National Park Service
Cuyahoga Valley National Park

ENVIRONMENTAL ASSESSMENT FOR TINKERS CREEK AQUEDUCT PHASE II

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CUYAHOGA VALLEY NATIONAL PARK
Environmental Assessment for Tinkers Creek Aqueduct – Phase II

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1.0 INTRODUCTION/PURPOSE AND NEED

1.1 About This Document

In 1969, the United States Congress passed the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) to establish a national policy,

> *"…which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; …"*

The Act also established the Council on Environmental Quality (CEQ) as an agency of the Executive Office of the President. In enacting NEPA, Congress recognized that nearly all federal activities affect the environment in some way. Section 102 of NEPA mandates that before federal agencies make decisions, they must consider the effects of their actions on the quality of the human environment. The act assigns CEQ the task of ensuring that federal agencies meet their obligations under NEPA.

The CEQ developed regulations (40 CFR 1500-1508) that describe the means for federal agencies to develop the Environmental Impact Statements (EISs) mandated by NEPA in Section 102. The CEQ regulations developed the Environmental Assessment (EA) to be used when there is not enough information to decide whether a proposed action may have significant impacts. If an EA concludes that a federal action will result in significant impacts, it becomes an EIS. Otherwise, it results in a Finding of No Significant Impact (FONSI).

Section 1508.09 of the CEQ regulations states that the purposes of an EA are to:

1. Briefly provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI.

2. Aid an agency's compliance with the Act when no environmental impact statement is necessary.

3. Facilitate preparation of a statement when one is necessary.

Preparation of an EA is also used to aid in an agency's compliance with Section 102(2)E of NEPA, which requires an agency to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

The Department of the Interior produced its NEPA regulations as Part 516 of its Departmental Manual (DM), and the National Park Service (NPS) produced several NEPA handbooks. The latest version of Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-Making was issued in 2001 along with an associated Handbook (the DO-12 Handbook). The NPS has added some requirements that go beyond those imposed by CEQ to help facilitate the requirements of the law that established the NPS (the Organic Act) and other laws and policies that guide our actions. This document has been completed under the guidance of the DO-12 Handbook.[1]

1.2 Background

1.2.1 Park History

The National Park System preserves outstanding representatives of the best of America's natural, cultural, and recreational resources of national significance. These resources constitute a significant part of the American heritage, its character, and future. Along with similar resources of local, state, tribal, and national significance administered by other public and private organizations and supported by NPS technical assistance and grant funding, the Cuyahoga Valley National Park (CVNP) is a vital part of America's system of parks and other preserved resources. The NPS not only directly and indirectly preserves these irreplaceable national treasures, but it also makes them available annually to millions of visitors from throughout both this country and the world.

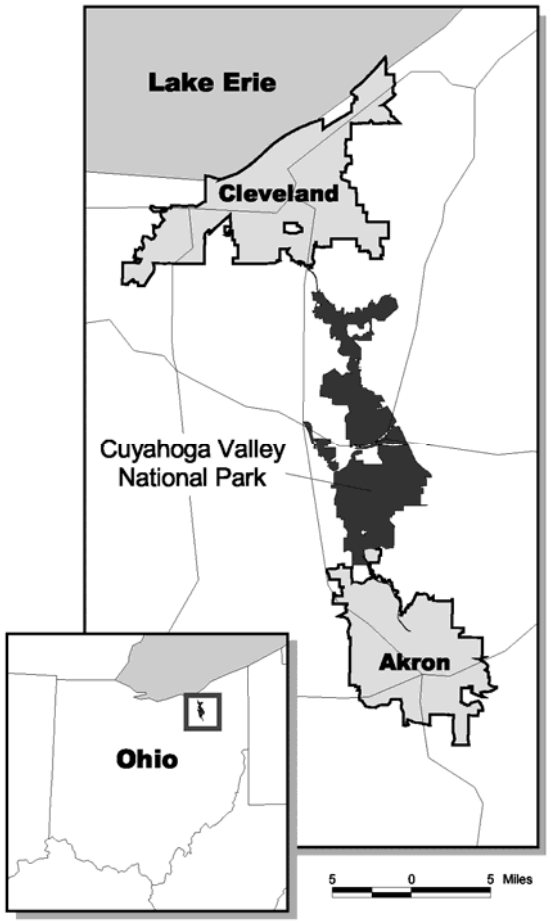

Figure 1. Location of Cuyahoga Valley National Park, Ohio.

The Cuyahoga River Valley was formed as the last glaciers retreated from northeastern Ohio about 15,000 years ago. The name "Cuyahoga" is a blend of several native peoples' names for the river, and is usually translated to mean "crooked river." The river flows to the north into Lake Erie. The river allowed travel by canoe to an eight-mile portage trail leading to the south-flowing Tuscarawas River, which eventually feeds the Ohio River and was therefore it was deemed neutral territory for all passing tribes.

[1] Available over the internet at http://www.nps.gov/policy/DOrders/RM12.pdf

The Cuyahoga River was the western boundary of the United States from 1795 to 1803. While the early canoe routes were suitable for the Native Americans, early settlers and farmers found the unpredictably swift currents to be treacherous. The Ohio & Erie Canal was constructed along the Cuyahoga in the early 1800's to provide a much-needed safe and dependable way to ship products to market. The canal opened in 1827, resulting in a subsequent economic boom in the surrounding area. Over time, canals were superseded by the development of railroads through the Cuyahoga Valley, and these were discontinued as the automobile replaced the railroad in importance. Located between the cities of Cleveland and Akron, the Cuyahoga Valley became the target of urban sprawl.

In December 1974, President Gerald Ford signed legislation creating the Cuyahoga Valley National Recreation Area (CVNRA), located along 22 miles of the Cuyahoga River between Cleveland and Akron, Ohio. It covers an area of over 32,800 acres and features a wide variety of natural, cultural, and historic resources. The purposes for the CVNRA included:

> *. . . preserving and protecting for public use and enjoyment the historic, scenic, natural, and recreational values of the Cuyahoga River and adjacent lands in the Cuyahoga Valley, and for the purpose of providing for the maintenance of needed recreational open space necessary to the urban environment . . .*

Historic resources in the CVNRA include the Ohio & Erie Canal (including the towpath), the Valley Railway, and numerous buildings and bridges. Many of these resources are on the National Register of Historic Places. The Ohio & Erie Canal National Heritage Corridor, which was established by Congress in 1996 under the Omnibus Parks Bill encompasses the primary resources associated with the Ohio & Erie Canal and its region and extends through the area. Natural resources include the river and a number of ecosystems with associated flora and fauna located in the river and in the river valley.

The CVNRA developed dramatically in the next 25 years following designation, offering many new facilities and programs to the public. The "Cuyahoga Valley National Recreation Area" was renamed "Cuyahoga Valley National Park" on October 11, 2000[2]. It is now the 15th most-visited national park, with 3.5 million visitors a year.

1.2.2 Project History

The Tinkers Creek Aqueduct carries the Ohio & Erie Canal over Tinkers Creek near the northern end of the CVNP in Cuyahoga County, Ohio. The aqueduct site is located between Locks 37 and 38 and is immediately adjacent to and downstream of the Canal Road Bridge over Tinkers Creek.

[2] All land designations in the park system have equal legal standing and differences do not extend far beyond nomenclature. See http://www.nps.gov/legacy/nomenclature.html. The park's name change did not change the purpose of the park. In fact, nothing changed with respect to the site other than the name designation from "National Recreation Area" to "National Park."

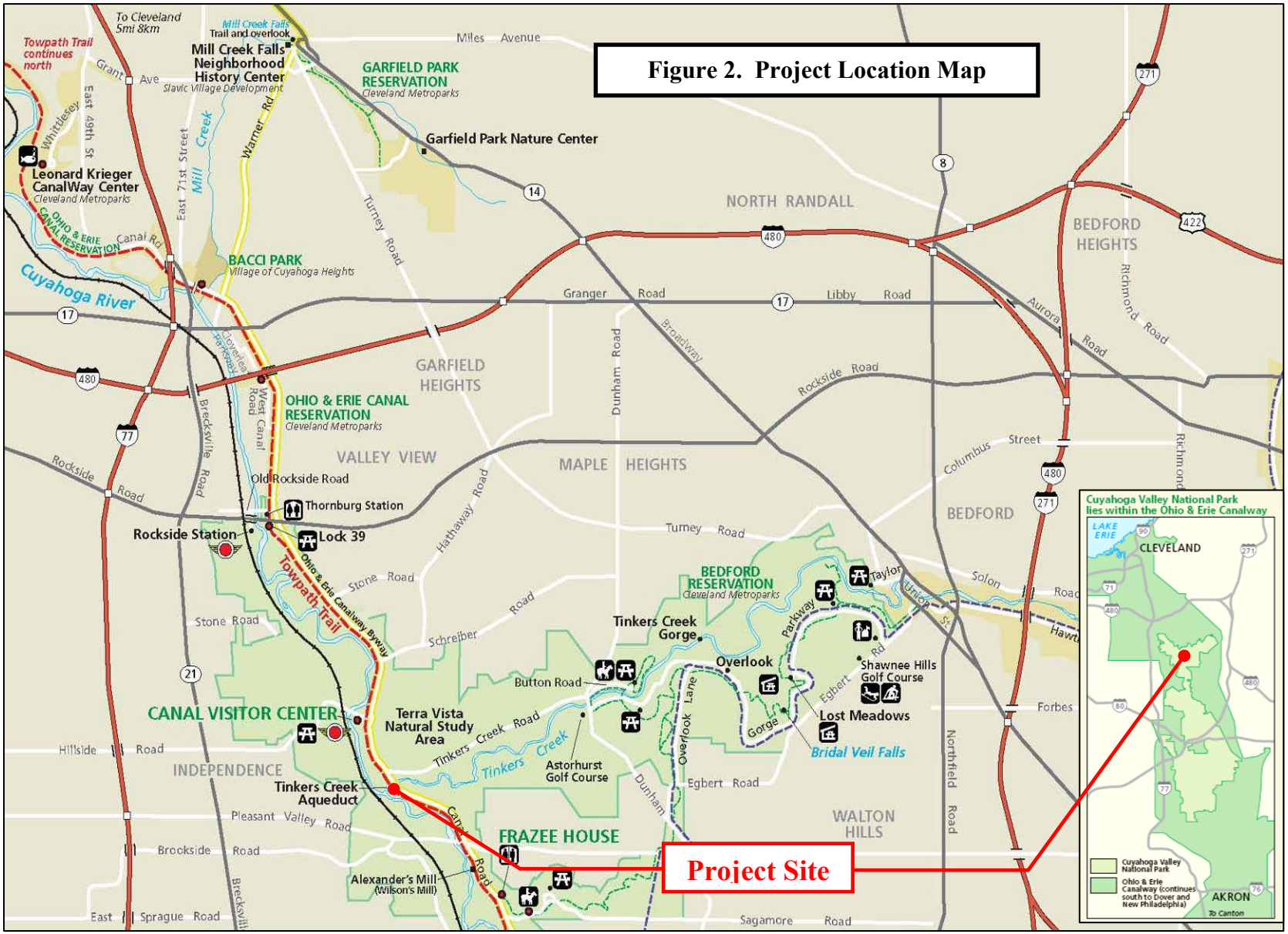
Figure 2. Project Location Map
Project Site
To Cleveland 5mi 8km
Towpath Trail continues north
Mill Creek Falls Trail and overlook
Mill Creek Falls Neighborhood History Center
Slavic Village Development
GARFIELD PARK RESERVATION
Cleveland Metroparks
Garfield Park Nature Center
Leonard Krieger CanalWay Center
Cleveland Metroparks
OHIO & ERIE CANAL RESERVATION
BACCI PARK
Village of Cuyahoga Heights
Cuyahoga River
NORTH RANDALL
BEDFORD HEIGHTS
GARFIELD HEIGHTS
OHIO & ERIE CANAL RESERVATION
Cleveland Metroparks
VALLEY VIEW
MAPLE HEIGHTS
BEDFORD
Old Rockside Road
Thornburg Station
Rockside Station
Lock 39
Towpath Trail
Ohio & Erie Canalway Byway
BEDFORD RESERVATION
Cleveland Metroparks
Tinkers Creek Gorge
Overlook
Shawnee Hills Golf Course
Lost Meadows
Bridal Veil Falls
Button Road
CANAL VISITOR CENTER
Terra Vista Natural Study Area
Tinkers Creek
Astorhurst Golf Course
INDEPENDENCE
Tinkers Creek Aqueduct
FRAZEE HOUSE
Alexander's Mill (Wilson's Mill)
WALTON HILLS
Egbert Road
Sagamore Road
Granger Road
Libby Road
Turney Road
Rockside Road
Hillside Road
Pleasant Valley Road
Brookside Road
East Sprague Road
Stone Road
Schreiber Road
Hathaway Road
Dunham Road
Broadway
Aurora Road
Richmond Road
Columbus Street
Solon Road
Forbes
Northfield Road
Cuyahoga Valley National Park lies within the Ohio & Erie Canalway
LAKE ERIE
CLEVELAND
AKRON
To Canton
Cuyahoga Valley National Park
Ohio & Erie Canalway (continues south to Dover and New Philadelphia)

The original aqueduct carrying the Ohio & Erie Canal over Tinkers Creek was constructed between 1825 and 1827 at a location upstream of the current site. It featured a wooden trunk with timber framing supported by uncut masonry abutments and a central pier. The timber and uncut stone were extremely susceptible to deterioration. The framing and trunk were replaced in 1836 and the pier in 1841-1842. These deteriorated by 1844, and a new aqueduct was constructed at the current site. No evidence of an aqueduct remains at the original location.

The first aqueduct at the current site was constructed in 1845 and consisted of a two-span structure supported on cut ashlar masonry abutments and pier. The superstructure rapidly deteriorated and was totally replaced in 1870 and again in 1896. In 1905 it was replaced by a two-span, steel truss carrying a timber trough and towpath bridge supported on rehabilitated masonry abutments and pier.

