove the drowning hazard or to provide whitewater features), could potentially benefit resident-fish migration between the areas upstream and downstream of the Dam. Since both alternatives would maintain the upstream impoundment for 1.2 miles, neither would result in an increase (upstream or downstream) in complex habitat features like riffles, runs, glides, instream bars, and a narrow, primary channel that fish depend on for feeding and spawning.

Fish species composition upstream and downstream would not likely change, as the reservoir-like conditions upstream would be maintained.

**Alternative 6: No Action**
Under this alternative, the existing Dam would continue to act as a passage barrier that impacts all aquatic organisms. The impoundment would remain and the shallow, fast-moving riverine features that support healthy macroinvertebrate, mussel, and fish populations would continue to be flooded.

Fish species composition upstream and downstream would not likely change, as the reservoir-like conditions upstream would be maintained.

**5.7 MUSSELS**
**Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)**
Based on the 2017 surveys and past surveys, DGIF concluded that removal (complete or partial) of Jordan’s Point Dam would not adversely affect freshwater mussels, instead allowing all resident fish, including mussel-larvae host fish, to freely pass through the area. Dam removal would also flush the thin layer of sediment and algae covering the substrate throughout the impounded area, return the bed features to riffle/run/glide morphology, and provide appropriate habitat for host-fish to spawn and feed as well as for mussels to burrow. The removal of the Dam (either partially or
completely) and Piers (either partially or completely) is expected to benefit freshwater mussels (Watson 2017).

**Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification**

Modification of the Millrace could provide passage for resident fish, including mussel-larvae host fish. Even if criteria for host-fish passage were met, maintenance of the 1.2-mile long impoundment would not provide the hydrology and habitat features consistent with ideal mussel habitat (Watson 2017).

**Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and**

**Alternative 5: Dam Modification and Rock-rapids Construction**

If designed specifically for host-fish species, either alternative could provide passage thereof. Even if criteria for host-fish passage were met either by structure design or by use of the Millrace as a fishway, maintenance of the 1.2-mile long impoundment would not provide the hydrology and habitat features consistent with ideal mussel habitat (Watson 2017).

**Alternative 6: No Action**

The “no-action” alternative would maintain the impediment to passage of all resident fish including host-fish for mussels, prevent flushing of sediment from upstream of the Dam, and maintain the existing layer of fine sediment and algae on the stream bottom in the impoundment. All of these conditions are detrimental to diverse and healthy riverine fish, mussel, and macroinvertebrate populations.

**5.8 WILDLIFE**

**Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)**

Either complete or partial removal of the Dam would narrow the baseflow width in the upstream 1.2-mile previously impounded reach, increasing the riparian area on one or both sides of the river by up to 25 feet (depending on the slope of the bank, proximity to the Dam, and geology in any given location). As this area revegetates, it would provide additional wildlife habitat at the edge of the river for deer, resident and migratory songbirds, bats, insects, and small mammals. An increase in riparian buffer width would not only increase wildlife habitat, it would increase runoff filtration, reduce nutrient pollution from fertilizers and storm-sewer overflows through plant uptake, and dissipate the hydraulic energy of the river by increasing roughness on the banks.

The complete or partial removal of the Dam may result in a localized shift of species composition in the impoundment reach with regard to migratory waterfowl species, but the overall utilization of the waterway by waterfowl will continue. While waterfowl do utilize the current impoundment, DGF’s waterfowl management biologists have not identified this portion of the Maury River as critical habitat for any of Virginia’s migratory waterfowl populations. The removal of the Dam will reduce open-water habitat potentially used by diving-duck species and Canada geese. The narrowing of the open-water area and the reduction in depth resulting from Dam removal will increase shallower feeding habitat which is beneficial for dabbling duck species such as mallards and wood ducks. These changes will benefit some species (e.g., wood ducks and mallards) more than others, but the overall impact to migratory waterfowl populations is not expected to be significant.
Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
No change in existing wildlife habitat is expected to result from this alternative.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
No change in existing wildlife habitat is expected to result from either of these alternatives.

Alternative 5 would involve the construction of as many as four grade-control structures
(“whitewater features”), each of which would require being “keyed” into the bank on both sides of
the river. Unless located in alignment with existing bedrock, this would involve excavation to bury
boulders into the bank to prevent the river cutting around these newly constructed features.
Excavation could impact tree roots along the bank or require tree removal in the riparian area.

Alternative 6: No Action
No change in existing wildlife habitat is expected to result from this alternative.

5.9 THREATENED AND ENDANGERED SPECIES
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier
Removal (Proposed Action)
No federally listed threatened or endangered species would be impacted by either of these
alternatives (DGIF 2018). The DGIF mussel biologist has stated that removal of at least a portion
of the Dam would make the possible re-introduction or eventual recovery of James spinymussel, a
federally threatened species, more likely to succeed. This opinion is based on the fact that host-fish
species would no longer be impeded from passing the barrier itself as well as the enhancement of
host-fish and mussel sheltering, spawning, and feeding habitat both upstream and downstream
(Watson 2017).

Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
There are currently no federally listed threatened or endangered species present in the vicinity of
the Dam. Under this alternative, no change is anticipated. Even if host-fish passage is provided by
modification of the Millrace, maintenance of the impoundment would not result in any change in
habitat conditions that would support mussel-reintroduction efforts or species recovery.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
Though no federally listed threatened or endangered species are currently present in the vicinity of
the Dam, permanently filling at least 2/3 of an acre of stream bottom to construct either of these
alternatives would reduce the amount of natural stream bottom available for host-fish and mussels
to shelter, spawn, and feed. Additionally, they would both maintain the impoundment and its
associated habitat impacts. If designed appropriately or in conjunction with Millrace modification,
these alternatives could provide aquatic-organism passage. However, they would result in a net
decrease in complex-habitat availability relative to the current condition, therefore not serving to
benefit any future effort to re-introduce James spinymussel or any other threatened or endangered
aquatic species.
Alternative 6: No Action
There are currently no federally listed threatened or endangered species present in the vicinity of the Dam. Under the “no-action” alternative, no change is anticipated.

5.10 WETLANDS
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
Eliminating the reservoir behind the Dam and restoring sediment transport has the potential to result in an increase in riparian, fringe wetland establishment both in the drawdown area and downstream where point bars and other features typically form. There is also potential for off-channel wetland creation in the Millrace area, benefitting amphibians and insectivorous birds.

Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
No changes to wetlands are expected as a result of this alternative.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
No changes to wetlands are expected as a result of either of these alternatives.

Alternative 6: No Action
No changes to wetlands are expected as a result of this alternative.

5.11 NOISE
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
Temporary impacts due to increased noise may occur during several weeks of construction for either of these alternatives. Heavy equipment would be used to remove the Dam and the sound of this equipment may affect the experience of neighbors and visitors to the park during this time. No long-term, adverse noise impacts would result from the associated construction activities.

Either complete or partial removal of the Dam would alter the ambient sound of the river at the Dam. It is anticipated that the streambed in the vicinity of the Dam is comprised of bedrock, and a natural water feature (ledge) would be exposed that would restore the sound of flowing water enjoyed by neighbors and visitors to the park. The sound of flowing water would also be heard in the fast-moving, restored-riffle sections of the previously impounded 1.2 mile reach.

Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
Repair of the Dam and Modification of the Millrace would rely on heavy equipment, resulting in temporary impacts due to increased noise during construction. No long-term, adverse noise impacts would result from the associated construction activities. Though there would be slightly less water flowing over the Dam at all times due to increased flow in the Millrace, this alternative would not result in any significant change to the ambient sound of water flowing over the Dam.
Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-rapids Construction
Both of these alternatives would similarly rely on heavy equipment to repair or modify the Dam and to construct either Rock-arch Rapids or Rock-rapids. Temporary impacts due to increased noise may occur during construction. No long-term, adverse noise impacts would result from the associated construction activities.

These two alternatives would change the ambient sound of the river. They would spread out the sound from a single 10-foot drop to a series of smaller drops or one, long, gradual drop.

Alternative 6: No Action
Under this alternative, there would be no change in noise or sound anticipated, or temporary impacts due to construction noise.

5.12 CULTURAL AND HISTORIC RESOURCES
Alternative 1: Complete Dam and Pier Removal
This alternative would result in the greatest impact to historic resources as no remnant of the Dam, fish ladder, or Piers would remain. Additionally, reduced frequency of flow to the Millrace would impact the interpretive value that constant flow currently provides and the longevity of remnant timbers on the floor of the gauge dock.

Alternative 2: Partial Dam and Pier Removal (Proposed Action)
The USFWS, in consultation with the SHPO, has determined that the Proposed Action would result in adverse effects to the Dam and Millrace. Adverse effects consist of 1) removal of a portion of Jordan’s Point Dam, and 2) resultant loss of flow into the Millrace under base-flow conditions. The loss of consistent flow in the Millrace is of concern to those in the community who are concerned about the impact to interpretive value of the Millrace as well as to the remains of the timbers that formed the “floor” of the gauge dock.

Following the guidelines of Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, a Memorandum of Agreement (MOA) among USFWS, SHPO, City of Lexington, and DGIF was developed that provides stipulations to mitigate the adverse effects of the Project (see Section 106/EA timeline in Appendix 5). Stipulations for mitigation measures were generated for the MOA in consultation with the consulting parties that chose to participate in the Section 106 process. Mitigation measures in the final MOA include the following:

- documentation of the Dam removal and any properties that might be uncovered during removal;
- preservation of remnants of the Dam on both banks, as well as the fish ladder and four of the Piers on the northern side of the river;
- documentation of the fish ladder at the intensive-level in the context of the Dam;
- recovery of two millstones reportedly located in the pool below the Dam for interpretive use by Miller’s House Museum;
- salvage and storage of timbers for use by local historical organizations should a crib dam be discovered;
- excavation of accumulated sediment at the entrance to the Millrace to increase the frequency of flow into the Millrace; and
• design and installation of interpretive signage about the headrace (upstream end of the Millrace) and the fish ladder.

Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
Alternative 3 would maintain the historic-resource value of the Dam and would maintain water flowing into the historic Millrace. There may be potential impacts to the structures in the Millrace as removal of the headgate to allow for fish passage would increase the flow at all times including baseflow and floods. Increased erosion of banks, foundations, and walls could occur due to increases in frequency, duration, and magnitude of unregulated flows (Brash 2018). Though not determined by SHPO to be a contributing resource to the Jordan’s Point Historic District, the Piers would remain as a visible reminder of the history of the railroad in Lexington.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-Rapids Construction
Both of these alternatives would result in impacts to the historic-resource value of the Dam, however, they would both maintain water in Millrace. Should either of these alternatives include modification of the Millrace to provide fish passage, there may be potential impacts to the structures in the Millrace as removal of the headgate and earthen dam would increase the flow in the Millrace at all times including baseflow and floods. Increased erosion of banks, foundations, and walls could occur due to increases in frequency, duration, and magnitude of unregulated flows (Brash 2018).

Alternative 6: No Action
The “no-action” alternative would cause no short-term impacts to historic resources. Until its failure, the Dam would remain in place and continue to be a contributing resource to the Historic District, and its presence would maintain flow into the Millrace, also a contributing resource.

5.13 RECREATION AND PUBLIC SAFETY
Alternative 1: Complete Dam and Pier Removal and Alternative 2: Partial Dam and Pier Removal (Proposed Action)
Either of these alternatives would result in a shift of recreational use from flatwater to free-flowing river activities and a shift in fishing opportunities from reservoir species (e.g., Largemouth Bass) to riverine species (e.g., Smallmouth Bass) most sought after by anglers.

Both alternatives would remove the drowning hazard of the Dam and entrapment hazard of the Piers, thereby improving public safety. Reduced head differential and reduced frequency, duration, and magnitude of flow into the Millrace would reduce the public-safety hazard of the headgate culvert.

Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification
Alternative 3 would maintain the impoundment for flatwater recreation and the existing angling opportunities. It would also maintain the drowning hazard posed by the Dam and the Piers. Modification of the Millrace would remove the public-safety hazard of the headgate culvert.

Alternative 4: Dam Repair and Rock Ramp or Rock-arch Rapids Construction and
Alternative 5: Dam Modification and Rock-Rapids Construction
Both of these alternatives would maintain flatwater upstream for recreation and, depending on the specifics of the chosen design, could create whitewater boating options. Existing angling opportunities would be maintained.

Both alternatives would eliminate the drowning hazard posed by the Dam and the entrapment hazard of the Piers. Modification of the Millrace for either of these alternatives would eliminate the public-safety hazard at the headgate culvert.

**Alternative 6: No Action**
The no-action alternative would maintain the reservoir for flatwater recreation and angling; the mandatory portage around the Dam; and the drowning hazards at the Dam, the Piers, and the Millrace headgate culvert.

6.0 COMPARISON OF ENVIRONMENTAL CONSEQUENCES
A comparison of environmental consequences of the alternatives is shown in Table 1.
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<tbody>
<tr>
<td>GENERAL</td>
<td><strong>Beneficial.</strong> Returns the upstream impoundment to a natural riverine system; removes the public-safety hazards of the Dam and Piers; reduces public-safety hazard of Millrace headgate.</td>
<td><strong>Beneficial.</strong> Returns the upstream impoundment to a natural riverine system; removes the public-safety hazards of the Dam and Piers; reduces public-safety hazard of Millrace headgate.</td>
<td><strong>Minimally Beneficial.</strong> Maintains the Dam and upstream impoundment; maintains public-safety hazards of the Dam and Piers; removes public safety hazard of Millrace headgate.</td>
<td><strong>Moderately Beneficial.</strong> Maintains the impoundment; removes the public-safety hazards of the Dam and Piers.</td>
<td><strong>Moderately Beneficial.</strong> Maintains the Dam and upstream impoundment; removes the public-safety hazards of the Dam, Piers, and Millrace headgate.</td>
<td><strong>No change.</strong> Maintains the Dam and upstream impoundment; maintains public-safety hazards of the Dam, Piers, and Millrace headgate.</td>
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<td>WATER QUALITY</td>
<td><strong>Beneficial.</strong> Reduces temperature, restores nutrient cycling and sediment transport processes.</td>
<td><strong>Beneficial.</strong> Reduces temperature, restores nutrient cycling and sediment transport processes.</td>
<td><strong>No change.</strong> Maintains current temperature, nutrient cycling, and sediment transport.</td>
<td><strong>No change.</strong> Maintains current temperature, nutrient cycling, and sediment transport.</td>
<td><strong>No change.</strong> Maintains current temperature, nutrient cycling, and sediment transport.</td>
<td><strong>No change.</strong> Maintains current temperature, nutrient cycling, and sediment transport.</td>
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<td>HYDROLOGY AND FLOODING</td>
<td><strong>Beneficial.</strong> Restores riverine hydrology; reduces</td>
<td><strong>Beneficial.</strong> Restores riverine hydrology; reduces</td>
<td><strong>No change.</strong> Maintains disruption of riverine</td>
<td><strong>No change.</strong> Maintains disruption of riverine</td>
<td><strong>No change.</strong> Maintains disruption of riverine</td>
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<td>RIVERINE HABITAT</td>
<td>Beneficial. Exposes natural streambed under Dam and Piers; restores riverine-habitat features.</td>
<td>Beneficial. Exposes natural streambed under Dam and Piers; restores riverine-habitat features.</td>
<td>Adverse Impact. Fills natural, cobble streambed; continues to flood upstream riverine-habitat features.</td>
<td>Adverse Impact. Fills natural, cobble streambed; continues to flood upstream riverine-habitat features.</td>
<td>No change. Maintains flooded upstream riverine-habitat features; covers streambed with Dam and Piers.</td>
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<td>FISH</td>
<td>Beneficial. Fully restores fish and other aquatic-organism passage; restores riverine habitat for sheltering, spawning, and feeding.</td>
<td>Beneficial. Fully restores fish and other aquatic-organism passage; restores riverine habitat for sheltering, spawning, and feeding.</td>
<td>Moderately Beneficial. Provides fish and other aquatic-organism passage around the barrier in the main channel; maintains reservoir and impacts to upstream and downstream sheltering,</td>
<td>Moderately Beneficial. Provides fish and other aquatic-organism passage; maintains reservoir and impacts to upstream and downstream sheltering,</td>
<td>No change. Impedes fish and other aquatic-organism passage; maintains reservoir and impacts to upstream and downstream sheltering, spawning, and feeding habitat.</td>
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<td>Spawning, and feeding habitat.</td>
<td>Downstream sheltering, spawning, and feeding habitat.</td>
<td>Spawning, and feeding habitat.</td>
<td>Minimally Beneficial. Provides passage for mussel host-fish species around the barrier in the main channel; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
<td>Minimally Beneficial. Provides passage for mussel host-fish species; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
<td>No change. Impedes passage for mussel host-fish species; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
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<td><strong>MUSSELS</strong></td>
<td><strong>Beneficial.</strong></td>
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<td>Fully restores passage for mussel host-fish species; restores riverine hydrology and sediment transport to enhance sheltering, spawning, and feeding habitat.</td>
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<td><strong>Minimally Beneficial.</strong></td>
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<td>Provides passage for mussel host-fish species around the barrier in the main channel; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
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<td><strong>Minimally Beneficial.</strong></td>
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<td>Provides passage for mussel host-fish species; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
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<td><strong>WILDLIFE</strong></td>
<td><strong>Beneficial.</strong></td>
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<td><strong>No change.</strong></td>
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<td>Increases riparian corridor width.</td>
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<td><strong>Beneficial.</strong></td>
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<td>Increases riparian corridor width.</td>
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<td><strong>THREATENED AND ENDANGERED SPECIES</strong></td>
<td><strong>Beneficial.</strong></td>
<td></td>
<td><strong>Minimally Beneficial.</strong></td>
<td><strong>Minimally Beneficial.</strong> Provides passage for mussel host-fish species; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
<td><strong>Minimally Beneficial.</strong> Provides passage for mussel host-fish species; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
<td><strong>No change.</strong> Maintains impediment to aquatic-organism passage, stream bottom covered by Dam and Piers, and habitat impacts resulting from impoundment.</td>
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<td>Exposes currently covered stream bottom; increases habitat complexity; fully restores passage for mussel host-fish species.</td>
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<td><strong>Beneficial.</strong></td>
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<td><strong>Minimally Beneficial.</strong> Provides passage for mussel host-fish species; maintains reservoir and impacts to mussel sheltering, spawning, and feeding habitat.</td>
<td><strong>No change.</strong> Maintains impediment to aquatic-organism passage, stream bottom covered by Dam and Piers, and habitat impacts resulting from impoundment.</td>
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<td>Exposes currently covered stream bottom; increases habitat complexity; fully restores passage for mussel host-fish species.</td>
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<td>Wetlands</td>
<td><strong>Beneficial.</strong> Potential for establishment of fringe wetlands in the drawdown area and downstream as well as off-channel wetlands in the Millrace.</td>
<td><strong>Beneficial.</strong> Potential for establishment of fringe wetlands in the drawdown area and downstream as well as off-channel wetlands in the Millrace.</td>
<td><strong>No change.</strong> No wetlands impacted.</td>
<td><strong>No change.</strong> No wetlands impacted.</td>
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<td>Noise</td>
<td><strong>Minor and Temporary Impact.</strong> Temporary noise impact due to construction activities; minor impact to ambient sound of water flowing over natural river features as opposed to the Dam.</td>
<td><strong>Minor and Temporary Impact.</strong> Temporary noise impact due to construction activities; minor impact to ambient sound of water flowing over natural river features as opposed to the Dam.</td>
<td><strong>Minor and Temporary Impact.</strong> Temporary noise impact due to construction activities; no change to ambient sound of water flowing over the Dam.</td>
<td><strong>Minor and Temporary Impact.</strong> Temporary noise impact due to construction activities; minor impact to ambient sound of water flowing over new structures as opposed to the Dam.</td>
<td><strong>Minor and Temporary Impact.</strong> Temporary noise impact due to construction activities; minor impact to ambient sound of water flowing over new structures as opposed to the Dam.</td>
<td><strong>No change.</strong> Temporary noise impact due to construction activities; minor impact to ambient sound of water flowing over new structures as opposed to the Dam.</td>
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<tr>
<td>Cultural and Historic Resources</td>
<td><strong>Adverse Impact.</strong> Completely removes the Dam, the fish ladder, and all of the Piers;</td>
<td><strong>Adverse Impact.</strong> Partially removes the Dam; leaves the fish ladder and some of the</td>
<td><strong>Minor Impact.</strong> Maintains the Dam and Piers; maintains water in the Millrace, though potential</td>
<td><strong>Adverse Impact.</strong> Impacts the Dam by covering; likely covers or removes the Piers; maintains</td>
<td><strong>Adverse Impact.</strong> Impacts the Dam by partial removal and covering; likely covers or</td>
<td>No change. Dam unaffected until failure; Piers remain; water remains in</td>
</tr>
<tr>
<td>RECREATION AND PUBLIC SAFETY</td>
<td><strong>Beneficial.</strong> Removes public-safety hazard of Dam and Piers; reduces public-safety hazard of Millrace headgate; removes mandatory portage; shifts recreation from flatwater to free-flowing river activities; improves angling opportunity for riverine species.</td>
<td><strong>Beneficial.</strong> Removes public-safety hazard of Dam and Piers; reduces public-safety hazard of Millrace headgate; removes mandatory portage; shifts recreation from flatwater to free-flowing river activities; improves angling opportunity for riverine species.</td>
<td><strong>Moderately Beneficial.</strong> Maintains public-safety hazard of Dam and Piers; removes public-safety hazard at Millrace headgate; maintains flatwater recreation and existing angling opportunities.</td>
<td><strong>Beneficial.</strong> Removes public-safety hazard of Dam, Piers and Millrace headgate; removes mandatory portage depending on design; maintains flatwater recreation and existing angling opportunities and adds whitewater recreational activities.</td>
<td><strong>No change.</strong> Maintains public-safety hazard of the Dam, Piers, and Millrace headgate; maintains mandatory portage; maintains flatwater recreation and existing angling opportunities.</td>
<td></td>
</tr>
</tbody>
</table>
7.0 CUMULATIVE IMPACTS
Cumulative impacts to the environment are the result of the incremental impacts of past actions, the proposed project, and reasonably foreseeable future actions (Council on Environmental Quality 1997). In “Considering Cumulative Effects under the NEPA,” the methodology is as follows:

1) Identification of the geographic area in which effects of the project may be felt;
2) Assessment of the impacts that are expected in that area from the project;
3) ID of other actions (past, present, and reasonably foreseeable) that have had or are expected to have impacts in the same geographic area;
4) Assessment of the impacts or expected impacts from these other actions; and
5) Assessment of the overall impact that can be expected if the individual impacts are allowed to accumulate

Geographic Area:

Immediate Vicinity of the Jordan’s Point Dam: This area contains the Proposed Action (Partial Dam and Pier Removal) and is the area of direct effect. The riverine habitat and hydrology would be restored, and approximately 1,896-square-feet of natural stream bottom would be exposed where the Dam and Piers currently exist. Aquatic-organism passage would be fully restored in the main channel by the Proposed Action. The public-safety hazards at the Dam and Piers would be removed, and the public-safety hazard at the Millrace headgate would be reduced. The Dam and the Millrace would be adversely affected as acknowledged through the Section 106 process.

