# Cuyahoga River Ecosystem Restoration
# Canal Diversion Dam Project
# Environmental Assessment

**October 2017**

**Ohio Environmental Protection Agency • National Park Service – Cuyahoga Valley National Park**
**Ohio Department of Natural Resources • US Army Corps of Engineers**

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# Environmental Assessment for Canal Diversion Dam Project
# Executive Summary
**Cuyahoga Valley National Park - Summit and Cuyahoga Counties, Ohio**

The National Park Service (NPS), Cuyahoga Valley National Park and the Ohio Environmental Protection Agency (Ohio EPA), in partnership with the US Army Corps of Engineers (USACE) and the Ohio Department of Natural Resources (ODNR), have considered a range of alternatives for the modification and/or removal of the Canal Diversion Dam in the Cuyahoga River. The dam spans the river between the City of Brecksville in Cuyahoga County and Sagamore Hills Township in Summit County, Ohio.

The Canal Diversion Dam (alternatively known as the Brecksville Dam, Station Road Dam, or the SR 82 Dam) is located in Cuyahoga Valley National Park (CVNP). This dam (183 feet long and nearly 8 feet high) feeds water into the Ohio and Erie Canal that then drains north through the CVNP and into Cleveland Metropark's Ohio and Erie Canal Reservation. The dam is owned by ODNR.

The Ohio EPA has concluded that Canal Diversion Dam negatively affects the water quality of the River and interrupts aquatic communities. These impacts result in the failure to achieve the goals of the Clean Water Act and the State of Ohio's Water Quality Standards. The Canal Diversion Dam project will identify an ecological restoration strategy to improve the water quality conditions of the Cuyahoga River while upholding the mission of protecting and preserving resource values of the Park.

The NPS, Ohio EPA, USACE and ODNR recognized the need to work together to establish procedures for timely disposition of issues or problems connected with the planning for the modification and/or removal of the Canal Diversion Dam. The agencies determined that the NPS is the lead federal agency with the Ohio EPA, USACE and ODNR as cooperating agencies with the responsibility to comply with National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA) and other legal requirements.

The following environmental assessment (EA) describes the effects of the project on the human environment in accordance with the National Environmental Policy Act of 1969, Council on Environmental Quality regulations (Title 40 Code of Federal Regulations [CFR] Part 1500 et sequentia), and other applicable laws, regulations, and policies. This EA also assesses the effects of the project on historic properties in accordance with Section 106 of the National Historic Preservation Act (NHPA).

Through interagency consultation and public involvement, the NPS and Ohio EPA have considered a wide range of alternatives to meet the project purpose and need and have subject three alternatives (
Alternative 1, No Action; Alternative 2, Modification of the Canal Diversion Dam with Canal Dredge; and Alternative 3, Full Removal of Canal Diversion Dam with Pump Installation) to detailed analysis. Because the Canal Diversion Dam and its predecessor, the Pinery Dam, supplied water to the Ohio and Erie Canal, a downstream portion of which is a National Historic Landmark (NHL), all action alternatives will maintain the canal in a watered condition. The NPS and Ohio EPA are recommending that Alternative 3, Dam Removal, is the alternative that best meets the project purpose and need.

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# Chapter 1: Purpose and Need

## Introduction

Congress established Cuyahoga Valley National Park (CUVA, the park) as a National Recreation Area in 1974 for the purpose of "preserving and protecting for public use and enjoyment, the historic, scenic, natural and recreational values" of the Cuyahoga Valley, thereby maintaining "needed recreational open space necessary to the urban environment" (Public Law 93-55). Congress directed park managers to use CUVA resources "in a manner, which will preserve its scenic, natural, and historic setting while providing for the recreational and educational needs of the visiting public." Public Law re-designated the National Recreation Area as a National Park in 2000.

Since the park's establishment, the National Park Service (NPS) and partners have helped to transform the once industrial Cuyahoga River Valley into restored landscapes that have retained and celebrated the cultural heritage, including that of the Ohio & Erie Canal Corridor. These accomplishments are particularly significant, given the park's location within a large metropolitan area of over three million people. The primary natural feature of CUVA is the Cuyahoga River (river), travelling 22 of its 100 miles through CUVA as it heads towards Lake Erie. Nearly 40 years since the adoption of the Clean Water Act, the river continues to embody ecological restoration and a rebirth of a healthier Great Lakes ecosystem for future generations.

The quality of the river continues to improve because of numerous place-based restoration initiatives across the watershed. For example, the removal of low head dams on the main stem of the river contributes to the health of the river system. With each dam removal, the river is closer to becoming a quality water resource for the region and a contributor to the health of the Great Lakes ecosystem. One of two remaining physical barriers in the river is the Canal Diversion Dam, a low head concrete dam located within CUVA. Owned by the Ohio Department of Natural Resources (ODNR), the Canal Diversion Dam (alternatively known as the Brecksville Dam, Station Road Dam, or the State Route 82 Dam) spans the river between the City of Brecksville in Cuyahoga County and Sagamore Hills Township in Summit County, Ohio. It is 183 feet long, nearly eight feet high, and diverts water into the Ohio & Erie Canal, which flows north into the Cleveland Metroparks Ohio and Erie Canal Reservation.

The Ohio Environmental Protection Agency (Ohio EPA) has concluded that the Canal Diversion Dam negatively affects the water quality of the river and interrupts aquatic communities. These impacts result in the failure to achieve the goals of the Clean Water Act and the State of Ohio's Water Quality Standards (WQS). The purpose and need of the Canal Diversion Dam project is to identify an ecological restoration strategy to improve the water quality conditions of the river while upholding the mission of protecting and preserving resource values of the park.

NPS in cooperation with the Ohio EPA, the US Army Corps of Engineers (USACE), and ODNR have worked together to comply with the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA) and other legal requirements when considering the range of alternatives for the modification and/or removal of the Canal Diversion Dam from the Cuyahoga River. Through interagency consultation and public involvement, three alternatives have been proposed for the project: Alternative 1, No Action; Alternative 2, Modification of the Canal Diversion Dam with Canal Dredge; and Alternative 3, Full Removal of Canal Diversion Dam with Pump Installation.

## 1.1 Issues and Objectives

In addition to improving the biological water quality conditions of the river, the issue of protecting the significance of the Ohio & Erie Canal by maintaining a watered condition was identified as being important. Objectives for the Canal Diversion Dam Project were developed with consideration of CUVA's purpose and significance, NPS policies and mission, as well as input from park staff, other agency stakeholders and the public. The alternatives identified for analysis will need to meet the objectives set forth for the project. The objectives for this project are to:

- *Improve the water quality of the Cuyahoga River and its habitat values while contributing to the ecological restoration of the Cuyahoga River basin and Great Lakes ecosystem*
- *Remove the barriers to native fish migration patterns*
- *Restore free flowing, natural riverine functions to a reach of the Cuyahoga River*
- *Preserve the cultural significance of the Ohio & Erie Canal and its natural and educational values*

## 1.2 Background

CUVA encompasses 33,000 acres in the Cuyahoga River Valley between the metropolitan areas of Cleveland and Akron, Ohio (Figure 1). CUVA lies within Cuyahoga and Summit counties and is located within 15 municipalities. Within the legislative boundary, NPS owns approximately 19,000 acres. The remainder of land is owned and under management by other public entities, compatible-use institutions or private parties. Two primary owners of non-NPS land within the project area are the Cleveland Metropolitan Park District and ODNR.

### 1.2.1 Project Area and Brief Description of the Park

The project area is approximately 48 acres in size and is located in the northern portion of CUVA along the river at River Mile 20.7. It is adjacent to the Station Road Bridge Trailhead and the Ohio & Erie Canal Towpath Trail (Towpath Trail) at trail milepost 17. The project area extends downstream of the Brecksville-Northfield High Level Bridge, east to the Ohio & Erie Canal, south to the confluence of Chippewa Creek and west to the Cuyahoga Valley Scenic Railway.

Ownership of the dam and surrounding land involves multiple entities (Figure 2). ODNR owns the Canal Diversion Dam structure and the remnant of the original Pinery Dam (NPS Memo 2011a). Cleveland Metroparks owns land adjacent to both dams. NPS manages the lands for visitor use and resource protection, and owns the land occupied by the Ohio & Erie Canal. NPS also owns the railroad tracks on the west side of the river.

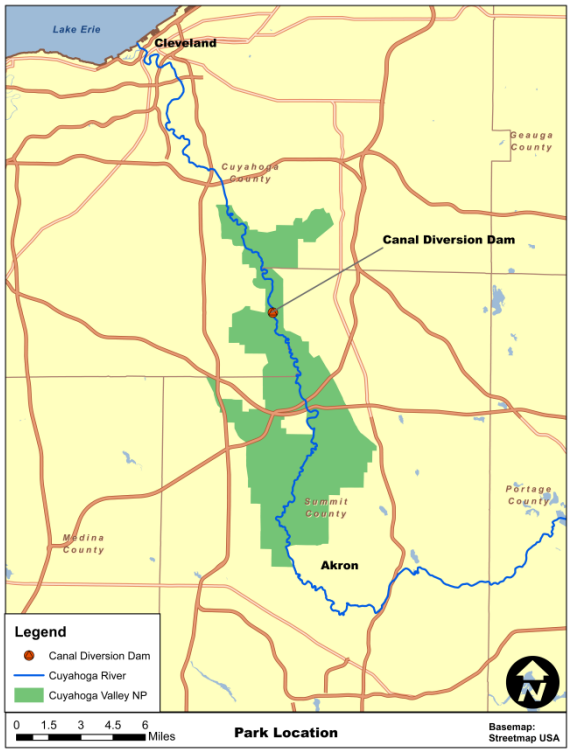


Figure 1. Park Location

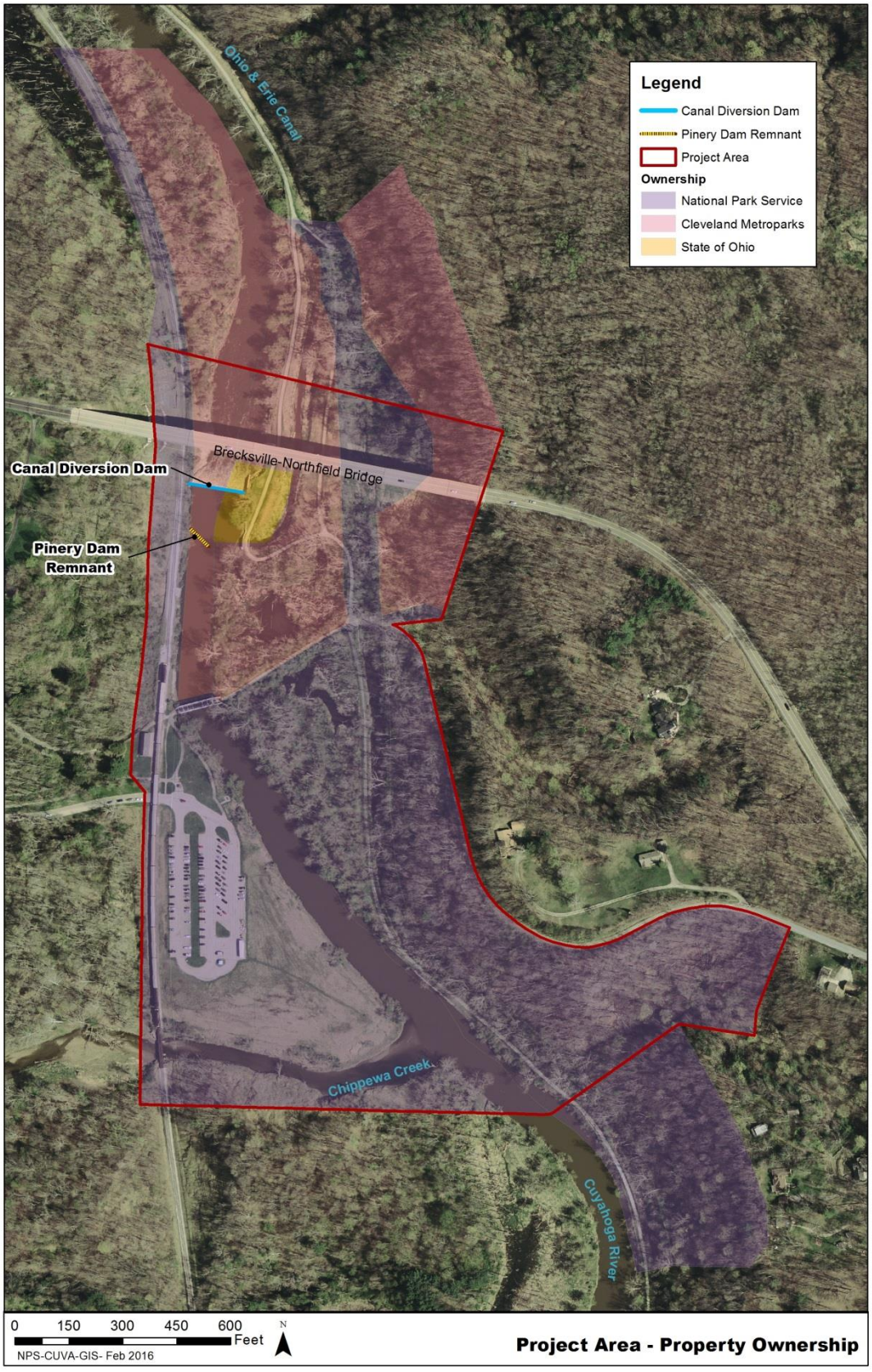


Figure 2. Project Area and Land Ownership

### 1.2.2 General Management Plan and Other Relevant Plans

The following plans and studies provide a framework for decision-making regarding the Canal Diversion Dam Project:

*General Management Plan (1977).* The General Management Plan (GMP) for CUVA provided guidance for management during the park's initial implementation stage. As stated in the GMP, "the general overall concept for management and development of Cuyahoga is that of resource preservation for compatible recreational use." The GMP states policies relative to resource management, such as:

- The Park will be managed by NPS as an integral part of the Cuyahoga River Basin, and all resources management strategies for the park will be coordinated with strategies for the entire basin.
- NPS will faithfully preserve all significant historic and archeological resources and will provide for their interpretation, use, and/or protection through adequate research and programming.
- Management for visitor use of CUVA will focus on recreational settings and programs rather than facility development. NPS will seek to provide for as wide a variety of recreational, interpretive, and educational uses as possible, as long as these uses reflect resource constraints and are compatible with the valley landscape.

*CUVA Five Year Strategic Action Plan (2017-2021)*. The priority focus for the next five years as outlined in this plan is to create a whole park vision for change that elevates the river and its natural and cultural features as the most important and iconic resources for park staff, visitors and stakeholders. The river's transformation into a thriving natural system and vibrant source of community is to be acknowledged by NPS and publicly recognized as an example of excellence for human, urban and ecosystem renewal.

*CUVA Foundation Document (2013).* Every unit of the national park system is required to have a formal statement of its core mission that will provide guidance for all planning and management decisions. CUVA developed a Foundation Document to guide its management and protect park resources and values that are integral to the purpose and identity of the park unit. The Cuyahoga River Ecosystem is identified within the Foundation Document as a fundamental resource with opportunities to remove dams, continue restoration of the river and riparian corridor, and reintroduce native species.

*CUVA Trail Management Plan (2012).* CUVA developed a Trail Management Plan and Environmental Impact Statement to provide a blueprint for the future management of the park's trail system. Included in the Trail Plan is the introduction of paddle launch sites along the river for improved access for recreation, including a paddle-launch site in the vicinity of the Canal Diversion Dam near the Station Road Bridge Trailhead.

*Cuyahoga Total Maximum Daily Load (TMDL) Report (2003)*. In 2003, the Ohio EPA finalized a Lower Cuyahoga River TMDL, which includes the project area. A TMDL identifies and evaluates water quality problems in impaired water bodies and proposes solutions to bring those waters into attainment of state and federal water-quality goals. The Canal Diversion Dam was identified as a source of water-quality impairment to the river in the Lower Cuyahoga TMDL. It also identifies the removal or modification of the Canal Diversion Dam as a specific restoration project to meet TMDL goals.

*Great Lakes Basin Restoration Plans (various*). The river and project area are located within the Great Lakes Basin within the Lake Erie watershed. The Great Lakes Basin, under the jurisdiction of the US Environmental

Protection Agency (USEPA), the International Joint Commission (IJC), and multiple federal, state and local agencies, has a number of plans that identify goals to restore the Great Lakes and its river systems. These plans include the *Great Lakes Restoration Initiative* (*2013*), *Remedial Action Plan for Cuyahoga Area of Concern* (*2001*), *Great Lakes Water Quality Agreement (2012)* and the *Lake Erie Lake wide Management Plan* (*2008*).

In coordination with these basin-wide plans, improvements to water resources in the river have occurred over the past ten years through the actions of numerous organizations, agencies and community stakeholders. These actions include reduced input of pollution into the river through the implementation of best management practices throughout the basin; the removal of the Kent, Cuyahoga Falls and Monroe Falls Dams; improvements of storm water and wastewater infrastructure; and the implementation of river, tributary and wetland restoration projects that contribute to the increased health of the river system.

During the scoping and development of the project, a number of studies were conducted to obtain additional information on the conditions of the project area, which include:

- History of the Brecksville Dam, (Tamburro 2003)
- Hydrologic Study and Design Alternatives: Watered Section of the Ohio & Erie Canal –Brecksville Dam Feeder to Rockside Road, (Bergmann 2005)
- National Register Assessment of the Brecksville Diversion Dam (SUM-3253-1) Cuyahoga Valley National Park, Summit and Cuyahoga Counties, Ohio (Hampton and Kenny 2006)
- Cuyahoga River Canal Diversion Dam Alternative Flow Options, (Miller, 2006)
- Cuyahoga River HEC-RAS Study, (Arcadis 2007)
- Cuyahoga Wetlands Delineation Report, (EnviroScience 2009)
- A Ground Penetrating Radar Survey to Find and Delineate the Pinery Dam in the Cuyahoga River, Near Ohio State Route 82, (Bates and Peck 2010)

### 1.2.3 Special Designations

CUVA has a number of special designations established outside of its enabling legislation as a national park. These designations identify unique resources within the park and affiliations with associated federal programs. Designations listed below are pertinent to this project.

*Ohio & Erie Canal National Heritage Canalway (Canalway*). The project area is located within the Ohio & Erie Canal National Heritage Canalway. As part of NPS National Heritage Areas Program, the Canalway was designated through Public Law 104-333. Legislation states that the "Canalway will preserve and interpret for the education and inspirational benefit of present and future generations the unique and significant contribution to our national heritage of certain historic cultural lands, waterways, and structures within the 87-mile Ohio & Erie Canal Corridor between Cleveland and Zoar" (Ohio & Erie Canal Association 2000).

*National Historic Landmarks (NHL)*. NHLs are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States. A portion of the water section of the Ohio & Erie Canal that may be affected by the removal or modification of the Brecksville Dam is a designated NHL. Designation of an NHL is under original authorization by the Historic Sites Act of 1935 and further authorization by the NHPA of 1966.

*Historic Districts*. A historic district is a group of buildings, properties, or sites that are designated by one of several entities on different levels as historically or architecturally significant. Due to the collection of buildings, structures, objects and landscape features along the length of the Ohio & Erie Canal and the Valley Railway, both linear resources are historic districts and cultural landscapes, and described further in Chapter 3 of this document.

### 1.2.4 Applicable Regulations and Guidelines

The following laws and associated regulations provided direction for the design of project alternatives, the analysis of impacts and the formulation of mitigation/avoidance measures. Other applicable laws and regulations are in Appendix A.

*NPS Organic Act of 1916*. NPS Organic Act directs NPS to manage the parks "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." *The Redwood National Park Expansion Act of 1978* reiterated this by stating that NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress (16-USC 1 a-1)."

The resources of CUVA are protected under the authorities of NPS Organic Act of 1916 (16 U.S.C. 1), the National Park System General Authorities Act (16 U.S.C. 1a-1 et seq.); Part 36 of the Code of Federal Regulations (CFR), and the park's enabling legislation (Public Law 93-555).

*NPS Management Policies, 2006*. Management Policies functions as the service-wide policy of NPS, which provides guidance and interpretation of laws, regulations, executive orders, and directives.

*Public Law 93-555. CUVA Enabling Legislation and Amendments*. Congress created CUVA in December 1974. The legislation was amended from a national recreation area to a national park in 2000. The project and this EA are consistent with all acts of Congress that govern the management of the park.

*National Environmental Policy Act of 1969*, *as Amended*. NEPA is implemented through the regulations of the Council of Environmental Quality (CEQ) [40 CFR 1500-1508] that requires detailed and documented environmental analysis of proposed federal actions that may affect the human environment.

*National Historic Preservation Act of 1966, as Amended* (16 USC 470). The NHPA established historic preservation as a national policy and authorized the Secretary of the Interior to expand and maintain a National Register of Historic Places (NRHP) that would include properties of national, state and local historic significance. Federal agencies consider the effects of their undertakings on historic properties in consultation with State and Tribal Historic Preservation Officers (SHPOs and THPOs).

## 1.3 Scoping Process and Public Participation

As defined in NPS Director's Order 12, "scoping is an early and open process to determine the scope of environmental issues and alternatives to be addressed in an Environmental Assessment." The summary of scoping and public participation is summarized in Chapter 5 of this document and in Appendix E.

## 1.4 Scope of Environmental Assessment

NPS Policy requires that all proposed projects be screened for potential impacts against the park's natural and cultural resources. Impact topics are resources of concern that could be affected, either beneficially or adversely, by implementing any of the proposed alternatives. An interdisciplinary review process determined which resources could be affected by this project, as well as:

- Federal laws, regulations and executive orders, including NEPA guidance documents
- NPS Management Policies (NPS 2006) and,
- Public scoping input

### 1.4.1 Issues and Impact Topics Addressed in this EA

Analyses of the impacts of project alternatives on the following environmental features are presented in Chapter 3 of the EA: (1) fluvial geomorphology; (2) water resources/water quality; (3) aquatic wildlife; and (4) cultural resources.

### 1.4.2 Impact Topics Dismissed from further Consideration

The impact topics described in this section are not fully evaluated in this EA because they were not identified during the scoping process, as being resources of concern or that the implementation of the proposed action would not substantially affect these resources. Additional information regarding their dismissal is listed below by impact topic.

*Archeological Resources.* There are no known archaeological sites located within the project area. The project area was repeatedly disturbed during the construction and maintenance of the Canal Diversion Dam. Based on the selected alternative, an archaeological survey of the directly affected area will be completed according to NPS standards and results will be coordinated with the Ohio State Preservation Officer. Should the survey identify significant archaeological resources, NPS will continue consultation with the SHPO to avoid, minimize, or mitigate any adverse effects.

*Vegetation.* The plant community within and surrounding the project area is dominated by non-native, invasive plants. With nearly 20% of plant species within the park being non-native, the proposed action alternatives will have a minor effect on vegetation. Recent dam removals upstream of the park boundary have shown that the newly exposed bank areas are quick to respond with initial plant growth from the existing seed bank. To supplement the plant growth, CUVA has an active on-going exotic plant management program as well as a native plant restoration program. Re-forestation projects of riparian corridors using native species propagated in the park's native plant nursery are ongoing. No loss of riparian habitat is expected. Several state listed plant species occur in proximity to, but not within the project area.

*Floodplain.* According to the recent Hydrologic Engineering Center-River Analysis Study (HEC-RAS), hydrologic modeling indicates that, removing the Brecksville Canal Diversion Dam will lower the base flood (100-year) elevation (BFE) up to 0.26 feet in the Cuyahoga River. The results of the study show that the removal of the dam will not cause any additional flood hazards and meets Federal Emergency Management Agency (FEMA) requirements for work in Zone A Flood Zones (Arcadis 2007). The proposed action alternatives would have a minor effect on the river's connectivity to the floodplain since the river flows within a narrow, incised channel with minimal floodplain interaction.

*Wetlands.* In 2009, EnviroScience, Inc. performed a delineation and functional assessment of riverine wetlands upstream and downstream of the Canal Diversion Dam. This study included a full delineation of all jurisdictional wetland and other water (streams and ponds) within the site and upstream of the dam for three miles. Palustrine emergent, mixed palustrine, and forested palustrine wetlands receive water from the surrounding areas that drain to the river and from the river following rain/snow events that cause the river to breach the banks. Generally, these wetlands are depressional, above the river level, and extend offsite away from the river into larger complexes. According to the Ohio EPA, the Cuyahoga River is an "entrenched" channel with limited connectivity to wetlands (EnviroScience 2009).

Additional hydrologic studies for this project (Arcadis 2007) report that with the removal of the Canal Diversion Dam the surface water elevation will drop on average up to 3.58 feet immediately upstream of the dam. Very little additional bank width will be exposed by this anticipated drop in water surface elevation for most of the river and Chippewa Creek. The proposed action alternatives and the lowering of the dam pool will have a minor impact on the adjacent wetlands.

*Nationwide Rivers Inventory (NRI).* In partial fulfillment of Section 5(d) requirements of the National Wild and Scenic Rivers Act (16 U.S.C 1271_1287), NPS has compiled and maintains a NRI to register river segments that potentially qualify as national wild, scenic or recreational river areas. In 1982, an eight-mile reach of the Cuyahoga River from the vicinity of the confluence of Chippewa Creek upstream to Peninsula was listed on the NRI with "Outstanding Remarkable Values (ORVs)" for Scenery, Recreation and Fish.

The proposed alternative for removal of the dam will improve water quality within the dam pool reservoir by creating a free flowing river, creating fish passage for native fish migration, and allowing recreational boaters to paddle through this segment of river without having a long portage around a dangerous low-head dam. CUVA's 2012 Trail Management Plan proposes two paddle launch sites within the NRI segment that will enhance visitor access for river use. Therefore, the proposed alternative to remove the dam will not adversely affect natural, cultural or recreational values of the NRI segment.

*American Heritage River.* The American Heritage River Program recognizes rivers with distinctive characteristics and strong community support. Under Executive Order 13061, the Cuyahoga River was designated an American Heritage River in 1997. The project does not change or affect this designation.

*Threatened, Protected, and Endangered Species (State or Federal).* Based on park surveys and information from Ohio's Natural Heritage Database, listed species are either not present, unlikely to occur in the project area based on habitat requirements, and/or not likely to be affected by considered alternatives even if present in the project area.

- The Federally listed endangered Indiana bat (*Myotis sodalis*), a tree roosting bat dependent on stream corridors and riparian areas which provide foraging sites, was recorded for the first time in 2002 in the

nearby Brecksville Reservation of the Cleveland Metroparks. The recently listed Northern long eared bat (*Myotis septentrionalis*) is present within the boundary of the park (Krynak and Petit 2005). No tree cutting is proposed in any of the alternatives. The Eastern Massasauga rattlesnake (*Sistrurus catenatus catenatus*) is a candidate species for listing under the Endangered Species Act and is listed as endangered by the State of Ohio. While the type of habitat this snake prefers is in CUVA, there is no record of this species ever occurring in the park.

- Two state-listed threatened turtles, the spotted turtle (*Clemmys guttata*) and Blanding's turtle (*Emydoidea blandingii)* have been identified in the lower Cuyahoga River area. Both turtles are found in slower moving waters or wetlands (including the canal) alongside the river. The Blanding's turtle has been located within the canal, in the Cleveland Metroparks Canalway Reservation, approximately 10 miles north of the project area (Quinn 1999; Spetz and Robison 2011). In all proposed action alternatives, the canal will remain in a watered condition and the effects on any aquatic turtles will be minor.
- Native mussels are protected in the State of Ohio (Section 1533.324 of the Ohio Revised Code). Additionally ten federally listed or proposed species occur in the State and are protected by the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). The Cuyahoga River is considered a group three large stream and federally listed species of mussels have not been found, nor are expected to be found (Smith et.al, 2002; Krebs, pers. comm. 2015). Some species of riverine mussels are slowly returning to the river as habitat conditions and water quality improve. Any potential mussel habitat within the project area will be re-surveyed prior to any proposed stream disturbance in accordance with the 2014 Ohio Mussel Survey Protocol.
- The following fish species are identified in the State's Natural Heritage Database but are not known to exist in the project area: the endangered Iowa darter (*Etheostoma exile*), pugnose minnow (*Opsopoeodus emiliae*), western banded killifish (*Fundulus diaphanus menona*), and the threatened lake chub sucker (*Erimyzon sucetta).*
- The cerulean warbler (*Setophaga cerulean*), is a state listed species of concern often observed within the immediate project area. This warbler is a migratory bird that nests 30-60 feet above ground in trees. It is listed as a species of concern due to the loss of large tracts of forested habitat. While often seen in the project area, there are at least nine other reported locations (eBird 2015) of this warbler by local birders within the past year. The dam pool may provide a source of food, but it is unlikely that is the reason these warblers occur in the area. Removing the dam and its pool would not likely cause the birds to leave the area. The proposed alternatives are not affecting large forested tracts or contributing to habitat loss for this species.