In 1913 the canal was abandoned as a waterway but the aqueduct remained in service to convey water used as a cooling source for the American Steel and Wire Company. The aqueduct superstructure underwent a major rehabilitation in the 1960s.

With the creation of the CVNRA in 1974, the Ohio & Erie Canal and Tinkers Creek Aqueduct became one of the resources managed by the NPS. The Tinkers Creek Aqueduct is individually listed on the National Register of Historic Places and is a contributing resource in the Ohio & Erie Canal National Historic Landmark. The Ohio & Erie Canal National Historic Landmark includes a four-mile watered section of the canal that generally retains its historic appearance, Alexander Mill, the Lock Tender's House (currently the Canal Visitor Center), Locks 37 and 38, and the Tinkers Creek Aqueduct.

The timber trough required on-going maintenance to ensure water tightness and by the late 20th century had deteriorated to the point that it could not effectively hold water. A report and letter was furnished to the CVNP in 2002 recommending the aqueduct be closed to pedestrian traffic (Gannett-Fleming, 2000). Earthen dams were placed at both ends of the aqueduct and three HDPE pipes were installed on the floor of the trough to convey the canal water across Tinkers Creek. Two HDPE pipes were initially installed, a third pipe was later added to increase flow capacity. The trusses, especially in their lower portions, continued to deteriorate to the point where they exhibited signs of localized failure and severe section loss.

In 2007, under emergency action, the NPS let a contract for Phase I of the aqueduct replacement project. Phase I (see Drawing 1in Appendix C) included removal of the existing truss superstructure, timber trough, HDPE conveyance pipes and Towpath Trail Bridge. To convey flow from Lock 37 to Lock 38 and to maintain the water levels in the Ohio & Erie Canal on either side of Tinkers Creek, the conveyance pipes were replaced with two steel pipes. Approximately 45 feet south of the structure, a vertical riser pipe and outfall pipe structure were constructed in the canal to serve as a temporary emergency outflow during storm events (see Figures 11 and 12 on page 57). A new two-span Towpath Trail Bridge was constructed that is supported off the existing stone abutments and pier.

The current action is the construction of Phase II, which will consist of removal of the temporary twin steel pipes structure, removal of the vertical riser pipe and outflow pipe structure, repair and rehabilitation of the masonry pier and abutments and construction of a new aqueduct superstructure and transition structures to restore the canal to its historic, functional condition.

In consultation with the Ohio State Historic Preservation Office (SHPO), the NPS determined that the phased removal and replacement of the Tinkers Creek Aqueduct will have an adverse effect on Tinkers Creek Aqueduct and the Ohio & Erie Canal. In July 2006, the NPS and the SHPO entered into a Memorandum of Agreement (MOA) pursuant to 36 CFR 800.6(a) of the regulations implementing Section 106 of the National Historic Preservation Act. Stipulations in the MOA include:

- Documentation of the Tinkers Creek Aqueduct to Historic American Engineering Record (HAER) Documentation Level II standards. This documentation has been accomplished.
- A Wayside Exhibit to be constructed and installed along the Towpath Trail adjacent to the new aqueduct which discusses the history of the Ohio & Erie Canal aqueducts over Tinkers Creek. This will be accomplished as part of Phase II.
- Design Review – Plans for both phases to be reviewed and approved by the SHPO. This has been done for Phase I and will be done for Phase II.
- Archaeological monitoring by a qualified archaeologist during ground disturbing activity.

1.3 Purpose and Need Statement

The NPS is considering the replacement of Tinker's Creek Aqueduct in CVNP. The Tinkers Creek Aqueduct is one of the historic resources to be preserved and protected for public use and enjoyment as part of the purpose for the Park. The aqueduct is located in the watered potion of the canal and is a critical element in maintaining the continuity of the waterway and the Towpath Trail in the area. Phase I of the project was undertaken in response to the urgent need resulting from the deteriorating aqueduct. There is now a need to complete the process that was started in Phase I.

Since it was not possible to preserve or restore all of the previous aqueduct superstructure due to advanced deterioration, the purpose of the project is to construct a new aqueduct superstructure and rehabilitate the existing masonry abutments and pier to restore the canal prism across Tinkers Creek in a manner that maintains an acceptable degree of historic accuracy consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties, and SHPO.

Other purposes for the project include:

- provision of safe recreational facilities for the public who use the Towpath Trail and for CVNP staff who maintain these resources.

- minimal interference with the natural processes and ecological character of Tinkers Creek; and

- meeting the need in a reasonable, cost-effective manner.

An EA analyzes the proposal and alternatives and their impacts on the environment. This EA has been prepared in accordance with NEPA and regulations of the CEQ (40 CFR 1508.9).

1.4 Laws (Statutes), Executive Orders, Regulations, Policies and Guidelines

The resources of CVNP are protected under the authorities of the National Park Service Organic Act of 1916 (16 U.S.C. § 1), which established the National Park Service; the National Park System General Authorities Act (16 U.S.C. §§ 1a-1 et seq.), which includes all areas administered by the National Park Service in one National Park System and clarifies the authorities applicable to the system; Part 36 of the Code of Federal Regulations (CFR), which provides for the proper use, management, government, and protection of persons, property, and natural and cultural resources within areas under the jurisdiction of the NPS; and the Park's enabling legislation (Public Law 93-555).

The Cuyahoga Valley National Recreation Area was established by Public Law 93-555 on December 27, 1974 and was renamed Cuyahoga Valley National Park on October 11, 2000. Section 1 of PL 93-555 states the purpose of the Park:

> *For the purpose of preserving and protecting the historic, scenic, natural, and recreational values of the Cuyahoga River and the adjacent lands of the Cuyahoga Valley and for the purpose of providing for the maintenance of needed recreational open space necessary to the urban environment, the Cuyahoga Valley National Recreation Area…. In the management of the recreation area, the Secretary of the Interior shall utilize the recreation area 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.*

Section 4 (d) of PL 93-555 addresses the duties of the Secretary of Interior:

> *The Secretary…shall inventory and evaluate all sites and structures within the recreation area having present and potential historic, cultural, or architectural significance and shall provide for appropriate programs for the preservation, restoration, interpretation and utilization of them.*

In addition to the language presented in PL 93-555 that created Cuyahoga Valley National Recreation Area, general preservation and management direction is provided by the National Park Service Organic Act of August 25, 1916. This act established the NPS and, by extension, states the overall mission for areas managed by the NPS:

> *… promote and regulate the use of the Federal areas known as national parks, monuments, and reservations…by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life 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.*

Additional laws, regulations and policies that have bearing on this action are listed below. See Appendix A for a brief description of each.

- Antiquities Act of 1906
- Archaeological and Historic Preservation Act of 1974
- Archaeological Resources Protection Act (ARPA) of 1979
- Clean Water Act of 1977
- The Endangered Species Act of 1973
- Historic Sites Act of 1935
- The National Environmental Policy Act of 1969 (NEPA)
- The National Historic Preservation Act (NHPA) of 1966
- National Park Service Organic Act of 1916
- National Park System General Authorities Act of 1970
- The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990
- Public Law 93-555
- Executive Order (EO) 11593 (Cultural Properties)
- EO 11988 (Floodplains)
- EO 11990 (Wetlands)
- EO 13112 (Invasive Species)
- EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)
- 40 CFR 1500-1508 (CEQ NEPA regulations of 1978).
- 43 CFR 3 (Antiquities Act).
- 43 CFR 7, Subparts A and B (ARPA, as amended), "Protection of Archaeological Resources, Uniform Regulations" and "Department of the Interior Supplemental Regulations."

All of Part 36 of the CFR provides for the proper use, management, government, and protection of persons, property, and natural and cultural resources within areas under the jurisdiction of the NPS. However, some sections are specifically noted here. See Appendix A for a brief description of each.

- 36 CFR 60 (NHPA and EO 11593), "National Register of Historic Places."
- 36 CFR 63 (NHPA and EO 11593), "Determinations of Eligibility for inclusion in the National Register of Historic Places."
- 36 CFR 65 (Historic Sites Act of 1935), "National Historic Landmarks Program."
- 36 CFR 68 (NHPA).
- 36 CFR 79 (NHPA and ARPA), "Curation of Federally-owned and Administered Archeological Collections."
- 36 CFR 800 (NHPA and EO 11593), "Protection of Historic and Cultural Properties."

The NPS Management Policies (NPS 2006) provide general guidance for managing natural resources.

Section 4.6.6 of the NPS Management Policies (NPS 2006) provides guidance on watershed and stream processes. This includes erosion, deposition, woody debris, stream migration and watershed management.

The Service will manage watersheds as complete hydrologic systems…The Service will manage streams to protect stream processes that create habitat features such as floodplains, riparian systems, woody debris accumulations, terraces, gravel bars, riffles, and pools. Stream processes include flooding, stream migration, and associated erosion and deposition.

The Service will achieve the protection of watershed and stream features primarily by avoiding impacts to watershed and riparian vegetation, and by allowing natural fluvial processes to proceed unimpeded.

The NPS Management Policies also provide guidance for managing cultural resources. Section 5.3.1 provides the following general guidance on protection and preservation of cultural resources:

The National Park Service will employ the most effective concepts, techniques, and equipment to protect the cultural resources against theft, fire, vandalism, overuse, deterioration, environmental impacts, and other threats, without compromising the integrity of the resources.

Section 5.3.5.2.7.of the NPS Management Policies (NPS 2006) provides guidance on new construction to a cultural landscape:

Contemporary alterations and additions to a cultural landscape must not radically change, obscure, or destroy its significant spatial organization, materials, and features. New buildings, structures, landscape features, and utilities may be constructed in a cultural landscape if

- *existing structures and improvements do not meet essential management needs;*
- *new construction is designed and sited to preserve the landscape's integrity and historic character; and*
- *the alterations, additions, or related new construction is differentiated from yet compatible with the landscape's historic character – unless associated with an approved restoration or reconstruction.*

New additions will meet the Secretary of the Interior's Standards for Rehabilitation.

Section 5.3.5.4.6 of the NPS Management Policies (NPS 2006) provides guidance on new reconstruction of historic structures:

In those areas of parks managed for the preservation, protection, and interpretation of cultural resources and their settings, new structures, landscape features, and utilities will be constructed only if

- *existing structures and improvements do not meet essential park management needs; and*

- *new construction is designed and sited to preserve the integrity and character of the area.*

Unless associated with an approved restoration or reconstruction, all alterations, additions, or related new construction will be differentiated from yet compatible with the historic character of the structure.

Cuyahoga Valley National Park's General Management Plan (NPS 1977) provides the overall concept for management and resource preservation for compatible recreational use. Among the policies for cultural resource management, the General Management Plan (GMP) for the Cuyahoga Valley National Park states:

The National Park Service will faithfully preserve all significant historic and archaeological resources and will provide for their interpretation, use, and/or protection through adequate research and programming.

The aforementioned references provide the legislative and policy guidance against which the feasible alternatives will be evaluated. The consistent message of the guidance is the need to consider both the continuity of natural processes and the preservation of historic, cultural and recreational features.

2.0 ISSUE IDENTIFICATION

Issues, as discussed in NEPA, describe the relationships between the action being proposed and the environmental (natural, cultural and socioeconomic) resources. Issues describe an association or a link between the action and the resource. Issues are not the same as impacts, which include the intensity or results of those relationships. Internal scoping (defining the range of potential issues) was conducted for this EA to identify what relationships exist between the proposed action and environmental resources.

External scoping was conducted with federal, state, and local agencies, along with solicitation for public comment in the region surrounding CVNP. A request for public comment and project description was posted on the NPS Planning, Environment and Public Comment (PEPC) website at http://parkplanning.nps.gov/ from July 7, 2009 to July 31, 2009. A notice was also published in the Akron Beacon Journal on July 13, 2009 requesting comments on the scope of the project and impact topics.

Scoping was conducted in July 2009 with federal, state, and local agencies and organizations. Each of the agencies and organizations involved with scoping had direct and indirect jurisdiction, insight, knowledge, expertise or concern for CVNP resources. No comments were received from federal, state, and local agencies/organizations. Input from Federal, state and local agencies/ organizations will continue to be sought through publication and distribution of this EA.

The following issues were identified through the scoping process:

- Construction of any build alternative would include the need for temporary causeways to be constructed in Tinkers Creek and a cofferdam to be constructed to do work on the center pier.

- Construction of any build alternative will disturb the vegetation in the area surrounding the Tinkers Creek Aqueduct. Construction disturbance will also leave the area susceptible to colonization by invasive plant species.

- The project lies within the range of the Indiana bat (*Myotis sodalis*), a federally listed endangered species, and the eastern massasauga (*Sistrurus catenatus catenatus*), a Federal Candidate species and an Ohio endangered species.

- The Tinkers Creek Aqueduct is individually listed in the National Register of Historic Places and is a contributing resource in the Ohio & Erie Canal National Historic Landmark. Other contributing resources include a 4-mile portion of the Ohio & Erie Canal, Alexander Mill, the Lock Tender's House (currently the Canal Visitor Center), Locks 37 and 38, and the Tinkers Creek Aqueduct together comprise a National Historic Landmark listed on the National Register of Historic Places.

- There are concerns for health and safety involved in any construction project.

- The Towpath Trail is the most utilized recreational resource within CVNP. Use of the trail would be routed around the current trail bridge over Tinkers Creek during

construction, and at times use of the trail would be interrupted for certain construction sequences.

- The project is located within a FEMA mapped floodplain.

- Continued maintenance would be required for either of the alternatives.