Upstream of Jordan’s Point Dam: The number of upstream miles on the Maury and its tributaries that would be connected and made accessible to aquatic organisms by the Proposed Action is 1,084. The Dam impounds approximately 1.2 miles of the river, which affects water temperature, sediment transport, and the aquatic community, including fish, mussels, and macroinvertebrates. This project would return the impounded reach to a riverine system. Flatwater recreational opportunities would be replaced by free-flowing river recreational opportunities. Reservoir-angling opportunities would be replaced by riverine-angling opportunities. Lowering of the water-surface elevation in the impoundment reach would increase the riparian-habitat area and decrease flooding along Furr’s Mill Road.

Downstream of Jordan’s Point Dam: The number of downstream miles on the Maury and its tributaries that would be connected and made accessible to aquatic organisms by the Proposed Action is 56. Downstream impacts would be expected to be negligible; however, suspended sediment or turbidity levels may be temporarily elevated during construction. Construction would be carried out during low-flow conditions. Any movement of sediment immediately upstream of the Dam would likely be minimal and would be expected to enhance immediately downstream areas lacking in fines due to scour.

Assessment of impacts from the project:

As described in Section 4.0, Affected Environment, impacts to water quality, hydrology and flooding, geology/sediment, riverine habitat, fish, mussels, wildlife, threatened and endangered species, wetlands, noise, and recreation and public safety, are projected to be non-existent, minimal, or beneficial.
Jordan’s Point Dam and Jordan’s Point Millrace were determined to be contributing resources to the Jordan’s Point Historic District, and USFWS determined (and SHPO concurred) that this project would result in adverse effects on those historic resources. As a result, an MOA has been developed among USFWS, DGIF, the City of Lexington, and SHPO that stipulates measures to mitigate for those effects.

Identification of other actions that have had, or are expected to have, impacts in the same geographic area:

There was a time in the mid- to late-1800’s, when the mainstem of the Maury River had at least 16 dams along 36 miles of its length between Rockbridge Baths and Glasgow (Trout and deVos 2014). Many of these structures were built as part of the canal and lock system that facilitated transportation of people and goods between Richmond and Lexington, while others powered mill operations or early electrical generation. These barriers resulted in a fragmented stream system with isolated aquatic populations. They altered natural flow regimes, sediment transport, hydrology, water chemistry, and floodplain connectivity. Loss of connectivity and alteration and degradation of habitat in the watershed have led to declines in fish and mussel richness and diversity. Today, most of the dams on the river either have been removed or have collapsed, reestablishing connectivity and continuity within those reaches. Though it will likely take decades for the river system to recover from such long-term fragmentation, the removal of each barrier has been a step towards reconnecting the river ecologically. The Proposed Action is one-more step towards returning the Maury to a free-flowing river, improving safe river access, and facilitating the restoration of the riverine aquatic system as a whole.

Assessment of the impacts or expected impacts from these other actions:

Cumulative effects from implementation of any other habitat-improvement actions would be positive for fish and wildlife. The Proposed Action is expected to provide long-term improvements to the environment through improved hydrologic connectivity, fish passage, sediment transport, habitat complexity, and biological integrity and diversity. The proposed project would also improve public safety at the project site, eliminating the potential risk of drowning and entrapment. As such, the proposed project would improve the quality of the human environment.

Assessment of overall impact to be expected if individual impacts are allowed to accumulate:

In assessing the considerations above, the Proposed Action would not result in significant adverse cumulative impacts. The Jordan’s Point Dam removal is significant not only to the fish and wildlife that live in the river, but also to the safety and well-being of the human community as outlined in Sections 4.0 and 5.0.
8.0 CONSULTATION, PUBLIC INVOLVEMENT, AND COORDINATION

Representatives of the following local governments, organizations, State and Federal agencies, Native American Tribes, and project-team members were consulted during project planning leading to the development of this EA:

- Private landowners and local citizens
- City of Lexington
- County of Rockbridge
- Virginia Military Institute
- Washington & Lee University
- Rockbridge Historical Society
- Historic Lexington Foundation
- Millers House Museum
- Virginia Canals and Navigation Society
- Natural Bridge Soil and Water Conservation District
- Rockbridge Area Conservation Council
- James River Association
- Friends of the Rivers of Virginia
- American Rivers
- Hurt & Proffitt, Inc.
- Virginia Department of Historic Resources
- Virginia Marine Resources Commission
- Virginia Department of Environmental Quality
- Virginia Department of Transportation
- Virginia Department of Conservation and Recreation
- Virginia Department of Game and Inland Fisheries
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- Absentee Shawnee Tribe of Oklahoma
- Cherokee Nation of Oklahoma
- Chickahominy Indian Tribe
- Delaware Nation of Oklahoma
- Eastern Band of the Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Monacan Indian Nation
- Nansemond Indian Tribe
- Pamunkey Indian Tribe
- Rappahannock Tribe
- Shawnee Tribe
Community discussion of the fate of the Dam began in 2006 after the drowning of a local teenager, followed by years of litigation related to the drowning. More recently, development of this Project began in March 2017 at the first of six public meetings involving the Lexington City Council and/or the Rockbridge County Board of Supervisors. At four of these meetings, public comment was invited and various positions were expressed with regard to the proposed project and alternatives. At the most well-attended and inter-jurisdictional meeting (May 15, 2017) the DGIF shared a presentation on the various alternatives available to the City and the proposed Dam removal, followed by extensive public comment. Approximately 100 people were in attendance with 30 people providing comments for the record.

On June 15, 2017 at a City Council public hearing, following comments by about a dozen members of the public and extensive discussion amongst Council members, City Council voted unanimously to move forward to develop a partnership agreement with DGIF to remove a significant portion of the Dam. The meeting was open to the public and posted on the City’s website more than a week in advance. The public hearing notification was also posted in the News-Gazette on May 31, 2017 and June 7, 2017. Prior to the meeting and the vote, Council received written comments in opposition (Rockbridge County, Virginia Military Institute, local historic societies, and individuals) as well as in support (Rockbridge Area Conservation Council, Natural Bridge Soil and Water Conservation District, James River Association, and individuals). Comments in opposition mostly focused on the anticipated loss of flatwater recreation, cadet-training opportunity from a jumping platform, and historic-resource value of the Dam and water flow into the Millrace. Comments in support mostly focused on anticipated benefits to water quality and river function, fish passage, public safety, and river access.

On January 4, 2018, Lexington City Council voted unanimously to enter into an agreement with DGIF to remove the Dam. Voting occurred at a City Council meeting that was open to the public and public noticed on the City’s website more than a week in advance.

There has been extensive newspaper coverage (articles and letters to the editor) of the proposed project by the local, weekly newspaper, the News-Gazette; The Roanoke Times; a local, independent, monthly publication, the Rockbridge Advocate; and a Roanoke, Virginia television station (WDBJ).

The City of Lexington, DGIF, and USFWS will continue to work to obtain necessary permits and satisfy appropriate regulatory requirements. Coordination will continue through project-construction activities and monitoring.

The Draft EA was available (digitally and in hard copy) for public review and comment for a 30-day period starting August 28, 2018. A summary of comments received during this period and responses to those comments are located in Appendix 6 of this document. The final EA and related documents can be accessed electronically on the City of Lexington website under the Government dropdown tab or at http://lexingtonva.gov/gov/jordans_point_dam.htm
9.0 REFERENCES

Aadland, Luther. 2010. Reconnecting Rivers: Natural Channel Design in Dam Removals and Fish Passage. Minnesota Department of Natural Resources. Division of Ecological Resources Stream Habitat Program.


Clarke, Sarah. 2018. Intensive-level Architectural Survey of the Jordan’s Point Dam (081-7164), the Jordan’s Point Millrace (117-5027-0004), and the Chesapeake and Ohio Railroad Piers (081-7165) in the City of Lexington and Rockbridge County, Virginia. June 14, 2018.


APPENDIX 1

Summary of water temperature data recorded by loggers deployed between
Bean’s Bottom and Jordan’s Point on the Maury River (Bernard et al. 2017)

Seven waterproof temperature loggers were deployed at approximately regular intervals between Bean’s Bottom and Jordan’s Point Park on Sept. 14, 2017 and retrieved on Oct. 26, 2017 (Table 1, Figure 1). Loggers recorded water temperature every 15 minutes during the period of deployment. Water temperature data collected during this period were analyzed to examine longitudinal variation in water temperature in this reach of the Maury River and to assess changes in water temperature over the section impounded by the Dam at Jordan’s Point. Water temperature generally increased from upstream to downstream during the monitoring period, but these changes were temporally heterogeneous with strong warming observed at some periods and relatively little difference observed at others. Warmest temperatures were typically observed at loggers located in the impounded section above the Dam (loggers MR5, MR6, and MR7). Longitudinal temperature variation was heterogeneous and influenced by inputs from springs and tributaries, as would be expected in a karst watershed (Figure 2, Figure 3). Most notably, the influence of a cold spring that enters the river near the top of the impounded section is observed by the decrease in water temperature over the top half of the impounded reach (between loggers MR5 and MR6; Figure 4, bottom panel). However, on the majority of monitored days this cooling influence was offset by warming of waters in the lower half of the impounded section between loggers MR6 and MR7 (Figure 4, bottom panel) and resulting in a net increase in water temperature over the impounded section (Figure 4, top panel).

<table>
<thead>
<tr>
<th>Logger ID</th>
<th>Longitude</th>
<th>Latitude</th>
<th>Mean Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR1</td>
<td>-79.449522</td>
<td>37.812936</td>
<td>67.1°</td>
</tr>
<tr>
<td>MR2</td>
<td>-79.453802</td>
<td>37.810908</td>
<td>67.2°</td>
</tr>
<tr>
<td>MR3</td>
<td>-79.456943</td>
<td>37.805804</td>
<td>67.2°</td>
</tr>
<tr>
<td>MR4</td>
<td>-79.453915</td>
<td>37.803566</td>
<td>66.9°</td>
</tr>
<tr>
<td>MR5</td>
<td>-79.447255</td>
<td>37.801356</td>
<td>67.2°</td>
</tr>
<tr>
<td>MR6</td>
<td>-79.440123</td>
<td>37.797437</td>
<td>66.7°</td>
</tr>
<tr>
<td>MR7</td>
<td>-79.431987</td>
<td>37.793527</td>
<td>67.4°</td>
</tr>
</tbody>
</table>

Table 1: Coordinates for logger deployment locations across study area, illustrated in Figure 1.
Figure 1: Approximate locations and ID codes of temperature loggers deployed in Maury River between 9-15-2017 and 10-26-2017. All loggers were affixed adjacent to streambanks and remained submerged during the deployment period.
Figure 2: Water temperatures recorded at logger locations between 9/15/2017 – 10/25/2017.
Figure 3: Top panel shows average afternoon (12:00 – 5:00 pm) water temperature recorded at logger locations over monitoring period. Logger locations are color-coded as indicated in legend below horizontal axis. Bottom panel shows daily air temperature data recorded in Lexington over the same period as mean (solid line), minimum (bottom dashed line) and maximum (top dashed line). Air temperature data retrieved from www.wunderground.com recorded at station located at 37.781 (lat) -79.454 (lon).
Figure 4: Maximum change in water temperature over length of impounded section during afternoon hours (12:00 – 5:00 pm, generally corresponding with peak solar insolation of water surface). The top panel illustrates water temperature changes observed over the entire length of the impounded section, i.e. the difference in temperature recorded at loggers MR5 and MR7 (see Figure 1). The bottom panel depicts water temperature changes between adjacent logger locations. The cooling influence of the spring input immediately downstream of MR5 is apparent as a net decrease in water temperature between MR5 and MR6 (upstream half of impounded section). Conversely, water temperatures increase over the downstream half of the impounded section between MR6 and MR7.
APPENDIX 2

Summary of macroinvertebrate community data collected below Jordan’s Point Dam on the Maury River (Horan et al. 2017)

Samples of aquatic macroinvertebrates were collected from three riffle habitat locations approximately 75 meters below the Dam at Jordan’s Point Park in Lexington, VA. The sampling method followed the Environmental Protection Agency’s 2013 SEDS standard operating procedures (Dorn 2013), which uses a D-frame net and 3 “kicks” just upstream of the net to dislodge organisms into the net. Subsampling methods followed standard procedure as described by Caton (1991), which uses a sampling grid on a wash box to select random portions of the sample for analysis. Macroinvertebrates were identified to family level and their corresponding pollution tolerance was scored following Hilsenhoff (1988). These data were in turn used to calculate site scores using standard Virginia Stream Condition Index metrics (Burton and Gerritson 2003). A total of 193 macroinvertebrates from 21 different families were found (Table 1). The most abundant macroinvertebrates by a wide margin were riffle beetles (Elmidae), water pennies (Psephenidae), and flatheaded mayflies (Heptageniidae), which together comprised almost two-thirds of the total macroinvertebrates found (123 out of 193). These three orders all belong to the scraper (also called grazer) FFG, which is comprised of organisms that feed primarily on algae growing on hard surfaces in rivers (Figure 1). The next most abundant FFG was predators, a class defined by a more carnivorous than herbivorous feeding pattern, followed by collectors (also called collector-gatherers) and filterers (also called collector-filterers), which feed on fine particulate organic matter (FPOM) either settled on the bottom or suspended in the river, respectively. Finally, only 2 shredders were found. This FFG depends on coarse particulate organic matter (CPOM), such as leaf litter, and the associated microbes for food (Closs et al 2004). The Virginia Stream Condition Index Metrics for the sample are shown in Table 2. The overall stream condition index value is 85.8, which reflects generally good stream health. Though the abundance of species from the Ephemeroptera, Trichoptera, and Plecoptera orders (which have low tolerance values) was far lower than the standards for this metric, the high richness of these orders along with the abundance of scrapers (also fairly low tolerance species) and the absence of species from the chironomidae family (high tolerance values) resulted in an overall high score.