Informal consultation and scoping (initiated in 2009 and re-evaluated in 2015), with the US Fish and Wildlife Service (USFWS) concluded, that no adverse impacts to threatened and endangered status species would result from implementation of the considered alternatives (Letters are in Appendix B).

*Ethnographic Resources*. NPS Director's Order 28 (Cultural Resource Management Guidelines) defines ethnographic resources as any feature assigned traditional, legendary, religious, subsistence, or other significance in the cultural system of a group associated with it. NPS consulted with Native American tribes traditionally associated with CUVA during project scoping and did not identify any ethnographic resources within the project area. In the event that prehistoric or historic Native American human remains or associated items of cultural significance are discovered during the development of the project, CUVA staff will immediately stop work in the area and make a reasonable effort to protect the human remains and other cultural items. The park Superintendent, with the assistance of the Midwest Regional Office Native American

Graves Protection and Repatriation Act (NAGPRA) coordinator will initiate consultation with any known lineal descendant and the Indian tribes and Native Hawaiian organizations and begin a formal process of consultation regarding the disposition of the cultural remains or artifacts.

*Indian Trust Resources*. Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or other action by any agency of the Department of the Interior be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources at CUVA and no lands are held in trust by the Secretary of the Interior for the benefit of Indians. Accordingly, no Indian trust resources would be affected by considered alternatives and this topic is dismissed from further consideration.

*Environmental Justice/Socially or Economically Disadvantaged Populations*. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The project area is not located within or adjacent to neighborhoods with high minority and/or low-income populations. Accordingly, considered alternatives would not have health or environmental effects on minorities or low-income populations or communities

# Chapter 2: Alternatives

NEPA governs the process of decision-making when a federal agency proposes any action that has the potential to affect the human environment. The NEPA process requires the consideration of a range of alternatives (including a No Action Alternative) and an assessment of their impacts to form the basis of making informed decisions. This chapter describes various alternatives and actions considered as part of the water quality restoration of the river near River Mile 20 within CUVA.

## 2.1 Alternative 1: No Action

The Canal Diversion Dam currently diverts water via the feeder gate system to the Ohio & Erie Canal. Built in 1952, the Canal Diversion Dam and feeder was an essential component providing water for the American Steel and Wire Company manufacturing operation located six miles north of the dam. This dam is 183 feet long and 8 feet high (Figure 3). Under the No Action Alternative, the modern Canal Diversion Dam, the feeder gate system and the remnants of the 1827 Pinery Dam, which is submerged beneath the dam pool, would remain in place. The current water quality of the river upstream of the Canal Diversion Dam is in non-attainment of Ohio's WQS for warm water aquatic life and habitat designation. The USEPA Section 303(d) also lists the river as "impaired" water quality. A physical barrier to native fish passage created by the Canal Diversion Dam would remain. Safety of park visitors would remain an issue for recreational paddlers and anglers due to the dangerous movement and force of water created by the hydraulic engineering of the Canal Diversion Dam. NPS would continue a minimal level of maintenance to dredge areas near the feeder gate where built up sediment occurs. Thus, current water level conditions (at times low due to seasonal fluctuations) would be maintained within the Ohio & Erie Canal.

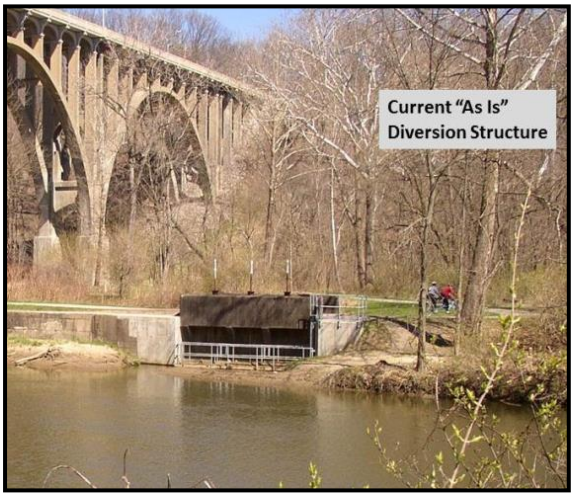


**Figure 3a and b. Alternative 1. No Action. Existing conditions showing the Canal Diversion Dam, the Brecksville Feeder Head Gate and the Brecksville-Northfield High Level Bridge, facing northeast.**

## 2.2 Action Alternatives

### 2.2.1 Actions Common to all Action Alternatives (Alternative 2 and Alternative 3)

*Maintaining Water in the Ohio & Erie Canal.* The watered section of the Ohio & Erie Canal extends from the canal feeder head gate to the terminus of the canal at Harvard Road in the Cleveland Metroparks Ohio & Erie Canal Reservation. This is the longest remaining watered section of the Ohio & Erie Canal. NPS repairs leaks in the canal prism and weir structures and performs a basic level of routine maintenance to the canal and its contributing elements. All action alternatives will incorporate a design to maintain a watered condition that will retain the cultural value of the canal and its NHL designation.

*Activities associated with dam removals and installation of modified structure or pump station.*

- All activities associated with the removal and construction would take place during periods of low flow.
- All access for removal would take place on the east side of the river and utilize heavy equipment (track hoe with jackhammer) to notch the dam down to the bedrock ledge, thereby allowing for the slow release of water when lowering of the dam pool.
- Potential grading of the east bank to create an access roadway into the river bed to access the western side of dam.

- Dam debris removal utilizing a bucket and removal by dump trucks from the east side of project area.
- Water drawdown will allow for recordation of Pinery Dam and Canal Diversion Dam prior to removal.
- Any new structures (modified dam or pump station) will be designed and built to meet all state and local ordinances. If there is any need for a cofferdam to complete the project, the Ohio EPA will approve the design.
- Period for deconstruction of dams is anticipated to occur within a one-week period, weather permitting.

*Permitting*. Ohio EPA will coordinate with USACE for any permits required.

*Coordination with other Agencies and Stakeholders*. NPS, Cleveland Metroparks and ODNR, will continue to work cooperatively to form an agreement for the ownership, operation and maintenance of any structures (modified dam/pump station) to maintain a watered condition in the Ohio & Erie Canal.

### 2.2.2 Alternative 2: Modification of Canal Diversion Dam with Canal Dredge

In Alternative 2, the Canal Diversion Dam and remnants of the Pinery Dam would be removed, the feeder gates would remain in place, and a partial (less than full width of river) or a lower dam (full width of river) would be constructed on site. This new structure would need to be a minimum of 3-4 feet in height in order to allow water to be diverted into the Ohio & Erie Canal. Elevation changes resulting from the modification of the Canal Diversion Dam would require the canal prism to be dredged for approximately one mile downstream (north) of the project area in order to generate a gravity flow of water from the river into the Canal (Figure 4 & 5). Dredged material would be removed via the same access route as the dam materials. Water levels in the canal would be lower than existing conditions and could become dry depending on fluctuations in precipitation that affect the flow of the river.

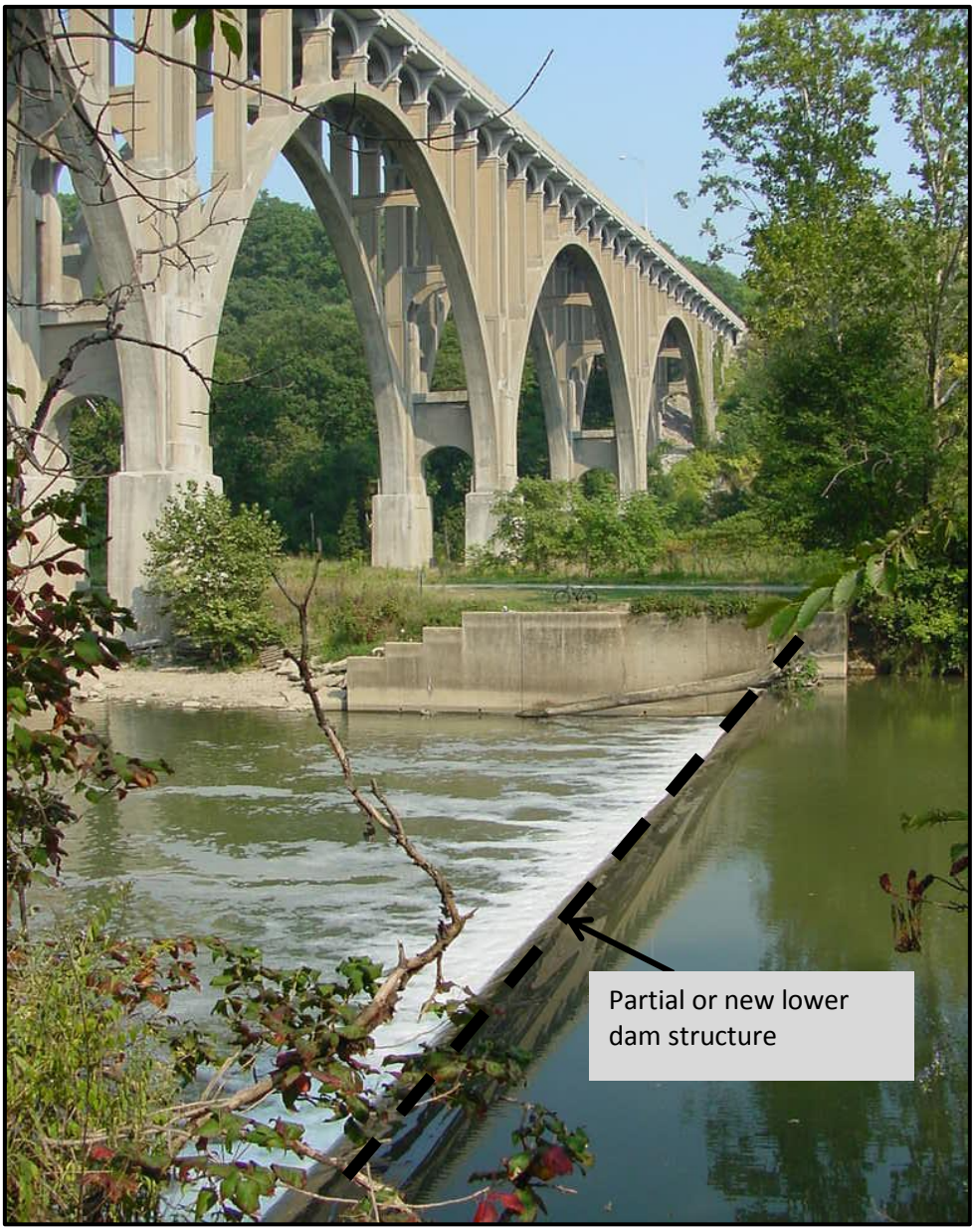


**Figure 4. Alternative 2. Conceptual Location of Modified Dam Structure.**

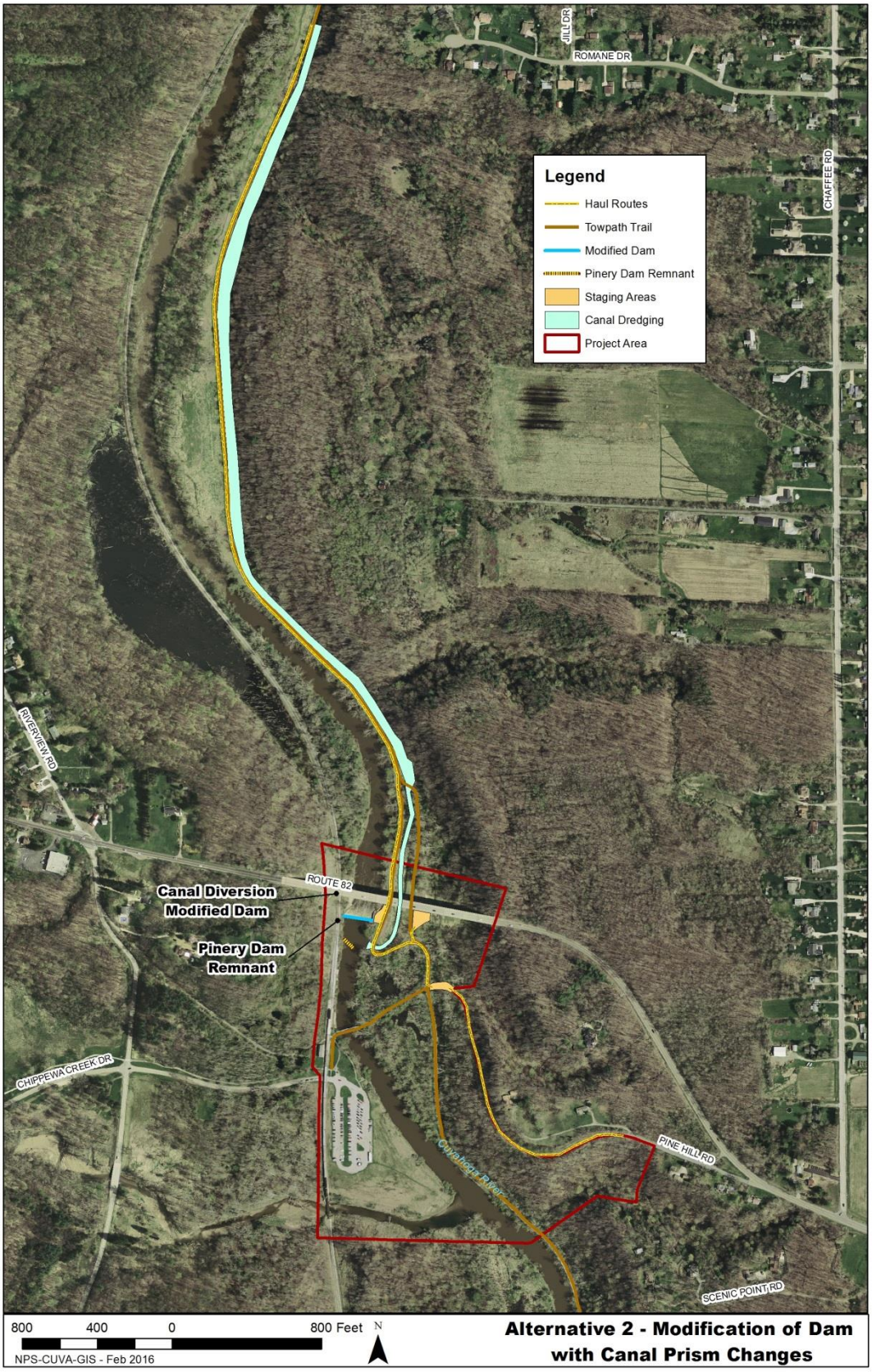


Figure 5. Alternative 2. Modification of Canal Diversion Dam with Canal Dredge

### 2.2.3 Alternative 3: Full Removal of Canal Diversion Dam with Pump Installation (Proposed Action)

In Alternative 3, the Canal Diversion Dam would be completely removed, the feeder gates would remain in place, and the river would be restored to grade levels that provide a natural, free flowing regime (Figures 6 & 7). Due to elevation changes resulting from the complete removal of the Canal Diversion Dam, an active watering system for the Ohio & Erie Canal would be designed and built to divert a desired amount of water into the canal in order to retain a desired water level to preserve its cultural value and avoid adverse effects. This action will be accomplished through the design and installation of a centrifugal or screw pumping system to aid in the lifting and diversion of the water from the river into the canal (Miller 2006). The structure for the pump will be located outside of the river and adjacent to the inlet of the canal. The total footprint of the watering system is anticipated to be approximately the same size of the current feeder gate area. NPS would continue a minimal level of maintenance to dredge areas near the feeder gate.

The concrete structure of the Canal Diversion Dam and the wing walls, as well as any remnants of the Pinery Dam will be removed from the riverbed and the channel restored to its preconstruction condition.

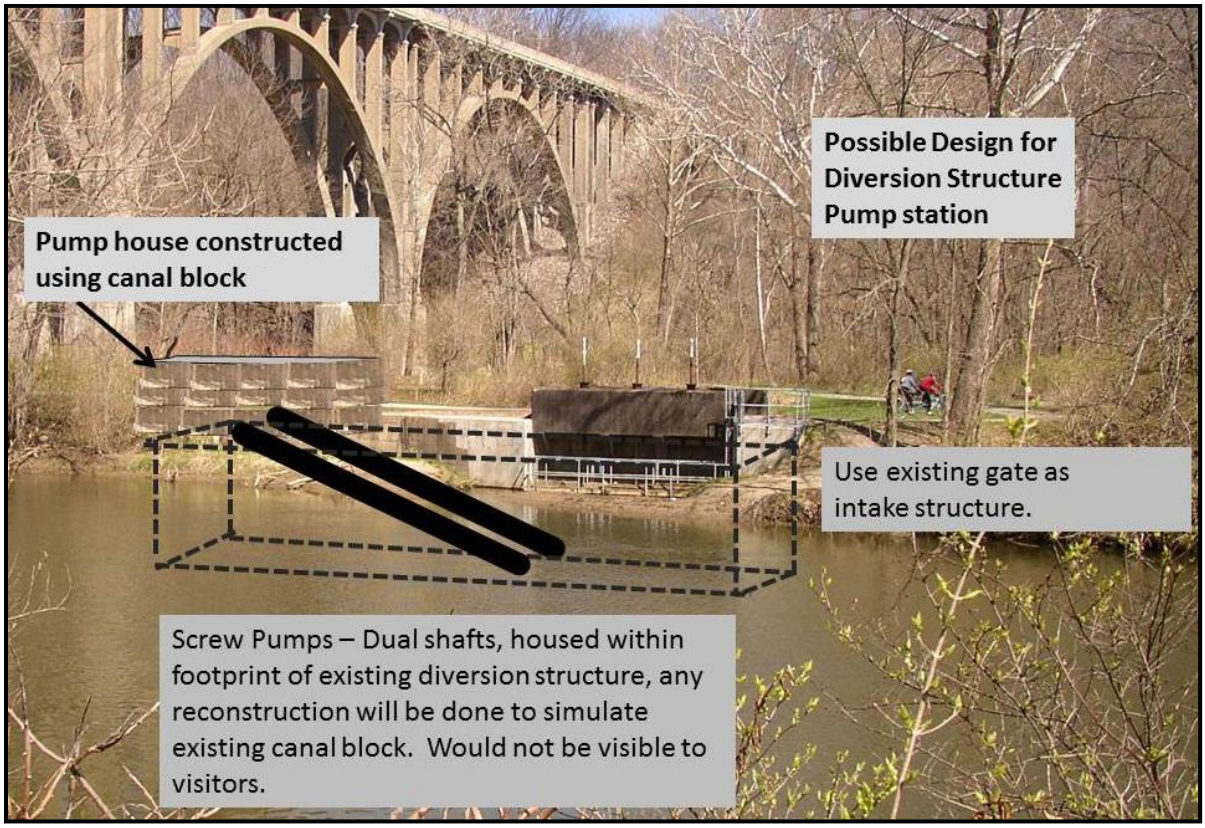


Figure 6. Alternative 3. Conceptual Design of Pump Installation

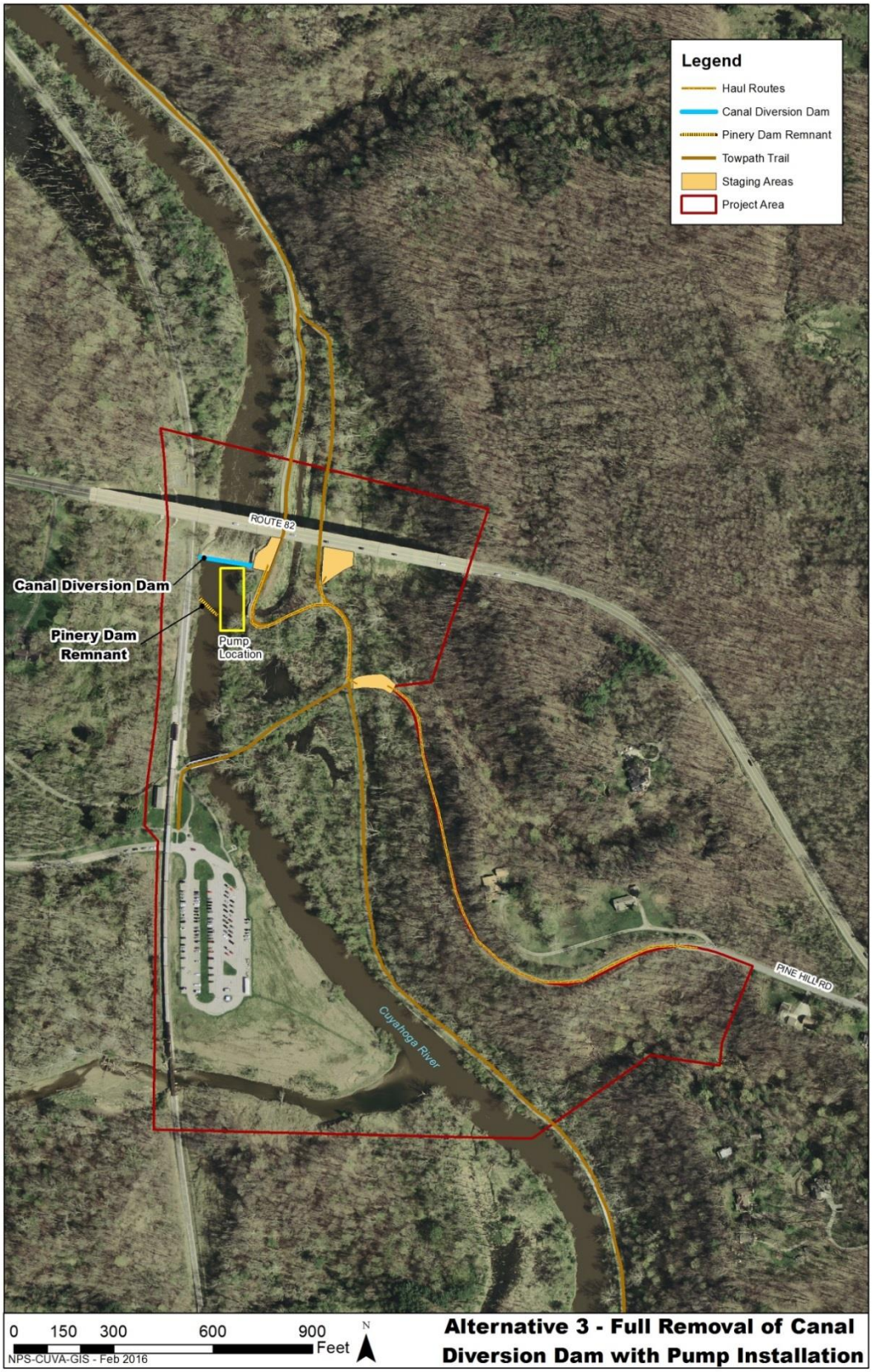


Figure 7. Alternative 3. Full Removal of Canal Diversion Dam with Pump Installation

## 2.3 Alternatives Considered but Dismissed from Detailed Analyses

In addition to the alternatives described above, NPS considered four other alternatives related to the Canal Diversion Dam project in order to improve water quality, including: (1) full removal of Canal Diversion Dam with the use of off-site water diverted to the Ohio & Erie Canal; (2) filling in the river downstream of the dam; (3) upstream pipe gravity feed/waterwheel and restoring non-watered canal segments upstream; and (4) utilization of a fish ladder associated with partial modification/removal of the dam. These alternatives are described below.

*Full removal of the Canal Diversion Dam with the use of off-site water diverted into the Ohio & Erie Canal.* After full removal of the dam, the river water would not be used to water the Ohio & Erie Canal. Instead, the canal would be watered by piping in water from a source in Brecksville. The City of Cleveland currently manages a water main within the City of Brecksville, which at times must be discharged to maintain adequate chlorine levels. A proposal to divert this excess water through a piping system from Brecksville to the canal in the project area was considered. However, due to the amount of multi-jurisdictional cooperation and extensive, off-site engineering and construction, this alternative was considered not feasible and was dismissed from further consideration.

*Filling in river downstream of the dam*. During public scoping, ideas to retain the dam structures and fill the river channel downstream of the dam with material to raise the downstream elevation to match the elevation of the river channel upstream of the dam were mentioned. Based on the State of Ohio WQS (OAC-1-01) and Antidegradation Rules (OAC 3745-1-05), the Ohio EPA determined this alternative would interfere with attainment of the river's designated aquatic life use and would be inconsistent with the project's primary purpose.

*Upstream pipe gravity feed/waterwheel and restore non-watered canal segments upstream of project area*. During public scoping, an idea to use a water wheel to divert water to extend the watered section of the canal south of the project area was discussed. This alternative would not be feasible since there is not enough of a drop in elevation to move enough water into the canal by use of only a waterwheel structure.

*Utilization of a fish ladder associated with partial modification/removal of dam structure.* Utilization of a fish ladder in association with modifying the existing dam was considered; however, the Ohio EPA determined that native fish in the Cuyahoga River would not utilize the ladder.

## 2.4 Comparison of Alternatives by Environmental Consequences

The alternatives provide opportunities to examine the options for the Dam structures and the impact to CUVA resources specifically to the Ohio & Erie Canal as well as the relationship to activities within or adjacent to the project area. A comparison of alternatives was conducted for their level of development and environmental consequences. This section provides a summary of these comparisons.

**Table 1. Comparative Summary of Impacts by Alternatives**

| Impact Topic | Alternative 1: No Action | Alternative 2: Modification w/canal dredge | Alternative 3: Full removal w/pump installation (Proposed Action) |
|---|---|---|---|
| ***Fluvial Geomorphology*** | **Direct/Indirect Impact** | **Direct/Indirect Impact** | **Direct/Indirect Impact** |
| | • History of bank stabilization problems<br>• River not free flowing<br>• Sediment accumulation | • Same as Alternative 1 | • History of bank stabilization problems<br>• River free flowing<br>• Slow release of sediment downstream |
| | **Cumulative Impact** | **Cumulative Impact** | **Cumulative Impact** |
| | Long-term adverse | Long-term adverse | Long-term beneficial |
| ***Water Resource – water quality*** | **Direct/Indirect Impact** | **Direct/Indirect Impact** | **Direct/Indirect Impact** |
| | • Dam pool remains<br>• Non-attainment of Ohio WQS<br>• River not free flowing | • Modified structure less of an impediment; dam pool remains<br>• WQS would likely reach partial attainment over the long-term<br>• River not free flowing | • River free flowing<br>• WQS are expected to reach full attainment |
| | **Cumulative Impact** | **Cumulative Impact** | **Cumulative Impact** |
| | Long-term adverse | Long-term adverse | Long-term beneficial |
| ***Aquatic Wildlife Species*** | **Direct/Indirect Impact** | **Direct/Indirect Impact** | **Direct/Indirect Impact** |
| | • Water quality has a negative impact upon aquatic species and habitat<br>• Dam remains a physical barrier to fish<br>• Seasonal water fluctuations in canal has potential to impact aquatic species | • Native/ non-native fish may have some passage<br>• Seasonal water fluctuations in canal has potential to negatively impact aquatic species<br>• Some potential benefits to habitat | • Natural processes restored for fish movement (native/non-native)<br>• Free flowing river provides habitat for fish and sensitive species<br>• Steady water level in Canal maintained providing habitat for aquatic species |
| | **Cumulative Impact** | **Cumulative Impact** | **Cumulative Impact** |
| | Long-term adverse | Long-term adverse | Long-term beneficial |
| ***Cultural Resources*** | **Direct/Indirect Impact** | **Direct/Indirect Impact** | **Direct/Indirect Impact** |
| | • All structures and water levels would remain in their current condition in the river and canal<br>• Seasonal water fluctuations into Canal can impact cultural resources when low | • Seasonal water fluctuations into Canal from modified structure and one mile Canal dredge has potential to impact cultural resources<br>• Diversion dam and Pinery dam are both removed; modified dam installed | • Removal of Historic Elements<br>• Consistent flow of water into Canal for maintaining watered condition<br>• pump house would introduce a new non-historic element to the project area |
| | **Cumulative Impact** | **Cumulative Impact** | **Cumulative Impact** |
| | Long-term adverse | Long-term adverse | Long-term beneficial |

# Chapter 3: Affected Environment

This "Affected Environment" describes existing conditions for those elements of the natural and cultural environment that could be affected by the actions proposed in the alternatives. The natural resources addressed include fluvial geomorphology, water resources, water quality and aquatic wildlife. The cultural resources include four historic properties: the Ohio & Erie Canal, the Valley Railway Historic District, the Brecksville-Northfield High Level Bridge and the Station Road Bridge. NPS and the Ohio EPA in consultation with reviewing agencies, interested parties and the public identified the impact topics. Information in this chapter aids in comparing impacts of each alternative, which are presented in Chapter 4: Environmental Consequences.