2.1 Issues and Impact Topics Addressed in this EA

The issues identified above were translated and focused into impact topics, or a more specific description of resources that may be impacted by the action. These impact topics are then carried through the analysis in the EA. The affected environment under each of the impact topics identified is presented in Chapter 4. An analysis of the impacts on these resources from each alternative is evaluated in Chapter 4.

2.1.1 Streamflow characteristics

National Park Service regulations and NPS Management Policies provide guidance on geologic resources and processes, including natural streamflow characteristics. The NPS is required to allow natural processes to proceed unimpeded. During construction of any build alternative, the natural streamflow characteristics would be temporarily altered.

2.1.2 Vegetation and Invasive plant species

Construction of any build alternative would disturb existing vegetation in the vicinity of the Tinkers Creek Aqueduct. Such activity will also leave the area susceptible to colonization by invasive plant species. Executive Order (EO) 13112 requires that federal agencies act to 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.

2.1.3 Historic Structures

The National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.) and the NPS Cultural Resource Management Guidelines (NPS 1997) and Policies (Director's Order 28) require the consideration of impacts on cultural resources listed on or eligible for listing on the National Register of Historic Places.

2.1.4 Cultural Landscapes

Tinkers Creek Aqueduct, in conjunction with the other contributing resources in the Ohio & Erie Canal National Historic Landmark may be considered to comprise a cultural landscape. According to the NPS Management Policies (NPS 2006) and Cultural Resource Management Guidelines (NPS 1997), all cultural landscapes are to be managed as cultural resources regardless of the type or level of significance. Management actions are to focus on preserving the physical attributes, biotic systems, and uses of a landscape as they contribute to historic significance.

2.1.5 Health and Safety

The Management Policies (NPS 2006) state that the NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. The policies also state, "While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessionaires, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees" (§ 8.2.5.1). Further, the National Park Service will strive to protect human life and provide for injury-free visits (§ 8.2.5).

2.1.6 Visitor Experience

The Management Policies (NPS 2006) state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks.

2.1.7 Park Operations

Any alternative, including the No Action Alternative, will require future maintenance. Maintenance operations will require NPS resources including funding for materials and manpower.

2.2 Issues and Impact Topics Identified and Considered But Not Addressed in this EA

2.2.1 Wetlands

NPS Management Policies (NPS 2006, Section 4.6.5) direct NPS to manage wetlands in compliance with the Clean Water Act, the Rivers and Harbors Appropriation Act of 1899, and Executive Order (EO) 11990 "Protection of Wetlands." Director's Order #77-1: Wetland Protection, establishes NPS policies, requirements and standards for implementing EO 11990. Director's Order #77-1 is included in Procedural Manual #77-1: Wetland Protection. These documents direct the NPS to minimize and mitigate the destruction, loss, or degradation of wetlands; preserve, enhance, and restore the natural and beneficial values of wetlands; and avoid direct and indirect support of new construction in wetlands unless there are no practicable alternatives and the proposed action includes all practicable measures to minimize harm to wetlands. Director's Order #77-1 states that the NPS will use "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin et al., 1979) as the standard for defining, classifying, and inventorying wetlands. The NPS Wetlands Inventory, which follows the guidelines of Section 5.1 of Procedural Manual #77-1, shows no wetlands other than the creek within 300 feet of the project area. The No Action Alternative would not affect any wetland areas. Any build alternative would involve reconstruction of the Tinkers Creek Aqueduct on the same site to the same dimensions. While there may be temporary wetland impacts during construction, there would be no permanent wetland impacts. An build alternative therefore qualifies as an excepted action to the need to prepare a Statement of Findings under EO 11990 in accordance with Section 4.2.1.g of Procedural Manual #77-1. Any build alternative would also satisfy the set of conditions listed and would implement the applicable Best Management

Practices (BMPs) listed in Appendix 2 of Procedural Manual #77-1. Therefore, this impact topic does not require further discussion in this EA.

2.2.2 Floodplains

Presidential EO 11988, Floodplain Management, requires each federal agency, in carrying out its activities, to take action to reduce the risk of flood loss, minimize the impacts of floods, restore and preserve the natural and beneficial values served by flood plains, and evaluate the potential effects of any actions it may take in the flood plain so as to ensure its planning programs reflect considerations of flood hazards and flood plain management. Director's Order #77-2: Floodplain Management establishes NPS policies, requirements and standards for implementing EO 11988. Furthermore, Cuyahoga County is enrolled in the National Flood Insurance Program (NFIP); thus actions taken in the floodplain must comply with zoning ordinances that are based on the NFIP regulations. These requirements generally apply to the 100-year flood plain where encroachments are limited to those that would cause no greater than a one-foot rise in water surface elevation, and to the floodway, where no encroachments are allowed. The project area is within the 100-year floodplain as depicted on Community Panel Number 390134 0003 B of the Village of Valley View, Ohio Flood Insurance Rate Map dated February 18, 1981. A build alternative will provide a structure with the same hydraulic opening size as the previous aqueduct structure and would therefore cause no changes to the floodplain. A build alternative also qualifies as an excepted action to the need to prepare a Statement of Findings under EO 11988 in accordance with Section V.B. of Procedural Manual #77-2, as Tinkers Creek Aqueduct is a historic structure whose location is integral to its significance. Therefore, this impact topic does not require further discussion in this EA.

2.2.3 Threatened, Endangered, or Special Concern Species

The Endangered Species Act of 1973, as amended, requires federal land managers to consider the effects their planned activities may have on species listed as endangered or threatened. Section 7 of the Endangered Species Act requires all federal agencies to consult with the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. In addition, the 2006 Management Policies (NPS 2006) and Director's Order-77 Natural Resources Management Guidelines require the National Park Service to examine the impacts on Federal Candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species.

Cuyahoga Valley is a refuge for a number of rare and endangered species of plants and animals. The federally endangered Indiana bat (*Myotis sodalis*) was found within CVNP boundaries in July 2002, the first instance of that species ever recorded in the Park. This documented bat location is approximately four miles south of the proposed project area. There are no potential roost trees or other habitat in the project area that would be suitable for Indiana bat.

Nesting bald eagles, which are federally protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, successfully fledged young in 2007 and 2008 from one

nest in Cuyahoga County along the Cuyahoga River in Brecksville, Ohio. This active nest is approximately three miles south of the proposed project area.

Piping plover (*Charadrius melodus*) is a federally listed endangered species that occurs in Cuyahoga County, but is not found within the Park. No suitable breeding habitat for piping plovers exists within CVNP boundaries.

The Park is also within the range of the Eastern massasauga (*Sistrurus catenatus catenatus)* rattlesnake, a candidate species for listing under the Endangered Species Act (ESA) and listed as endangered by the State of Ohio. The species has not been detected within the Park, and a survey to identify those areas which have the highest potential for supporting *S.c.catenatus* was conducted in 2003. The results of the survey indicated that most of the Park's small wooded wetland areas have little potential for supporting viable *S.c.catenatus* populations (Lockhart 2003).

Many state-listed plant and animal species have been recorded in the Park. Forty-one state-listed rare plant species are known to occur. These plants occur in various habitats in the Park. At least 28 bird species observed in the Park are of conservation concern in Ohio. Most of these species of concern have exhibited steep population declines throughout their range or regionally due to habitat loss and degradation. Three state-listed turtles have been recorded in or near the Park (ODNR 2008).

Protection under the Migratory Bird Treaty Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition, this act serves to protect environmental conditions for migratory birds from pollution or other ecosystem degradations. Some migratory birds may be potential transients of the general area, but the immediate project area contains little to no suitable habitat for migratory birds. Construction-related noise could potentially disturb transient bird species, but these adverse impacts would be 1) temporary, lasting only as long as the construction operation, and 2) negligible, because suitable habitat for transient birds is found throughout the Park and region.

Cuyahoga Valley National Park has no designated critical habitat within the Park's boundary for any federally listed species. One species federally listed as endangered or threatened, one federally listed as species of concern, and 56 state protected species occur at Cuyahoga Valley National Park.

According to CVNP databases, no state listed plant species are located within the proposed project area. No threatened, endangered, or other species of concern are known to occur in the project area, and impacts to transient bird species would be temporary and negligible. Further, such negligible impacts would not result in any unacceptable impacts; the proposed actions are consistent with §1.4.7.1 of NPS Management Policies 2006 (NPS 2006). Because these effects are minor or less in degree and would not result in any unacceptable impacts, this topic is dismissed from further analysis.

2.2.4 Wildlife and Wildlife Habitat

The 2006 Management Policies (NPS 2006) and Director's Order-77 Natural Resources Management Guidelines require the National Park Service to maintain all animals native to park ecosystems by minimizing human impacts on native animal populations and ecosystems and the processes that sustain them. Wildlife within the project area is typical deciduous forest assemblages from the Eastern United States. According to park species lists the diverse wildlife assemblages include 246 species of birds, 91 aquatic macroinvertebrates, 61 butterflies, 77 fishes, 44 mammals, 24 amphibians, and 23 species of reptiles.

The project area is located adjacent to a county road, adjacent to the Towpath Trail, and in line with the Ohio & Erie Canal. Vegetation in the area is primarily mowed grass. The area is not conducive to wildlife habitat. Some migratory birds may be potential transients of the general area, but the immediate project area contains little to no suitable habitat for migratory birds. Construction-related noise could potentially disturb transient bird species and other wildlife, but these adverse impacts would be 1) temporary, lasting only as long as the construction operation, and 2) negligible, because suitable habitat for transient birds and other wildlife is found throughout the Park and region.

The project area provides minimal habitat for wildlife; therefore, construction of any build alternative is expected to result in negligible to less than minor adverse impacts to wildlife. Further, such minor or negligible impacts would not result in any unacceptable impacts; the proposed action is consistent with §1.4.7.1 of NPS Management Policies 2006 (NPS 2006). This topic is therefore dismissed from further analysis in this document.

2.2.5 Nationwide Rivers Inventory Status

A reach of the Cuyahoga River from the vicinity of Chippewa Creek upstream to Peninsula is included in the Nationwide Rivers Inventory with "Outstandingly Remarkable Values (ORV's)" for Scenery, Recreation and Fish. An impact to one or more of the ORV's in this reach could impact the ability for the reach to be designated at as a Wild or Scenic River in the future. However, the Tinkers Creek Aqueduct is not located near this reach and has no potential to adversely impact the NWI reach.

2.2.6 National Natural Landmarks

Tinkers Creek Gorge is a National Natural Landmark located within Cuyahoga Valley National Park. It is owned by Cleveland Metroparks. In this area, Tinkers Creek drops 220 feet over two miles and has a steep, walled gorge, which is a unique area with numerous tree, shrub and flower species. This gorge is located three miles upstream of the project area, and this topic is therefore dismissed from further analysis in this document.

2.2.7 Sole or Principal Drinking Water Aquifers

Cuyahoga Valley National Park is not located within the limits of a designated U. S. Environmental Protection Agency Sole Source Aquifer. Therefore, no further processing is required under the Safe Drinking Water Act of 1974.

2.2.8 Air Quality

The 1963 Clean Air Act (42 USC 7401 et seq., as amended) requires federal land managers to have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. There is some potential for the action to involve the use of construction equipment that will result in emissions. However, any such emissions would be localized, temporary and insignificant to the Park's air quality.

2.2.9 Noise

NPS Management Policies (NPS 2006) state that the parks will strive to preserve the natural quiet and the natural sounds associated with the physical and biological resources for the parks. Activities which cause excessive or unnecessary unnatural sounds in and adjacent to parks should be minimized so as not to adversely affect park resources, values, or visitors' enjoyment of them. There is some potential for the action to involve the use of construction equipment that will result in unnatural sounds. However, any such disturbance would be localized, temporary and insignificant to the Park's natural sounds.

2.2.10 Geologic Resources

National Park Service regulations and NPS Management Policies provide guidance on geologic resources and processes. There are no geologic resources or processes involved with the action.

2.2.11 Cultural Resources: Archaeological Resources

The National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.) and the NPS Cultural Resource Management Guidelines (NPS 1997) and Policies (Director's Order 28) require the consideration of impacts on cultural resources listed on or eligible for listing on the National Register of Historic Places.

In general, most archeological survey work at CVNP occurs in conjunction with projects that require ground disturbance. The planning process in relation to these projects typically provides for archeological inventory work to be completed prior to the actual ground disturbing activity.

One of the stipulations in the MOA for the Phase I project (see Section 1.2.2) is for archaeological monitoring to be performed by a qualified archaeologist during ground disturbing activity.

Archeologists from the National Park Service's Midwest Archeological Center were consulted throughout the planning process for the work to be undertaken on the Tinkers Creek Aqueduct.

As final construction plans were developed and reviewed, it was determined that the ground disturbing activities associated with the project would have no adverse effect on any archeological sites included in or eligible for the National Register of Historic Places. The disturbances that were originally of concern when the MOA was initiated no longer apply since all of the excavation would be limited to previously disturbed areas and would not impact any undisturbed terrain or areas where there is any possibility of encountering intact buried resources. It was therefore determined that archeological monitoring of the ground disturbing activities is not necessary.

2.2.12 Prime Farmlands

The Federal Farmland Protection Policy Act (FPPA) of 1987 requires federal agencies to consider the adverse effects their programs may have on the preservation of farmland, review alternatives that could lessen adverse effects, and ensure that their programs are compatible with private, local and state programs and policies to protect farmland. The purpose of the FPPA is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. The Web Soil Survey indicates that the soils surrounding the Tinkers Creek Aqueduct site include Chagrin silt loam, occasionally flooded (Ch) and Tioga loam, frequently flooded (Tg). The Chagrin silt loam is rated as a soil for prime farmland and the Tioga loam is rated as prime farmland if protected from flooding. However, the entire Tinkers Creek Aqueduct site has already been developed for uses other than that of agriculture and is therefore not subject to further analysis under the FPPA.

2.2.13 Energy Resources

There will be temporary use of energy from the construction of any build alternative and from future maintenance of all alternatives. However, these impacts are considered negligible and will not be discussed further.