The composition of FFGs reflects characteristics of primary production and the overall river food web. Currently, the macroinvertebrate composition suggests the river environment resembles a mid-order stream with high autochthonous input (primary production in the river, e.g. epilithic algae) compared to allochthonous input (primary production coming in from outside the river, e.g., leaf litter), thus favoring
scrapers while making the habitat unsuitable for shredders (Vannote et al 1980). The proportion of collectors/filterers should theoretically be higher in a mid-order stream. Their low abundance in this particular location can be attributed to low availability of FPOM / CPOM. This could be a function of the hydrologic conditions created just downstream of the Dam (i.e. turbulent flow preventing benthic deposition) or, alternatively, upstream of the Dam (prevention of downstream transport past the Dam). Previous studies demonstrate that removal of low-head dams can lead to transient changes in macroinvertebrate communities immediately upstream and downstream of dams related to changes in sediment transport processes (Stanley et al. 2002; Stanley and Doyle 2003). The magnitude of changes is directly related to the volume of sediment released by dam removal and the influence of subsequent streamflow conditions on its downstream transport. In the long term, we would hypothesize that the benthic invertebrate community in this location would respond to dam removal with an increase in shredder and collector/filterer feeding groups reflecting increased availability of allochthonous CPOM and FPOM from upstream.


<table>
<thead>
<tr>
<th>Family ID</th>
<th>Common Name</th>
<th>Order</th>
<th>FFG¹</th>
<th>Tol.²</th>
<th>Abun.³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leptophlebiidae</td>
<td>Prong-gilled mayfly</td>
<td>Ephemeroptera</td>
<td>Collector</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Leptoceridae</td>
<td>Longhorned caddisfly</td>
<td>Trichoptera</td>
<td>Collector</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Philopotamidae</td>
<td>Fingernet caddisfly</td>
<td>Trichoptera</td>
<td>Collector</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Oligochaeta</td>
<td>Earthworm</td>
<td>Oligochaeta</td>
<td>Collector</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Psychomyiidae</td>
<td>Net-tube caddisfly</td>
<td>Trichoptera</td>
<td>Collector</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hydropsychidae</td>
<td>Netspinning caddisfly</td>
<td>Trichoptera</td>
<td>Filterer</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Isonychiidae</td>
<td>Brushlegged mayfly</td>
<td>Ephemeroptera</td>
<td>Filterer</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Brachycentridae</td>
<td>Humless casemaker</td>
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<td>Filterer</td>
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<td>1</td>
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<td>Sphaeriidae</td>
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<td>Pelecypoda</td>
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<tr>
<td>Hydramcarina</td>
<td>Aquatic mite</td>
<td>Hydracarina</td>
<td>Predator</td>
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<td>Rhyacophilidae</td>
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<tr>
<td>Pleuroceridae</td>
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<tr>
<td>Elmidae</td>
<td>Riffle beetle</td>
<td>Coleoptera</td>
<td>Scraper</td>
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<td>Psephenidae</td>
<td>Water penny</td>
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<td>Heptageniidae</td>
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<td>Pteronarcyidae</td>
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¹FFG = functional feeding group; ²Tol. = tolerance value; ³Abun. = abundance
## Table 2: Virginia Stream Conditions Index Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value 1</th>
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<td>Richness</td>
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<tr>
<td>EPT$^1$ Taxa</td>
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<td>%Ephemeroptera</td>
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<td>%PT-Hydropsychidae$^2$</td>
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<td>%PT-H Score</td>
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<td>%Scrapers</td>
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<td>%Scraper Score</td>
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<td>%Chironomidae</td>
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<td>%2Dominant Taxa$^3$</td>
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<td>%2Dom Score</td>
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<td>Modified Family Biotic Index$^4$</td>
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<td>%MFBI Score</td>
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Score equations found in Table 6.1 of Burton and Gerritsen (2003). $^1$Ephemeroptera+Plecoptera+Trichoptera; $^2$P+T, not including Hydropsychidae family; $^3$sum of abundances of 2 most abundant families; $^4$sum of (tolerance*abundance) value for each family, divided by total abundance

## Figure 1: Macroinvertebrate Sample Distribution by Functional Feeding Group
APPENDIX 3

Floodplain Model Results

Jordan’s Point Dam
Base Flood Evaluation
Project No. 20171737

PROJECT DESCRIPTION
Hurt and Proffitt has been working with DGIF in the development of Dam removal permit drawings at the Lexington Lake Dam in Rockbridge County, VA. The purpose of this document is to summarize hydraulic modeling of Maury River and impacts of the proposed Dam removal on the 100-yr floodplain and ordinary high water (OHW) level.

HYDRAULIC MODELING
A hydraulic model of a portion of Maury River was developed using HEC-RAS to evaluate potential impacts of the proposed Dam removal on the Maury River 100-year floodplain. Maury River cross sections were developed using contours received from the City of Lexington. Base river conditions were developed and the water depth compared to the FEMA elevations found on FIRM 51163C0266C dated April 6, 2000. The model cross sections are summarized below:

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<thead>
<tr>
<th>River Station</th>
<th>FEMA W.S. Elev (ft)</th>
<th>Existing W.S. Elev (ft)</th>
<th>Difference W.S. Elev (ft)</th>
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<td>1000</td>
<td>916</td>
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<td>1487</td>
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Dam Removal Location
Based on the current floodplain mapping and site contours, the Maury River 100-year floodplain elevation is approximately 30-35 feet above the current ground elevation. To determine potential floodplain impacts, the proposed Dam removal was added to the HEC-RAS model. Model cross section 4712 represents the Jordan's Point Dam. A summary of the exist/post Dam removal model simulations are below:

<table>
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<th>Cross Section</th>
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<th>Water Elev Proposed</th>
<th>Difference Ex/PR</th>
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<th>Difference Ex/PR</th>
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Comparison of the existing and proposed site conditions remained the same downstream of the Dam. Based on the HEC-RAS model results, a reduction of the 100-year floodplain upstream of the Dam is predicted. The largest difference of 3.5 feet can be seen at the Dam, while approximately 3600 feet upstream, the difference in modeled water surface elevation is back to existing conditions.

**ORDINARY HIGH WATER LEVEL**

HEC-RAS simulations of the Maury River were completed to evaluate changes to the OHW level for the existing and proposed conditions. According to the US Army Corp of Engineers, the OHWM is the line on the shoreline coincident with the elevation contour that represents the approximate location of the line on the shore established by fluctuations of water and indicated by physical characteristics such as shelving, destruction of terrestrial vegetation, presence of litter or debris, or changes in the character of soil. The model assumes a water level that is roughly 4 feet above the top of the Dam. The summary of the existing and proposed conditions of the river are given in the table below:
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<th>Water Elev.</th>
<th>Difference</th>
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</table>

The OHW simulation is similar to the 100-year floodplain simulation in that change is predicted upstream of the Dam and no change downstream. At the Dam, a 7.2 feet water surface reduction has been modeled and the proposed water surface is 4.2 feet lower approximately 3600 feet upstream of the Dam.
APPENDIX 4

Creel-survey data from Maury River 2004 (W&L and DGIF)
(Reach 1: Rockbridge Baths to Alone Mill Road; Reach 2: Alone Mill Road to Jordan Point Dam; Reach 3: Jordan Point Dam to Rt. 60 Takeout (BV); Reach 4: Glenn Maury Park to Gooseneck Dam on River Rd; Reach 5: River Rd. to Glasgow)

<table>
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<th>Target</th>
<th>City/county</th>
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<td>bank</td>
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<td>Lexington</td>
</tr>
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</tr>
<tr>
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APPENDIX 5

Timeline of Jordan’s Point Dam Project Section 106 and EA Processes:

March 2, 2017: Virginia Department of Game and Inland Fisheries (DGIF) presented a conceptual plan for Dam removal at Lexington City Council Work Session. The meeting was open to the public and posted on the City of Lexington (City) website more than a week in advance. Approximately a dozen members of the public were in attendance.

March 21, 2017: Initial communication sent from DGIF to Virginia Department of Historic Resources (DHR) about the potential project.

March 27, 2017: DGIF presented the conceptual plan for Dam removal to Rockbridge County Board of Supervisors. The meeting was open to the public and was posted on the City of Lexington website more than a week in advance. Approximately two dozen members of the public were in attendance and several provided comments.

May 15, 2017: An inter-jurisdictional meeting was held in Lexington with Lexington City Council and Rockbridge County Board of Supervisors in attendance. The meeting was open to the public and was posted on the City of Lexington website several weeks in advance. Notification of the presentation was published in the local weekly paper, The News-Gazette on May 10, 2017. DGIF presented a Powerpoint presentation on the proposed Dam removal and alternatives available to the City, followed by extensive public comment. Approximately 100 people were in attendance with 30 people providing comments for the record.

May 18, 2017: DGIF met with Lexington City Council to answer questions about the proposed removal. The meeting was open to the public and was posted on the City of Lexington website more than a week in advance. Approximately two dozen persons were in attendance.

June 15, 2017: At a City Council public hearing, following public comments by about a dozen members of the public and extensive discussion amongst Council members, City Council voted unanimously to move forward to develop a partnership agreement with DGIF to remove the Dam. The meeting was open to the public and posted on the City’s website more than a week in advance. The public hearing notification was also posted in the News-Gazette on May 31, 2017 and June 7, 2017. Prior to the meeting and the vote, Council received written comments from Rockbridge County, Virginia Military Institute, local Historic Societies, Rockbridge Area Conservation Council, Natural Bridge Soil and Water Conservation District, James River Association, and several local residents.

June 30, 2017: DGIF sent DHR the powerpoint presentation on proposed Dam removal/alternatives from June 15 meeting and copies of written comment submitted by the community.

July 19, 2017: On-site pre-application meeting was held at Jordan’s Point with DHR, DEQ, US Army Corps of Engineers, VDOT, Rockbridge County, City of Lexington, VMI, and VMRC.

January 4, 2018: At a City Council meeting that was open to the public and posted on the City’s website more than a week in advance, City Council voted unanimously to officially enter into a contract with DGIF to pursue funding and permits to remove the Dam. There were two dozen members of the public present and public comments were made by six members of the audience prior to the vote.