## 3.1 Fluvial Geomorphology

CUVA is located at the confluence of the Allegheny Plateau and the Central Lowlands and is shaped by multiple glaciations. The Cuyahoga River between Akron and Cleveland flows across Devonian and Mississippian shale and Pennsylvanian and Mississippian sandstone. When the area's last glacier receded, about 15,000 years ago, glacial till composed of rock, sand, gravel and clay remained in a wide valley with erodible slopes ranging up to 400-feet high (NPS 2010). The fluvial geomorphological characteristics of the river and Chippewa Creek are influenced by natural and manmade modifications within their channels. These natural processes, influenced by human activity, include erosion, deposition, and sediment transport.

### 3.1.1 Bedrock and Site Geology

In a recent study by The University of Akron, characterization of the bedrock and an estimate of the sediment accumulation within the Canal Diversion Dam pool were recorded using ground penetrating radar equipment. Results show the river channel substrate within the existing dam pool is bedrock. From the center of the river channel to the west bank the channel floor is comprised of bedrock with little to no sediment accumulation. From the center of the river channel to the east bank, muddy fluvial sediment has accumulated above the bedrock from a range of less than 8 inches (20 centimeters) to greater than 31 inches (80 centimeters) in depth near the feeder gates (Bates and Peck 2010). Additionally, the 1951 construction drawings for the Canal Diversion Dam identified an approximate three-foot tall natural rock ledge within the area when the dam was built (State of Ohio Department of Public Works 1951).

### 3.1.2 Soils

There are two soil types found within the project area: Geeburg-Mentor and Chagrin. The Geeburg-Mentor silt loams are soils found on dissected parts of terraces with 25 to 75% slopes. Permeability is very slow and runoff is rapid. These soils have low potential use for most uses other than woodland habitat for woodland wildlife and some recreational use. Hazards of erosion are very severe when vegetation is removed. The Chagrin, silt loamy soils are deep soils that are nearly level, well drained, and are in the highest position on floodplains. It is occasionally flooded for brief periods; permeability is moderate and surface runoff is slow. This soil is suited to extensive recreational uses including hiking trails. Special measures are needed in some places to control stream bank erosion and keep channels from cutting through the soil (USDA 1980). The Wetland Delineation Study conducted for the project stated that the soils in the project area are well drained and typically comprised of sandy substrates (EnviroScience 2009).

In the 2004 *Final Programmatic Environmental Assessment for Riverbank Management of the Cuyahoga River,* a program was developed in order to approach riverbank stabilization projects with a "more proactive and holistic management strategy," including preserving historic resources adjacent to the river and its tributaries with minimal interference with the river's ecological river processes. This assessment identified 24 areas of concern along the Towpath Trail and 13 along the Valley Railway. These areas were experiencing high, moderate, or minor rates of erosion. The Ohio & Erie Canal Towpath Trail and Valley Railway, the most significant linear recreational and cultural features in the park are threatened constantly by erosion and bank failures in numerous locations on the river and its tributaries (NPS 2004).

NPS currently addresses these concerns through a monitoring program that identifies sites along the Ohio & Erie Canal Towpath Trail and Valley Railway that are in imminent danger of failure. Stabilization measures are implemented when funding is available at the sites of highest priority. While this approach is effective in preventing the loss of portions of the Towpath Trail and Valley Railway, its reactive nature mandates the use of a limited array of stabilization measures that may conflict with other environmental objectives. Although the Towpath Trail and Valley Railway are the primary features of concern, CUVA also owns other infrastructure, including several bridges over the river.

Similarly, although the river is the primary source of the erosion and bank failure concerns, its tributaries also have the potential to threaten the Towpath Trail and Valley Railway as well as other cultural, historic and recreational resources through flooding and sedimentation. The river, though often confined by the infrastructure of the railroad tracks and Towpath Trail, causes lateral erosion on the outside banks. Heavy rain events and runoff cause destabilization of the tributary steam banks that affects downstream structures, and deposits sediment into their lower courses, and eventually, the main stem of the river. Unstable slopes are common and most of the valley floor is subject to flooding.

The resources within the project area that may be affected by proposed actions are focused on the stabilization of the riverbank soils and nearby structures and the deposition of sediment into the river channel. The Final Programmatic Environmental Assessment for Riverbank Management of the Cuyahoga River identified one site within the immediate project adjacent to the Towpath Trail where Chippewa Creek enters the river. This site was identified as "moderate" for encroachment risk and susceptibility to bank erosion and continues to be monitored as it has a history of stabilization problems (NPS 2004).

## 3.2 Water Resources

The Cuyahoga River is the main natural resource feature within CUVA. This section describes the river, Chippewa Creek, the water quality within the project area, and the aquatic wildlife that could be affected by implementation of the proposed action.

The Cuyahoga Valley is home to an assortment of plants and wildlife including rare, threatened and endangered species. CUVA protects the area's natural features, which include relatively large tracts of forest, stunning exposed rock ledges, and waterfalls. Once known as the river that burned, the river and surrounding lands are undergoing restoration, resulting in the return of many native species. CUVA contains three significant elements, including the Cuyahoga River Valley and its associated ecological functions, its cultural resources and landscapes, and its recreational history and outdoor use opportunities. Together, the park's 22-mile river segment, more than 225 miles of perennial streams, over 1,500 wetlands, floodplains, headwaters and cold-water stream habitats provide an ecological buffer against the impacts of development as the river connects to the Great Lakes ecosystem.

The river is the main arterial waterway within the Cleveland-Akron metropolitan area. The name “Cuyahoga” is a blend of several native peoples’ names for the river and often translated to mean “crooked river.” The river flows south from its headwaters towards the city of Akron, and then curves north to Lake Erie. It allowed travel by canoe to an eight-mile portage trail leading to the south-flowing Tuscarawas River, which eventually feeds the Ohio River. Travelling for nearly 100 miles through the region, the Cuyahoga River has been a centerpiece of the region’s history and a significant contribution to the area’s industrial and ecological heritage. The river and the adjacent Ohio & Erie Canal served for many years as the primary transportation route for industrial production throughout the region. The significance of the river began to evolve from an industrial wasteland to an ecological resource with the well-publicized burning of the river in 1969, which moved the nation towards establishing the Clean Water Act (NPS 2003).

The US Geological Survey (USGS) has classified the river watershed as hydrologic unit code (HUC) # 0411002. This classification system divides and subdivides the United States into successively smaller river basin units used for collection and organization of water resources data. The Cuyahoga River drains approximately 520,320 acres in Northeastern Ohio (USGS 2016). About 6.5% of this drainage area is within CUVA. Valley walls and tributary ravines characterize the watershed with steep forested slopes rising 100 to 600 feet above the floodplain. The immediate project area contains 800 lineal feet of river. Chippewa Creek, a tributary to the Cuyahoga River, is located 0.2 linear miles upstream of the Canal Diversion Dam at the southern boundary of the project area.

### 3.2.1 Water Quality in the Project Area

After years of restoration and water quality improvements, the river is now emerging as an outdoor recreation resource. However, the river – although much improved from its days as the “river that burned” – remains listed as an impaired waterbody on Ohio's 303 (d) list pursuant to the Clean Water Act. This is due to organic enrichment, nutrient enrichment, low dissolved oxygen, toxicity, sedimentation, and habitat degradation in the river. The river receives discharges of storm water, combined sewer overflows, and incompletely disinfected wastewater from areas upstream of CUVA. Storm wastewater is a significant issue within the watershed. Oil and chemical spills and winter road salt runoff are periodic problems. Non-point sources within the watershed include pesticides and fertilizers from residential areas, golf courses, agricultural fields, and ski slopes. Downstream of CUVA’s northernmost boundary the watershed is dominated by industry and dense urban development near the city of Cleveland.

The Cuyahoga River is an effluent dominated stream, consisting primarily of treated effluent from large National Pollutant Discharge Elimination System (NPDES) permitted wastewater treatment plants (WWTP). These major treatment plants are permitted to discharge 291 million gallons per day or 450.8 cubic feet per second (cfs) into the river. The total WWTP flow upstream of the USGS Independence gage at the northern boundary of CUVA is 181 cfs. The USGS Independence gage data indicates an average flow of 855 cfs (Straub 1997). Heavily influenced by extreme flood flows this indicates that the river may have up to 21% treated effluent at average flows. Looking at typical flows, the harmonic mean flow is 308 cfs, which could consist of up to 58% treated effluent.

The Ohio EPA and the US EPA in accordance with the Clean Water Act have established WQS for the Cuyahoga River and its tributaries. The state has established use designations that apply to the water resources within CUVA; state resource water, warm water habitat, cold-water habitat, and primary contact recreation (Ohio EPA 2007). The river within CUVA is in full attainment of the state of Ohio’s WQS for aquatic life – except for the

segment within the project area. According to the Ohio EPA's TMDL for the Lower Cuyahoga River, the Canal Diversion Dam is one of the causes of non-attainment in this section of river. A TMDL serves as a planning tool and potential starting point for restoration or protection activities with the ultimate goal of attaining or maintaining water quality standards by recommending controls needed to restore and maintain the quality of water resources. The physical modifications to the river upstream of the dam include the creation of an impoundment resulting in the loss of riverine habitat characteristics.

Comprehensive survey results from 1996, 2000, and 2008 indicate that the river is currently in full attainment of Ohio's biological WQS downstream of the dam and is in non-attainment upstream of the dam. Although fish communities in general continue to recover, and have shown significant improvements in the past four decades, the one exception is the Canal Diversion Dam vicinity and the upstream dam pool. This area remains in non-attainment of the state's WQS for fish and macroinvertebrate communities (Ohio EPA 1996, 2000, 2008).

The Cuyahoga River from its mouth to the upper end of the Gorge Dam pool is listed as an Area of Concern (AOC) for the Great Lakes. This includes the project area. AOCs are areas with persistent pollution problems specifically identified in Annex 1 of the 1987 Great Lakes Water Quality Agreement. The Ohio EPA and a committee of local stakeholders were required to identify and remedy the problems by developing a Remedial Action Plan (RAP) for the river. The Great Lakes Water Quality Agreement lists fourteen beneficial use impairments (BUIs) which may be identified in an AOC. There are ten BUIs identified in the Cuyahoga River. Specific to the project area are three BUIs, listed in Table 2. Currently, the BUIs are being mitigated which may result in "delisting" the impairments and eventually removing the section of river from the list of AOCs within the Great Lakes Basin. Tables 2 and 3 summarize the three BUIs and their delisting targets that are specific to the project area (Cuyahoga Remedial Action Plan 2009). The Canal Diversion Dam directly influences these three impairments, which are likely to remain as long as the dam and its upstream pool exist.

**Table 2. Summary of Beneficial Use Impairments in the Project Area and Delisting Targets**

| Beneficial Use Impairment | Delisting Target |
|---|---|
| Degradation of Fish Populations | IBI and MIwb scores do not significantly diverge from applicable biocriteria IBI=38 (wading site), IBI=40 (boat site), MIwb=7.9 (wading site), MIwb=8.7 (boat site). Nonsignificant departure from biocriteria for WWH is <4 IBI units; <0.5 MIwb units. |
| Loss of Fish Habitat | For mainstem and tributaries, habitat quality shall average a Qualitative Habitat. Evaluation Index (QHEI) score of 60 or better throughout the free-flowing stream stretches of the AOC. |
| Degradation of Benthos (community of bottom dwelling organisms) | ICI scores do not significantly diverge from state biological criteria (ICI=34). Nonsignificant departure from biocriteria for WWH is < 4 ICI units. |

**IBI- Index of Biotic Integrity; MIwb - Modified Index of Biotic Integrity; WWH- warm water habitat; QHEI- quantitative habitat evaluation index; ICI- Index of Community Integrity (fish); (Cuyahoga RAP, 2009).**

**Table 3. Beneficial Use Impairment for the Cuyahoga River within the Park and Project Area.**

| River Segment | Degradation of Fish Populations | Loss of Fish Habitat | Degradation of Benthos |
|---|---|---|---|
| Cuyahoga River Mainstem from RM 45 (Gorge Dam) to RM 27 (Upstream of Canal Diversion Dam Pool) | Not Impaired | Not Impaired | Not Impaired |
| Cuyahoga River Mainstem from RM 27 (Canal Diversion Dam Pool) to RM 20. | Impaired | Impaired | Impaired |

A comparison of IBI, MIwb, ICI, and QHEI scores for the Cuyahoga River by River Mile from 1984-2008 are listed in Table 4. Because exact sampling locations often varied between surveys, sites that were similar in proximity or functionality (e.g., upstream or downstream from a major discharge or confluence) were grouped to demonstrate trends. Nearby Chippewa Creek, entering the Cuyahoga River 0.2 miles upstream of the dam, was evaluated in 2009 for fish communities. This segment had an IBI score of 42, which met the biological water quality standard for the stream at that time.

**Table 4. Comparison of Biocriteria Scores by River Mile.**

Values in **bold** meet Delisting Targets (IBI=40 for boat site, IBI=38 for wading site; MIwb=8.7 boat site, MIwb=7.9 wading site, ICI=34; QHEI=60).

| | | | 1984 | | 1991 1996 | | | 2000 | | | | 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **River Mile** | **IBI** | **MIwb** | **ICI a** | **IBI** | **MIwb** | **ICI** | **QHEI** | **IBI** | **MIwb** | **ICI** | **QHEI** | **IBI** | **MIwb** | **ICI** | **QHEI** |
| 42.6 | 27 | 7.4 | **32** | 33 | 8.1 | 28 | **86.0** | **42** | **8.2** | **38** | **78.5** | **46** | **8.5** | **36** | **85.5** |
| 39.7 | 22 | 6.5 | 24 | 25 | 6.9 | **32** | **76.5** | 33 | **8.3** | **34** | **76.5** | **36** | **8.4** | **42** | **81.0** |
| 33.2 | 12 | 0.8 | 10 | 17 | 4.8 | 24 | **81.0** | 23 | 7.7 | **42** | **81.0** | **42** | **8.3** | **38** | **83.0** |
| 26.5 | 12 | 1.0 | 16 | 22 | 7.0 | **36** | **73.0** | 30 | 7.9 | **32** | **78.0** | **36** | 8.1 | **38** | **81.5** |
| 24.1 | 12 | 3.1 | P | - | - | - | - | - | - | - | - | 34 | **8.8** | **50** | **83.5** |
| 22.4 | - | - | - | - | 3.9 | - | **60.0** | - | - | - | - | 34 | **8.3** | - | **75.5** |
| 20.8***** | 15 | 4.3 | - | | - | - | - | - | - | - | - | 26 | 5.9 | 24 | 56.0 |

*****project area

## 3.3 Aquatic Wildlife

The recovery of the lower Cuyahoga River over the past several decades is not only evident in the improvement in the aquatic assemblages that inhabit the river water, but also in the terrestrial wildlife associated with the riparian habitat of the river corridor. Efforts to improve water quality and preserve wetlands have transformed a polluted river into an attractive place for wildlife. According to inventories conducted at CUVA, the park supports 91 species of aquatic macroinvertebrates, 59 species of fishes, 20 species of amphibians, and 20 species of reptiles.

The most common amphibians found in CUVA include Jefferson's salamander (*Ambystoma jeffersonianum*), gray tree frog (*Hyla versicolor*), northern chorus frog (*Pseudacris triseriata*), slimy salamander (*Plethodon glutinous*), pickerel frog (*Rana palustris*), northern leopard frog (*Rana pipens*), and wood frog (*Rana sylvatica*). Species considered abundant include American toad (*Bufo americanus*), spring peeper (*Pseudacris crucifer*) Northern dusky salamander (*Desmognathus fuscus*), two-lined salamander (*Eurycea bislineata*), red-backed salamander (*Plethodon cinereus*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), and eastern newt (*Notophthalmus viridescens*). Most of these species can be heard or seen along the Ohio & Erie Canal (NPS 2014).

Twenty species of reptiles are found in CUVA including 11 snakes, 8 turtles and 1 skink. All species are native with the exception of the red-eared and the yellow-bellied sliders. The most common snakes found include ring-necked snake (*Diadophis punctatus*), Eastern milk snake (*Lampropeltis triangulum*), Northern water snake (*Nerodia sipedon*), DeKay snake (*Storeria dekayii*), and common garter snake (*Thamnophis sirtalis*). The most common turtles encountered include the common snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), and non-native red-eared slider (*Trachemys scripta elegans*). The spotted turtle (*Clemmys guttata*), a state listed threatened species, was observed in a Park wetland 11 miles south of the project area in 2008 and 2016. Another state-listed threatened turtle, the Blanding's turtle (*Emydoidea blandingii*) has been found approximately 10 miles north of the project area within the Cleveland Metroparks Canal Reservation.

### 3.3.1 Aquatic Species

The Cuyahoga River contains aquatic species typical of Lake Erie basin river systems; however, its urbanization, especially in its lower reaches, undercut its ability to maintain aquatic species that are found in less disturbed river systems within the Lake Erie watershed. A diversity of fish can largely be dependent upon the chemical and physical health of the particular river system. Within the Cuyahoga River basin, the Ohio EPA has identified seventy-seven species of fish. Within CUVA (from River mile 38.3 to River Mile 12.15), 59 species were recorded between 1984 and 2008 (Ohio EPA 2016).

As the health of the Lake Erie basin and the river systems that feed into it continue to improve, native species that historically were present in the Cuyahoga River are viable once again. Ohio EPA's Cuyahoga River Biological and Water Quality Study (Ohio EPA 2008a) found 12 species of fish in the Canal Diversion Dam pool compared to 25 species below the dam impoundment (Figure 8). There were no species of darters found in the pool compared to three darter species below the dam and four darter species at the upstream end of the dam pool. These findings are typical expectations comparing impounded to free-flowing riverine systems.

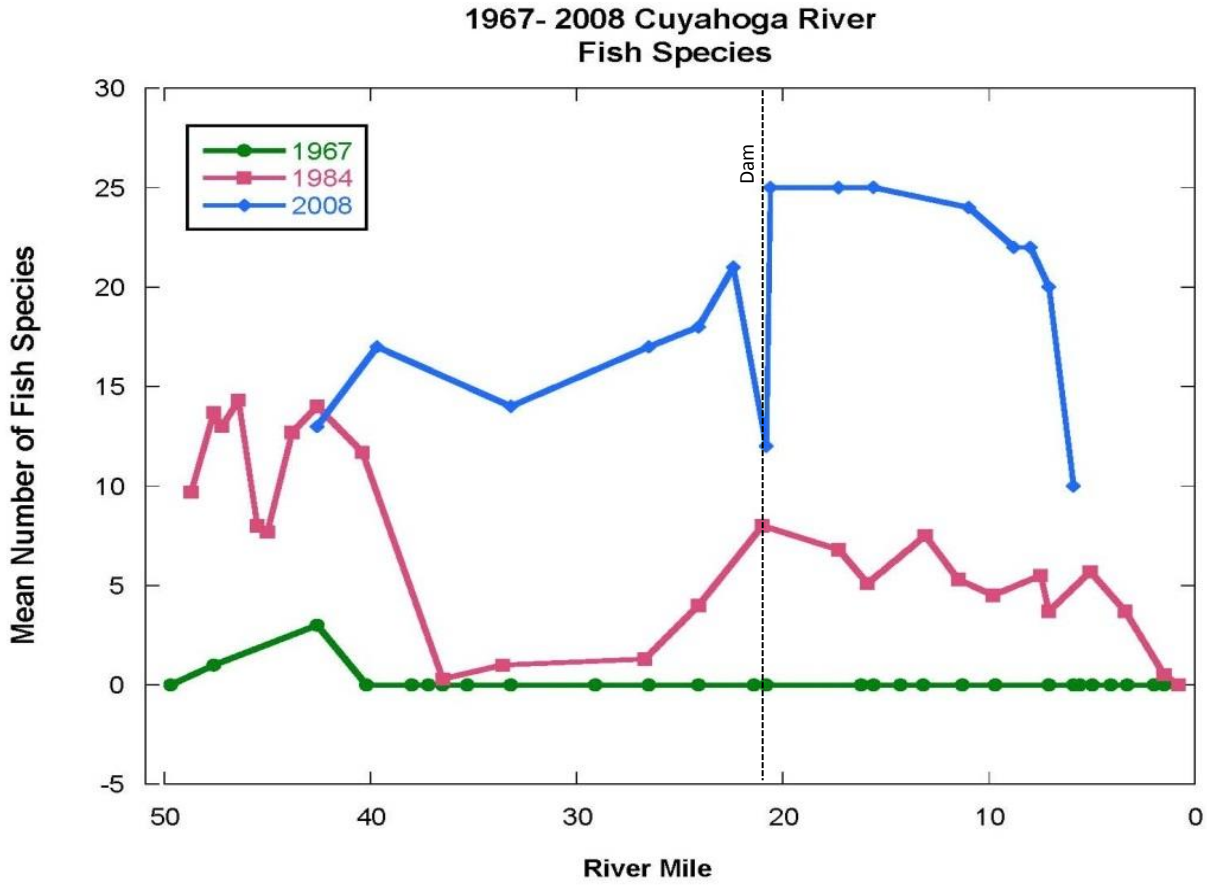


Figure 8. Cuyahoga River Fish Species 1967-2008

Ohio EPA uses an Index of Biotic Integrity (IBI as modified from Karr) to assess fish community health in rivers and streams. Electrofishing techniques are used to collect fish in a standardized length of stream. Fish are identified to species, weighed, and counted. This data is used to calculate a multi-metric score, which reflects the health of a fish community (Ohio EPA 1987). IBI scores are used to determine fish community health and compared to Ohio's WQS. Ohio has incorporated biological criteria into its WQS program. The WQS for fish communities in this section of the river is an IBI score of 40 (maximum score is 60). Fish communities below (downstream) the dam scored in the upper forties (at the exceptional level) while the dam pool site scored a 26 (low to fair) and did not meet the WQS (Table 4 and Figure 9). Recent dam removals upstream of CUVA on the Cuyahoga River have resulted in biological community and habitat improvements and have been documented using these biological criteria (Tuckerman 2007; Krieger 2013).

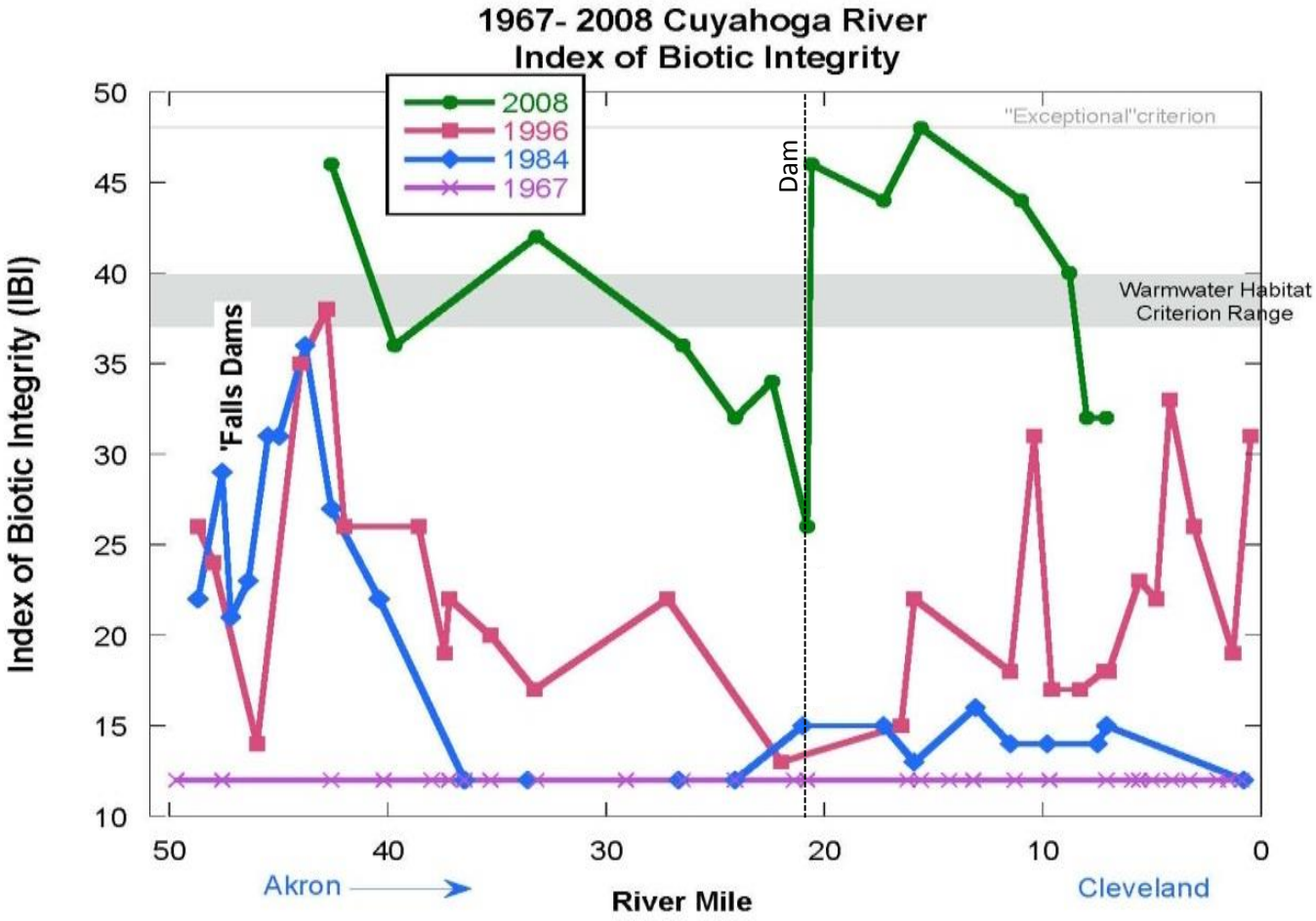


Figure 9. Index of Biotic Integrity 1967-2008

### 3.3.2 Habitat Available for Aquatic Species

The Qualitative Habitat Evaluation Index (QHEI) is an index of macro-habitat quality developed by the Ohio EPA. The index measures habitat quality, which generally corresponds to physical factors that affect fish communities. The index has a maximum score of 100, with scores of 60 or greater generally representing suitable habitat available to support healthy WWH fish communities. Scores are based on six interrelated metrics: substrate, in stream cover, channel morphology, riparian and bank condition, pool and riffle quality, and gradient. QHEI scores from the most recent Ohio EPA survey (2008) are included in Figure 10. QHEI scores for the project area score below 60.

A mussel survey conducted by Cleveland State University in 2002 recorded the presence of five extant species of unionids within CUVA boundaries (Smith, et al. 2002). Two species in particular were found in large numbers in the watered section of the Ohio and Erie Canal: *Pyganodon grandis* (Giant Floater) and *Toxolasma parvus* (Lilliput). At that time data suggested that the total number of individuals of the Giant Floater mussel in the watered portion of the canal could be several thousand (>3000). The number of mussels found in the canal indicated that the canal provided habitat to thriving populations of these two mussel species.