2.2.14 Affiliated Tribes

The National Environmental Policy Act requires the consideration of possible conflicts between the proposal and land use plans, policies or controls for entities including Indian Tribes. The National Historic Preservation Act, as amended in 1992 (16 USC 470 et seq.) requires consultation with Indian Tribes. Letters were sent to tribes as part of the external scoping process.

2.2.15 Environmental Justice

Executive Order 12898, Environmental Justice in Minority and Low-Income Populations, directs federal agencies to assess whether their actions have disproportionately high and adverse human health or environmental effects on minority and low-income populations. There are no identifiable minority or low-income populations within CVNP or influenced by CVNP. It is therefore concluded that the actions of CVNP will have no disproportionately high and adverse human health or environmental effects on minority and low-income populations.

2.2.16 Economic Factors

It is required by NEPA that not only cultural and natural factors be analyzed but also the "human environment" which includes economics. This may also include land use (occupancy, income, values, ownership and type of use) and socioeconomics (employment, occupation, income changes, tax base, infrastructures, etc.). There could be temporary contributions to employment and business in the surrounding area from the construction of any build alternative. Impact on visitor experience is discussed in this EA, and could also be reflected in the regional economy. However, these impacts are considered negligible and will not be discussed further.

2.2.17 Social Factors

Another aspect of the "human environment" is the social impact related to the proposed actions. The proposed action is not anticipated to have any effect on social factors in or around CVNP.

3.0 ALTERNATIVES

The CEQ has provided guidance on the development and analysis of alternatives under NEPA. A full range of alternatives, framed by the purpose and need, must be developed for analysis for any federal action. They should meet the project objectives, at least to a large degree. They should also be developed to minimize impacts to environmental resources. Alternatives should also be "reasonable," which CEQ has defined as those that are economically and technically feasible, and show evidence of common sense. Alternatives that could not be implemented if they were chosen (for economic or technical reasons), or that do not resolve the need for action and fulfill the stated purpose in taking action to a large degree, are therefore not considered reasonable.

3.1 Alternative 1 - No Action

The CEQ has specified that one of the alternatives must be the "no action" alternative for two reasons. One is that it is almost always a viable choice in the range of alternatives, and the other is that it sets a baseline of existing impact that may be projected into the future against which to compare impacts of action alternatives.

Under the No Action Alternative (see Drawing 1 in Appendix C), the existing improvements constructed under Phase I would remain, and Phase II would not be constructed. The new Towpath Trail Bridge would remain in its current location. The steel pipes constructed to carry canal water over the creek would continue to maintain flow in the canal. The high-water overflow spillway structure would remain and continue to function as a flood event overflow. The abutments and center pier of the previous aqueduct structure would be maintained, but these features would continue to deteriorate. The NPS would be unable to fulfill all of the stipulations in the MOA with the SHPO (see Section 1.2).

3.2 Alternative 2 – Construct New Aqueduct Structure (Preferred)

Alternative 2 would consist of construction of Phase II of the Tinkers Creek Aqueduct. The steel pipes would be replaced with an aqueduct superstructure that would restore the canal prism across Tinkers Creek, and would feature the same geometry, elevation and plan location as the previous aqueduct superstructure. The existing masonry substructures (center pier and abutments) would be rehabilitated in a manner that maintains an acceptable degree of historical accuracy, is consistent with the Secretary of the Interior's Standards of Treatment of Historic Properties, and is acceptable to the Ohio SHPO. The elevation of the low chord of the superstructure would be the same or higher than that of the previous aqueduct structure.

One historic trend for all of the previous aqueduct structures is that they have always deteriorated rapidly and have needed to be rehabilitated or replaced. This is part of the nature of an aqueduct structure, because they must be constructed at the same elevations as the waterways that they convey. However, these elevations are below frequent flood elevations so that an aqueduct structure is subject to static and dynamic hydraulic pressures, scour, buoyancy, and debris impact from the waterbodies that they cross. This alternative would therefore utilize design features that

can resist hydraulic loads including static and dynamic hydraulic pressure, buoyancy and debris impact.

The design developed for this alternative would be a two-span, reinforced concrete through girder and floor slab system. The structural through girder and floor slab elements would also serve as the trough which would have inside dimensions that match the previous structure (5'-8 ¼" x 21'-10"). The total length of the aqueduct would be approximately 94'-0" with two identical continuous spans of 47'-0". The through girders would be designed to be cast-in-place (but could be precast) and the floor slab would be cast-in-place.

New concrete stub abutments would be located immediately behind the existing masonry abutments and founded on micropiles. The existing masonry abutments would feature non-structural restoration including replacement of crack stones, re-setting displaced stones, and re-pointing of open joints. The existing masonry pier would be restored, and would consist of dismantling the existing pier down to the timber mat (exclusive of the portion of the pier currently carrying the Towpath Trail Bridge), installation of micropiles, a reinforced concrete footing and reconstruction of the masonry pier back to its previous configuration.

Reinforced concrete transition structures would be constructed at either end of the new aqueduct to provide a smooth hydraulic transition from the earthen canal section to the concrete trough section. Sealed expansion joints would be provided at the trough-to-transition structure interface at each end.

The high-water overflow spillway structure would be removed. Two 24" diameter cast iron waste gates would be located in the west wall of one transition structure with high-density polyethylene (HDPE) outfall pipes discharging downstream of the aqueduct.

The alternative also includes installation of a wayside exhibit which would utilize the HAER documentation developed prior to removal of the previous aqueduct superstructure (see Section 1.2). The general site and canal would also be restored immediately adjacent to the aqueduct.

3.3 Alternatives Considered But Rejected

As mentioned above, alternatives should be "reasonable." Unreasonable alternatives should be eliminated before impact analysis begins. Unreasonable alternatives may be those that are unreasonably expensive; that cannot be implemented for technical or logistic reasons; that do not meet Park mandates; that are inconsistent with carefully considered, up-to-date Park statements of purpose and significance or management objectives; or that have severe environmental impacts (DO-12 Handbook).

3.3.1 Remove Aqueduct Structures

This alternative would include removal of the steel pipes constructed to carry canal water over the creek and the high-water overflow spillway structure without construction of a new aqueduct superstructure. The result of this would be that the water could no longer be maintained in the canal north (downstream) of Tinkers Creek. If the structure on the south (upstream) end of the

canal is removed and not replaced, the canal to the south (upstream) of Tinkers Creek would also no longer hold water. Such an action was suggested in one of the comments received from the public (see Appendix B).

Such an action would be counter to one of the purposes for the Park:

> *. . . preserving and protecting for public use and enjoyment the historic, scenic, natural, and recreational values of the Cuyahoga River and adjacent lands in the Cuyahoga Valley,. . .*

Furthermore, such an action would cause an adverse effect to the entire Ohio & Erie Canal National Historic Landmark, which would be a violation of the National Historic Preservation Act. It would also be counter to the NPS Management Policies for cultural resource management (NPS 2006, Chapter 5). This alternative would therefore be counter to Park mandates and NPS Management Policies; would be inconsistent with the purpose and need for the project, and would result in severe environmental impacts. It is therefore unreasonable and will be removed from further consideration.

3.3.2. Various Design Options

A Concept Study Report and a Value Analysis were performed and are part of the administrative record for the project. The four major components of the proposed aqueduct are superstructure, abutments, pier and foundations. The reports investigated design options for each of the components.

Seven superstructure options were investigated. They considered a wide range of materials, fabrication and construction practices. Design options that were considered and rejected included:

- Steel Through Girder
- Prefabricated Steel Truss
- Precast, Post-Tensioned Concrete Through Girder
- Stiffened Steel Plate Trough
- Precast, Prestressed Box Beams
- Glued Laminated Timber Beams

Two of the options were dismissed because it would not be possible to maintain the original canal prism elevation without increasing the depth of the structure and lowering the low chord, which would reduce the available hydraulic opening and cause additional flooding impacts. Another option was dismissed because it would be highly susceptible to debris impact damage and long term maintenance would be significantly higher than other options.

Four abutment options were investigated. Design options that were considered and rejected included:

- Structural Rehabilitation
- New Concrete Abutment on Piles
- Pile Bent Installed Through the Existing Abutment

Two of these options were dismissed because of technical engineering challenges along with unreasonable cost. The new concrete abutment option would involve removal of the existing historic masonry abutments, which would not meet standards discussed with SHPO with regard to implementing the MOA.

Five pier options were investigated. Design options that were considered and rejected included:

- Non-structural pier rehabilitation
- New Concrete Pier on Piles
- Remove existing pier
- Structural Pile Bent Pier

Three of these options would involve the removal of the existing pier or changing the existing pier to be non-functional. This would not meet standards discussed with SHPO with regard to implementing the MOA. Another, non-structural pier rehabilitation, would not be technically feasible.

Two types of foundations were investigated. The use of driven piles was considered and rejected because of the potential for damage to the existing masonry pier and abutments and the existing Towpath Trail Bridge, and the constraints posed by the site for the use of the large equipment that would be needed.

Combinations of the remaining options of the four major components were analyzed and evaluated. Evaluation factors included protection of natural resources, protection of cultural resources, provision of visitor enjoyment and public safety, use of sustainable design principles, maintainability, and cost. The combination of options that rated most highly in the value analysis is what was selected as Alternative 2.

3.5 Environmentally Preferable Alternative

The environmentally preferable alternative is the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historic, cultural, and natural resources. When identifying the environmentally preferable alternative, economic, recreational, and technical issues are not considered. The environmentally preferable alternative is the alternative that will promote the national environmental policy expressed in NEPA (Section 101(b)) as the alternative that will help the Nation:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2. assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

3. attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

4. preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;

5. achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative 2 best fulfills the responsibility of this generation as trustee of the environment for succeeding generations. This is based primarily on goals of this alternative to maintain the continuity of the Ohio & Erie Canal and Towpath Trail in this area while providing the cultural landscape of an aqueduct over Tinkers Creek.

Alternative 2 fulfills the second objective by maximizing the assurance of safety, health, productivity and culturally pleasing surroundings. Upon completion of construction, the Towpath Trail of Alternative 2 would provide a safe and healthful location with the aesthetically and culturally pleasing surroundings of a canal and aqueduct constructed to an acceptable degree of historical accuracy.

Alternative 2 fulfills the third objective by aspiring to the widest range of beneficial uses of the environment without degradation or risk to health and safety. Alternative 2 aspires to the enjoyment of the Towpath Trail including views of the canal, Tinkers Creek, and an aqueduct structure without undesirable consequences.

Alternative 2 fulfills the fourth objective by preserving the important historic and cultural aspects of our natural heritage in preserving an operating section of the Ohio & Erie Canal an aqueduct constructed to an acceptable degree of historical accuracy. It will do this as much as possible while maintaining an environment which supports diversity and variety of choice.

Alternative 2 balances population with resource use by allowing an increase for use of the Towpath Trail, Towpath Bridge and appreciation for the Ohio & Erie Canal and the Tinkers Creek Aqueduct in a way which permits high standards of living and a wide sharing of life’s amenities.

Alternative 1 would utilize the fewest depletable resources of the two alternatives, as no additional resources would be utilized.

Alternative 2 is considered the environmentally preferable alternative, as it meets five of the six NEPA objectives.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

For each impact topic identified in Section 2.1, a process for impact assessment was developed based on the directives of Sections 2.9 and 4.5(g) of the DO-12 Handbook. National Park Service units are directed to assess the extent of impacts on park resources as defined by the context, duration, and intensity of the effect. While measurement by quantitative means is useful, it is even more crucial for the public and decision-makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. With interpretation, one can ascertain whether a certain impact intensity to a park resource is "minor," compared to "major," and what criteria were used as a basis for that conclusion.

To determine impacts, methodologies were identified to measure the change in park resources that would occur with the implementation of each alternative. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial, of the various alternatives.

Potential impacts are described in terms of type (Are the effects beneficial or adverse?), context (Are the effects site-specific, local, or even regional?), duration (Are the effects short-term, lasting less than six months, or long-term, lasting more than a year?), and intensity (Are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document.

Each alternative is compared to a baseline to determine the context, duration, and intensity of resource impacts. For purposes of impact analysis, the baseline is the continuation of current management (Alternative 1, the No Action Alternative) projected over the next 10 years. In the absence of quantitative data, best professional judgment was used to determine impacts. In general, the thresholds used come from existing literature, federal and state standards, and consultation with subject matter experts and appropriate agencies.

For the purposes of analysis, the following assumptions are used for all impact topics except where specifically noted:

Short-term impacts: Those impacts occurring in the immediate future (usually 1 to 6 months). This time period was selected because the anticipated construction time is 6 months.

Long-term impacts: Those impacts occurring through the next 10 years.

Direct impacts: Those impacts occurring from the direct use or influence of the alternative.

Indirect impacts: Those impacts occurring from (activity) that indirectly alter a resource or condition. Such impacts occur later in time or farther in distance than the action.

Study Area: Each resource impact is assessed in direct relationship to those resources affected both inside and outside the park, to the extent that the impacts can be substantially traced, linked, or connected to the alternatives. Each impact topic, therefore, has a study area relative to the resource being assessed, and it is further defined in the impact methodology.

Cumulative Impact

The CEQ regulations (40 CFR 1508.7) require the assessment of "cumulative impacts," which are defined as:

> *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.*

In January 1997, the CEQ published a handbook entitled, Considering Cumulative Effects Under the National Environmental Policy Act.[3] The introduction to the handbook opens with, "Evidence is increasing that the most devastating environmental effects may result not from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time."

Cumulative impacts are considered for all alternatives, including the no-action alternative. They were determined by looking at each resource (impact topic), determining which past, present, and future actions would impact the resource for the determined spatial and temporal boundaries, and then combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at the Park and, if applicable, the surrounding region.