January 18, 2018: DGIF contracted with Hurt & Proffitt for intensive-level architectural documentation of properties (Jordan’s Point Dam, the C&O railroad Piers, and the headrace portion of the Millrace) within the
Area of Potential Effects (APE) that were previously undocumented in the Virginia Cultural Resource Information System (VCRIS) to determine their eligibility for the National Register of Historic Places.

March 12, 2018: Preliminary project information submitted to DHR including APE and project description.

March 20, 2018: Joint Permit Application submitted to VMRC, US Army Corps of Engineers, and DEQ.

April 4, 2018: Submittal of Draft intensive-level architectural survey to DHR by contractor

May 7, 2018: Letter sent from Corps of Engineers to USFWS designating USFWS as the lead federal agency and authorizing USFWS to conduct Section 106 coordination on its behalf.

June 4, 2018: DHR comments on Intensive-level architectural survey sent to contractor.

June 4 and 5, 2018: USFWS sent notice of upcoming action and invitations to participate in anticipated 106 consultation to 11 parties and 12 Native American Tribes.

June 5, 2018: Revised Intensive-level architectural survey and VCRIS forms submitted by contractor to DHR.

June 13, 2018: DHR sent additional comments on the intensive-level architectural survey to contractor following team review.

June 14, 2018: USFWS sent notice of upcoming action and invitations to participate in anticipated Section 106 consultation to four additional parties.

June 18, 2018: USFWS letter of adverse effects determination sent to DHR.

June 19, 2018: Contractor submitted the Final Intensive-level architectural survey and the VCRIS forms to DHR.


June 19, 2018: DHR sent letter to USFWS concurring with adverse effects determination.

June 28, 2018: USFWS notified Advisory Council on Historic Preservation (ACHP) of adverse effects through submittal of e106 Form, Lead Agency Designation Letter, List of Potential Consulting Parties, Project Drawings, Map Depicting Project Area, Summary of Public Involvement, Correspondence from USFWS to Virginia Department of Historic Resources (VDHR) Determining an Adverse Effect, Map of the APE, DHR Correspondence Concurring with Adverse Effect Determination, and Intensive-Level Architecture Survey.

July 26, 2018: Email communication from ACHP declining to participate in consultation and indicating that a letter is forthcoming.

July 28, 2018: Draft MOA among USFWS, City of Lexington, SHPO, and DGIF sent to the 13 consulting parties that responded to the invitation to participate in consultation; requested their comments within 30 days (by August 27, 2018).

August 3, 2018: Response received from Monacan Nation accepting invitation to participate in consultation.

August 4, 2018: Draft MOA sent to Monacan Nation and request for their comments within 30 days (by September 3, 2018).
August 10, 2018: Letter received from ACHP declining to participate in consultation.

August 27, 2018: End of the comment period for the draft MOA; four consulting parties provided comments.

August 28, 2018 DGIF puts draft Environmental Assessment (EA) out for public comment through September 27, 2018; public notice published in Lexington paper, posted on DGIF and the City websites; hard copies made available at City Manager’s office.


September 18, 2018: USFWS sent follow-up email and left voice mail for Monacan Nation seeking their comments on the draft MOA.

September 20, 2018: USFWS sent second follow-up email to Monacan Nation seeking their comments on the draft MOA by September 24, 2018.

September 20, 2018: Draft MOA comments compiled and responses to those comments drafted; the MOA revised to reflect comments received to-date.

September 27, 2018 End of public comment period for draft EA; fourteen letters of comment were received.

October 2, 2018: The Section 106 process awaiting comments from the Monacan Nation on the draft MOA. They accepted the invitation to participate as a consulting party, but have not submitted comments or responded to repeated phone calls/emails.

October 11, 2018: With the help of the Tribal liaison, USFWS contacted the tribal Chief of the Monacan Nation and request comments by October 18th.

October 19, 2018: Monacan Nation draft MOA comments received.

October 24, 2018: USFWS finalized revisions to the MOA and responses to comments; final MOA sent to signatories and consulting parties for concurrence and signatures

November 2, 2018: Final MOA is fully executed.

November 6, 2018: Final EA (including comments and responses) is finalized.
APPENDIX 6

Summary of Public Comments and Responses

Environmental Assessment:

Jordan’s Point Dam Removal

Maury River, Lexington, Virginia

The Virginia Department of Game and Inland Fisheries (DGIF), in cooperation with the US Fish and Wildlife Service (USFWS), prepared an Environmental Assessment (EA) of the proposed partial removal of Jordan’s Point Dam (Dam) and the C&O railroad piers (Piers) on the Maury River at the boundary of the City of Lexington (City) and Rockbridge County (County). The draft EA was published on August 28, 2018 on the City website. In addition, paper copies of the EA were available from the City Manager’s office for public review and comment. Notice of the availability of the EA for public review and the process for informing DGIF of comments was published on August 29, 2018 in the News-Gazette (published in Lexington, VA serving the City and County) and was posted on the DGIF website. The comment period was open for 30 days until September 27, 2018.

Fourteen letters were received by the DGIF within the comment period. Three of the letters expressed general support of the project, one letter expressed general opposition to the project, and ten letters provided specific comments on the document. General comments of support or opposition are appreciated, but are not included in the summary. In addition, comments that include statements of opinion that are not supported by additional information or facts are not included. Substantive comments that include specific concerns or additional information are summarized in the list below along with a brief response and reference to EA information relevant to the issue. The comments and responses are grouped according to the Section of the EA or topic to which they refer.

INTRODUCTION/BACKGROUND

Comment: Page 1, Section 1. It is stated that 'The proposed action is receiving funding through the National Fish Passage Program and the State Wildlife Grant funds from the US Fish and Wildlife Service (USFWS)'. It is not clear which of the identified alternatives qualifies for the identified grants. If fish passage is restored and the dam height is lowered so as to remove it from the inventory will the identified funds still be available to support this action? Are there other grants which might be available (historic grants) that might support actions other than the recommended alternative if selected?

Update the assessment to include a better understanding of the funding that is available for each of the identified alternatives.

Response: The EA is not intended as an assessment of funding availability.

Comment: Pages 1 and 2, Section 1.3, Paragraph 1. The Dam is described to be approximately 10 feet in height. With regard to regulatory issues, one foot can be substantive. Consider describing the dam as 9 feet in height, to match the DCR records.

Response: The dimensions of the Dam in the EA are based on DGIF field-collected, GPS-based survey data and will not be revised.
Comment: Section 4.6, Paragraph 4. Consider describing the dam as 9' in height to accurately match the DCR records.
Source: https://consapps.dcr.virginia.gov/DSIS/#/dams/details/2431/basics

Response: The dimensions of the Dam in the EA are based on DGIF field-collected, GPS-based survey data and will not be revised.

Comment: Pages 1 and 2, Section 1.3, Paragraph 1. Since safety is considered through this Environmental Assessment, the DCR "low hazard - special" designation should be included in the overall description of the Dam. Source: Virginia Dam Inventory System - https://consapps.dcr.virginia.gov/IDS IS/#/dams
(Note: At time of posting, it remains unclear as to whether the Dam is rated simply "Low Hazard" or "Low Hazard - Special." While the Dam Inventory System currently lists it as "Low Hazard - Special", recent communications with DCR indicate that this may have changed).

Response: The EA (page 2, Section 1.3) has been revised to include this information.

Comment: Page 2, section 1.2 states 'the piers are owned by Virginia Military Institute'. In the VMI letter date 4 August 2017 we state 'Analysis of all available documentation points toward VMI owning the Jordan's Point railroad piers; however, in the absence of a title search we cannot with 100% certainty confirm such analysis. While we in good faith believe VMI to be the owners of the piers, we cannot guarantee that there may not be another individual or entity with ownership interest. If VDGIF moves forward with the planning and removal of the piers without conducting a title search, please understand that VDGIF will be accepting the risk of such decision.'

The wording of the Environmental Assessment needs to be revised to more correctly reflect the status of the pier ownership for the awareness of all parties involved.

Response: This statement of apparent ownership is based on the Deed of Gift dated May 13, 2010, between V.M.I. Foundation, Incorporated ("Grantor") and Virginia Military Institute ("Grantee"). The EA has been revised to include this reference.

Comment: The report fails to note that the park includes several river-access points upstream and downstream of the Dam and a railed overlook on the bridge abutment at the southern end of the Dam.

Response: The EA has been revised to include this information.

Comment: Page 2. The DEA references Brash 2007 to state that the dam is "structurally compromised". Clearly the dam has cracks, voids and leaks, but may not be structurally compromised. American Dams is conducting a stability analysis of the dam. We plan to complete this effort once flows decrease to about 200 cfs. The dam has stood the test of time and is over 100 years old. Additionally, it has been 11 years since this analysis was completed. In reviewing Brash 2007, we could find no analysis that indicates the dam is structurally compromised.

Response: The 2007 Engineering report (posted on the City of Lexington website's Jordan's Point Dam page http://lexingtonva.gov/gov/jordans_point_dam.htm) included scuba diving for underwater photos, measurement of cracks and voids, and dye tests to identify seeps. This document was submitted by the Dam owner to the DCR Dam Safety Program and is appropriate documentation of the structural condition of the Dam. Additionally, the Jordan's Point Dam Stability Analysis prepared for Americans Dams by Klienschmidt (September 17, 2018) states that the Dam does not meet the FERC sliding safety factor of 1.5 under flood load, "indicating that the structure is unstable."
PURPOSE AND NEED

**Comment:** Page 2, Section 2.0, Paragraph 4. It is contextually important to note that there are currently multiple barriers below the Dam, and that removal of the Dam will connect the headwaters with approximately 7.5 miles of the Maury River, downstream to the Moomaw Dam. Consider adding that there are a total of 14 downstream barriers (some with passage) and that removal will connect 7.5 miles downstream to the 20' Moomaw Dam in Buena Vista.

**Response:** The reference in this section to stream miles and aquatic connectivity is from the Chesapeake Bay Fish Passage Prioritization Tool. The EA has been revised to clarify how this mileage is calculated. The location of the downstream Moomaw’s Dam is referred to several times in the EA.

**Comment:** Proposal to Remove Jordan’s Point Dam Marginally Increases Aquatic-Habitat

The Draft Environmental Assessment (DEA) states that “The purposes of this project are to increase complexity of instream habitat; restore riverine-channel hydraulics and sediment transport for 1.2 miles upstream; improve aquatic-habitat connectivity to the headwaters; remove a fish-passage barrier and public safety/boating hazard; and eliminate downstream scour resulting from waterway impoundment.” Further the DEA states that “The total number of stream miles on the Maury and its tributaries that are affected by this impediment is 1,140.3 miles” (DEA p. 3) and “The total number of stream miles on the Maury and its tributaries that would be made accessible to all aquatic organisms by the Proposed Action is 1,140.3 miles” (DEA p. 33). These are misleading statements. In fact, the total additional miles of improved aquatic-habitat connectivity would only be about 8 miles of mainstem habitat and associated tributary habitat between Moomaw Dam in Buena Vista and Jordan’s Point Dam. Moomaw Dam and seven dams downstream on the James River present barriers to fish passage and aquatic-habitat connectivity. The final EA should be revised to accurately reflect the additional number of river miles that will be hydraulically connected.

**Response:** The references to stream miles and aquatic connectivity in the EA are from the Chesapeake Bay Fish Passage Prioritization Tool. The EA has been revised to clarify how this mileage is calculated.

**Comment:** As noted above only about 8 miles of the Maury river and associated tributary habitat between Jordan’s Point Dam and the Moomaw Dam in Buena Vista would be affected, not the 1140 miles stated in the DEA. The DEA states that dam removal would return the currently impounded reach to a free-flowing system. This amounts to only 1.2 miles of the 1140 miles of stream reach in the James River basin. The existing lentic habitat continues to provide habitat for those species that prefer lentic habitats. While this would not be considered “natural” habitat, it has existed for over 100 years.