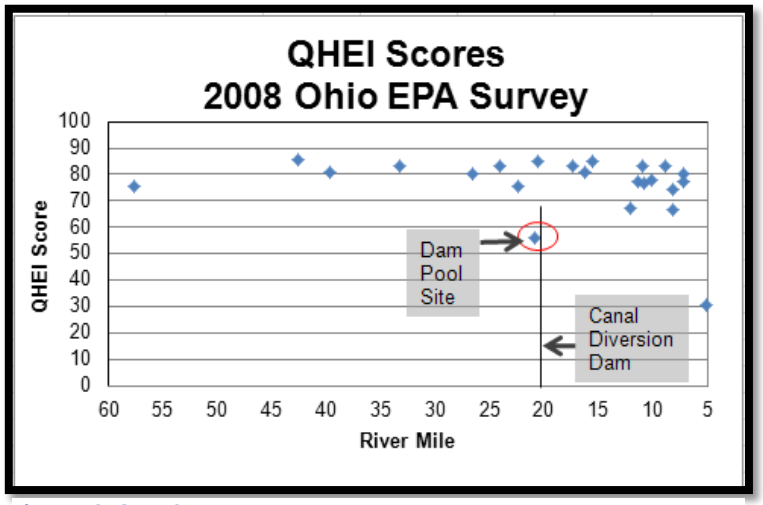


Figure 10. QHEI Scores

In 2000; however, the canal was drained for repairs resulting in a significant loss of mussels due to lack of water and wet sediment. This de-watering of the canal places mussels in conditions of extreme stress. Mussels are capable of burrowing several centimeters into the sediment to survive for short periods. Lower water levels have drastic effects on water temperature and chemistry, especially in the summer months. Normal water depth in the canal is approximately 9 feet (3 meters). The Giant Floater exhibits the highest growth rate at a depth of 3 to 9 feet (1-3 meters). Researchers recommend that it would be beneficial for the mussel population in the canal not to experience a water level below 3 feet (Smith, et al. 2002). CUVA now has procedures in place to protect mussels when de-watering the canal for maintenance or construction.

### 3.3.3 Invasive Aquatic Species

The Great Lakes and its river systems have the potential to be harmed by a variety of invasive aquatic species that can alter the ecosystem and affect its native inhabitants. The National Invasive Species Council defines an invasive species as one that "is both non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm, or harm to human health." Aquatic invasive species found in some of the Lake Erie river systems include sea lamprey (*Petromyzon marinus*), gobies (*Apollonia melanostomus*), and zebra mussels (*Dreissena polymorpha*) and carp (*Cyprinus carpio*). Many of the invasive aquatic species described in this section are not currently located within the Cuyahoga River or project area.

Changes proposed to the river in the action alternatives may affect the presence or absence of invasive species in the future. Sea lampreys are predacious, eel-like fish native to the coastal regions of both sides of the Atlantic Ocean. They entered the Great Lakes about 1921 and contributed greatly to the decline of whitefish and lake trout. In August 2015, the USFWS Sea Lamprey Control Program staff assessed the sea lamprey larval production potential for the Cuyahoga River and its tributaries. Twenty-one sites along the main stem of the river as well as several tributaries were examined. The Canal Diversion Dam project area and Chippewa Creek were included in this assessment. During these surveys, no sea lampreys or native lampreys were detected. Larval habitat transects were also conducted with very little larval habitat found. Spawning habitat was observed in one tributary upstream of the Canal Diversion Dam (Jubar 2015).

The round goby is a bottom-dwelling fish, native to Eastern Europe that entered the eastern Great Lakes in ballast water. They can spawn several times per year, grow to about 8 inches, are aggressive, and compete with native bottom-dwellers like sculpins and log perch. They are expected to be harmful to Great Lakes and inland fisheries. These species currently do not exist within the river.

Zebra mussels and Quagga mussels *(Dreissena rostriformis)* are small, fingernail-sized mussels native to the Caspian Sea region of Asia. These mussels, tolerant of a wide range of environmental conditions, have spread to areas in all of the Great Lakes. Zebra mussels can clog water intake systems of power plants and water treatment facilities, as well as the cooling systems of boat engines, costing millions of dollars in damage each year. Additionally they have severely reduced or eliminated native mussel species. Neither of these mussel species currently exists within the river.

The Common Carp is native to Europe, but stocked into Ohio waters in 1879 as a food fish. This species thrives in a wide variety of conditions and found in waters in every county in Ohio. They are highly tolerant of poor water quality and often become very abundant in areas where few other fish species will live. Carp prefer warm lakes, streams, ponds and sloughs with a lot of organic matter. They do not multiply readily in clear, cold water. They root around on the bottom while feeding often uprooting vegetation and making the water very turbid (murky). Common carp currently exist within the river and the Ohio & Erie Canal.

## 3.4 Cultural Resources

CUVA exists in part to preserve and protect its cultural resources and the historic values of the Cuyahoga River valley (Cockrell 1992). For the purposes of this analysis, cultural resources are “historic properties,” which are defined as properties that are listed in or have been determined as eligible for listing in the National Register of Historic Places (NRHP; 36 CFR 800.16(l)1; McClain *et al*. 2014). The NRHP is a comprehensive record of districts, sites, objects, structures and buildings of national, regional, state or local significance to American history, architecture, archaeology, engineering and culture kept by NPS under the authority of the NHPA. CUVA in general and the project area in particular contain a number of different types of historic properties, including historic buildings and structures, and cultural landscapes.

CUVA is obliged under Section 110 of the NRHP to identify the historic properties within its jurisdiction (16 U.S.C. 470). To do this, NPS has surveyed CUVA and included all known historic properties in the Park’s List of Classified Structures (LCS), Cultural Landscapes Inventory (CLI) and Archaeological Sites Management Information System (ASMIS). However, because of the size of the park, the passage of time and an evolving understanding of historical significance, these inventories are necessarily incomplete. The LCS is an evaluated inventory of all historic and prehistoric structures that have historical, architectural and/or engineering

significance within CUVA. The LCS is similar to, and often overlaps with, the Ohio Historic Inventory (OHI), a method of recordation and a planning tool that is maintained by the state of Ohio. Similar to the LCS, the CLI is a comprehensive inventory of all culturally and historically significant landscapes within CUVA and may include some of the structures in listed in the LCS.

NHLs are those districts, sites, buildings, structures, or objects of exceptional national historical significance that are designated as such by the Secretary of the Interior. The NHPA provides for a higher level of protection for designated NHL, requiring that prior to the approval of any undertaking that may directly and adversely affect any NHL, NPS must undertake all possible planning to minimize harm to the NHL. While Section 106 requires NPS to take into account the effects of any actions on historic properties, Section 110 requires NPS to make every effort to avoid any adverse effects to a NHL.

### 3.4.1 Methodology

NPS and Ohio EPA have prepared this EA in accordance with Section 106 of the NHPA of 1966, as amended, the Advisory Council's procedures on historic preservation (36 CFR Part 800) and the 2008 Programmatic Agreement (PA) between our agency, the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers. The attached EA and findings below therefore serve as documentation for consultation in accordance with 36 CFR 800.8(c). The approach to identification of historic properties and an the assessment of potential project effects are based upon broad NPS standards defined in NPS Cultural Resources Management Guidelines under Director's Order 28 and the PA.

The members of NPS interdisciplinary cultural resource management (CRM) team worked together to identify and evaluate all historic properties that may be affected by any of the alternatives. The CRM team includes an historian, architectural historian, archaeologist, landscape architect and historical architect, all of whom exceed the Secretary of the Interior’s Professional Qualifications Standards (36 CFR 61) for their respective fields of expertise. To consider the effects of its action on historic properties, the CRM team conduced background research, consultation with SHPO and a limited about of fieldwork.

For the background research, the CRM team reviewed the cultural resource files at CUVA, NPS Midwest Region Office (MWRO; Finney 2002) and Midwest Archaeological Center (MWAC) and consulted the Ohio SHPO online mapping system to identify any previously recorded cultural resources in the APE and plotted the location of these resources on project mapping. The CRM team found that the previously recorded cultural resources were included in the CUVA historic structures building files (HSS), NPS Historic Structures Reports, the LCS, the OHI, the CLI, the NRHP and the Historic American Engineering Record (HAER; see Cossel 1993; Scrattish and Unrau 1984; Tamburro and Hiner 2002). Members of the CRM team also conducted a field review to document and update the condition of the previously recorded cultural resources and check for any unrecorded properties 50 years old or older that may be affected by the undertaking.

In consultation with the SHPO, NPS and Ohio EPA agree to conduct archaeological investigations within the construction limits of any of the build alternatives, the results of which will be used to inform its final design and support a finding of NRHP eligibility and effect that be coordinated with the SHPO prior to the development of any build alternative.

Should NPS find, in consultation with the SHPO, that the development of the selected alternative will have no adverse effect to significant archaeological resources, no further evaluation of historic properties would be necessary and Section 106 process would be concluded. Should NPS find that the development of the selected alternative will have an adverse effect to significant archaeological resources, the NPS will continue to consult with the SHPO to resolve adverse effects and conclude the Section 106 process through the execution of an agreement document.

### 3.4.2 Area of Potential Effects (APE)

Federal regulations define an undertaking's Area of Potential Effects (APE) as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties (36 CFR 800.16). An APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. For example, the proposed undertaking might result in direct effects to resources, such as the actual removal of the Brecksville Canal Diversion Dam, or indirect effects, such as the changes to the water level of the upstream impoundment and watered downstream sections of the Ohio & Erie Canal (McClain *et al*. 2014). To account for all possible direct and indirect project effects, NPS has developed an expansive APE that includes not only the immediate project area, but also areas both up and downstream of the existing dam (Figure 11).

The APE for direct effects (direct APE) includes all areas that may be subject to ground disturbance, use or construction-and operation-related visual, auditory or atmospheric effects. This Direct APE therefore includes the dam site, all possible work staging areas, areas through which construction equipment would access the site and all associated NPS designated tracts, including Tracts 103-93 (portion east of the river to the north of the bridge and area south of the bridge and east of the railroad) 104-06, 104-43, 104-44, 105-75, 105-76, 105-94, 105-95, 105-123. Due to the elevated railroad grade, the western boundary of the Direct APE is the western boundary of the Valley Railway (Tract 104-43). Because all action alternatives would involve the modification or removal of the existing Brecksville Canal Diversion Dam, the APE for indirect effects (indirect APE) includes the river impoundment behind the dam extending for two miles upstream, as well as the watered section of the Ohio & Erie Canal extending from the Brecksville (Pinery) Feeder Head Gate for 6.2 miles (5.4 linear miles) to northern boundary of CUVA at Rockside Road. The Direct APE and the indirect APE together form the project APE.

### 3.4.3 Historic Properties

The CRM team identified 30 previously recorded aboveground cultural resources within the APE, most of which have been recorded in multiple inventories (Table 5, Figure 11). Of the 30 previously recorded resources, 10 of which are located exclusively within the Direct APE, 18 of the resources are located exclusively within the Indirect APE, and two of the resources are located in both the Direct and Indirect APE. Historic properties within the APE include a four-mile-long watered section of the canal that is designated as a NHL, the highest designation for historic places reserved for those resources of exceptional value to the nation. Properties are listed in the NRHP as landscapes, historic districts, buildings and structures, some of which are individually significant and others that are significant only as contributing elements to a larger resource. Apart from two linear resources, the Valley Railway Historic District and the Ohio & Erie Canal, all of the previously recorded resources are classified as structures, with the exception of the Lock Tender's House and Alexander's Mill, buildings with a functional and associative relationship to the Ohio & Erie Canal.

In spite of there being 30 resources recorded on multiple inventories, in terms of Section 106, there are only four historic properties within the APE: The Brecksville-Northfield High Level Bridge, the Station Road Bridge, the Valley Railway Historic District and the Ohio & Erie Canal. The two bridges, both structures, are significant for their location, design, workmanship, materials and association and are therefore defined by the material qualities of the resources themselves. The Valley Railway Historic District is a linear resource confined within its associated right-of-way, with no contributing elements present beyond the single-track corridor that runs through the APE. In contrast, the Ohio & Erie Canal is an expansive historic property with many contributing elements. Within the APE, 26 previously recorded individual elements contribute to the thematic resource and/or the NRHP-eligible cultural landscape.

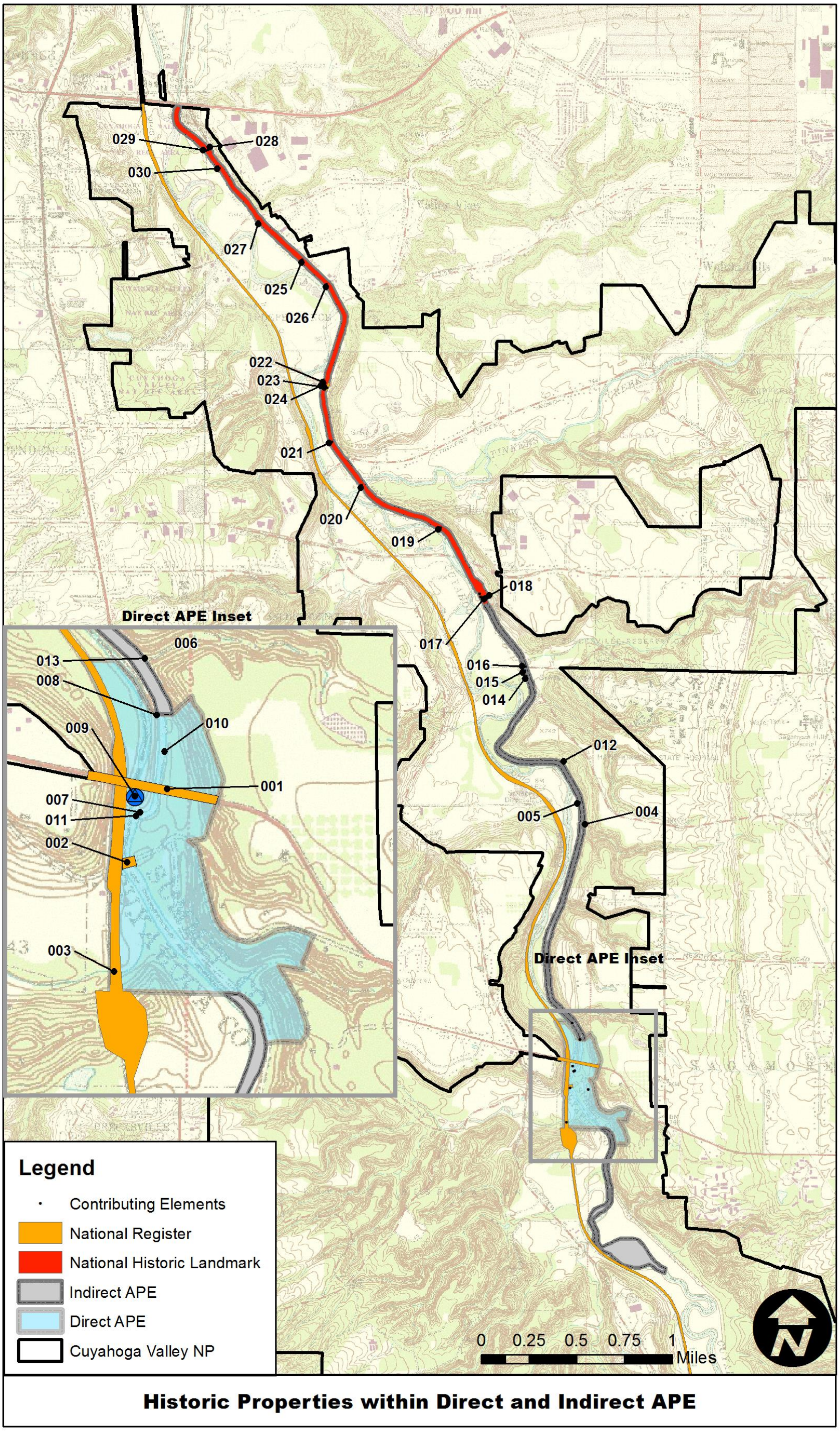




Figure 11. Historic Properties within Direct and Indirect APE

## Table 5. Historic Properties within Direct and Indirect APE

| Key # | Tract(s) | APE | Building File # *LCS (in BOLD)* | Survey Number(s) | Name | Dates | Location | Class | Type/Style | Significance | NRHP Status | CLI Status Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | 104-06 | Direct APE | N/A | NR 86000078 Ohio Bridge Inventory 7706871 | Brecksville-Northfield High Level Bridge | 1931 | Carries SR 82 over the Cuyahoga River Sagamore Hills Summit County Brecksville Cuyahoga County | Structure | Multiple Span Concrete Arch Bridge | Criterion C Engineering | NRHP Listed (Structure and 80 ft. R/W) | N/A |
| 002 | 104-04 | Direct APE | **HS-427** | NR 79000312 | Station Road Bridge | 1882 1992 | E of Brecksville at Cuyahoga River Brecksville Cuyahoga County Sagamore Hills Summit County | Structure | Pratt Whipple Truss | Criterion C Engineering | NRHP Listed (Structure and Abutments) | N/A |
| 003 | 104-44 | Direct APE | HS-900 | NR 85001123 | Valley Railway | 1871-1915 | Independence Cuyahoga County to Akron Summit County | District Landscape | Single Track Railway Line | Criteria A and C Transportation Engineering | NRHP Listed DOE Landscape (Variable R/W) | Completed |
| 004 | Multiple | Direct APE | HS-100 | NR 66000607 | Ohio and Erie Canal Thematic Resource | 1825-1913 | Independence Valley View Cuyahoga County Sagamore Hills Summit County | District Thematic Resource | Landscape | Criteria A and C Transportation Engineering | NRHP Listed NHL (4 miles) DOE Landscape (70 ft. corridor) | Component Landscape Fair ("entire spectrum of associated features") |
| 005 | Multiple | Direct APE | HS-100 | SUM-3255-01 | Canal Prism | 1826 | SR 82 to Highland Rd Lock 34 Sagamore Hills Summit County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Contributing Element | Contributing |
| 006 | 103-93 105-32 105-33 | Direct and Indirect APE | N/A | N/A | Pinery Narrows | N/A | Valley View Cuyahoga County Sagamore Hills Summit County | Landscape | Landscape | N/A | N/A | Contributing Good/Fair |
| 007 | 103-93 | Direct APE | N/A | SUM-3246-01 | Brecksville Feeder Head Gate | 1826 1952 | South of SR 82 Sagamore Hills Summit County | Structure | Engineered | N/A | N/A | Contributing Excellent |
| 008 | 103-75 | Direct APE | **HS-118** | SUM-3252-01 | Lock 36 Pinery Lock Remnant & Spillway | 1826 1905 | W of Chaffee Rd. Sagamore Hills Summit County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | Noncontributing Deteriorated |
| 009 | N/A | Direct APE | N/A | SUM-3253-01 | Brecksville Dam | 1952 | Near Station Rd Sagamore Hills Summit County | Structure | Engineered | N/A | N/A | Contributing Excellent |
| 010 | 103-75 | Direct APE | **HS-133** | SUM-3254-01 | Brecksville (Pinery) Feeder | 1826 | Station Rd near SR 82 Sagamore Hills Summit County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | Contributing Excellent |
| 011 | n/a | direct APE | N/A | N/A | Pinery Dam | 1826 | Cuyahoga River Brecksville, Cuyahoga County Sagamore Hills Summit County | Site | Engineered | Criteria A and C Transportation Engineering Criterion D Information Potential | Considered by NPS as Eligible Contributing Element | N/A (CLI conflates the Pinery and Brecksville Dams) |
| 012 | 103-75 | Direct APE; Indirect APE | **HS-119** | N/A | O. & E. Canal: Canal Segment #36 (Includes Locks 36 and 37) | 1826 | 3 miles of the O&E Canal from Fitzwater Road to the Route 82 bridge in Brecksville. | Structures | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | Contributing Good/Fair |
| 013 | 103-75 | Indirect APE | **HS-132** | SUM-3251-01 | Mudcatcher at Galley Run | 1826 1908 1913 | STA 714+32 0.5 mi N of Lock 36 Sagamore Hills Summit County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | Contributing Excellent |
| 014 | 125-32 | Indirect APE | **HS-130** | CUY-6535-19 | O & E Canal Floodgate | 1826 1905 | Canal Sta 638+20 Canal Rd 2.5 mi S of Lock 37 Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | Contributing Deteriorated |
| 015 | 125-32 | Indirect APE | **HS-131** | CUY-6533-19 | O & E Canal Wasteway | 1826 1905 1913 | Canal Rd 2.5 mi S of Lock 37 Independence Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | |
| 016 | N/A | Indirect APE | N/A | CUY-6534-19 | Ohio & Erie Sta 636 Culvert Sagamore Creek Culvert (replaced 2009) | 1892 1914 2009 | Canal Sta 636 Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element | Contributing Deteriorated Rebuilt |
| 017 | 101-33 | Indirect APE | **HS-121 HS-121A** | CUY-463-19 NR 79000290 | Lock #37 (14 Mile Lock) and Spillway | 1826 1905 | S of Fitzwater Rd Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing Good/Fair |
| 018 | 101-33 Will be 125-65 | Indirect APE | N/A | CUY-458-19 NR 79000298 HAER OH-58 | Alexander's Mill Wilson's Feed Mill | 1855 1850-1874 | 7604 Canal Rd Valley View Cuyahoga County | Building | No Style Noted | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing Excellent |
| 019 | 101-33 | Indirect APE | **HS-122** | N/A | O. & E. Canal: Canal Segment #37A | 1825 1905 1913 | Lock 37 to the Tinkers Creek Aqueduct | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing |

**Table 5. Historic Properties within Direct and Indirect APE (cont.)**

| Key # | Tract(s) | APE | HSS # *LCS* | Survey Number(s) | Name | Dates | Location | Class | Type/Style | Significance | NRHP Status | CLI Status Condition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 020 | 101-33 | Indirect APE | **HS-123** | CUY-462-19 NR 79000296 | Tinkers Creek Aqueduct | 1845 1905 2007 | 100 ft. SW of Canal Rd & Tinker's Creek Rd Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing Rebuilt |
| 021 | 101-33 | Indirect APE | **HS-124** | N/A | O. & E. Canal: Canal Segment #37B | 1845 1905 1913 | Tinkers Creek Aqueduct to Lock 38 | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing |
| 022 | 101-33 | Indirect APE | **HS-126** | CUY-461-19 HAER No. OH-59-C | Lock #38 12 Mile Lock | 1825 1905 1992 | West of Canal Rd Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing Excellent |
| 023 | 101-33 | Indirect APE | **HS-126A** | N/A | Lock #38 Spillway | 1825 1905 | Weir is east of Lock 38 | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing Good/Fair |
| 024 | 101-27 | Indirect APE | **HS-125** | CUY-438-19 NR 79000293 | Lock Tender's House and Inn | c. 1820 1853 1992 | 7104 Canal Rd Valley View Cuyahoga County | Building | Greek Revival | Criterion C Architecture | NRHP Listed Contributing Element **NHL** | Contributing Excellent |
| 025 | 101-33 | Indirect APE | **HS-127** | N/A | O. & E. Canal: Canal Segment #38 | 1826 1913 | Canal between Lock 38 and Lock 39 | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing |
| 026 | 101-33 | Indirect APE | N/A | CUY-6537-19 | Ohio & Erie Canal Sta 505 Culvert (replaced 2005) | 1826 1909 | Canal Rd 50 ft. N of Schreiber Rd Independence Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element **NHL** | Contributing Good/Fair |
| 027 | 101-33 | Indirect APE | N/A | CUY-6287-19 | Ohio & Erie Canal Sta 478+ 90 Culvert (replaced 2005) | 1826 1909 1950 2005 | 120 ft. S of Stone Rd Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element **NHL** | Contributing Good/Fair |
| 028 | 101-33 | Indirect APE | **HS-128** | CUY-460-19 NR 79000292 HAER No. OH-59-D | Lock #39 (11 Mile Lock) & Spillway | 1826 1905 | Canal Rd S of Rockside Rd. Valley View Cuyahoga County | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP Listed Contributing Element **NHL** | Contributing Good/Fair |
| 029 | 101-33 | Indirect APE | **HS-128A** | N/A | Lock #39 Spillway | 1825 1905 | Weir is east of Lock 39 | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element **NHL** | Contributing Good/Fair |
| 030 | 101-33 | Indirect APE | **HS-129** | CUY-6282-19 | Lock #39 Wasteway | 1826 1905 1913 | Wasteway is south of Lock 39 | Structure | Engineered | Criteria A and C Transportation Engineering | NRHP-Eligible Contributing Element **NHL** | Contributing Deteriorated |

### 3.4.4 Direct APE (Project Area)

The following historic properties are located within the Direct APE.

*Brecksville-Northfield High Level Bridge***.** The Brecksville-Northfield High Level Bridge carries State Route 82 over the Cuyahoga River Valley, immediately to the north of the Brecksville Canal Diversion Dam. The multiple-span concrete arch bridge was constructed in 1931 and has recently been rehabilitated. The bridge is 40 ft. wide with 30 ft. of roadway (Johannesen 1985). The double-ribbed, open-spandrel concrete arch bridge consisting of seven spans that area 1,132 ft. long and 145 ft. high. The road and bridge are within both Cuyahoga and Summit counties and are maintained by the Ohio Department of Transportation and under State of Ohio ownership. The bridge was recorded for the Ohio Bridge Inventory (7706871) and is individually listed in the NRHP under Criterion C for it architectural and engineering significance (NR 86000078). The historic property boundary includes the bridge structure and abutments, and well as an 80 ft. wide right of way extending from the roadway centerline. The bridge does not contribute to any significant landscapes with CUVA, although it is iconic and much photographed.

*Station Road Bridge.* The Station Road Bridge is a relic of an earlier transportation system. The Pratt Whipple Truss Bridge was built in 1881-1882 to carry the old Brecksville-Northfield Road over the Cuyahoga River between Cuyahoga County and Summit County. The pin-connected, 9-panel, wrought iron through truss, is 128.5 ft. long and 18.7 ft. wide. The Pratt Through Truss was a long established and extremely popular truss configuration, noted for simplicity and durability that evolved into a staple of bridge manufacturers, particularly when used as a simple span less than 250 ft. in length. The arrangement of the chords and web members is the defining characteristic of a truss configuration, the most tested of which evolved into patented designs. The potentially infinite combination of elements meant that, in spite of a rough standardization of form, each bridge is unique.

Located in the Direct APE, the bridge is on the CUVA List of Classified Structures (HS-427) and is listed individually in the NRHP in 1979 as a structure under Criterion C for its engineering and architectural significance; it is a complete example of a non-standard design pin-connected truss bridge (NR 79000312). The historic property boundary includes the bridge structure and its abutments. NPS rehabilitated the bridge according to the Secretary of the *Interior's Standards for the Treatment of Historic Properties* in 1992 (36 CFR 67). This double intersection truss bridge is the oldest surviving bridge in the Cuyahoga Valley and it is often photographed in the foreground of the Brecksville-Northfield High Level Bridge. The bridge is in good condition and is open to pedestrians, bicyclists and equestrians.

*Valley Railway.* The Valley Railway Historic District is a “linear industrial district” centered on a single-track railway that extends more than 24 miles from Rockside Road in Independence, Cuyahoga County, to Howard Street in Akron, Summit County. Workers began to build the railroad through the valley in 1871, but owing to a protected depression and other delays, the line was not opened to regular rail traffic until 1880 (Johannesen 1984). Eventually, the railroad was integrated into the Baltimore and Ohio Railroad (B & O) system to transport coal from the Goshen and Pittsburgh No. 8 coalfields to northern Ohio and provide limited passenger service. In the modern era, the Cuyahoga Valley Scenic Railway (CVSR) operates the railroad on tracks that are located in the project area along the western bank of the Cuyahoga River. That portion of the railway within CUVA was recorded for the park’s HSS (HS-900). As one of six historic districts within the park, the Valley Railway represents a significant transportation corridor for the State of Ohio and the evolution of transportation in the valley. The railway was listed in the NRHP as a historic district (NR 85001123). NPS recorded the entirety of the railway as a NRHP-eligible cultural landscape in a CLI. Its historic property boundary is variable along its entire

length, but conforms to Tract 104-44 within the APE. There are no individually recorded contributing elements within the APE.

*Ohio & Erie Canal.* The most important and widely recognized collection of resources in the park, the twenty-two miles of the Ohio & Erie Canal corridor generally follows the Cuyahoga River between Akron and Cleveland, bisecting CUVA along its north–south axis. The Ohio & Erie Canal, though manmade, is part of the Cuyahoga River hydrologic system. The Ohio & Erie Canal is watered by the Cuyahoga River and supplemented by surface water from a number of small intermittent streams that enter directly into the canal in the 8-mile section that flows north from the Brecksville Canal Diversion Dam to Rockside Road and then continues north beyond the boundary. Today, about one-third of the earliest completed section of the Ohio & Erie Canal between Cleveland and Akron contains water and much of the remaining two-thirds, although dry, are still readily apparent in the landscape.