Past projects:

Construction of the Ohio & Erie Canal began in 1825 and was completed seven years later. The canal became the main means of transportation of wheat to the eastern states, and at its peak, included more than 1,000 miles of main line canals, feeders, and side cuts. The original aqueduct was constructed at a different location, where deterioration necessitated the replacement of the framing and trunk in 1836 and of the pier in 1841 to 1842. Construction of a new aqueduct was completed at the current site in the spring of 1845 (see discussed in Section 1.2). Associated with the construction of the canal was the construction of the towpath. It was originally a path used by animals pulling canal boats, and the path itself was on top of the soil excavated during the construction of the canals.

[3] See http://ceq.hss.doe.gov/nepa/ccenepa/ccenepa.htm

In 1913 the canal was abandoned as a waterway but the aqueduct remained in service to convey water used as a cooling source for the American Steel and Wire Company (later U.S. Steel). The aqueduct superstructure underwent a major rehabilitation in the 1960's.

The site is included among over 32,800 acres designated as the Cuyahoga Valley National Recreation Area (CVNRA) in legislation signed in 1974. The "Cuyahoga Valley National Recreation Area" was renamed "Cuyahoga Valley National Park" in 2000.

Canal Road Bridge over Tinker's Creek is located approximately 23 feet upstream of the aqueduct location. The current bridge was constructed in the 1990's.

In 2000 the Towpath Trail Bridge, supported off of the aqueduct, was closed to pedestrian traffic. The trusses, especially in their lower chord, also continued to deteriorate to the point where they exhibited signs of localized failure and severe sections loss and in 2007, under emergency action, the NPS let a contract for Phase 1 of the aqueduct replacement project.

Present projects:

The Cuyahoga Valley Scenic Railroad, the Ohio & Erie Canal, the Towpath Trail, and the Tinkers Creek Aqueduct are among the resources maintained at the Park. The Cuyahoga Valley Scenic Railroad is a not-for-profit organization that operates passenger excursion trains on the Valley Railway. The northern boarding area is located off Old Rockside Road in Independence, Cuyahoga County, Ohio. There is a current project to expand and improve the existing 149 space gravel parking area by 70 additional spaces to accommodate increase use and future train service to Cleveland. The boarding area platform would be expanded by 120-feet to allow visitors to board the train without blocking Old Rockside Road and local businesses. A trail bridge over the Cuyahoga River is proposed to allow pedestrian and bicycle access from the boarding area to Lock 39 Trailhead servicing the Towpath Trail.

To the south, there is a project to replace a truss bridge carrying Fitzwater Road over the Cuyahoga River and a bridge over the canal and a waste weir on a new roadway alignment. The project also includes construction of a public trailhead associated parking on the west side of the Cuyahoga River south of Fitzwater Road, with a connection trail to the Towpath Trail. During construction, this project will close the trail in the vicinity of the bridge replacement for some periods of time.

The Cuyahoga County Engineer's Office is currently replacing Rockside Road Bridge No. 218 over the Ohio & Erie Canal and the Towpath Trail north of Lock 39 at the north end of the park. Construction began in 2009 and is expected to be completed in 2010.

Future projects:

The Ohio & Erie National Heritage Canalway was designated by Congress as an affiliated unit of the National Park Service in 1996. As part of the development of the Canalway, the Management Plan calls for the extension of the existing Towpath Trail north and south of the Park. The northern extension, of about six miles, would connect the Park to downtown

Cleveland and Lake Erie. The trail extension would follow a new trail alignment, as the historic towpath and canal were largely obliterated by the construction of railways and other industrial developments in Cleveland's Flats. The trail construction would include earth movement and the construction of structures and underpasses to span existing features. The first phase of the trail extension is expected to begin construction in 2011. There are also plans to construct trails to connect nearby neighborhoods to the Towpath Trail.

The surrounding city of Independence and Village of Valley View are continuing to grow. Their location between Cleveland and Akron allows for commuting to either city. The aqueduct is located in the southern portion of the Village of Valley View, where the land use is a mix of residential, light manufacturing and parkland. A rise in the population of the surrounding communities may increase use of Canal Road as well as the Park and Towpath Trail.

Impairment Analysis

The NPS Management Policies (NPS 2006) require an analysis of potential effects to determine whether or not actions impair park resources. The fundamental purpose of the National Park System, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within a park system unit, that discretion is limited by the statutory requirement that the agency must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severely adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park;
- key to the natural or cultural integrity of the Park; or
- identified as a goal in the Park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the Park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the Park.

The following process was used to determine whether the alternatives had the potential to impair park resources and values:

1. Cuyahoga Valley National Park's enabling legislation, the *General Management Plan* (NPS 1977), and other relevant background were reviewed with regard to CVNP's purpose and significance, resource values, and resource management goals or desired future conditions.

2. Management objectives specific to resource protection goals at CVNP were identified.

3. Thresholds were established for each resource of concern to determine the context, intensity and duration of impacts, as defined above.

4. An analysis was conducted to determine if the magnitude of impact reached the level of "impairment," as defined by *NPS Management Policies* (NPS 2006).

The impact analysis includes any findings of impairment to park resources and values for each of the alternatives.

4.1 Streamflow Characteristics

4.1.1 Regulations and Policies

Section 4.6.6 of the NPS Management Policies (NPS 2006) states that,

> *The Service will protect watershed and stream features primarily by avoiding impacts on watershed and riparian vegetation and by allowing natural fluvial processes to proceed unimpeded. When conflicts between infrastructure (such as bridges and pipeline crossings) and stream processes are unavoidable, NPS managers will first consider relocating or redesigning facilities rather than manipulating streams. Where stream manipulation is unavoidable, managers will use techniques that are visually nonobtrusive and that protect natural processes to the greatest extent practicable.*

4.1.2 Affected Environment

More than 22 miles of the Cuyahoga River pass through CVNP. The Cuyahoga River drains more than 800 square miles of Northeastern Ohio and only 6.5% of this drainage area is within CVNP. According to topographical maps published by the U. S. Geological Survey, more than 20 perennial streams totaling over 200 miles in length exist within the Park boundary. At over 28 miles, Tinkers Creek is the longest of the Cuyahoga River's tributaries. It drains approximately 96.4 square mile. The Tinkers Creek Aqueduct is located approximately 400 feet upstream of the confluence of Tinkers Creek at River Mile 16.36 of the Cuyahoga River.

Hydrologic and hydraulic data for the Cuyahoga River and Tinkers Creek was developed by adjusting USGS gage data to the site. The data is summarized in Tables 4-1 and 4-2. The channel bed consists of gravels and sands that are subject to scouring and infilling; however, there presently exists a sediment balance such that, other than minor scouring and deposition that occurs during flood events, channel bed elevations have remained stable over time.

Table 4-1. Cuyahoga River Hydrologic and Hydraulic Data[1]

HYDROLOGIC EVENT	DISCHARGE AT USGS INDEPENDENCE, OHIO GAGE STATION[2] (CFS)	WATER SURFACE ELEVATION AT TINKERS CREEK CONFLUENCE (FT)
100-YR	16,900	618.7
50-YR	15,800	617.8
10-YR	11,800	612.7
95TH PERCENTILE OF MEAN DAILY DISCHARGE[3] (EXCEEDED 5% OF THE TIME)	2,606	607.3
90TH PERCENTILE OF MEAN DAILY DISCHARGE (EXCEEDED 10% OF THE TIME)	1,829	605.9
50TH PERCENTILE OF MEAN DAILY DISCHARGE[4] (EXCEEDED 50% OF THE TIME)	453	602.4
10TH PERCENTILE OF MEAN DAILY DISCHARGE (EXCEEDED 90% OF THE TIME)	124	600.7
5TH PERCENTILE OF MEAN DAILY DISCHARGE (EXCEEDED 95% OF THE TIME)	95	600.4

[1] Discharge and water surface elevation are based solely on Cuyahoga River flow data.
[2] Mean daily discharge data collected from USGS Gage Station 04208000 (Cuyahoga River at Independence Ohio, 240 feet downstream of Old Rockside Road) at: http://waterdata.usgs.gov/usa/nwis/uv?site_no=04208000
[3] 95th percentile of mean daily discharge during the months of February through April correlates to a discharge of 5,407 cfs at the gage and water surface elevation of 610.3 ft at the confluence with Tinkers Creek.
[4] 50th percentile of mean daily discharge during the months of February through April correlates to a discharge of 1,356 cfs and water surface elevation of 604.9 ft at the confluence with Tinkers Creek.

Table 4-2. Tinkers Creek Hydrologic and Hydraulic Data at the Downstream Fascia of Canal Road[1]

HYDROLOGIC EVENT	DISCHARGE[2] (CFS)	ELEVATION (FT)	VELOCITY[3] (FT/S)	DEPTH[4] (FT)
100-YR	6,750	614.6	6.1	12.1
50-YR	6,100	613.3	6.2	10.8
10-YR	4,400	610.3	6.2	7.8
95TH PERCENTILE OF MEAN DAILY DISCHARGE[5] (EXCEEDED 5% OF THE TIME)	581	605.3	2.5	2.8
90TH PERCENTILE OF MEAN DAILY DISCHARGE (EXCEEDED 10% OF THE TIME)	363	604.7	2.0	2.2
50TH PERCENTILE OF MEAN DAILY DISCHARGE[6] (EXCEEDED 50% OF THE TIME)	73	603.4	1.0	0.9
10TH PERCENTILE OF MEAN DAILY DISCHARGE (EXCEEDED 90% OF THE TIME)	24	602.9	0.5	0.4
5TH PERCENTILE OF MEAN DAILY DISCHARGE (EXCEEDED 95% OF THE TIME)	19	602.9	0.4	0.4

[1] Discharge and water surface elevation is based solely on Tinkers Creek flow data. This table does not include backwater from the Cuyahoga River.
[2] Mean daily discharge data collected from USGS Gage Station 04207200 (Tinkers Creek at Bedford Ohio) at http://waterdata.usgs.gov/usa/nwis/uv?site_no=04207200 and adjusted for drainage area increase between the gage and mouth of Tinkers Creek.
[3] For the mean daily discharge hydrologic events, the flow velocity at the downstream fascia of Canal Road is similar to the velocity predicted at the aqueduct.
[4] Channel bed elevation is 602.5 ft.
[5] 95th percentile of mean daily discharge during the months of February through April correlates to a discharge of 1,608 cfs, a water surface elevation of 606.8 ft, and flow velocity of 4.32 ft/s at the downstream fascia of Canal Road.
[6] 50th percentile of mean daily discharge during the months of February through April correlates to a discharge of 225 cfs, a water surface elevation of 604.2 ft, and flow velocity of 1.62 ft/s at the downstream fascia of canal road.

4.1.3 Methodology

Available information on streamflow characteristics potentially impacted by the proposed alternatives was compiled through a hydraulics analysis and by talking to Park staff. Predictions about short-term and long-term impacts to streamflow characteristics were based on previous experience of projects of similar scope and characteristics. Analyses of the potential intensity of impacts on streamflow characteristics were derived from the available information on the Park and best professional judgment. The duration of construction of the build alternative is estimated to be six months; therefore, the duration of any short term impacts is six months.

Definition of Intensity Levels:

Negligible: The alternative could result in a change in stream flow characteristics, but the change would be so small that it would not be measurable or perceptible.

Minor: **Adverse -** The alternative could result in some change in stream flow characteristics that is measurable, but changes would be small and of little consequence with respect to effects on channel forming processes or aquatic species.

Beneficial – A beneficial change of similar magnitude to a Minor Adverse impact on streamflow characteristics.

Moderate: **Adverse -** The alternative would result in some change in stream flow characteristics that would be measurable with consequences with respect to effects on channel-forming processes or aquatic species.

Beneficial – A beneficial change of similar magnitude to a Moderate Adverse impact on streamflow characteristics.

Major: **Adverse** - The alternative would result in noticeable and large changes in stream flow characteristics and result in adverse effects on channel-forming processes or aquatic species.

Beneficial – A beneficial change of similar magnitude to a Major Adverse impact on streamflow characteristics.

Impairment: The alternative would result in substantial regional changes in stream flow characteristics and have large-scale adverse effects on channel-forming processes or aquatic species.

4.1.4 Alternative 1 – No Action

Direct Impacts - The impacts from the No Action Alternative would be Negligible. The two steel pipes would block flood flows (Figure 3), but the resulting flood levels would be slightly less than those produced by the previous steel truss superstructure. The alternative would not change the existing stable sediment balance.

Figure 3. High water over existing steel pipes (March 9, 2009)

Indirect Impacts – There would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – The location of the Tinkers Creek Aqueduct in the past has affected flood flows (Figure 4). There has been an overall trend to increase flood flows as a result of development in the drainage area. The No Action Alternative would slightly improve impacts on flood levels over the previous steel truss superstructure for a long-term Minor Beneficial impact. Anticipated future impacts would be to reverse the increase in flood flows through an improved emphasis on watershed planning and management practices.

Figure 4. High water over previous aqueduct structure (date unknown)

Conclusions - The No Action Alternative would result in a Negligible direct impact on streamflow characteristics, and may be considered a long-term Minor Beneficial impact on impacts from flood flows. There would be no impairment on streamflow characteristics as a result of this alternative.

4.1.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – Alternative 2 would include a replacement superstructure that retains the existing pier and abutments. The replacement structure would be able to pass 2864 cfs (less than a 10-year event) with zero freeboard. By comparison, the Canal Road Bridge structure, located 40 feet upstream, can pass 6359 cfs with zero freeboard. Alternative 2 would increase flood levels for all flood events greater than 2,864 cfs as compared to the twin steel pipes that presently span across Tinkers Creek on the existing aqueduct substructures (a long-term Moderate Adverse impact).

In terms impacts on the channel forming processes and aquatic habitat, Alternative 2 will have a Negligible impact as compared to the existing conditions because the bridge opening width will remain equal to the existing width.