**Response:** The reference in the EA to stream miles and aquatic connectivity is from the Chesapeake Bay Fish Passage Prioritization Tool. The EA has been revised to clarify how this mileage is calculated. 100 or 200 years of impoundment does not constitute natural conditions that existed for thousands of years prior to the presence of a dam.

**Comment:** Page 8. The DEA states “A key purpose and goal for this project is to restore the riffle/run/pool/glide features...” American Dams appreciates that riffle/run/pool/glide features provide for sheltering, spawning, and feeding habitat. However, the current 1.2 mile-long reservoir also provides for beneficial aquatic habitat. American Dams questions whether removal of Jordan’s Point Dam provides significant restoration considering that there is an estimated 1140 miles of stream in the James River basin and removal of Jordan’s Point Dam represents a minor increase in riffle/run/pool/glide features.

**Response:** Restoration of aquatic habitat where none currently exists is of indisputable benefit to the aquatic organisms present. “Significant restoration” relative to an entire river basin is not the measure by which state and federal regulatory agencies quantify restoration or impacts. In Virginia, impacts to (and restoration of) aquatic habitat in waters of the United States are quantified by state and federal regulatory agencies in their
Joint Permit Application (per Section 404 of the Clean Water Act) based on square footage not square footage as a percentage of an entire waterbody.

ALTERNATIVES
Comment: Several comments were made that the modification and use of the Millrace as a potential fish-passage option was not considered.
Response: We agree that the Millrace could be modified to accommodate fish passage depending on the target species and requirements thereof. The EA has been revised to reflect the potential use of the Millrace as a fishway.

Comment: A comment was made that the graphic of "whitewater park" alternative was not reflective of the alternative described and that a more accurate graphic was available.
Response: The EA has been revised to include the graphic in question (Figure 5).

Comment: Page 4, Section 3.0, Table. There are two question marks in Alternatives 4 and 5 under the "Removes Fish Passage Barrier" column. We feel that a complete Environmental Assessment should be more definitive.
Response: It is not a given that a Rock Ramp, Rock-arch Rapids, or Rock-rapids, will provide fish-passage. They would each need to be designed specifically for such, or include opening of the Millrace by removal of the headgate culvert and earthen dam. The question mark was intended to suggest that it is possible that fish-passage could be achieved, but that the design would need to specifically accommodate the needs of the resident species. For clarity, the notation in the table has been revised and an explanatory note added below the table.

Comment: Page 5, Section 3.3, Alternative 1, Paragraph 3. Consider changing the wording of the 3rd sentence, which is currently, "It would reduce the frequency of water flowing into the Jordan's Point Millrace...." Water currently flows through the millrace constantly. Alternative 1 would likely result in no water flowing through the millrace except in flood conditions.
Response: We believe that the current wording is appropriate. Based on the elevation of the Millrace headgate relative to baseflow water-surface elevation, water is not expected to access the Millrace continuously, though more frequently than "in flood conditions."

Comment: Page 7, Section 3.3, Alternative 2, Paragraph 4. Consider changing the sentence "All practical efforts will be made to leave intact a portion of the dam on both sides of the river to provide for historic interpretation," to "A portion of the dam on both sides of the river will be left intact for historic interpretation."
Response: The EA has been revised to reflect this wording.

Comment: Pages 5 - 7, Section 3.3, Alternatives 1 and 2. There appears to be no consideration of the seasonal timing of dam removal with regard to impacts on spawning fish. Consider adding discussion of the optimum time (season) and flow to remove the dam, in consideration of spawning species and downstream silt release.
Response: Section 4.4 GEOLOGY/SEDIMENT indicates that the upstream sediment wedge is minimal (Figure 6). Downstream silt release as a result of Dam removal is not expected to impact spawning. Section 7 review and DGIF Environmental Services Section (ESS) review of the Joint Permit Application for US Army Corps of Engineers, Virginia Marine Resources, and Virginia Department of Environmental Quality permits acquisition did not recommend any time-of-year restrictions for any species.
Comment: Page 9, Section 3.3, Alternative 5. Alternative 5 excludes the "Upstream Pool" drawing (from the 2008 Lacy study), which could provide a better alternative for fish passage.

Response: The EA has been revised to show this graphic (in Figure 5) which is aligned with the narrative description of this alternative.

Comment: Alternative 3: Dam Repair and No Pier Removal Should be Evaluated as an Alternative

Alternative 3 was eliminated from further consideration because it did not meet the purposes or needs of the project. Just because the alternative does not meet a subjective purpose and need is not an appropriate basis for eliminating an alternative. American Dams is examining the stability of the Jordan’s Point Dam and assessing the cost of repair. This alternative may have significant benefits to the local community, and although not a stated purpose of the project, it should be considered as an alternative to the no-action alternative. In addition to dam repair, American Dams requests that the final EA consider repairing the dam and including options for hydraulic conductivity, fish passage and whitewater recreation.

Response: An alternative that does not meet any of the project Purposes and Needs can validly be eliminated from further consideration in an EA. However, we acknowledge that an alternative that includes repair of the Dam and modification of the Millrace could meet one of the project Purposes and Needs (upstream/downstream passage). The EA has been revised to include further consideration of a modified Alternative 3: Dam Repair, No Pier Removal, and Millrace Modification.

GENERAL AFFECTED ENVIRONMENT

Comment: Page 11. The DEA notes that “There is general disruption to the natural state of the riverine system in the project area.” Given that Moomaw Dam creates a similar reservoir to Jordan’s Point downstream from Jordan’s Point, use of words like “general disruption” seem inappropriate. DGIF should consider if the area immediately downstream of the dam would remain scoured under the no dam condition.

Response: Section 5.4 Geology/Sediment speaks to the area downstream (and upstream) of the Dam being returned to natural sediment transport conditions. Without the immense shear stress that occurs downstream of a 10-foot tall dam, the scour will no longer occur. The EA has been revised to clarify this point.

WATER QUALITY

Comment: Page 11. Section 4.2, Paragraph 1. Consider revising the final sentence to simply, "This section is downstream of the Moomaw Dam." With the introduction of the Moomaw Dam in Section 4.1 (as noted above) it will be self-evident that the no PCBs have been documented upstream of that structure.

Response: Section 4.2 has been revised to clarify the location of PCBs relative to Moomaw’s Dam.

Comment: Page 11. Section 4.2, Paragraphs 3 and 4. With regard to water temperature and correlation between microinvertebrates (sic) and stream health, references to Benard et al. (2017) and Horan et al (2017) suggest marginal confidence in findings. As these are unpublished undergraduate works, consider either removing reference or providing copies as appendices to the Environmental Assessment, to allow for more rigorous external review.

Response: The data from these papers have been included in the revised EA as Appendices 1 and 2.

Comment: Page 13, Section 4.4, Paragraph 7. Consider amending the final two sentences to simply, "The Virginia Department of Environmental Quality (DEQ) has no data indicating the presence of PCB’s above the Moomaw Dam in Buena Vista."
Response: The EA has been revised to clarify this wording.

Comment: Pages 10-11. Section 4.1. In order to provide more clarity, include in this introductory section description of the 20 foot tall "Moomaw Dam", approximately 7.5 miles downstream of the Jordan's Point Dam. Currently, the first mention of the Moomaw Dam is in Section 4.2.

Response: We believe Section 4.2 is an appropriate location for this information.

Comment: The DEA suggests that impacts to water quality would be short term. This is conjecture. Adverse sediment impacts existed for several years when the Embrey Dam on the Rappahannock River was removed in 2004 (Fredericksburg Free-Lance Star editorial, August 2011). The DEA should address the potential lingering effects of sediment within the Jordan’s Point headpond.

Response: Though no data are presented in this comment, it is worth noting that the geology of the Rappahannock River watershed, the river morphology, and the amount of sediment located behind Embrey Dam are significantly different than the conditions at Jordan’s Point Dam. More than 295,000 cubic yards of material was dredged from the Embrey Dam impoundment whereas only 1,700 cubic yards of sediment (and possibly crib dam) are present in the upstream wedge at Jordan’s Point Dam. Geomorphologically, “several years” qualifies as “short-term” with regard to river systems that are adjusting to being free-flowing after being impounded for a century or more. Literature on “short-term” effects of dam removal cite periods of study ranging from several months to four years, depending on the topic (sediment transport, macroinvertebrates, revegetation, etc.), timing relative to flood events, physiographic region, etc.

Comment: Page 11. “Low head dams negatively affect water quality and reduce biodiversity (Ohio EPA 2013).” This is an overly broad statement along with the following sentence that states “the quality of water deteriorates towards the reservoir bed…” These generalizations can be misleading. Considerable field work has been conducted on the Scott’s Mill, Cushaw, Big Island, and Holcomb Rock headponds downstream on the James River. DGIF should confer with other DGIF staff that have specific experience on these projects to amend the DEA to reflect specifics of how these headponds affect water quality. Secondly, the final EA should provide specifics on how water quality is affected at Jordan’s Point. What are the current water quality conditions in the headpond? It is important for the decision makers to provide actual measurements rather than generalized statements. Specifically, at the Scott’s Mill headpond, water temperatures are cooler at the bottom of the deeper pools during the low flow summer periods. American Dams suggests that this is a benefit not a negative.

Response: Water temperature data from the impoundment are provided in Appendix 4. DGIF staff have not found any data to support the suggestion that dams and their impoundments are beneficial to the water quality of an otherwise-healthy riverine system.

Comment: The DEA speaks to the 2,370 square feet of natural stream that would be restored from removal of the dam. While this may be accurate, the significance is minimal as it amounts to only 0.05 acres. The DEA also states that water quality would be improved in the 1.2 mile reservoir area. The DEA continues that the dissolved oxygen would be improved and water temperature decreased. This is speculative. There is no data to back that up other than the Ohio EPA 2013 reference. The final EA should present the measured temperature increases in the reservoir and explain based on scientific principles the anticipated magnitude of change. This would enable the reader to better understand the magnitude of change and potential benefit. American Dams suggests that DGIF consider conducting a simple heat balance of the reservoir and no reservoir conditions for the final EA. Because the retention time is so short, the reservoir may not warm the water significantly. DGIF should quantify the change rather than assert this benefit. As for dissolved oxygen (DO), it seems reasonable to assume that the DO would increase in the “no dam” alternative, but there is no data to support that. Is the dissolved oxygen at saturation levels at the upstream end of the impoundment? If so, then it is not likely that removing the dam would
significantly increase DO. The DEA also mentions that macroinvertebrates downstream would also benefit with dam removal because sediment would be transported downstream. There is no substantiation of how far downstream this benefit would persist. Moreover, the DEA states that any adverse impacts to downstream water quality would be short-term. There is not qualification of what the short-term time frame is. On the Rappahannock River, sediment problems persisted for years after the dam was removed. This is not a short-term effect.

**Response:** The statement that the “significance” of stream bottom impact of the dam footprint is “minimal” is subjective. In Virginia, impacts to (and restoration of) aquatic habitat in waters of the United States are quantified by state and federal regulatory agencies in their Joint Permit Application (per Section 404 of the Clean Water Act) based on square footage not square footage as a percentage of an entire waterbody.

Temperature data is presented in Appendix 1 of the final EA. Though variable with season, depth of pool, and temperature, effects of dams on dissolved oxygen in impoundments is well-documented in literature. The EA has been revised to include additional references.

The Riverine Habitat section of the EA states that the current lack of fines in the substrate extends from the Dam downstream to about 150 feet beyond the Route 11 bridge. Literature and field data showing a minimal amount of sediment in the impoundment support the statement that downstream impacts to water quality as a result of siltation following dam removal would be minimal and short-term. The reference to the Rappahannock River as an analogous situation been addressed in the response to the similar comment.

**HYDROLOGY AND FLOODING**

**Comment:** The DEA speaks to flood reduction benefits of Furr’s Mill Road, but no information is presented on the seriousness of the problem, how frequent this road floods, or how much reduction in flooding would take place. The DEA infers that 3500 feet of the road would have reduced flooding. There is no comparison of the flood plain elevations for the “with” and “without” dam alternatives. The DEA should also note that the dam (and reservoir) was constructed before the road.