The importance of the Ohio & Erie Canal to CUVA is reflected in the designation of the sum of its associated resources as a historic property and the way in which the designated area associated with the canal has grown over time. The portion of the Ohio & Erie Canal within CUVA first listed in the NRHP was a 1.5-mile long watered section in Valley View, designated as a NHL in 1966. This was expanded in 1975 to include a four-mile long, 24.5-acre section in Valley View Township, in Cuyahoga County, all of which is located within the APE (NR 66000607). This designation included the canal prism, three locks, the now rebuilt Tinkers Creek Aqueduct (NR 79000296), as well as the NRHP listed Alexander's Grist Mill (NR 79000298) and the Lock Keeper's House and Inn (NR 79000293). Although not explicitly named as a contributing feature, the registration form notes the centrality of water to the listing, particularly to the inclusion of Alexander's Grist Mill, as well as water's importance in illustrating the historic use of the canal, considered an important characteristic of this section. This section has been considered a NHL from the time of its first designation as a historic property (Mendinghall 1975).

In 1976, the SHPO sponsored a revision to and expansion of the NRHP listing by nominating portions of the Ohio & Erie Canal totaling 16 miles within what was then the Cuyahoga Valley National Recreation Area (CVNRA) as a noncontiguous "thematic resource." This was an attempt to account for landscape change while recognizing the scale of the resource and its importance to CUVA (Poh-Miller 1976). Expanding on the earlier designations, the northern section of the thematic grouping encompassed the entire portion of the canal within the APE, including the whole landscape of the Pinery Narrows (portions of Tracts 103-93, 105-32 and 105-33), an area noted to be "in an excellent state of preservation" (Poh-Miller 1976). Both watered and un-watered portions of the canal are included within this northern section. In the 1976 NRHP nomination, which focused on the 1825-1854 period of significance, the condition of the resource was noted to vary from "ruins" to "good," and the nominated resource retained integrity; the excluded portions, including several locks, were considered to have lost integrity. The nomination retained the 70 ft. wide corridor as a historic property boundary as well as all extant physical features of the canal, as well as structures and sites historically related to the canal, including the Lock Tender's House and Inn and Alexander's Grist Mill.

The NRHP status of the Ohio & Erie Canal within CUVA was again modified and its boundary expanded in 2004 through the completion of CLI by the Midwest Regional Office (MWR) staff of the National Park Service. Focused on an 1825 to 1913 period of significance, the inventory also included elements from outside of that range in an attempt to grasp the sum of the resources in a holistic manner. The CLI notes that the northern six miles of the canal within CUVA, from Rockside Road to Route 82, remain in a watered condition, crediting the Brecksville Canal Diversion Dam feeder for maintaining a constant supply of water in the canal. The historic property boundary of the canal defined by the CLI was even more expansive than that of the NRHP thematic

resource a wide range of NRHP contributing elements, non-contributing NRHP elements and other landscape features.

Based on the content of the CLI, this more comprehensive designation and all of the resources that it encompasses were determined by NPS to be eligible for the NRHP in 2004 in consultation with the SHPO, a finding reaffirmed by the park superintendent in approval of an updated CLI in 2009. Because of the designation of the broader Ohio & Erie Canal landscape as a historic property, there are 26 NRHP contributing elements to the canal within the APE. In addition to the unifying resource of the actual canal prism, there are five additional canal-related contributing resources within the Direct APE; four of which are components of what historians have called the Pinery Feeder complex, including: the Pinery Dam remnant, the Brecksville Canal Diversion Dam (SUM-3253-01), the Brecksville Feeder Headgate (SUM-3246-01) and Lock 36 (HS-118; SUM-3252-01). Remaining resources are located within the Indirect APE downstream.

### 3.4.5 Ohio and Erie Canal Contributing Elements in the Direct APE

*Canal Prism*. The canal prism (HS-100) located within both the Direct and Indirect APE was recorded for several different inventories because it serves to unify the contributing elements along its course. The portion of the canal prism within the Direct APE that runs south from below the Brecksville-Northfield High Level Bridge (SR 82) in Summit County was recorded for the Ohio Historic Inventory (OHI; SUM-3255-01) and is a contributing element to the NRHP thematic resource and the CLI. Similarly, discrete but contiguous sections of the canal property are included in the LCS. The three-mile-long Segment 36 of the canal prism, that runs north from the Brecksville-Northfield High Level Bridge (SR 82) into the Indirect APE and on to Fitzwater Road, including both Locks 36 and 37, is on the LCS (HS-119) and is considered a contributing element in good condition to both the NRHP listing and the CLI. The watered portion of the canal from Lock 37 north to the northern boundary of CUVA within the Indirect APE is also designated as an NHL. Canal Segment 37A (HS-122) from Lock 37 to the rebuilt the Tinkers Creek Aqueduct, Segment 37B from Tinkers Creek to Lock 38 (HS-124) and Segment 38 from Lock 38 to Lock 39 (HS-127) are all listed in the LCS, are contributing elements to the NRHP thematic resources and are included in the NHL designation.

*Pinery Feeder*. Soon after completion of the Ohio & Erie Canal through Pinery Narrows in 1825, low water levels necessitated the construction of dam and canal feeder system at the small falls on of the Cuyahoga River between Brecksville and Northfield Townships (Tamburro 2003). The Pinery Feeder Canal was originally constructed in 1827 to supplement the original canal design. The feeder complex consisted of a dam, feeder channel and a gate. The original diversion dam, called the Pinery Dam, was built of wooden timbers bolted to the river bedrock and stacked on top of one another to form a rock filled V-shape dam that pointed upstream and diverted river water through the control gate into the feeder channel and canal. The canal gate regulated the water flow and could block the flow to drain this section of the canal for maintenance. Portions of the feeder dam were rebuilt in 1857 and 1875 and its maintenance was a constant concern. In 1902, the Pinery Dam was raised one foot in height to divert additional water into a relic canal channel that was rebuilt by the State of Ohio between 1902 and 1909 (Tamburro 2003).

The Pinery Dam was an important element of the river landscape and ecology until the 1952 construction of the modern Brecksville Canal Diversion Dam. Construction drawings of the modern concrete dam indicated that the wooden crib dam was still intact and was to be breeched to clear the way for the construction of the newer dam and the remnant was inundated by the higher water level of the new impoundment. Working in consultation with NPS, University of Akron conducted a Ground Penetrating Radar (GPR) study of the dam pool in August 2010 that located and mapped the extant portion of the Pinery Dam along with what likely

represents the actual parts of the crib structure (Bates and Peck 2010). MWAC archeologists have found that, based on existing information, the Pinery Dam should be considered significant and eligible for listing on the NRHP. MWAC recommended further documentation of the resource while it is still fully submerged if possible, or quickly after it is exposed to the air, since the wooden structure is only stable when submerged.

*Brecksville Canal Diversion Dam.* The Brecksville Canal Diversion Dam is a well-known local landmark that continues to feed water into the Canal. Built in 1952 as part of a much larger industrial water system, the 183 ft. long and nearly 8 ft. high Brecksville Canal Diversion Dam and feeder was an essential component of the American Steel and Wire Company (AS&W) manufacturing operation located six miles to north of the dam on the industrial flats below Cuyahoga Heights. AS&W built the existing dam and gate to supply water to the longest remaining watered section of the Ohio & Erie Canal, not in the interest resource preservation, but as an important part of the steel production process. Under the subsequent hydraulic lease from the State of Ohio, the maintenance the diversion dam, canal and associated structures had been the responsibility of the steel company, which had regularly dredged the canal channel to ensure there was no disruption of the water supply (Tamburro 2003). Changes in steel making technology eventually made the canal-borne water unnecessary, so when the lease to AS&W expired, the state of Ohio transferred the Ohio & Erie Canal lands to NPS in 1988. Individual structures, including the Pinery Dam remnant, the feeder gates and the Canal Diversion Dam remained in the ownership of the state of Ohio.

In 2006, professional historians completed a detailed NRHP eligibility assessment of the Brecksville Canal Diversion Dam complex. The assessment concluded that the modern dam was not eligible for the NRHP based on a lack of significant historical association, specifically in its association with late history of the Ohio & Erie Canal and later history of the AS&W Cuyahoga Works water supply system. Furthermore, they found that there is no association with important historical persons, no significance as a common functional concrete low-head fixed crest dam of the early 1950's and no potential to yield further information (Hampton and Kenny, 2006). The study noted that NPS has repaired the concrete structure, gates and walkway.

Located outside the park property and therefore excluded from the LCS, the Brecksville Canal Diversion Dam was recorded for the OHI (SUM-3253-01) and is been considered by the CLI to be contributing element to the landscape in excellent condition, in spite of its modern construction and development well outside of the Ohio & Erie Canal's defined period of significance. The feeder complex, comprised of the Brecksville Feeder Head Gate (SUM-3246-01), Brecksville Feeder (SUM-3254-1) and the Brecksville Canal Diversion Dam, is located approximately 120 ft. north (downstream) of the original Pinery Dam. Based on the results of a well-documented historical investigation, NPS considered the Brecksville Dam Feeder Complex, consisting of the dam, head gates and canal feeder channel, as a significant cultural landscape of the Ohio & Erie Canal, in addition to recommending additional work to identify and define the earlier Pinery Dam (Tamburro 2003). Brecksville Canal Diversion Dam Feeder Head Gate and Brecksville Feeder are not listed in the LCS, NRHP and are not within the boundaries of an NRHP district. However, as the structures are considered in the CLI as contributing elements to the canal landscape, they are also considered by NPS to be historic properties as part of the larger canal landscape.

*Lock 36 (Pinery Lock and Spillway).* In contrast, feeder guard-lock Lock 36 (Pinery Lock and Spillway) is considered a historic property, but is considered a noncontributing deteriorated element to the CLI landscape. The lock remnant and spillway, highly altered and site of a modern pedestrian bridge and interpretive sign, was recorded for the OHI (SUM-3252-01) and was included in the 1976 NRHP Thematic Resource nomination (Mendinghall 1976). Lock 36 and associated spillway, damaged during the construction of the Northfield-Brecksville High Level Bridge, are considered NRHP-eligible by virtue of its inclusion on the park's LCS (HS-118).

### 3.4.6 Ohio and Erie Canal Contributing Elements in the Indirect APE

There are 18 previously recorded resources located exclusively within the Indirect APE. The Indirect APE includes three downstream segments of the Ohio & Erie Canal (Segments 37 A, 37 B and 38) that may be affected by changes to the watering of the canal along these three segments; other resources include 13 other structures and 2 buildings. Four of the resources (two buildings, two locks) were individually listed in the NRHP and one has been substantially modified (the Tinker's Creek Aqueduct) when a portion of the resource was demolished and reconstructed of modern materials; the original sandstone pylons remain. The resources are described below, with related resources described together.

*Mudcatcher at Galley Run.* The Mudcatcher at Gallery Run, located 0.25 miles north of the Brecksville Canal Diversion Dam in Sagamore Hills, Summit County, is located on the east side of the canal. This partially collapsed sandstone structure restrained sediment from the steep gradient of Gallery Run from entering the canal. Included on the park's LCS (HS-132) and recorded for the OHI (SUM-3251-01), the structure was not included in the Ohio & Erie Canal NRHP nominations but is NRHP-eligible by virtue of its inclusion in the LCS. The structure is listed in the CLI as a contributing element in excellent condition.

*Canal Floodgate and Wasteway.* The Canal Floodgate and Wasteway are two geographically and functionally related elements of the canal landscape located to the west of Canal Road and east of a prominent bend in the Cuyahoga River. The structures, which are 140 ft. apart, are located 2.5 miles south of Lock 37 in Independence, Cuyahoga County. Each was individually recorded for the OHI (Floodgate CUY-6535-19; Wasteway CUY-6533-19). They are eligible for the NRHP by virtue of their inclusion in the park's LCS (HS-131). They are included in the CLI as a single contributing element in deteriorated condition.

*Sagamore Creek Culvert.* The Sagamore Creek Culvert, located in Valley View, was not original to the canal, having been built in 1892, rebuilt in 1914 and replaced in 2009. The structure has been recorded for the Ohio Historic Inventory (CUY-6534-19) and is eligible for the NRHP by virtue of its inclusion in the park's LCS. The culvert remains a contributing element to the NRHP Thematic Resource and is a contributing element to the CLI.

*Lock 37 and Spillway.* Lock 37 (which also known as 14 Mile Lock) and its associated spillway have been the subject of several designations because it is closely associated with the adjacent Alexander's Grist Mill. Located south of Fitzwater Road in Valley View, Cuyahoga County, the structure was recorded for the Ohio Historic Inventory (CUY-463-19) and it was included in the park's LCS (HS-121 and HS-121A). Lock 37 and its spillway are individually listed in the NRHP under Criterion A and C and are included as a contributing element to the original Ohio and Erie Canal NRHP listing and subsequent thematic resource relisting. It is a part of the NHL. The lock and spillway are also considered a significant contributing element to the CLI in good/fair condition.

*Alexander's Grist Mill.* Alexander's Grist Mill (Alexander's Mill) is located at Lock No. 37 on the Ohio & Erie Canal in Valley View, Cuyahoga County. The mill is the last surviving gristmill in Cuyahoga County. After 1900, it was re-equipped as a feed mill, reflecting changes in the flour and feed milling industries. It continued to use waterpower until 1970 (HAER 1986). The mill's waterpower system, including the head gates and turbines, is still in place and the water in the canal retains an important part of the property's interpretation. Widely recognized as a local landmark, Alexander's Grist Mill was recorded for the OHI (CUY-458-19) and was recorded in great detailed for the HAER (OH-58). Not owned by CUVA, the mill is not included in the park's LCS. Individually listed in the NRHP (NR 79000298) for its architectural and associative significance, the property

was important to the early NRHP designation and its subsequent expansion. It is included in the NHL. The mill is also considered a contributing element to the CLI in excellent condition.

*Tinker's Creek Aqueduct.* The reconstructed Tinker's Creek Aqueduct is located 100 ft. southwest of Tinker's Creek in Valley View, Cuyahoga County. The 1845 structure, rebuilt in 1905, was again rebuilt in 2007 with a new deck resting on its historic pylons and abutments. Long a well-known local landmark, the aqueduct was recorded for the OHI (CUY-462-19) and is included in the park's LCS (HS-123), in spite of its reconstruction with modern materials. A focal point of the original NRHP designation and subsequent expansion, the aqueduct was also individually listed in the NRHP (NR 79000296), in addition to being a contributing element to the district designations and the NHL. Considered a contributing element to the CLI in deteriorated condition even after its reconstruction in 2007, the current structure is a mixture of modern and historic elements.

*Lock 38 and Spillway.* Lock 38 and its associated spillway are located west of Canal Road in Valley View, Cuyahoga County, adjacent to the Lock Tender's House and Inn, which serves as the Canal Exploration Center. These thematically and functionally related structures, dating from 1825 and rebuilt in 1905, were recorded for the OHI (CUY-461-19) and are listed in the parks LCS (HS-126 and HS-126A). Although rebuilt in 1905, the intact condition of the lock and its prominent location led to its detailed recordation for the HAER (HEAR OH-59-C) and its rehabilitation as working lock in 1992 (HAER 1988a). NPS rehabilitated the canal lock to operate in a watered condition and water is considered an important interpretive amenity, allowing for public demonstrations of the lock's function and use.

*Lock Tender's House and Inn (Canal Exploration Center).* The formerly known Lock Tender's House and Inn, now the Canal Exploration Center is a Greek Revival house and commercial structure. The building relates to the adjacent Lock 38, west of Canal Road in Valley View, Cuyahoga County. A prominent local landmark, the building was recorded for the OHI (CUY-438-19) in 1976 and was included in the park's LCS (HS-125). Situated on the watered portion of the Ohio & Erie Canal, the building is individually listed in the NRHP (NR 79000293) and it was included as a contributing resource in the initial NRHP nomination. It was included in the subsequent expansion of the historic district and is an important part of the NHL. The building is also a contributing element to the CLI in excellent condition.

*Culverts (Sta. 505 and Sta. 478+90).* Two culverts carry the canal over minor watercourses. The first canal culvert is located 50 ft. north of Schreiber Road in Valley View, Cuyahoga County. Recorded for the OHI (CUY-6537-19), it is a contributing element of the NHL portion of the canal. The second culvert, located 120 ft. south of Stone Road in Valley View in Cuyahoga County, is also a contributing element to the NHL portion of the canal. Although neither culvert was including in the park's LCS, both are considered significant under Criterion A and C for their architectural and associative significance. Both culverts are considered as contributing elements to the CLI in good/fair condition, although replaced in 2005.

*Lock 39 Wasteway.* This wasteway consists of a waste weir and spillway located south of Lock 39 in Valley View, Cuyahoga County. Recorded for the OHI (CUY-6282-19) and included in the park's LCS (HS-129), this 1826 structure was rebuilt in 1905 and abandoned in 1913. It is a contributing element to the NHL, but is not included in the park's LCS. Considered significant for its architectural and historical associations, the structure is a contributing structure to the CLI in a deteriorated condition.

*Lock 39 (11 Mile Lock) and Spillway.* Lock 39 and its associated spillway are located near the northern boundary of CUVA. They are the northernmost contributing elements within the APE. The lock, built in 1826 and rebuilt in 1905, was recorded for the OHI in 1976 (CUY-460-19) and is included in the park's LCS (HS-128). The lock was also recorded for the HAER (OH-59-D). The spillway structure was not recorded individually for the OHI,

but was included in the park's LCS (HS-128A). Both structures are contributing elements to the original NRHP designation and the NHL (HAER 1988b). Both structures are considered contributing elements to the CLI in good/fair condition

### 3.4.7 Cultural Landscape

Recognized as a foundational cultural resource of park, the Ohio & Erie Canal was given the preeminent place in the Parks HSS and its designation (HS-100) reflects its importance to CUVA. Originally listed in the NRHP as a noncontiguous historic district, three sections of the canal were later relisted as broader NRHP thematic resource under Criteria A and C for its association with the development of the larger transportation system and for the engineering accomplishment of its construction, maintenance and use (NR 66000607). The NRHP period of significance spans the time from its original construction in 1925 through its peak to its near abandonment following the damaging 1913 flood. Although much of the material character of the Brecksville Canal Diversion Dam, Pinery Feeder and watered portion of the canal are also associated with its modern industrial use as water supply conduit, the portion of canal north of the dam retains its integrity of location, design, feeling and association and remains a NRHP resource. A 4-mile long portion of the canal including Lock 37 and Alexander's Grist Mill is a nationally significant NHL.

The designated historic property associated with the Ohio & Erie Canal has grown over time. The historic property boundary as described in the NRHP documentation was initially limited to the a corridor extending along the length of the canal prism at a distance of 40 ft. from the centerline on the towpath side and a distance of 30 ft. on the opposite side. This boundary also included the whole of any contributing features including locks and weirs, as well as the individually NRHP-eligible structures the Lock Tender's House and the Alexander's Mill. The historic property boundary of the canal as defined by the CLI is even more expansive. The CLI captures the entire length of the canal corridor through the park and the entire spectrum of associated resources, all considered by NPS to be eligible for the NRHP.

When viewed at this broader landscape scale, the assemblage of resources associated with the canal that are located within the APE is significant and retains integrity. Some structures have been substantially altered by modern construction or rehabilitation (i.e., Lock 36; Tinker's Creek Aqueduct; several culverts) and the broad historic property boundary has been subject to many modern intrusions including roadways, bridges and pipeline crossings. Some associated buildings and structures have deteriorated due to time and maintenance deferral.

The CLI considered the Ohio & Erie Canal cultural landscape to be in fair condition at the larger landscape scale. The Cultural Landscapes Inventory Professional Procedures Guide (CLIPP) defines a landscape in fair condition as a landscape that shows clear evidence of minor disturbances and deterioration. However, in total, the buildings, structures and objects that are associated with the canal and are located in the APE retain integrity of location, design, materials, workmanship and association. The aspects of setting and feeling have been impaired somewhat due to the construction of modern highways and roadways, which has negatively affected several portions of the canal, but sections of the canal corridor have intact setting that evokes a feeling. Although not explicitly named as a contributing element, the water in the watered sections helps to convey the canal's significance. The continued existence and interpretive value of the watered section of the Ohio & Erie Canal enhances the canal landscape by conveying a sense of time and place, particularly within the portion of the Pinery Narrows that is within APE.

### 3.5 Management of Project Area

NPS manages the land portion of the project area and shares concurrent jurisdiction with local law enforcement entities. Within the project area, NPS is also responsible for the maintenance of the Towpath Trail, railroad tracks and associated trailhead facilities. The non-profit park partner, Cuyahoga Valley Scenic Railroad, operates the Scenic Railway. No maintenance of the Canal Diversion Dam or care of the remaining submerged portion of the Pinery Dam is conducted by ODNR. Currently, there are no formal long-term management agreements among the state of Ohio, Ohio and Erie Canalway partners, Cleveland Metroparks, and NPS regarding the various components of the project area (feeder gates, etc.).

## Chapter 4: Environmental Consequences

### 4.1 Introduction

This section analyzes the potential effects of both adverse and beneficial impacts of each alternative on the affected environment topics described in Chapter 3. The analysis includes effects of each individual alternative and compares the effects to other alternatives. The no action alternative (Alternative 1) compares the effects of current actions and management direction with that proposed in the action alternatives. A comparative summary of impacts by alternatives is in Table 1, Chapter 2.

**Methodology and Assumptions**. This describes the methods used to predict the impact. The methods utilized are the best available at the time of this document and based upon recent studies, literature review, existing information on impact topics, and the best professional judgment of the Ohio EPA, Park staff and other agency stakeholders.

**Impact Indicators**. As directed by NEPA and NPS Director's Order 12, consideration should include context, intensity, duration and timing as described below.

**Context**. Context is the affected environment within which an impact would occur. Affected environment can be site-specific, which is defined as the project area; local, which is defined as the park boundary; regional, which is defined as within 20 miles of the park boundary; or global which is defined as extending beyond 20 miles of the park boundary.

**Intensity.** This refers to the severity of the impact. Impacts may be either beneficial or adverse. Beneficial impacts are those that involve a positive change that moves the resource toward a desired condition. Adverse impacts involve a change that moves the resource away from a desired condition or detracts from its appearance and condition.

**Duration**. Duration refers to the time over which the effects of an impact persist. Duration of impacts can be short-term or long-term.

- Short-term – impacts last for less than one year, often quite less. This would include any temporary impacts such as construction associated with the alternatives
- Long-term – impacts last for more than one year. This would include impacts that are permanent.

**Types of Impacts**. As outlined in NPS Director's Order 12, the following categories of impacts need to be considered and analyzed.

- Direct effects. (40 CFR 1508.8) Direct effects are caused by the alternatives at the same time and in the same place as the action.
- Indirect effects. (40 CFR 1508.8) Indirect effects are impacts caused by the alternatives that occur later in time or farther in distance than the action.
- Cumulative effects (40 CFR 1508.7) Cumulative effects are "additive" impacts to a particular resource and include impacts of actions in the past, present and the reasonable near future. The actions or projects that were identified and analyzed as part of cumulative effects are listed below.

### 4.1.1 Cumulative Impact Scenario and Analysis Methodology

NEPA regulations administered by the Council of Environmental Quality require the assessment of cumulative impacts in the planning process for federal projects. "Cumulative impact" as defined in Section 1508.7 of NEPA, "is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Cumulative impacts are analyzed for all alternatives under each impact topic. The following plans, projects or actions are considered in the cumulative impact analysis:

- In 1825, the completion of the Ohio & Erie Canal through Pinery Narrows necessitated the construction of the Pinery Dam and canal feeder system at the small falls on the river between Brecksville and Northfield Townships due to low water in the canal (Tamburro 2003).
- The Pinery Feeder Canal was originally constructed in 1827 to supplement the original canal design. The feeder complex consisted of a dam, feeder channel, and a gate.
- In 1952, the modern Canal Diversion Dam was constructed to provide water via the canal for industrial use downstream.
- *The Cuyahoga Remedial Action Plan* lead by the Ohio EPA and is working to "de-list" the Cuyahoga River as an AOC by eliminating 14 beneficial use impairments, including dams.
- *The 2000 Ohio & Erie Canal Heritage Corridor Management Plan* outlines the management goals and concepts for the 110-mile long Heritage Corridor. CUVA lies within the Heritage Corridor.
- *The 2003 Lower Cuyahoga River Total Maximum Daily Load* serves as a planning tool and potential starting point for restoration or protection activities with the ultimate goal of attaining or maintaining water quality standards.
- *The 2004 Final Programmatic EA for River Bank Management* outlines proactive and holistic management strategies for riverbank stabilization that incorporates both historical preservation mandates and its environmental objectives.
- *The 2012 Cuyahoga Valley National Park Trail Management Plan* provides a blueprint for CUVA that guides the expansion, restoration, management, and operation of the trail system.

- *Cuyahoga River Water Trail Partners* Group is working in conjunction with NPS Rivers,Trails and Conservation Assistance (RTCA) program on the development of a strategy for designation of the Cuyahoga River as a state water trail and potentially a national recreation water trail, under NPS National Recreation Trails program.
- *The CUVA River Use Strategy Team* is currently developing strategies to protect and enhance river values, while ensuring that CUVA provides adequate and safe infrastructure for staff and visitors for recreational river use.
- *Previous Dam Removals*. The successful removal of dams within the Cuyahoga River upstream in the cities of Cuyahoga Falls, Kent and Monroe Falls are well documented.
- *The 2013 Cuyahoga Valley National Park Foundations Document* serves as the underlying guidance for all management and planning decisions. The Cuyahoga River Ecosystem is identified as a fundamental resource value of CUVA.
- *The 2014 City of Akron's Integrated Plan* outlines how the City plans to provide effective and efficient wastewater and storm water management in order to reduce the number of sewer overflows into the Cuyahoga River that contributes to the degradation of water quality.
- *The Northeast Ohio Regional Sewer District's (NEORSD)* regional storm water management program addresses problems related to storm water runoff from hard surfaces that contribute to stream flooding, erosion and water quality issues that cross community boundaries.
- *The Cuyahoga Valley National Park Strategic Action Plan, (2017-2021)* guides CUVA's priority focus for the next five years by creating a whole park vision for change that elevates the river and its natural and cultural features as the most important and iconic resources for park staff, visitors and stakeholders. The river's transformation into a thriving natural system and vibrant source of community is to be acknowledged by NPS and publicly recognized as an example of excellence for human, urban and ecosystem renewal.

## 4.2 Fluvial Geomorphology

### 4.2.1 Relationship to Erosion, Stream Bank Stabilization and Sediment Transport

*Erosion/Stream bank Stabilization/Sediment Transport*. Stream banks along the Cuyahoga River are susceptible to erosion due to the soil types and gradient of the conditions within the area.

### 4.2.2 Methodology

NPS regulations and NPS Management Policies provide guidance on geologic resources and processes, including natural river processes. The specific process of interest under this EA is fluvial geomorphology, referred to as natural river processes in this document. Based on the proposed alternatives, Park civil engineers made evaluations to address current and future implications for river processes within the project area.

### 4.2.3 Impacts of the Alternatives

#### 4.2.3.1 Impacts of Alternative 1 – No Action

**Direct and Indirect Impacts**

The Final Programmatic EA for Riverbank Management categorized one site within the project area as "moderate" for encroachment risk and susceptibility to bank erosion. This area has a history of bank stabilization problems and is located within the dam pool on the east bank of the Cuyahoga River upstream of the Chippewa Creek confluence. The banks are prone to slumping due to highly erodible soils that become saturated during high flow events and fail during the subsequent drawdowns. These conditions will be on going in the No Action Alternative. The stream dynamic will remain unaffected and unchanged. Sediment will continue to be trapped behind the dam, causing build up in front of the canal feeder gates. Periodic dredging at the feeder gates will continue to allow better water flow into the canal.

**Cumulative Impacts**

Soon after completion of the Ohio & Erie Canal through Pinery Narrows in 1825, low water levels necessitated the construction of the Pinery Dam and canal feeder system at the small falls on the river between Brecksville and Northfield Townships (Tamburro 2003). The Pinery Feeder Canal was originally constructed in 1827 to supplement the original canal design. The feeder complex consisted of a dam, feeder channel, and a gate. The canal gate regulated the water flow and could block the flow to drain this section of the canal for maintenance (i.e. dredging).

In 1952, the modern Canal Diversion Dam was constructed. Construction drawings of the modern concrete dam indicated that the wooden crib dam was still intact and was breeched to clear the way for the construction of the newer dam and the rest inundated by the higher water level of the new impoundment following completion of the project (NPS 1984). These past activities had and continue to have an impact on bank stabilization as well as sediment loading that impact the area today.