During construction, two conditions would be needed to construct the new superstructure:

1. Falsework set in the streambed for construction of the concrete trough; and
2. A cofferdam and causeway for the pier reconstruction. The causeway would be constructed from one bank of Tinkers Creek, leaving the other side unobstructed.

The area of Tinkers Creek to be filled for the temporary causeway and cofferdam would be approximately 4,550 sq ft.

Both of these temporary conditions, each being no more than 13 weeks duration, were modeled using the US Army Corps of Engineers "Hydrologic Engineering Centers River Analysis System" (HEC- RAS) Version 4.0 program to verify that neither condition (each having a duration of 13 weeks) would create a flooding event that exceeded the risk associated with a 10 year event under the permanent conditions. This would be a Negligible impact.

Indirect Impacts – There would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – There has been an overall trend to increase flood flows as a result of development in the drainage area. The replacement superstructure, a reinforced concrete trough, would be a smaller hydraulic obstruction than the steel truss structure that was removed in 2007 under Phase I (a long-term Minor Beneficial impact). This superstructure, or one with the same opening, has been in place since 1845. Anticipated future impacts would be to reverse the increase in flood flows through an improved emphasis on watershed planning and management practices.

Conclusions – Alternative 2 would result in a long-term Minor Adverse direct impact on flood flows, and a Negligible direct impact on other streamflow characteristics. It would be a long-term Minor Beneficial impact on impacts from flood flows compared with the impact from past aqueduct superstructures. There would be no impairment on streamflow characteristics as a result of this alternative.

4.2 Vegetation and Invasive plant species

4.2.1 Regulations and Policies

Management Policies (NPS 2006, Section 4) direct the NPS to preserve and restore native plants, animals, and their communities and ecosystems, as well as biological processes, such as succession. This includes preserving and protecting, “natural abundances, diversity, dynamics, distributions, habitat and behaviors...” as well as by, “minimizing human impacts on” native plant and animal populations (Section 4.4.1). Management Policies (Section 4.1.5) also compel the NPS to restore natural conditions and processes to human-disturbed lands.

Management Policies also provides guidance on the removal of plants from parks. It states that when the NPS allows the removal of plants for any authorized action, the NPS will seek to, "ensure that such removals will not cause unacceptable impacts on native resources, natural processes, or other park resources." Additionally, the NPS, "will manage such removals to prevent them from interfering broadly with: Natural habitats, natural abundances, and natural distributions of native species and natural processes; Rare, threatened, and endangered plant or animal species or their critical habitats; Scientific study, interpretation, environmental education, appreciation of wildlife, or other public benefits; Opportunities to restore depressed populations of native species; or Breeding or spawning grounds of native species" (NPS 2006; Section 4.4.2.1).

Executive Order 13112 requires that Federal agencies act to prevent the introduction of invasive species; provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.

4.2.2 Affected Environment

The area around the Tinkers Creek Aqueduct is a maintained mowed grass area. The entire area was disturbed in 2007 for construction of Phase I. At the conclusion of construction, areas immediately adjacent to the Towpath Trail were seeded with a lawn seed mixture that included bluegrass (*Poa pratensis, var.*), ryegrass (L*olium perenne var.*) and fescue (*Festuca arundinacea var.*). Other areas were seeded with a native grass mixture that included Blackwell switchgrass (*Panicum virgatum*), tomahawk Indiangrass (*Sorghastrum nutas*) and annual ryegrass (*Lollium multiflorum*). The remaining abutments of the aqueduct are covered with wild grape (*Vitis spp.*).

Figure 5. Reestablished vegetation, looking south (August 2009)

Over 940 plant species occur in the various habitats within CVNP. Approximately 186 of these species are exotic species not native to the area. Of these 186 species of exotic plants, 14 plant species are currently considered invasive within the Park. Four of these species are found in nearby wetlands, floodplains, river and streambanks, road margins, rights of way, and disturbed areas, and along developed trails. These include common reed (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*), Japanese knotweed (*Polygonum cuspidatum*) and purple loosestrife (*Lythrum salicaria*).

4.2.3 Methodology

A qualitative assessment of impacts to vegetation was conducted based on literature review, site inspection, GIS analysis, and existing natural resources data. No original data collection was undertaken in connection with this portion of this EA. Predictions about short-term and long-term impacts to vegetation were based on previous experience with projects of similar scope and vegetative characteristics. Analysis of potential intensity of impacts on vegetation was derived from the available information on the Park and the professional judgment of the Park resource specialists. The duration for short-term impacts to vegetation was determined to be 18 months because the construction is expected to be completed in six months, and vegetation would re-establish the following year.

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.

Minor: **Adverse** - Impacts would be detectable, but they would be localized and not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them.

Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes; however long-term characteristics would remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to reproduction or other factors affecting population levels.

Key ecosystem processes might have short-term disruptions that would fall within natural variation. Sufficient habitat would remain functional, maintaining viability of all species. Impacts would be outside critical reproduction periods for sensitive native species.

There would be no measureable increase in invasive plant species.

Beneficial – A beneficial change of similar magnitude to a Minor Adverse impact on native species, their habitats, the natural processes sustaining them or on reductions in the numbers or coverage of invasive plant species.

Moderate: **Adverse** - Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they may be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes, but would be expected to rebound to pre-impact numbers, remaining stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to factors affecting short-term population levels.

Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient habitat would remain functional, maintaining viability of all native species. Some impacts might occur in key habitat for sensitive native species.

Such impacts may also include the introduction of invasive plants that would cause short-term disruptions.

Beneficial – A beneficial change of similar magnitude to a Moderate Adverse impact on native species, their habitats, the natural processes sustaining them or on reductions in the numbers or coverage of invasive plant species.

Major: **Adverse** - Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be either outside the natural range of variability for long periods of time or permanent in nature in the Park.
Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with significant depression of long-term population numbers. Frequent responses to disturbance by some individuals would be expected, with negative impacts to factors resulting in long-term decreases in population levels.

Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

Such impacts may also introduce a new invasive plant to the area that persists long-term.

Beneficial – A beneficial change of similar magnitude to a Major Adverse impact on native species, their habitats, the natural processes sustaining them or on reductions in the numbers or coverage of invasive plant species.

Impairment: Some of the major impacts described above might be an impairment of Park resources if their severity, duration, and timing resulted in the elimination of a native species or significant population declines in a native species, or they precluded the Park's ability to meet recovery objectives for listed species. In addition, these adverse, major impacts to Park resources and values would

contribute to deterioration of the Park's plant resources and values to the extent that the Park's purpose could not be fulfilled as established in its enabling legislation; affect resources key to the Park's natural or cultural integrity or opportunities for enjoyment; or affect the resource whose conservation is identified as a goal in the Park's General Management Plan or other Park planning documents.

4.2.4 Alternative 1 – No Action

Direct Impacts – There would not be any direct impacts under this alternative other than periodic mowing. It is assumed that periodic maintenance would also include periodic clearing of wild grape and other vegetation from the remaining structural elements. This maintenance would be needed because allowing the vegetation to remain would accelerate the deterioration of the remaining structural elements. The impact intensity would be Negligible.

Indirect Impacts – There is no evidence of invasive plant species in the immediate project area, and there is nothing in the alternative that would promote the infestation of invasive plant species. No indirect impacts are anticipated under the No Action Alternative. The impact would therefore be Negligible.

Cumulative Impacts – There would be Negligible additional impact to add to the past impacts from the development of the Ohio & Erie Canal, the Towpath Trail, previous aqueduct structures and the most recent Phase I project in 2007. There are no foreseeable future impacts that would impact vegetation in the area.

Conclusions – There would be Negligible direct, indirect and cumulative impacts under this alternative. There would therefore be no impairment of vegetation under this alternative.

4.2.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – All of the vegetation in the area surrounding the aqueduct would be impacted from construction activities (see Figure 6 for an example). The area affected is anticipated to be approximately 19,500 sq. ft. (0.45 acres). The area would be reseeded at the conclusion of construction, with annual grasses expected to be reestablished in the following 6 months to a year. There would be no long-term impacts. The impact would therefore be short-term Minor Adverse.

Figure 6. Phase I construction, looking south (May 2007).

Indirect Impacts – Disturbance from construction activity has the potential to promote colonization by invasive plant species. The potential for this impact will be minimized through the timely planting of native species during reseeding, and monitoring/maintenance following the conclusion of construction until the establishment of the native species. Indirect impacts to vegetation will therefore be Negligible.

Cumulative Impacts – The short-term Minor Adverse direct impacts would be added to the past impacts from the development of the Ohio & Erie Canal, the Towpath Trail, previous aqueduct structures and the most recent Phase I project in 2007. There are no foreseeable future impacts that would impact vegetation in the area.

Conclusions – The only impacts to vegetation would be temporary impacts during construction. Direct, Indirect and Cumulative impacts would therefore be short-term Minor Adverse. There would therefore be no impairment of vegetation under this alternative.

4.3 Historic Structures

4.3.1 Regulations and Policies

Laws, regulations, and policies have general application for cultural resource management throughout the NPS. These include the Antiquities Act, the Historic Sites Act, the National Historic Preservation Act, the National Environmental Policy Act, and the Archeological and Historic Preservation Act (see Appendix A and Section 1.3 of this EA). Protection of cultural resources is also in accordance with Executive Order 11593, Protection and Enhancement of the Cultural Environment, 1971 (see Appendix A).

Cultural resource management procedures are detailed in the NPS Management Policies (NPS 2006) and the NPS Cultural Resource Management Guideline (NPS 1997). Specific standards and guidelines for the treatment of cultural resources are provided in The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation and Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.

4.3.2 Affected Environment

The Tinkers Creek Aqueduct is individually listed on the National Register of Historic Places. The first aqueduct structure at the current location was constructed in 1845. In 2007, under emergency action, the NPS let a contract for Phase I of the aqueduct replacement project (see Section 1.2.2). Phase I included removal of the existing truss superstructure, timber trough, conveyance pipes and Towpath Trail Bridge. The remaining elements from the previous structure include the two abutments and the center pier (see Figure 7). These features were originally constructed in 1845, and have been rehabilitated since that time. The work involved in Phase I included some repair/rehabilitation of the pier.

Figure 7. Remaining abutments and pier, looking north (October 2007)

4.3.3 Methodology

In this environmental assessment, impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the CEQ regulations. These impact analyses are intended to comply with the requirements of the National Environmental Policy Act.

Compliance with Section 106 of the NHPA was advanced during Phase 1 of the project. Implementation of a Memorandum of Agreement that resulted from the Section 106 process continues concurrently for the Preferred Alternative.

Impacts to historic structures were identified and evaluated by: (1) Determining the Area of Potential Effect (APE); (2) Identifying cultural resources present in the APE; (3) Applying how the action affects the cultural resource; and (4) Considering ways to avoid, minimize, or mitigate adverse effects. CEQ regulations and DO #12 also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (e.g. reducing the intensity of an impact from major to moderate or minor).

The NPS Management Policies (NPS 2006) call for the treatment of historic structures to be based on sound preservation practice to enable the long-term preservation of a structure's historic features, materials and qualities. For purposes of analyzing potential impacts to historic structures/buildings, the thresholds of change for the intensity of an impact are defined as follows:

Negligible: Impact(s) is at the lowest levels of detection - barely perceptible and not measurable.

Minor: **Adverse** - Impact would not affect the preservation of the structure's historic features, materials or qualities.

Beneficial - Stabilization/ preservation of character defining features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Moderate: **Adverse** - Impact would alter a character defining feature(s) of the structure or building but would not diminish the overall integrity of the resource.

Beneficial – Rehabilitation of a structure or building in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

Major: **Adverse** - Impact would alter a character defining feature(s) of the structure or building, diminishing the integrity of the resource.

Beneficial – Restoration of a structure or building in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

4.3.4 Alternative 1 – No Action

Direct Impacts –There would be no impact to the remaining features of the aqueduct structure other than normal deterioration over time. This would be a Negligible impact.

Indirect Impacts – Since the existing conditions include two steel pipes to convey water to the northern portion of the canal, the 4-mile watered portion of the canal would continue to function and there would be a Negligible impact on the associated canal structures.

Cumulative Impacts - The 2007 Phase I work removed the most recent superstructure of the Tinkers Creek Aqueduct. This was performed as an emergency action due to the advanced deterioration of the superstructure. The work did go through the consultation process of Section 106 of the National Historic Preservation Act, and was determined to have an "adverse effect" on Tinkers Creek Aqueduct and the Ohio & Erie Canal. This impact would be considered long-term Major Adverse impact under the methodology used in this EA. Proposed mitigation of the Phase I impact is documented in an MOA and includes the "replacement of the existing aqueduct with a contemporary-but-compatible structure using the historic abutments and center pier" along with the stipulations summarized in Section 1.2.2. The No Action Alternative would not complete the proposed mitigation or the MOA stipulation of a Wayside Exhibit. The abutments and pier of the aqueduct structure would remain, and HAER documentation has been accomplished that would assist in the interpretation of those features, but the remainder of the proposed mitigation from Phase I would not be accomplished. This alternative, with some mitigation accomplished from the long-term Major Adverse impact of Phase I, would result in a long-term Moderate Adverse cumulative impact to the historic aqueduct structure.

Conclusions – While there are Negligible direct and indirect impacts, the No Action Alternative would prevent the completion of the proposed mitigation from the impact of the Phase I construction resulting in a long-term Moderate Adverse cumulative impact. Since the abutments and pier from the structure would remain intact, and there is complete HAER documentation, there would be no impairment of the Tinkers Creek Aqueduct structure.

4.3.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – This alternative would replace the current steel pipes "with a contemporary-but-compatible structure using the historic abutments and center pier," which is part of the proposed mitigation for the adverse effect documented in the MOA with the Ohio SHPO. While not specified in the MOA, coordination with the SHPO has established that the rehabilitation of the existing masonry substructures will be done in a manner that maintains an acceptable degree of historical accuracy and is consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties. This would mitigate the long-term Moderate Adverse cumulative impact in the No Action Alternative and would therefore be considered a long-term Moderate Beneficial direct impact.