**Response:** The wording in the EA refers to a portion of Furr’s Mill Road that occurs 3,500 feet upstream of the Dam and experiences periodic flooding. There are VDOT signs on this portion of the road indicating the potential for flooding. Based on hydraulic modelling by Hurt & Proffitt, the change in ordinary OHW elevation (similar to bankfull flow) in this portion of the impoundment will be reduced by approximately 4.2 feet following Dam removal. The EA has been revised to include the projected change in OHW elevation along this portion of the road. We believe that the date of construction of the road relative to that of the Dam is immaterial.

**GEOLOGY AND SEDIMENT**

**Comment:** Page 21, Section 5.4, Paragraph 1. Consider clarifying the following statement; "... riparian planting of newly exposed streambanks would be offered on a voluntary basis to interested landowners." It seems unclear as to how this would occur. Who would fund and complete the plantings?

**Response:** It is not the purpose of the EA to indicate funding responsibility of each component of the Proposed Action. These specifics are appropriately addressed in project agreement documents among partners.

**Comment:** Page 12. The DEA generalizes that dams result in a “starving” of “the reach downstream of sediment (Petts 1984: Poff et al., 1997)”. The final EA should consider the specifics of Jordan’s Point sediment movement and not just rely on literature. The dam has been in existence for over 100 years and may well be in dynamic equilibrium. This can be verified using a bedload model combined with the bathymetry data collected by DGIF. American Dams members observed suspended sediment being carried over the dam during a site reconnaissance
of high flows on September 18, 2018. Figure 6 of the DEA infers that sediment may be carried over the dam during high flow.

Response: DGIF documents the fine layer of sediment covering most of the impoundment reach, yet acknowledges that significant fine sediment is carried over the Dam during high flows, hence the small sediment wedge upstream of the Dam documented in the EA. Much of the depletion of the fine material downstream in this case is a result of scour due to high shear stress of water flowing over the Dam.

RIVERINE HABITAT
Comment: Page 14, Section 4.5, Paragraph 2. For context, consider noting that the 2,370 square feet of reclaimed river bottom represents an estimated 0.01% of the total Maury riverbed. (42.8 miles x a very conservative 100' average width = 22,598,400 sf total).

Response: In Virginia, impacts to (and restoration of) aquatic habitat in waters of the United States are quantified by state and federal regulatory agencies in their Joint Permit Application (per Section 404 of the Clean Water Act) based on square footage not square footage as a percentage of an entire waterbody.

Comment: The DEA notes that with complete dam and pier removal “an estimated 750-square feet of natural, subaqueous bottom as habitat for aquatic organisms would replace the Dam footprint.” At best this is a very minor benefit and should be characterized in the final EA as such.

Response: Restoration of aquatic habitat where none currently exists is of indisputable benefit to the aquatic organisms present.

FISH
Comment: Page 13-14, Sections 4.5 and 4.6. The narrative indicates that fish populations are robust in the Maury River. The small 1.2 mile of flatwater impoundment, which has been in place for an estimated 200 years, represents a small portion of the 42 mile length of the Maury River. The only other flat water impoundment is located behind the Route 60 dam located in Buena Vista. Both these impoundments represent a significantly varied recreational opportunity for the public. The benefits of re-establishing fish passage around the dam (or both dams) is clear. However, the discussion associated with restoration of riverine habitat is limited to the immediate vicinity of the Jordan's Point Dam. Discussion of fish passage becomes more general and less specific to the Maury River. The health of the fish population would seem to indicate an already healthy riverine habitat. Restoration of fish passage around the dam is obviously beneficial but is additional riverine habitat required to maintain the current healthy fish populations?
Revise these two sections to better reflect the conditions associated with the Maury River, in total as well as with the specifics of the Jordan's Point Dam.

Response: We believe that these sections (Riverine Habitat and Fish) adequately describe the affected environment. Restoration of the natural riverine environment and natural fish passage for all species will provide benefits to native fish and wildlife species.

Comment: Page 23, Section 5.6, Paragraph 1. For clarity, consider amending the second sentence to, "..would provide feeding and spawning habitat for riverine fish that does not currently exist in the 2,370 sf of riverbed currently occupied by the Dam and piers."

Response: For clarity, the EA has been revised to include this language.

Comment: Page 23, Section 5.6, Paragraph 1. With regard to any discussion on fish, please note the DGIF's online publication regarding fishing on the Maury River (emphasis added via italics).
Bean's Bottom (Rt. 631) to Jordan Point Park (Rt. 11): Map Distance: 2.5 miles
Put in on river left above the Rt. 631 (Furrs Mill Road) bridge. This is a short float, but worth it for anglers. Take out on river right at Jordan's Point Park just upstream of the athletic field 700 feet upstream of a 10-foot dam. Anglers, boaters, and other river users should take caution and not approach the dam. Orange buoys across the river and signs are placed just upstream of the dam to warn people to stay away.

Response: The EA adequately speaks to the use of upstream and downstream reaches for angling and the safety concerns associated with the Dam.

Comment: Page 14. Generic statements like “Obstructions like dams could block certain species from locating suitable spawning areas…” are troublesome without specific data to back them up. Jordan’s Point Dam blocks upstream fish passage for about 8 mainstem river miles. The final EA should be specific on what resident species are unable to reach spawning grounds.

Response: The impact of the Jordan’s Point Dam to passage for resident fish is appropriately discussed in the EA.

MUSSELS
Comment: The DEA states that dam removal would allow all resident fish, including mussel-larvae host fish, to freely pass through the area. However, there is a dam 8 miles downstream that severely limits this potential benefit. Interestingly, when DGIF conducted a mussel survey upstream and downstream of the dam in 2017, four live Atlantic spike (Elliptio producta) were found in the reservoir. There is no discussion on the effects of dam removal on these mussels.


Comment: Page 16. Section 4.7 discusses the Affected Environment for mussels, but includes a conclusory statement that belongs in the Environmental Consequences section of the DEA. The statement “Based on historic and more recent mussel surveys in the Maury River, it is unlikely that removal of the dam would negatively impact mussel species at the project location …” should be removed from this section and placed in the Environmental Consequences section. Given that there were live mussels found in the impoundment, the DEA does not make clear how these mussels might be affected when the dam is removed.

Response: The EA has been revised to remove the statement from this section. It is included in the Environmental Consequences Section. It is noted in the EA that the mussel biologist clearly states in his survey report that no mussel populations will be impacted if the Dam is removed.

WILDLIFE
Comment: The document fails to mention impacts to federally-protected migratory bird species.

Response: The WILDLIFE sections of the EA have been revised to include information of migratory bird species. While resident and migratory waterfowl use the current impoundment upstream of the Dam, DGIF's waterfowl management biologists have not identified this portion of the Maury River as critical habitat for any of Virginia's migratory waterfowl populations and do not anticipate significant impacts as a result of reduction in impoundment area. The increase in riparian habitat may serve to benefit migratory songbirds.
THREATENED AND ENDANGERED SPECIES
Comment: Page 25, Section 5.9, Paragraph 2. For context, consider adding, "... permanently filling 0.66 of an acre of the estimated 519 acres of total stream bottom..." (42.8 miles x a conservative 100’ average width = 22,598,400 sf.; 22,589,400 / 43,560 = 519 ac.).

Response: In Virginia, impacts to aquatic habitat in waters of the United States are quantified by state and federal regulatory agencies in their Joint Permit Application (per Section 404 of the Clean Water Act) based on square footage not square footage as a percentage of an entire waterbody.

Comment: Page 25, Section 5.9, Paragraph 2. Consider removing the term "conceivably." If properly designed, and/or in combination with an open mill race in the form of a nature-like fishway, aquatic organism passage could be provided.

Response: The EA has been revised to eliminate the redundancy of the statement.

WETLANDS
Comment: Page 25, Section 5.10 Paragraph 1. Consider adding that wetlands may be created in the existing mill race due to pooled, non-moving water as a result of rainfall collection or flooding remnants. The concern has been expressed that standing pools will provide breeding habitat for mosquitoes and impact the ability to enjoy the park in warm seasons. Potential for creation of mosquito breeding habitat in a public gathering area should be mentioned somewhere in the document.

Response: We agree that the creation of off-channel wetland habitat may result in the Millrace channel post-Dam removal. Wetland habitat is beneficial for amphibians and insectivorous birds that rely on low velocity, wet areas and that feed on insects. The EA has been revised to include this information.

NOISE
Comment: Page 26, Section 5.11, Paragraph 4. Consider adding, "... restoring the sound of flowing water enjoyed by neighbors and visitors to the park," to match the description of Alternative 1.

Response: The EA has been revised to incorporate this comment.

Comment: The DEA does address noise from water flowing over the dam. No quantification of the noise is provided, other than to state that this benefit will be lost and replaced by “the sound of flowing water enjoyed by neighbors and visitors to the park.” This seems to suggest that the sound of flowing water will be preferred. This is a subjective assessment. More importantly, aesthetics includes visual effects and these are not addressed in the DEA. Water flowing over dams has often been considered a positive visual effect in Federal Energy Regulatory Commission licensing proceedings. The DEA should discuss the impact of dam removal on the water flow over the dam, as well as the visual effect of the mudflats that will exist until vegetation can be restored.

Response: Both visual and noise aesthetics are inherently subjective. The re-vegetation of newly exposed banks is expected to occur rapidly and is addressed in Section 5.4 of the EA.

CULTURAL AND HISTORIC RESOURCES
Comment: Page 1, Introduction, 1st paragraph. The removal of the Jordan's Point Dam and the C&O Railroad Piers are identified. The impacts to the historically significant mill race when water levels are not maintained are not identified.

Update the introduction to include the long term impacts to the mill race when water flow through the mill race is not maintained.
Response: The introduction refers to the activities of the Proposed Action. The impacts to the Millrace as a result of that action are addressed in the appropriate sections of the document. The structural assessment report on the Millrace is available on the City of Lexington website on the Jordan’s Point Dam page (http://lexingtonva.gov/gov/jordans_point_dam.htm).

Comment: Page 5, Table comparing alternatives. While the narrative of the various alternatives discusses the historical impacts the table does not include the historical impacts in this visual summary of the discussion. Revise the table to include a column that reflects the historical impacts of each alternative considered.

Response: This table is an illustration of the alternatives “ability to meet project Purpose and Need.” The project Purpose and Need are described in Section 2.0 as removal of public-safety hazard, removal of fish-passage barrier, and restoration of riverine hydrology, ecology, sediment transport, and complex habitat. Cultural and historic resource discussion occurs in Section 4.12, consequences of the various alternatives on cultural and historic resources are addressed in Section 5.12 and in the table beginning on page 29 in Section 6.0 Comparison of Environmental Consequences.

Comment: Pages 6 and 7, Alternatives 1 and 2. While the summary of Alternative 1 correctly identifies that water levels in the mill race will not be maintained it does not include the associated long term impacts this will have on the mill race. Representatives of local historical organizations have stated that not maintaining the water levels in the millrace will lead to its eventual deterioration and failure. Alternative 2 has the same impact of reduced water flows through the mill race. While some level of mitigation is offered to offset the loss of the dam and the piers no mitigation is offered for the eventual loss of the millrace.

Revise the narratives of alternatives 1 and 2 to more completely represent the historical impacts and proposed mitigation of each alternative.

Response: The Millrace will not be “lost,” though it will be impacted and that adverse effect has been acknowledged in the Section 106 process. Interpretive signage at the headrace of the Millrace and retrieval of millstones from the pool downstream of the Dam are proposed as mitigation in the Memorandum of Agreement (MOA).