Surrounding urban and suburban development and related storm water runoff contribute to flooding of the Cuyahoga River. As a result, erosion and bank failures are a constant concern. Tributaries of the river have the potential to threaten the Towpath Trail and Valley Railway as well as other cultural, historic and recreational resources some of which are located within the floodplain. The river, though often confined by the infrastructure of the railroad tracks and Towpath Trail, causes lateral erosion on the outside banks. Unstable slopes are common and most of the valley floor is subject to flooding.

Within the project area, one site is considered "moderate" for encroachment risk (10-20 foot distance from the Towpath Trail or Valley Railway to top of riverbank) and susceptibility to bank erosion (0.5 to 1.0 foot/year of bank lost along a given plane).

Under Alternative 1, no new activities will be taking place in the project area. As bank erosion continues to threaten the historic Ohio & Erie Canal Towpath Trail, mitigation with stabilization projects will be necessary to protect the resources. With these adverse effects, conditions will continue to worsen over time.

#### 4.2.3.2 Impacts of Alternative 2

**Direct and Indirect Impacts**

The fluvial geologic resources within the project area that have the potential to be affected by Alternative 2 are focused on the stabilization of the riverbank soils and the release of any impounded sediment.

*Removal of both dams*.

According to the HEC-RAS model, very little additional bank width will be exposed by the anticipated drop in water surface elevation for most of the river and Chippewa Creek. The greatest bank width exposed will occur immediately upstream of the dam (up to 30 feet), where the water surface elevation will drop the most and the banks are less steep. In areas of steeper banks, slope stabilization or revegetation may be needed. Results of the hydraulic analysis indicated that a scour analysis for the three bridges (Station Road Bridge, Chippewa Creek Railroad Bridge and the Riverview Road Bridge over Chippewa Creek) within the project area was not necessary. Bridge scour is the removal of sediment and rocks from around bridge abutments caused by swiftly moving water that can cause scour compromising the integrity of the structure (Arcadis 2007).

The Brecksville-Northfield High Level Bridge was not analyzed as a bridge for the hydraulic model; however, the piers within the floodplain were modeled to represent its impact. The Ohio Department of Transportation (ODOT) reviewed the HEC-RAS analysis and in a letter, dated 7 March 2007, determined that the proposed dam removal would have minimal impacts on the Brecksville-Northfield High Level Bridge and, therefore had no objection to the project (ODOT 2007).

Potential head cutting and stream bank erosion because of the dam pool water being lowered could indirectly affect adjacent tributaries. There is a potential indirect impact to the east bank of the Cuyahoga River upstream of the Chippewa Creek confluence that is within the dam pool that has a history of bank stability problems. The banks are prone to slumping due to highly erodible soils that become saturated during high flow events and fail during the subsequent drawdowns. Based on recent studies, there is little to no sediment accumulation from the

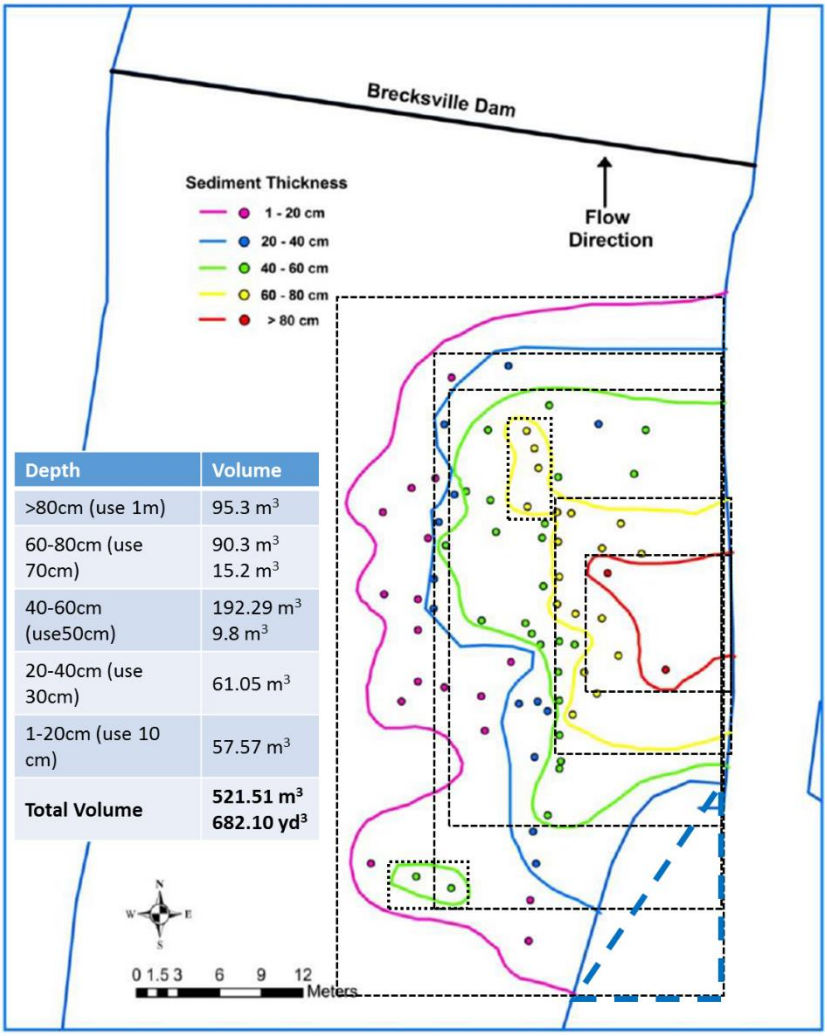


Figure 12. Dam pool sediment volume

center of the river channel to the west bank of the bedrock streambed floor. From the center of the river channel to the east bank, there is muddy fluvial sediment that has accumulated above the bedrock, from a minimum of 8 inches to greater than 32 inches in depth near the feeder gate (Bates and Peck 2010, and Figure 12). Following dam removal, there will be a direct, slow release of sediment that has been trapped by the dam. The sediment will be transported downstream, increasing sediment loading and sediment-associated nutrients, causing an immediate short-term effect. An approximate maximum value of 682.1 $yd^3$ or 947 tons exist in the dam pool around the feeder gates based on the Bates and Peck report. This volume may be better understood in the context of sediment transport at the Cuyahoga River Independence gage. Total suspended solids concentrations have been monitored almost daily by Heidelberg University at this location since November 1981. Based on this data set (using the complete years 1982-2015) the Cuyahoga River transported over 947 tons of sediment daily past the gage 17% of the monitored days or just over 8 weeks per year. This transport is mediated by rain-influenced flow with a maximum-recorded value of 159,610 tons. Each year the river has transported on average 220,497 tons past the gage as measured by water column total suspended solids. The volume of material within the Canal Diversion Dam is negligible in comparison to the overall movement of material in the Cuyahoga River.

From a regulatory standpoint, results from the Ohio EPA's Laboratory Organic Analysis Data Report on sediment samples collected and analyzed from the dam pool in 2009 show no cause for concern of contaminated sediments being released downstream (Ohio EPA 2009). Additional sediment samples will be collected for analysis in 2017. The 2009 data is now over 7 years old and needs to be updated.

Over the short term, construction activities have the potential to increase erosion through heavy vehicle use, excavation of the canal prism and grading. Small amounts of sediment will be released from the dam pool and move downstream. With the lowering or modification of the Canal Diversion Dam, water levels in the dam pool will be lower, exposing some banks upstream of the dam. Some of these banks may require bank stabilization measures to insure erosion does not affect cultural resources.

**Cumulative Impacts**

Similar to the No Action Alternative, past activities had and continue to have an impact on bank stabilization as well as sediment loading that impact the area today. Surrounding urban and suburban development and storm water runoff continue to cause erosion and bank failure concern along the River. Similarly, although the river is the primary source of the erosion and bank failure concerns, its tributaries also have the potential to threaten the Towpath Trail and Valley Railway as well as other cultural, historic, and recreational resources. Though often confined by the infrastructure of the railroad tracks and Towpath Trail, the river causes lateral erosion on the outside banks. Unstable slopes are common and most of the valley floor is subject to flooding.

As discussed in Chapter 3, resources within the project area that may be affected by the proposed actions are focused on the stabilization of the riverbank soils and nearby structures, and the deposition of sediment into the river channel. Since the late 1990's CUVA has been monitoring river processes, including erosion of riverbanks. In 2004, CUVA addressed these issues of riverbank management for the protection of the historic, cultural and recreational resources from the erosional effects of the river and its tributaries by preparing a Programmatic EA for Riverbank Management of the Cuyahoga River. This Riverbank Management Program was developed to approach stabilization with a proactive and holistic management strategy that incorporates both CUVA's historical mandates and its natural resource objectives.

The Towpath Trail and the Valley Railway are the most significant linear recreational and cultural features within CUVA and occupy the same valley corridor as the river. These fabricated features and steep slopes confine the river by affecting its natural meandering into the floodplain, thus creating stabilization and erosion issues throughout the park. Bank failure is prevalent on many reaches of the river.

On-going, long-term monitoring programs for riverbank management have categorized sites as high, moderate, and low priority. Within the project area one site is considered "moderate" for encroachment risk (10-20 ft. distance from the Towpath Trail or Valley Railway to top of riverbank) and susceptibility to bank erosion (0.5 to 1.0 foot per year of bank lost along a given plane). Over the long-term, the river will not be free flowing due to the installation of the modified dam structure. The river will be impounded by the dam, which will affect the natural substrate, riparian features, channel form and function. While NPS is required to allow natural processes to proceed unimpeded, it may interrupt those processes to protect other resources or for safety reasons.

Overall, for Alternative 2, short-term impacts would result from required project activity in the river resulting in some temporary increases in suspended sediment in the river. Removing both dams would release the small amount of stored sediment. Suspended sediments would be washed out immediately into the river with the majority of impact ending within six months to a year. Four dam removals from 2004-2014 within the Cuyahoga watershed have shown the river recovers from sediment events within a year or less (Ohio EPA 2008). Long-term, the actions proposed under Alternative 2 are not anticipated to have any additional adverse impacts in the river as compared to Alternative 1, with the exception of the dredging of the canal prism. The dredging of the canal prism will require on-going maintenance to ensure adequate flow of water from the river into the canal. This is considered long-term and potentially adverse as it can increase bank stabilization and erosion problems along the canal.

#### 4.2.3.3 Impacts of Alternative 3 (Proposed Action)

**Direct and Indirect Impacts**

All direct and indirect impacts are similar to Alternative 2 with the exception of the installation of a modified structure and a minimal amount of canal dredging for maintenance of structures. Alternative 3 has the installation of the pump to divert water into the canal.

**Cumulative Impacts**

Cumulative impacts are similar to Alternative 2 with the addition of the following.

Upon removal of the dam, the river system will adjust its width, depth and slope so that it can move laterally through bank erosion and gravel bar building in areas not confined by the infrastructure of the railroad tracks and Towpath Trail. Over the long-term, the river will be free flowing creating a more natural substrate, riparian features, channel form and function.

Under Alternative 3, short-term impacts from the project activity (initial dam removal and construction of pump) would result in a slight increase in sediment release and total suspended solids. It is reasonable to anticipate that future actions in the project area will continue to include bank stabilization activities along the Towpath Trail and Valley Railway. CUVA staff would continue a minimal amount of dredging for maintenance of canal structures.

In the long-term, the actions proposed under Alternative 3 would result in long-term beneficial impacts to stream flow characteristics. There is no anticipation of upstream erosion caused by a headcut at the dam for this project. This is a condition evaluated as part of any dam removal as the consequences may cause additional erosion. In the case of the Canal Diversion Dam, the structure was actually constructed over a bedrock outcropping, as depicted in the c. 1950 photo showing the Pinery Dam (Figure 13). The outcropping is a natural feature currently in the pool and will prevent additional upstream erosion from a headcut.

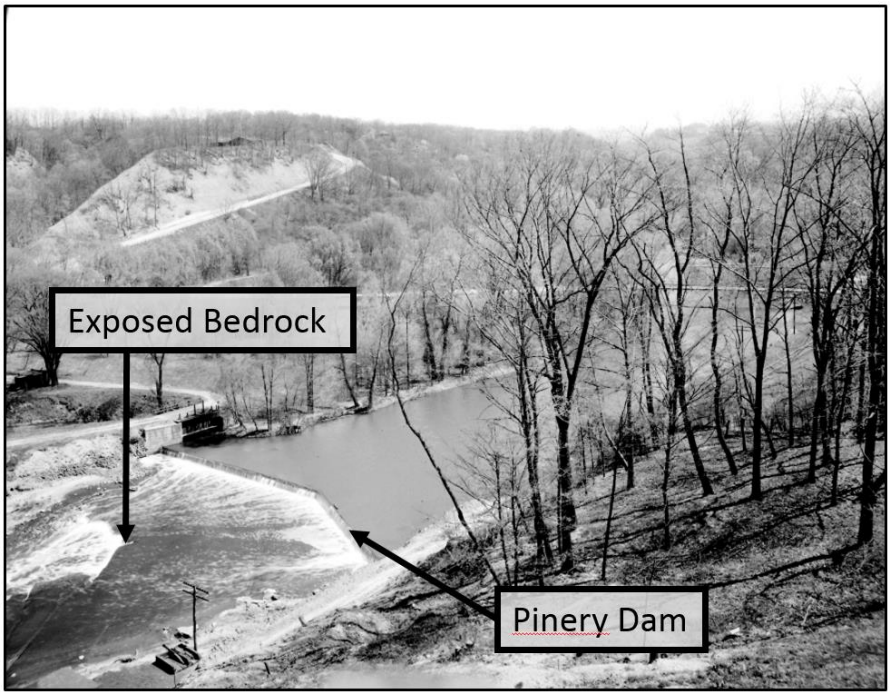


Figure 13. Pinery Dam

## 4.3 Impacts on Water Resources

### 4.3.1 Relationship of Canal Diversion Dam Modification/Removal to Water Quality

The Cuyahoga River serves as the primary water resource within CUVA. Physically removing or modifying physical barriers within the river would have an effect on biological water quality and streamflow characteristics.

### 4.3.2 Methodology

Water quality impacts associated with the alternatives analysis for the Canal Diversion Dam were evaluated using current studies generated for the project; comparisons of quantitative data from the various studies completed over the years, data from recent dam removal projects within the Cuyahoga River watershed; and literature regarding the influences of dams and dam removals on water resources. Information was gathered using established protocols and then compared to standards or targets.

Ohio utilizes biological standards to measure water quality. Analysis of fish and macroinvertebrate communities is done utilizing established methods, scores are generated which can then be compared to biological criteria in Ohio's WQS. Use attainment is a term describing the degree that environmental indicators that are either above or below criteria specified by the Ohio WQS, Ohio Administrative Code (OAC) 3745-1. Three attainment status results are possible – full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the bio criteria. Partial attainment means that one or more of the applicable indices fails to meet the bio criteria. Non-attainment means that none of the applicable indices meets the bio criteria or one of the organism groups reflects very poor or poor performance (Ohio EPA 2008).

### 4.3.3 Impacts of the Alternatives

#### 4.3.3.1 Impacts of Alternative 1 (No Action)

**Direct and Indirect Impacts**

The Canal Diversion Dam and upstream dam pool at river mile 20.7 has been identified by the Ohio EPA as an area in non-attainment of the State of Ohio WQS for fish and macroinvertebrate communities. The Canal Diversion Dam allowing water to be stored in an artificial dam pool/reservoir has altered the natural flow regime of the river and created a condition of non-attainment.

The Ohio & Erie Canal aside from being a significant cultural resource provides natural habitat for fish, turtles, mussels, beaver, otter, and birds. Under the No Action alternative, the canal will remain in a watered state due to the presence of the Canal Diversion Dam.

**Cumulative Impacts**

Over time, the surrounding urban and suburban development has affected the water quality of the Cuyahoga River and its tributaries. The river receives discharges of storm water, combined sewer overflows, and incompletely disinfected wastewater from areas upstream. Storm wastewater is a significant issue within the watershed. Oil and chemical spills and winter road salt runoff are periodic problems. Other suspected contaminants from non-point sources in and around the valley include runoff from pesticides and fertilizers originating from residential areas, golf courses, agricultural fields, and ski slopes. Under Alternative 1, the area upstream of the dam will remain in non-attainment for fish and macroinvertebrate communities in violation of the State of Ohio WQS and the Clean Water Act. The natural flow regime of the river remains altered and the Canal Diversion Dam continues to store water in an artificial pool/reservoir. In addition to the non-attainment status of WQS, the river within the park boundary was listed in the late 1980's as an AOC for the Great Lakes. These AOCs are areas with persistent pollution problems.

#### 4.3.3.2 Impacts of Alternative 2

**Direct and Indirect Impacts**

Under Alternative 2, the modification to the Canal Diversion Dam and the changes to the canal prism by dredging would result in only a partial restoration of natural processes in the river within the project area and may not restore water quality conditions that meet full attainment of Ohio's WQS in a timely manner (Zawiski, pers. comm. 2014). The river would not be free flowing and some portion of the dam pool would remain. Although some ecological improvements to flow and sediment transport may occur from the dam modification, the project area would not be in full attainment. Improvements to the flow regime or changes in the dam pool size and depth may promote the rehabilitation of some native species. Additionally, the potential for migration or movement of certain species within the river may be a direct result under proposed conditions.

A short-term increase in turbidity (cloudy) and total suspended solids (TSS) concentration during dam modification is expected. While both measurements indicate the amount of solids suspended in the water, Ohio EPA and USEPA water quality standards do not exist for these parameters. The levels of turbidity and TSS are expected to be less than those levels currently experienced during heavy rain events. Based on recent Ohio EPA monitoring data from 2013-2014 dam removals upstream in Cuyahoga Falls, turbidity levels return to base condition within one weeks' time (Ohio EPA 2013).

**Cumulative Impacts**

Under Alternative 2, the modification of the Canal Diversion Dam would be less of an impediment than the current structure, providing some ecological benefits, including the return of some naturalized flow and sediment transport. The short term, adverse impacts from turbidity due to construction activity associated with the modification of the dam and canal dredging would be expected to stabilize in less than a year. WQS would likely reach partial attainment status over the long-term.

Overall, Alternative 2 would have a long-term, adverse impact on the project area for water quality. The modification to the dam and the changes to the canal would result in only a partial restoration of the natural process to the project area and meet partial attainment of the Ohio WQS. For further information on water quality, refer to section 3.2.2 of this document.

**4.3.3.3 Impacts of Alternative 3 (Proposed Action)**

**Direct and Indirect Impacts**

Dam removal can have ecological benefits, including the return of a more naturalized flow, temperature regime, and sediment transport to the river system promoting the rehabilitation of native species, while providing for the migration or movement of species within a river.

Water surface elevation downstream of the Canal Feeder Gates will increase slightly after the dam is removed. Therefore, the higher flow rate through this portion of the Cuyahoga River will result in a modestly higher water surface elevation as well. The 0.71-foot increase in water surface elevation for a 100-year event, conducted in the HEC-RAS Study downstream of the dam in the Cuyahoga River represents a slight difference in the location of a drop in the water surface profile.

The profiles conducted in the HEC-RAS Study for the Ohio & Erie Canal show that the dam removal will result in a lower 100-year water surface elevation only upstream to the Station Road Bridge. However, the average water surface elevation will be lowered for nearly two miles upstream (length of existing dam pool) in the Cuyahoga River and to the upstream face of the railroad bridge over Chippewa Creek.

Similar to Alternative 2, disturbances associated with construction equipment would occur and would have a short-term adverse impact on water quality/clarity due to the sediment release during the deconstruction of the dams as well as the construction and installation of the pump.

**Cumulative Impacts**

Similar to the other alternatives the history of surrounding urban and suburban development has affected the water quality of the Cuyahoga River and its tributaries. The river still receives discharges of storm water, combined sewer overflows, and incompletely disinfected wastewater from municipalities immediately upstream of the park boundary. Storm water management is a significant issue within the watershed and especially within highly developed and industrial areas. In addition to direct discharges and storm water runoff, non-point sources of pollution such as runoff from fertilizers and pesticides exist throughout the watershed.

Based on studies of four previously removed dams within the Cuyahoga River watershed, the Ohio EPA has observed stream recovery patterns in the macroinvertebrate communities, followed later by fish abundance and biomass with structural and functional indicators responding last. After dam removals, more instream cover with larger riparian vegetation and larger aquatic macrophyte beds are created. This improvement in habitat ensures the structural and functional integrity of the fish community and subsequently full attainment of Ohio's WQS will be reached in the long-term (Ohio EPA 2008).

Following the dam removal, there will be rehabilitation of native species while providing for the migration or movement of aquatic species within the river. The natural flow fluctuations will result in an increase in the biodiversity and population densities of native aquatic organisms. The changes identified are considered long-term, beneficial impacts for water resources.

Overall, Alternative 3, the full removal of the Canal Diversion Dam with the installation and operation of a pump would have a long-term, beneficial impact on the project area for water quality. The removal of the dam would result in restoration of the natural process resulting in the project area meeting full attainment of the Ohio WQS. The primary intent of this project is to improve water quality for this section of the Cuyahoga River, which would be fully achieved under Alternative 3.

## 4.4 Impacts on Aquatic Wildlife

### 4.4.1 Relationship of Canal Diversion Dam Modification/Removal to Aquatic Wildlife Resources

*Aquatic Wildlife Habitat*. Modifications caused by the proposed action may alter the habitat of the existing aquatic wildlife or create new habitat not currently present.

*Introduction or Proliferation of Exotic Species.* Modifications caused by the proposed action may alter conditions that influence the introduction or change in the presence of non-native wildlife species, notably aquatic species.

### 4.4.2 Methodology

Direct impacts on aquatic habitats were evaluated including habitat loss, degradation, and the potential for aquatic invasive species introduction into the project area. Assembly of information and evaluation was based upon available information on habitats in the park, and discussion with CUVA staff and other agency stakeholders in the fields of wildlife biology, aquatic biology and fisheries management.

### 4.4.3 Impacts of the Alternatives

#### 4.4.3.1 Impacts of Alternative 1 (No Action)

**Direct and Indirect Impacts**

Currently there are 12 aquatic species of fish present in the Canal Diversion Dam pool compared to 25 species below the impoundment. Pollution sensitive species are absent from the dam pool. The dam is the first physical barrier that migrating fishes encounter. Most native fishes cannot "jump" the dam in order to move upstream. The non-native rainbow trout (steelhead) have a tendency to gather just beneath the low head dam and are capable of jumping the dam. The dam is a barrier to all other fish species except during periods of high

rain events where all capable species are able to move upstream of the dam. Additionally, the watered canal serves as a habitat for mussels, fish, and turtles. The potential exists for fish to access the river upstream of the dam via the canal.

**Cumulative Impacts**

The river contains aquatic species typical of the Lake Erie basin river systems; however, its history of urbanization, especially in its lower reaches, undercut its ability to maintain aquatic species that are found in less disturbed river systems within the Lake Erie watershed. As the Lake Erie basin and the river systems that feed into it continue to improve, native species that historically were present in the Cuyahoga River are viable once again. However, Ohio EPA's 2008 survey found 12 species of fish in the Canal Diversion Dam pool compared to 25 species below the impoundment. There were no darters found in the pool compared to three darter species below the dam and four darter species at the upstream end of the dam pool. These findings are typical expectations comparing impounded to free flowing riverine systems. QHEI scores from the most recent Ohio EPA survey in 2008 concluded that the project area scored below 60. Habitat evaluation scores for the river and tributaries should exceed 60 to reach full attainment of Ohio WQS.

In the past, the park has de-watered the canal for maintenance purposes such as bridgework, aqueduct and weir repairs causing an adverse impact to mussel populations. Such work resulted in the development of a Canal De-watering Standard Operating Procedure that mitigates the impacts to mussels by maintaining a minimal water level required for mussel species. De-watering of the canal places mussels in conditions of extreme stress. Mussels are capable of burrowing several centimeters into the sediment to survive for short periods. Lower water levels have drastic effects on water temperature and chemistry, especially in the summer months. Researchers have recommended that it would be beneficial for the mussel population in the canal not to experience a water level less than three feet deep (Smith, et.al 2002).

Improvements in habitat and the biological community resulting from dam removals within the watershed have been well documented within the Cuyahoga River (Tuckerman 2007). Under Alternative 1, the aquatic species and habitat would continue to exist in their current conditions. There would continue to be fewer or no sensitive species of darters in the dam pool. While the Canal Diversion Dam would continue to restrict the movement of aquatic species upstream, it could also provide a barrier (during base flow conditions) to the potential movement of non-native aquatic species that access the river from Lake Erie.

#### 4.4.3.2 Impacts of Alternative 2

**Direct and Indirect Impacts**

Fishes and other aquatic species (e.g. turtles) may benefit from the modification of the Canal Diversion Dam with potential access to upstream sections of the river; as the dam pool reservoir is lowered, some natural habitat such as riffles runs and glides may become established for fish habitat and sensitive species (e.g. darters). Aquatic species including amphibians, mussels and some turtles are sensitive to the size and type of their habitat. With a modification of the dam, non-native aquatic species may also be able to migrate upstream.

The length of canal dredging is expected to extend one-mile down-stream from the feeder gate. Along with the modification of the Canal Diversion Dam, the dredging of the canal is needed to support a gravity feed of water from the river into the canal. Water levels within the canal may fluctuate and become lower (or even dry) at times due to seasonal fluctuations or canal maintenance. Lower levels of water will affect aquatic organisms

such as mussels, and some fishes that cannot escape to deeper waters for survival. Because the canal will require ongoing dredging maintenance after the initial project to maintain gravity feed, it is anticipated that the impacts of dredging will be long-term and adverse, especially if the water levels in the canal are impacted by lower flows in the river.

**Cumulative Impacts**

Under Alternative 2, the cumulative impacts associated with the actions proposed would result in partial restoration of natural processes in the project area that could include the movement of native and aquatic species to the area. With the modification of the dam, a structure will remain in the river creating a dam pool reservoir that is likely to be lower than the existing dam pool. A lower dam pool may allow some natural habitat such as riffles runs and glides to become established for fish habitat and sensitive species (e.g. darters). Depending on the height, a modified dam structure could possibly provide a barrier (during base flow conditions) to the potential movement of non-native aquatic species that access the river from Lake Erie. However, during high flows species can move upstream potentially causing long-term adverse impacts.

Overall, under Alternative 2 impacts to aquatic species from construction activity are expected to be short term and adverse. Modification of the dam structure is anticipated to have long-term, adverse impacts, as it will still pose a barrier to native fish movement and not allow natural processes to restore aquatic habitat within the dam pool to reach full attainment of the biological WQS.

The impacts to aquatic species in the Ohio & Erie Canal have the potential to be long-term and adverse due to seasonal fluctuation of the water level. Past fluctuating water levels due to de-watering or seasonal flows in the canal have placed mussels in conditions of extreme stress. Lower water levels have drastic effects on water temperature and chemistry, especially in the summer months. Maintenance dredging will need to be a long-term practice to maintain the canal in a watered condition.

#### 4.4.3.3 Impacts of Alternative 3 (Proposed Action)

**Direct and Indirect Impacts**

Once the Canal Diversion Dam (and the remnant of the Pinery Dam) is removed, the dam pool reservoir will be lowered and a natural channel would become established providing habitat such as riffles runs and glides for fish and sensitive species (e.g. darters). Any stored sediment would be released slowly during low flow conditions. This process of a slow release of sediment during the removal of the dams has been successful with similar projects upstream and did not have a significant adverse effect on fish or aquatic life attainment status (Ohio EPA 2008). Removal of the dams will remove the physical barrier to all fish species (native/non-native) thereby improving the diversity of native fish throughout the project area and especially within the former dam pool area.

Indirectly with the installation of a pump to divert water into the canal, the Ohio & Erie Canal will remain in a fully watered condition providing water for aquatic species such as mussels, fish and turtles. NPS would continue a minimal level of dredging to maintain canal structures.

**Cumulative Impacts**

The Canal Diversion Dam and upstream dam pool at river mile 20.7 has been identified by the Ohio EPA as an area in non-attainment of State of Ohio WQS for fish and macroinvertebrate communities. The Canal Diversion Dam allowing water to be stored in an artificial dam pool/reservoir has altered the natural flow regime of the river. Removal of the dam will restore river ecology to a condition not seen since 1825-26 through the physical alteration of the former impoundment.

In the long-term, the cumulative impacts associated with the actions proposed under Alternative 3 would result in the restoration of natural processes in the project area, including the movement of both native and non-native aquatic species, and the potential return of riverine mussel species. Several aquatic listed species of concern (sturgeon and muskellunge) have the potential to return as well with habitat improvement. Full attainment of WQS for aquatic life use would be met under this alternative.