Indirect Impacts – There would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – Following on the discussion of cumulative impacts under the No Action Alternative, the construction of a new aqueduct superstructure would complete the proposed work documented in the MOA with SHPO. The overall result would therefore be a mitigated long-term Major Adverse cumulative impact.

Conclusions – Alternative 2 would result in a long-term Moderate Beneficial direct impact, which would result in an overall mitigated long-term Major Adverse cumulative impact to the historic Tinkers Creek Aqueduct structure. There would be no impairment of this structure.

4.4 Cultural Landscapes

4.4.1 Regulations and Policies

National Park Service guidelines for cultural resource management are derived from a series of laws, regulations, and policies (see Section 4.3.2). Of particular importance is the enabling legislation establishing each park for a specific purpose. As previously stated in this document, CVNP was created by Congress in 1974 as Cuyahoga Valley National Recreation Area for the purpose of "preserving and protecting for public use and enjoyment, the historic, scenic, natural, and recreational values" of the Cuyahoga Valley (Public Law 93-555, 1974). Cultural Resource management at CVNP primarily concentrates on the preservation and protection of historic and scenic values of which the cultural landscape is part.

Specific standards and guidelines for the treatment of cultural landscapes are provided in The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes. Additionally, *NPS Management Policies* (NPS 2006) and *Cultural Resource Management Guidelines* (NPS 1997), state that all cultural landscapes are to be managed as cultural resources regardless of the type or level of significance. Management actions are to focus on preserving the physical attributes, biotic systems, and uses of a landscape as they contribute to historic significance.

4.4.2 Affected Environment

In the Park's "Cultural Landscape Report" (NPS 1987), one of the six primary cultural landscape themes is "transportation." The most distinctive transport feature is the remains of the Ohio & Erie Canal. The Tinkers Creek Aqueduct is a primary feature in a four-mile section of the canal that generally retains its historic appearance, and is a component of the canal landscape of the Park. These features have also been designated as a National Historic Landmark. Besides the Tinkers Creek Aqueduct, other components include the canal itself, Alexander Mill, the Lock Tender's House (currently the Canal Visitor Center), and Locks 37 and 38.

Phase I of the aqueduct replacement project (see Section 1.2.2) included removal of the existing truss superstructure, timber trough, conveyance pipes and Towpath Trail Bridge. To maintain proper water levels in the Ohio & Erie Canal on either side of Tinkers Creek, the conveyance pipes were replaced with two steel flume pipes and a riser and outflow structure was constructed.

4.4.3 Methodology

A cultural landscape is a geographic area, including both natural and cultural resources associated with a historic event, activity or person. The cultural landscape is a tangible manifestation of human actions and beliefs that has been set against and within the natural landscape. Preservation treatments should seek to protect and preserve the historic character of a landscape over time through maintaining the continuity of distinctive characteristics; therefore, emphasis is placed on maintaining the character and feeling of the landscape rather than on preserving a specific appearance or time period.

Analyses of the potential intensity of impacts on the canal theme cultural landscape in the area affected by the Tinkers Creek Aqueduct were derived from the available information on the Park and the professional judgment of the Park resource specialists. The duration for short-term impacts to the cultural landscape was determined to be six months, the anticipated duration of construction.

For purposes of analyzing potential impacts to cultural landscapes, the thresholds of change for the intensity of an impact are defined as follows:

Negligible: Impact(s) is at the lowest levels of detection - barely perceptible and not measurable.

Minor: **Adverse** - Impact(s) would not affect the character-defining patterns and features of the cultural landscape.

Beneficial –The action would preserve the character defining patterns and features of the cultural landscape and allow for its satisfactory protection, maintenance and interpretation.

Moderate: **Adverse** - Impact(s) would alter a character defining pattern(s) or feature(s) of the cultural landscape but would not diminish the integrity of the landscape.

Beneficial – Rehabilitation of a landscape or its patterns and features for contemporary use and would retain its essential features, integrity and character.

Major: **Adverse** - Impact(s) would alter a character defining pattern(s) or feature(s) of the cultural landscape, diminishing the integrity of the landscape to the extent that the general character and feeling is changed.

Beneficial – Restoration of a landscape that would improve and preserve its essential features, integrity and character.

4.4.4 Alternative 1 – No Action

Direct Impacts - There would be no impact to the transportation/canal landscape pattern other than normal deterioration over time or the remaining aqueduct features. This would be a Negligible impact.

Indirect Impacts – Since the other sections of the canal are maintained by the existing steel pipes, there would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – As discussed in Section 4.3.4, the 2007 Phase I work removed the most recent superstructure of the Tinkers Creek Aqueduct. The pipes installed during Phase I construction maintain the watered portion of the canal along with its cultural landscape features. The aqueduct site, however, no longer retains the look of a historic aqueduct. The mitigation proposed for the historic structure would also mitigate impacts to the cultural landscape at this

location, and the No Action Alternative would not complete the proposed mitigation. This alternative would therefore result in a partially mitigated long-term Moderate Adverse impact to the cultural landscape at the aqueduct location.

Conclusions – The No Action Alternative would result in a Negligible direct impact and there would be no anticipated indirect impacts. The No Action Alternative would prevent the completion of the proposed mitigation from the Phase I project, retaining a long-term Moderate Adverse cumulative impact. There would be no impairment of the Tinkers Creek Aqueduct structure.

4.4.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – While not a historic reproduction, this alternative would replace the current steel pipes "with a contemporary-but-compatible structure using the historic abutments and center pier," which is part of the proposed mitigation for the adverse effect documented in the MOA with the Ohio SHPO. This would restore the look of the historic aqueduct to this location. This would mitigate the long-term Moderate Adverse cumulative impact in the No Action Alternative and would therefore be considered a long-term Moderate Beneficial direct impact.

Indirect Impacts – Since the other sections of the canal would be maintained by the aqueduct structures, there would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – Following on the discussion of cumulative impacts under the No Action Alternative, the construction of a new aqueduct structure would restore the look of a historic aqueduct following the removal of the previous structure. The overall result would therefore be a long-term Minor Adverse (or a mitigated long-term Moderate Adverse) cumulative impact.

Conclusions - Alternative 2 would result in a long-term Moderate Beneficial direct impact, which would result in an overall mitigated long-term Moderate Adverse cumulative impact to the historic aqueduct cultural landscape at Tinkers Creek. There would be no impairment of this cultural landscape.

Figure 8. Existing Conditions, looking northwest (June 2008)


Figure 9. Photosimulation of Alternative 2.

4.5 Health and Safety

4.5.1 Regulations and Policies

The NPS Management Policies (NPS 2006) state that the NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. Section 8.2.5.1 also states that, "While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessionaires, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees." Furthermore, the NPS will strive to protect human life and provide for injury-free visits (NPS 2006, Section 8.2.51). Director's Order #83: Public Health provides additional guidance.

4.5.2 Affected Environment

The Tinkers Creek Aqueduct is located along the Ohio & Erie Canal, between the Cuyahoga River and Canal Road. The Canal Road bridge over Tinkers Creek is located 40 feet upstream of the aqueduct location. Visitors using the Towpath Trail are separated from the traffic on Canal Road. The Towpath Trail Bridge over Tinkers Creek was constructed in 2007 as part of Phase I. It provides a safe crossing over Tinkers Creek to trail users without having to walk along Canal Road.

4.5.3 Methodology

The methodology on human health and safety involves relative levels of risk invoked by conditions potentially resulting from the alternatives. The potential for change in human health and safety was evaluated by identifying the projected change in risk of potential human health and safety related impacts attributable to either alternative. For each alternative, a judgment was made as to the potential for impact based on previous experience of projects of similar scope and characteristics. This potential impact was then characterized by type (beneficial or adverse), context (site-specific, local or regional), duration (short term or long term) and intensity.

For purposes of analyzing potential impacts to health and safety, the thresholds for the intensity of an impact are defined as follows:

Negligible: The impact to human health and safety would not be measurable or perceptible.

Minor: **Adverse.** The impact would be measurable or perceptible, and it would be limited to a relatively small number of people in localized areas. Impacts to human health and safety could be realized through a minor increase in the potential for conflicts in current accident areas.

Beneficial. Conditions would cause a measurable or perceptible improvement that would be limited to a relatively small number of people in localized areas. Such impacts to human health and safety could be realized through a minor decrease in the potential for conflicts in current accident areas.

Moderate: **Adverse.** The impact to human health and safety would be sufficient to cause a permanent increase in accident rates in existing low-accident locations, or to create the potential for additional human conflicts in areas that currently do not exhibit noticeable human conflict trends.

Beneficial. The impact to human health and safety would be sufficient to cause a permanent decrease in accident rates in existing high-accident locations, or to create the potential for fewer human conflicts in areas that currently exhibit noticeable human conflict trends.

Major: **Adverse.** The impact to human health and safety would be substantial through the creation of new areas with a high potential for serious accidents or hazards.

Beneficial. The impact to human health and safety would be substantial through the elimination of potential hazards.

4.5.4 Alternative 1 – No Action

Direct Impacts - The No Action Alternative would have a Negligible impact on the health and safety of visitors and staff. The current Towpath Trail Bridge was constructed in 2007 and provides safe crossing of Tinkers Creek for trail users. The trail is located a safe distance from the adjacent Canal Road.

Indirect Impacts – There would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – At times in the past, the Towpath Trail did not have its own continuous crossing over Tinkers Creek. Trail users had to share the Canal Road Bridge to cross Tinkers Creek, which is a potential hazard to trail users. With the construction of the Towpath Trail Bridge in Phase I, the potential hazard was removed for a long-term Minor Beneficial impact. The No Action Alternative would maintain that benefit.

Conclusions – There are Negligible direct impacts and no indirect impacts associated with the No Action Alternative. The alternative would maintain the long-term Minor Beneficial cumulative impact of the new Towpath Trail Bridge constructed in 2007.

4.5.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – Construction of the new aqueduct structure would require the use of heavy construction equipment. Even with safety measures implemented at the construction site, such construction would involve temporary hazards to visitors and staff, as well as to the construction workers. The current Towpath Trail Bridge is too close to the aqueduct construction site for concurrent safe use and it would also need to be temporarily removed during the construction process to ensure it would not be damaged during construction of the new aqueduct superstructure. A detour would therefore be provided during construction for Towpath Trail users who would once again need to cross Tinkers Creek on the Canal Road Bridge. Such impacts would be temporary and rated as short-term Minor Adverse. Impacts to visitor use and experience involved with closing the Towpath Trail for safety reasons are covered in Section 4.6.

There is little potential to encounter buried hazardous materials or contaminated wastes during construction. The entire site was recently excavated for the construction of Phase I and no such materials were encountered.

Indirect Impacts – During construction, certain operations will necessitate closing the Towpath Trail temporarily. This could cause more users to divert to other sections of the Towpath Trail, putting additional use pressures on those areas. It is possible that such closures could be concurrent with those from construction of the Fitzwater Bridge to the south. Still, in light of all of the other trails available and the very short detour length, this impact should be Negligible.

Cumulative Impacts – As discussed for the No Action Alternative, with the construction of the Towpath Trail Bridge in Phase I, a potential hazard was removed for a long-term Minor Beneficial impact to Towpath Trail users. Construction activity would add a short-term Minor Adverse impact over a temporary duration. The long-term impacts on health and safety for visitors and staff would be to maintain the long-term Minor Beneficial cumulative impact.

Conclusions – There would be a short-term Minor Adverse potential impact on the health and safety of visitors and staff during construction of this alternative, with a potential for Negligible indirect impact to other trail segments for short periods of time. Following these temporary impacts, the long-term Minor Beneficial cumulative impact of the new Towpath Trail Bridge constructed in 2007 would be restored.

4.6 Visitor Use and Experience

4.6.1 Regulations and Policies

NPS Management Policies (NPS 2006) state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks, and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. The NPS Management Policies (NPS 2006) provides the basic service-wide policies on visitor use and recreation activities (Section 8.2.2), visitor safety (Section 8.2.5), and interpretation and educational activities (Section 7.1).

4.6.2 Affected Environment

The Park is comprised of a largely forested landscape bisected by the Cuyahoga River, interspersed with old fields, agriculture, and historic buildings and features. The abundant scenic resources of the Park, within an hour's drive of three cities (Cleveland, Akron and Canton), containing about 4 million people, make it an attractive destination, as well as a respite from the bustle of city life. Evidence of the long history of use by humans is contrasted by the large tracts of more natural areas. Scenic views and vistas from either side of the valley reveal patterns of nature and of humans. Visitors also enjoy parts of the Park because of what they do not experience there - industry, signs, noise, light pollution.

Visitors come to CVNP to use and experience the Park in many different ways, but these translate into what they come to "see" and "do." These park resources can be divided into two main categories: scenic values and recreational activities. Annual Visitor Use Surveys conducted by the NPS provide information about the multitude of reasons why visitors come to CVNP, which include various types of recreational activities, educational programs, and relaxing and enjoying nature.

Figure 10. Visitors using the Towpath Trail Bridge (August 30, 2009)

Walking, running, biking, and hiking on the Ohio & Erie Canal Towpath Trail is very popular. Indeed, the Towpath Trail is probably the most significant recreational resource in the Park. When the Towpath Trail reconstruction was completed in 1993, park visitation increased by 1 million visitors that year alone (Schleicher et al. 1994). Annual park visitation in 2007 was 2.5 million. More than 100 miles of other trails traverse the CVNP landscape.

Besides the enjoyment of the trail itself, visitors can enjoy the cultural landscape for canals in this overall section of the trail (see Section 4.4.2).