Comment: Pages 7-10, Alternatives 4 and 5. The discussion of these two alternatives correctly assesses that these two alternatives would ‘... maintain the upstream impoundment .... and resultant river flow into the historically significant millrace.’ It also states that they would '...impact the historic-resource value of the dam by covering the visible face of the dam ...'. There is no indication that input from the local historical organizations was sought on alternatives 4 and 5, i.e. would they be accepting of covering the face of the dam if it resulted in maintaining the water flow through the historically significant mill race.

Revise the narratives of alternatives 4 and 5 to more completely represent the historical impacts of these two alternatives. Use input from local historical organizations as the basis for establishing the preferred historical solution and/or mitigation.

Response: Adverse effects to historic properties are determined by the lead federal agency with concurrence by the State Historic Preservation Office (SHPO), not by local historical organizations. Local, historical organizations were included in public meetings and were consulted for input through the Section 106 process. The statement that covering the face of the Dam would result in an impact (visual) is a valid statement.

Comment: Page 17, Section 4.12. During the public meetings held to discuss the potential removal of the Jordan's Point Dam representatives from various local historical groups stated that if water levels were not maintained in the millrace it would eventually deteriorate and fail. The Intensive-level Architectural Survey of the Jordan's Point Dam, the Jordan's Point Millrace, and the Chesapeake and Ohio Railroad Piers in the City of Lexington and
Rockbridge County, VA does not discuss the construction of the millrace. No opinion is offered to validate or invalidate the statement made during the public meetings.

While it is stated that the State Historic Preservation Office reviewed the Intensive-Level Architectural Survey it is not clear that that local historical organization were allowed to review and provide comment. As the City of Lexington is identified as the owner of the Jordan's Point Dam it would appear that providing local historical organizations an opportunity to review and provide input would be required.

Comments on Jordan's Point draft Memorandum of Agreement already document the inadequacy of the Architectural Survey in relation to the millrace. Revise this section of the Environmental Assessment to more correctly reflect the stated claim that without water the historically significant millrace will eventually deteriorate and fail. Provide local historical organizations the opportunity to review and provide input on the Intensive-Level Architectural Survey to ensure its accuracy and completeness.

**Response:** The Architectural Survey of the Millrace is a combination of the tailrace survey that was completed prior to the nomination of the Jordan's Point Historic District and the headrace survey that was completed in 2018 in an effort to identify undocumented properties that could be affected by proposed actions taken at Jordan's Point Dam. The Virginia Department of Historic Resources (DHR) reviewed, suggested edits, and accepted the Survey as meeting its standards.

The possible "deterioration and failure" of the Millrace has been assessed by a structural engineer. That report determined that with the proposed action the Millrace itself will remain, the exposed gauge-dock timbers will have an increased rate of decay without constant water, and the walls and foundation structures may actually have increased longevity with reduced water flow.

Input on the Intensive-level Architectural Survey is not a component of this EA. That being said, any architectural historian that meets the qualifications of DHR and has a license to access VCRIS can update historical property files and provide information that, once reviewed and approved by DHR, can add to the historical documentation.

**Comment:** Page 2, Section 1.3, Paragraph 1. While it is accurate that the existing Dam structure dates to around 1900, it is contextually important to add that the mill pool above the dam has existed continuously since the early 1800's. (see reference to mill race in Section 4.12, paragraph 5 of the draft Environmental Assessment).

**Response:** Section 1.3 Background addresses the current Dam. The EA has been revised to reflect this point about the impoundment history in Section 4.1 General Affected Environment.

**Comment:** Page 26, Section 5.12, Paragraph 1. It is certain that the drying out of submerged timbers will greatly accelerate decay. Consider removing the word "possibly".

**Response:** The EA has been revised to clarify this wording.

**Comment:** Page 27, Section 5.12, Paragraph 4. We disagree with the statement that "Both of these alternatives would result in similar impacts to the historic-resource value of the Dam as those described in alternative 2...." Preservation of the mill race and Dam, even if refaced, is not similar to removal of the majority of the Dam and removing water flow from the mill race, as is posited Alternative 2. Consider removing this reference.

**Response:** Though not removed, the Dam would be impacted by either Alternatives 4 (covering the entire face of the Dam with rock and/or mortar) or 5 (removing almost half of the Dam height and then covering it with rock). The EA has been revised to clarify wording with regard to the impacts. They would both maintain flow into the Millrace and that point is appropriately recognized in the EA.

**Comment:** The DEA addresses the historic aspects of dam removal. American Dams understands that Department of Game and Inland Fisheries (DGIF) is continuing to work with the Virginia Department of Historic Resources (DHR) on the Section 106 process (of the National Historic Preservation Act). The DEA appropriately
states that dam removal would constitute an adverse impact. The final DEA should reflect the results of the final Memorandum of Agreement on mitigating the adverse effects. DHR has stated in previous proceedings that it is preferred to save the bottom of an historic structure rather than leave remnants of the dam, piers and fish ladder (Notes of May 8, 2018 meeting on the Scott’s Mill Hydropower Project, Lynchburg). The Jordan’s Point Dam is over 100 years old and is an important historic resource.

**Response:** The historic-resource value of the Dam is acknowledged through the Section 106 process. Mitigation measures stipulated in the final MOA are included in the EA.

### RECREATION AND PUBLIC SAFETY

**Comment:** Several comments were made that if the fish ladder or portions of each side of the Dam are left after partial Dam removal, they could become public-safety concerns or “collect trash” at high water.

**Response:** The fish ladder and remnant portions of the Dam are intended to provide for historic interpretation as noted in Section 5.12 of the EA. After partial Dam removal, the fish ladder and remnant portions of the Dam will be located outside of the active river channel and are not expected to pose a public-safety risk. The presence, absence, or location of trash in the river is beyond the scope of this EA.

**Comment:** A comment was made that there were two public safety issues that were not included in the EA. The first of these was that not only are the railroad piers undercut and could result in entrapment, but also that they will likely catch trees and other debris and create strainers (another type of drowning hazard). The second was that the Millrace headgate is a syphon hazard and that, with reduced water surface elevation and flow into the Millrace upon Dam removal, the frequency and magnitude of that hazard would be reduced.

**Response:** The EA has been revised to include these public safety issues.

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**Comment:** EA Does Not Adequately Address Public Concerns Raised During Scoping

Page 1 of the DEA notes several public concerns raised during the public scoping including “sediment, aesthetics, recreation, fishing, flooding, expected riverine conditions after dam removal, and the dams historical significance.” Several of these concerns were not addressed in the DEA or were inadequately addressed.

Section 4.13 (page 18) of the DEA states that the impoundment provides a popular site for flatwater recreation within the community. However, page 27 only notes that dam removal would result in a shift of recreational use from flatwater to free-flowing activities. The DEA fails to provide any mitigation for the loss of this important recreational attribute. Given the recreational use from the adjacent park, the importance of the reservoir for swimming, fishing, and other flat water recreation is understated. The DEA should quantify this use to gain a better perspective on whether the conversion to free-flowing recreation would result in a net recreation benefit. The (sic) are numerous opportunities for free-flowing recreation nearby, but the existing flat water recreation is important to the local community.

**Response:** The flatwater recreation is appropriately acknowledged in Section 4.13 of the EA.

**Comment:** Page 36 of the DEA states that there were comments during public scoping that the Virginia Military Institute (VMI) uses Jordan’s Point reservoir for cadet-training. However, there is no mention of the impact of dam removal on this activity. The DEA should incorporate this into the impact section and identify any mitigation measures and associated costs for VMI to find training sites elsewhere.

**Response:** The EA recognizes the use of jumping platforms in the impoundment reach in Section 4.13. Mitigation of the loss of a jumping platform is not a requirement of any of the state or federal regulations.

**Comment:** American Dams does not dispute that there could be a shift in fish species in the reservoir area with dam removal, but this could be considered a benefit by some and a negative by others. There is no data presented
that describes what anglers in the area prefer to catch. American Dams suggests that DGIF consider its own online publication about the Maury River fishery which states that the short float trip on the reservoir between Route 631 and Jordan’s Point park is worth it for anglers.

**Response:** It is duly noted in the EA that anglers enjoy the impoundment reach of the river as well as the unimpounded reaches. The EA has been revised to include creel survey data from W&L/DGIF (Appendix 4) that indicate that Smallmouth Bass (a riverine species) is, by far, the preferred species of anglers throughout the Maury River, including the reach from Alone Mills Road to Jordan’s Point Dam. Improving riverine habitat in the impoundment reach would benefit that species.

**COMPARISON OF ENVIRONMENTAL CONSEQUENCES**

**Comment:** Page 32, Table 1 - Cultural and Historic Resources. Alternatives 1/2 and 3/4 (sic) are rated equally as "Adverse Impact". These should not be rated equally, since 3/4 (sic) actually retain most of the historic features. Consider rerating.

**Response:** Removing any portion of the Dam or covering the face of any or all of it will likely have adverse impacts on the historic resource. Such a determination of impacts will be made by the lead federal agency in consultation with DHR, prior to implementation of any alternative that is undertaken at this site.

**Comment:** In summary, the DEA tries to make a case for dam removal by overstating the benefits of removal. In reality, the benefits are marginal compared to preserving the dam. The final EA should revise Table 1. Summary of environmental consequences to provide a more objective analysis of benefits and impacts. If there is a benefit or impact the final EA should provide an objective assessment of the level of impact or benefit, to enable a well-reasoned decision on dam removal to be made.

**Response:** While we appreciate the comment, since there is no additional information or data presented about the suggested benefits or impacts, no change has been made in response to this comment.

**Comment:** Pages 19 to 32. These pages and particularly Table 1 describe the environmental consequences of the proposed action. However, the analysis primarily speaks to only the benefits of the action and neglects to cover the adverse effects. Similarly, for the alternative that preserves the dam, there is little discussion of the benefits that would persist. The DEA should be revised to objectively present both benefits and impacts of each alternative. Moreover, the degree of effect should be presented.

**Response:** While we appreciate the comment, since there is no additional information presented about the suggested benefits or impacts of dam preservation, no change has been made in response to this comment.

**CUMULATIVE IMPACTS**

**Comment:** Page 33. Cumulative impacts are the impacts on the environment which results (sic) from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. However, the past and foreseeable future actions pertain primarily to dams in the James River Basin. No other actions are presented. The DEA implies removal of dams will lead to recovery from long-term fragmentation, although it “will likely take decades.” Factors like over-harvest and loss of habitat from development and climate change are not discussed. American Dams is concerned that the DEA implies that the habitat issues related to the James River basin is the result of the various dams in the basin. DGIF last year abandoned American shad restocking efforts. To date the stocking program was unsuccessful despite the opening of the fishway there. Clearly there are factors other than dams that may be affecting recovery of the anadromous fishery. American Dams shares DGIF interest in the recovery of diadromous fish and mussels in the James River basin and proposes to continue to work with DGIF and other resource agencies to facilitate recovery of these species. The DEA should be revised to reflect all significant cumulative effect factors regarding fish passage and hydraulic conductivity. Lastly, dams on the James and Maury rivers (e.g., Scotts Mill, Reusens, Holcomb Rock, Coleman
Falls, Snowden, Cushaw and Moomaw) provide valuable benefits including water supply, hydroelectric generation, and water quality improvements. Thus, it is not likely that these dams will be removed in the near future.

**Response:** The removal of the Dam is an effort to address the loss of habitat from human development on the Maury River. Certainly, over-harvest of aquatic resources and climate change are issues that affect the overall health of the river system, but those are not “actions” undertaken by the responsible agencies and fall well outside the scope of this EA. We believe that all appropriate actions have been included in this analysis.

**GENERAL/MISCELLANEOUS**

**Comment:** A comment was made that the reference to the monthly, independent publication was incorrect, that it should have referred to the Rockbridge Advocate rather than the Advocate.

**Response:** The reference in the EA has been revised accordingly.

**Comment:** A comment was made that the EA deadline for comments was premature and a deadline extension was requested. This comment was received more than two weeks before the end of the 30-day comment period.

**Response:** A 30-day comment period is standard for an environmental assessment.