## 4.5 Impacts on Cultural Resources

### 4.5.1 Methodology

To determine the number of effects and intensity of impacts to the historic properties, NPS applied the definition of effect to each alternative. An effect is defined as the alteration to the characteristics of a historic property qualifying it for inclusion in, or eligibility for, the NRHP (36 CFR 800.16). Because of the nature of the affected cultural resources and the scale and nature of the undertaking, NPS found that the modification or removal of the Brecksville Canal Diversion Dam, as well as the No Action Alternative, would not affect the Brecksville-Northfield High Level Bridge, the Station Road Bridge, or the Valley Railway.

#### 4.5.1.1 Determination of Effect

*Brecksville-Northfield High Level Bridge.* The engineering significance of the Brecksville-Northfield High Level Bridge is conveyed through the bridge's location, design, materials and workmanship, which is reflected in the historic property boundary that encompasses the bridge and its immediate setting. Alternatives 2 and 3 would change the setting to a small degree through modification or removal of the dams. Alternative 3 also involves the construction of a new pump house; however, this would in not detract from the ability of material characteristics to convey the significance of the structure.

*Station Road Bridge*. Like the High Level Bridge, the significance of the Station Road Bridge is reflected in its material characteristics: the location, design, materials and workmanship of the bridge and its abutments, which is encompassed by a discrete historic property boundary. The setting, although altered through the establishment of CUVA, construction of the modern dam and changes in the transportation system represented by the High Level Bridge, helps convey its historical associations by illustrating the changes to transportation over time. The removal or alteration of the Brecksville Canal Diversion Dam will alter the setting by removing a modern intrusion, but will not detract from the significance of the 1882 Pratt Whipple Truss Bridge.

*Valley Railway Historic District*. The location, design, setting and association are the significant aspects of the Valley Railway Historic District, which includes the bed, ballast, ties and rails within a variable right-of-way that serves as the historic property boundary. The railroad is active and requires constant maintenance and upkeep. The materials and workmanship, as well as some of the design, are of very recent vintage. Although

subject to threats from the migration of the river channel, as discussed above, due to its significance expressed through its location and its associations, the modification or removal of the Brecksville Canal Diversion Dam will not result in a change to any of the Valley Railway Historic District's contributing elements.

*Ohio & Erie Canal*. The scale and nature of the NRHP-eligible Ohio & Erie Canal Landscape as defined by the CLI greatly expanded the qualities that constitute its significance to include the entire spectrum of associated resources, including some beyond the 70-foot wide corridor defined in early NRHP documentation. Although the CLI noted the deteriorating condition of the canal landscape as a threat to the resource, the no action alternative would not measurably change this condition for better or for worse and would not affect the Ohio & Erie Canal. Alternative 2 would involve the removal or modification of the Brecksville Canal Diversion Dam exposing the now submerged Pinery Dam. This would expose the structure to the atmosphere, accelerating its decay and would result in a change to the water level in the downstream section of the canal, affecting the landscape as a whole, as well as contributing elements to the NHL such as Alexander's Mill and Lock 38. Alternative 3 would result in the removal of the Brecksville Canal Diversion Dam, alteration of its head gates, removal of the remnant of the Pinery Dam and construction of a pump house to maintain a constant level of water in the canal, which would add a new element to the landscape.

#### 4.5.1.2 Criteria of Adverse Effect

Based on the nature of the alternatives and the reasonable and foreseeable secondary effects of the undertaking, any alternative that satisfies the project purpose and need would affect the Ohio & Erie Canal in some manner. Therefore, NPS assessed potential effects to each contributing element of the Ohio & Erie Canal, applied the Criteria of Adverse Effect (36 CFR 800.5) and made reasoned judgements on potential impacts. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association (36 CFR 800.16).

Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative. Adverse effects could include physical destruction of or damage to all or part of the property; alteration, restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access that is not consistent with the Secretary's Standards for the Treatment of Historic Properties and applicable guidelines; change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features; neglect of a property which causes its deterioration; and transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance (36 CFR 800.5(a)2).

To gauge the extent and intensity of potential project effects, NPS applied the criteria of adverse effects to each of the contributing elements to the Ohio & Erie Canal within the APE. This was done to determine if they would be affected by the undertaking and if affected, to determine whether the project would detract from the characteristics that convey the significance of the larger Ohio & Erie Canal landscape.

### 4.5.2 Impacts of the Alternatives

**Methodology**

The analysis includes the alternatives and their level of impact to historic properties. The analysis included a qualitative assessment of the potential for each alternative to effect historic properties and an assessment of the effect's impacts to historic properties done in consultation with the CRM Team (Table 6).

#### 4.5.2.1 Impacts of Alternative 1

Under the No Action Alternative, the Canal Diversion Dam and the Pinery Dam structures would remain, as they currently exist, with the feeder gate being used to control water flow. There is currently no regular ongoing maintenance of these structures, although the feeder canal was dredged in 2015. Current water levels would remain the same or lower due to seasonal fluctuations, but would be maintained within the Ohio & Erie Canal.

**Direct and Indirect Impacts**

Under Alternative 1, there would be no change to the status quo within the APE. Water will continue to be diverted into the canal via the dam and feeder gates presenting a "watered condition" in the Ohio & Erie Canal in the immediate project area and downstream to the NHL, including contributing elements such as the Alexander Mill and Lock 38, an operational lock providing lock demonstrations to Park visitors. Under current conditions there are periods of low water flow due to seasonal precipitation as well as on-going issues with sediment build up that often prevents the lock gates from being fully operational (HAER 1988c), causing long-term, minor, adverse impacts that are unrelated to this undertaking. Any remains of the historic Pinery Dam would remain submerged beneath the dam pool reservoir. The feeder gate complex would remain in its current condition. Maintenance of the canal prism and associated structures would continue to occur on a case-by-case basis, or as funding permits. The NPS found that Alternative 1, the no action alternative, would not affect any historic properties.

**Cumulative Impacts**

Under Alternative 1, the dam would continue to divert water into the canal, maintaining a watered canal from the Pinery Feeder Gate downstream beyond the park boundary. Sediment buildup at the feeder gates and throughout the canal prism, including the Lock 38 and associated structures, would continue to be a maintenance issue resulting in long term, negligible impacts to the canal and associated structures. There would be no cumulative effects to historic properties.

#### 4.5.2.2 Impacts of Alternative 2

In Alternative 2, the Canal Diversion Dam would be removed, the feeder gates would remain in place and a partial or lower dam would be constructed on site to divert water into the canal. Remnants of the Pinery Dam would be removed. Elevation changes resulting from the modification of the Canal Diversion Dam would require the canal prism to be altered via dredging for approximately one mile downstream (north) of the project area in order to generate gravity feed flow of water from the river into the canal.

**Direct and Indirect Impacts**

The modification of the Dam and the canal prism dredging may result in times when the canal would be very low or dry due to seasonal fluctuations in precipitation; these conditions have occurred in the past due to low flow or periods where there was no water due to leaks and construction/repairs. If persistent for the long-term, Lock 38 and associated canal structures downstream could be susceptible to additional deterioration if exposed to air for long periods of time and the changes to the setting could cost these downstream structures the ability to demonstrate the historic function and use of the canal. Periods of no water in the canal bed could change the setting; alter the feeling and obscure historic associations of the many contributing elements downstream. Long periods of no water may contribute to long-term, adverse conditions of resource deterioration. The modification of the dam would maintain some level of water in the canal cultural landscape, including the NHL and the features of the canal from the Diversion Dam downstream to the park boundary. It would do so in a manner that would be more susceptible to seasonal fluctuations and periods of denudation than in Alternatives 1 or 3 (NPS 2000). The NPS found that Alternative 2 would have no effect to 7 elements of the Ohio and Erie Canal, no adverse effect to 5 elements and an adverse effect to 14 elements, 9 of which are located within the NHL.

**Cumulative Impacts**

Lower levels of water or periods of no water within the Canal prism may contribute to the cumulative effects of deterioration in canal structures over time and inhibit the ability to demonstrate historic function and use of the canal. In total, Alternative 2 would adversely affect 17 contributing elements to the Ohio & Erie Canal, 11 of which are located within the NHL. Alternative 2 would result in five negligible impacts, 4 minor impacts, 15 moderate impacts and 2 major impacts to contributing elements and would therefore adversely affect the Ohio & Erie Canal as a whole, as well as having specific adverse effects to the NHL. A finding of adverse effect is appropriate for Alternative 2, which would have a major impact on the Ohio & Erie Canal. In consultation with NPS CRM Team, SHPO and other interested parties, adverse effects will be mitigated through wayside exhibits related to the modern use of the canal, documentation and detailed recordation of adversely affected elements, including the two dams and completion of an NPS Historic Structures Report for the entire NRHP listed or eligible Ohio & Erie Canal landscape.

#### 4.5.2.3 Impacts of Alternative 3 (Proposed Action)

In Alternative 3, the Canal Diversion Dam would be removed completely; the feeder gates would remain in place and the river would be restored to grade levels that provide a natural flow regime. Due to elevation changes in the river level resulting from the complete removal of the Canal Diversion Dam, an active watering system for the canal would be designed to divert a desired and mechanically controlled level of water into the canal. This would be accomplished through the installation of a pumping system to aid in the diversion of the water from the river into the canal. The canal prism at the feeder gate would be maintained by removing excess sediment buildup when necessary. The concrete structure of the Canal Diversion Dam, including the wing walls, as well as the remnants of the Pinery Dam, would also be removed from the riverbed and channel. The removal will expose a natural bedrock waterfall feature and include an elevation change of up to three feet (Bates and Peck 2010).

**Direct and Indirect Impacts**

Alternative 3 is the full removal of the Canal Diversion Dam and the addition of a pump to divert water into the canal to maintain a watered appearance. The pump will divert water into the canal, maintaining a watered canal from the Feeder Gate downstream beyond the park boundary, thus maintaining the historic significance of the broader Ohio & Erie Canal landscape, including the entire NHL. The removal of the Brecksville Canal Diversion Dam and the installation of an active watering system in its place would alter the cultural "feel" or character of the immediate project area, including the Feeder Gate Complex and introduce a new visual and audible element into the setting. Alternative 3 would result in the removal of two dams (Canal Diversion Dam and the Pinery Dam) that are contributing elements to the Ohio & Erie Canal but will limit the impacts to downstream elements and will ensure that the canal within the NHL will remain in a watered condition. The NPS found that Alternative 3 would have no effect to 23 elements of the Ohio and Erie Canal, no adverse effect to one element, and an adverse effect to 2 elements, and no adverse effect to any part of the NHL.

**Cumulative Impacts**

The removal of the Brecksville Canal Diversion Dam will restore the river ecology to a condition not seen since 1825-1826, changing the setting of large portions of the valley within the park through the physical alteration of the former impoundment and downstream morphology. The active watering system will introduce a long-term visual, audible and atmospheric element to the vicinity of several historic properties. In consultation with NPS CRM Team, SHPO and other interested parties, adverse effects will be mitigated through wayside exhibits related to the modern use of the canal, documentation and detailed recordation of adversely affected elements including the two dams and completion of a NPS Historic Resource Survey of the entire NRHP listed or eligible Ohio & Erie Canal landscape.

Alternative 3 will result in adverse effects to the Brecksville Canal Diversion Dam and the Pinery Dam. Therefore, Alternative 3 will have an adverse effect to two contributing elements of the Ohio & Erie Canal. As this alternative preserves the flow of water through the watered section of the canal, there will be no adverse effects to the Ohio & Erie Canal NHL, a seminal resource in the park.

**Table 6. Summary of Effects**

| Historic Property | Distance (linear) and Bearing of Nearest Point from Dam | **Criteria of Adverse Effect**<br>An undertaking has an adverse effect on an historic property when it may alter, directly or indirectly, any of the characteristics that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, or association. | **Alternative 1 Evaluation**<br><br>**No Action** | **Alternative 2 Evaluation**<br><br>**Modification** | **Alternative 3 Evaluation**<br><br>**Removal** |
|---|---|---|---|---|---|
| Canal Prism | 430 ft.<br>(0.8 mi)<br>East | Although none of the alternatives will directly affect the canal, Alternative 1 will maintain the *status quo*, resulting in siltation of the feeder and the prism below the feeder, requiring periodic maintenance and dredging. Alternative 2 could require modification of the prism and affect the downstream watered portion, the reduction of water or periods of dryness further affecting the setting. Alternative 3 would maintain the water levels in the canal prism. | No Effect | **Adverse Effect** | No Effect |
| Pinery Narrows | Dam is located within Pinery Narrows | The whole of Pinery Narrows is considered a contributing element to the CLI. Alternative 1 would not result in any change to the setting. Alternative 2 could alter the setting through modification of the prism and the reduction of water flow or periods of dryness in the canal, but would not affect the landscape of the Pinery Narrows in any meaningful way. Alternative 3 would not change any aspect of the setting within Pinery Narrows. | No Effect | No Effect | No Effect |
| Brecksville Feeder Head Gate | 164 ft.<br>(0.3 mi)<br>Southeast | The Brecksville Feeder Head Gate is a modern (c.1952) structure built atop and amid portions of the earlier Pinery Dam Head Gate (1826). This functional structure is used to regulate the flow of water into the feeder channel and is regularly clogged with silt. Alternative 1 would maintain this condition. Alternative 2 would also maintain the head gate as a functional structure. Alternative 3 would preserve the head gate with the construction of a pump house nearby. Although the proposed pump house would not directly affect the head gate, it would introduce a new visual element to the setting. | No Effect | No Effect | No Adverse Effect |
| Lock 36<br>Pinery Lock Remnant Spillway | 760 ft. (0.14 mi)<br>Northeast | Lock 36 was altered in 1905, damaged during the 1913 flood and partially destroyed during the development of the Northfield-Brecksville High Level bridge in 1931. The lock once regulated the flow of water from the feeder into the main prism, but was functionally obsolete once the canal was repurposed as an industrial canal in the 1950s and it is considered deteriorated and non-contributing. Alternative 1 will not alter the structure in any way. Alternative 2 would not materially affect the lock. Alternative 3 would result in no change to the lock. | No Effect | No Effect | No Effect |
| Brecksville Dam (Canal Diversion Dam) | 0 ft.<br>(0 mi.) | The Brecksville Canal Diversion Dam is a modern (c. 1952) structure built as part of a large industrial complex to channel water over ten miles downstream to a steel mill. The dam, combined with the nearby head gate, raised the water level on the river, impounding the earlier Pinery Dam. Not considered eligible for the NRHP individually or as part of the O & E Canal districts, the dam is considered eligible by virtue of its inclusion as a contributing element to the CLI. Alternative 1 would maintain the *status quo* and have no effect on the dam. Alternative 2 would result in the removal of the dam with a modified structure built in its place. Alternative 3 would result in the full removal of the dam. | No Effect | **Adverse Effect** | **Adverse Effect** |
| Brecksville (Pinery) Feeder | 160 ft.<br>(0.3 mi)<br>East | The Pinery Feeder was constructed in 1826, but was successively altered through repair and reuse, most dramatically when serving as an industrial canal from 1952 to the late 1980s. Dredged in 2015, the feeder is a site of dense siltation from the water entering through the head gate. Alternative 1 will not result in any change to the Pinery Feeder. Alternative 2 could result in alteration of the prism and a reduction of water flow or periods of dryness of the feeder, changing its use and setting. Alternative 3 would result in a more constant flow of water through the feeder. | No Effect | **Adverse Effect** | No Effect |
| Pinery Dam | 120 ft.<br>(0.2 mi)<br>South | The remnant of the Pinery Dam is a portion of the original crib dam that was greatly altered and then inundated during the construction of the Brecksville Canal Diversion Dam in 1951-1952. The extent of the site was defined by ground penetrating radar and was considered by NPS as eligible for the NRHP as a contributing element to the Ohio and Erie Canal. Alternative 1 would maintain the existing conditions and would not affect the Pinery Dam. Alternative 2 and 3 would result in its removal. | No Effect | **Adverse Effect** | **Adverse Effect** |
| O. & E. Canal: Canal Segment #36<br>(Includes Locks 36 and 37) | 760 ft. (0.14 mi)<br>Northeast | This is the watered section of the canal through the Pinery Narrows from the Pinery Feeder to just past Alexander's Mill. An early focus of the historic designation and part of the NHL, this section is considered the intact section of the canal in the region, notwithstanding its use and maintenance as an industrial canal. Alternative 1 would not result in a change to this section, providing for periodic maintenance of the prism. Alternative 2 could alter the prism and this section's character defining feature, its capacity to convey a consistent water flow, an important aspect of the setting through Pinery Narrows. Alternative 3 would avoid impacts to the NHL through the provisioning of a constant flow of water. | No Effect | **Adverse Effect** | No Effect |
| Mudcatcher at Galley Run | 1,196 ft.<br>(0.23 mi)<br>North | The Mudcatcher at Galley Run is a large sandstone structure built after the completion of the canal to regulate the flow of silt and clay into the prism. The massive sandstone structure was supplemented with concrete in 1905 and later breached. Located well above the canal, the structure will not be affected by Alternatives 1 or 3 and the setting only slightly altered by Alternative 2, which would lower the water level on the canal. | No Effect | No Adverse Effect | No Effect |
| O & E Canal Floodgate | 10,881 ft.<br>(2.06 mi)<br>Northwest | The floodgate, closely related to the waste way (below) is one of several structures used to regulate the level of water in the canal. Built in 1826, rebuilt in 1905, damaged by the 1913 flood and rebuilt again in the 1950s as part of the industrial canal, the structure related directly to the maintenance of water in the canal. Alterative 1 will not affect the structure and Alternative 3 will ensure it retains a functional relationship with the larger canal system. Alternative 2 would not result in a material change to the structure itself, but could alter its use and setting. | No Effect | No Adverse Effect | No Effect |
| O & E Canal Waste way | 11,030 ft.<br>(2.09 mi)<br>Northwest | The waste way, closely related to the floodgate (above) is one of several structures used to regulate the level of water in the canal. Built in 1826, rebuilt in 1905, damaged by the 1913 flood and rebuilt again in the 1950s as part of the industrial canal, the structure related directly to the maintenance of water in the canal. Alterative 1 will not affect the structure and Alternative 3 will ensure it retains a functional relationship with the larger canal system. Alternative 2 would not result in a material change to the structure itself, but could alter its use and setting. | No Effect | No Adverse Effect | No Effect |
| Ohio & Erie Sta 636 Culvert Sagamore Creek Culvert | 11,089 ft.<br>(2.10 mi)<br>Northwest | The culvert carries the canal prism and towpath over Sagamore Creek. Built in 1892 during the period of the canal's decline and rebuilt following the 1913 flood, the recently rebuilt culvert has served to conduct water over the creek throughout the industrial era to the present. None of the alternatives will materially affect the culvert and given its function and modern vintage, even during periods of low/no flow would not affect the structure. | No Effect | No Effect | No Effect |

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| Lock #37<br>(14 Mile Lock)<br>and Spillway<br>NHL | 13,217 ft.<br>(2.5 mi)/<br>13,303 ft.<br>(2.52 mi)<br>North | Lock 37 and its spillway are directly related to the adjacent Alexander's Mill. The lock, which was original to the canal and rebuilt in 1905, backs up the water to flow over the spillway by the mill, demonstrating the use of the canal for both transportation and industry. The lock and spillway were included in the earliest historic designation and is central to the NHL and the CLI. Alternative 1 would not result in any change to the structures, assuming regular maintenance and Alternative 3 would reflect their function and use. Alternative 2 could result in reduction of water levels or periods of dryness and would not only change the setting, but also obscure an association with the mill. | No Effect | **Adverse Effect** | No Effect |
| Alexander's Mill<br>Wilson's Feed<br>Mill<br>NHL | 13,112 ft.<br>(2.48 mi)<br>North | Alexander's Mill is a much recorded and well-recognized historic property that is a contributing resource to the NRHP districts, NHL and CLI. It was built in 1855 to take advantage of the power of surplus water that built up behind Lock 37. Rebuilt and expanded, the core of the structure is intact. Alternative 1 would not result to any change to the mill and Alternative 3 would maintain the water level in the canal adjacent to the mill. Alternative 2 could result in reduction of water levels or periods of dryness, which would alter the setting and obscure the functional relationship between the canal, lock, spillway and mill. | No Effect | **Adverse Effect** | No Effect |
| O. & E. Canal:<br>Canal Segment<br>#37A<br>NHL | 13,726 ft.<br>(2.6 mi)<br>North | This segment of the canal, which is included in the LCS, NRHP, NHL and CLI, is also the segment most displaying the mark of the industrial era. Maintained as an industrial canal, the boundary of this segment is intruded upon by several modern bridges, pipelines and Canal Road. Alternative 1 would not result in any change to this section and Alternative 3 would ensure a constant supply of water in this segment. Alternative 2 could result in the reduction of water flow or periods of dryness in this segment of the canal. | No Effect | **Adverse Effect** | No Effect |
| Tinkers Creek<br>Aqueduct<br>NHL | 17,052 ft.<br>(3.23 mi)<br>Northwest | The Tinkers Creek Aqueduct was a seminal resource of the earliest NRHP and NHL designations. Originally built in 1844 and rebuilt in 1905, the aqueduct was a landmark in the Tinkers Creek Valley. Maintained as an important part of the industrial canal in the early 1950s through the 1980s, the aqueduct fell into disrepair and was rebuilt in 2007. Although sub structural elements of the original remain, the aqueduct is a modern artifact that nonetheless is considered a NRHP resource by NPS. Alternatives 1 and 3 would not result in any change to the structure and Alternative 2 could alter the water level, but would have no effect on any significant characteristics | No Effect | No Adverse Effect | No Effect |
| O. & E. Canal:<br>Canal Segment<br>#37B<br>NHL | 17,052 ft.<br>(3.23 mi)<br>Northwest | This segment of the canal runs from the Tinkers Creek Aqueduct to Lock 38, a distance of only 0.6 miles, is in good condition, crossed by only one modern bridge. This segment is located between the towpath and Canal Road, has long been in watered condition and was included in the early NRHP designation and the NHL, as well as in the CLI as an important landscape element. Alternative 1 would not alter the existing conditions, assuming periodic maintenance and Alternative 3 would ensure a constant flow of water through this section to Lock 38. Alternative 2, however, could result in the reduction of water flow or periods of dryness of the segment and would diminish the setting, feeling and association. | No Effect | **Adverse Effect** | No Effect |
| Lock #38<br>12 Mile Lock<br>NHL | 20,011 ft.<br>(3.8 mi)<br>Northwest | Lock 38 and its associated spillway are important parts of the Park's Canal Exploration Center, which is housed in the adjacent Lock Tender's House. Built in 1825, rebuilt in 1905, the lock and spillway were rehabilitated in 1992 as a working lock dependent on water flowing through the canal. Due to its intact conditions and location, the lock and spillway were included in the earliest NRHP designation, are part of the NHL as contributing elements to the CLI in excellent condition. Alternative 1 would maintain the current conditions with periodic maintenance and Alternative 3 would ensure a constant flow of water through the canal. Alternative 2 could result in the reduction of water flow or periods of dryness in the lock and would therefore detract from the setting, feeling and historical associations. | No Effect | **Adverse Effect** | No Effect |
| Lock #38<br>Spillway<br>NHL | 19,962 ft.<br>(3.78 mi)<br>Northwest | The spillway is located southeast of the lock on a small side channel, allowing excess water to continue flow downstream in the canal. The spillway was included in the early NRHP designations and the NHL, as well as the CLI and was recorded for the HAER. Alterative 1 will not result in a change from the existing conditions, which periods of flowing water and dry periods. Alternative 2 could result could result in the reduction of water flow or periods of dryness and isolation of the structure. Alternative 3 would ensure a steady flow of water and the continuing function of the structure as a spillway. | No Effect | **Adverse Effect** | No Effect |
| Lock Tender's<br>House and Inn<br>NHL | 20,054 ft.<br>(3.8 mi)<br>Northwest | The Lock Tender's House, now the Park's Canal Exploration Center, is listed in the NRHP. It was a part of the early NRHP designations of the canal and is part of the NHL. Significant for its architecture, none of the Alternatives would affect any of the qualities that constitute the significance of the building or change its relationship to the canal. | No Effect | No Effect | No Effect |
| O. & E. Canal:<br>Canal Segment<br>#38<br>NHL | 19,962 ft.<br>(3.78 mi)<br>Northwest | This 1.5-mile long segment runs from Lock 38 north to Lock 39, just south of the northern boundary of the Park. Like the segment to the south, the prism is framed by the towpath to the west and Canal Road to the east and has only one modern intrusion. Part of the early NRHP designations, the NHL and CLI, Alternative 1 would maintain the current conditions and Alternative 3 would ensure a constant flow of water. Alterative 2 could result in the reduction of water flow or periods of dryness of the canal, diminishing its setting, feeling, and obscuring important historical associations. | No Effect | **Adverse Effect** | No Effect |
| Ohio & Erie Canal<br>Sta 505 Culvert<br>NHL | 22,613 ft.<br>(4.28 mi)<br>Northwest | The culvert carries the canal prism and towpath over an unnamed tributary. Originally built in 1826 and rebuilt in 1909, the culvert has served to conduct water over the creek throughout the industrial era to the present. The culvert is part of the NHRP and NHL designations, and is included in the CLI. None of the alternatives will materially affect the culvert, and given its function and modern vintage, even the reduction of water flow or periods of dryness of the canal would not affect the structure. | No Effect | No Effect | No Effect |
| Ohio & Erie Canal<br>Sta 478+ 90<br>Culvert<br>NHL | 24,931 ft.<br>(4.72 mi)<br>Northwest | The culvert carries the canal prism and towpath over an unnamed tributary. Originally built in 1826, rebuilt in 1909 and replaced during the conversion of the canal to an industrial function in the 1950s, the culvert has served to conduct water over the creek throughout the industrial era to the present. The culvert is part of the NHRP and NHL designations, and is included in the CLI. None of the alternatives will materially affect the culvert, and given its function and modern vintage, even the reduction of water flow or periods of dryness of the canal, would not affect the structure. | No Effect | No Effect | No Effect |
| Lock #39<br>(11 Mile Lock)<br>NHL | 27,164 ft.<br>(5.14 mi)<br>Northwest | Lock 39 is the northern-most lock in the Park. Built in 1826 and rebuilt in 1905, the Lock and associated spill and waste ways have been a functional element of the canal from its construction through its reconstruction and into the modern industrial era. Included in the early NRHP designations and the NHL, the lock was recorded for the HAER, as well as considered a contributing element the CLI in good/fair condition. Alternative 1 would maintain the current conditions with periodic maintenance and Alternative 3 would ensure a constant flow of water through the canal. Alternative 2 could result in the reduction of water flow or periods of dryness through the lock and would therefore detract from the setting, feeling and historical associations. | No Effect | **Adverse Effect** | No Effect |

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| Lock #39<br>Spillway<br>NHL | 27,236 ft.<br>(5.16 mi)<br>Northwest | The spillway is located immediately to the northeast of the lock on a small side channel, allowing excess water to continue flow downstream in the canal. The spillway was included in the early NRHP designations and the NHL, as well as the CLI. Alterative 1 will not result in a change from the existing conditions, which periods of flowing water and dry periods. Alternative 2 could result in the reduction of water flow or periods of dryness of the side channel and isolation of the structure. Alternative 3 would ensure a steady flow of water and the continuing function of the structure as a spillway. | No Effect | **Adverse Effect** | No Effect |
| Lock #39<br>Waste way<br>NHL | 26,709<br>(5.06 mi)<br>Northwest | The waste way is related closely to the spillway and Lock 39 (above) and is one of several structures used to regulate the level of water in the canal. Built in 1826, rebuilt in 1905, damaged by the 1913 flood, the structure related directly to the maintenance of water in the canal. The structure is considered deteriorated. Alterative 1 will not affect the structure and Alternative 3 will ensure it retains a functional relationship with the larger canal system. Alternative 2 would not result in a material change to the structure itself, but could alter its use. | No Effect | No Adverse Effect | No Effect |
| **Summary** | | **Alternative 1** will have no effect on the Ohio & Erie Canal.<br><br>**Alternative 2** will have an adverse effect (including adverse effects to elements of the NHL) on the Ohio & Erie Canal.<br><br>**Alternative 3** will have an adverse effect on the Ohio & Erie Canal (but no effect to the NHL). | 26 No Effect | 7 No Effect<br><br>5 No Adverse Effect<br><br>14 Adverse Effect<br><br>9 NHL Adverse Effect | 23 No Effect<br><br>1 No Adverse Effect<br><br>2 Adverse Effect |
| **Finding** | | | No Historic Properties Affected | **Adverse Effect** | **Adverse Effect** |

# Chapter 5: Consultation and Coordination

## 5.1 Public Involvement

Public involvement has been a component of the planning process for the Canal Diversion Dam project. Activities have included public meetings, public comment periods and the distribution of updates to stakeholders. In addition, through NPS's Planning Environment and Public Comment (PEPC) website, materials were made available for public viewing.