4.6.3 Methodology

The purpose of this impact analysis is to determine if the alternatives are compatible or in conflict with the purpose of the Park, its visitor use/experience goals, and the direction provided by NPS Management Policies (NPS 2006). Thus, these policies and goals were integrated into the impact thresholds.

The potential for change in visitor use/experience was evaluated by identifying projected changes in use of the Towpath Trail in the vicinity of the aqueduct. For each alternative, a judgment was made as to the potential for impact based on previous experience of projects of similar scope and characteristics. This potential impact was then characterized by type (beneficial or adverse), context (site-specific, local or regional), duration (short term or long term) and intensity.

Impact to visitor use/experience of the Towpath Trail and the aqueduct would result from construction activities. Such activities could cause the temporary closing of the facilities for the safety of visitors. The construction activities could also involve temporary dirt, dust, noise, barricades and other activities common to construction sites, which are not compatible with the natural setting of CVNP. The activities would therefore produce adverse impacts.

For purposes of analyzing potential impacts to visitor use/experience, the thresholds for the intensity of an impact are defined as follows:

Negligible: Visitors would not likely be aware of the effects associated with changes resulting from the alternative.

Minor: **Adverse.** Visitors would likely be aware of the adverse effects associated with changes resulting from the alternative; however the decrease in visitor use and experience would be slight and likely short term. Other areas in the Park would remain available for similar visitor use/experience and use without impairment of Park resources and values.

Beneficial. Visitors would likely be aware of the beneficial effects associated with changes resulting from the alternative; however the increase in visitor use and experience would be slight and likely short term.

Moderate: **Adverse.** Visitors would be aware of the adverse effects associated with changes resulting from the alternative. Decrease in visitor use and experience would be readily apparent and likely long term. Other areas in the Park would remain available for similar visitor use/experience and use without impairment of Park resources and values, but visitor dissatisfaction might be measurably affected. Some visitors who desire to continue their use and enjoyment of the

activity/visitor experience would be required to pursue their choice in other available local or regional areas.

Beneficial. Visitors would be aware of the beneficial effects associated with changes resulting from the alternative. Increase in visitor use and experience would be readily apparent and likely long term.

Major: **Adverse.** Visitors would be highly aware of the adverse effects associated with changes resulting from the alternative. Decreases in visitor use and experience would be readily apparent and long term. The decrease in visitor use and experience proposed in the alternative would preclude future generations of some visitors from enjoying Park resources and values. Some visitors who desire to continue their use and enjoyment of the activity / visitor experience would be required to pursue their choice in other available local or regional areas.

Beneficial. Visitors would be highly aware of the beneficial effects associated with changes resulting from the alternative. Increases in visitor use and experience would be readily apparent and long term.

4.6.4 Alternative 1 – No Action

Direct Impacts - With the construction of the new trail bridge over Tinkers Creek in 2007, visitor use and enjoyment of the Towpath Trail was improved. Use of the trail would continue under the No Action Alternative; however, the enjoyment would not include a view of a cultural landscape that includes an aqueduct structure. This would be a long-term Minor Adverse impact.

Indirect Impacts – There would be no indirect impacts anticipated for this alternative.

Cumulative Impacts – As discussed in Section 4.5.4, construction of Phase I in 2007 included a new Towpath Trail Bridge over Tinkers Creek. Besides improving health and safety, this feature has improved visitor enjoyment for this section of the Towpath Trail. As discussed in Section 4.3.4, the 2007 Phase I work replaced the most recent superstructure of the Tinkers Creek Aqueduct with steel pipes that maintain the watered portion of the canal along with its cultural landscape features. The location of the aqueduct, however, no longer retains the look of a historic aqueduct. Overall then, the 2007 construction of Phase I was a long-term Minor Beneficial impact to visitor use and experience. This alternative would maintain this impact to visitor use and experience.

Conclusions – The No Action Alternative would have a long-term Minor Adverse impact on visitor use and experience. It would also maintain the long-term Minor Beneficial cumulative impact from the 2007 Phase I construction.

4.6.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – As discussed in Section 4.5.5, construction of the new aqueduct structure would involve temporary hazards to visitors, and occasional temporary closure of the Towpath Trail during certain construction operations. The detours and occasional closings would be an inconvenience for visitors, and during such times, visitors may opt to utilize other portions of the Towpath Trail or one of the many other trails in the area. Such impacts would be temporary and rated as short-term Minor Adverse.

Upon completion of construction, the beneficial impact if the trail bridge over Tinkers Creek Aqueduct would be reinstated. The visitor experience would be enhanced by the completion of the Tinkers Creek Aqueduct that would provide the cultural landscape of that historic site (see Section 4.4). The overall impacts would therefore be a long-term Minor Beneficial impact to visitor use and experience.

Indirect Impacts – During construction, certain operations will necessitate closing the Towpath Trail temporarily. This could cause more users to divert to other sections of the Towpath Trail, putting additional use pressures on those areas. It is possible that such closures could be concurrent with those from construction of the Fitzwater Bridge to the south. Still, in light of all of the other trails available, this impact should be Negligible.

Cumulative Impacts – The minor beneficial use from the 2007 Phase I construction of the Towpath Trail Bridge over Tinkers Creek would be followed with an additional long-term Minor Beneficial impact from the construction of a new aqueduct structure for an overall long-term Moderate Beneficial cumulative impact to visitor use and experience.

Conclusions – Following a short-term Minor Adverse temporary direct impact, the long-term Minor Beneficial direct impact would supplement the previous long-term Minor Beneficial past impact of the Phase I project for an overall long-term Moderate Beneficial cumulative impact to visitor use and experience.

4.7 Park Operations

4.7.1 Regulations and Policies

Section 1.9.5.2 of the NPS Management Policies (NPS 2006) state:

> *The National Park Service will provide visitor and administrative facilities that are necessary, appropriate, and consistent with the conservation of park resources and values. Facilities will be harmonious with park resources, compatible with natural processes, esthetically pleasing, functional, energy- and water-efficient, cost-effective, universally designed, and as welcoming as possible to all segments of the population. Park facilities and operations of all sizes will demonstrate environmental leadership by incorporating sustainable practices to the maximum extent practicable in planning, design, siting, construction, and maintenance.*

Section 1.9 of the NPS Management Policies (NPS 2006) address park facilities, and state that the Service must, ". . . avoid the future operation and maintenance costs of unnecessary or ineffective facilities, regardless of how the asset investment is funded. The Service must also recognize the ongoing operations and maintenance costs of its facilities and be able to sustain them over time."

4.7.2 Affected Environment

The NPS resources involved include the Ohio & Erie Canal, the Towpath Trail, the Towpath Trail Bridge over Tinkers Creek, and the remaining substructure components of the Tinkers Creek Aqueduct. These are all adjacent and parallel to Canal Road, which offers ready access for maintenance activities. The area surrounding the Ohio & Erie Canal and the Towpath Trail is maintained as mowed grass.

The two steel pipes constructed in 2007 as part of Phase I convey and maintain water in the canal between Locks 37 and 38. The riser and outflow structures installed in 2007 allow excess water to flow out of the canal prism during flood events (see Figures 11 and 12). These structures were designed to be temporary features that would be removed as part of Phase II.

Since the location of the aqueduct is 400 feet upstream of the Cuyahoga River, there is little threat of erosion from that river. There are no observable trends of long term scour at the substructure components of the aqueduct that remain at the site.

Figure 11. Riser in canal south of aqueduct draining high water (April 2009)

Figure 12. Outflow structure draining high water from canal into Tinkers Creek (April 2009)

4.7.3 Methodology

A Value Analysis was prepared for alternative aqueduct designs that included an evaluation of operational efficiency and sustainability. One major aspect of this included maintainability, which is defined as durability of improvements and the service life of the structure. This includes such factors as shop fabrication and on-site construction quality, corrosion resistance, need for re-painting, ease of repair, and resistance to debris impact. The other major aspect included operations system, which included consideration of the level of maintenance requirements, the life-cycle costs and the amount of debris removal required. Analyses of the potential intensity of impacts to Park operations were derived from the available information and best professional judgment. The duration of construction of the build alternative is estimated to be six months; therefore, the duration of any short term impacts is six months.

For purposes of analyzing potential impacts to Park operations, the thresholds for the intensity of an impact are defined as follows:

Negligible: The impact would not have a detectable effect on Park operations.

Minor: **Adverse.** The impact on Park operations would be detectable and would be of a magnitude that would not have an appreciable effect on Park operations.

Beneficial. A beneficial change of similar magnitude to a Minor Adverse impact on Park operations.

Moderate: **Adverse.** The impact on Park operations would be of a magnitude that would cause an appreciable effect on Park operations, such as the need for additional materials and equipment or permanent additions to the Park maintenance staff.

Beneficial. A change that would cause an appreciable benefit to Park operations, such as savings in equipment and materials and in Park maintenance manpower.

Major: **Adverse.** The impact on Park operations would be of a magnitude that would cause a substantial burden on Park operations.

Beneficial. A beneficial change of similar magnitude to a Major Adverse impact on Park operations.

4.7.4 Alternative 1 – No Action

Direct Impacts – Some of the existing facilities at the Tinkers Creek Aqueduct site would require very little effort to maintain. The steel pipes would last in place with occasional vegetation removal. The remaining substructure components of the aqueduct would gradually deteriorate over time (see Section 4.3.4). The riser and outflow structure installed in 2007 was designed to be temporary. If left in place, they would require periodic repairs and replacement in 50 years. The direct impact of the No Action Alternative on Park operations would therefore be long-term Minor Adverse.

Indirect Impacts – The two existing pipes were installed to maintain water in the canal prism between Locks 37 and 38, but nothing was installed to replace the waste gates in the previous aqueduct superstructure. Should it be needed, dewatering of the canal prism in this area would be accomplished by blocking the canal prism at the spillway at Lock 37 and discharging flow through the waste gate structure just south of Lock 37 and by opening the upstream set of gates at Lock 38. Any remaining water would have to be pumped. This would be a long-term Minor Adverse indirect impact.

Cumulative Impacts – One characteristic of the Tinkers Creek Aqueduct over the years has been the frequent need for rehabilitation and repair. The steel pipes constructed in 2007 as part of Phase I greatly decreased the amount of maintenance and expenditure of Park resources from that of the aqueduct superstructure. This would be somewhat offset by the anticipated maintenance needs of the temporary riser and outflow structure.

Conclusions - The direct and indirect impacts of the No Action Alternative would be long-term Minor Adverse.

4.7.5 Alternative 2 – Construct New Aqueduct Structure

Direct Impacts – A Value Analysis, including a lifecycle cost analysis, was performed on various design options for a new aqueduct structure. The analysis also included evaluation of sustainable design values such as minimizing site disturbance, utilizing sustainable materials, and promotion of functional and aesthetic qualities. Some of the attributes of the selected design include superior hydraulic characteristics (less snagging and trapping of debris and sediment), a high resistance to debris impact, and ease of future repair. The rehabilitation of the substructure components and the new superstructure would be designed to resist scour from Tinkers Creek flood events. With proper maintenance, the new aqueduct structure should last for an estimated 75 years, and this maintenance would include only such tasks as a biennial inspection, replacing expansion seats every 15 years, and a reapplication of waterproofing every 15 years. This would be a long-term Moderate Beneficial direct impact.

Indirect Impacts – The new aqueduct structure would be designed to include two 24" diameter waste gates that would be located in the west wall of the south transition structure. These replace the operational functionality that was available in the previous aqueduct superstructure. This would be a long-term Moderate Beneficial impact.

Cumulative Impacts – As discussed for the No Action Alternative, throughout its history, the Tinkers Creek Aqueduct has needed frequent repairs and rehabilitations. This is common with aqueduct structures in general since they must typically be located at elevations where they must endure frequent flood flows. The new aqueduct would be designed to better withstand these conditions without the need for frequent repairs and rehabilitations.

Conclusions – Construction of a new aqueduct structure would result in a long-term Moderate Beneficial direct impact and a long-term Moderate Beneficial indirect impact on Park operations.

5.0 CONSULTATION AND COORDINATION

5.1 Public Involvement

External scoping was conducted with federal, state, and local agencies, along with solicitation for public comment in the region surrounding CVNP. A request for public comment and project description was posted on the NPS PEPC website at http://parkplanning.nps.gov/ from July 7, 2009 to July 31, 2009. A notice was also published in the Akron Beacon Journal on July 13, 2009 requesting comments on the scope of the project and impact topics.

Four comments were received from the public. Most favored the proposal to replace the existing steel pipes with a new aqueduct. One commenter felt the pipes were adequate and was concerned a new structure would promote flooding upstream by catching debris the way the historic iron and steel aqueduct did. This is addressed in Section 4.1. Those favoring replacement wanted a structure that was visually pleasing. One asked about the feasibility of filling the canal. This concern is addressed in Section 3.3.1.

5.2 Agencies and Organizations Contacted During the EA Process

Appendix B includes a list of agencies and organizations contacted during the scoping process.

5.3 Prepares and Contributors

Name	Title/Responsibility	Education	Experience
National Park Service, Cuyahoga Valley National Park			
Robert W. Bobel, P.E.	Park Engineer	B.S. Civil Engineering	15 years consultant; 22 years NPS
Kevin Skerl	Ecologist/NEPA Coordinator	B.S. Wildlife Biology M.S. Conservation Biology	3 years, non-profit conservation 11 years, NPS
Lisa Petit	Chief, Resource Management Division	B.S. Zoology M.S. Biology Ph.D Zoology	8 years Federal research; 7 years NPS
Consultants - Bergmann Associates			
Kenneth R. Avery, P.E.	Water Resources Segment Leader	B.S. Civil & Environmental Engineering M.S. Water Resources Engineering	32 years, consultants
James F. Boggs	Senior Environmental Scientist, Principal Author	B.S. Biology/Geology M.S. Natural Resources Management	31 years, consultants

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