### 5.1.1 Stakeholder Groups and Public Scoping

Stakeholder groups with specific interest and/or expertise about the project were identified as early as 2002. These groups and the public have been invited to participate in several public scoping workshops held by NPS and the Ohio EPA. Stakeholders and the public were involved in the scoping of alternatives and were kept informed through newsletter updates. Outreach for workshops and meetings were provided through agency press releases for local media and distribution of information to known stakeholder groups.

This removal of Canal Diversion Dam has been a topic of debate for many years. The history of public involvement covers a ten-year period from 2002 as outlined below. Early in the planning process, the IDT determined that it was necessary to prepare an Environmental Impact Statement (EIS) for the project. Following extensive internal review and interagency consultation, preliminary analysis for the alternatives indicated there was no potential for significant impacts to NPS resources and values and no concerns or issues were expressed during the public scoping process that would have the potential for highly controversial impacts. Therefore, on 23 December 2015, NPS terminated the EIS and prepared an EA to develop and analyze alternatives that satisfy the project purpose and need. The Ohio EPA, ODNR, and USACE remained cooperating agencies on the EA.

- 8 August 2002 **Stakeholder Letter**. Scoping letter mailed to nine key agencies requesting input on issues and water quality for Canal Diversion Dam Project.
- 17 September 2002 **Stakeholder Scoping Meeting**. Meeting held at NPS Boston Store Visitor Center and attended by nine key agencies. Purpose and need, requirements, constraints, and desired outcomes were discussed framed by water quality issues caused by the Canal Diversion Dam.
- 18 May 2005 the EIS process began. IDT is identified which included Ohio EPA, USACE, ODNR's Division of Wildlife and Division of Water, Cleveland Metroparks and the Friends of the Crooked River.
- 11 August 2005 **Initial Stakeholder Scoping Meeting**. Held by NPS and Ohio EPA at Happy Days Visitor Center and attended by 28 people representing a variety of entities. Discussion included the development of alternatives regarding the Canal Diversion Dam and water quality issues.
- 30 November 2005 **Citizen Based Stakeholder Meeting**. Meeting held by NPS and Ohio EPA at Happy Days Visitor Center and attended by 32 people. Canal Diversion Dam and the water quality issues discussed. Comments from the meeting compiled and reviewed.
- January 2007 **Newsletter 1**. Distributed to stakeholders, media and interested individuals. Provided background information and described the planning process.
- May 2007 **Newsletter 2**. Distributed to stakeholders, media and interested individuals. Provided background information and described the planning process.

- July 2009 ***Federal Register*** **Notice of Intent (NOI)** to prepare an EIS published. NOI included notification of park planning website available for public review.
- 28 October 2009 **Public Scoping Meeting**. Meeting held by NPS and Ohio EPA at Happy Days Visitor Center to provide status updates on project and gather additional comments on alternatives. Local media coverage included Akron Beacon Journal. Approximately 65 individuals attended. Additional comments were accepted on-line through the PEPC website and in written format.
- December 2012 **Newsletter 3.** Distributed to stakeholder, media and interested individuals. Provided background, purpose and need of project and proposed alternatives.
- 23 December 2015 **Notice of termination** of EIS for Modification/Removal of the Canal Diversion Dam in Cuyahoga Valley National Park, Ohio was published in the *Federal Register*.
- 16 August 2016 **Newsletter 4**. Distributed to stakeholders, media and interested individuals. Presentation of findings and solicitation of public review and comment during comment period of 29 August to 29 September2016.
- 7 September 2016 **Public Open House** and solicitation of public comment. Open house at Happy Days Visitor Center to present the findings of the draft EA and solicit public comment.

## 5.2 Public Agencies Consulted During the Planning Process

Relevant correspondence from consulting agencies and the public is found in the appendices. In addition to the public agencies that were formally consulted (Appendix B), comments were solicited and received from stakeholder groups and general public (Appendices D and E), and their comments considered during the evaluation of alternatives. Cultural resource coordination for this project as required under Section 106 of the National Historic Preservation Act, as amended was an important part of the Draft EA review process. Documents related to the Section 106 process and consultation with the SHPO (Appendix C).

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## References


Arcadis, U.S., Inc.
2007 *Cuyahoga River HEC-RAS Study.* Arcadis, U.S., Inc. Akron, Ohio.

Bates, D. and J. Peck
2010 *A Ground Penetrating Radar Survey to Find and Delineate the Pinery Dam in the Cuyahoga River, Near Ohio State Route 82*. Department of Geology and Environmental Science, University of Akron, Ohio.

Bergmann Associates
2005 *Hydrological Study and Design Alternatives: Watered Section of the Ohio & Erie Canal-Brecksville Feeder Dam to Rockside Road*. *Task Order # 38.* Cuyahoga Valley National Park, Ohio.

Cockrell, R.
1992 *A Green Shrouded Miracle: The Administrative History of Cuyahoga Valley National Recreation Area, Ohio*. National Park Service, Midwest Region, Omaha, Nebraska.

Cossel, P.
1993 *Ohio and Erie Canal, Masonry and Concrete Structures (Draft) Historic Structure Report.* Cuyahoga Valley National Recreation Area, National Park Service, Brecksville, Ohio.

Corbett, R.G and B. Manner
1988 *Geology and Habitats of the Cuyahoga Valley National Recreation Area, Ohio.* Ohio J. Sci. 88 (1): 40-47.

Cuyahoga River Community Planning Organization and Ohio EPA
2009 *A Request for Delisting of Select Beneficial Use Impairments in Segments and Tributaries of the Cuyahoga Area of Concern*. Submitted by the Cuyahoga River Remedial Action Plan Coordinating Committee and the Ohio Environmental Protection Agency. Cleveland, Ohio.

e-Bird Reports
2015 *e-Bird Reports*. Available at: http://ebird.org/

EnviroScience, Inc.
2009 *Wetlands and Other Waters Delineation Report*. *Approximately 3 miles of the Cuyahoga River (RM 23.4 to RM 20.6) and 0.2 miles of Chippewa Creek (RM 0.2-0.0) in Brecksville and Sagamore Hills. Summit and Cuyahoga Counties, Ohio*. Project #1443-3137.

Finney, F. A.
2002 *Calumet, Canal, and Cuyahoga: An Archeological Overview and Assessment of the Cuyahoga Valley National Park, Ohio*. Upper Midwest Archeology and the National Park Service Mid-West Regional Office, Omaha, Nebraska.

Great Lakes Basin Restoration Plans
2013 *Great Lakes Basin Restoration Plans*. Available at: http://greatlakesrestoration.us/

Hacker, D. B.
2004 *Geology of National Parks*. Kendall Hunt Publishing Co., Dubuque Iowa,

Hampton, R. and H. Kenny
2006 *National Register Assessment of the Brecksville Diversion Dam (SUM-3253-1) Cuyahoga Valley National Park, Summit and Cuyahoga Counties, Ohio*. Submitted to The Friends of the Crooked River by Hardlines Design Company, Columbus Ohio.

Historic American Engineering Record (HAER)
1986 *Alexander's Grist Mill (Wilson's Mill)* HAER NO. OH-58. National Park Service, Historic American Engineering Record, Washington, D.C.

Historic American Engineering Record (HAER)
1988a *Ohio and Erie Canal: Lock #38* (HAER No. OH-59-C), Canal and Hillside Roads, Valley View, Cuyahoga County, Ohio. Historian Carol Poh Miller. National Park Service, Historic American Engineering Record, Washington, D.C.

Historic American Engineering Record (HAER)
1988b *Ohio and Erie Canal: Lock #39* (HAER No. OH-59-D), West side of Canal Road, 3400 feet North side of Stone Road, Cuyahoga County, Ohio. Historic American Engineering Record, National Park Service, Washington, D.C.

Historic American Engineering Record (HAER)
1988c *Ohio and Erie Canal: Typical Lock Gates* (HAER No. OH-60). West side of Canal Road, 3400 feet North side of Stone Road, Cuyahoga County, Ohio. Historic American Engineering Record, National Park Service, Washington, D.C.

International Joint Commission
2011 *Great Lakes Water Quality Agreement.* Available at: http://www.ijc.org/rel/agree/quality.html

Johannesen, E.
1984 Valley Railway Historic District. *National Register of Historic Places Inventory¬–Nomination Form.* Western Reserve Historical Society, Cleveland, Ohio.

Johannesen, E.
1985 Brecksville-Northfield High Level Bridge. *National Register of Historic Places Inventory¬–Nomination Form*. Western Reserve Historical Society, Cleveland, Ohio.

Jubar, A.
2015 *Sea Lamprey Management in the Great Lakes*. Investigator's Annual Report submitted for National Park Service Research Permit # CUVA-2015-SCI-0011. https://irma.nps.gov/rprs/

Krebs, R.

2015 Personal communication between Meg Plona, NPS Biologist and Robert Krebs, Cleveland State University on 11/10/2015 regarding mussels in the Cuyahoga River and Cuyahoga Valley National Park.

Krieger, K.A., and B. Zawiski

2013 *Changes in biotic and habitat indices in response to dam removals in Ohio*, in De Graff, J.V., and Evans, J.E., eds., *The Challenges of Dam Removal and River Restoration: Geological Society of America Reviews in Engineering Geology*, v. XXI, p. 105–116, doi:10.1130/2013.4121 (09).

Krynak, T. and D. Petit

2005 *An inventory of Indiana Bats (Myotis sodalis) and other bat species in Cuyahoga Valley National Park.* Technical Report NPS/HTLN/CUVA. Heartland Network Inventory and Monitoring Program, National Park Service. Republic, Missouri.

McLain, S., S. Lindloff and K. Baer

2014 *Dam Removal and Historic Preservation: Reconciling Dual Objectives*. The National Park Service and American Rivers, Washington, D. C.

Mendinghall, J. S.

1974 Ohio and Erie Canal. *National Register of Historic Places – Registration Form*. Prepared by the National Park Service, Washington, D.C.

Miller, C. M.

2006 *Cuyahoga River Canal Diversion Dam Alternative Flow Options*, Department of Civil Engineering, University of Akron, Ohio.

National Park Service (NPS)

1977 *General Management Plan: Cuyahoga Valley National Recreation Area, Ohio*. Denver Service Center, Denver Colorado.

1984 *National Park Service Historic Structures Report*. Cuyahoga Valley National Recreation Area, Brecksville, Ohio.

1993 *National Park Service Historic Structures Report.* Cuyahoga Valley National Recreation Area, Brecksville, Ohio.

1995 National Park Service Literature and Site Visit to Brecksville Feeder Dam

2000 *Cuyahoga Valley National Recreation Area Cultural Landscape Thematic Overview and Methodology Guide* Valley National Park, Brecksville, Ohio.

2003 Cuyahoga Valley National Park Long Range Interpretive Plan. Cuyahoga Valley National Park, Brecksville, Ohio.

2004 *Final Programmatic EA for Riverbank Management*. Cuyahoga Valley National Park, Brecksville, Ohio.

2006 NPS *Management Policies 2006 – The Guide to Managing the National Park System*, Washington, D.C. Available at: http://www1.nature.nps.gov/policiesguidance/managementpolicy.cfm/

2008 *Strategic Plan Cuyahoga Valley National Park*. Cuyahoga Valley National Park, Brecksville, Ohio.

2009 National Recreation Trails Program. Available at: http://www.americantrails.org/nationalrecreationtrails/

2009a National Registry of Natural Landmarks, National Landmarks Program. Available at http://www.nature.nps.gov/nnl/

2010 *Geologic Resources Inventory Scoping Summary, Cuyahoga Valley National Park*, Brecksville, Ohio. Available at: https://www.nature.nps.gov/geology/inventory/publications/s_summaries/CUVA_Scoping_Summary_2010_0125.pdf

2011 National Park Service *NPScape Upstream Watershed Delineation Processing SOP: Upstream watershed analysis for select National Park units*.

2011a National Park Service Memorandum regarding ownership of dam and lease lands with Ohio Department of Natural Resources. On file at Cuyahoga Valley National Park, Resource Management Office, Brecksville, Ohio.

2012 *Cuyahoga Valley National Park Final Trail Management Plan and Environmental Impact Statement*. Cuyahoga Valley National Park. Brecksville, Ohio.

2013 *Cuyahoga Valley National Park Climate Action Plan*. Cuyahoga Valley National Park, Brecksville, Ohio

2013 *Foundation Document, Cuyahoga Valley National Park.* Brecksville, Ohio.

2014 *Cuyahoga Valley National Park Final White-tailed Deer Management Plan/Environmental Impact Statement.* Cuyahoga Valley National Park, Brecksville, Ohio.

2016 *Cuyahoga Valley Strategic Action Plan*. Cuyahoga Valley National Park, Brecksville, Ohio.

Ohio Department of Natural Resources

2014 *Ohio Mussel Survey Protocol*. Available at http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/licenses%20&%20permits/OH%20Mussel%20Survey%20Protocol%20-%20April%202014.pdf.

Ohio Department of Public Works

1951 *Construction Plans of Brecksville Dam, Cuyahoga and Summit Co.* S.O. Lindell, Director. Copy

Ohio Department of Transportation

2007 March 2007 *Scour Report Letter.* On file at Cuyahoga Valley National Park, Resource Management Office, Brecksville, Ohio.

Ohio Division of Geological Survey

2001 *A brief summary of the geologic history of Ohio. Ohio Division of Geological Survey*, Columbus, Ohio. Geo Facts 23.

Ohio Environmental Protection Agency

1987 *"Ohio Environmental Protection Agency Biological Criteria for the Protection of Aquatic Life. Volumes I, II, and III."*

2003 *Total Maximum Daily Loads for the Lower Cuyahoga River Final Report*. Available at: https://www.epa.state.oh.us/dsw/tmdl/CuyahogaRiver.aspx.

2007 State of Ohio Water Quality Standards; OAC Chapter: 3745-1 of the Administrative Code. Available at: http://www.epa.ohio.gov/dsw/rules/3745_1.aspx

2008 *Cuyahoga River Aquatic Life Use Attainment Following the Kent and Munroe Falls Dam Modifications.* Water Quality Report NEDO/2008-08—01. Columbus, Ohio. 82 pp.

2008a *Cuyahoga River Biological and Water Quality Study; Biological Community Data and Delisting Potential.* Presentation to Cuyahoga River RAP Coordinating Committee. On file at Cuyahoga Valley National Park, Resource Management Office, Brecksville, Ohio.

2009 *Laboratory Organic Analysis Data Report* (Location Cuyahoga Dam Pool). Division of Environmental Services. Report on file at Cuyahoga Valley National Park, Resource Management Office, Brecksville, Ohio.

2013 *Total Suspended Solids Concentrations – Cuyahoga Falls Dam Removals*. Monitoring Data on file at Ohio EPA, Northeast Ohio District Office, Twinsburg, Ohio

2016 Biological Monitoring Data maintained in the Ecological Assessment and Analysis Application (EA3) Database. Ohio EPA, Northeast Ohio District Office, Twinsburg, Ohio.

Ohio & Erie Canal Association

2000 *Ohio & Erie Canal National Heritage Corridor Management Plan*.

Poh-Miller, C.
1979 Ohio and Erie Canal Thematic Resources. *National Register of Historic Places Nomination Form*. Ohio Historic Preservation Office, Columbus, Ohio.

Quinn, H.
1999 *Turtle Survey of the Cuyahoga Watershed: Species Richness, Abundance, Distribution and Management Recommendations.*

Rumschlag, J.H. and J.A. Peck
2007 *Short-term Sediment and Morphologic Response of the Middle Cuyahoga River to the Removal of the Munroe Falls Dam, Summit County, Ohio*. J. Great Lakes Res. 33 (Special Issue 2): 142-153.

Scrattish, N. and H. Unrau
1984 *Historic Structure Report, Ohio and Erie Canal, Cuyahoga Valley National Recreation Area*. Cuyahoga Valley National Recreation Area, National Park Service, Brecksville, Ohio.

Sifritt, S.K.
1983 *A Field Guide to the Geology of the Cuyahoga Valley National Recreation Area Cleveland, Ohio*.

Smith, D. C. and M. A. Gates, R.A.Krebs, and M. J.S. Tevesz
2002 *A Survey of Freshwater Mussels (Unionidae) and other Molluscs in the Cuyahoga Valley National Park*. Department of Biology, Geology, and Environmental Sciences, Cleveland State University, Cleveland, Ohio.

Spetz, J. C. and T.L. Robison
2011 Blanding's Turtle (*Emydoidea blandingii*) Head Start and Restoration Effort at Cleveland Metroparks Ohio & Erie Canal Reservation. *Cleveland Metroparks Technical Report 2011/NR-09.* Division of Natural Resources, Cleveland Metroparks, Fairview Park, Ohio.

Straub, D.E.
1997 *Low-Flow Characteristics of Streams in Ohio through Water Year 1997. Water-Resources Investigations Report 01-4140*. U.S. Department of Interior; U. S. Geological Survey in cooperation with the Ohio Department of Natural Resources, Columbus, Ohio.

Szabo, J.P.
1987 *Wisconsin stratigraphy of the Cuyahoga Valley in the Erie Basi, northeastern Ohio*. Can. J. Earth Sci. 24: 279-290.

Tamburro, S.
2003 *History of the Brecksville Dam*. Manuscript on File, Resource Management Division, Cuyahoga Valley National Park, Brecksville, Ohio.

Tuckerman, S. and B. Zawiski
2007 *Case studies of dam removal and TMDLs: Process and results*: Journal of Great Lakes Research, v. 33, Special Issue 2, p. 103–116.

United States Department of Agriculture, Soil Conservation Service (USDA)

1980 *Soil Survey of Cuyahoga County, Ohio*. US Department of Agriculture, Soil Conservation Service and the Ohio Department of Natural Resources, Columbus, Ohio.

United States Environmental Protection Agency (USEPA)

2007 *An Approach for Using Load Duration Curves in the Development of TMDLs*. Office of Wetlands, Oceans and Watersheds, United States Environmental Protection Agency, Washington, D.C.

US Geological Survey (USGS)

2016 *Ohio Water Science Center*. Available at: http://oh.water.usgs.gov/.

Zawiski, B.

2014 Personal communication between Meg Plona, Biologist, Veronica Dickerson, Environmental Protection Specialist and William Zawiski, Ohio EPA on 11/21/14 regarding modification of dams and partial attainment of water quality standards.

## Commonly Used Acronyms

| | |
|---|---|
| A P E | Area of Potential Effect |
| CFR | Code of Federal Regulations |
| CLI | Cultural Landscape Inventory |
| CLIPP | Cultural Landscape Inventory and Professional Procedure Guide |
| CUVA | Cuyahoga Valley National Park |
| EA | Environmental Assessment |
| ESA | Endangered Species Act |
| EO | Executive Order |
| GMP | General Management Plan |
| HAER | Historic American Engineering Record |
| HSS | Historic Structures Survey |
| IBI | Index of Biotic Integrity |
| IDT | Interdisciplinary Team |
| IJC | International Joint commission |
| LCS | List of Classified Structures |
| NEPA | National Environmental Policy Act |
| NHL | National Historic Landmark |
| NHPA | National Historic Preservation Act |
| NRHP | National Register of Historic Places |
| NRI | National Rivers Inventory |
| NPS | National Park Service |
| ODNR | Ohio Department of National Resources |
| Ohio EPA | Ohio Environmental Protection Agency |
| RAP | Remedial Action Plan |
| SHPO | State Historic Preservation Office |
| USACE | US Army Corps of Engineers |
| USEPA | US Environmental Protection Agency |
| USFWS | US Fish and Wildlife Service |

## Glossary

*Action alternative*: Any alternative that is not the "no action" alternative.

*Affected environment*: Existing conditions that are subject to direct and indirect changes as a result of actions described in the alternatives under consideration.

*Compliance*: To be in accordance with established policies, laws, and regulations.

*Cultural landscape*: A geographic (including both cultural and natural resources and the wildlife or domestic animals therein) associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

*Environmental Assessment*: A planning tool administered by the Council of Environmental Quality to assist in planning and decision-making.

*Human environment*: Is both the natural and physical environment, and the relationship of people with the environment.

*Mitigation*: An activity designed to avoid, minimize, rectify, eliminate or compensate for impacts of a proposed project. A mitigation measure should be a solution to an identified environmental problem.

*National Environmental Policy Act:* The law that requires detailed and documented environmental analysis of proposed federal actions that may affect the quality of the human environment.

*National Heritage Corridor*: A national designation intended to help local entities protect and use historic, cultural, and recreation resource for community benefits while raising regional and national awareness of their unique importance.

*National Register of Historic Places*: The comprehensive list of districts, sites, buildings, structures, and objects of national, regional, state, and local significance in American history, architecture, archeology, engineering, and culture.

*Restoration (natural):* Work conducted to remove impacts to natural resources and restore natural processes, and to return a site to natural conditions.

*Re-vegetation*: The replacement or augmentation of native plants in an area that had been previously disturbed or currently does not hold vegetation.

*Scoping*: An information collection process by which all relevant issues and concerns, as well as alternatives to a proposed federal action area identified. This process includes the review of all relevant planning and management documents, consultation and discussion with interested agencies and organizations, and public input.

*Water Trail*: Recreational routes with a network of public access points connecting people, places, and communities to the waterways that provides high quality outdoor recreational opportunities.

## Appendix A: Other Applicable Policies and Regulations

*Endangered Species Act of 1978.* As amended, the Act prohibits federal actions from jeopardizing the existence of federally listed threatened or endangered species or adversely affecting designated critical habitat. Federal agencies must consult with the U.S. Fish and Wildlife Service to determine the potential for adverse effects.

*Clean Water Act of 1972, 1987*. The Act establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

*Rivers and Harbors Act of 1899*. The Act sets restrictions on the discharge of material into navigable waters or tributaries or to dam navigable streams without a permit from Congress.

*Archeological Resources Protection Act (ARPA) of 1979*. (P.L. 96-95; 93 Stat.712). The Act defines archeological resources, their excavation or removal regulations, preservation policies, cooperation with other parties and the development of plans for surveying public lands for archeological resources.

*Native American Graves Protection and Repatriation Act (NAGPRA) of 1990*. The Act requires federal agencies and institutions that receive federal funds to provide information about Native American human remains, funerary objects, sacred objects and objects of cultural patrimony to lineal descendants, Indian tribes and native Hawaiian organizations and, upon presentation of a valid request, dispose of or repatriate these objects to them.

*NPS Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making*. Director's Order 12 provides a planning process for NPS compliance with the National Environmental Policy Act (NEPA).

*NPS Director's Order 40: Dam Safety & Security Program*. Director's Order 40 establishes policies and procedures for dams within NPS unit boundaries, or where park resources could be impacted by non-NPS owned dams inside and outside of park boundaries.

*NPS Director's Order 77*. Natural Resource Protection, Reference Manual. Director's Order 77 sets forth guidance to NPS employees responsible for managing, conserving and protecting natural resources found in NPS units.

*Executive Order 11990: Protection of Wetlands*. The Order sets forth guidance to "avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."

*Executive Order 11988: Floodplain Management*. The Order requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

*Executive Order 13061: American Heritage River*. The American Heritage River Program recognizes rivers with distinctive characteristics and strong community involvement.

*Executive Order 13112: Invasive Species Management*. The Order requires that the actions of federal agencies prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause.

*Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds*. The Order directs actions of federal departments and agencies to implement the Migratory Bird Treaty Act.

*Executive Order 13423: Strengthening Federal Environmental, Energy, and Transportation Management*. The Order requires that federal agencies to conduct their environmental, transportation, and energy- related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner. The Order specifically states, "improve energy fficiency and reduce greenhouse gas emissions of the agency, through reduction of energy usage."

*Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance*. The Order requires federal agencies to increase energy efficiency; measure, report, and reduce their greenhouse gas emissions from direct and indirect activities; conserve and protect water resources through efficiency, reuse, and storm water management; eliminate waste, recycle, and prevent pollution; leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services; design, construct, maintain, and operate high performance sustainable buildings in sustainable locations; strengthen the vitality and livability of the communities in which Federal facilities are located.

Part 36 of the Code of Federal Regulations (CFR). This CFR provides for the proper use, management, government, and protection of persons, property, and natural and cultural resources within areas under the jurisdiction of NPS. The following sections of Part 36 of the CFR apply specifically to the actions being considered.

36 CFR Part 2. Resource Protection, Public Use and Recreation
2.1 Preservation of natural, cultural and archeological resources.
2.2 Wildlife Protection

*Part 40 of the (CFR). 1500-1508 (Council of Environmental Quality, NEPA regulations of 1978*). This section provides regulations for implementing the Procedural Provisions of NEPA.

*Part 43 CFR 46. Implementation of the National Environmental Policy Act of 1969*. A bureau proposed action is subject to the procedural requirements of NEPA if it would cause effects on the human environment and is subject to bureau control and responsibility.

## Appendix B: Agency Consultation

United States Fish and Wildlife Service (November 24, 2009)

United States Fish and Wildlife Service (July 29, 2015)

Northeast Ohio Regional Sewer District (September 20, 2016)

United States Environmental Protection Agency (September 28, 2016)

United States Army Corps of Engineers, Regulatory Branch (October 7, 2016)

Response

## Appendix C: SHPO Consultation

NPS transmittal letter to SHPO (September 2, 2016)

SHPO request for additional information (September 30, 2016)

NPS response to request for additional information (November 28, 2016)

SHPO Concurrence (June 8, 2017)

Signed MOA (executed July 14, 2017)

Summary of Tribal Consultation

Miami Tribe of Oklahoma Consultation (September 14, 2016)

## Appendix D: Public Comment

Non-Substantive Public Comments

Substantive Public Comments

Response

## Appendix E: Agencies and Groups Contacted During Public Scoping Activities

Boston Township
Cleveland Metropolitan Park District
Cleveland Museum of Natural History
Conservancy for Cuyahoga Valley National Park
Crown Point Ecology Center
Cuyahoga County Board of Commissioners
Cuyahoga County Planning Commission
Cuyahoga County Soil and Water Conservation District
Cuyahoga RAP - Cuyahoga River Community Planning Organization
Cuyahoga Valley Countryside Conservancy
Cuyahoga Valley Scenic Railroad

City of Akron
City of Brecksville
City of Cuyahoga Falls
City of Hudson
City of Independence

EcoCity Cleveland
Friends of Crooked River
Greater Akron Audubon Society
Keelhaulers Canoe Club
Northeast Ohio Four County Planning
Northfield Center Township
Northfield Center Fire Department
Ohio Canal Corridor

Ohio Department of Agriculture
Ohio EPA - DEFA
Ohio Department of Natural Resources-Division of Water and Division of Wildlife
Ohio Environmental Council
Ohio & Erie Canal Corridor Coalition
Ohio Historic Preservation Office

Public Employees for Environmental Responsibility
Richfield Township
Sagamore Hills Township
Sierra Club Circulation
Summit County Council
Summit County Department of Environmental Services
Summit County Executive
Summit County Metroparks
Summit County Soil & Water Conservation District
The Nature Conservancy

US Army Corps of Engineers
US Environmental Protection Agency

US Fish & Wildlife Service – Columbus, Ohio
US Geological Survey – Columbus, Ohio
US House of Representatives
US Senate

Village of Boston Heights
Village of Northfield
Village of Peninsula
Village of Richfield
Village of Valley View
Village of Walton Hills

Western Reserve Historical Society
Western Reserve Resource Conservation and Development

**Tribal Nations:**
Absentee-Shawnee Tribe of Indians of Oklahoma
Delaware Tribe of Indians
Delaware Tribe of Western Oklahoma
Eastern Shawnee Tribe of Oklahoma
Miami Tribe of Oklahoma
Ottawa Tribe of Oklahoma
Seneca Nation of Indians
Seneca-Cayuga Tribe of Western Oklahoma
Shawnee Tribe
Wyandotte Nation